HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Washougal Late-Winter Steelhead - Skamania Hatchery (Integrated)
Species or Hatchery Stock:	Washougal River Winter Steelhead (*Oncorhynchus mykiss*)
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Washougal River/Lower Columbia River
Date Submitted:	November 27, 2024
Date Last Updated:	November 27, 2024

This page purposely left blank

Executive Summary

The Washington Department of Fish and Wildlife is submitting a Hatchery and Genetic Management Plan (HGMP) for the Washougal River winter steelhead program out of Skamania Hatchery to the National Marine Fisheries Service (NMFS) for consultation under Section 4(d), Limit No. 5 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 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. The Mitchell Act programs are intended to support Northwest fishing economies 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 Lower Columbia Salmon Recovery Plan (LCSRP). WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River Fisheries Management and Evaluation Plan (FMEP) (WDFW 2003). Most tributary fisheries and some mainstem salmon/steelhead fisheries are currently managed as mark-selective (no wild retention) fisheries to minimize the impact on listed wild fish.

This is an integrated conservation/harvest program with the purpose to produce hatchery fish from Washougal River endemic winter steelhead for sustainable escapement to the watershed to provide demographic support for the Washougal wild winter steelhead population while providing recreational fisheries currently under mark-selective fishery regulations.

Broodstock Collection, Rearing, and Release:
Broodstock will be collected from natural origin and integrated program F1 progeny adults returning to the Washougal River basin. Natural origin Washougal winter steelhead are preferred with F1 hatchery origin fish used if needed. Skamania Hatchery swim-in, Washougal Hatchery swim-in, and Washougal Hatchery Intake Trap are the primary collection locations. Other broodstock collection methods such as angling, seining or alternative trapping methodologies may be utilized. Broodstock collection will occur over the entire duration of the run.
The number of adults that will be utilized for brood is estimated to be 42 adults with a female fecundity of 4,500 eggs/female, with an estimated adult holding mortality of 6% and an average of 30% mortality from green egg to smolt release. All juveniles will be reared on-site at Skamania Hatchery. All smolts are released by being loaded into transfer tanks via fish pump and released either into the West Fork Washougal are near the adult fish ladder entrance at Skamania Hatchery or trucked down river for direct release in years with low WF Washougal river flows. Direct release infrastructure is not currently available. Smolt releases will begin in April and may continue through May.

Harvest:
Tribal and non-Tribal commercial and recreational fisheries directed at salmon and steelhead produced through WDFW hatchery releases are managed to minimize incidental impacts to ESA-listed Chinook salmon, coho salmon, chum salmon, and steelhead. Each year state and tribal co-managers plan and agree to a package of recreational and commercial salmon fisheries in consultation with federal and Canadian fishery managers. These pre-season planning processes, known as the Pacific Fishery Management Council (PFMC), North of Falcon (NOF), and Pacific Salmon Commission (PSC) planning processes, involve a series of public meetings between domestic and international federal, state, tribal and industry representatives and other concerned citizens.

Operation and Maintenance of Hatchery Facilities:

Water rights for the purpose of fish propagation at Skamania Hatchery are formalized through the Washington Department of Ecology (WDOE). The facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit and operates within the limitations established in its permit administered by WDOE-WAG 13-1026. This facility operates under the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006), which details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.

Monitoring, Evaluation, and Adaptive Management:

Results of research, monitoring and evaluation activities will be reported via annual and semi-annual reports associated with the Mitchell Act Biological Opinion (BiOp) and the WDFW's Columbia River Fisheries Development Program contract with NOAA Fisheries, respectively. Results will be reviewed annually by WDFW hatchery and fishery managers and compared to program performance goals and BiOp limits to determine if adaptive management is needed.

SECTION 1 _ GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Washougal Late-Winter Steelhead - Skamania Hatchery

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

Washougal River Winter Steelhead (*Oncorhynchus mykiss*)

ESA Status: "Threatened" March 19, 1998 (63FR13347); reaffirmed on January 5, 2006 (70FR37160); Reaffirmed August 15, 2011 (76FR50448; updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

1.3) Responsible organization and individuals

Hatchery Operations Staff Lead Contact

Name (and title): Aaron Roberts, Operations and Hatchery Reform Manager
Agency or Tribe: Washington Department of Fish & Wildlife
Address: 111 Merwin Hatchery Ct, Ariel WA 98603-9727
Telephone: (360) 225-4390
Email: Aaron.Roberts.dfw.wa.gov

Fish Management Staff Lead Contact

Name (and title): Kevin Young, Region 5 Regional Hatchery Operation and Reform Manager
Agency or Tribe: Washington Department of Fish & Wildlife
Address: 5525 S 11th St, Ridgefield WA 98642
Telephone: (564) 220-6393
Email: Kevin.Young@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/funder of Mitchell Act Columbia River Fisheries Development Program

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

Funding Sources	Operational Information
	Full time equivalent staff – 3.42
Mitchell Act	Annual operating cost (dollars) - $575,296

The above information for full-time equivalent staff and annual operating cost applies cumulatively to Washougal/Skamania Hatchery Anadromous Fish Programs and is not broken out specifically by program.

1.5) Location(s) of hatchery and associated facilities.

Broodstock Source: Winter Steelhead (*Oncorhynchus mykiss*) Washougal River Stock ESA Status: "Threatened" March 19, 1998 (63FR13347); reaffirmed on January 5, 2006 (70FR37160); Reaffirmed August 15, 2011 (76FR50448); updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

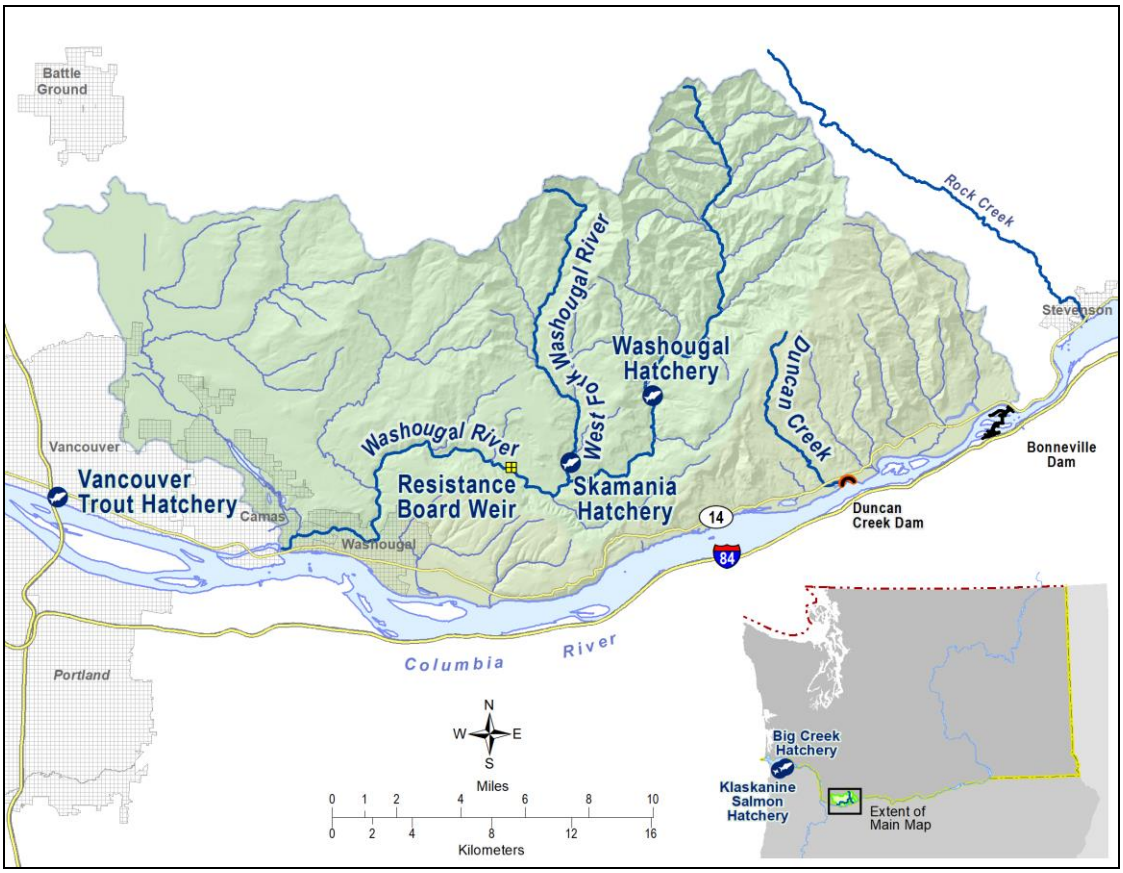

Figure 1.5.1: WDFW hatchery facilities in the Washougal Basin utilized for the Skamania Winter Steelhead program. Source: WDFW GIS Unit 2018.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Skamania Hatchery	Broodstock collection, Adult holding, Spawning, Rearing, Acclimation, Release	WF Washougal River (WRIA 28.0232) at RKm 1.63; tributary to the Washougal River (WRIA 28.0160) at R.M.14.4; tributary to the Columbia River via Camas Slough (WRIA 28.0154) at R.M. 118.1, Lower Columbia River, Washington.

1.6) Type of program.

Integrated Conservation/Harvest.

1.7) Purpose (Goal) of program.

Mitigation/Augmentation.

The purpose of the program is to produce hatchery fish from Washougal River endemic winter steelhead for sustainable escapement to the watershed to provide demographic support for the Washougal wild winter steelhead population while providing recreational fisheries currently under mark-selective fishery regulations.

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.

The Mitchell Act programs are intended to support Northwest fishing economies 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 *Lower Columbia Salmon Recovery Plan* (LCSRP).

WDFW protects listed fish and provides harvest opportunity on hatchery fish through the Lower Columbia River *Fish Management and Evaluation Plan* (FMEP) (WDFW 2003). Most tributary fisheries and some mainstem salmon/steelhead fisheries are currently managed as mark-selective (no wild retention) fisheries to minimize the impact on listed wild fish.

In order to minimize impact on listed fish by WDFW facilities operation, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Washougal/Skamania winter steelhead program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights are formalized through trust water right S2-*12684CWRIS from the Department of Ecology. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	WDFW secured funding to begin work in 2012 on a new river intake system, the work was completed in late 2012 and met NMFS screening criteria at that time (NMFS 2011). WDFW will need to evaluate the structure for compliance with newer criteria (NMFS 2022b).
Effluent Discharge	4.2	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) administered by the Washington Department of Ecology (DOE) - WAG 13-1026. Discharges are monitored and reported.
Broodstock Collection & Adult Passage	7.9	The hatchery weir and associated intake facilities were rebuilt in 2012 to provide passage compliant with NMFS guidelines (NMFS 2011). Pacific Coast Salmon Recovery Funds (PCSRF) were secured to install a velocity weir/barrier across the river at the entrance to the Skamania Hatchery fish ladder.
Disease Transmission	2.2.3, 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. Visual precocity assessment conducted prior to release.

1.9) List of program "Performance Standards".

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

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

1.10.1) "Performance Indicators" addressing benefits.

