HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Samish Hatchery Fall Chinook Program (Segregated)
Species or Hatchery Stock:	Chinook (*Oncorhynchus tshawytscha*) Samish Hatchery
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Samish River / Puget Sound
Date Submitted:	November 18, 2014
Date Last Updated:	December 21, 2015

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Executive Summary

In 2002, the Washington Department of Fish and Wildlife (WDFW) and the Puget Sound Treaty Tribes (PSTT) submitted a Hatchery and Genetic Management Plan (HGMP) for the Samish Hatchery Chinook sub-yearling program under Limit 6 of the 4(d) rule. In August of 2005, WDFW provided updated HGMPs to NOAA-Fisheries. Consistent with the co-management provisions of the Puget Sound Salmon Management Plan (PSSMP 1985), the co-managers are now re-submitting a Samish Fall Chinook Hatchery HGMP to further update the description of the program.

The purpose of the Samish Hatchery Fall Chinook program is to contribute toward harvest goals for treaty and non-treaty fisheries, consistent with conservation goals for potentially affected naturally spawning populations and the environment. The program provides ongoing mitigation for the salmon production lost from habitat degradation in Bellingham Bay and its tributaries. Habitat degradation has reduced the natural production of salmon and steelhead and nearly eliminated sustainable fisheries for naturally produced Chinook salmon and steelhead.

Two naturally spawning Chinook populations have been identified in the Samish-Nooksack region.

1. A North Fork Nooksack River early-timed Chinook population, with a *Primary* designation. Spawning escapement has averaged 1,659 adults from 1999 to 2013, mostly of hatchery origin, compared to an average historic abundance of about 26,000 (SSDC 2007). This population is in the preservation phase of recovery. An integrated conservation hatchery program operated by WDFW supports this population. It is not the subject of this HGMP.
2. A South Fork Nooksack spring Chinook population, also designated as *Primary.* Spawning escapement has averaged only 67 adults from 1999 to 2013, compared to an historic average of about 13,000 (SSDC 2007). This population is in the preservation phase of recovery and is supported by a conservation hatchery program operated by the Lummi Nation. It is not the subject of this HGMP.

Natural-origin fall Chinook which spawn in the Nooksack and Samish rivers closely resemble the Green River-origin stock used for the fall Chinook hatchery programs. It is unknown if these spawning aggregations are self-sustaining. No native late-timed (fall) Chinook population currently exists in the Nooksack basin. The Puget Sound Technical Recovery Team concluded that “there is no evidence that an independent population of Chinook salmon existed in the Samish River” (Ruckelshaus et al. 2006), nor has NOAA Fisheries identified fall Chinook from the Samish Hatchery as a component of the Puget Sound Chinook ESU (NMFS 2005, 2013 78FR38270).

The Puget Sound Salmon Recovery Plan identified a goal to “recover self-sustaining, harvestable salmon runs in a manner that contributes to the overall health of Puget Sound and its watersheds and allows us to enjoy and use this precious resource in concert with our region’s economic vitality and prosperity” (SSDC 2007). The recovery plan for ESA-listed Chinook Salmon was adopted by NOAA-Fisheries and identified a planning range for abundance of 16,000- 26,000 for the North Fork Nooksack and 9,100 – 13,000 for the South Fork Nooksack. The co-managers have vigorously pursued actions to recover the South Fork and North Fork Nooksack Chinook populations. These actions include working

with local governments to protect and restore habitat, hatchery programs to conserve and rebuild the populations, and a Fishery Resource Management Plan approved by NOAA Fisheries that places tight constraints on the allowable fishery impacts on Nooksack Chinook and severely limits fisheries.

The goal for harvest is to restore the number of fish, of Nooksack-Samish origin, available for harvest to historic levels. These fish will be of hatchery-origin until natural populations are restored to healthy and harvestable levels. Habitat degradation in the Nooksack and Samish river basins and in Bellingham Bay has severely reduced the natural production of salmon and steelhead available for harvest. Nooksack-Samish Chinook, in the past, contributed substantially to fishing opportunities throughout the west coast, including international fisheries managed under the Pacific Salmon Treaty, coastal US fisheries managed under the Magnuson-Stevens Act, and treaty and non-treaty fisheries in both terminal and pre-terminal areas of Puget Sound.

Harvest of fall Chinook from the Nooksack-Samish basins has been reduced from in excess of 100,000 to less than 10,000 annually. Specifically, an initial objective identified by the Lummi Nation is to attain an average annual total terminal area harvest of 81,000 Chinook, which is comparable to the average annual harvest in the mid-1980s. It is anticipated that 90% of the terminal harvest will be from hatchery production, and a substantial portion of that will be from the Samish Hatchery. A short-term objective is to produce sufficient hatchery Chinook to support a 50% mark rate in Puget Sound recreational fisheries. The Samish Hatchery is an important contributor to the late summer recreational fishery in Area 7, and production (or survival rates) will need to be increased to achieve the target mark rate. The WDFW, in collaboration with the Puget Sound Recreational Fisheries Enhancement Fund Oversight Committee, has identified a longer-term objective of increasing recreational angler trips in Puget Sound by 5% per biennium. In addition, the hatchery fish produced will act to buffer impacts on stocks of concern in mixed stock fisheries and to increase prey abundance for endangered Southern Resident Killer Whales.

The co-managers are proposing an integrated suite of tribal and WDFW hatchery programs that will be managed consistent with the harvest and conservation goals identified above. Through a series of stages, the hatchery program will be managed to meet explicit targets in terms of benefits to fisheries and potential risks to natural populations and the environment (Table 1[1]). The WDFW, in consultation with the co-managers, may move to Stage 3 although the Lummi Nation has not been able to become self-sufficient for Chinook salmon broodstock.

Key management measures to meet harvest benefits and control risks are summarized in tables 2 and 3. Results of research, monitoring and evaluation activities will be reviewed at annual program review

[1] Program assumptions for Table 1:

Lummi Programs: 0.3% return rate to the terminal area in Stage 1, a 0.5% return rate in Stage 2, and a 1.0% return rate in Stage 3 and in Stage 4. 75% terminal harvest rate in all stages.

Samish Program: SAR =0.65%; terminal area comprises 34.9% of adult production; Puget Sound marine sport comprises 5.5% of adult production.

workshops where hatchery program adjustments will be considered in coordination with habitat and harvest management. The purpose of adaptively managing the program is to improve harvest benefits and reduce identified risks to ESA-listed populations. The criteria for moving between stages of the program will be based on 5-year running averages and will be addressed in annual staff workshops.

Table 1. Summary of release targets and expected outcomes for each stage of the Samish Fall Chinook hatchery program.

Stage	Smolt Release Targets		Minimum Criteria for moving between Stages[1/]	Terminal Harvest	Samish Catch in Puget Sound Marine Sport Fishery	Mark Rate in July – Sept Area 7 Sport Fishery
	Transfer To Lummi Programs	Release at Samish Hatchery				
1 Current Broodstock	1,000,000	4,000,000	1) Lummi hatchery programs are self-sufficient. 2) PS sport fishery exploitation rates maintained. 3) Operating funds provided for 1M in production. 4) Stray contribution less than 5%[2/]	Lummi Programs = 2,000 Samish = 9,100 Total = 11,100	1,400	47%
2 Self Sufficient Tribal Broodstock	0	5,000,000	1) Operating and capital funds provided for additional 1M increase in production. 2) PS sport fishery exploitation rates maintained. 3) Stray contribution less than 5%[2/]	Lummi Programs = 3,500 Samish = 11,400 Total = 14,900	1,700	49%
3 Increased Production	0	6,000,000	1) PS sport fishery angler trips increase by 25% [3/]. 2) Operating and capital funds provided for additional 2M increase in production. 3) Stray contribution less than 5%[2/]	Lummi Programs = 3,500 Samish = 13,600 Total = 17,100	2,100	51%
4 New Facility	0	8,000,000		Lummi Programs = 3,500 Samish = 18,200 Total = 21,700	2,800	54%

[1/]The criteria represent averages observed over 5 years.

[2/] Contribution from the Lummi Nation Lower Nooksack Fall Chinook and Samish Hatchery Chinook programs of 5% or less of the South Fork, and 5% or less of the North Fork, natural spawners within the Spring Chinook spawning time period.

[3/] The enhanced recreational fishery is based on a 5% increase in number of angler trips per biennium for five biennia, or an overall increase of 26.6% of angler trips over 10 years.

Table 2. Summary of potential benefits, performance targets, and management measures.

Potential Benefits	Performance Target	HGMP Reference	Management Measures (HGMP Reference)
Terminal Catch	Annual harvest of 81,000 in terminal area.	1.8 3.3	• Release fish at a size, time, and life history stage to maximize terminal catch and Puget Sound marine sport catch (section 10.1). • Maintain or improve fish culture practices to improve in-hatchery and post-release survival (sections 9 & 10) • Increase production releases in stages consistent with Table 1.
Puget Sound Marine Sport Fishery Mark Rate	Mark rate of at least 50% in Area 7 sport fishery during July-Sept. time period.		
Puget Sound Marine Sport Fishery Catch	>25% increase in Puget Sound marine sport fishery in next 10 years.		

Table 3. Summary of key potential hazards, risk aversion measures, and performance standards.

