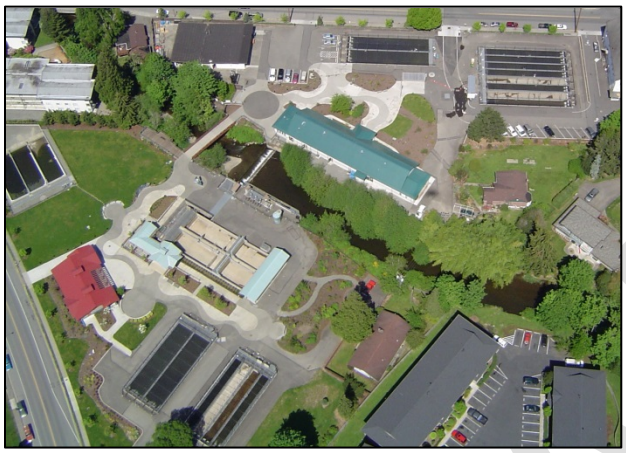
HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)



Photos provided by WDFW staff. Aerial photo by Steve Foley, April 2004.

Hatchery Program:	Issaquah Coho Hatchery Program (Integrated)
Species or Hatchery Stock:	Issaquah Creek Coho (*Oncorhynchus kisutch*)
Agency/Operator:	Washington Department of Fish & Wildlife
Watershed and Region:	Lake Washington/Puget Sound
Date Submitted:	
Date Last Updated:	October 27, 2014

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Executive Summary

ESA Permit Status:
On March 31, 2004, the Washington Department of Fish and Wildlife (WDFW) and the Puget Sound Treaty Tribes submitted a Hatchery Genetic Management Plan (HGMP) for the Issaquah Hatchery coho program under Limit 6 of the 4(d) rule. In a letter from NOAA Fisheries dated August 4, 2004, the co-managers were informed that NOAA Fisheries anticipated completing a draft Environmental Impact Statement (EIS) by spring 2005. NOAA noted that "A final EIS may then be completed by winter 2005-2006, after which time NOAA Fisheries will release ESA 4(d) Rule determinations for the hatchery plans." The letter concluded by stating that "Your work on these hatchery plans is important, and will substantially contribute to on-going salmon recovery efforts within the region." The WDFW provided updated HGMPs to NOAA Fisheries in August 2005.

The WDFW and the Co-managers are now re-submitting an updated HGMP for the Issaquah Hatchery coho program to further update the description of the program and incorporate new information and analyses.

The Puget Sound coho Evolutionary Significant Unit (ESU) is not listed under the ESA.

Issaquah Hatchery Coho Program:
The purpose of the program is to produce Issaquah Creek coho for sustainable recreational and tribal fisheries. This program also provides educational opportunities through its Watershed Interpretative Center, staffed by volunteers trained and provided by the Friends of Issaquah Salmon Hatchery (FISH - an on-site, non-profit group). Program fish will be produced at Issaquah Hatchery, located on Issaquah Creek, tributary to the Sammamish River, tributary to North Lake Washington. The program annually releases 450,000 yearling smolts to the Issaquah Creek. The NWSSC-Laebugten coho programs will release 25,000 yearling smolts from a net pen, located in the Puget Sound at the Edmonds Marina, and 80,000 fed fry released into North and Swamp creeks, which are independent tributaries to the Sammamish River. In addition, Issaquah Hatchery provides more than 200,000 eyed-eggs and 10,000 fry to regional educational co-op programs.

The program will be operated as an "integrated" program with the intent to minimize the genetic and reproductive fitness differences between the hatchery broodstock and the naturally spawning population from which they are derived.

Harvest:
Tribal and non-Tribal commercial and recreational fisheries directed at salmon and steelhead produced through WDFW hatchery releases are managed to minimize incidental effects to listed Chinook salmon and steelhead. Compliance with the fisheries management strategy defined in the *Comprehensive Coho Management Plan* (PSTT and WDFW 1998) allows fisheries on WDFW hatchery-origin stocks that are not likely to adversely affect listed Chinook, steelhead or listed summer chum.

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 planning processes, involve a series of public meetings between domestic and international federal, state, tribal and industry representatives and other concerned citizens.

Based on the average smolt-to-adult survival rate of 4.34% for 2000-2002 brood years (RMIS 2014), and a programmed release goal of 450,000 smolts, the estimated adult production (goal) level would be 19,530.

Monitoring, Evaluation, and Adaptive Management:
The following monitoring programs provide information to adaptively manage the coho hatchery programs.

WDFW conducts annual spawning ground surveys in Issaquah Creek and other Lake Washington tributaries (e.g. Cedar River). Survey data are used to track annual trends in population abundance and

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spatial distribution. A portion of the release group are coded-wire tagged to evaluate catch contribution, run timing, migration patterns, total survival and straying into other watersheds. In addition, the Co-managers currently sample annually and monitor adult salmon and steelhead in the Hiram Chittenden fish ladder and locks (Ballard Locks), in fisheries, in hatchery returns, and on the spawning grounds.

WDFW continues to annually monitor natural production and smolt emigration timing via juvenile trapping near the mouth of the Cedar River (tributary to Lake Washington), and near the mouth of Bear Creek (tributary to the Sammamish River). The Bear Creek trap also captures production from its tributary, Cottage Lake Creek.

A number of monitoring activities are on-going or planned by Seattle Public Utilities (SPU), related to the *Cedar River Habitat Conservation Plan* and the sockeye hatchery and fish ladder at Landsburg Dam. Colonization of the watershed upstream of Landsburg Dam is being investigated through a variety of studies on Chinook and coho in this area.

The Muckleshoot Tribe has begun a study of alternative release sites for Issaquah coho. In 2015, 50K coho yearlings will be released from three sites in the Lake Washington Basin to assess possible survival benefits from releases closer to Puget Sound

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1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Issaquah Hatchery Coho Program and NWSSC-Laebugten Coho Program.

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

Issaquah Creek (Lake Washington) coho salmon (*Oncorhynchus kisutch*); not ESA-listed.

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

Name (and title):	Brodie Antipa, Region 4 Hatchery Operations Manager
Agency or Tribe:	Washington Department of Fish and Wildlife
Address:	13030 Auburn Black Diamond Rd., Auburn WA 98092
Telephone:	(253) 931-3928
Fax:	**(**253) 833-2805
Email:	Brodie.Antipa@dfw.wa.gov

Fish Management Staff Lead Contact

Name (and title):	Aaron Bosworth, Region 12 District Biologist
Agency or Tribe:	Washington Department of Fish and Wildlife
Address:	16018 Mill Creek Boulevard, Mill Creek, WA 98012
Telephone:	425-775-1311 ex 102
Fax:	425-338-1066
Email:	Aaron.Bosworth@dfw.wa.gov

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

Co-manager policies are in effect for all Puget Sound hatchery programs. The **Muckleshoot** and **Suquamish Indian Tribes**, along with WDFW, prepare an annual Fishery Management Plan for the harvest of Lake Washington system fish released from hatchery programs. The legal basis for co-management of salmon in Puget Sound is based on the *Puget Sound Salmon Management Plan* (PSSMP), which was developed by the Co-managers and adopted as an order of the Federal court in 1985 (*United States v. Washington*, No. 9213 Phase 1 (sub no. 85-2) 1985).

In addition to the on-station production at Issaquah Hatchery, eggs and sub-yearlings are provided to local schools and educational programs, as well as volunteer cooperative projects throughout the Lake Washington watershed.

NWSSC-Laebugten Coho Program: The Washington Council (**Northwest Steelhead and Salmon Council - NWSSC**) of **Trout Unlimited, Edmonds-Laebugten Chapter**. This group maintains a net pen and a salmon hatchery. Volunteers feed the fish while in the net pen, and release them. The hatchery facility incubates eggs received from Issaquah Hatchery, and rears them for release as zero-age fry.

Trout Unlimited NWSSC-Laebugten Contact

Name (and title):	Walter Thompson, Hatchery Manager
Agency or Tribe:	Washington Council (NWSSC) of Trout Unlimited, Edmonds/Laebugten Chapter
Address:	95 Pine Street, Edmonds WA 98020 (Willow Creek Hatchery)
Telephone:	425-774-3903 (Walter Thompson)
Fax:	NA
Email:	Wedell@msn.com

The City of Edmonds Parks Department owns the land on which the Willow Creek Hatchery facility is built.

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

Issaquah Hatchery Coho Program:

Funding Sources	Operational Information (for FY 2013)
General Fund – State	**Full time equivalent staff** – 2.6
DJ– Federal	Annual operating cost (dollars) - $324,489
Federal	

The above information for annual operating cost applies cumulatively and cannot be broken out specifically by program.

NWSSC-Laebugten Coho Program:

Funding Sources	Operational Information
Annual operating cost (dollars)	$1,675 (feed costs)

Funding for fish feed is through the Aquatic Lands Enhancement Account (ALEA) provided to WDFW for Co-op fish production projects. Funds to provide and maintain the net pen are the responsibility of NWSSC-Edmonds/ Laebugten Chapter. Staffing is provided through volunteer labor.

1.5 Location(s) of hatchery and associated facilities.

Broodstock Source: Issaquah Creek coho

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Issaquah Hatchery (on-station)	Broodstock Collection; Adult holding/ spawning; Incubation; Rearing; Acclimation	Located on Issaquah Creek (WRIA 08.0178) at RM 3.0; drains into Sammamish Lake at Sec 17,T24N,R6E, the outlet of which drains into the Sammamish River (WRIA 08.0057) at R.M 13.8; tributary to North Lake Washington at Sec 11,T26N,R4E; drains into Puget Sound through the Ship Canal (WRIA 08.0028) at Sec10,T25,R3E.
Willow Creek Salmon Hatchery (NWSSC-Laebugten)	Incubation; Early-Rearing	Located at 95 Pine Street, Edmonds WA 98020, on Willow (Deer) Creek (LLID# 1223896477911), at the southwest corner of Edmonds Marsh (47°48'13"N 122°23'3"W).
Edmonds net pen (NWSSC-Laebugten)	Acclimation; Release	Located at the Port of Edmonds Public Fishing Pier, 336 Admiral Way, Edmonds WA.
In-River (NWSSC-Laebugten)	Release	North Creek (WRIA 08.0070): Tributary to Sammamish River at RM 6.5 (April/May) and RM 2.5 (June). Sammamish River is tributary to North Lake Washington at Sec 11,T26N,R4E; drains into Puget Sound through the Ship Canal (WRIA 08.0028) at Sec10,T25,R3E.
		Swamp Creek (WRIA 08.0059): Tributary to Sammamish River at RM 5.0. Sammamish River is tributary to North Lake Washington at Sec 11,T26N,R4E; drains into Puget Sound through the Ship Canal (WRIA 08.0028) at Sec10,T25,R3E.

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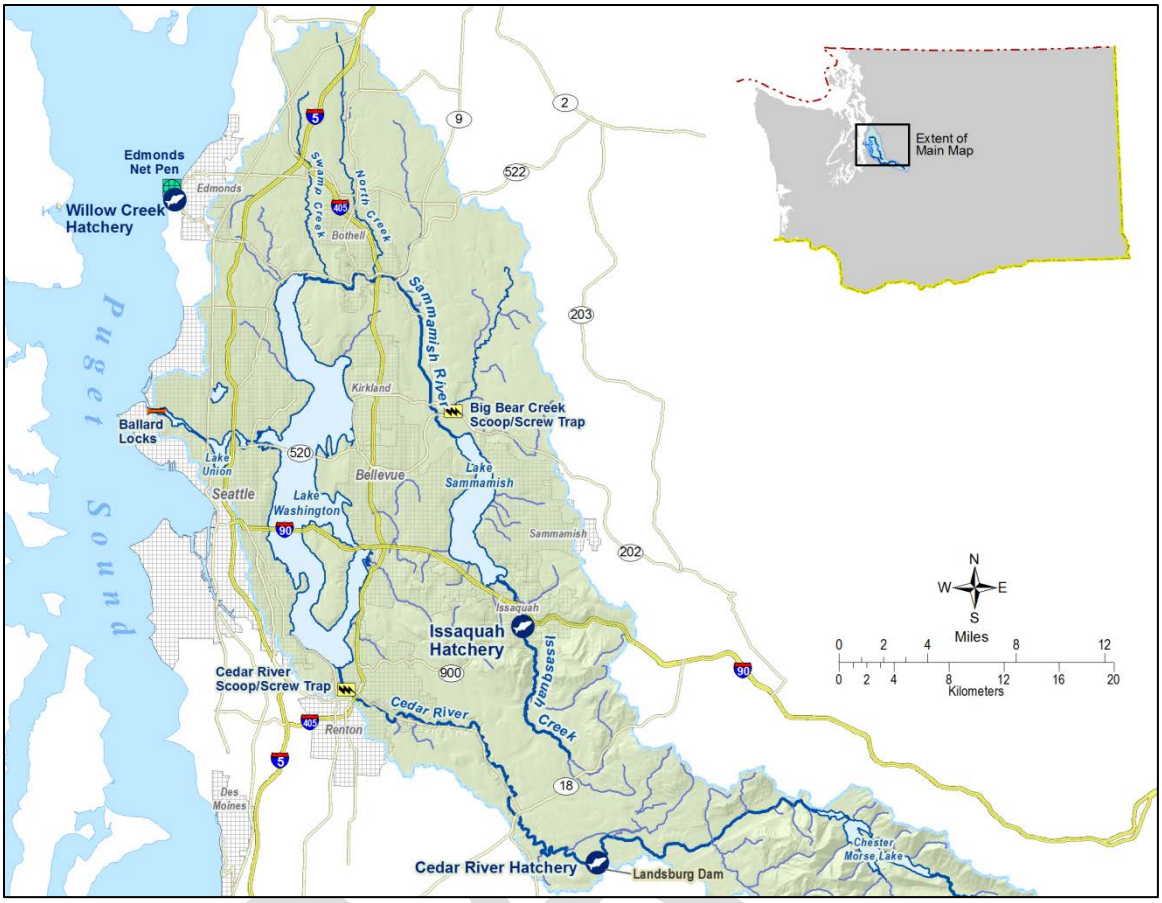

Figure 1.5.1: Map of Issaquah Salmon Hatchery (WDFW) and Edmonds net pen and Willow Creek Hatchery (NWSSC-Laebugten) in the Cedar-Sammamish watershed. Source: WDFW GIS Unit 2014.