Table 1.10.1.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
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 fishery 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 harvest in sport fisheries. Harvest is currently monitored using WDFW's Catch Record Card system.
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. Fishery compliance with ESA is managed with sport fishery regulations that minimize impacts to ESA-listed fish (i.e. mark-selective regulations) and are monitored by WDFW law enforcement officers. The LCR FMEP (WDFW 2003) outlines anticipated encounter rates and expected mortality rates for these fisheries. Natural and hatchery populations are monitored annually to assess key hatchery metrics (i.e., pHOS, pNOB, PNI) to assess compliance with permitted limits.
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.	Annually mass-mark hatchery releases to differentiate hatchery from natural-origin fish (i.e., adipose fin clip). The external mark enables promulgation of mark-selective fisheries, which reduce directed harvest mortality on natural-origin fish.	Monitoring includes QA/QC review during adipose clipping to evaluate and reduce occurrence of mis-clips.

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 natural origin returns to the hatchery and spawning grounds.
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, tags, otolith-mark, other, etc., depending on species) production fish to identify them from naturally produced fish.	Annually monitor and report size, number marked, mass-mark quality (mark rate/tag rate) and date of all hatchery releases by mark type.
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	Annual broodstock collection curves are developed and reviewed in-season to ensure broodstock is collected representatively and systematically throughout the return. Collect annual run timing, age and sex composition and spawn timing data. Adhere to WDFW spawning guidelines (Seidel 1983; Busack and Knudsen 2007)
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 weight (fish per pound), length, number, precocity, and date of release.
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, and length.	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.
Non-monetary societal benefits for which the program is designed are achieved.	Program is designed to help achieve the goals of conserving natural salmon and steelhead populations while maintaining sustainable fishing opportunities.	On-going viable salmon population parameter monitoring and assessment of fishery performance will determine success of program.

1.10.2) "Performance Indicators" addressing risks.

Table 1.10.2.1: "Performance Indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
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.

		Fishery compliance with ESA is managed with sport fishery regulations that minimize impacts to ESA-listed fish (i.e. mark-selective regulations) and are monitored by WDFW law enforcement officers. The LCR FMEP (WDFW 2003) outlines anticipated encounter rates and expected mortality rates for these fisheries. Natural and hatchery populations are monitored annually to assess key hatchery metrics (i.e., pHOS, pNOB, PNI) and compare with permitted limits. Hatcheries and other Adult Collection Facilities monitor in-season handle of natural origin fish for compliance with direct and indirect take limits.
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.	Annually mass-mark hatchery releases to differentiate hatchery from natural-origin fish (i.e., adipose fin clip). The external mark enables promulgation of mark-selective fisheries, which reduce directed harvest mortality on natural-origin fish.	Monitoring includes QA/QC review during adipose clipping to evaluate and reduce occurrence of mis-clips.
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, tags, 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 marked, date of release and mass-mark quality (adipose fin-clip rate) of all hatchery releases.
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 marked, date of release and mass-mark quality (tag rate) of hatchery releases.
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.	Annual broodstock collection curves are developed and reviewed in-season to ensure broodstock is collected representatively and systematically throughout the return.

		Collect annual run timing, age and sex composition and spawn timing data. Adhere to WDFW spawning guidelines (Seidel 1983; Busack and Knudsen 2007)
Life history characteristics of the natural population do not change as a result of the hatchery program.	Life history patterns of adult natural origin returns are stable. Life history characteristics for adults return timing, age and sex composition, spawning timing, and size at return. .	Collect annual run timing, spawn timing, age and sex composition data from returning natural origin and hatchery origin adults for comparison.
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.	Periodic collection of tissue samples to allow for future genetic analysis.
Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.	Collection of natural origin broodstock is less than 33% of the annual natural origin escapement.	Natural origin broodstock collection utilizes in-season collection ratios that prevent more than 33% of the population being collected for broodstock.
Hatchery-origin adults in natural production areas do not negatively affect the total natural spawning population.	Proportionate Natural Influence (PNI) target: 5- year average PNI >0.67.	Annual calculation of PNI to provide for tracking of 5-year average.
Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release).	Annually record and report release information, including location, method and age class in hatchery data systems (WDFW Hatcheries Headquarters Database).
Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volitional or direct).	Annually monitor and record weight(fpp), length, number, visual precocity assessment, release type and date of release.
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. 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*	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. Annual reports indicating levels of compliance with applicable standards and criteria. Periodic site visits by fish health staff to determine level of compliance with applicable standards and criteria.

	and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (Fish Health Policy Chapter 5, IHOT 1995).	
Effluent from hatchery facility will not detrimentally affect natural populations.	NPDES permit standards.	Discharge water quality compared to applicable water quality standards by NPDES permit. Flow and discharge reported in monthly NPDES reports.
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.	Compliance with Water Right Permit. Water withdrawals and structures compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	WDFW water withdrawals are maintained within permitted levels. Barrier and intake structure passage and screening compliance is assessed and needed fixes are prioritized.
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 developed and 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, all female broodstock and a subset of male 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 with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
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. Annual viable salmonid population (VSP) parameter monitoring occurs for steelhead,

		coho, Chinook and chum salmon in the basin.
Weir/trapping operations do not result in significant stress, injury or mortality in natural populations.	Compliance with permitted direct and incidental take limits for natural origin fish.	Adult Collection Facilities (ACFs) follow established protocols that are updated annually. Incidental Take and associated mortalities are monitored in season to ensure compliance within permitted limits.
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.	Annually monitor and record weight (fpp), length, number, release type, precocity, and date of release.
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 operating costs, including 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).

Up to 42 adults are needed to reach production goals. The egg-take goal supports in-system releases. Additional eggs may be taken to cover potential loss. Overall, adults utilized may be on a sliding scale dependent on natural origin availability (no more than 33% of the natural-origin run will be used), pHOS, F1 contribution, fecundity, and observed in hatchery survival.

Table 1.11.1.1: Potential future program egg-take, release goals, and adult (jacks not included) natural origin (NOR) broodstock needs, with a fecundity of 4,500 egg/female. Note: numbers and rates will vary annually, with changes in the mean rates from the previous five years and/or changes in program release goals. Calculations in table may vary slightly due to rounding.

Program	Egg-take Goal	Release Goal	NOR Brood Need (at pNOB of 100%)
Fully integrated; PNI ≥ 0.67	90,000	60,000	42

Note: F1 adults may serve as backfill during low natural origin run years.

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

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

Program	Maximum Number	Age Class	Size		Release Month	Location		
			grams	fpp		Stream	Major Watershed	Eco-province
Current Program								
Segregated Winter	85,000	Yearling	82.5	5.5	April	W. Fork	Washougal	LCR
	20,000	Yearling	82.5	5.5	April	Rock Cr.	Wind	LCR
Proposed Program								
Integrated Winter	60,000	Yearling	82-60	5.5-7.5	Apr-May	W. Fork	Washougal	LCR

Note: Rock Creek outplants are proposed to shift to Kalama Falls Early Winter stock (KEWs). Eggs will be taken and eyed at Kalama Falls Hatchery then shipped to Skamania Hatchery to be reared and outplanted in Rock Creek.

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: Annual adult returns of Winter steelhead in Washougal River Basin.

Return Year	Return to Skamania Hatchery		Watershed Escapement	
	Hatchery Origin	Natural Origin	Hatchery Origin	Natural Origin
2013	270	0	37	641
2014	253	0	33	355
2015	438	17	71	577
2016	1,028	1	81	555
2017	186	0	149	453
2018	449	33	159	279
2019	360	14	50	80
2020	920	36	128	130
2021	521	13	219	205
2022	301	20	249	121
2023	187	13	243	129
2024	1,024	28	NA	NA
Average	**495**	**15**	**129**	**320**

Source: WDFW Hatcheries Headquarters Database, SCoRE/SPI, and Buehrens et al, 2024.

Note: The on-station Chamber's Creek stock early-winter steelhead program was discontinued; switched to Eagle Creek NFH stock brood year 2017, and Big Creek Hatchery (ODFW) stock brood year 2018.

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

The first year of operation for this hatchery was 1957. Steelhead production has been on-going at the facility through 2024. The new integrated Washougal winter steelhead program is proposed to start with broodstock collection in the spring of 2025.

1.14) Expected duration of program.

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

1.15) Watersheds targeted by program.

West Fork Washougal River (WRIA 28.0233; also referred to as the North Fork) and the Washougal River (WRIA 28.0159), Lower Columbia River

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

1.16.1) Brief Overview of Key Issues

Winter steelhead from the Skamania Hatchery have been released into the Washougal River to support a winter steelhead sport fishery and to maintain a broodstock for this program. Smolts are released from the hatchery into the North Fork Washougal River to encourage migration back to the facility, which is at the upper end of the sport fishery so that they are highly susceptible to harvest. Any adults that escape the fishery and fail to return to the hatchery may spawn in the system.

In February 2008, WDFW formally adopted a *Statewide Steelhead Management Plan* (SSMP) (WDFW 2008) that guides statewide policies, strategies and actions pertaining to steelhead in Washington State. This plan called for the development of regional watershed plans that further guide steelhead management at the local level. WDFW's process for developing regional watershed plans for all LCR steelhead populations included the development of stakeholder workgroups that provided input into the planning process. During this process, all current hatchery steelhead programs were reviewed and evaluated for possible program improvements. Program improvements included, but were not limited to, changes in smolt release numbers, changes in broodstock composition (e.g. converting to indigenous stock), and changes in fishery regulations to better protect adults and/or juveniles. Additionally, the SSMP called for the development of a network of wild steelhead gene banks throughout the state and these gene banks were implemented through the regional watershed steelhead management plan development process. This led to gene banks being established in the Grays, North Toutle, East Fork Lewis, and Wind rivers. As a result, several hatchery plants were eliminated or re-programed. This included an increase in the winter steelhead plant in the Washougal River from 60,000 to 85,000.

In 2016, NMFS proposed that WDFW modify broodstock sources in the Lower Columbia River "to better align hatchery broodstock with the diversity of the natural-origin populations that could be potentially affected by the hatchery programs through interbreeding on the spawning grounds." Several broodstocks were transitioned to stocks that are more genetically similar to the local populations. This included all Mitchell Act-funded programs releasing early-winter hatchery steelhead, which originated from Chambers Creek (Puget Sound) stock.

As a result, in brood year 2017, the program broodstock switched from an early-winter steelhead stock localized from Chambers Creek stock to Clackamas River (OR) early-winter steelhead from Eagle Creek NFH. In brood year 2018, the program transitioned to using winter steelhead stock transferred from ODFW's Big Creek Hatchery.

After switching the stock utilized for broodstock, the segregated program had higher than desired pHOS and geneflow. WDFW reviewed alternatives from the existing Skamania early winter steelhead HGMP and determined "Alternative 1" was the most appropriate to balancing conservation risks with fishery opportunity; "*Alternative 1: Use local indigenous stocks in an integrated program"* (WSTHD Skamania HGMP, 2014).

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 sport fisheries in the lower Columbia River and is consistent with the mitigation requirements.

Alternative 2: Adjust segregated program size and release strategies appropriately in response to the results of modeling outputs, and/or recently implemented monitoring programs.