Potential Hazards	HGMP References	Risk Aversion Measures	Performance Standards
Adult Passage	2.2.3 7.2	• Leave fish ladder open during the adult return of steelhead.	Trap operated consistent with HGMP protocols.
Broodstock Management	2.2.3 3.3 10.11	• Release smolts on-station to maximize homing fidelity. • Implement mark-selective fisheries or time and area management measures to increase the catch of hatchery-origin fall Chinook salmon while limiting impacts on ESA-listed Chinook salmon. • Phase production increases and decreases consistent with Table 1.	Contribution from the Lummi and Samish Hatchery of 5% or less of the South Fork, and 5% or less of the North Fork, natural spawners within the early Chinook spawn time period.
Ecological Interactions	2.2.3 10.1	• Release fish at a size, time, and life history stage to limit interactions with listed-species.	Smolts released at ~80fpp in May.
Water Withdrawal	4.1	• Obtain water for the Samish Hatchery from Friday Creek and the Samish River consistent with S1-*03495C, S1-*22140C, S1-*17762C, S1-*20468C, and S124618C. • Obtain water used at the Kendall Creek Hatchery to incubate Samish Chinook eggs consistent with G1-*10562C and G1-23273.	Water withdrawals consistent with requirements.
Effluent Discharge	4.1	• Release effluent consistent with NPDES permit WAG 13-3011 for the Samish Hatchery and WAG13-3007 for the Kendall Creek Hatchery.	Effluent compliant with permit requirements.
Intake Screening	4.2	• The surface water intake on Friday Creek is in compliance with state and federal guidelines (NMFS 1995, 1996), and meets NMFS (2011) design criteria. Screens were replaced in 2004. • The surface water intakes at the Samish River are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current "Anadromous Salmonid Passage Facility Design" criteria (NMFS 2011). The construction of new intake with fish passage, along with new adult ponds, is included in the "Capitol Project" list sent for approval to legislature.	Surface water intakes compliant with state and federal guidelines.

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Samish Hatchery Fall Chinook Program.

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

Samish Fall Chinook (*Oncorhynchus tshawytscha*)

Status: Not listed. Naturally-produced Chinook in the Samish River are not considered a population segment in the Puget Sound ESU, nor is the hatchery population included in NOAA Fisheries' Hatchery Listing Policy (NMFS 2005, 2013 78FR38270). The Technical Recovery Team (TRT) found no evidence that an independent population of Chinook existed in the Samish River (Ruckelshaus et al. 2006).

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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

The program is co-managed with the Lummi Nation, Nooksack Indian Tribe, Upper Skagit Indian Tribe, and Swinomish Indian Tribe.

In addition, eggs collected at the Samish Hatchery also currently supply the Lummi Nation fall Chinook program.

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

Funding Sources	Operational Information (for FY 2015)
General Fund - State	Full time equivalent staff – 2.48
DJ - Federal	Annual operating cost - $242,354

Annual operating cost applies cumulatively to Samish Hatchery sub-yearling Chinook program.

1.5 Location(s) of hatchery and associated facilities.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Samish Hatchery	Broodstock collection	Samish fish trap, Samish River, RM 10.5.
	Rearing, Acclimation	Located on Friday Creek (WRIA 03.0017) at RM 1; tributary to the Samish River (WRIA 03.0005) at RM 10.5.
Kendall Cr. Hatchery	Incubation	Located at the mouth of Kendall Creek (WRIA 01.0406); tributary to the North Fork Nooksack River (WRIA 01.0120) at RM 46.

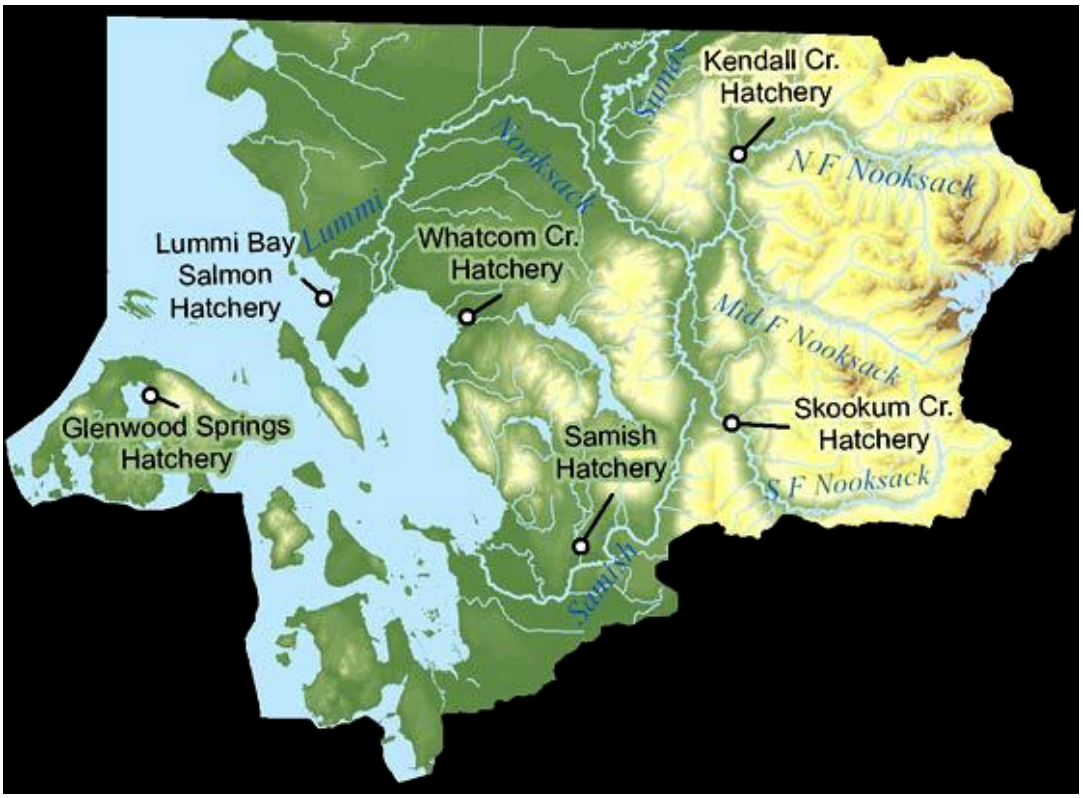

Figure 1.5.1: Map of the Nooksack and Samish Basins hatchery and trapping facilities. Source: WDFW GIS Staff.

1.6 Type of program.

This is a segregated harvest program.

1.7 Purpose (Goal) of program.

Harvest augmentation to replace natural production lost due to habitat loss.

1.8 Justification for the program.

This program will be managed to avoid impeding the recovery of ESA-listed Chinook in the Nooksack River basin while providing a harvestable surplus. The purpose of the program is to produce Chinook for sustainable fisheries (*Magnuson/Stevens Act*, 1976). Harvest is included in pre-terminal and terminal areas for recreational, non-treaty commercial fisheries, and treaty commercial fisheries (*U.S. v Washington* 1974), obligations under the Pacific Salmon Treaty to buffer impacts on stocks of concern in mixed stock fisheries, and to increase prey abundance for endangered southern resident killer whales.

This program, in conjunction with other fall chinook programs in the same management area, is intended to restore fishing opportunities lost due to reduced habitat productivity impacts on

natural populations, while being managed in a precautionary manner to reduce interactions with ESA-listed Chinook to acceptable levels.

1.9 List of program "Performance Standards".

See HGMP section 1.10.

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

1.10.1 "Performance Indicators" addressing benefits.

Table 1.10.1.1: List of "Performance Indicators" addressing benefits.

Benefits	
Performance Standard	**Performance Indicator**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in applicable agreements such as under *U.S. v Washington* (1974).	Contributes to co-manager harvest.
3.1.2 Program contributes to mitigation requirements.	Number of fish released by program, returning, or caught, as applicable to given mitigation requirement.
3.2.1 Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.
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.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults. All hatchery releases mass-marked (fin clips, otoliths, tags, etc.) to allow for their differentiation from naturally-produced fish.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal distribution and age composition of collected broodstock and naturally produced population at point of collection.
3.5.5 Juveniles are released at fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Level of smoltification at release. Release type (forced, volitional, or direct).
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.
3.8.2 Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	Artificial production was chosen as the preferred alternative for attaining hatchery production objective.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural and recreational benefits to the general populations and cultural, ceremonial and subsistence (C&S) and recreational benefits for PNW Native Americans and provide contributions to local charitable organizations. Recreational fishery angler days, length of season, number of licenses purchased.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1: List of "Performance Indicators" addressing risks.

Risks	
Performance Standard	**Performance Indicator**
3.1.3 Program addresses ESA responsibilities.	ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.
3.2.1 Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.
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.	Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery. Recreational angler days, by fishery. Annual escapement of natural populations that are affected by fisheries targeting program fish.
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.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults. Total hatchery releases are mass-marked (adipose-fin clip, CWT, otolith-mark, other, etc., depending on species) production fish to differentiate them from naturally-produced fish.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal distribution and age composition of collected broodstock and naturally produced population at point of collection.
3.4.2 Broodstock collection does not significantly reduce potential juvenile production of NF or SF Nooksack Chinook in natural rearing areas.	Number of spawners of natural-origin removed for broodstock.
3.4.3 Life history characteristics of the natural population do not change as a result of this hatchery program.	Life history characteristics of the natural populations do not change as a result of this artificial production.
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.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Total number of spawners estimated to pass the collection facility to spawning areas compared to minimum effective population size (when established) required for those natural populations.
3.5.3 Artificially-produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish.
3.5.4 Juveniles are released on-station or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release). Proportion of adult returns to program's intended return location, compared to fisheries and artificial or natural production areas.

3.5.5 Juveniles are released at fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Level of smoltification at release. Release type (forced, volitional, or direct).
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, WDFW Fish Health Policy, INAD, MDFWP).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria. Annual program review workshops conducted by the co-managers.
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. WDOE water rights 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.
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.	Necropsies of fish to assess health, nutritional status, and culture conditions.
	Release and/or transfer exams for pathogens and parasites.
	Inspection of adult broodstock for pathogens and parasites.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.
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.
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.
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.
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.
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.

1.11 Expected size of program.

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

Up to 3,454 adults (1:1 male to female ratio), are collected annually to meet the release goal of 4,000,000 and 1,000,000 sub-yearlings for WDFW and Lummi Nation's fall Chinook programs, respectively. When the program moves between stages, the broodstock required will vary in proportion to the change in the number of juveniles released.

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

Table 1.11.1: Proposed Annual Fish Releases.