1.6 Type of program.

Integrated Harvest.

1.7 Purpose (Goal) of program.

Harvest Augmentation/Education.

1.8 Justification for the program.

Natural-origin coho populations cannot sustain consumable sport or treaty tribe harvest opportunities in the east and northwest tributaries of Lake Washington, Sammamish River, Lake Sammamish, and Issaquah Creek. The purpose of the program is to produce coho for sustainable fisheries (Magnuson/Stevens Act), for harvest in terminal recreational fisheries, and to fulfill Treaty Indian fishing right entitlements (*U.S. v Washington*).

In addition, this program provides educational opportunities through its Watershed Interpretative Center. Volunteer docents, trained and provided Friends of Issaquah Salmon Hatchery ("FISH," an on-site, non-profit group) provides guided tours of the facility and watershed education to 9,000+ visitors annually, seven-days a week, year-round. They are also an integral part of annual Issaquah Salmon Days Festival (sponsored by the Issaquah Chamber of Commerce), which attracts 200,000+ people.

NWSSC-Laebugten Coho Program: The goal of the program is to acclimate and release 105,000 locally-adapted coho salmon (80,000 fry from the hatchery, and 25,000 smolts from a marine net

pen) providing coho salmon for non-tribal sport and commercial harvest (Stevens/Magnuson Act for sustainable fisheries) and for tribal harvest (*U.S. v Washington* 1974).

In addition, the fry program is geared towards educating elementary and middle school students from Edmonds, Mukilteo and Northshore school districts about Pacific Salmon ecology. The Willow Creek facility provides an opportunity to teach such environmental issues as water quality, habitat, wetlands ecology, the identification of salmon food sources, salmon life history, etc. Students (and their parents) also participate in the fry releases into North and Swamp creeks.

To minimize impacts on ESA-listed fish by WDFW facilities operation and the Issaquah and NWSSC Laebugten coho program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Issaquah and NWSSC Laebugten coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1, 4.2	*Issaquah Coho Program*: Surface water rights are formalized through trust WDOE water right permits (see **Table 4.1.1**). Monitoring and measurement of water usage is reported in monthly NPDES reports. Withdrawal of water for the hatchery is curtailed for low-flow periods when Chinook are present, presenting a low-to-moderate delay risk for upstream-migrant listed fish. *NWSSC-Laebugten Coho Program*: Usage of surface water from Willow Creek is regulated under water right #S1-24635C. Water from is returned 10-ft below the intake.
Intake Screening	4.2	The upper intake was replaced in 2013/2014; the barrier dam was removed and boulder weirs were installed. The screens at the upper and lower intakes are in compliance with state and federal guidelines (NMFS 1995, 1996, 2011).
Effluent Discharge	4.2	The hatchery operates in compliance with NPDES discharge permit guidelines (# WAG13-3010). *NWSSC-Laebugten Coho Program*: Total on-site production at Willow Creek Hatchery is < 20,000 lbs and < 5,000 lbs of fish feed per month and therefore, does not require an "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit.
Broodstock Collection & Adult Passage	2.2.3, 6.3, 7.9	A hatchery weir on Issaquah Creek diverts all upstream-migrants into the hatchery adult pond where they are sorted for spawning or passage upstream. The trap is operated from late-August through late-November, to capture Chinook (September-October) and coho for program broodstock needs. Unmarked Chinook encountered during coho spawning are returned to the creek. The upper intake was redesigned/renovated in 2013/2014, and the boulder weirs that were installed do not impede fish passage. Diversion into the adult holding ponds ends in late-November, and has not been observed to delay winter steelhead migrations, which were historically recorded from January through May. *NWSSC-Laebugten Coho Program*: No broodstock are collected at Willow Creek Hatchery.

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Disease Transmission	5.8, 7.7, 9.2.7	The *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size, and life-history stage (smolts) to foster rapid migration to marine waters. *NWSSC-Laebugten Coho Program*: Net pen fish are released at a time, size, life-history stage (smolts), and location to foster rapid migration to marine waters. Smolts are released in June to allow ESA-listed juvenile salmonids to grow to a size that reduces the potential for predation. Zero-age fry are released in two Sammamish River tributaries at a time and size to minimize interaction with out-migrating natural steelhead and Chinook juveniles.

1.9 List of program "Performance Standards".

See HGMP section1.10. Standards and indicators are referenced from Northwest Power Planning Council (NPPC) Artificial Production Review (APR) (NPPC 2001).

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

1.10.1 "Performance Indicators" addressing benefits.

Table 1.10.1.1: "Performance indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in *US v WA.*	Contributes to co-manager harvest.	Participate in annual coordination between co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process and North of Falcon).
3.1.2- Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development within the Lake Washington system and contributes to sport, tribal and commercial fisheries.	Survival and contribution to fisheries will be estimated for each brood year released.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1 Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Externally-marked hatchery fish differentiate hatchery from natural-origin fish and enable mark-selective fisheries, which can reduce directed harvest mortality on wild fish.	Harvests and hatchery returns are monitored by agencies to provide up-to-date information.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate	A percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (fin-clips, otoliths, tags, etc.) a portion of the fish production to	Program fish have been 100% mass-marked (ad-clipped) since brood year 1999. Monitor size, number, date of release and mass-mark quality

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effects of the program on the local natural population.	allow for their differentiation from naturally-produced fish.	Annual estimates of mass-mark rate (ad-clip, Ad/CWT) of all hatchery releases. Returning fish are sampled in fisheries, hatchery return and on the spawning ground . Numbers of estimated hatchery (marked) and natural (unmarked) are recorded annually.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and spawning escapement timing data are collected. Adhere to WDFW spawning guidelines. (Seidel 1983, HSRG 2004).
3.5.5 Juveniles are released at fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Smoltification status (size fpp/mass, CV and condition factor) and behavior are monitored in the hatchery.	Condition of fish monitored in the hatchery throughout rearing stages. Monitor size, number, date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is properly-sized to meet harvest objectives; program fish are fully utilized in target fisheries.	Harvests and hatchery returns are monitored throughout the run.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Adhere to HSRG (2004) and WDFW spawning guidelines (Seidel 1983). Apply minimal monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Annual run timing, age and sex composition data are collected upon adult return. Growth rates, mark rate and size at release and release dates are recorded annually
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefit that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal ceremonial use.	Annual harvest of hatchery fish based on CWT recovery estimates and creel surveys.
	Provide information about agency programs and hatchery operations to such internal and external audiences as local schools and special interest groups. Off-station efforts may include festivals, classroom participation, stream adoptions and fairs.	Record on-station organized education and outreach events. Evaluate use and/or exposure of program materials and exhibits as they help support goals of the information and education program.

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1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1: "Performance indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities.	This HGMP has been submitted for program authorization under auspices of the ESA. Risks have been addressed through best available science hatchery management actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Monitor juvenile hatchery fish size, number, date of release and mass-mark quality; monitor contribution of hatchery adult fish to fisheries and escapement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Harvest is regulated to meet appropriate biological assessment criteria. Mass-mark juvenile hatchery fish prior to release to differentiate hatchery- from natural-origin fish and enable state agencies to implement selective fisheries.	Harvests and escapements are monitored by agencies to provide up-to-date information.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, etc., depending on species) produced fish to allow for their differentiation from naturally-produced fish for selective fisheries.	100% mass-marking as of brood year 1999. Annual harvest of mass-marked hatchery fish assessed based on creel surveys and CWT recovery estimates, when available.
3.3.1 Hatchery program contributes to an increasing number of spawners returning to natural spawning areas.	Total number of spawners, categorized by origin, are monitored (pHOS, spawner-recruit ratios).	Escapement is estimated using index reaches of standard tributaries in conjunction with expansion based on historic mark/recapture study. Fish origin determined from expanded mark/tag recovery estimates.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production and to evaluate effects of the program on the local natural population.	All hatchery production is identifiable in some manner (fin-marks, tags, otolith, etc.) consistent with information needs.	Annual estimates of mass-mark (ad-clip) rate of all hatchery releases. Returning fish encountered are examined for the fin-mark upon hatchery return and on the spawning ground. Numbers of estimated hatchery (marked) and natural (unmarked) are recorded annually. Currently managed as a Stabilizing population: pHOS and PNI goals = "current".
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and return timing data are collected. Adhere to WDFW spawning guidelines. (Seidel 1983, HSRG 2004).

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broodstock is taken.		
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Integrated harvest – collection of NOB does not significantly reduce potential juvenile production in the system.	Currently managed as a Stabilizing population: pHOS and PNI goals = "current".
3.4.3 Life history characteristics of the natural population do not change as a result of this hatchery program.	Life history patterns of juvenile and adult NOR are stable.	Unknown. Plan in progress to annually monitor for production levels – age and size data collected. WDFW currently has smolt/fry traps on the Cedar River and in the Bear/Cottage Lake creeks watershed.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	Currently not monitored.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and return timing data are collected.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS).	Currently managed as a Stabilizing population: pHOS and PNI goals = "current".
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Fish are released in lower river locations after acclimation.	Annual release information, including location, method, and age class are recorded in hatchery database.
3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release (17 fpp coho). Release type (forced, volitional or direct).	Monitor size, number, date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is sized appropriately for harvest goals. Numbers of surplus hatchery returns are calculated annually.	Numbers of adults returning to the hatchery, broodstock collected, and surplus returns are recorded annually.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006), INAD, MDFWP).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit.	Flow and discharge reported in monthly NPDES reports.

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	WDOE water right permit compliance.	
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.5 Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal and federal carcass distribution guidelines.	All applicable fish disease policies are followed (see HGMP sections 7.5 and 7.8).	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Disposition of carcasses are recorded in the WDFW Hatchery Adult Database.
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently	Annually record number of salmonids passed above the weir. Spawning ground surveys are not conducted upstream from the

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produced population.	compared to historic distribution.	Issaquah Hatchery weir.
3.7.7 Weir/trap operations do not result in significant stress, injury or mortality in natural populations.	All observations of natural-origin fish at hatchery facilities are recorded and reported annually.	Trap checked daily. Natural- and hatchery-origin fish abundances recorded and reported annually.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Not available.
3.8.1 Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	Total cost of operation.	Annual operational cost of program compared to calculated fishery contribution value (Wegge 2009).

1.11 Expected size of program.

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

The egg-take goal of 985,000 requires collection of up to 1000 adults. For the on-station release (450,000 yearlings), approximately 450 adults are needed (225 females: 225 males at 1:1 ratio), based on an average fecundity of 2,500 (2003-2008 brood years) eggs/female, an egg take goal of 558,000 and an egg-to-smolt survival of 81%. Percent of hatchery- and natural-origin fish should be kept at level no lower than current, based on affected natural population categorized as stabilizing. Eggs and fry provided for off-station plants are hatchery x hatchery crosses (HxH), however, sub-yearlings provided to the Laebugten net pen program are integrated.

NWSSC-Laebugten Coho Program: Broodstock level needed to provide 25,000 fish to the net pen is approximately 10 pairs; around 22 pairs are required to produce the 80,000 eggs provided for the unfed fry program. This is a proportion of the total coho broodstock taken at the Issaquah Hatchery.

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

Table 1.11.2.1: Issaquah coho release levels by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed-Eggs	Various Region 4 enhancement co-ops	201,250[a]
Fry	Educational enhancement co-op[b]	10,000
Yearling	Issaquah Creek (WRIA 08.0178)	450,000[c]

Source: Future Brood Document 2013.

[a] Eyed eggs are transferred to various educational and volunteer co-op projects within the watershed for incubation and release.

[b] Lively Environmental Center, in Mill Creek, released into Nickel Creek (WRIA 08.0077A).

[c] Decreased from 535,000 in 2008. Does not include smolt releases from Laebugten net pen.

Table 1.11.2.2: NWSSC-Laebugten coho release levels by life stage and location

Life Stage	Release Location	Annual Release Level
Fry	North Creek (WRIA 08.0070)	65,000
	Swamp Creek (WRIA 08.0059)	15,000
Yearling	Edmonds Net Pen (Edmonds Marina)	25,000

Source: Future Brood Document 2014.

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

Based on the average smolt-to-adult survival rate of 4.34% for 2000-2002 brood years (RMIS 2014), and a programmed release goal of 450,000 smolts, the estimated adult production (goal) level would be 19,530 (see also HGMP section 3.3.1).