1.16.3) Potential Reforms and Investments

In the early 2000s, it was identified that screening and passage were not compliant with NOAA-NMFS standards for ESA fish at that time. Capital funds were secured, and work began on the Skamania Hatchery intake in 2012. The intake was modified to be compliant with NOAA standards (NMFS 2011); WDFW will need to evaluate the structure for compliance with the most recent NMFS criteria (NMFS 2022b). To control upstream passage of hatchery fish, Pacific Coast Salmon Recovery Funds were secured to install a velocity weir/barrier across the river at the entrance to the Skamania Hatchery fish ladder. This included a return to stream chute for release of all natural origin fish (wild fish). This work was completed in 2017. A performance assessment of this barrier is needed to determine if any additional modifications are required. Additionally, a natural waterfall below the facility sometimes creates a velocity barrier to returning hatchery winter steelhead, especially gravid females. Assessment of options for improved collection of hatchery fish below the falls is warranted.

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.

This HGMP is submitted to the NOAA-NMFS for ESA consultation and take prohibition exemption under ESA section 4(d), Limit No. 5.

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

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

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

Lower Columbia River steelhead (*Oncorhynchus mykiss*). Listed as a threatened species on March 19, 1998 (63FR13347); threatened status reaffirmed on January 5, 2006 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448); updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

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

Lower Columbia River Chinook (*Oncorhynchus tshawytscha*). Listed as "threatened" on March 24, 1999 (64FR14308); threatened status reaffirmed on June 28, 2005 (70FR37160); reaffirmed threatened by five-year status review, completed August 15, 2011 (76 FR 50448); updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

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); updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

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); updated April 14, 2014 (79 FR 20802); reaffirmed threatened by five-year status review, completed May 26, 2016 (81 FR 33468); reaffirmed threatened by five-year status review, completed September 23, 2022.

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.

Evaluations of the status of ESA listed salmonid populations are conducted at regular intervals by NOAA fisheries staff. The latest 5-year status review was completed in 2022 (NMFS 2022a) and is available at the following link: 2022 5-Year Review: Summary & Evaluation of Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, Lower Columbia River Coho Salmon, and Lower Columbia River Steelhead. Additionally, a biological viability assessment update was completed in January of 2022 (Ford 2022) and is available at the following link: Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endangered Species Act: Pacific Northwest (noaa.gov).The Washington State Governor's Salmon Recovery Office also produces a summary of salmonid population status called the State of Salmon in Watersheds report. The latest report was released in 2022 and is available at the following link: Lower Columbia River Salmon Recovery Region - State of Salmon (wa.gov).

- Provide the most recent 12-year (e.g. 1988-1999) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

While much of the baseline data for productivity analyses are already being collected, to date, measures of productivity (e.g., recruits per spawner, SAR%) have not yet been consistently calculated for the Washougal Winter Steelhead population. The 2017 Mitchell Act BiOp (NMFS 2017) identifies the need to evaluate measures of productivity, likely through a life-cycle modeling approach, to evaluate the current phase of recovery for Washougal Winter Steelhead populations and establish triggers for moving between phases. We hope to have a much more robust analysis of productivity, including population level abundance estimates for the Washougal Winter Steelhead Population in the near future.

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

Table 2.2.2.1: Numbers of spawners in nature, pHOS, Natural origin smolt and adult production, and survival and productivity of Natural origin Winter Steelhead in the Washougal River Basin, 2011-2022

Year	Spawners in Nature		
	Natural origin	Hatchery origin	pHOS
2011	194	10	5.0%
2012	289	17	5.6%
2013	641	37	5.5%
2014	355	33	8.6%
2015	577	71	11.0%
2016	555	81	12.7%
2017	453	149	24.7%
2018	279	159	36.3%
2019	80	50	38.5%
2020	130	128	49.7%
2021	205	219	51.6%
2022	121	249	67.3%
Mean	**340**	**118**	**30.6%**

Winter steelhead in the Washougal River have been identified as a "primary" population (LCFRB 2010). The projected PNI for the new integrated Washougal winter steelhead program is 0.70. WDFW proposes a management target of a 5-year average of >0.67, with a goal of achieving >.70 annually as outlined in WDFW's Statewide Steelhead Management Plan (WDFW 2008).

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: Up to 42 natural origin adults will be collected annually with the maximum number of natural origin (NOR) steelhead that can be collected for broodstock limited to 33% of the Washougal winter steelhead population annual NOR return. Pre-spawn steelhead captured for use as broodstock will be held until ripe. Skamania Hatchery swim-in, Washougal Hatchery Swim-in, and Washougal Hatchery Intake Trap are the primary collection locations. We may also utilize other broodstock collection methods such as angling, seining or alternative trapping methodologies. Broodstock collection may occur from December through May. Both natural-origin and F1 adults will be kill spawned to maximize fecundity and reduce the need for

additional broodstock; as the program progresses, live spawning of natural origin adults may be considered.

Rearing Program:

Operation of Hatchery Facilities: Washougal/Skamania Hatcheries withdraw water from the watershed. This can further reduce low flows in late summer and early fall from the sections between the intake location and where the non-consumptive water rejoins the river. For the Skamania hatchery, this is approximately a distance of 1600 ft and on the Washougal River, this is a distance of approximately 2000 ft. Water intakes have engineered design criteria to minimize impingement of naturally produced fish on intake screens and the Mitchell Act Hatcheries Intake and Passage Study (April 2003) has assessed which structures are ESA compliant and forwarded needed improvements for funding. For Skamania Hatchery, the intake screens were updated in 2012 and met criteria at that time but may not meet newest NMFS criteria. The Skamania intake rebuild included installation of a pump back system to address the dewatering between the intake and outfall structure. WDFW will need to evaluate the structure, and funding will be requested dependent on findings. For Washougal Hatchery, WDFW received Inflation Reduction Act funding to address the intake structure, which is currently under contract with an Architectural & Engineering Firm to design and permit with completion planned by early 2029. Effluent at outfall areas is rapidly diluted with main stem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). Indirect take from this operation is unknown.

Disease: Over the years, rearing densities, disease prevention and fish health monitoring have greatly improved the health of the hatchery programs. Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995) Chapter 5 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 Stewart and Bjornn 1990). Prior to release, the steelhead population health and condition is established by the Area Fish Health Specialist. This is commonly done 1-3 weeks pre-release and up to 6 weeks on systems with pathogen free water and little or no history of disease. Indirect take from disease is unknown.

Release:

Potential Washougal winter steelhead predation and competition effects on listed salmonids and eulachon: The proposed annual production goal is up to 60,000 yearling smolts with releases in the main Washougal and W.F. Washougal depending on water flow and temperature. Steelhead releases range from 5.5 to 7.5 fpp (210-180 mm fl) and may be released between April and June. Washougal steelhead releases could encounter listed Chinook, coho, steelhead, chum and eulachon in the Washougal River sub-basin and Columbia mainstem. Due to size differences between steelhead smolts and sub-yearlings, competition is probably low with regards to food and spatial preference between species and size. At 5.5 fpp (210 mm fl), potential predation on listed Chinook would be on fish of 62-64 mm fl and smaller. Smolts from on station releases in large river systems travel rapidly – migration rates of approximately 20 river miles per day were observed by steelhead smolts in the Cowlitz River (Harza 1999).

Residualism: WDFW steelhead programs are reared and released in a smolted condition. To maximize smolting characteristics and minimize residual steelhead, WDFW adheres to a combination of acclimation, volitional release strategies, and release guidelines (Tipping 2001).

- Condition factors, including a lean 0.90 to 0.99 K factor, and co-efficient of variation (CVs) of less than 10% are general steelhead rearing parameters.
- 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.

Columbia River Steelhead pHOS and Genetic Monitoring: This activity allows for the monitoring of key LCR and MCR steelhead populations to assess pHOS, genetic introgression or gene flow between natural and hatchery-origin steelhead. Monitoring of pHOS occurs annually (Buehrens et al. 2024) while genetic monitoring is implemented as needed to support on-going assessment and adaptive management of Mitchell Act hatchery programs.

Other 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.

Encounters with listed fish outside of the targeted species is expected to be minimal. This is a new integrated program, no applicable past information on takes is available.

- 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).

"Take" Tables were submitted to NMFS in WDFW's *Proposed Management Measures Associated with Hatcheries Funded by The Mitchell Act* (WDFW 2024).

- 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.

If take levels from this operation are projected to or have exceeded those permitted, then staff would inform the WDFW Regional Program Manager, Hatchery and Fishery Policy Analyst, or Regional Hatchery Operations Manager who, along with the Hatchery Complex Manager, would consult with NOAA-NMFS for adaptive management review and protocols.

SECTION 3 _ RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

This is an integrated program with a harvest component and is used to supplement natural-origin fish. WDFW's primary objective is to augment harvest while minimizing the abundance of hatchery-origin fish on the natural spawning grounds.

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.

The Washougal River Winter Steelhead Program is managed to be consistent with the Principles and Recommendations of the Hatchery Scientific Review Group (HSRG 2015). The Winter Steelhead Program will also be operated to follow applicable WDFW guidelines and policies, including:

- *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and NWIFC 2006)
- American Fisheries Society Fish Health Blue Book (http://www.afs-fhs.org/blue-book.php)

Additionally, the Winter Steelhead Program has been designed and is implemented to achieve or exceed Best Management Practices standards for salmon hatcheries and the populations that they support (see Sections 1.9 and 1.10). Best Management Practices address critical salmonid culture topics, including water quality (Section 4), facilities (Section 5), broodstock origin (Section 6), collection (Section 7), and spawning (Section 8), incubation and rearing (Section 9), and release (Section 10). Best Management Practices and associated protocols may be obtained from a number of sources, including Fish Hatchery Management (Piper et al. 1982) and other fish culture manuals, HSRG recommendations (HSRG 2015), as well as from successful protocols used at various state, tribal, and federal hatcheries and the scientific literature (e.g., IHOT 1995; Flagg and Nash 1999; Williams et al. 2003; Campton 2004; Busack and Knudsen 2007; Galbreath et al. 2008; HSRG 2004, 2009, 2014, 2017; Bartron et al. 2018). These practices and protocols keep the well-being and health of the fish and the natural populations that they supplement in the forefront of all operational considerations. Further, we understand that Best Management Practices change with new fish culture innovations, so we will continue to stay apprised of improvements in order to employ the best salmonid aquaculture practices and optimize program effectiveness. Therefore, monitoring and evaluation (Section 11) is a critical component of this program and is designed to evaluate whether the program is successful in implementing Best Management Practices and subsequently achieving its objectives. It allows us to adaptively manage the program by identifying where improvements may be necessary and improving the program through appropriate changes.

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

1) Anadromous Salmon and Steelhead Hatchery Policy (C-3624)
2) ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead (NMFS 2013)
3) The Conservation and Sustainable Fisheries Plan (WDFW et al. 2016)

Descriptions of these policies and excerpts are shown below:

Policies/Plans – Key Excerpts

Anadromous Salmon and Steelhead Hatchery Policy (C-3624):

The purpose of the Anadromous Salmon and Steelhead Hatchery Policy (Policy) is threefold:

1) to guide hatcheries and their individual rearing programs to advance the conservation and recovery of natural-origin salmon and steelhead by implementing hatchery reform measures.