Program Stage	Life Stage	Release Location	Annual Release
1	Sub-yearling smolts	Sub-yearling smolts	4,000,000*/**
2	Sub-yearling smolts	Sub-yearling smolts	5,000,000
3	Sub-yearling smolts	Sub-yearling smolts	6,000,000
4	Sub-yearling smolts	Sub-yearling smolts	8,000,000

* Program release goal was scaled back in 2002 from 5.2-million on-station release to 4,000,000.

** The yearling program was eliminated in 2006 (last release in 2007).

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

The average smolt-to-adult survival rate for sub-yearlings was 0.65% for brood years 1996-2008 (RMIS 2014, see HGMP section 3.3.1). Based on the smolt-to-adult survival and a programmed release goal of 4,000,000 sub-yearlings, the estimated adult production would be 26,000. Yearling smolts releases were discontinued as of the 2006 brood, but had a smolt-to-adult survival of 0.04% for brood years 1996-1997 and 2002-2005 (**Table 3.3.1.1**).

Table 1.12.1: Samish Hatchery Fall Chinook Returns 2002-2013.

Year	Hatchery Returns
2002	15,837
2003	10,372
2004	5,820
2005	4,905
2006	5,494
2007	12,219
2008	9,656
2009	10,088
2010	15,670
2011	8,518
2012	6,683
2013	8,731
Average	**9,499**

Source: WDFW Hatchery Headquarters Database 2014.

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

Program was initiated in 1914. See HGMP section 6.1 for broodstock history and origin.

1.14 Expected duration of program.

On-going.

1.15 Watersheds targeted by program.

Samish River (WRIA 03.0005).

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

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."

As an alternative action to achieve program goals, the Co-managers considered moving the entire production to the Lummi Nation facility; the action was dismissed due to conservation concerns and infrastructure constraints.

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.

The Samish Fall Chinook HGMP was previously submitted to NOAA Fisheries in 2002 and 2005, but was not acted on at that time. 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 directly.

-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 (Ford 2011), as well as twenty-seven artificial propagation programs (NMFS 2013 78FR38270).

Puget Sound steelhead *(Oncorhynchus mykis*s): 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. This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive) (Ford 2011). 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).

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.

Puget Sound Chinook salmon: Updated Risk Summary. All Puget Sound Chinook populations are below the TRT planning range for abundance and productivity. 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 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).

Table 2.2.2.1: Nooksack Chinook, minimum viability spawning abundance and abundance at equilibrium or replacement, and spawning A/P at MSY for a recovered state as determined by EDT analyses of properly functioning conditions and expressed as a Beverton-Holt function. The TRT minimum viability abundance was the equilibrium abundance or 17,000, whichever was less.

Region and population	TRT minimum viability abundance	Under properly functioning conditions (PFC)			NMFS Escapement Thresholds	
		Equilibrium abundance	Spawners at MSY	Productivity at MSY	Critical[a]	Rebuilding[b]
Strait of Georgia					400	500
NF Nooksack	16,000	16,400	3,680	3.4	200[c]	-
SF Nooksack	9,100	9,100	2,000	3.6	200[c]	-
ESU	**261,300**	**307,500**	**70,948**	**3.2**	**3,875**	**2,785**

Source: Ford 2011; NMFS 2011.

[a] Critical natural-origin escapement thresholds under current habitat and environmental conditions (McElhaney et al. 2000; NMFS 2000a).

[b] Rebuilding natural-origin escapement thresholds under current habitat and environmental conditions (McElhaney et al. 2000; NMFS 2000a).

[c] Based on generic VSP guidance (McElhaney et al. 2000; NMFS 2000a).

*Puget Sound steelhead: Updated Risk Summary***.** The number of winter steelhead spawners has increased for many populations in Puget Sound since 2009. The number of spawners for 16 Puget Sound winter steelhead populations, relative to the average number of spawners for each population in the four year period up to the listing in 2007, increased an average of 51% in 2009 to 141% in 2013. These recent, short-term increases in spawners are a positive development, but do not negate the long-term risks facing Puget Sound steelhead DPS. Using spawner data collected through 2008 or 2009, Ford (2011) concluded that the status of the listed Puget Sound steelhead DPS has not changed substantially since the 2007 listing, and 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.

Samish River steelhead in Puget Sound steelhead DPS. Ford (2011) used spawner data collected through 2008 and concluded the following: **"**Steelhead counts in the Samish River have declined sharply in recent years. Assuming these counts are a reasonable reflection of spawner abundance, the estimated probability that this steelhead population would decline to 10% of its current estimated abundance (i.e., to 43 fish) is high—about 80% within 25 years. With an estimated mean population growth rate (u est) of −0.037 (λ = 0.964) and process variance (Q est)

of 0.140, we can be highly confident ($P < 0.05$) that a 90% decline in this population will not occur within the next 5−10 years, and that a 99% decline will not occur within the next 15 years. However, beyond the next 25 years we are highly uncertain about the precise level of risk". Hard et al (2015) estimated the capacity for winter steelhead in the Samish River DPS was 3,193 to 6,386 fish.

Table 2.2.2.2: Interim DIP abundance goals for steelhead in Puget Sound based on a four-year average. QET, quasi extinction threshold; SAS, smolt to adult survival. Minimum abundance = 100 (Low Abundance), 250 (Viable).

Population Basin				Quasi	Low Abundance	Viable	Capacity
Population Name	Area km^2	Mean Elevation (m)	Total Stream Length (m)	Extinction Threshold	1% SAS	5% SAS	20% SAS
Samish/ Bellingham Bay Tributaries DIP	661	203	453,694	31	319	1,596	6,386
Puget DPS Total				**1,462**	**30,449**	**153,194**	**613,662**

Source: Hard et al. 2015.

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

Table 2.2.2.3: Puget Sound Chinook population average productivity for five-year intervals measured as recruits per spawner (R/S) and spawners per spawner (S/S). Trend over the intervals is also given. [a]

Brood Years	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006		Trend	
Populations	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**
North + Middle Fork Nooksack	*5.56*	*2.52*	*2.83*	*1.28*	*0.61*	*0.39*	*0.55*	*0.31*	*0.32*	*0.11*	*-1.28*	*-0.58*
South Fork Nooksack	*2.01*	*0.93*	*1.3*	*0.62*	*1.6*	*0.99*	*1.66*	*0.94*	*2.99*	*0.92*	*0.23*	*0.03*
ESU	***9.57***	***2.19***	***5.05***	***0.96***	***3.01***	***1.24***	***2.70***	***1.19***	***1.67***	***0.67***	***-1.81***	***-0.28***

Source Data: Ford 2011.

[a] This is from analyses reported by Ford (2011). These analyses incorporate assumptions for years where escapements were not sampled for hatchery: natural-origin ratios, and are not necessarily agreed to by WDFW and Co-managers.

Table 2.2.2.4: Short and long term population trend and growth rate estimates for the Puget Sound Chinook ESU populations. [a]

Regions and Populations	Years	Trend Natural Spawners w/Cl	Hatchery Fish Success = 0 Lambda w/Cl	p>1	Hatchery Fish Success = 1 Lambda w/Cl	p>1
Lower-North Fork-Middle Fork Nooksack Spring Run	1995-2009	1.092 (1.023 - 1.165)	1.082 (0.622 - 1.884)	0.84	0.607 (0.232 - 1.589)	0.05
	1984-2009	1.049 (0.995 - 1.106)	1.032 (0.909 - 1.172)	0.74	0.729 (0.571 - 0.93)	0.01
South Fork Nooksack River Spring Run	1995-2009	1.05 (0.995 - 1.107)	1.068 (0.507 - 2.251)	0.77	0.938 (0.388 - 2.269)	0.26
	1984-2009	1.006 (0.976 - 1.038)	1.009 (0.883 - 1.154)	0.57	0.927 (0.825 - 1.041)	0.07

Source Data: Ford 2011.

[a] This is from analyses reported by Ford (2011). These are based on analyses reported by Ford (2011) that are not necessarily agreed to by WDFW and the Co-managers. "Lambda" is a measure of population growth rate. See Ford (2011) for explanation of the meaning of the columns.

Table 2.2.2.5: Steelhead Population Exp. Trend ln(nat. spawners) (95% CI).

Population	1979-2011	1995-2011
Samish River winter-run	1.031 (0.915-1.160)	0.993 (0.592-1.666)

Source: Hard et al. 2015.

- Provide the most recent 12-year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Table 2.2.2.6: Nooksack River Chinook (early) escapement from 2002-2013.

Return Year	Escapement	
	S.F. Nooksack	N. F./MF Nooksack
2002	135	3,741
2003	69	2,857
2004	29	1,719
2005	19	2,047
2006	61	1,184
2007	26	1,438
2008	80	1,266
2009	45	1,903
2010	24	2,044
2011	81	865
2012	121	758
2013	10	1,347
Average	**58**	**1,764**

Source: WDFW SaSI 2015.

Table 2.2.2.7: Samish River Winter Steelhead Escapement 2004 to 2015.

Year	Escapement
2003/2004	930
2004/2005	597
2005/2006	791
2006/2007	494
2007/2008	432
2008/2009	434
2009/2010	697
2010/2011	1,028
2011/2012	524
2012/2013	916
2013/2014	680
2014/2015	1,876 [1/]
Average	**783**

Source: SaSI, WDFW 2014.
[1/] Preliminary

- 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.

Proportions are not monitored in spawn surveys in the Samish River. Naturally spawning Samish Chinook are not considered an independent population (Ruckelshaus et al. 2006).

Table 2.2.2.8: NF/MF Nooksack early Chinook spawners (*Oncorhynchus tshawytscha*) from 2002-2013.

Year	NF/MF Nooksack River		
	Natural-Origin	Hatchery-Origin	% of Natural Origin
2002	224	3,517	6%
2003	210	2,647	7%
2004	314	1,405	18%
2005	210	1,837	10%
2006	311	873	26%
2007	334	1,104	23%
2008	307	959	24%
2009	269	1,634	14%
2010	204	1,840	10%
2011	99	766	11%
2012	281	477	37%
2013	100	1,247	7%
Average	**239**	**1,526**	**16%**

Source: SaSI, 2015.