Table 1.12.1: Issaquah Hatchery coho escapement 2002- 2013.

Brood Year	Hatchery Escapement
2002	1,483
2003	5,643
2004	21,449
2005	9,370
2006	8,745
2007	3,475
2008	4,296
2009	13,867
2010	568
2011	4,954
2012	10,626
2013	10,614
Average	**7,924**

Source: WDFW Hatcheries Headquarters Database 2014.

Table 1.12.2: Area Under the Curve index area live counts for coho adult natural spawning escapements to the Cedar River mainstem and the Bear Creek/Cottage Lake Creeks watershed. There is no expansion to un-surveyed sections or for fish not seen (WDFW Escapement Data).

Return Year	Cedar River Basin	Sammamish River Basin	System Total
2002	1,001	862	1,863
2003	1,286	1,763	3,049
2004	653	644	1,297
2005	1,240	315	1,555
2006	115	456	571
2007	504	541	1,045
2008	349	641	990
2009	236	749	985
2010	0	158	158
2011	115	34	149
2012	445	1,250	1,694
2013	998	317	1,315
Average	**579**	**644**	**1,223**

Source: SaSI WDFW 2014.

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Table 1.12.3: Catch and abundance of Bear Creek juvenile coho migrants, brood years 1997-2009.

Year		Catch		Trapping Dates		Est'd Production	95% CI		CV
Brood	Trap	Actual	Est'd	Start	End		Low	High	
1997	**1999**	14,896	38	2/23	7/13	62,970	50,645	75,295	10.0
1998	**2000**	7,737	0	1/24	7/13	28,142	26,133	30,151	3.6
1999	**2001**	6,617	0	4/10	7/12	21,665	18,947	24,383	6.4
2000	**2002**	1,736	15	4/12	7/15	58,212	52,791	63,633	4.8
2001	**2003**	15,048	0	4/9	7/8	48,561	42,304	54,818	6.6
2002	**2004**	9,111	0	4/5	6/26	21,085	18,641	23,529	5.9
2003	**2005**	16,191	0	4/8	7/14	43,725	43,638	43,813	0.1
2004	**2006**	11,439	0	4/8	6/29	46,987	44,658	49,316	9.7
2005	**2007**	2,802	0	4/15	7/11	25,143	20,220	30,066	9.9
2006	**2008**	1,572	0	4/16	7/9	12,208	9,807	14,609	9.9
2007	**2009**	3,822	104	4/22	6/30	33,395	26,840	39,951	10.0
2008	**2010**	1,895	59	4/22	7/4	13,100	11,427	14,773	6.5
2009	**2011**	4,628	243	4/27	7/16	34,513	25,700	43,326	13.0

Source: Kiyohara and Zimmerman 2012.

NWSSC-Laebugten Coho Program: Fish are not coded-wire tagged; no data available to evaluate smolt-to-adult survivals.

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

Program was initiated in 1935.

NWSSC-Laebugten Coho Program: The Edmondts Net Pen project was initiated in 1978. The Willow Creek Hatchery project was initiated in 1986, with Chinook, but switched to coho in 1992.

1.14 Expected duration of program.

Ongoing.

1.15 Watersheds targeted by program.

Issaquah Hatchery Coho Program: Lake Washington watershed (WRIA 8) and Issaquah Creek (WRIA 08.0178).

NWSSC-Laebugten Coho Program: These fish are intended to contribute to Puget Sound sport and net fisheries.

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

None at this time.

Issaquah Coho Program: In order for any alternative actions to be considered for attaining program goals, the affected parties (co-managers) must approve any changes. The *Puget Sound Salmon Management Plan* (PSSMP 1985), a federal court order, describes the co-management responsibilities of WDFW and the tribes with regard to fishery management and artificial production. The *PSSMP* explicitly states that "no change may be made to the Equilibrium Brood Document (program production goals) without prior agreement of the affected parties." In the Lake Washington watershed, any changes in the production at the Issaquah Hatchery have to be reviewed and approved by WDFW and the Muckleshoot Tribe (the WDFW and the Muckleshoot Tribe agreed to and signed a "Production/Mass Marking Agreement" in April 2000). To maximize natural-origin fish in the broodstock, the Co-managers agreed to move toward an integrated population (see also HGMP section 2.2.3). The hatchery began to incorporate natural-origin recruits (NORs) into the hatchery spawning population in 2006 at a rate no lower than

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current, as per the recommendations of the Hatchery Scientific Review Group (HSRG) and management strategy for a stabilizing natural population.

NWSSC-Laebugten Coho Program: The release of coho could potentially result in ecological interactions with ESA-listed species, however, this potential interaction was reduced when the programmed allocation was reduced to 80,000 eyed-eggs for the unfed fry program. Further reductions were not pursued so program goals could be attained: providing coho salmon for non-tribal sport and commercial harvest (Stevens/Magnuson Act for sustainable fisheries) and for tribal harvest (*U.S. v Washington* 1974).

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

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

This HGMP was previously submitted to NOAA in 2005, but was never acted upon. This HGMP is submitted to NOAA Fisheries for ESA consultation, and determination regarding compliance of the plan with ESA section 4(d) rule criteria for joint state/tribal hatchery resource management plans affecting listed Chinook salmon and steelhead.

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.

None.

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

Puget Sound 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 (76FR50448). The Puget Sound Chinook salmon ESU is composed of 31 historically quasi-independent populations, of which 22 are believed to be extant currently. The ESU includes all naturally-spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington, as well as twenty-six artificial propagation programs (Ford 2011). In the Lake Washington basin, the Technical Recovery Team (TRT) has identified demographically independent populations (DIPs) in the Sammamish and Cedar Rivers (Ruckelshaus et al. 2006).

Puget Sound steelhead *(Oncorhynchus mykiss*): were listed as *Threatened* under the ESA on May 11, 2007 (72FR26722); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The DPS includes all naturally spawned anadromous winter-run and summer-run *O. mykiss* (steelhead) populations, below natural migration barriers in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington (Ford 2011). This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). Also includes steelhead from six artificial propagation programs: Green River Natural; White River Winter Steelhead Supplementation; Hood Canal Steelhead Supplementation Off-station Projects in the Dewatto, Skokomish, and Duckabush Rivers; and the Lower Elwha Fish Hatchery Wild Steelhead Recovery (NMFS 2013 78FR38270).

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In the Lake Washington basin, the TRT has preliminarily delineated two demographically independent populations (DIPs) of winter steelhead; (Cedar River and Lake Washington); no summer run populations were identified in the region (PSSTRT 2013).

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.

Issaquah Creek Hatchery fall Chinook in the Puget Sound Chinook ESU. NMFS (1999) considered this stock to be part of the ESU but not essential for recovery. Stock was designated as Category 2b. This hatchery stock was founded in 1937 from the Green River stock (HSRG 2003) that are part of the ESU, but are not released through this program into its native watershed. Historically, fall-run Chinook salmon were probably not present in Issaquah Creek (SSHAG 2003).

Lake Washington (Sammamish River and Cedar River) fall Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2002-2013) have averaged 849 for spawners in the Cedar River DIP and 1,149 for the Sammamish River DIP. Both DIPs have shown an increasing population trend during this same period (SaSI, WDFW 2014).

*Puget Sound Chinook salmon: Updated Risk Summary***.** All Puget Sound Chinook populations are well below the TRT planning range for recovery escapement levels. Most populations are also consistently below the spawner recruit levels identified by the TRT as consistent with recovery. Across the ESU, most populations have declined in abundance somewhat since the last status review in 2005, and trends since 1995 are mostly flat. Several of the risk factors identified by Good et al. (2005) are also still present, including high fractions of hatchery fish in many populations and widespread loss and degradation of habitat. Many of the habitat and hatchery actions identified in the Puget Sound Chinook recovery plan are expected to take years or decades to be implemented and to produce significant improvements in natural population attributes, and these trends are consistent with these expectations. Overall, the new information on abundance, productivity, spatial structure and diversity since the 2005 review does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

See Issaquah Fall Chinook HGMP for Viability Criteria.

Lake Washington winter-run steelhead in the Puget Sound steelhead DPS. The counts have been very low since 2000. The estimated mean population growth rate is −0.23 (λ = 0.794) and process variance is 0.380. The estimated probability that the Lake Washington steelhead population would decline to 10% of its current estimated abundance (<1 fish) is high—approximately 90% within 40 years. An extinction risk envelope could not be calculated for this population from the data. Based on a habitat based intrinsic potential (IP) estimate by the PSSTRT (2013), the capacity for winter steelhead in this DIP is 5,268 to 10,536 adults.

*Puget Sound steelhead: Updated Risk Summary***.** The status of the listed Puget Sound steelhead DPS has not changed substantially since the 2007 listing. Most populations within the DPS are showing continued downward trends in estimated abundance, a few sharply so (Ford 2011). For all but a few putative demographically independent populations of steelhead in Puget Sound, estimates of mean population growth rates obtained from observed spawner or redd counts are declining — typically 3 to 10% annually — and extinction risk within 100 years for most populations in the DPS is estimated to be moderate to high, especially for *draft* populations in the *putative* South Sound and Olympic MPGs. Collectively, these analyses indicate that steelhead in the Puget Sound DPS remain at risk of extinction throughout all or a significant portion of their range in the foreseeable future, but are not currently in danger of imminent extinction.

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Table 2.2.2.1: Interim DIP abundance goals for steelhead in Puget Sound, based on a four-year average. Abundance goals for summer-run fish *(italics*) are still under review. QET, quasi extinction threshold; SAS, smolt to adult survival. Minimum abundance = 100 (Low Abundance), 250 (Viable).

Population Basin				Quasi Extinction Threshold	Low Abundance	Viable	Capacity
Population Name	Area km^2	Mean Elevation (m)	Total Stream Length (m)		1% SAS	5% SAS	20% SAS
North Lk WA Tributaries	978	119	441,887	36	527	2,634	10,536
Cedar River	650	461	402,349	35	597	2,975	11,899
Puget DPS Total				**1,462**	**30,449**	**153,194**	**613,662**

Source: Hard et al. 2014

- Provide the most recent 12 year progeny-to-parent ratios, survival data by life-stage or other measures of productivity for the listed population.

See Issaquah Fall Chinook HGMP for productivity criteria.

Table 2.2.2.2: Exp. Steelhead Population Trend ln(nat. spawners) (95% CI)

Population	1985-2009	1995-2009
Lake Washington winter-run	0.807 (0.770 - 0.845)	0.731 (0.656 - 0.815)

Source: Ford 2011. These are based on analyses reported by Ford (2011) that are not necessarily agreed to by WDFW and the Muckleshoot and Suquamish Tribes.

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

See Issaquah Fall Chinook HGMP for Chinook abundance criteria.

Table 2.2.2.3: Total escapement of Lake Washington winter steelhead natural spawners, 2002-2013.

Year	Escapement
2002	38
2003	20
2004	44
2005	22[a]
2006	32[a]
2007	8[b]
2008	4[c]
2009	0
2010	2
2011	4
2012	0
2013	8

Source: SaSI, WDFW 2013, Aaron Bosworth WDFW 2013.

[a] All redds were in the Cedar, there were no redds located in any other tributaries.

[b] There were five redds in the Cedar, there were no redds found in any other tributaries.

[c] There were two redds located in the Cedar River. No other Lake Washington tributaries were surveyed.

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- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

See Issaquah Fall Chinook HGMP for annual proportions of hatchery and natural-origin Chinook on the spawning grounds.

2.2.3 <u>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.</u>

- 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 Collection: Broodstock collection for Issaquah Creek coho are collected from October to December. There is some overlap with the end of the Chinook migration period, and some listed Chinook may be captured in the hatchery trap in October.

Hatchery broodstock collection methods have been revised per the Hatchery Scientific Review Group recommendation (February 2002), and the Fish and Wildlife Commission Policy (C-3619, November 2009) (see also HGMP sections 6.2.3 & 6.3).

Genetic Effects: There are no known genetic effects on listed fish from this program. Natural-origin coho are integrated into the broodstock with the intent to increase local adaptation to the natural environment and boost productivity, while managing for other viability parameters (abundance, spatial distribution and genetic diversity). Issaquah Hatchery coho production is 100% identifiable through a combination of adipose fin-clips and coded-wire tags, and are monitored in terminal area fisheries and hatchery escapements.

Adult passage: The hatchery weir/intake on Issaquah Creek diverts all returning adult Chinook into the hatchery adult pond where they are sorted for spawning or passage upstream. This occurs during the normal adult return time (September and October). The upper intake is a vertical screen (see also HGMP section 4.2), with boulder weirs to allow fish to free migrate past the structure (**Figure 2.2.3.1**). Steelhead are not generally present during this timeframe (September-November); cutthroat trout encountered are released above the weir; sockeye and kokanee are passed upstream if encountered.