2) to perpetuate salmon and steelhead in accordance with existing mitigation programs and agreements for permanently lost or impaired habitat; and

3) to provide sustainable economic and stability benefits to recreational, commercial and tribal fisheries in Washington State as appropriate.

ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead (NMFS 2013):
The goal of ESA recovery under this plan is to improve the viability of these salmon and steelhead, and the ecosystems upon which they depend, to the point that they no longer require ESA protection.

Lower Columbia Conservation and Sustainable Fisheries Plan (WDFW et al. 2016):
The Conservation and Sustainable Fisheries (CSF) Plan sets forth a comprehensive plan of action for Lower Columbia hatchery and harvest programs. The goal of this plan is to support efforts to return natural origin lower Columbia salmon and steelhead to healthy, harvestable levels while sustaining important fisheries. It sets forth strategies, actions, and management practices that Washington Department of Fish and Wildlife (WDFW) will use in maintaining and operating its Lower Columbia hatcheries and in managing related fisheries.

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 biological surveys and experiments, and install 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.
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.

Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document. The Future Brood Document (FBD) is a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season.

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. NMFS issued a Biological Opinion for mainstem Columbia River fisheries through a Section 7 consultation under the 2008–2017 *U.S. v Oregon* Management Agreement for upriver Chinook, sockeye, steelhead, coho, and white sturgeon" (2008–2017 MA). All fisheries are reviewed annually through the North of Falcon process. The *U.S. v Oregon* Technical Advisory Committee (TAC) has prepared Biological Assessments (BAs) for combined fisheries based on relevant *U.S. v Oregon* management plans and agreements. The current BA concerns Columbia River treaty Indian and non-Indian fisheries, as described in the "2008–2017 *U.S. v Oregon* Management Agreement for upriver Chinook,

sockeye, steelhead, coho, and white sturgeon" (2008–2017 MA). WDFW has submitted a *Fisheries Management and Evaluation Plan* (FMEP) for tributary fisheries and has received a permit from NMFS for those fisheries, with the exception of coho. WDFW will be updating the FMEP for lower Columbia River tributary fisheries within the next few years to include coho and will be updating the FMEP to include changes to fall Chinook and steelhead fisheries.

3.3.1) Describe fisheries benefitting from the program and indicate harvest levels and rates for program-origin fish for the last twelve years (2009-21), if available.

Incidental impact on non-targeted wild steelhead. Selective fisheries rules were initiated for steelhead in lower Columbia River tributaries in 1986 to provide maximum sport harvest (retention of adipose-clipped fish only) and require the release of all wild steelhead. This has reduced wild steelhead harvest statewide to approximately 1% of the catch. Selective gear restrictions and cool water temperatures minimize mortality on listed steelhead. Non-targeted wild steelhead may be hooked and released with an unknown impact for most streams and direct studies have not been done in this system. Nelson et al. (2005) showed catch and release mortalities on steelhead caught in recreational fisheries in the Chilliwack River, British Columbia of 1.4% to 5.8% in 1999 and 2000. This study also showed no indication of increased mortality on fish that had been caught released multiple times. WDFW conducted an additional hooking mortality study on the Cowlitz River from 2017 to 2020; hooking mortality rates were generally very low and the effects of covariates on survival supported the results of previous research (Courter et al. 2023). As such, hooking mortality associated with recreational sport harvest is generally believed to be less than 10% of fish hooked and released.

Winter steelhead plants contribute to limited Lower Columbia River mainstem sport fisheries; incidental harvest may occur during the lower Columbia River Spring Chinook tangle net fisheries. Program is 100% mass marked (adipose fin-clipped) for the purpose of selective fisheries management.

Table 3.3.1.1: Sport harvest, escapement and estimated survival to adult return rates (%SAR), Washougal River (Skamania) winter steelhead, based on WDFW Catch Record Card (CRC) data

Brood Year	Return Year	Smolts Released	Sport Harvest	Hatchery Spawners	Hatchery Escapement	SAR %
2009	2011/2012	63,156	645	NA	373	1.61%
2010	2012/2013	59,993	405	37	270	1.19%
2011	2013/2014	63,030	435	33	253	1.14%
2012	2014/2015	60,000	438	71	482	1.65%
2013	2015/2016	84,020	772	81	1,028	2.24%
2014	2016/2017	96,405	366	149	186	0.73%
2015	2017/2018	76,892	321	159	449	1.21%
2016	2018/2019	74,479	89	50	360	0.67%
2017	2019/2020	87,855	135	128	920	1.35%
2018	2020/2021	89,250	114	219	521	0.96%
2019	2021/2022	85,091	76	249	301	0.74%
2020	2022/2023	86,271	103	243	187	0.62%
2021	2023/2024	85,526	312	NA	1,024	1.56%
Average		**77,844**	**324**	**129**	**489**	**1.20%**

Note: Smolts were released from Skamania Hatchery and Mainstem Washougal River
SAR%: Smolt to adult survival. SAR% is underestimated as fish are not cwt'd to assess fisheries contributions and is currently calculated from fish released and recovered in the same watershed.

3.4) Relationship to habitat protection and recovery strategies.

The primary guiding document outlining recovery and habitat protection/restoration actions is the *ESA Recovery Plan for Lower Columbia River Coho Salmon, Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, and Lower Columbia River Steelhead (NMFS 2013):* The goal of ESA recovery under this plan is to improve the viability of these salmon and steelhead, and the ecosystems upon which they depend, to the point that they no longer require ESA protection. This NMFS plan incorporated the *Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plan* (LCFRB 2010) as the guiding recovery plan for Washington's Lower Columbia River salmon and steelhead populations including those on the Washougal.

LCFRB 2010 included the following components:

Sub-Basin Planning: Identifying actions specific to the Washougal River Sub-basin and its salmon and steelhead populations (Volume 1; Regional Chapters, LCFRB 2010)

Habitat Treatment and Protection: Ecosystem Diagnosis and Treatment (EDT) compares current habitat to that of the basin in an historically unmodified state. EDT has been modeled for productivity in the Washougal Basin in the Lower Columbia Salmon Recovery and Fish and Wildlife Sub-basin Plans and has been used to prioritize restoration actions and establish reintroduction transport goals.

Limiting Factors Analysis (LFA) - A WRIA 28 (Washougal, Lake River, and Bonneville tributaries) LFA was conducted by the Washington State Conservation Commission (Wade 2001).

WDFW maintains an inventory of known barriers to fish passage, which is updated as new information becomes available. WDFW's Habitat Program issues hydraulic permits for construction or modifications to streams and wetlands, providing habitat protection to riparian areas and actual watercourses within the watershed.

3.5) Ecological interactions.

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

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

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Multiple programs including fall Chinook, coho and steelhead programs are released from the

Washougal/Skamania Hatchery Complex and natural production of fall Chinook, coho, chum and steelhead occurring in this system along with non-salmonid fishes (eulachon, sculpins, lampreys and sucker etc.). None of these species would be expected to have a positive impact on the program except by providing nutrient enhancement which will provide benefit to all of the natural populations.

(4) *Salmonid and non-salmonid fishes or species that could be positively impacted by the program.* Steelhead smolts can be preyed upon release thru the entire migration corridor from the river sub-basin to the mainstem Columbia River and estuary, and thus providing a food source for other populations. Northern pikeminnows and introduced spiny rays in the Columbia mainstem sloughs as well as avian predators, including gulls, mergansers, cormorants, belted kingfishers, great blue herons and night herons can prey on steelhead smolts. Mammals that benefit from migrating smolts and returning adults include: harbor seals, sea lions, river otters and orcas. Except for yearling coho and steelhead, these species may serve as prey items during the emigration through the basin. Hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish and may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish. Hatchery releases can also behaviorally encourage mass emigration of multiple species through the watershed, reducing residency. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1993) and salmonid carcasses can be an important source of marine derived nutrients (Cederholm et al. 1999). 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).

SECTION 4 _ WATER SOURCE

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

Table 4.1.1: Water sources at Skamania Hatchery.

Facility	Water Source	Water Right		Available Water Flow	Avg Water Temp. (F°)[a]	Usage	Limitations
		Record/Cert.No.	Permit No.				
Skamania Hatchery	West Fork Washougal R. (surface) gravity intake	S2-*12684C WRIS/ 06652	09511	20 cfs	50	Rearing, adult holding	Pathogens present (IHNV, BCWD and ICH)
	Vogel Creek (surface) gravity intake	S2-*12685C WRIS/ 06653	09512	6 cfs	49	Incubation, early-rearing	No pathogens present
	Ground (well water)	G2-047894CL	NA-Claims	45gpm			

Source: Phinney 2006, WDOE Water Resources Explorer 2023, WDFW hatchery data.

Water rights total 11,670 gpm from West Fork Washougal River and Vogel Creek. The river provides most of the water used. Actual water use averages 9,800 gpm and ranges from 6,650 to

11,460 gpm. Vogel Creek water is used for incubation and early rearing while Washougal River water is used thereafter until spring release.

Adults are held on re-use water flowing from rearing units during times when rearing units are being used and fresh flow when rearing units are empty.

The water right permit was formalized through the Washington Department of Ecology (WDOE) and were obtained by the WDFW in 1953.

NPDES Permits:

This facility operates under the *"Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System* (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE). Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE.

Discharges from the cleaning treatment system are monitored as follows:

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

Table 4.1.2: Record of NPDES permit compliance at Skamania Hatchery.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Skamania WAG13-1026	Y	Y	Y	7/24/2019	0	N	Y

Source: Ann Leroux, WDFW Hatcheries Headquarters Database 2023.

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.

Water for raceways is diverted from the West Fork Washougal River while incubation and the hatchery building are supplied from Vogel Creek and are formalized through trust water right from the Washington Department of Ecology (**Table 4.1.1**). Monitoring and measurement of water usage is reported in monthly NPDES reports.

Intake on the West Fork Washougal was completely remodeled in 2012 to meet NMFS standard (NMFS 2011) (**Figure 4.1**); WDFW will need to evaluate the structure for compliance with the newer criteria (NMFS 2022b). Vogel Creek is not an anadromous fish-bearing stream (WDFW SalmonScape 2014).

Figure 4.1: Intake structure at Skamania Hatchery, West Fork Washougal River.

Figure 4.2: Intake structure at Skamania Hatchery, Vogel Creek.

SECTION 5 _ FACILITIES

5.1) Broodstock collection facilities (or methods).

A fish ladder approximately 80' long leads from the West Fork Washougal River to a 20' x 20' trap area where returning fish are routed to one of the three holding ponds for holding and sorting. All flow for these ponds and the fish ladder is re-use water from the raceways when in use and

fresh flow when raceways are empty. The Skamania facility did not have a barrier at the entrance to the fish ladder, which allowed a portion of the hatchery fish to pass upstream during the winter and spring migration periods. Pacific Coast Salmon Recovery Funds were secured to install a velocity weir/barrier across the river at the entrance to the Skamania Hatchery fish ladder, which was completed in 2017.

Skamania Hatchery swim-in, Washougal Hatchery Swim-in, and Washougal Hatchery Intake traps are the primary collection locations; may also utilize other broodstock collection methods such as angling, seining or alternative trapping methodologies to achieve necessary brood levels.