There are three Chinook Stocks encountered during spawning ground surveys in the South Fork Nooksack River. The estimates are broken into hatchery and natural origin based on CWT and/or adipose fin clip, and the natural origin Chinook are further estimated by stock by DNA microsatellite tissue assignment.

Table 2.2.2.9: Estimated Escapement of Chinook into the South Fork Nooksack by origin and stock.

Return Year	South Fk Native	North Fk NOR	Fall NOR	Kendall Cr Hatchery	Other Hatchery	Total Natural
2002	135	55	98	289	47	624
2003	69	0	150	210	162	591
2004	29	29	88	14	12	172
2005	19	56	56	32	70	233
2006	62	104	192	84	90	532
2007	26	44	128	112	35	345
2008	80	106	126	109	23	444
2009	45	58	187	128	38	456
2010	24	49	123	299	58	553
2011	81	82	114	172	32	481
2012	121	165	93	97	38	514
2013	10	30	22	162	19	243

Preliminary Co-manager Data

2.2.3 Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take (*see "Attachment 1" for definition of "take"*).

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

Broodstock collection effects: Samish fall Chinook is the only program propagated at Samish Hatchery. Broodstock for the program is collected from the Samish River at the Samish fishway trap from September through late-October. The trap is located at the diversion dam, which has a fish passage ladder. With the exception of broodstock collection, the ladder is left open to allow unimpeded fish movement. During collection time, all passing fish are directed from the ladder into the holding pond, where they are sorted. Hatchery-origin fish are held for broodstock; since 2013, all unmarked Chinook and all other species, when encountered, are passed upstream. Chinook broodstock collection takes place before winter steelhead run time, which typically occurs from late-December to early-April (Brett Barkdull, personal communication, 2014), thus no encounters are expected. No steelhead or bull trout has been seen at the hatchery pond since at least 1998 (WDFW hatchery staff, personal communication, 2014).

See "Take Tables" at the end of this document for direct take.

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.

Predation/Competition: No native natural-origin Chinook population exists in Samish River that could be impacted by the hatchery program (Ruckelshaus et al. 2006). Native steelhead, which are present in the river at the time of hatchery Chinook releases, are unlikely to be negatively-

impacted. This is because juvenile Chinook are released at a time, size and life-history stage (smolts) to foster rapid downstream migration to marine waters (Seiler et al., 2000, 2001, 2002) to limit competition and predation. Smolts are released in May at the average size of 84mm. The USFWS (1994) has suggested that juvenile salmonids can consume fish which are one-third or less of its own body length. Native steelhead at this time would be either still in redds, or at least a year old, and would be larger than the size range for possible Chinook consumption. The Samish watershed does not support spawning bull trout, though it is used by older age classes for foraging, migration and overwintering (USFWS 2004); these would be too large for Chinook smolts to consume.

Disease Transmission: Interactions between hatchery-reared and naturally-produced populations may be a source of pathogen and disease transmission, although there is little evidence showing that diseases are transmitted from hatchery fish to natural-origin fish (Steward and Bjornn 1990). WDFW conducts fish disease examinations to ensure minimal disease transmission and to prevent the introduction and/or spread of any fish diseases. Fish health monitoring efforts include fish health examinations and virus sampling, abnormal fish loss investigations, virus sampling, and pre-transfer and pre-liberation inspections. All activities are done in accordance with guidelines developed under the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (*WDFW and WWTIT 1998, updated 2006).

Genetic Effects: The Samish River has not been identified by the Puget Sound Technical Recovery Team (PSTRT) as a watershed where an indigenous fall Chinook salmon population was historically present. The program may have incorporated natural-origin fish for use as broodstock over the years although Samish River naturally-produced Chinook are not considered a viable population segment in the Puget Sound ESU nor is the hatchery population included in NOAA Fisheries' Hatchery Listing Policy (NMFS 2005).

The presence of naturally-spawning fall Chinook in the neighboring Nooksack Basin has raised concerns about the potential for gene flow from the non-indigenous Samish Hatchery stock to the South Fork Nooksack and North Fork Nooksack Chinook population. However, genetic analysis indicates that limited introgression is occurring. Warheit and Seamons (2015, unpublished data) examined a total of 1067 Chinook adult carcasses collected from the NF, MF, and SF Nooksack rivers in 2008 (313; Aug 11 – Oct 16), 2009 (203; Aug 4 – Oct 12), and 2013 (551; Jul 23 – Sep 27), as part of an on-going genetic mark-recapture project. We used the standard conditional likelihood method to assign samples to NFMF Nooksack, SF Nooksack, and Samish (Fall) Chinook, with baseline samples collected from these populations in the 1980s and 1990s. We set a posterior probability threshold at 0.75, above which we assigned individuals as "pure" (i.e., not introgressed). Over 95% of these "pure" individuals had maximum posterior probabilities greater than 0.95. Most of the carcasses (92%) were assigned to "pure" NFMF Nooksack, followed by Samish (3%), and SF Nooksack (1.5%). Nearly 3% of the carcasses were NFMF – SF Nooksack hybrids, while only four of the 1067 carcasses (0.4%) showed introgression between spring-run Nooksack and Samish (Fall) populations.

The comanagers also implemented a captive brood population supplementation program for the South Fork Nooksack population, and offspring from these fish are beginning to return from early releases. Genetic diversity may be adversely affected by straying non-population hatchery fish, such as straying of non-indigenous fall Chinook that can potentially interbreed with the native stock. Based on the data collected during years 2008-2013 on the SF Nooksack spawning grounds and 2008-2012 on the North Fork (NF) Nooksack spawning grounds, 7.21% and 0.2% Chinook respectively were identified as of Samish hatchery- origin (relative to all spawners). However, relative to the SF natural spring population specifically, the proportion of Samish hatchery-origin fish released from the Samish Hatchery has been 25.4% (see also HGMP section 10.11). All Samish hatchery-origin Chinook released from Samish and Lummi Nation programs can be identified by unique otolith mark, as all WDFW and Lummi releases have been otolith-marked starting with brood year 2004.

To lower possible negative impacts of fall Chinook program, the releases at the Samish Hatchery were reduced from 5.2-million to 4.0-million in 2002, and the yearling portion of the program was eliminated in 2006. This has resulted in reduced harvest levels. In 2008, the Lummi Nation has changed the release site for their program from mainstem Nooksack into Bertrand Creek (Nooksack River tributary at RM 12.6). The SF population abundance is expected to increase in response to the hatchery population rebuilding program, and as habitat conditions improve.

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

The proportion of natural-origin Chinook used for Samish Hatchery broodstock was unknown prior to consistent mass-marking, initiated in 2000. As of 2004, returning adipose fin-clipped hatchery adults could be differentiated from their natural-origin counterparts, and take levels of listed Chinook may be determined during broodstock collection activities.

- 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" table at the end of HGMP.

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Any projected take that will exceed the estimates given in this HGMP from this operation on a yearly basis would be communicated to WDFW Fish Program, tribal Co-managers and NOAA staff for additional guidance.

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.

This hatchery program is a component of the Co-managers' *Comprehensive Management Plan for Puget Sound Chinook,* and it is intended to produce adults that contribute to preterminal and terminal area harvest and to Pacific Salmon Treaty obligations, buffering impacts on stocks of concern in mixed stock fisheries, and supplement prey for endangered southern resident killer whales.

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

Future Brood Document (FBD): Hatchery salmon and steelhead production levels are detailed in the annual *Future Brood Document*. The FBD is a pre-season planning document for fish hatchery production in Washington State for the upcoming broodstock collection and fish rearing season (July 1 – June 30). The FBD is coordinated between WDFW, the Northwest Indian Fisheries Commission (NWIFC), coordinating Puget Sound and coastal treaty tribes, eastern Washington treaty tribes, and Federal fish hatcheries. Hatchery production by volunteers, schools, and Regional Fisheries Enhancement Groups (RFEGs) are represented by WDFW.

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound Chinook 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.

See also HGMP section 3.1.

3.3 Relationship to harvest objectives.

The Co-managers' general harvest goals are to provide fishing opportunities consistent with the mandate of the agency for restoration and not impeding recovery of wild indigenous salmonid runs to the extent that current habitat conditions support these, the Pacific Salmon Treaty, the *Puget Sound Salmon Management Plan*, *U.S. v Washington*, and other state, federal, and international legal obligations. Tribal and non-tribal commercial and recreational fisheries directed at salmon and other species produced through WDFW hatchery releases will be managed to minimize incidental effects to listed salmon and steelhead.

The goal for harvest is to restore the number of fish, of Nooksack-Samish origin, available for harvest to historic levels. Habitat degradation in the Nooksack and Samish river basins and in Bellingham Bay has severely reduced the natural production of salmon and steelhead available for harvest. Nooksack-Samish Chinook, in the past, contributed substantially to fishing opportunities throughout the west coast, including international fisheries managed under the Pacific Salmon Treaty, coastal US fisheries managed under the Magnuson-Stevens Act, and treaty and non-treaty fisheries in both terminal and pre-terminal areas of Puget Sound.

Harvest of fall Chinook from the Nooksack-Samish basins has been reduced from in excess of 100,000 to less than 10,000 annually, with approximately 90% of that originating from the Samish Hatchery. Specifically, an initial objective identified by the Lummi Nation is to attain an average annual total terminal area harvest of 81,000 Chinook, which is comparable to the average annual harvest in the mid-1980s. It is anticipated that 90% of the terminal harvest will be from hatchery production, and a substantial portion of that will be from the Samish Hatchery. A second short term objective is to produce sufficient hatchery Chinook to support a 50% mark rate in Puget Sound recreational fisheries. The Samish Hatchery is an important contributor to the late summer recreational fishery in Area 7, and production (or survival rates) will need to be increased to achieve the target mark rate. The WDFW, in collaboration with the Puget Sound Recreational Fisheries Enhancement Fund Oversight Committee, has identified a longer-term objective of increasing recreational angler trips in Puget Sound by 5% per biennium. In addition, the hatchery fish produced will act to buffer impacts on stocks of concern in mixed stock fisheries and to increase prey abundance for endangered Southern Resident Killer Whales.