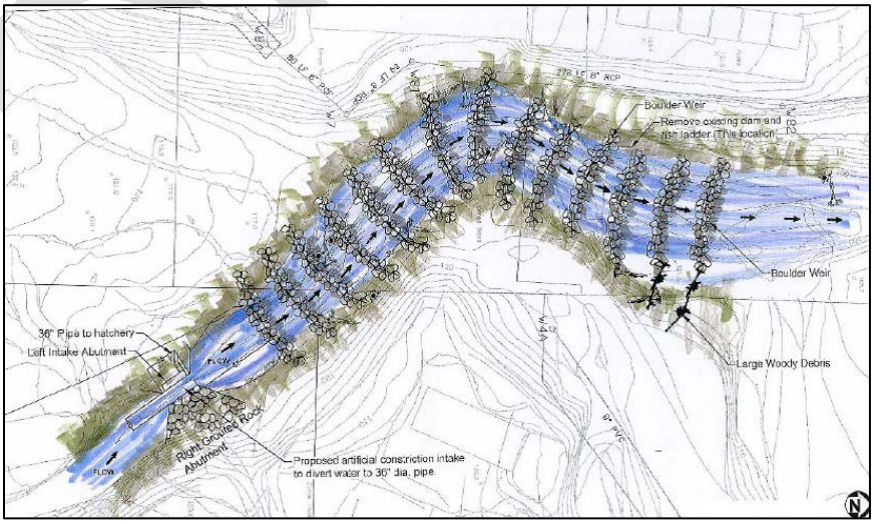

Figure 2.2.3.1: Issaquah Creek Integrated Fish Passage Improvement Project design replaced existing the dam structure with a series of boulder weirs. Source: City of Issaquah.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include: water withdrawal, hatchery effluent, and intake compliance. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect 'Take" associated with the operations of these facilities. No take of listed fish have been reported by staff during the normal operation of the hatchery.

Disease Transmission: The risk of disease transmission to wild salmonids in the area (Puget Sound) is low. Transmission of hatchery-origin diseases from the hatchery to wild fish in areas where they co-occur is an unlikely event. Although hatchery populations can be considered to be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). These impacts are addressed by rearing fish at lower densities, within widely recognized guidelines, continuing well-developed monitoring, diagnostic, and treatment programs already in place (*Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

Predation/Competition Although coho have been documented to prey on other salmonids (primarily pink, chum and sockeye salmon) (Hawkins and Tipping 1999; Seiler et al. 2002; Hargreaves and LeBrasseur 1986), any predation potential to listed populations should be minimized by the timing and proximity of the release. Studies in the Green River have shown that yearling coho typically spend less than a week in the lower river and estuary reaches of the river (Ruggerone et al. 2006). Issaquah Hatchery coho are released in May at 17 fpp (131 mm fl). Juvenile Chinook salmon emigrating out of Issaquah Creek during this period, averaged 54.2 mm (s.d.= 5.59, range 45 to 64 mm) (Seiler et al., 2003). This is larger than the threshold predation susceptibility size, and therefore, natural-origin listed Chinook are not likely to be preyed upon by the hatchery coho. Food resource competition risks to listed Chinook juveniles are not likely to be substantial since the larger program coho are likely to select different food sources. A previous 1.0-million fed-fry program component was eliminated in 1996.

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

Past levels of natural broodstock incorporated into the hatchery population are unknown. Juvenile coho released from Issaquah Hatchery have been mass-marked with adipose fin-clips and coded-wire tags since the 1999 brood (2003 return), thereby enabling identification of returning hatchery-origin fish from the Cedar/Sammamish system.

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

See "Take" Tables at the end of this document.

- 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.

Take levels have been unknown so no contingency plans have been established. Due to mass-marking, hatchery fish have been identifiable since the 2002 return. WDFW will consult with NMFS to develop a contingency plan and in any case where take levels are exceeded or are projected to exceed the take levels in the plan, WDFW will consult with NMFS in a timely manner.

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3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

WDFW hatchery programs in Puget Sound operate under, and adhere to Co-manager priorities and legal requirements of the *Puget Sound Salmon Management Plan* (*PSSMP* 1985), and the Terms and Conditions of Permits issued under the Endangered Species Act (ESA). Legal requirements, Co-manager priorities and general principles for hatchery management are adapted to the unique genetic and ecological conditions of the Cedar/Sammamish watershed.

Comprehensive Coho Management Plan (CCMP): Provides an overarching co-manager agreed-to plan, which seeks to develop and implement improved coho management approaches that support the maintenance and restoration of wild stocks in a manner that reflects the regions fisheries objectives (resource protection, allocation, and harvest stabilization), production constraints, and production opportunities (PSTT and WDFW 1998).

Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the *Hatchery and Fishery Reform Policy C-3619* in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. *WDFW Policy C-3619* works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under *U.S. v Washington* (1974) and *U.S. v Oregon* and that hatchery reform actions must be done in close coordination with tribal Co-managers (available at http://wdfw.wa.gov/commission/policies/c3619.html).

Hatchery Reform- Principles and Recommendations of the Hatchery Scientific Review Group. WDFW programs have incorporated the suggestions this report provided, in a detailed description of the HSRG's scientific framework, tools and resources developed for evaluating hatchery programs, the processes used to apply these tools, and the resulting principles, system-wide recommendations, and program-specific recommendations to reform (HSRG 2004). See also HGMP section 6.2.3.

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

The WDFW and the Muckleshoot Tribe agreed to and signed a "Production/Mass Marking Agreement" in April 2000. Production and marking goals shall be agreed to annually between the Co-managers.

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound ESU, operates under *U.S v Washington* (1974) and the *Puget Sound Salmon Management Plan* (PSSMP 1985) which provides the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered Puget Sound Salmon Management Plan (PSSMP 1985).

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 upcoming brood stock collection and fish rearing

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seasons (July 1 – June 30). The FBD is coordinated between WDFW, the Northwest Indian Fisheries Commission (NWIFC) representing Puget Sound and coastal treaty tribes, eastern Washington treaty tribes, and Federal fish hatcheries.

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

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

Table 3.3.1.1: Issaquah Hatchery coho fishery contributions for BY 2000-2002.

Brood Years: 2000-2002 Fishery Years: 2003-2005		
	Average SAR%[a]	**4.34**
Agency	***Non-WA Fishery***	***% of total Survival***
ADFG	All	*0.0*
CDFO	All	*2.4*
NMFS	All	*0.0*
ODFW	All	*0.9*
Agency	***WA Fishery***	***% of total Survival***
WDFW	10- Ocean Troll	*0.1*
WDFW	15- Treaty Troll	*1.3*
WDFW	23- PS Net	*43.0*
WDFW	41- Ocean Sport- Charter	*1.1*
WDFW	42- Ocean Sport- Private	*3.5*
WDFW	45- PS Sport	*9.6*
WDFW	46- Freshwater Sport[b]	*0.7*
UW	50- Hatchery Escapement (Strays)[c]	*0.0*
WDFW	50- Hatchery Escapement	*37.3*
WDFW	50- Hatchery Escapement (Strays)[d]	*0.0*
	Total	***100.0***

Source: RMIS 2012.
[a] Average SAR% = (tags recovered/tags released).
[b] Freshwater Sport based on WDFW Catch Record Card (CRC) data.
[c] An estimated 6.12 tags recovered at Portage Bay Hatchery.
[d] A single tag recovered at McKernan Hatchery.

NWSSC-Laebugten Coho Program: There are no current data available for determining the fisheries contributions of the NWSSC-Laebugten net pen program; fish are released ad-marked but are not coded-wire tagged.

3.4 Relationship to habitat protection and recovery strategies.

Over half the land area in the Lake Washington and Lake Sammamish basin (WRIA 8) is within the urban growth boundary. Urbanization and impervious land cover have led to irreversible changes in hydrology, water quality, and in-stream habitat diversity, reducing the potential historically productive stream habitat. Habitat protection and recovery strategies are addressed in documents developed for the Puget Sound area and individual watersheds. Different groups are involved in planning, funding and realizing restoration projects through the region as listed below.

Puget Sound Salmon Recovery Plan (2005): Describes habitat related challenges (http://www.govlink.org/watersheds/9/plan-implementation/HabitatPlan.aspx). Based on this recovery plan, a number of habitat actions have been implemented, with additional improvements identified to be considered in the future.

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Salmon Recovery Funding Board (SRFB): Created by the Legislature in 1999, the SRFB is composed of five citizens appointed by the Governor and five state agency directors, the Board provides grant funds to protect or restore salmon habitat and assist related activities. It works closely with local watershed groups known as lead entities (see below). The Board supports salmon recovery by funding habitat protection and restoration projects, and related programs and activities that produce sustainable and measurable benefits for fish and their habitat.

Lead Entities: The Lead Entity for Issaquah Creek (Sammamish Lake watershed) is King County (WRIA 8). It also covers the Cedar River watershed and Lake Washington. As work is completed (state and local resource management jurisdictions) on assessing the habitat factors limiting natural production and identifying and implementing habitat restoration and protection strategies in the Lake Washington watershed, WDFW will incorporate relevant information into this document.

Regional Fisheries Enhancement Groups (RFEG): Citizen based groups in conjunction with local governments work on habitat actions to benefit both listed and non-listed stock in the system including the Mid Puget Sound Regional Enhancement Group (RFEG).

Puget Sound Partnership Action Plan: An ESU-wide recovery planning effort is being undertaken by the Puget Sound Partnership, a collaborative group dedicated to restoring salmon and steelhead throughout Puget Sound (online at http://www.pugetsoundpartnership.org).

State of Our Watershed: Individual member Tribes have worked with the NWIFC and SSHIAP to create the State of Our Watersheds report. This document examines key indicators of habitat quality and quantity across more than 20 watersheds in western Washington that lie within tribal Usual and Accustomed fishing areas as defined by *U.S. v Washington* (Boldt decision). The Lake Washington basin habitat section can be found under the Muckleshoot chapter at http://maps.nwifc.org:8080/sow2012/.

WDFW Authorized Net Pen Project SEPA# 10040 (June 17, 2010): Covers the installation and removal of fish net pens (both WDFW operated and cooperator operated) at 25 locations throughout Washington State.

3.5 Ecological interactions. [Please review Addendum A before completing this section. If it is necessary to complete Addendum A, then limit this section to NMFS jurisdictional species. Otherwise complete this section as is.]

(1) *Salmonid and non-salmonid fishes or other species that could negatively impact the program.* Negative impacts by fish and other species on the Issaquah Creek Hatchery program could occur directly through predation on program fish, or indirectly through food resource competition, genetic effects, or other ecological interactions. In particular, fishes and other species could negatively impact Issaquah Creek salmon survival rates through predation on newly released, emigrating juvenile fish in the freshwater and marine areas. Certain avian and mammalian species may also prey on juvenile salmon while the fish are rearing at the hatchery site, if these species are not excluded from the rearing areas. Species that could negatively impact juvenile salmon through predation include the following:

- Avian predators, including eagles, mergansers, cormorants, terns, belted kingfishers, great blue herons, and little green herons
- Mammalian predators, including mink, river otters, harbor seals, and sea lions
- Smallmouth bass
- Largemouth bass
- Perch
- Cutthroat trout
- Pacific Lamprey

Rearing and migrating adult salmon originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in Issaquah Creek to the

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detriment of population abundance and the program's success in augmenting harvest. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters
- Bears

(2) Salmonid and non-salmonid fishes or other species that could be negatively impacted by the program (focus is on listed and candidate salmonid species).

- Puget Sound Chinook
- Puget Sound steelhead
- Puget Sound bull trout

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Fish species that could positively impact the program may include other salmonid species present in the Issaquah Creek and Lake Washington watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the salmon during their downstream freshwater migration. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating salmon

(4) *Salmonid and non-salmonid fishes or other species that could be positively impacted by the program.* Freshwater and marine fish species that prey on juvenile fish could be positively impacted by the hatchery program. Nutrients provided by decaying hatchery salmon carcasses may also benefit fish in freshwater. These species include:

- Southern Resident Killer Whale
- Northern pikeminnow
- Chinook salmon
- Cutthroat trout
- Steelhead
- Pacific Lamprey
- Pacific staghorn sculpin
- Numerous marine pelagic fish species
- Warm water species (e.g. smallmouth bass)

(5) *Nutrient Enhancement*. Adults originating from this program that return to river may provide a source of nutrients in oligotrohic coastal river systems and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

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4 SECTION 4. WATER SOURCE

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

Table 4.1.1: Water sources available at Issaquah Hatchery.

Water Source	Water Right		Available Water Flow	Water Temp. (Fº)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Issaquah Cr (surface)	S1-04730C WRIS/ 01330	02974	10 cfs	30-75	Broodstocking, incubation, rearing acclimation	Low flows in August/ September during drought summers
Issaquah Cr (surface) Lower intake (pump)	S1-*20852C WRIS/ 11478	15397	10 cfs			
Issaquah Cr (surface) Upper intake (gravity)	S1-00735C WRIS	------	16 cfs			
Well[a]	G1-21648C WRIS		500	45-60	Incubation, rearing (Kokanee only)	No limitation

Source: Phinney 2006, WDOE Water Resources Explorer 2014, WDFW hatchery data.
[a] Water right is held by Darigold Inc. and was obtained from WDOE in 1974 for 1,100 gallons per minute (gpm).

Issaquah Hatchery: Issaquah Hatchery is supplied with surface water from Issaquah Creek; total available flow is around 36 cfs. Issaquah Creek is a small urban stream in which flow rates and heights change rapidly with weather conditions. High winter flows are common due to land use activities upstream from the hatchery, (Fuss and Ashbrook 1995). The daily temperature differences can reach 10ºF between day and night and yearly temperatures can range from 30º to 75ºF depending on the season. Large quantities of nutrients are released into the creek from agriculture activities, urban development and upstream located landfill. Water quality has deteriorated significantly within last several decades, reducing hatchery rearing capacity by at least 25% (Fuss and Ashbrook 1995).