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

Table 5.2.1. Transportation equipment available at Skamania Hatchery.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Norm. Transit Time (minutes)	Chemical(s) Used	Dosage (ppm)
Tanker Truck	1800	Y	N	20	Vida Life	5000 ppm (~0.5%)

The Skamania Hatchery has one fish transport truck, a 1991 International 1,800-gallon tanker truck. The truck has the capacity for hauling and off-loading brood fish. Plans are in development for an overhead crane loading system using a water-to-water container for loading fish for re-cycle to the fishery downstream.

5.3) Broodstock holding and spawning facilities.

Three concrete raceways 12' X 135' 4.75' (7,695 cu.ft.) are used for holding brood fish. These holding ponds have a cover building over the center portion for sorting and spawning adult fish. These ponds are very effective at holding steelhead with annual mortality at less than 1%. All flow for these ponds and the fish ladder is re-use water from the raceways when in use and fresh flow when raceways are empty. Integrated Hatchery Operations Team (IHOT) adult holding guidelines followed for adult holding, density, water quality and predator control measures to provide the necessary security for the broodstock.

5.4) Incubation facilities.

Table 5.4.1: Incubation facilities at Skamania.

Incubator Type	Units (number)	Flow (gpm)	Volume (cu.ft.)	Loading-Eyeing (eggs/unit)	Loading-Hatching (eggs/unit)
Skamania Hatchery-Shallow Troughs (5 cells/trough)	64 Shallow Troughs	5	9	75,000	12,500

5.5) Rearing facilities.

Table 5.5.1: Rearing/holding ponds at Skamania Hatchery.

Ponds (No.)	Pond Type	Volume (cu.ft)	Length (ft.)	Width (ft.)	Depth (ft.)	Flow (gpm)	Max. Flow Index	Max. Density Index
64	Shallow Troughs (Post emergence Rearing)-Skamania Hatchery	9	15	1.0	0.6	5	1.6	0.25
6	Fiberglass Intermediate - Skamania Hatchery	90	15	3.0	2.0	35	1.6	0.25
10	Concrete Intermediate Raceways- Skamania Hatchery	280	35	4.0	2.0	60	1.6	0.25
32	Concrete Raceways-Skamania Hatchery	2,200	80	10	2.75	325	1.6	0.25

5.6) Acclimation/release facilities.

Fish are trucked from Skamania Hatchery ponds and are transported downstream for release in West Fork Washougal below the hatchery. Fish may also be transported to the lower portions of the mainstem Washougal River in years where low water flow is restrictive for outmigration and survival. Direct release to river infrastructure is not available currently.

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

Operational. Winter ice, snow, slush ice and high-water events can interrupt flow. Staff are available 24/7 to handle these problems. Bird predation is also a problem and Skamania Hatchery has predator netting in place over the raceways as well as electric fencing for otter predation control.

Disease. Virus problems have led to quarantine and removal of batches of eggs or fish from the system. Fish or eggs are sent to a local landfill or rendering plant for disposal.

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.

Skamania Hatchery is sited to minimize the risk of catastrophic fish loss from flooding and set up with low water alarm probes in strategic locations to prevent loss due to loss of water. Alarm systems are monitored 24/7 with staff available to respond to problems.

IHOT fish health guidelines are followed. WDFW fish health specialists conduct routine inspections and problems are managed promptly to limit mortality and reduce possible disease transmission. As for the threat of a virus outbreak, we have very strict disinfection procedures and comprehensive lab analysis of all egg-takes for culling, if needed.

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 for the integrated winter program will be collected from returning Washougal River natural origin Winter Steelhead. F1 progeny may be utilized depending on natural origin run size, pHOS, and projected PNI.

6.2) Supporting information.

6.2.1) History.

Skamania Hatchery. Skamania early-winter hatchery steelhead were developed from early returning/spawning Chambers Creek winter steelhead stock. Spawning and return times are approximately three months earlier, compared to wild fish. Skamania Hatchery has been stocking hatchery steelhead into the river system since 1957. The first fish captured at the Skamania Hatchery for broodstock began in about 1982. Broodstock shortfalls were made up from numerous hatcheries (**Table 6.2.1.1**). Timing of Skamania stock adult migration occurs late-November through February, with peak movement in January. After the 1980 Mt. St. Helens eruption, straying Cowlitz River steelhead may have spawned with native Washougal stocks (LCFRB 2010). Discontinuation of the Skamania early-winter hatchery steelhead program will occur in 2024.

Table 6.2.1.1: Source of broodstock used for Skamania Hatchery winter steelhead program.

Broodstock Source	Origin	Year(s) Used	
		Begin	End
Chambers Creek Hatchery	H	Unk	Unk
Tokul Creek Hatchery Winter Steelhead	H	Unk	Unk
Beaver Creek Hatchery Winter Steelhead	H	1994	Unk
Skamania Hatchery Winter Steelhead	H	1982	2015
Cowlitz Hatchery Winter Steelhead	H	1994	1995
Lewis River Hatchery Winter Steelhead	H	1996	1999
Kalama Hatchery Winter Steelhead	H	1999	1999
Eagle Creek NFH-Clackamas Winter Steelhead	H	2016	2017
Big Creek Hatchery (ODFW)	H	2018	2024

6.2.2) Annual size.

The broodstock goal for this program is up to 42 adult natural-origin winter-late steelhead to meet the program release goal of 60,000 yearlings. F1 adults may be utilized in the event that there is a shortfall of natural origin steelhead.

6.2.3) Past and proposed level of natural fish in broodstock.

Wild winter-run have never been incorporated into this hatchery's smolt releases in the basin prior to initiation of this program. The integrated program is comprised of wild broodstock and may incorporate F1 progeny as backfill in low return years.

PNI should be >0.67 (pNOB >10%, and pHOS <30%).

Broodstock for this program will be managed with a goal of having pNOB at least twice the value of pHOS to ensure that the proper PNI level is achieved. No more than 30% of the natural-origin run will be used as broodstock. Wild winter steelhead not used as broodstock are held for a short period to gather biological data and returned to the river upstream of the fishway trap.

6.2.4) Genetic or ecological differences.

Historic programs: Skamania Hatchery stock was originally developed from Chambers Creek early-winter steelhead, introduced into the Columbia River in the 1950s. Wild stock interbreeding with Skamania Hatchery broodstock is thought to be low because of assumed differences in spawn timing. The wild steelhead smolt emigration appears to be slightly later timed than the hatchery releases (LCFRB 2010).

In brood year 2017, WDFW changed the broodstock source to Clackamas (OR) early-winter steelhead from Eagle Creek NFH; NMFS directed WDFW to move to a broodstock source closer to the Washougal basin stocks, while phasing out existing Chambers Creek–origin hatchery stock. As of brood year 2018, the program shifted to using Big Creek Hatchery (ODFW) stock for its program because the Eagle Creek stock segregated program was phased-out to protect native stocks. Big Creek Hatchery stock is derived primarily from adults returning to Big Creek, although the program has received backfill from Klaskanine Hatchery during years with low stock returns (see also Big Creek Hatchery Program Management Plan 2018).

New program: The proposed new integrated winter steelhead program will utilize endemic natural origin Washougal winter steelhead to maintain genetic similarity between the hatchery and wild populations.

6.2.5) Reasons for choosing.

Indigenous winter-late steelhead that will be utilized are considered to be genetically and behaviorally distinct from both the segregated hatchery early-winter and summer steelhead that have been historically stocked in the Washougal watershed.

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

WDFW will attempt to collect broodstock proportionately throughout the winter-late steelhead run to prevent run timing divergence from the natural population. Adults will be selected randomly without regard for size or appearance in order to maximize the genetic representation in the broodstock. Severely damaged (seal bites) and wounded fish may be avoided and returned to stream if holding may result in mortality. Adults, above broodstock needs are handled with care and are released back into the Washougal River. Genetic screening of early returning natural origin winter steelhead (December/January) may be implemented to minimize perpetuation of Chamber's Creek influence in the natural population.

SECTION 7 _ BROODSTOCK COLLECTION

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

Natural-origin adult winter steelhead returning to the Washougal River. Backfill for the program will be collected from F1 progeny.

7.2) Collection or sampling design.

Skamania Hatchery swim-in, Washougal Hatchery Swim-in, and Washougal Hatchery Intake traps are the primary collection locations. We may also utilize other broodstock collection methods such as angling, seining or alternative trapping methodologies.

WDFW will attempt to collect broodstock proportionately throughout the winter-late steelhead run to prevent run timing divergence from the natural population. Adults will be selected randomly without regard for size or appearance in order to maximize the genetic representation in the broodstock. Severely damaged (seal bites) and wounded fish may be avoided and returned to stream if holding may result in mortality.

7.3) Identity.

Mass-marking (Adipose fin Clip) for steelhead began in the mid-1980s.

The on-station and off-station production at Skamania Hatchery are 100% marked with an adipose fin-clip (AD). New integrated program juveniles may have a differential mark such as a left ventral fin clip (LV), right ventral fin clip (RV), maxillary clip, or a coded wire tag for monitoring purposes as well as distinguishing integrated fish from the segregated programs.

7.4) Proposed number to be collected:

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

The program goal is to collect up to 42 natural origin adults, at an approximate 1:1 female to male ratio, with an estimated 6% pre-spawn mortality and a fecundity estimation of up to 4,500 eggs/female, in order to meet program egg-take goals. The maximum number of NORs that can be collected for broodstock is limited to 33% of the Washougal winter steelhead population annual NOR return. Adults selected for broodstock are done so in a manner that ensures egg take goals are met and mortality is minimized. Additional females may be needed if fecundity is lower than estimated.

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

Collection levels for previous Skamania Hatchery early-winter broodstock is shown in **Table 7.4.2.1**; previous production goals supported programs on the White Salmon River (discontinued

2011), E.F. Lewis (discontinued 2014), Salmon Creek/Klineline Ponds (Sourced from KFH after 2017) and Rock Creek (Sourced from KFH after 2024).

Table 7.4.2.1: Total broodstock collected and resultant egg-take, by year, Skamania Hatchery localized winter steelhead.

Year	Adults		Egg-take
	Females	Males	
2012	59	59	226,881
2013	61	61	251,374
2014	56	56	226,793
2015	51	51	211,150
2016	61	61	239,200
2017	*	*	*166,600
2018	*	*	*153,160
2019	*	*	*136,564
2020	*	*	*130,000
2021	43	44	147,592
2022	42	42	177,445
2023	41	37	177,233
2024	45	45	168,366
Average	**51**	**51**	**202,893**

Source: WDFW Hatcheries Headquarters Database

* Eyed eggs received from Eagle Creek National Fish Hatchery, Big Creek Hatchery (ODFW) or Sandy Hatchery (ODFW)

Note: Counts are for entire segregated program, including plants in East Fork Lewis River (discontinued 2017, Big White Salmon River (discontinued 2017), Salmon Cr. (Sourced from KFH after 2017) and Rock Cr. (Sourced from KFH after 2024).