The annual pre-season planning process for northwest recreational and commercial salmon fisheries, known as "North of Falcon", involves a series of public meetings between federal, state, tribal and industry representatives and other concerned citizens. North of Falcon coincides with meetings of the *Pacific Fishery Management Council*, which sets the ocean salmon seasons at these meetings. The regulations developed by the Pacific Management Council are promulgated by NMFS and reviewed for compliance with ESA requirements.

3.3.1 Describe fisheries benefitting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Table 3.3.1.1: Samish River Hatchery Fall Chinook Fishery Contributions.

Brood Years: 1996-2008 (Sub-yearling) and 1996-1997 and 2002-2005 (Yearling) Fishery Years: 2000-2012 (Sub-yearling) and 2000-2001 and 2006-2009 (Yearling)			
	Average SAR%[a]	**0.65**	**0.04**
Agency	***Non-WA Fishery***	***% exploitation rate***	
		Sub-yearlings	***Yearlings***
ADFG	All	*0.3*	---
CDFO	All	*18.8*	*9.9*
NMFS	All	*0.6*	---
ODFW	All	*0.2*	*5.7*
Agency	***WA Fishery***	***Sub-yearlings***	***Yearlings***
WDFW	10- Ocean Troll	*1.1*	---
MAKA	15- Treaty Troll	*0.9*	---
WDFW	15- Treaty Troll	*2.4*	---
LUMM	23- PS Net	*0.1*	---
MAKA	23- PS Net	*0.0*	---
WDFW	23- PS Net	*34.8*	*52.3*
WDFW	41- Ocean Sport- Charter	*0.1*	*1.1*
WDFW	42- Ocean Sport- Private	*0.4*	---
WDFW	45- PS Sport	*3.5*	*1.7*
WDFW	45- PS Sport - Winter Blackmouth[b]	*2.0*	---
WDFW	46- Freshwater Sport[c]	*11.0*	*10.4*
WDFW	50- Hatchery Escapement	*23.1*	*17.9*
WDFW	54- Spawning Grounds	*0.6*	*1.0*
	Total	***100.0***	***100.0***

Source: RMIS 2014.

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

[b] Winter Blackmouth fishery occurs between October and April.

[c] Freshwater Sport based on WDFW Catch Record Card (CRC) data for sub-yearlings; Freshwater Sport based on RMIS CWT data for yearlings and is unlikely to fully represent the contribution to this fishery.

3.4 Relationship to habitat protection and recovery strategies.

The purpose of this joint State-Tribal hatchery program is to provide harvest opportunity while remaining consistent with the Co-managers' primary management strategy and recovery objectives. Habitat protection and restoration strategies are essential to the recovery of self-sustaining, natural populations. If land use decisions are made consistent with sufficient habitat protection and restoration, and harvest goals are being met, the hatchery program will be the remaining focus to meet management criteria.

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or other species that could negatively impact the program.* Negative impacts by fishes and other species on the Samish Hatchery Chinook 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 program Chinook 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 Chinook 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 Chinook through predation include the following:

- Avian predators, including mergansers, cormorants, belted kingfishers and great blue herons

- Mammalian predators, including mink, river otters, harbor seals, and sea lions, and possibly whales
- Cutthroat trout
- Coho salmon

Rearing and migrating adult Chinook originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Samish River. Species that may benefit, but negatively impact program fish through predation may include:

- Southern-resident killer whales
- Sea lions
- Harbor seals
- River otters

(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
- 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 and trout present in the Samish River watershed through natural production. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing both direct and indirect food resources for the emigrating Chinook. 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). Increases in forage fish would provide more food resourced for Chinook after they leave the river.

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

- Southern-resident killer whales
- Northern pikeminnow
- Coho salmon
- Cutthroat trout
- Pacific staghorn sculpin
- Numerous marine pelagic fish species
- Bull trout

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 Samish Hatchery.

Water Source	Water Right		Available Water Flow	Water Temp. (Fº)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Friday Cr. (surface)	S1-*03495C WRIS/ 00749	01871	15.0 cfs	32-58	Incubation, rearing, acclimation	Low flows in the summer, high and low water temperatures
	S1-*22140C WRIS/ 11845	16877	8.13 cfs			
Samish R. (surface)	S1-*17762C WRIS/ 09937	13063	8.0 cfs	39-58	Broodstock collection and holding, rearing, acclimation	Low flows, high water temperatures, heavy sediment loads.
	S1-*20468C WRIS/ 10245	15051	7.0 cfs			
	S1-24618C WRIS	-----	10.0 cfs			

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

Samish Creek Hatchery. Friday Creek is the only water source available for full production at Samish Hatchery. Well water was available for use in production at Samish Hatchery until spring 2012. Since fall 2012, collected eggs have been fertilized and incubated to the eyed stage at Kendall Creek Hatchery (see below).

The trap and holding/rearing ponds are located on Samish River. Heavy sediment loads block the water intake and fish access to the ladder. This requires annual dredging to clear the intake access. The dredging is done before adult fish return to the spawning grounds.

Surface water rights at Samish Hatchery are formalized through the Washington Department of Ecology (WDOE) (**Table 4.1.1**). Friday Creek water right certificates were obtained in 1931 and 1970; Samish River water rights were obtained in 1963, 1967 and 1985.

Table 4.1.2: Water sources used at Kendall Creek Hatchery for Samish fall Chinook production.

Water Source	Water Right		Available Water Flow	Water Temp. (Fº)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Wells (2) (Infiltration trench)	G1-*10562C WRIS 06970	09733	4950 gpm	47	Incubation	None
Wells (3)	G1-23273	-----	11000 gpm			

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

Kendall Creek Hatchery. Since fall 2012, green eggs are transported to Kendall Creek Hatchery for fertilization, incubation to the eyed-egg stage, and thermal otolith-marking. The Kendall Creek Hatchery incubation room utilizes water from five wells, which provide excellent-quality, pathogen-free water. Water temperature is a constant 47°F.

NPDES permits:
These facilities operate under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the WDOE (**Table 4.1.3)**. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from WDOE.

Discharges from the cleaning treatment system are monitored as follows:

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

Table 4.1.3. Record of NPDES permit compliance at Samish Hatchery.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 years (see Table 4.1.4)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Quarterly	Annual				
Samish WAG-13-3011	Y	Y	Y	2/14/2012	1	N	Y
Kendall Cr WAG13-3007	Y	Y	Y	5/23/2005	1	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.

Table 4.1.4. List of NPDES Violations over the last five years (2009-2013).

Facility	Monitoring Month	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
Samish Hatchery	September 2011	NA	NA	NA	DMR due to Ecology by July 30, 2011	Late DMR to Ecology	Explanation to personnel to correct procedures
Kendall Creek Hatchery	September 2011	NA	NA	NA	DMR due to Ecology by July 30, 2011	Late DMR to Ecology	Explanation to personnel to correct procedures

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

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.

The surface water intake on Friday Creek is in compliance with state and federal guidelines (NMFS 1995, 1996), and meets NMFS (2011) screening passage requirements. Screens were replaced in 2004.

The surface water intakes at the Samish River are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current "Anadromous Salmonid Passage Facility Design" criteria (NMFS 2011). The construction of new intake with fish passage, along with new adult ponds, is included in the "Capitol project" list sent for approval to legislature.

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Broodstock is collected by trapping returning fish at the adult collection dam on Samish River.

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

A 1,000-gallon tanker truck, equipped with aerators and oxygen tanks, is used for transporting juveniles.

5.3 Broodstock holding and spawning facilities.

Adults are held in the ½-acre asphalt bottom pond, adjacent to Samish River and filled with river water. Spawning takes place at the side of the pond and collected gametes are transported to the Kendall Creek Hatchery for fertilization and incubation till the eyed stage.

5.4 Incubation facilities.

Table 5.4.1: Incubation Vessels Available at Kendall and Samish Hatcheries.

Facility	Type	Number	Size
Samish	Vertical stack incubators	1,000 trays	24" x 25"
Kendall Creek	Vertical stack incubators	336 trays	24" x 25"
	Troughs	24	24" x 31" x 17"

Source: Samish Hatchery staff, 2012

Incubation to the eyed-egg stage takes place at Kendall Creek Hatchery, after which, eggs are transferred back to Samish Hatchery for further incubation, rearing and release.

5.5 Rearing facilities.

Table 5.5.1: Rearing Facilities Available at Samish Hatchery.

Location	Type	Number	Size
Samish Hatchery	Concrete ponds	4	20' x 80' x 4'
	Concrete ponds	8	10' x 100' x 4'
	Asphalt bottom ponds	1	¼-acre (60' x 120' x 5')
Samish River	Asphalt bottom ponds – adults holding ponds	1	½-acre (229' x 79' x 4.5')

Source: Samish Hatchery staff, 2012.

5.6 Acclimation/release facilities.

Fish are released from Samish Hatchery into Friday Creek and holding/rearing ponds located on Samish River, and are acclimated to Friday Creek and Samish River water, respectively.

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

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.

ESA-listed fish are not propagated in this program. To ensure cultured fish safety, however, a hatchery employee is on stand-by at Samish Hatchery at all times to monitor hatchery operations and respond to any unexpected events while production takes place. Both the Samish Hatchery and holding ponds are equipped with low water alarms. A back-up generator is available at the holding ponds in case of power loss. Water to Samish Hatchery is gravity-fed.

Fish rearing is conducted in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (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.

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.

Marked hatchery-origin fall Chinook returning to the Samish River Hatchery.