Surface water rights at Issaquah Hatchery are formalized through the Washington Department of Ecology (WDOE), and were obtained in 1939, 1968 and 1970.

Table 4.1.2: Water sources available at Willow Creek Hatchery.

Water Source	Water Right		Available Water Flow	Water Temp. (ºF)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Deer (Willow) Cr. (surface)	S1-24635C WRIS	------	1 cfs (winter)	40 - 45 (winter)	Incubation, early-rearing	Urban location, subject to run-off and siltation during heavy rain events.

Source: Phinney 2006, WDOE Water Resources Explorer 2014, NWSSC Laebugten data.

NWSSC-Laebugten Coho Programs:

Willow Creek Hatchery: Willow Creek (also known as "Deer Creek") is a small urban creek that drains into Edmonds Marsh. The marsh covers about 20+ acres and empties into Puget Sound through an underground culvert about 1,000 feet long. Willow Creek runs all year-round; as with most urban creeks, flows can fluctuate substantially, ranging from 200 to 800 cfs during heavy rain events. Average water flow in the winter is around 1.08 cfs (486 gpm), and around 0.75-0.83 cfs (355 gpm) in the summer. The creek is approximately 1.5 miles long. It emerges from the ground about 14 blocks east of the hatchery, and flows through many back yards, and under parking lots and roads, and has a short run through a wooded section of the City of Woodway. Water temperature ranges from 40 - 45 °F in the winter and 45 - 55 °F during summer months.

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Surface water rights at Willow Creek Hatchery are formalized through the Washington Department of Ecology (WDOE), and were obtained by the Laebugten Salmon Club (NWSSC-Laebugten) in 1985.

Net Pen: The net pen passively uses saltwater at the Port of Edmonds, in central Puget Sound.

NPDES permits:
Issaquah Hatchery 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), WAG 13-3010. 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 4.1.3. Record of NPDES permit compliance at Issaquah Hatchery.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs (see Table4.1.4)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Issaquah WAG13-3010	Y	Y	Y	4/07/2005	8	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.

Table 4.1.4. List of NPDES violations at Issaquah Hatchery over the last five years (2009-2013).

Monitoring Month	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
January 2009	TSS	EW Max Net Composite	318.0 mg/L	100.0 mg/L	Due to flooding.	NA
February 2009	TSS		162.2 mg/L	100.0 mg/L		
April 2009	TSS		221.7 mg/L	100.0 mg/L		
		Drawdown Max Grab	134.4 mg/L	100.0 mg/L	Due to flooding.	NA
November 2009	TSS	Avg Net Composite	7.2 mg/L	5.0 mg/L	High river flow and snow melt.	NA
December 2010	TSS		5.6 mg/L	5.0 mg/L	High water event.	
April 2012	TSS	Avg Net Composite	11.6 mg/L	5.0 mg/L	High influent 9.6mg/L with lowering of pond for clipping.	Explanation to personnel to correct procedures

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.
Note: These violations did not result in non-compliance with NPDES permit.

NWSSC-Laebugten Coho Program: Total on-site production at both the net pen and Willow Creek Hatchery is <20,000 lbs and < 5,000 lbs of fish feed per month; therefore, these programs do not require an "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit.

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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.

Issaquah Hatchery: There are two intakes on Issaquah Creek. The upper intake is a screened vertical intake structure with boulder weirs that feeds water to the hatchery by gravity and is located approximately three quarters of a mile upstream. The old intake/barrier dam, constructed in 1936, did not meet current screening and fish passage requirements (**Figure 4.2.1**). The 12-ft high dam was removed and the intake was replaced in 2013/2014 (**Figure 4.2.2**). The new intake is designed to be self-cleaning, using bursts of air from a 1000-gallon air tank and two computerized compressors; in addition , the narrow (8-ft) channel creates more current, to sweep silt and leaves through faster. The intake produces water to the facility at about 5,000 gpm.

Figure 4.2.1: The old barrier dam intake and fish ladder did not meet current fish passage requirements (photo by Issaquah Hatchery staff).

Figure 4.2.2: New intake structure (photo by Issaquah Hatchery staff).

Another intake, located at the hatchery, is supported by five pumps and can provide 5,500 gpm. The intake screens are in compliance with state and federal guidelines (NMFS 1995, 1996, 2011).

Willow Creek Hatchery: Water to the hatchery is provided through a gravity-fed system from a weir box next to the creek, through a 50-60 feet pipe into the rearing pond. The intake is covered by a ¼-inch mesh screen. A 2.5-hp pump is used to pull water from the rearing pond into the hatchery building. Water supplied to the incubators flows through a 9-ft tall settling tank, and leaves the incubators through PVC pipes to the rearing pond outfall and back to the creek. The outfall into the creek is about 6-ft from the intake. The water intake does not pose any potential danger to listed fish as none reside above the hatchery intake, although cutthroat trout are present. Washington Department of Fisheries (WDF) issued the facility a Hydraulic Project Approval (HPA) in 1985, the year it was built. WDF required that the pond outfall be placed within 10-ft of the intake pipe.

Figure 4.2.1: Intake at Willow Creek Hatchery.

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Broodstock is collected by trapping adults returning to the hatchery (see also HGMP section 7.2).

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

Issaquah Coho Program: An 800-gallon tanker truck, equipped with aerators and oxygen (property of Tokul Creek hatchery), is available for transportation when needed. Fry are transferred in a fry tank on a 1-ton flatbed truck.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: A 300-gallon tank mounted on a two-wheeled trailer, equipped with oxygen is available at the facility to transport fry.

Eyed-eggs are transported from Issaquah Hatchery in burlap bags, in coolers.

Edmonds Net Pen: Fish are transported from Issaquah Hatchery in two 800-gallon trucks, equipped aerators and oxygen tanks.

5.3 Broodstock holding and spawning facilities.

Issaquah Coho Program: Broodstock is held in two 100' x 20' x 5' adult ponds supplied with creek water. Ponds have sprinkler system. Spawning takes place at the ponds site.

NWSSC-Laebugten Coho Program: Broodstock for these programs are collected at Issaquah Hatchery.

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Figure 5.3.1: Location of the NWSSC-Laebugten coho programs at Willow Creek Hatchery and Edmonds net pen. Source: WDFW GIS Unit 2014.

5.4 Incubation facilities.

Issaquah Coho Program:

Table 5.4.1: Incubation vessels available at Issaquah Hatchery

Type	Number	Size
Vertical stack incubators	864 trays	24" x 25"
Shallow troughs	4	16' x 1' x 0.3'
Deep troughs	10	14' x 2' x 1.5'
Intermediate troughs	8	14' x 3' x 3'

NWSSC-Laebugten Coho Program
Willow Creek Hatchery:

Table 5.4.2: Incubation vessels available at Willow Creek Salmon Hatchery.

Type	Number	Tray Size
Vertical Heath incubators	8 trays	24" x 25" x 3"
Deep fiberglass troughs	2	16’ x 2’ x 1’

Edmonds Net Pen: Incubation takes place at Issaquah Hatchery.

5.5 Rearing facilities.

Table 5.5.1:Rearing ponds available at Issaquah Hatchery.

Type	Number	Size
Concrete raceways	8	100' x 10' x 4'
	4	100' x 20' x 4'
	2	100' x 20' x 5'
	4	80' x 10' x 5'

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery:

Table 5.5.2: Rearing ponds available at Willow Creek Hatchery.

Type	Number	Size
Asphalt-bottom fry pond	1	40' diameter x 4.75’

The 40’-diameter pond is enclosed with cyclone fencing and topped with 2” mesh predator netting (**Figure 5.5.1)**.

Figure 5.5.1: Asphalt rearing pond at Willow Creek Hatchery (NWSSC-Laebugten).

Edmonds Net Pen:

Table 5.5.3: Rearing vessels used for Edmonds net pen coho.

Type	Number	Size
Net Pen	1	20' x 20' x 10'

Figure 5.5.2: NWSSC-Laebugten net pen at Edmonds Marina.

The pen is built with 3/8” mesh size, and covered with 2-inch mesh predator netting. The pen is attached to the “L”-shaped Edmonds Fishing Pier, to the “inside” of the “L” via 3-5/8” stainless steel wires ropes with concrete weights on the bottom, and pulleys on three corners of the pen (**Figure 5.5.2**). The pen floats freely in the brackish water and rides fairly well up and down with the tides.

5.6 Acclimation/release facilities.

Issaquah Coho Program: Juveniles are reared in water supplied from Issaquah Creek the entire time at the hatchery and released directly from rearing ponds into Issaquah Creek. Experimental groups will be released off-station in 2015. Probable release sites are north Lake Washington and the University of Washington hatchery pond.

In addition, juvenile coho are provided to local schools and various enhancement co-operative programs in the basin. This includes fry (at 500 fpp) provided to the Lively Environmental Center in Mill Creek, which was developed by Snohomish County and the Adopt-a-Stream Foundation for the Everett School District. Fry are reared at the facility, and released at 200 fpp into Nickel Creek (WRIA 08.0077A).

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Coho are incubated and reared in Willow Creek water from eyed-egg stage until release as fry. Fry are trucked and released directly into North and Swamp creeks.

Edmonds Net Pen: Incubation and early-rearing is at Issaquah Hatchery. Juveniles are transported to the net pen in February, and reared in Puget Sound until on-site release as close as possible to June 1 (see HGMP section 5.5).

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

Issaquah Coho Program: One year a clogged intake screen led to the loss of approximately 50,000 yearling coho.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: On May 23, 2004, urban run-off (oils and heavy metals) into Willow Creek after heavy rains killed around 8,500 coho fry. The snow/ice storm in December 2011 caused a power failure that resulted in 30,000 eggs lost in the incubator.

Edmonds Net Pen: No operational difficulties have led to significant fish loss.

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.

Although listed fish are not reared in this program, risk aversion measures are in place to protect the hatchery stock. A hatchery employee is on stand-by at the hatchery at all times to monitor hatchery operations and respond to any unexpected events. The facility is equipped with low water alarms and a back-up generator in case of power loss.

Fish rearing is conducted in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Adherence to artificial propagation, sanitation and disease control practices defined in the policy should reduce the risk of fish disease pathogen transfers.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: In the event of power outage or a pump failure, a remote alarm system will alert staff via phone. A 2500 watt Honda back-up generator is available onsite.

Edmonds Net Pen: No electronic monitoring at the net pen site. Volunteers check the pens on a daily basis, and the Port of Edmonds will contact NWSSC-Laebugten staff if they observe anything amiss.

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6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 Source.

Adult coho returning to the Issaquah Hatchery trap. Puget Sound coho are not ESA-listed.

6.2 Supporting information.

6.2.1 History.

Issaquah Coho Program: Since its inception in 1936, the Issaquah Hatchery coho program has relied on two sources: locally-collected adults and fish transplants from Soos Creek Hatchery (Green River). The program has been self-sustaining since 1992 (with the exception of 2010, when 540,020 were transferred from the Wallace River Hatchery integrated coho program to make up for a shortfall) (See section 9.1.1).

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: The facility was built in early 1985, on land formerly owned by Union Oil of California, currently owned by the City of Edmonds. The hatchery originally propagated Chinook, using fish from Soos Creek Hatchery (Duwamish-Green River). The Chinook program was discontinued in 1992, program, and the facility began a coho program using fish from Issaquah Hatchery.

Edmonds Net Pen. The coho net pen project was initiated in 1978. Coho were originally supplied from Marblemount Hatchery (Skagit River stock); as of 2003, coho releases are from Issaquah Hatchery. Issaquah Creek coho stock was selected to reduce the potential impacts of adult strays into local watersheds.

6.2.2 Annual size.

Issaquah Coho Program: Up to 1,000 adults collected annually.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Approximately 22 pairs are needed to produce the 80,000 eggs provided for the fry releases.

Edmonds Net Pen: Approximately 10 pairs are needed to achieve program the goal of 25,000 fingerlings provided for the net pen program.

6.2.3 Past and proposed level of natural fish in broodstock.

Issaquah Coho Program: Coho were not consistently mass-marked until 2003 releases (brood year 1999). Prior to consistent mass-marking the level of natural-origin fish incorporated into the hatchery brood stock was unknown.

Coho production for the on-station releases at Issaquah Hatchery is an integrated program, which requires annual inclusion of natural-origin fish into hatchery broodstock at the current rate as this stock is designated as a stabilizing population for recovery purposes (HSRG 2004). Eggs and fry provided for off-station releases are from HxH crosses; sub-yearlings provided to the Laebugten net pen program are from integrated stock.

The co-managers have agreed to integrate the hatchery broodstock with natural-origin adults at a 10-20 % level of program as per the recommendations of the Hatchery Scientific Review Group (HSRG).

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Table 6.2.3.1: Integration rate for Issaquah coho program on-station releases 2007-2012 brood years.

Year	pNOB	pHOS	PNI
2007[a]	0.41	0.74	0.35
2008[a]	0.48	0.75	0.39
2009[a]	0.58	0.82	0.23
2010[b]	0.05	0.65	0.07
2011	0.17	0.82	0.17
2012	0.33	0.75	0.31
Average	**0.28**	**0.76**	**0.27**

Source: WDFW-HEAT Broodstock Tracking Tables 2013.
[a] pNOB verified with scale samples.
[b] Did not make on-station brood integration goal, backfilled with HxH from Wallace Hatchery.