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

Food-grade quality hatchery steelhead in surplus of broodstock backfill needs may be donated to local Tribes and food banks. Hatchery winter steelhead may also be planted in non-anadromous lakes for additional harvest opportunity. Recycling into the Washougal River fishery may occur if management targets for pHOS, pNOB and resulting PNI are being met. Monitoring of the hatchery origin spawners (HOS) needed to replace recruitment from natural origin spawners (NOS) taken to brood will occur. F1 hatchery fish may be returned to the Washougal River to ensure demographic replacement of NOS removed for brood is occurring, if management targets for pHOS, pNOB and resulting PNI are being met.

7.6) Fish transportation and holding methods.

Protocols to hold and transport fish from other broodstock collection methods (angling, netting or alternative trapping sites) will be determined by WDFW in consultation with NOAA Fisheries. For river collection methods, fish tubes or aerated transport tanks will be used to protect captured fish and reduce stress during transit to Skamania Hatchery.

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 routine 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. Spawning implements are rinsed with an iodophor solution, and spawning area and implements are disinfected with iodophor solution at the end of spawning.

7.8) Disposition of carcasses.

Food-grade quality carcasses are donated to local Tribes and food banks. Fish unfit for consumption, and all mortality carcasses are taken to a local rendering plant or landfill.

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.

WDFW's general principles for NOR broodstock management in integrated Mitchell Act programs with a dual of objective of conservation and harvest follow the HSRG guidance (HSRG 2009) of achieving a proportionate natural influence (PNI) of ≥0.67 for populations with a Primary recovery designation and a ≥0.5 for those with a Contributing recovery designation. Since PNI is a function of both the pNOB incorporated into the hatchery program and the pHOS in the natural spawning population, the pNOB goal for each integrated program will vary and may include pNOB targets of 100%.

Current NOR abundance in many populations/years is insufficient (even if all NOR spawners were taken to broodstock) to achieve a pNOB target of 100%. Additionally, removing NOR spawners from populations in which spawner abundance is below that which maximizes recruitment reduces natural origin recruitment if the reproductive output of the removed spawners is not offset by HOR spawners spawning in the wild and supplementing the remaining NOR spawners. To protect against risks posed by overmining NOR populations to provide broodstock for integrated programs, WDFW proposes to manage NOR broodstock collection at a rate ≤ 33% of the annual NOR spawner abundance, up to the NOR broodstock maximum collection number. In determining annual pNOB collection rate targets for each program, WDFW will consider: 1) recent pHOS values (within established pHOS limits), 2) estimates of hatchery origin spawners (HOS) needed to replace recruitment from natural origin spawners (NOS) taken to brood, 3) program egg-take needs, and 4) recent and forecasted NOR abundance, to balance achieving PNI goals while ensuring broodstock collection is not negatively impacting NOR recruitment. In practice, this means in years with large NOR run sizes pNOB will be as high as 100% and in years with low NOR run sizes pNOB will be low enough to ensure HOS in the natural environment can be sufficiently abundant to replace recruitment from NOS taken to brood while not exceeding pHOS limits.

WDFW will attempt to collect broodstock proportionately throughout the winter-late steelhead run to prevent run timing divergence from the natural population. Adults will be selected randomly without regard for size or appearance in order to maximize the genetic representation in the broodstock. Severely damaged (seal bites) and wounded fish may be avoided and returned to stream if holding may result in mortality.

SECTION 8 _ MATING - Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

During spawning, males and females will be checked for ripeness. Mates are selected randomly from the adults collected throughout the run that are ripe at each respective spawning event.

8.2) Males.

Ripe males are randomly spawned with factorial matrix spawning (i.e., 1x1, 2x1, 3x3).

8.3) Fertilization.

NOR and F1 adults utilized in brood will be kill spawned; as the program progresses live spawning of natural origin adults may be considered. Eggs are fertilized in a factorial matrix cross (i.e., 1x1, 2x1, 3x3); the eggs from a female may be fertilized by up to three different males.

8.4) Cryopreserved gametes.

Not applicable. 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.

- Both natural-origin and F1 adults will be kill spawned to maximize fecundity and reduce the need for additional broodstock.
- Mating cohorts are randomly selected.
- Protocols for fish health, disinfection, and genetic guidelines will be followed.
- Spawn all collected mature broodstock without regard for size or appearance in order to maximize the genetic representation in the broodstock spawned. If not spawning all collected mature adults over the season, apply the same rational to individual spawn days.
- Randomize mating and avoid selectivity beyond ripeness on a given spawn day.
- Do not mix milt from multiple males and add to eggs (pooling prior to mixing) in order to eliminate disproportionate genetic male contributions.
- Minimize re-use of males for multiple spawning events.

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

9.1) Incubation:

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

Table 9.1.1.1: Survival rates from egg-take to ponding, Skamania Hatchery early-winter steelhead (segregated).

Brood Year	Egg-Take**	% Survival		Number of Smolts Released into Washougal R.
		Green-to-Eyed	Eyed Egg-to-Ponding	
2011	249,123	94.3	93.1	63,030
2012	226,881	94	98.1	60,000
2013	251,374	80.2	97.5	84,020
2014	226,793	87.2	97.6	96,405
2015	211,150	93.5	94.5	76,892
2016	239,200	79.4	88.4	74,479
2017	*166,600	*	97.7	87,855
2018	*153,160	*	98.3	89,250
2019	*136,564	*	97.5	81,091
2020	*130,000	*	93.9	86,271
2021	147,592	91.4	96	85,526
2022	177,445	87.1	95.6	84,791
2023	177,233	91.4	95.4	88,790
2024	168,366	88.5	95.1	0***

Source: WDFW Hatcheries Headquarters Database and Hatchery Records, 2024.

* Eyed eggs received from Eagle Creek National Fish Hatchery, Big Creek Hatchery (ODFW) or Sandy Hatchery (ODFW)
**Egg take is for full program including plants into Rock Creek and previously in Salmon Creek.
***Segregated program terminated.

9.1.2) Cause for, and disposition of surplus egg takes.

Egg takes are managed according to data/information of historical egg-takes at the facility and are maintained within ±5%. If excess eggs are collected, it is because mean fecundity and/or mean fertility have exceeded expected levels. In general, excess production will be outplanted to non-anadromous waters or destroyed.

9.1.3) Incubation conditions.

Skamania Hatchery: Flow to the incubation building is from Vogel Creek (pathogen free source). Silt in this water source is a common occurrence during rain events and is handled by standard daily trough cleaning techniques while eggs are monitored to determine fertilization and mortality. The water temperature is monitored continuously with a digital high/low thermometer and recorded daily. Temperature units (TU) are tracked for embryonic development. Although the water is saturated with oxygen at 12 ppm, dissolved oxygen content is monitored and are at acceptable levels (minimum criteria of 8 ppm). Disinfection procedures are implemented and adhered to during all phases of the rearing cycle (egg take through transfer to outdoor rearing vessels). Egg treatments with formalin occur during the green to eyed eggs stages to control fungus.

9.1.4) Ponding.

Skamania Hatchery: Initial feeding and early rearing occurs in the incubation troughs. Ponding/feeding begins on a volitional basis when the fry are 100% at the swim-up stage. At this point very little, if any, yolk sack will be present. Fry are ponded when the yolk slit is approximately 1-mm wide (approximately 1600 TUs) or based on (95% yolk absorption) KD factor. Fish are moved to outdoor raceways for final rearing and marking operations prior to release starting in April.

9.1.5) Fish health maintenance and monitoring.

Staff conducts daily inspection, visual monitoring and sampling from eyed egg, 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. Formalin (37% formaldehyde) is dispensed into water for control of ectoparasites on juvenile fish and for fungus control on eggs. Egg mortality ranges from 6% to 16 %, and all eggs are processed through an automated egg picking machine and to some degree by hand.

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

- IHOT and WDFW fish health guidelines followed.
- Multiple egg baskets and shallow troughs are used for incubation.
- 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 (2011-22), or for years dependable data are available.

Segregated Washougal early-winter steelhead program: From brood years 2011-2022, we have collected a mean of 207,516 green eggs for the entire Early-Winter Steelhead program, including outplants, and a mean of 89% survived to the eyed stage. A mean of 96% of the eyed eggs survived to ponding as unfed fry. The hatchery released a mean of 80,801 smolts each year into the Washougal Basin and a mean of 19,804 were planted in Rock Creek since its inception in brood year 2012 through brood year 2022. (Table 9.1.1.1).

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

The fish are reared using the loading densities recommended by Piper et al. (1982). 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 33 lbs. at 10 gpm (3.33 lbs/gpm). Fiberglass intermediate and raceway maximum loading for early rearing is 132 lbs. for the tanks at 40 gpm (3.3 lbs/gpm) and 1000 lbs. per raceway at 300 gpm.(3.33 lbs/gpm). The final loading per raceway is approximately 3200 lbs. at 300 gpm (10.6 lbs./gpm).

9.2.3) Fish rearing conditions

Environmental parameters: flow rates, water temperatures, dissolved oxygen and Total Settable Solids (TSS) are monitored on a routine basis thru the rearing period. All ponds are broom cleaned once per month, or as necessary, and pressure-washed between broods. The raceways are covered to protect the fish from birds with predator netting. Hand feeding is done during the summer and early fall months, and demand feeders are used on all raceways throughout the fall and winter months until planting begins.

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.

This is a new program so fish growth information is not yet available. Table 9.2.4.1 presents information from the Kalama Falls Integrated Winter Late Steelhead program, which is expected to be similar to the new Washougal Integrated Winter Steelhead program.

Table 9.2.4.1: Monthly fish growth information, Kalama Falls Integrated Winter Late Steelhead.

Rearing Period	Length (mm)	Weight (fpp)	Condition Factor	Growth Rate
May	NA	1,700	NA	NA
June	32	1,371	NA	0.19
July	50	376	NA	0.73
August	73	122	NA	0.68
September	117	55	NA	0.55
October	103	42	NA	0.24
November	115	31	NA	0.26
December	125	23.4	NA	0.25
January	137	18.9	NA	0.19
February	149	15.4	NA	0.19
March	155	12.4	NA	0.19
April	157	10.9	NA	0.12
May	175	9	NA	0.17

Source: WDFW Hatcheries Headquarters Database and Hatchery Records.

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

New program. No energy reserve data is 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*).

This is a new program so food conversion efficiency data is not yet available. Table 9.2.6.1 presents data from the Skamania Early-Winter Steelhead program as a surrogate.

Table 9.2.6.1: Feed information by period, type and application, Skamania Hatchery early-winter steelhead (segregated).

Rearing Period	Food Type	Application Schedule (#feedings/day)	Feeding Rate Range (%B.W./day)	Food Conversion During Period
May-September	Starter feed crumbles #0-#2/ Pellets 1.2-1.5 mm	5 to 10	1.0-3.0	0.45-0.80
September-November	Pellets 1.5-2.0 mm	1 to 5/Demand	1.0-3.0	0.60-0.80
November - April	Pellets 2.0-3.0 mm	Demand	1.0-2.5	0.60-0.80
March-April	Pellets 3.0-4.0 mm	Demand	1.0-2.5	0.60-0.80

Source: WDFW hatchery records.

Fish are given a variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contracts. Feeding frequencies and growth rates varies depending on water temperatures and fish size.