6.2 Supporting information.

6.2.1 History.

Samish Hatchery has been releasing juvenile fall Chinook into the Samish River since 1914; no native fall Chinook salmon population previously existed in the river (Ruckelshaus 2006). The first eggs used for broodstock were of Columbia River-origin (Kalama and Wind rivers) (WDFG, 1916). In 1929, Green River-origin fall Chinook eggs were transferred to Samish Hatchery and supplanted Columbia River-origin eggs as the source of fall Chinook production (WDFG 1932). No Chinook eggs were taken from broodstock returning to Samish Hatchery prior to 1937 (WDF 1939; 1941) (70FR37160, June 28, 2005; NMFS SHIEER 2004). A consistent year-to-year Chinook salmon egg transfer from Soos Creek Hatchery to Samish Hatchery began in 1938, in an attempt to create a return to Samish River Hatchery that could sustain the hatchery program (WDF 1938). Transfers of Green River hatchery-lineage fall Chinook from other WDFW hatcheries in the region continued through the early-1990s, as needed, to meet on-station production objectives.

6.2.2 Annual size.

Up to 3,454 adults (1:1 male to female ratio), collected annually, assuming 4,000 fecundity and up to 10% pre-spawning mortality. When the program moves between stages, the broodstock required will vary in proportion to the change in the number of juveniles released.

6.2.3 Past and proposed level of natural fish in broodstock.

The production at Samish Hatchery was mass-marked (adipose fin clipped) starting in 2000, to allow identification in mark-selective fisheries to provide harvest with limited mortality on natural-origin Chinook. Prior to this date, the level of natural-origin fish used for broodstock was unknown; however, the Samish River does not have a native self-sustaining Chinook salmon population (SaSI 2013; Ruckelshaus et al. 2006). Chinook returns were introduced, and are sustained, by hatchery production (70FR37160 June 28, 2005; NMFS SHIEER 2004). Since

2013, only hatchery-origin fish (adipose fin-clipped and/or coded-wire tagged) are targeted for broodstock and are randomly selected. Natural-origin fish (unmarked and untagged) are safely and promptly returned to the river when encountered.

6.2.4 Genetic or ecological differences.

The TRT found no evidence that an independent population of Chinook existed in the Samish River (Ruckelshaus et al. 2006). Chinook returns were introduced, and are sustained by hatchery production. Genetic sampling of the fall Chinook population propagated through the program and the program's stock-transfer history indicate that the hatchery fish are related to other transplanted Green River lineage hatchery populations, and distinct from neighboring natural Chinook salmon populations, including the Nooksack River basin and Skagit River basin Chinook populations (Young and Shaklee 2002), (70FR37160 June 28, 2005; NMFS SHIEER 2004). Genetic patterns are currently not monitored.

6.2.5 Reasons for choosing.

The program is designed to provide Chinook salmon for commercial and recreational fisheries harvest (70FR37160 June 28, 2005; NMFS SHIEER 2004). To suit the purpose, the artificial hatchery stock was created in place where natural fall Chinook population was not historically present using Soos Creek Hatchery stock from Green River, which was available for transfers at the time.

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

This program is managed as segregated and natural-origin fish are not intentionally used for hatchery broodstock. Volunteers returning to the hatchery are sorted by mark type during broodstock collection and surplus events. Natural-origin fish, which are unmarked and untagged, are returned to the river when encountered.

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 for the program is collected from Samish River at Samish fishway trap from September to late-October. The trap is located at the diversion dam, located at RM 10.5, that has a fish passage ladder. The passage is closed from September until late-October, during Chinook broodstock collection. Fish are directed from the ladder into the holding pond, where marked hatchery-origin fish are sorted and held for broodstock, and unmarked fish can be directed up the river. The holding pond is divided into three sections to allow for fish separation. Only marked hatchery-origin Chinook are retained; all other species are passed upstream through a pipe system. The passage is open from the end of broodstock collection in late-October through the following September, to allow unimpeded fish movement.

7.3 Identity.

All Chinook released from Samish Hatchery have been consistently 100% mass-marked (adipose fin-clipped), with exception of the half of the Double Index Tag (DIT) group, since brood year 2000 (RMIS 2012). Additionally, all smolts (100%) have been thermally otolith-marked (OT) since brood year 2004. In addition to these marks, 200,000 smolts are also coded-wire tagged

(CWT). A DIT group of 200,000 smolts is released unclipped, but are OT+CWT (see **Table 10.7.1**).

7.4 Proposed number to be collected:

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

Up to 3,454 adults (1:1 male to female ratio), are collected annually to meet the release goal of 4,000,000 and 1,000,000 sub-yearlings for WDFW and Lummi Nation's fall Chinook programs, respectively. When the program moves between stages, the broodstock required will vary in proportion to the change in the number of juveniles released.

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: Sex composition of broodstock spawned for Samish Hatchery fall Chinook program.

Brood Year	Adults		Jacks
	Females	Males	
2002	1,608	1,554	12
2003	1,509	1,403	2
2004	1,340	1,155	28
2005	997	986	13
2006	1,058	1,096	0
2007	1,741	1,800	0
2008	2,181	2,186	0
2009	1,350	1,142	0
2010	1,609	1,693	0
2011	1,503	1,637	0
2012	1,587	1,716	7
2013	1,352	1,510	0
Average	**1,486**	**1,490**	**5**

Source: WDFW Hatchery Headquarters Database 2014.

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

Returning hatchery-origin Chinook in excess of broodstock needs are disposed of to the contracted fish buyer.

7.6 Fish transportation and holding methods.

Adults are not transported.

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 to adult broodstock.

7.8 Disposition of carcasses.

All carcasses are disposed of to a contracted fish buyer. This generates revenue for funding RFEGs statewide. Disposition of carcasses is reported in the WDFW Hatcheries Headquarters Database.

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.

This program does not propagate ESA-listed fish. Returning hatchery fish are sorted by mark types during broodstock collection and surplus events. Natural-origin fish, distinguished by lack of adipose fin-clip (AD) and/or CWT presence, are returned to the river when encountered.

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 at least two times a week, three times a week when necessary. Gametes are transferred in 350,000 egg batches to Kendall Creek Hatchery for fertilization up to three times a day.

8.2 Males.

All males collected, including jacks, are considered for spawning and are chosen randomly on any spawning day.

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). After fertilization, eggs are placed in freestyles and water-hardened for one hour in an iodophor solution of 100ppm.

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.

This program's mating scheme practices do not include listed fish. Naturally spawning Chinook in the Samish River are not considered a population segment in the Puget Sound ESU, nor is the hatchery population included in NOAA Fisheries' Hatchery Listing Policy (NMFS 2005). Only hatchery-origin fall Chinook that return to the Samish Hatchery are collected for the program broodstock. Natural- origin fish are returned to the river when encountered.

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:

The current egg-take goal for the Samish fall Chinook program is 7.2-million eggs (WDFW Future Brood Document 2014). This take includes the 1,000,000 collected for Lummi Nation fall Chinook programs.

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

Table 9.1.1: Survival rates from egg-take to ponding, Samish hatchery, fall Chinook program.

Brood Year	Eggs Collected	Survival Rates (%)	
		Green-to-Eyed Up	Eyed-Up-to-Ponding
2002	7,279,700	81	95
2003	6,004,000	90	95
2004	5,792,000	73	97
2005	4,085,000	85	93
2006	4,104,000	88	77
2007	6,252,200	88	90
2008	7,734,000	89	80
2009	6,455,000	93	78
2010	6,690,000	95	98
2011	6,555,720	93	91
2012	5,575,000	94	90
2013	6,367,060	87	85
Average	**6,074,473**	**88**	**89**

Source: WDFW Hatchery Records 2014.

9.1.2 Cause for, and disposition of surplus egg takes.

No excess eggs are collected for this program. The current management approach does 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.

Samish Hatchery. Eggs are placed in vertical trays at 7,200 per tray.

Kendall Creek Hatchery. Eggs are loaded at approximately 350,000 per trough.

9.1.4 Incubation conditions.

Kendall Creek Hatchery. Eggs collected at Samish Hatchery are fertilized and incubated at Kendall Creek Hatchery. Incubation takes place in deep troughs and vertical trays supplied with pathogen-free well water at the rate of 12 gpm and 4 gpm respectively. The well water has stable temperature of about 48°F. Once eyed and hardened adequately, eggs are shocked and dead eggs are removed. All remaining eggs are thermally otolith-marked with unique patterns for different release groups (Volk et al 1990). Eyed and otolith-marked eggs are transferred to Lummi Bay Hatchery (1,000,000) and Samish Hatchery (remaining) in late-November through mid-December for further incubation and rearing. Eggs are transported to Kendall Creek Hatchery in shallow baskets by WDFW personnel (transport time is about 40 minutes), and to Lummi Bay Hatchery in 5-gallon buckets by Lummi personnel (transport time is about one hour). In 2013, however, all eggs were sent back to Samish Hatchery for incubation and initial rearing before 1,000,000 fry were shipped to Lummi Bay Hatchery.

Samish Hatchery. Eggs transferred back to Samish Hatchery are further incubated in trays supplied with Friday Creek water at a flow rate of 4 gpm. Water temperature is monitored daily and dissolved oxygen levels are monitored as needed.

9.1.5 Ponding.

Samish Hatchery. Fish are moved from trays into 12 concrete ponds when they are 100%+ buttoned up (January/February). Ponds are supplied with surface water from Friday Creek.

9.1.6 Fish health maintenance and monitoring.

Kendall Creek Hatchery. All fertilized eggs are water-hardened in an iodophor solution. Fungus in incubators is controlled by formalin drip (15 minute injection per day at a target dose of 1,667-ppm formalin) throughout incubation until just prior to hatching. 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 ESA-listed fish are propagated through this program.

9.2 Rearing:

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

Table 9.2.1: Survival rates from fry-to-yearling smolts, Samish Hatchery, fall Chinook program.