NWSSC-Laebugten Coho Program: Although coho on-station production at Issaquah Hatchery is managed as an integrated program, fish destined for transfers are not integrated (from hatchery x hatchery crosses), and both NWSSC-Laebugten Edmonds net pen and Willow Creek hatchery coho productions are currently managed as segregated programs.

6.2.4 Genetic or ecological differences.

There are no known genetic or ecological differences between both the hatchery-origin and the natural-origin coho in the basin. The majority of naturally spawning fish are of hatchery-origin.

Table 6.2.4.1: In-season percentage of marked adult coho passing the Ballard Locks, 2002-2012.

Return Year	% Marked
2002	0.38
2003	0.67
2004	0.74
2005	0.81
2006	0.72
2007	0.74
2008	0.75
2009	0.82
2010	0.65
2011	0.82
2012	0.75
Average	**0.71**

Source: Aaron Bosworth, WDFW, 2013.

6.2.5 Reasons for choosing.

Issaquah Coho Program: Local stock was a natural choice for the hatchery program. Green River stock was originally chosen for its availability.

NWSSC-Laebugten Coho Program: Skagit River hatchery coho were initially selected to support the net program, as this was the most available stock for transfers. As of 2003, both net pen and fry program has used Issaquah Creek coho stock, in order to reduce the potential impacts of adult strays into local watersheds.

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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.

No listed fish are selected for broodstock through this program. Puget Sound coho are not ESA-listed. Broodstock is selected randomly from all adult returns to the Issaquah Hatchery trap. By selecting adults randomly from all returns, unmarked fish which are progeny of naturally-spawning hatchery fish, are also integrated into the broodstock. This is done for the purpose of keeping the hatchery and naturally-spawning fish genetically similar and reducing the risk of divergence of these populations (*HSRG* 2004).

7 SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2 Collection or sampling design.

Broodstock is collected by trapping returning adults. Permanent air-bladder weir, operated from early-September (beginning of Chinook run), through the last week of November (the end of coho run), prevents upstream migrations and diverts fish into the ladder and two holding ponds.

7.3 Identity.

Issaquah Coho Program: All fish released through this hatchery program has been consistently 100% mass-marked (adipose fin-clipped), since the 2002 return, (1999 brood release). Additionally approximately 104,000 fish released from 2012-2013 (2010-2011 broods) were coded-wire tagged.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: All fish are released unmarked.

Edmonds Net Pen: Coho releases have been consistently mass-marked since 1999.

7.4 Proposed number to be collected:

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

Issaquah Coho Program: Up to 1,000 adults collected annually.

NWSSC-Laebugten Coho Program: Approximately 10 pairs are needed to provide fish for the net pen program, and around 22 pairs to produce eggs for the unfed fry program at Willows Creek Hatchery.

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

Table 7.4.2.1: Fish origin and sex composition of coho broodstock spawned at Issaquah Hatchery.

Brood Year	Hatchery Adults			Natural Adults			Unknown Adults		
	Females	Males	Jacks	Females	Males	Jacks	Females	Males	Jacks
2002	343	420	0	NA	NA	NA	NA	NA	NA
2003	723	875	10	NA	NA	NA	108	128	0
2004	585	652	0	40	60	0	NA	NA	NA
2005	590	583	0	4	11	0	NA	NA	NA
2006[a]	497	435	0	40	99	0	NA	NA	NA
2007	449	414	14	81	137	1	NA	NA	NA
2008	393	370	10	72	98	1	NA	NA	NA
2009	468	426	6	32	94	0	NA	NA	NA

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2010	135	123	14	6	6	3	NA	NA	NA
2011	513	478	14	12	45	4	NA	NA	NA
2012	564	536	8	51	83	2	NA	NA	NA
2013	430	421	12	0	1	1	NA	NA	NA
Avg.	**474**	**478**	**7**	**34**	**63**	**1**	**NA**	**NA**	**NA**

Source: WDFW Hatcheries Headquarters Database 2014.
[a] First year of integrated management of the program (on-station portion only).

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

A total of up to 3,000 fish, collected above broodstock needs, are released upstream for natural spawning. Remaining fish may be outplanted live in selected Sammamish and Lake Washington watershed tributaries (Tibbetts, Coal and Kelsey creeks) or are disposed of to the contracted fish buyer.

7.6 Fish transportation and holding methods.

Adults are not transported except for potential surplus fish out-plants in selected watershed streams. Surplus adults used for out-planting are transported by fish haul tank trucks outfitted with aeration equipment. Broodstock are held in two 100' x 20' x 5' adult ponds supplied with creek water, until ripe and spawned.

7.7 Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006) are adhered to. No antibiotics or formalin treatment is applied.

7.8 Disposition of carcasses.

Carcasses are disposed of to the contracted fish buyer.

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.

No listed fish are collected for broodstock through this program. Coho are not ESA-listed.

Trapping methods do not pose a lethal risk. Hatchery-origin Chinook from Issaquah Hatchery are mass-marked, and as of the 2004 adult returns, enabling differentiation from unmarked, naturally-produced Chinook. Coho collection in September and October may overlap with the end of the Chinook run, but unmarked Chinook returning to the hatchery are collected and utilized for hatchery broodstock for the integrated Chinook program. Any natural-origin Chinook trapped during coho collection, and which are not needed for hatchery programs, are returned unharmed to the river. Diversion into the adult holding ponds ends in late-November, and has not been observed to delay winter steelhead migrations which historically were recorded from January through May

8 SECTION 8. MATING

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

8.1 Selection method.

Broodstock is selected randomly from ripe fish across the entire maturation time frame. Spawning takes place once a week.

NWSSC-Laebugten Coho Program: Broodstock for this program is collected at Issaquah Salmon.

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8.2 Males.

All males collected, including jacks, are considered for spawning and are selected randomly on spawn days.

8.3 Fertilization.

Eggs from five females are collected into one bucket and milt from each male is collected separately. Eggs from one bucket are spread equally into five buckets and each batch is fertilized separately with milt from one male (matrix spawning). After allowing for fertilization time another male is added as a backup.

8.4 Cryopreserved gametes.

Cryopreserved gametes are not used.

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

No listed fish are included in mating scheme through this program.

9 SECTION 9. INCUBATION AND REARING -

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

9.1 Incubation:

Current egg-take goal for Issaquah coho program is 985,000; which includes 575,000 for on station needs and 410,000 to supply the co-op programs (FBD 2014).

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, Issaquah Hatchery coho 2002-2013.

Brood Year	Eggs Collected	Survival Rates (%)	
		Green-to-Eyed Up	Eyed-Up-to-Ponding
2002	5,520,000	89.3	94.4
2003	1,833,000	95.5	97.7
2004	1,910,111	93.9	95.4
2005	1,342,700	94.6	97.9
2006	1,442,650	90.6	97.0
2007	1,317,000	96.0	95.6
2008	1,242,000	95.5	97.0
2009	1,254,000	96.8	95.0
2010	1,007,520[a]	96.0	85.4
2011	1,214,700	96.3	97.0
2012	1,276,750	95.2	96.5
2013	1,074,500	95.8	97.0
Average	**1,766,128**	**94.6**	**95.5**

Source: WDFW Hatchery Records 2014.

[a] In 2010, 540,020 eggs were transferred from the Wallace River Hatchery integrated coho program because of escapement shortfalls at Issaquah Hatchery.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Eyed-eggs are received from Issaquah Hatchery in January/February.

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Table 9.1.1.2: Egg-to–ponding survival, Willow Creek Hatchery coho program.

Brood Year	Survival Rate (%)
2007	99.7
2008	99.7
2009	99.7
2010	99.7
2011	99.8
2012	62.5 [a]

Source: NWSSC-Laebugten Records 2013 (data prior to 2007 is not available).

[a] Survival rate was lower in 2012 as a result of egg loss caused by power failure in mid-January, due to a snow/ice storm.

Edmonds Net Pen: Incubation of eggs for fish destined to release from the Edmonds net pen takes place at Issaquah Hatchery.

9.1.2 Cause for, and disposition of surplus egg takes.

No excess eggs are collected for this program. Current management approach do not allow for the taking of eggs in surplus of program goal. If hatchery losses exceed the expected levels, then program goals for release are not met.

9.1.3 Loading densities applied during incubation.

Issaquah Coho Program: Fertilized eggs are placed in vertical trays at 9,000 per tray. Once eyed, eggs are shocked, mortality picked and placed back into trays at 8,000 per tray.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Eyed-eggs are placed in vertical trays at around 5,000 per tray.

Net Pen: Incubation of eggs for fish destined for release from the Edmonds net pen takes place at Issaquah Hatchery.

9.1.4 Incubation conditions.

Issaquah Coho Program: All eggs are incubated in trays supplied with creek water and the rate of 3 gpm. Water temperature is monitored daily. Dissolved oxygen is checked when needed. Vexar® layers are placed in trays as a substrate substitute.

Use of surface water causes silt problems. Excess amount of silt is removed by “rodding” trays and brushing the tray screens. A new water filtration system, installed in the summer of 2003, has significantly reduced egg and fry mortality due to suffocation.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: All eggs are incubated in trays supplied with creek water and the rate of 4-5 gpm. Water temperature is monitored daily (Table 9.1.4.1). Dissolved oxygen is checked when needed. Vexar® layers are placed in trays as a substrate substitute. Use of surface water causes minor silt recruitment, especially after heavy rains. Excess silt is removed by “rodding” trays weekly, as needed.

Table 9.1.4.1: Monthly average water temperature (°F), Willow Creek.

Month	Average Water Temperature (ºF)
January	42.2
February	43.0
March	43.5
April	48.9
May	50.3
June	51.4

Source: NWSSC-Laebugten Records 2013.

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9.1.5 Ponding.

Issaquah Coho Program: When 95%+ buttoned up (March) fish are placed in any combination of available rearing ponds, supplied with creek water.

Willow Creek Hatchery: When buttoned-up (March), fish are moved into the fiberglass troughs supplied with creek water.

9.1.6 Fish health maintenance and monitoring.

Issaquah Coho Program: All fertilized eggs are water hardened in an iodophor solution. Fungus in incubators is controlled by formalin drip, (15-minute daily injection at a target dose of 1,667-ppm formalin), throughout incubation to just prior to hatch. Once eyed, eggs are shocked and dead eggs removed. Fry loss is picked at the time of ponding and then daily.

Willow Creek Hatchery: Dead eggs are picked upon arrival, and the eggs are given a 10-minute iodine bath (iodophor) before being placed in the trays for incubation. Trays are checked regularly, but dead eggs are picked only if dead egg masses show, to reduce handling. Eggs are not treated with chemicals in the incubator (no formalin used). Fry loss is picked at the time of ponding, and then daily.

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

No listed fish are incubated for this program. All water systems are connected to 24-hr/day low water alarms and an emergency backup generator.

9.2 Rearing:

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

Table 9.2.1.1: Survival rates from fry to sub-yearling and yearling, Issaquah Hatchery coho 2000-2011.

Brood Year	Survival Rates (%)	
	Fry-to-Sub-yearling	Sub-yearling-to-Smolt
2001	85.9	99.2
2002	76.3	99.3
2003	78.8	98.7
2004	67.5	99.4
2005	48.9	84.1
2006	96.3	98.9
2007	70.1	99.7
2008	86.0	99.0
2009	89.5	94.5
2010	80.1	88.1
2011	89.6	99.8
2012	84.1	99.5
Average	**79.4**	**96.7**

Source: WDFW Hatchery Records 2014.

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Willow Creek Hatchery:

Table 9.2.1.2: Survival rates from ponding to release, Willow Creek Hatchery unfed coho fry.

Brood Year	Survival Rate (%)
2007	99.8
2008	99.9
2009	99.8
2010	99.8
2011	99.8
2012	99.7

Source: NWSSC-Laebugten Records 2013 (data prior to 2007 is not available).

Edmonds Net Pen: Mortalities are not recorded at the net pen (this program is staffed by volunteers), but the mortality rate is believed to be <1% annually.

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

Issaquah Coho Program: Loading and density levels at WDFW hatcheries conform to standards and guidelines set forth in Fish Hatchery Management (Piper et. al. 1982) and the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Fish rearing densities are maintained at maximum less than 3 lbs of fish/gpm at release and under 0.35 lbs/ft^3.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Ponding densities start at 0.01- lbs/ft^3. Around April 1, pond density is 0.02 lbs/ft^3, after which planting begins.

Edmonds Net Pen: Density starts at 0.375-lbs/ft^3. At release time (around June 1), fish density is 1-lbs/ft^3.

9.2.3 Fish rearing conditions.

Issaquah Coho Program: Coho are reared in all combinations of available ponds. Ponds are supplied with creek water. Fish are mass-marked in December, when they reach around 30 fpp.

Eyed-eggs are transferred to the enhancement co-ops in January. Fry (500 fpp) sent to the Lively Environmental Center educational co-op are transported in April, using in a fry tank on a 1 ton flatbed truck; transport time is around 45 minutes. Sub-yearlings (25 fpp) sent to Laebugten net pens are transported in February in two 800-gallon trucks; transport time is 45 minutes. All transferred fish are mass-marked.

Table 9.2.3.1: Monthly average surface water temperature (°F) at Issaquah Creek.

Month	Average Water Temperature (ºF)
January	42
February	43
March	45
April	49
May	52
June	56
July	59
August	59
September	56
October	51
November	46
December	43

Source: WDFW Hatchery Records 2014.