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

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

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

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

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

The migratory state of the release population is noticeable by fish behavior. Aggressive screen and intake crowding, swarming against sloped pond sides, a silvery physical appearance and loose scales during feeding events are signs of smolt development. From past history, hatchery

specialists will reduce feed regimes in early spring as fish show signs of smolting. Also, at this time feed conversions fall, and fish appear leaner with condition factors falling well below 1.0 (K) to 0.90 (K). Correspondingly, environmental cues including daylight increase, spike in the water temperature and spring freshets which will also be part of the management decision to release fish. ATPase activity is not measured.

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

None.

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.

- Facilities provide secure operational environment through the use of alarm systems, emergency plans and 24/7 staff response.
- Hatchery program operates under approved genetic, spawning, stock transfer, fish health and NPDES discharge requirements.
- Hatchery program smolts are marked to allow differentiation from natural-origin fish.
- Smolts are acclimated and released in areas and timing that mimics wild steelhead in the Washougal system.
- On-going research and adaptive management will provide monitoring needed for the future.

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 fish release levels, Skamania Hatchery.

Age Class	Size (fpp)	Release Month	Max Number	Location
Yearlings	5.5-7.5	April-May	60,000	Washougal River (WRIA 28)

Note: 5.5 to 7.5 fpp = 185 to 205 mm fork length (FL)

Note: Rock Creek outplants are proposed to shift to Kalama Falls Early Winter stock (KEWs). Eggs will be taken and eyed at Kalama Falls Hatchery then shipped to Skamania Hatchery to be reared and outplanted to Rock Creek.

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

Table 10.2.1: Proposed Washougal Basin release sites.

Stream, river, or watercourse:	WF Washougal River (WRIA 28.0232)	Washougal River (WRIA 28.0159)
Release point:	RKm. 1.61	RKm. 5.63
Major watershed:	Salmon-Washougal	
Basin or Region:	Lower Columbia River	

Release locations have varied throughout the history of the program. There are currently two that have been utilized (Table 10.2.1) within the Washougal Watershed. Typically, juveniles are planted below the hatchery ladder, but in years where low water level or high-water temperature have been observed juveniles have been trucked down to the lower mainstem Washougal. Either location may be utilized to ensure successful outmigration.

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

Table 10.3.1: Numbers released, date of release, average size at release (fpp) and CVs, by release year, Skamania Hatchery early-winter steelhead on-station program (segregated).

Release year	Number	Avg size (fpp)	CV	Date Released
2013	60,000	5.4	10.7	April 9-18
2014	84,020	5.4	NA	17-Apr
2015	96,405	5.4	6.63	7-Apr
2016	76,892	5.4	7.31	April 5-6
2017	74,479	5.4	8.25	April 21-23
2018	87,855	5.4	7.88	17-Apr
2019	89,250	5.3	8.24	15-Apr
2020	85,091	5.8	6.67	April 15 and May 11
2021	86,271	5.6	7.36	15-Apr
2022	85,526	5.3	7.06	18-Apr
2023	84,791	5.6	6.63	April 26-27
2024	88,790	5.1	4.97	April 15-16

Source: Hatcheries Headquarters Database
Note: 6.0 fpp = 198 mm fork length (f.l.); 5.5 fpp = 205 mm f.l.
CV = coefficient of variation

10.4) Actual dates of release and description of release protocols.

All smolts are trucked to a release site for direct release as volitional release infrastructure is not currently available. Smolts released into the West Fork Washougal are loaded into transfer tanks via fish pump and released near the adult fish ladder entrance at Skamania Hatchery. All smolt releases have begun in April.

10.5) Fish transportation procedures, if applicable.

Fish are loaded with 6-inch fish pumps and oxygen is supplied through diffuser stones in the tanks. Densities are always less than one pound per gallon. Transport time to off-station sites vary; transport time for Washougal system releases is 10-20 minutes. The primary truck is insulated, while the other transport trucks are not. No problems with elevated temperatures during hauling have been experienced.

Table 10.5.1: Transport available.

Equipment Type	Capacity (gallons)	Supp. Oxygen (y/n)	Temp. Control (y/n)	Normal Transit Time		Chemical(s) Used	Dosage (ppm)
				Site	Minutes		
Tanker Truck	1800	Y	N	Mainstem Washougal R	15-20	Vida Life	5000 ppm (~0.5%)
				WF Washougal R	5		

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

Fish are reared and acclimated at the Skamania Hatchery on WF Washougal River water. All fish are programmed to be at smolt size (5.5-7.5 fpp) before release. In April/May, yearling smolts are pumped from the ponds and transported for direct releases into the WF Washougal River at RKm 2.4 (adjacent to Skamania Hatchery) and/or transported downriver (see HGMP section 10.5) to the Washougal River at RKm 12.9.

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

Fish are 100% mass-marked so that they can be distinguished from the natural population, a year before release, depending on growth rates and water temperature. Juveniles from this program will be marked with adipose fin-clips (AD) and may include a differential vent clip, maxillary clip, or a CWT to differentiate from the segregated program as it phases out.

Table 10.7.1: Marks applied, by brood year, age class and mark-type, Skamania Hatchery winter steelhead program.

Age Class	Program	AD+ *
Yearling	On-Station	100%

*Note: On Station releases will receive 100% Ad Clip and may receive either a left or right ventricle clip, maxillary clip, or a CWT to distinguish between past program returns and other release groups.

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, instruct hatchery staff for disposition of the surplus. In general, excess production will be outplanted to non-anadromous waters or destroyed.

10.9) Fish health certification procedures applied pre-release.

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. Whenever abnormal behavior or mortality is observed prior to normal examination schedule, staff will contact the Area Fish Health Specialist. The Fish Health Specialist examines affected fish and recommends the appropriate treatment. Reporting and control of selected fish pathogens are done in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) and IHOT guidelines.

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

If the program is threatened by ecological or mechanical events, the Complex Manager would contact and inform regional management of the situation and determination of a directive per permit guidelines and agency policy. Based on a determination of a partial or complete emergency-release of program fish, hatchery personnel would pump and haul fish off station for release. Preferably, no release of fish will occur without a review by WDFW Fish Management and a risk assessment.

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

- All program fish are mass-marked for easy differentiation from naturally produced fish.
- 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 strategies are to ensure that hatchery fish migrate from the hatchery/release site with a minimal amount of interaction with native fish populations.
- WDFW fish health and operational concerns for Skamania Hatchery programs are communicated to WDFW Region 5 staff for any risk management or needed treatment.

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.

Current Monitoring: As part of WDFW's core Viable Salmonid Population (VSP) monitoring program (Table11.1.1.1), steelhead population monitoring currently includes annual estimates of Washougal Winter steelhead abundance and pHOS utilizing redd counts, carcass recoveries and live observations of steelhead (Buehrens et al. 2024).

Additional work was done in the summer of 2023 to verify estimates of pHOS and assess genetic introgression of hatchery winter steelhead into the Washougal natural origin winter steelhead population. The study design followed a similar study design as Buehrens et al. (2014) where a steelhead distribution model was used as the sampling frame to select 64 spatially balanced sampling sites using a Generalized Random Tessellation Stratified (GRTS) (Stevens and Olsen 2004) method. These sites were sampled from June through September to collect tissue samples from age-0 steelhead. Samples were genotyped by the WDFW molecular genetics laboratory using the 379-SNP panel developed for use with LCR steelhead. Preliminary results showed slightly lower estimates of pHOS in comparison to estimates from standard methods (Buehrens et al. 2024). Final analyses will be completed in winter 2024/2025 after additional baseline data are genotyped to improve stock assignments. This work is not scheduled to occur annually, but it will be done as needed to assess the program.

WDFW has funded a Hatchery M&E program meant to bring standardization to reporting of hatchery program performance. The program focuses on in-hatchery and out-of-hatchery survival as well as examines the risks and benefits of programs. The data currently collected and examined relates to survival of broodstock from collection to spawn, green eggs to eyed eggs, eyed eggs to ponding, ponding to mass mark, and mass mark to release. It also focuses on the release of smolt production from the facility (number of smolts, location they are released, when they are released, size they are released at, and how they are released). WDFW is monitoring the quality of smolts released from facilities (Fish health reports, fish CV for length and weight, percocity and residualism rates). Furthermore, the program is concerned with returning adults and their contributions to fisheries, spawning populations, and collections at hatcheries and other infrastructure. All components are focused on assessing the risks and benefits of hatchery programs and bringing a larger regional and statewide perspective to individual programs.

Fishery evaluation currently occurs annually through WDFW's Catch Record Card (CRC) system that produces estimates of hatchery origin steelhead harvested in the Washougal River. A more intensive creel survey on the Washougal River was conducted from 2011 to 2014 to estimate angler effort and catch and estimate impacts on wild steelhead (Bentley et al 2015).

Adult Collection and Trapping Locations: We propose to utilize the Skamania Hatchery swim, Washougal Hatchery Swim-in, and Washougal Hatchery Intake traps as primary locations for collecting natural origin steelhead for broodstock. Additionally, we may also utilize other broodstock collection methods such as angling, seining or alternative trapping methodologies. All of these collection points provide additional opportunity to monitor wild steelhead populations through the collection of biological samples and potential tagging of adult fish prior to release.

To control upstream passage of hatchery fish, Pacific Coast Salmon Recovery Funds were secured to install a velocity weir/barrier across the river at the entrance to the Skamania Hatchery fish ladder. This included a return to stream chute for release of all natural origin fish (wild fish). This work was completed in 2017. A performance assessment of this barrier is needed to determine if any additional modifications are required. Additionally, a natural waterfall barrier below the facility creates a seasonal velocity barrier to returning hatchery winter steelhead, especially gravid females. Assessment of options for improved collection of hatchery fish below the falls is warranted.

Additional research, monitoring and evaluation in the Lower Columbia:

Table 11.1.1.1: Current WDFW monitoring and evaluation projects partially funded by Mitchell Act.

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.

A variety of fund sources, including Mitchell Act funding, are used by WDFW to implement comprehensive VSP monitoring (Table 11.1.1.1) including that conducted on the Washougal River for winter steelhead. Both Mitchell Act funding and Washington State general funds support hatchery monitoring at Washougal and Skamania hatcheries.

Funding of additional gene flow/introgression work and Skamania velocity barrier assessment may need to be pursued.

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 and evaluation operations follow scientific protocols and implement best practices to minimize impacts to fish being handled.

WDFW plans to implement the following operational best practices:

- For adult steelhead collection activities:

- All sites will be evaluated to determine what method is likely to be most effective at capturing fish with the least impact to natural origin fish.
- Seining/netting locations are inspected prior to net deployment to identify any potential net snagging hazards. These hazards are avoided.
- Netting activities use soft small mesh seines (generally less than 1") or small mesh "tangle" nets to minimize potential for gilling.
- All nets are actively monitored to minimize soak times and regulate the number of fish captured per set.
- Angling may be used in areas where snagging hazards prevent deployment of nets.
- Staff use standard fish handling protocols for tagging and sampling, including the use of approved anesthetics and recovery times.
- Natural origin fish captured for broodstock, or transport will be moved using transport tubes and/or aerated tanks.