Brood Year	Survival Rates (%)	
	Fry-to-Sub-yearling Smolt	Sub-yearling-to-Smolt
2002	81	90
2003	89	84
2004	88	88
2005	99	39
2006	99	Program Discontinued
2007	88	
2008	96	
2009	96	
2010	88	
2011	89	
2012	91	
2013	89	
Average	**91**	**75**

Source: WDFW Hatchery Records 2014.

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

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

9.2.3 Fish rearing conditions.

Chinook are initially reared in all 12 available concrete ponds supplied with Friday Creek water. Mass-marking begins when fish reach 250 fpp, usually at the end of March. Fish to be released

into Friday Creek are marked first, and then dispersed into all available concrete ponds and the asphalt-bottom pond for final rearing. The portion to be released to the Samish River is marked last and transferred to the holding pond adjacent to the Samish River.

In 2013, one-million fry for Lummi Nation fall Chinook program were shipped in March to the Lummi Bay Hatchery from Samish Hatchery. Typically, fish for the Lummi Nation program are shipped as eyed-eggs directly from Kendall Creek Hatchery.

Table 9.2.3.1: Monthly average surface water temperature (°F) at Samish River and Friday Creek

Month	Average Water Temperature (ºF)	
	Samish River	Friday Creek
January	39	39
February	41	41
March	43	43
April	48	48
May	52	52
June	No recording during these months as fish are generally not on-station during this time period.	
July		
August		
September	58	58
October	50	50
November	43	43
December	40	40

Source: WDFW Hatchery Records 2012.

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 fall Chinook reared at Samish Hatchery.

Month	Average Size (fpp)
January	1,000
February	780
March	500
April	250
May	84

Source: WDFW Hatchery Records 2012.

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

See HGMP section 9.2.4 for growth rates. Energy reserve data 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*).

Chinook are fed a variety of diet formulations including starter, crumbles and pellets; the brand used may vary, depending on cost and vendor contracts. Feeding frequencies vary depending on

the fish size and water temperature, and usually begin at eight feedings/seven days a week, and end at one feeding/five days a week.

Feed rates vary from 2.0% to 2.5% B.W./day. An overall season food conversion rate is approximately 0.7:1 for sub-yearling smolts.

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

Fish health is monitored on a daily basis by hatchery staff and at least monthly by a WDFW Fish Health Specialist. Hatchery personnel carry out treatments prescribed by the Fish Health Specialist. Procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). See also HGMP section 10.9 for WDFW standard fish health procedures.

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

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.

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.

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.

Not applicable. No ESA-listed fish are under propagation through this program.

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 number and size at release.

Program Stage	Age Class	Max. Number	Size (fpp)	Release Date	Location
1	Sub-yearling smolt	4,000,000	80	May	Samish River
2	Sub-yearling smolt	5,000,000	80	May	Samish River
3	Sub-yearling smolt	6,000,000	80	May	Samish River
4	Sub-yearling smolt	8,000,000	80	May	Samish River

Source: WDFW, Future Brood Document 2014.

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

Stream, river, or watercourse:	Samish River (WRIA 03.0005)	Friday Creek (WRIA 03.0017)
Release point:	Samish holding pond, RM 10.5	Samish Hatchery, RM 1.0
Major watershed:	Samish River	
Basin or Region:	Puget Sound	

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

Table 10.3.1: Actual number and size at release, 2003-2014.

Release Year	Sub-yearling smolts				Yearling smolts		
	Number	Avg. size (fpp)	Date(s)	CV	Number	Avg. size (fpp)	Date(s)
2003	3,155,083	101	5/5-14	4.4	88,644	10	3/1
2004	3,553,382	95	4/3/17	3.9	90,765	12	2/28
2005	3,584,011	89	4/23-5/16	3.4	85,900	11	2/17
2006	2,518,433	84	5/5-18	6.1	88,000	10	2/26
2007	2,880,999	92	5/1-7	3.8	34,148	9	3/4
2008	4,086,003	86	5/8-19	3.2	Program Discontinued		
2009	4,265,427	95	5/4	n/a			
2010	4,160,000	84	5/4-6	1.8			
2011	4,010,326	86	5/2-19	2.7			
2012	4,002,290	84	5/14-15	3.5			
2013	4,0084,24	97	5/9, 15, 6/24	3.8			
2014	4,003,965	98	5/18-21	4.3			
Average	**3,656,965**	**91**		**3.7**	**77,491**	**10**	

Source: WDFW Hatcheries Headquarters Database 2014.
Note: 80 fpp ~88 mm fork length (fl); 90 fpp ~84 mm fl; 100 fpp ~81 mm fl.
10 fpp ~176 mm fl; 12 fpp ~166 mm fl; 15 fpp ~154 mm fl.

10.4 Actual dates of release and description of release protocols.

Fish are volitionally released. The last remaining fish are forced out of the ponds.

See **Table 10.3.1** for actual release dates.

10.5 Fish transportation procedures, if applicable.

Juveniles destined for release into Samish River are transported in a 1,000-gallon truck to adult holding pond. Fish are loaded at densities below 0.75 pounds per gallon of tank water. Transportation time is five minutes.

10.6 Acclimation procedures.

Fish are released from Samish Hatchery and from holding/rearing ponds located on the Samish River are acclimated to Friday Creek and Samish River water. Fish destined for release from holding ponds are transported in March.

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

Table 10.7.1: Number released, by age and mark type.

Brood Year	Sub-yearlings	Marking
2012	3,600,000	AD + Otolith
	200,000	AD+ CWT + Otolith
	200,000	CWT + Otolith

Source: WDFW, Future Brood Document 2014.

All Chinook released from Samish Hatchery have been consistently mass-marked since brood year 2000, (RMIS data). A portion of the releases are AD+CWT (150,000-300,000), and the DIT group (150,000-200,000) are released CWT-only.

Releases have also been 100% otolith marked since brood year 2004.

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

Egg-take is carefully managed to minimize the likelihood of collecting surplus eggs or raising surplus fry. Actual releases should not exceed 110% of the program release goal. Should it arise for some unforeseen reason, regional staff, Tribal co-managers and NOAA Fisheries will be informed and consulted and proper action will be taken.

10.9 Fish health certification procedures applied pre-release.

- *All fish health monitoring is conducted by a qualified WDFW Fish Health Specialist.*
- *Juvenile fish examinations are conducted at least monthly and more often if necessary*. A representative sample (at the discretion of the fish health specialist) of healthy and moribund fish from each lot is examined.
- *Abnormal levels of fish loss are investigated if they occur.*
- *Fish health status is determined prior to release or transfer to another facility*. The exam may occur during the regular monthly monitoring visit, i.e. within one month of release or transfer.
- *Appropriate actions, including drug or chemical treatments are recommended as necessary*. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile is be generated when possible.
- *Findings and results of fish health monitoring are recorded on a standard fish health reporting form and maintained in a fish health database.*
- *Fish culture practices are reviewed as necessary with facility personnel*. Where pertinent; nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures and treatments are discussed.

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

In case of water system failure, portable pumps fitted ted with screens will be used to supply water from the creek. If that fails, fish will be released directly into the creek. During severe drought conditions, fish may be released early to prevent fish loss.

WDFW Hatcheries Standby Procedures (revised in March 2012), provide guidelines which include 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.

Naturally-produced Chinook in the Samish River are not considered a viable population segment in the Puget Sound ESU (Ruckelshaus at al. 2006), nor is the hatchery population included in NOAA Fisheries Hatchery Listing Policy (NMFS 2005).

However, straying of hatchery-origin adult fall Chinook salmon into the neighboring Nooksack Basin has been identified as an issue by the co-managers. To lower possible negative impacts of fall Chinook program, the release at the Samish Hatchery was reduced from 5.2-million to 4.0-million juveniles in 2002, and the yearling portion was eliminated in 2006.

In addition, a captive brood program was initiated to supplement SF Nooksack Chinook. As the number of SF Nooksack Chinook spawners increase, genetic risks from the non-local hatchery strays will decrease. Even though there is temporal separation between the spawn timing of the two stocks, some straying of non-indigenous fall Chinook could potentially interbreed with the native stock. Based on the data collected on the SF Nooksack spawning grounds in 2008-2013, and on the NF Nooksack spawning grounds in 2008-2012, 7.21% and 0.2% Chinook, respectively,

were identified as of Samish hatchery-origin (relative to all spawners). However, relative to the SF natural spring population specifically, the proportion of Samish hatchery-origin fish released from the Samish Hatchery has been 25.4%. Based on the same data, calculated expanded projection for years 2014-2020, the impacts from the Samish Hatchery program to the focal population (SF Spring Chinook) is presented in **Table 10.11.1** from the Stage 1 program size of 4 million. A projection is also provided for the year 2020 for a program size of 5 million. The return year 2020 is the first potential year with returns of age 3 and 4 fish from a Stage 2 release of 5 million.

All Samish hatchery-origin fish are otolith marked to enable monitoring of stray contributions. Continued monitoring and evaluation will be needed to determine whether straying to spawning grounds is a risk factor that would impede recovery of populations essential for recovery of the Puget Sound ESU. The co-managers have established a performance standard of a contribution from the Lummi Nation Lower Nooksack Fall Chinook and Samish Fall Chinook Hatchery programs of 5% or less of the South Fork, and 5% or less of the North Fork, natural spawners within the Spring Chinook spawning time period. If contributions from Samish program Chinook to SF Nooksack or NF/Middle Fork (MF) Nooksack populations are determined to impede recovery, Tribal co-managers, WDFW regional staff and NOAA Fisheries will be informed and appropriate remedies developed and implemented.

Table 10.11.1: Ratio of Samish origin fall Chinook released from the Samish hatchery on natural spawning grounds in the SF Nooksack in current years and as projected for years 2014-2020.