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NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Fish are initially reared in fiberglass troughs for about a week, and then moved into an asphalt pond supplied with creek water (see HGMP section 5.5), where they remain until release in April/May (500 fpp), or June (100 fpp).

Edmonds Net Pen: Early-rearing takes place at Issaquah Hatchery (see *Issaquah Coho Program* section above). Mass-marked yearlings are shipped to the Edmonds net pen in February at 10 fpp. Juveniles are transferred in two 800-gallon trucks; transportation time is approximately 45 minutes.

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

Table 9.2.4.1: Average size (fpp), by month, of juvenile coho reared at Issaquah Hatchery.

Month	Average Size (fpp)
March	1,200
April	700
May	300
June	150
July	100
August	70
September	50
October	40
November	35
December	30
January	28
February	25
March	20
April	19
May	17

Source: WDFW Hatchery Records 2014.

NWSSC-Laebugten Coho Program: Growth information is not collected at Willow Creek Hatchery or Edmonds net pen to minimize fish handling.

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

See HGMP section 9.2.4 for monthly fish grow data. Energy reserve data are not 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).

Issaquah Coho Program: Coho are fed a variety of diet formulations including starter, crumbles and pellets; feed brand used may vary, depending on cost and vendor contacts. Feeding frequencies varies depending on the fish size and water temperature and usually begin at eight feedings/7 days a week, and end at 1 feeding/3 days a week.

Feed rates varies from 1.0% to 3.0% B.W./day. An overall season food conversion rate is approximately 1.2:1.

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NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Fry are fed a starter diet formulation currently of Bio-Oregon brand (feed brand varies with the contract price). Fry are usually fed three times daily. Feed rates are calculated weekly, and typically starts out at 2.5% B.W./day, and may range from 2.4 to 2.1% B.W. at release (depending on water temperature).

Edmonds Net Pen: Coho juveniles are fed a variety of diet formulations including crumbles and pellets; currently of Bio-Oregon brand (feed brand varies with the contract price). Fish are fed 2-3 times a week, depending on weather and tides. Fish feed is provided by Issaquah Hatchery.

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

Issaquah Coho Program: Fish health is monitored on a daily basis by hatchery staff, and at least monthly by a state Fish Health Specialist (FHS). Hatchery personnel carry out treatments prescribed by the FHS. Procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Eggs are monitored prior to transfer (see *Issaquah Coho Program* section above). At Willow Creek Hatchery, eggs are treated iodophor prior to being put in the incubator. Fish health is monitored on a daily basis by hatchery staff. Issaquah Hatchery will be contacted if any fish health issues arise, but no WDFW Fish Health Specialist intervention was necessary since 1991.

At the end of the season incubator trays and troughs are scrubbed and air-dried and prior to the start of the next season washed with a light iodine solution.

Edmonds Net pen: Prior to transfer, juveniles are monitored and health status is certified by a WDFW Fish Health Specialist (see *Issaquah Coho Program* section above). Volunteers check the net pen on a daily basis; any observed mortalities are netted out. Observed mortalities are removed daily as well. If any health issues arise, Issaquah Hatchery is contacted, and WDFW staff are sent for observation and advice; no major issues have occurred.

The net pen site is allowed to fallow after release (June-December), to flush any nutrient sediments from the area and reduce disease risks. The net and frame is scrubbed down and cleaned at the end of the season; the Port of Edmonds allows NWSSC-Laebugten to use their pressure washing equipment and facility. The pen is stored at Willow Creek Hatchery.

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

Issaquah Coho Program: The migratory state of the release population is determined by fish behavior. Aggressive screen and intake crowding, leaner condition factors, a more silvery physical appearance and loose scales during feeding events are signs of smolt development. ATPase activity is not measured.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Not applicable. Fish are released as fry.

Edmonds Net Pen: The migratory state of the release population is determined by fish behavior and appearance. Aggressive crowding at the nets, leaner condition factors, a more silvery physical appearance and loose scales -- particularly noticeable during feeding events -- are signs of smolt development. Gill ATPase activity is not measured.

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

No "NATURES" type rearing methods are applied through the program.

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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.

No listed fish are under propagation through this program, however, all reasonable and prudent measures are employed to minimize rearing and incubation losses and disease outbreaks. These include the use of high quality feeds for rearing, rearing densities and loadings that conform to best management practices, and fish health monitoring and treatment in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

10 SECTION 10. RELEASE

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

10.1 Proposed fish release levels.

Table 10.1.1: Proposed Issaquah Hatchery coho on-station release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	450,000	17	May[a]	Issaquah Cr

Note: 17 fpp – 131 mm fork length.
[a] Until 2010, on-station releases occurred in April (see HGMP section 10.4).

Table 10.1.2: Proposed NWSSC Laebugten fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	25,000	10	June 1	Puget Sound
Sub-yearling	10,000	100	June	Lake Washington
Fry	70,000	500	April/May	Lake Washington

Note: 10 fpp ~ 167 mm fork length; 500 fpp = ~45 mm fl.
Source: Future Brood Document 2014

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

Stream, river, or watercourse: Issaquah Creek (08.0178)

Release point: RM 3.0 (Issaquah Hatchery)

Major watershed: Lake Washington

Basin or Region: Puget Sound

In 2015 experimental groups will be released in North Lake Washington and the Ship Canal.

NWSSC-Laebugten Coho Program:

Stream, river, or watercourse:	Puget Sound	North Creek (WRIA 08.0070) Swamp Creek (WRIA 08.0059)	
Release point:	Edmonds Marina Boat Basin	North Creek	R.M. 6.5 (April/May) R.M. 2.5 (June)
		Swamp Creek	R.M. 5.0
Major watershed:	Puget Sound	Sammamish R /N Lake Washington	
Basin or Region:	Puget Sound	North Lake Washington	

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

Table 10.3.1: Number, size and dates of release, by year, 2002-2013.

Release Year	Yearling	Avg. size (fpp)	CV	Date(s)	Release Type
2002	514,800	17	6.6	3/28-3/29	Volitional/Forced
2003	535,900	16	5.7	4/15	Forced
2004	422,800	17	5.2	4/9,4/10,4/21	Forced
2005	412,200	14	6.7	4/8, 4/13	Forced
2006	400,690	16	5.9	4/11	Forced
2007	269,838	18	6.1	4/18	Forced
2008	525,000	18	4.8	4/18	Forced
2009	358,650	17	6.2	4/21	Forced
2010	469,650	18	6.2	4/15	Volitional
2011	506,300	20	5.6	5/10	Volitional
2012	373,100	18	5.4	5/10-5/20	Volitional
2013	443,966	17	5.4	5/10	Forced
Average	**436,075**	**17**	**5.8**		

Source: WDFW Hatcheries Headquarters Database 2014.

Table 10.3.2: Number released, by stage, size and date, Willow Creek Hatchery coho program, 2002-2012.

Release Year	Fry								
	North Creek			Swamp Creek			Other		
	Number	Size (fpp)	Date(s)	Number	Size (fpp)	Date(s)	Number	Size (fpp)	Date(s)
2002	----	----	----	----	----	---	[a]62,918	123	4/27 5/5, 5/10, 5/25
2003	44,200	185	4/26 5/24	18,700	170	5/10	[b]5,000	70	6/7
2004	45,720	231	4/1-2	28,250	280	4/17	----	----	---
2005	39,000	510	4/16	12,000	380	4/1	----	----	---
	18,000	90	6/4	5,000	310	5/14	----	----	---
2006	15,000	285	5/6	18,000	250	4/20	----	----	---
	15,000	174	6/10	----	----	---	----	----	---
2007	43,000	215	4/29, 5/6,	20,000	185	5/19	----	----	---
	12,800	110	6/10	----	----	---	----	----	---
2008	44,370	550	4/12	23,750	475	4/30	----	----	---
	11,400	115	6/3	----	----	---	----	----	---
2009	46,700	520	3/30	18,100	323	4/25	----	----	---
	12,800	142	6/3	----	----	---	----	----	---
2010	56,850	333	3/31, 6/10	18,500	315	4/24	----	----	---
2011	45,000	429	4/27 5/5, 5/10	17,395	245	5/21	----	----	---
	14,440	185	6/9	----	----	---	----	----	---
2012[c]	13,000	200	5/7	15,600	185	5/12	----	----	---
	7,000	125	6/12	----	----	---	----	----	---

Source: WDFW Hatcheries Headquarters Database 2013.

[a] Releases into Sammamish River.

[b] Releases into Scriber Lake (WRIA 08.0061).

[c] In 2012, releases into North Creek were reduced as a result of egg loss caused by power outage in mid-January, due a to snow/ice storm.

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Table 10.3.3: Number released, by stage, size and date, NWSSC-Laebugten Edmonds net pen coho program.

Release Year	Yearling (Net Pen)			
	Number	Size (fpp)	Date(s)	CV
2001	n/a	n/a	n/a	n/a
2002	30,000	12	5/28	n/a
2003	28,000	10	6/1	n/a
2004	28,000	13	5/30	n/a
2005	28,000	9	5/29	n/a
2006	17,500	10	6/17	n/a
2007	25,000	12	6/10	n/a
2008	38,000	10	6/4	n/a
2009	28,500	12	6/3	n/a
2010	28,000	9	5/11-30	n/a
2011	29,800	9	6/7	n/a
2012	15,000	10	6/1	n/a
Average	**26,730**	**10.4**		

Source: WDFW Hatcheries Headquarters Database 2013

10.4 Actual dates of release and description of release protocols.

Issaquah Coho Program: Fish are initially released volitionally; after 10 days, the remaining fish are forced out of ponds. Fish were released in April until brood year 2009. As of 2011 (brood year 2010), fish are released in May to reduce smolt migration time through the system. See **Table 10.3.1** for actual release dates.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: A total of 65,000 fry are planted into North Creek, and 15,000 fry into Swamp Creek. In a typical year 55,000 fry are released in April into North Creek, and 15,000 fry are released in May into Swamp Creek. The remaining 10,000 fish are held until around June 1 for educational purposes (for field trip classes), and are released at ~100 fpp into North Creek. Fish are released directly into North and Swamp creeks through a 4-inch cam lock transfer hose. See also HGMP section 10.5 and **Table 10.3.2** for actual release dates.

Edmonds Net Pen: Fish are released from the net pen directly into Puget Sound. WDFW has worked with NWSSC-Laebugten to ensure that yearlings are released as close as possible to June 1, to encourage residualism in the Puget Sound and provide Puget Sound anglers with resident coho harvest opportunity. See **Table 10.3.3** for actual release dates.

10.5 Fish transportation procedures, if applicable.

Issaquah Coho Program: In February, sub-yearlings coho (25 fpp) are transferred to Laebugten net pens in two 800-gallon trucks; transport time is around 45 minutes. Fry (500 fpp), transferred to the Lively Environmental Center educational co-op in April, using in a fry tank on a 1 ton flatbed truck; transport time is around 45 minutes.

No transportation is needed for on-station releases.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Fish are transported to release sites in 300-gallon transfer tank equipped with aerator stones, mounted on a two-wheeled trailer. Total transport time is approximately 20 minutes.

Edmonds Net Pen: Not applicable. Fish are released directly from the net pen into Puget Sound.

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10.6 Acclimation procedures.

Issaquah Coho Program: On-station releases are reared in water supplied from Issaquah Creek the entire time at the hatchery.

Coho fry (500 fpp) are transferred to Lively Environmental Center in April. They are reared and acclimated until their release into Nickel Creek in June, at 200 fpp.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: Coho are reared from eyed-eggs until release on Willow Creek water. At release, fry are transported and pumped directly into North and Swamp creeks.

Edmonds Net Pen: Coho are incubated and reared at Issaquah Hatchery until transfer to the net pen. Yearlings are transferred in February, and reared in Puget Sound water until on-site release as close as possible to June 1.

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

Table 10.7.1: Marks applied, and number of the total hatchery population marked.

Brood Year	Release	Marking
2013	450,000	Ad-only
2014	400,000	Ad-only
	50,000	Ad+CWT

Source: WDFW, Future Brood Document 2014.

All fish released through this hatchery program have been consistently 100% mass-marked (adipose fin-clipped) since the 1999 releases (1997 brood). A portion of the approximately 130,000 fish released from 2002 to 2004 (brood years 2000-2002) were coded-wire tagged. From 2012 to 2014 (brood years 2010 through 2012), 50,000 coho will be released with a coded-wire tag in addition to the adipose fin-clip (Ad+CWT).

Table 10.7.2: Marks applied and number of the total hatchery population marked, Willow Creek Hatchery and Edmonds Net Pens.

Brood Year	Stage	Number	Marking
2014	Fry	80,000	Unmarked
	Yearling	25,000	AD Only

Source: WDFW, Future Brood Document 2014.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: The facility receives eyed-eggs, and all fish released through this hatchery program are unmarked.

Edmonds Net Pen: Juveniles are mass marked at Issaquah Hatchery before transfer to the net pen, and are released as adipose fin-clipped smolts. Coho have been consistently mass-marked at Issaquah Hatchery since 1999.

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

Issaquah Coho Program: Egg-take is carefully managed to minimize the likelihood of collecting surplus eggs or raising surplus fry. Actual releases should not exceed 10% of the program release goal and at this hatchery it was never a problem. Should it arise for some unforeseen reason, regional staff and NOAA Fisheries will be informed and consulted and proper action will be taken.