- For juvenile work associated with introgression studies:
  - Electrofishing surveys will follow NMFS guidelines for electrofishing in waters with ESA-listed salmonids (NMFS 2000).
  - Fish will be carefully netted from the river.
  - Fish not in good condition will be released immediately to minimize impacts.
  - Fish will be handled as quickly and gently as possible.
  - Fish behavior while in holding vessels will be monitored closely for signs of stress. To minimize stress, water in holding vessels will be changed out frequently and fish density will be minimized by using multiple holding vessels.
  - Prior to biological sampling, all salmonids will be anaesthetized in a buffered (NaHCO3) tricaine methanesulfonate (MS-222) solution (~60 mg/L).
- All anaesthetized fish will be allowed to fully recover before being released back into the river. Recovery vessels will contain battery-operated aerators to help revive fish as quickly as possible. All crews will be led by experienced staff and all staff will be trained in safe handling protocols and safety requirements.

WDFW will take risk aversion measures to eliminate or reduce ecological effects, injury, or mortality as a result of monitoring activities. In addition, we will adaptively manage all aspects of the program to continue to minimize associated risks using the most recent available scientific research.

SECTION 12 RESEARCH

12.1) Objective or purpose.

No research is directly associated with the program

12.2) Cooperating and funding agencies.

Not applicable

12.3) Principle investigator or project supervisor and staff.

Not applicable

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

Not applicable

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

Not applicable

12.6) Dates or time period in which research activity occurs.

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

12.10) Alternative methods to achieve project objectives.

Not applicable

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

Not applicable

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

Not applicable

SECTION 13 ATTACHMENTS AND CITATIONS

American Fisheries Society. 2014. Fish Health Section, Blue Book. Diagnostic Section | AFS Fish Health Section | AFS-FHS.org

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.

Bartron, M.L., N.M. Sard, and K.T. Scribner. 2018. Evaluation of effective number of breeders and coancestry among progeny produced using common hatchery mating strategies. Transactions of the American Fisheries Society 147:185-194.

Bentley, K., B. Glaser, T. Buehrens, J. Byrne, and S. Kelsey. 2015. Evaluation of recreational steelhead catch in the South Fork Toutle and Washougal rivers, 2011-2014. Washington Department of Fish and Wildlife. FPT 15-06.

Buehrens, T., M. Zimmerman, B. Glaser, K. Warheit. 2014. Lower Columbia Hatchery Steelhead Introgression Study Design. Washington Department of Fish and Wildlife.

Buehrens, T., J. Wilson, S. Gray, J. Scott. 2024. Estimates of Lower Columbia River Steelhead pHOS: A Report to NOAA Fisheries. Washington Department of Fish and Wildlife. Olympia, WA. 33 pp.

Busack, C. and C.M. Knudsen. 2007. Using factorial mating designs to increase the effective number of breeders in fish hatcheries. Aquaculture 273:24-32.

Campton, D. E. 2004. Sperm competition in salmon hatcheries - the need to institutionalize genetically benign spawning protocols. Transactions of the American Fisheries Society 133:1277-1289.

Cederholm, C.J., Kunze, M.D., Murota, T. and Sibatani, A. 1999. Pacific Salmon Carcasses: Essential Contributions of Nutrients and Energy for Aquatic and Terrestrial Ecosystems. Fisheries, 24: 6-15. https://doi.org/10.1577/1548-8446(1999)024<0006:PSC>2.0.CO;2.

Courter, I.I., T.W. Buehrens, M. Roes, T.E. Blackman, B. Briscoe, and S. Gibbs. 2023. Influence of angling methods and terminal tackle on survival of salmon and steelhead caught and released in the Cowlitz River, Washington. Fisheries Research 268. https://doi.org/10.1016/j.fishres.2023.106848.

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.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.

Enhancement Planning Team. 1986. Salmon and steelhead enhancement plan for the Washington and Columbia River conservation area. Preliminary Review Draft.

Flagg, T.A. and C.E. Nash, editors. 1999. A conceptual framework for conservation hatchery strategies for Pacific salmonids. Northwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Seattle.

Ford M.J., editor. 2022. Biological Viability Assessment Update for Pacific Salmon and Steelhead Listed Under the Endanger Species Act: Pacific Northwest. U.S. Department of Commerce, NOAA Techical Memorandum NMFS-NWFSC-171. https://doi.org/10.25923/kq2n-ke70.

Galbreath, J.A, C.A. Beasley, B.A. Berejikian, R.W. Carmichael, D.E. Fast, M.J. Ford, P. F., Hesse, L.M. McDonald, A.R. Murdoch, C.M. Peven, and D.A. Venditti. 2008. Recommendations for broad scale monitoring to evaluate the effects of hatchery supplementation on the fitness of natural salmon and steelhead populations. Final Draft Report of the Ad Hoc Supplementation Monitoring and Evaluation Workgroup, Northwest Power and Conservation Council, Portland, Oregon.

Gregory, S.V., Bisson, P.A. (1997). Degradation and loss of anadromous salmonid habitat in the Pacific Northwest. Pages 277-314 *in* D.J. Stouder, P.A. Bisson, and R.J. Naiman, editors, Pacific Salmon & their Ecosystems. Springer, Boston.

Harza. 1999. The 1997 and 1998 technical study reports, Cowlitz River Hydroelectric Project. Vol. 2, 35-42.

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. Columbia River hatchery reform system-wide report. Long Live the Kings. Seattle, Washington. Available from: http://www.hatcheryreform.us/hrp/reports/system/welcome_show.action.

HSRG (Hatchery Scientific Review Group). 2014. On the science of hatcheries: an updated perspective on the role of hatcheries in salmon and steelhead management in the Pacific Northwest. Hatchery Scientific Review Group.

HSRG (Hatchery Scientific Review Group). 2015. Annual report to Congress on the science of hatcheries, 2015. Long Live the Kings, Seattle. (available from www.hatcheryreform.org).

HSRG, WDFW, and NWIFC. 2004. Technical Discussion Paper #1: Integrated Hatchery Program. Hatchery Scientific Review Group. 2017. Implementation of hatchery reform in the context of recovery planning using the AHA-ISIT tool. Prepared for the Washington Department of Fish and Wildlife, Olympia.

IHOT (Integrated Hatchery Operations Team). 1995. Policies and procedures for Columbia Basin anadromous salmonid hatcheries, Annual Report 1994. Report to Bonneville Power Administration, Contract No. 1992BI60629, Project No.199204300, (BPA Report DOE/BP-60629) 119 pp.

Kline, T. C. Jr., J. J. Goering, O. A. Mathisen, P. H. Poe, P.L.Parker, and R. S. Scalan. 1993. Recycling of elements trans-ported upstream by runs of Pacific salmon: II. 15N and 13 C evidence in the Kvichak River watershed, Bristol Bay, southwestern Alaska. Can. J. Fish. Aquat. Sci. 50: 2,350-2,365.

LCFRB (Lower Columbia Fish Recovery Board). 2010. Lower Columbia salmon recovery and fish and wildlife subbasin plan, volume 1. Longview, Washington.

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. International Association of Theoretical and Applied Limnology 23: 2249-2258.

Nelson, T.C., M.L. Rosenau and N.T. Johnston. 2005. Behavior and survival of wild and hatchery-origin winter steelhead spawners caught and released in a recreational fishery. North American Journal of Fisheries Management 25:931–943.

NMFS (National Marine Fisheries Service). 2000. Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act. 5 p.

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

NMFS (National Marine Fisheries Service). 2013. Lower Columbia River plan for salmon and steelhead. Available at: http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/lower_columbia_river/lower_columbia_river_recovery_plan_for_salmon_steelhead.html.

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 (National Marine Fisheries Service). 2017. Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on NOAAs National Marine Fisheries Service's Implementation of the Mitchell Act Final Environment Impact Statement preferred alternative and administration of Mitchell Act hatchery funding. NMFS Consultation Number: NWR-2014-697. 512 p.

NMFS (National Marine Fisheries Service). 2022. 2022 5-Year Review: Summary & Evaluation of Lower Columbia River Chinook Salmon, Columbia River Chum Salmon, Lower Columbia River Coho Salmon, and Lower Columbia River Steelhead. 129 pp. https://doi.org/10.25923/431f-fc96

NMFS (National Marine Fisheries Service). 2022. NOAA Fisheries West Coast Region Anadromous Salmonid Passage Design Manual, NMFS, WCR, Portland, Oregon

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.

ODFW (Oregon Department of Fish and Wildlife). 2018. Big Creek Hatchery Program Management Plan. 20 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.

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

Stevens, D.L. and Olsen, A.R. 2004. Spatially Balanced Sampling of Natural Resources. Journal of the American Statistical Association 99(465): 262-278.

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.

Tipping, J. 2001. Profile of a great hatchery steelhead smolt. WDFW Tech. Memo. Washington Department of Fish and Wildlife. Olympia, Washington. 7pp.

Wade, G. 2001. Salmon and Steelhead Habitat Limiting Factors, Water Resource Inventory Area 28. Washington State Conservation Commission.

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). 2003 Lower Columbia River Fisheries Management and Evaluation Plan (FMEP). Submitted to NMFS (National Marine Fisheries Service). (Approved 2001; Updated 2003). Portland, Oregon.

WDFW (Washington Department of Fish and Wildlife). 2008. Statewide Steelhead Management Plan: Statewide Policies, Strategies, and Actions. Olympia, Washington. 44 pp. Available from: http://wdfw.wa.gov/publications/00149/.

WDFW (Washington Department of Fish and Wildlife). 2024. FishBooks hatchery database. Hatcheries Data Unit, Washington Department of Fish and Wildlife. Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife). 2024. 2024 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). 2012. 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) and LCFRB (Lower Columbia Fish Recovery Board). 2016. Lower Columbia Conservation and Sustainable Fisheries Plan. Washington Department of Fish and Wildlife. Olympia, Washington. 444 pp. 810197_be1b3e40d7534bb3875875d36925e1f7.pdf

WDFW (Washington Department of Fish and Wildlife). 2024. Proposed management measures associated with hatcheries funded by the Mitchell Act. Draft October 28, 2024. Unpublished report available from Washington Department of Fish and Wildlife, Olympia, WA.

WDFW (Washington Department of Fish and Wildlife). 2014. Winter Steelhead Skamania HGMP. Submitted to NOAA March 12, 2014, Supplemental information July 11, 2014. Washington Department of Fish and Wildlife, Olympia, WA

WDFW (Washington Department of Fish and Wildlife). 1966. Fish Health Manual. Updated March 1998, revised March 2010. Fish Health Unit, Washington Department of Fish and Wildlife. Olympia, Washington.

WDOE (Washington Department of Ecology). 2023. Water Resources Explorer. Data pulled from: https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx.

Williams, R., J. Lichatowich, P. Mundy, and M. Powell. 2003. Integrating artificial production with salmonid life history, genetic, and ecosystem diversity: a landscape perspective. Issue Paper for Trout Unlimited, West Coast Conservation Office, Portland.

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.

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:_____

SECTION 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 Clark and Skamania 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.

Not applicable

15.5) References

Not applicable

SECTION 16 Take Tables

"Take" Tables were submitted to NMFS in WDFW's *Proposed Management Measures Associated with Hatcheries Funded by The Mitchell Act* (WDFW 2024).