Brood Year	Release	Return year												
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2005	0													
2006	0													
2007	0													
2008	0													
2009	0													
2010	1,989						3	7						
2011	32,677							49	114					
2012	155,740								234	545				
2013	677,410									1,016	2,371			
2014	677,540										1,016	2,371		
2015	350,000											525	1,225	
2016	400,000												600	1,400
2017	400,000													1,400
		Estimated						Projected						
SF Nooksack Spring		83	45	24	84	122	11	109	401	1,614	3,440	2,950	1,878	2,853
Samish HOS - 4M		10	16	24	14	17	7	19	19	19	19	19	19	19
% Stray Overlap		11%	26%	50%	14%	12%	39%	14.8%	4.5%	1.2%	0.5%	0.6%	1.0%	0.7%
Samish HOS - 5M														24
% Stray Overlap														0.8%

Source: WDFW and PSTIT 2014, unpublished, Co-managers data, 2014.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

The monitoring process is used to verify whether program goals are achieved and to evaluate program benefits against risks posed to natural populations. Elements of the annual monitoring and evaluation plan for this program are identified in HGMP section 1.10. Data necessary to monitor Performance Indicators are collected in different environments where fish are present during their life cycle and include monitoring of hatchery and natural populations. The evaluation process outside of the hatchery is possible by marking, monitoring and identifying fish released through hatchery programs (see **Table 10.7.1** for Samish fall Chinook program-specific markings). Applied specific markings, or marking combinations, allow for selective harvest on hatchery stocks, monitoring of interactions of hatchery and wild fish in rivers, estuaries and marine habitats and assessment of the status of the targeted population(s). The numbers of tagged, un-tagged and marked salmon are monitored annually in fisheries, spawning grounds and hatcheries.

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

Fish rearing for this program is performed in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) to culture healthy juveniles and prevent introduction and/or spread of diseases. Adult broodstock is annually inspected for pathogens by a WDFW Fish Health Specialist to assess fish health and detect potential disease problems. Lots of 60 adult broodstock, at the time of spawning, are examined for pathogens and preventative measures to avoid, or administration of therapeutic treatments to treat disease, are prescribed as necessary. Juvenile rearing conditions are monitored and recorded annually, including: utilized water, its temperatures and flows; feeding patterns and type of food used; fish size, numbers, physical condition, and survival rates, numbers, size, life stage, behavior, appearance and CV at release as well as release sites, types and dates and acclimation procedures. As fish grow, health records are maintained in databases to identify trends in fish health and diseases to allow for fish health management plans based on findings.

Annual operational costs are recorded and can be compared to estimated fishery contribution values provided by Wegge (2009).

All released juveniles are properly marked with the combination of thermal otolith-marks and/or adipose fin-clips (AD) and/or coded wire tags (CWTs) to allow identification and monitoring of migrating juveniles and returning adults. Fish in commercial, recreational, ceremonial and subsistence fisheries are annually sampled for the presence and absence of AD-marks and CWTs to estimate fisheries contributions to the Pacific Salmon Treaty and recreational fisheries. Mass-marking (AD) allow for mark-selective fisheries when appropriate. CWT retrieval allows evaluation of catch contribution, run timing, migration patterns, total survival and straying into other watersheds. The DIT group (otolith-mark + CWT), used as an indicator stock, allows estimates of impacts to natural populations. Numbers and codes of CWTs recovered in fisheries are annually reported to RMIS database, and the data are available through their web site (http://www.rmpc.org/). Details of harvest monitoring methods are presented in the *Puget Sound Comprehensive Management Plan* (WDFW and PSTT 2010).

Adult Chinook returning to the Samish basin natural spawning grounds are annually monitored during spawners and carcass surveys. Information in regard of built redds, life and dead fish counts and biological data from sampled carcasses; length, sex, scales, otoliths, DNA, CWTs and observations of presence/absence adipose fin are collected annually. Total natural spawner abundance on the natural spawning grounds (based on redd counts) is estimated below hatchery rack. Collected data allow evaluation of run timing, migration patterns and survival. Spawning

ground surveys in Samish River are conducted by WDFW between RM 8.2 and 10.5 from early-September through late-October.

Spawner and carcass surveys are performed across Puget Sound watersheds. Surveys targeted at spring Chinook in Nooksack basin revealed presence of Samish hatchery-origin fall Chinook strays in SF and NF Nooksack River. Straying of hatchery-origin adult fall Chinook salmon into the neighboring Nooksack Basin has been identified as a concern (see HGMP section 10.11). To evaluate impacts to the natural population from the Samish hatchery strays, all fish released through Samish program are otolith-marked, and otoliths are collected from carcasses sampled in both forks. In addition to otolith collection, other data and information are also collected, including detected CWTs and recording of adipose fin status. Spawning and carcass surveys in Nooksack Basin are conducted by WDFW, Lummi Nation and Nooksack Tribe staff. Comprehensive spawning ground surveys in SF, NF and MF Nooksack River are conducted regularly (weather permitting) during the spring Chinook spawning period, which is through September 30 in SF (with carcasses evaluated through October 7), and until early- to mid-September in NF and MF, where spring Chinook spawn earlier.

There is currently no comprehensive monitoring conducted in mainstem Nooksack River; however, that part of the river is located downstream from spawning areas used by the two populations of interest.

Fish monitoring will be regularly evaluated by the co-managers with the intent of implementing adjustments necessary for consistency with recovery and fishing objectives.

Table 11.1.1.1. Nooksack River spawning grounds monitoring.

Agency/ Tribe	Nooksack River	Location	Date
WDFW	North Fork	RM 40.6-65.0	Mid-July through early-September
		All Chinook tributaries and side channels excluding areas covered by Nooksack Tribe.	
	South Fork	RM 20.7-30.5	Mid-August through the first week of October
Lummi Nation	Middle Fork	RM 0.0-6.5	Mid-July through early-September
		All Chinook tributaries	
	South Fork	RM 12.2-20.7 and Chinook tributaries to this stretch	Mid-August through the first week of October
Nooksack Tribe	South Fork	RM 0.0-12.2 and Hutchison Creek	
	North Fork	Chinook tributaries and side channels not covered by WDFW	Mid-July through early-September

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 *Resource Management Plan for Puget Sound Chinook* (WDFW and PSTT 2010).

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.

Research specific to the Samish River Hatchery fall Chinook program is not currently conducted.

12.2 Cooperating and funding agencies.

Not applicable.

12.3 Principle investigator or project supervisor and staff.

Not applicable.

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

Not applicable.

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

Not applicable.

12.6 Dates or time period in which research activity occurs.

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

12.10 Alternative methods to achieve project objectives.

Not applicable.

12.11 List species similar or related to the threatened species; provide number and causes

of mortality related to this research project.

Not applicable.

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

Not applicable.

13 SECTION 13. ATTACHMENTS AND CITATIONS

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14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

15 ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1 List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The WDFW and the USFWS have a Cooperative Agreement pursuant to section 6(c) of the Endangered Species Act that covers the majority of the WDFW actions, including hatchery operations.

> *"The department is authorized by the USFWS for certain activities that may result in the take of bull trout, including salmon/steelhead hatchery broodstocking, hatchery monitoring and evaluation activities and conservation activities such as adult traps, juvenile monitoring, spawning ground surveys..."*

15.2 Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

Samish River foraging, migration, and overwintering habitat. - **Puget Sound 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) five year review completed April 29, 2008 (69 FR 19449) (USFWS 2008). The USFSW identified the Samish River as important foraging, migration and overwintering habitat for Puget Sound bull trout (USFWS 2004). This habitat area consists of the mainstem of the Samish River as well as Friday Creek and it is thought that bull trout from the Nooksack and Skagit core areas likely are the most significant users of the watershed due to their close proximity. The Samish watershed supports populations of steelhead, cutthroat, coho, chum and Chinook salmon, which provide an abundant forage base for anadromous bull trout. Both adult and sub-adult bull trout have been caught in the Samish River and most observations of bull trout have occurred between December and February.

Habitat - Agriculture is the major land use within this system. Agricultural practices and residential development have impacted habitat through river diking, draining and filling of wetlands, resulting in a loss of both estuarine and freshwater habitat (Smith et al. 2003). The Samish River and Friday Creek are said to have generally poor riparian conditions as a result of land conversions to non-forest land uses. This has resulted in warm water temperatures throughout much of the drainage, which limits bull trout use of the drainage. Water quality also tends to be poor in the system, with high sediment and nutrient loads due to forestry and agricultural practices (USFWS 2004).

Several other listed and candidate species are found in Skagit 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:

Gray Wolf (*Canis lupus*) –Threatened
Grizzly bear (*Ursus arctos horribilis*) –Threatened
Canada Lynx (*Lynx canadensis*) –Threatened [critical habitat designated]
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened [critical habitat designated]
Oregon spotted frog (*Rana pretiosa*) - Threatened

Proposed:
Dolly Varden (*Salvelinus malma*) due to similarity of appearance

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

15.3 Analyze effects.

There are no activities associated with this hatchery program that would directly impact the Puget Sound bull trout population. 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 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: Fall Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Nooksack/Skagit Puget Sound Summer /Fall Chinook	**Activity:** Samish Fall Chinook Sub-yearling Program
Location of hatchery activity: Samish Hatchery, RM 1 Friday Creek (WRIA 03.0017)	**Dates of activity:** August-May/June	**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)	-	-	186	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	224	-
Intentional lethal take f)	-	-	0	-
Unintentional lethal take g)	-	-	67	-
Other Take (specify) h)	-	-	-	-

Maximum number of fish handled during one season for each category for years 2007-2013.

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

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

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

Listed species affected: Steelhead *(Oncorhynchus mykiss)*	**ESU/Population:** Puget Sound Steelhead	**Activity:** Samish Fall Chinook Sub-yearling Program
Location of hatchery activity: Samish Hatchery, RM 1 Friday Creek (WRIA 03.0017)	**Dates of activity:** August-May/June	**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)	-	-	0	-
Intentional lethal take f)	-	-	0	-
Unintentional lethal take g)	-	-	0	-
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.