Live coho may be out-planted to neighboring tributaries as described above.

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NWSSC-Laebugten Coho Program: Coho are transferred to Willow Creek Hatchery and the Edmonds net pen in the amount identified in the Future Brood Document. No surplus fish are available for this program.

10.9 Fish health certification procedures applied pre-release.

Issaquah Coho Program: Prior to release, fish health is monitored and the fish health status of the population is certified by a WDFW Fish Health Specialist.

NWSSC-Laebugten Coho Program: Fish are monitored and checked by a WDFW Fish Health Specialist prior to shipping from Issaquah Hatchery. Issaquah Hatchery will be contacted if any fish health issues arise, but no WDFW Fish Health Specialist intervention was necessary since 1991.

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

In the case of a catastrophic event (drought or flooding) critical to fish survival, fish could be released early to prevent the loss in the ponds.

Hatcheries Standby Procedures (revised March 2012), a guideline developed by WDFW, includes information regarding proper actions to follow by hatchery employees in case of an emergency.

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.

Issaquah Coho Program: The production and release of only smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delays in the rivers, limiting interactions with listed Chinook and steelhead.

The on-station coho production at Issaquah hatchery is released volitionally, and are closely visually monitored for smolting activities to ensure they are released fully-smolted. Coefficient of variation (CV) for length at release is also monitored and average CV value of 10.0% or less is desirable to confirm the likelihood that most fish are ready to migrate (Fuss and Ashbrook 1995). For release years 2000-2011, the average CV was 5.8% (see Table 10.3.1).

At Issaquah Hatchery the goal is to release coho in May, at 17 fpp. This size corresponds with average fork length (fl) of 131 mm. Assuming the "1/3 size rule" (USFWS 1994), Chinook salmon smaller than 44 mm fl may be susceptible to predation by the average size hatchery coho released through this program. Juvenile Chinook salmon emigrating out of the Issaquah Creek in May range in size from 45 to 64 mm fl, (Seiler et al., 2003) and are larger than the threshold predation susceptibility size thus less likely to be preyed upon by the hatchery coho.

NWSSC-Laebugten Coho Program:

Willow Creek Hatchery: The majority of the fish are released as fry in April/May at a size to minimize interaction with out-migrating natural steelhead and Chinook salmon juveniles (see HGMP section 2.2.3 and *Issaquah Coho Program* section above).

Edmonds Net pen: Yearling coho smolts are released from the net pen in as close as possible to June 1, to encourage residualization and maximize harvest opportunities. Release of fish from pens directly into marine waters eliminates freshwater juvenile interaction (see HGMP section 2.2.3).

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

Elements of the annual Monitoring and Evaluation plan for this program are identified in HGMP section 1.10. The purpose of a monitoring program is to identify and evaluate the benefits and risks that may derive from the hatchery program. The monitoring program is designed to answer

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questions of whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group is identified (see HGMP section 10.7) with distinct otolith marks, adipose fin-clips, coded-wire tags, blank-wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This will allow for selective harvest on hatchery stocks when appropriate, monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats and assessment of the status of the target population. WDFW will monitor salmon and steelhead escapement into the target and non-target populations to estimate the number of tagged, un-tagged and marked fish escaping into the river each year and the stray rates of hatchery salmon into the rivers.

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

WDFW will monitor coho escapement upon return as adults to estimate the numbers of tagged, untagged and mass-marked fish escaping to the river each year not only in Issaquah Creek, but into other Lake Washington tributaries (e.g. Cedar River). A portion of the release group (see HGMP section 10.7) is coded-wire tagged to evaluate catch contribution, run timing, migration patterns, total survival and straying into other watersheds. Also, monitoring is required to determine whether or not the smolts released from Issaquah Creek are migrating immediately to the Ballard Locks or are they spending time in the lake where they may be posing a risk to natural-origin salmon or being preyed upon (Tabor et al. 2004) by other fishes.

The Co-managers currently sample annually and monitor adult salmon and steelhead in the Hiram Chittenden fish ladder and locks (Ballard Locks), in fisheries, in hatchery returns, and on the spawning grounds. Sampling includes collection of data on fish size (length and/or weight), age (scales and/or otoliths), hatchery vs. natural origin (scales, otoliths, fin-clips and/or coded-wire tags), and stock origin (DNA samples). Monitoring includes catch accounting and both hatchery and spawning ground escapement estimation (live fish counts, carcass counts and/or redd sampling). Ultrasonic and/or radio tagging studies as well as mark/recapture studies have been conducted on adult Chinook, sockeye, coho and steelhead.

Frequent monitoring is required to correctly identify Chinook redds during the sockeye run. Coho escapement estimation remains coarse due to difficulty in visibility and covering the entire watershed area as well as the need to update the original mark/recapture index study.

WDFW's Wild Salmon Production/Evaluation Unit (WSPE) operates two juvenile migrant traps in the Lake Washington Basin: one near the mouth of the Cedar River (WRIA 08.0299); and another near the mouth of Bear Creek (WRIA 08.0105). The Bear Creek trap also captures production from its tributary, Cottage Lake Creek (WRIA 08.0122). This project is funded by local contracts; future funding is uncertain, but monitoring operations are expected to continue into the foreseeable future. These traps enumerate Chinook, coho, sockeye, and steelhead, as well as facilitate collection of biological data on age, size and timing. These data are reported annually by WSPE.

A trap was operated below the hatchery in Issaquah Creek in 2001. It is important to consider reinitiating operation of this trap location as funding becomes available in order to assess productivity of this tributary system.

Several PIT tag studies have been conducted on some of the larger out-migrating salmon. Juvenile Chinook and coho have been tagged at the two juvenile migrant traps as well as at the Issaquah and UW hatcheries. Chinook, coho and sockeye migrating through the Ship Canal have also been tagged. The timing and mortality of these smolts from the tagging location to the PIT

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tag readers at the Locks has been estimated. Some additional data from these smolts has been collected as the fish have returned as adults.

A number of monitoring activities are ongoing or planned by SPU, related to the Cedar River Habitat Conservation Plan, and the sockeye hatchery and fish ladder at Landsburg Dam. Colonization of the watershed upstream of Landsburg Dam is being investigated through a variety of studies on Chinook and coho in this area. An adaptive management plan for the hatchery includes a suite of monitoring projects relating to the health of hatchery and natural sockeye and the limnology of Lake Washington. SPU's monitoring is subject to a budget that is limited through agreement.

The most significant unmet monitoring need in the basin is smolt sampling at the Ballard Locks (or in the Ship Canal). Juvenile fish are enumerated in two of the largest tributaries in the basin, and sockeye were traditionally sampled as pre-smolts in Lake Washington proper, but recent evidence suggests that highly dynamic or variable factors impact juvenile salmon and steelhead survival as they migrate through the system. These factors, including passage problems at the Locks, flow and temperature impairment in the Ship Canal, increased predation rates, changes in limnology, increased urbanization, and others have made it difficult to separate freshwater mortality from marine mortality. Enumerating and sampling out-migrating smolts at the Locks is a critical, unfunded monitoring need in this basin.

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

Funding and resources are currently committed to monitor and evaluate this program as detailed in the *Comprehensive Coho Management Plan* (PSTT and WDFW 1998).

Operation of two juvenile migrant traps currently operating near the mouths of the Cedar River and Bear Creek is funded by local contracts. Future funding is uncertain, but annual monitoring is expected to continue.

See HGMP section 11.1.1.

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

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans. Monitoring and evaluation will be undertaken, with consultation with NOAA Fisheries, in a manner that does not result in an unauthorized take of listed fish.

12 SECTION 12. RESEARCH

12.1 Objective or purpose.

Evaluate potential survival benefits from different juvenile release sites.

12.2 Cooperating and funding agencies.

Muckleshoot Indian Tribe

12.3 Principle investigator or project supervisor and staff.

Mike Mahovlich, Muckleshoot Tribe biologist

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

Not applicable.

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

These fish will be treated like any other hatchery fish except that instead of being volitionally released on-site, they will be trucked to alternate release sites. At this point the two additional release sites are the north end of Lake Washington at the mouth of the Sammamish River, and the University of Washington (UW) Hatchery. The UW Hatchery fish will be reared for several weeks on-site before release there.

12.6 Dates or time period in which research activity occurs.

2013 brood released in 2015.

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

Fish will be reared at the Issaquah Hatchery, tagged (CWTs) in September 2014, and released in May 2015. Fish destined to be released at the UW Hatchery will be reared for several weeks at that site. All fish released off-site will be transferred in an aerated, 300 or 1,000 gallon tanker truck. Total transport time should be approximately one hour.

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.

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14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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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.

Chester Morse Lake Bull Trout *(Salvelinus confluentus):* Bull trout were listed as a threatened species in the Coastal-Puget Sound Distinct Population Segment on November 1, 1999 (64 FR 58910). The USFSW identified Chester Morse Lake in the Upper Cedar River watershed as a core area with four local populations and one potential local population (USFWS 2004). The local populations include Boulder Creek, the Upper Cedar River, Rack Creek and the Rex River and Shotgun Creek has been identified as a potential local population. Chester Morse Lake bull trout exhibit an adfluvial life history rear and forage in both Chester Morse Lake and Masonry Pool. The primary spawning areas for bull trout in this core area are in the Upper Cedar and Rex rivers, with most spawning activity occurring from October to mid-December (WDFW 2004). The level of emigration of bull trout from the Chester Morse Lake core area into the lower Cedar River is currently unknown and only a few incidental sightings have been documented below Landsburg (USFWS 2004).The recovered abundance level for the Chester Morse Lake population has been set at 500 adults.

Table 15.2.1: Summary table of core area rankings for population abundance, distribution and trend.

Core Area Population	Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Chester Morse Lake	1000-2500	25-125	Increasing	Widespread, low-severity	Potential Risk

Source: USFWS 2008

Lake Washington foraging, migration, and overwintering habitat - The Lake Washington foraging, migration, and overwintering habitat consists of the lower Cedar River below Cedar Falls, the Sammamish River, Lakes Washington, Sammamish and Union, the Lake Washington Ship Canal, and all accessible tributaries. The extent of use of this area and the status of the population are currently unknown and reports of bull trout in Lake Washington are relatively rare (USFWS 2004, WDFW 2004). Two bull trout were observed in the headwaters of Issaquah Creek in 1993, but is thought that they were likely anadromous migrants (WDFW 2004). The potential for spawning in the Lake Washington basin is believed to be very low as a majority of accessible habitat is low elevation, below 152 meters (500 feet), and thus not expected to have the proper thermal regime to sustain successful spawning (USFWS 2004). Due to observations of bull trout at the Ballard Locks it is believed that bull trout are migrating into this watershed from other core areas to take advantage of the abundance of forage fish.

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Habitat - Past forest practices and reservoir management have likely had the most significant impacts to bull trout habitat within the core area. Although the adult spawner abundance appeared to be at extremely low levels in the 1990's, recent returns strongly indicate that this population has likely rebounded near or to recovered levels. Past and current flood events have likely been exacerbated by the existing forest conditions, but are expected to improve over time given current forest management under the City of Seattle's Cedar River Habitat Conservation Plan. A number of actions being conducted under the habitat conservation plan are directed at restoring and protecting bull trout habitats within the core area, managing the reservoir to minimize negative impacts to bull trout, and monitoring the distribution and abundance of the bull trout population (USFWS 2004).

Several listed and candidate species are found in King 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:

Marbled murrelet (*Brachyramphus marmoratus*) –Threatened [critical habitat designated]
Canada Lynx (*Lynx canadensis*) –Threatened [critical habitat designated]
Gray Wolf (*Canis lupus*) –Threatened
Grizzly bear (*Ursus arctos horribilis*) –Threatened
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened [critical habitat designated]

Candidate Species
Fisher *(Martes pennanti)* – West Coast DPS
North American wolverine *(Gulo gulo luteus)* – contiguous U.S. DPS
Oregon spotted frog *(Rana pretiosa)* [historic]
Yellow-billed cuckoo *(Coccyzus americanus)*
Whitebark pine *(Pinus albicaulis*)

15.3 Analyze effects.

There are no activities associated with this hatchery program that would directly impact the Lake Washington of Chester Morse Lake bull trout populations. There is the possibility for indirect "take" associated with hatchery program operations—up to and including unintentional lethal take. Any observations of bull trout encountered during any hatchery activity, up to and including lethal take associated with hatchery activities, are reported annually by WDFW to USFWS under the ESA section 6 operating agreement. See also HGMP section 15.1.

15.4 Actions taken to minimize potential effects.

All adult trapping facilities are regularly checked at consistent short intervals while actively trapping. All efforts are made to minimize any holding time listed fish remain in any traps.

All off-station collection activities attempt to minimize interaction with and effects to listed bull trout.

15.5 References

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"Take" Tables

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

Listed species affected: Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Puget Sound/ North Lake Washington Chinook		**Activity:** Issaquah Coho Program	
Location of hatchery activity: Issaquah Hatchery, RM 3 Issaquah Creek (08.0178)	**Dates of activity:** October--November		**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

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

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

Listed species affected: Steelhead *(Oncorhynchus mykiss)*	**ESU/Population:** Puget Sound Steelhead	**Activity:** Issaquah Coho Program	
Location of hatchery activity: Issaquah Hatchery, RM 3 Issaquah Creek (08.0178)	**Dates of activity:** October--November	**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***		
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

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