HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	NF Nooksack River Fall Chum Hatchery Program (Integrated)
Species or Hatchery Stock:	Chum Salmon (*Oncorhynchus keta*) NF Nooksack River
Agency/Operator:	Washington Department of Fish and Wildlife and Lummi Nation
Watershed and Region:	Nooksack/ North Puget Sound
Date Submitted:	
Date Last Updated:	January 16, 2012

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Kendall Creek Hatchery (Nooksack River) Fall Chum Program

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

NF Nooksack fall chum (*Oncorhynchus keta*); status – not listed.

1.3) Responsible organization and individuals

WDFW Hatchery Operations Staff Lead Contact

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WDFW Fish Management Staff Lead Contact

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Lummi Natural Resouces Staff Contact

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

Co-manager policies are in effect for all Puget Sound hatchery programs. The *Lummi* and *Nooksack* tribes, along with WDFW, prepare an annual fishery management plan for the harvest of Nooksack River fall chum produced from this program.

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

Funding Sources: WDFW	**Operational Information**
General Fund – State	Full time equivalent staff (Kendall Creek) – 4.29
DJ – Federal	Annual operating cost (dollars) - $676,144
Federal Restoration program	
ALEA	
Local Restoration program	

The above information for annual operating cost applies cumulatively to the Kendall Creek Hatchery Fish Programs and cannot be broken out specifically by program.

Funding Sources: LNR	Operational Information
Lummi Nation Resources Budget	Hatchery staff – 1 FTE Full time staff - 4 Chum program costs $15,000 Broodstock selection $10,000

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

Broodstock Source:
NF Nooksack River (WRIA 01.0120) fall chum

Egg Fertilization and Incubation Locations:

Lummi Bay Complex: 3801 B Haxton Way, Bellingham WA 98226. Located on Lummi Bay (Strait of Georgia), Sections 8,9,10; TWN 38N; Range 1E.

Sandy Point Facility: Incubation occurs in a building adjacent to the Lummi Nation Sandy Point Wastewater Treatment Plant (4369 Germaine Road, Ferndale WA, near Neptune Beach), 300 yards inland from the Strait of Georgia on Sandy Point (Lummi Bay).

Incubation, Rearing and Release Locations:

Kendall Creek Hatchery: Located at the mouth of Kendall Creek (WRIA 01.0406), tributary to the NF Nooksack River (WRIA 01.0120) at RM 46, Puget Sound, Washington.

1.6) Type of program.

Integrated harvest.

1.7) Purpose (Goal) of program.

Harvest Augmentation. This program is used to increase production for harvest.

1.8) Justification for the program.

This program will be operated to ensure fish for tribal harvest opportunities pursuant to rights reserved in the Treaty of Point Elliott which, absent a hatchery program, would have been decreased due to habitat degradation associated with development in the Nooksack Watershed and the shorelines of Bellingham Bay and Southeast Georgia Strait. This will be accomplished while minimizing risks to listed salmonids because of the release locations. Potential impacts from this program, if they occur, would occur in the nearshore environment in common with releases from other programs.

To minimize impacts on listed fish from facilities operations: the following Risk Aversions are included.

Table 1.8.1: Summary of risk aversion measures for the Kendall Creek fall chum program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	The water for the Sandy Point Incubation Facility comes from the Sandy Point Reservation Aquifer. Well water and surface water rights at Kendall Creek are formalized through trust water right permit #s G1-10562c, G1-23261c and S1-00317. Water used in the hatchery is routed to Kendall Creek immediately below the hatchery.
Intake Screening	4.2	Kendall Creek gravity water intake screens are not in compliance with state and NOAA Fisheries screening criteria (NMFS 2011).

		These screens are identified for replacement but are a lower priority than others since listed Chinook do not occur above the rack on Kendall Creek. In most years, the creek is very low or dry during the time of spring Chinook spawning. Kendall Creek is not considered to support spawning and early rearing of bull trout due to the low elevation setting (USFWS 2004).
Effluent Discharge	4.2	Hatchery effluent for Lummi Bay Complex is monitored according to the NPDES requirements - permit #WAG130018. Effluent at Kendall Creek is regulated through NPDES permit # WAG 13-3007.
Broodstock Collection & Adult Passage	2.2.3, 7.9	Initial chum broodstocking in the North Fork Nooksack occurs after the spawning of Chinook is complete. The goal of broodstocking efforts is to avoid areas of Chinook spawning. Broodstocking occurs after steelhead fry emergence and prior to adult spawning.
Disease Transmission	9.2.7	The program is operated consistent with the Co-managers Fish Health Policy (WDFW and WWTIT 1998, updated 2006).
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size, and life-history stage (smolts) to foster rapid migration to marine waters.

1.9) List of program "Performance Standards".

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

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

1.10.1: "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights in US v WA.	Contribution to co-manager harvest.	Annual coordination between co-managers to identify and report on issues of interest, coordinate management, and review programs (EBD process, North of Falcon, HAIPs).
3.1.2- Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development within the Nooksack basin and contributes to sport, tribal and commercial fisheries.	Survival and contribution to fisheries will be estimated for each brood year released.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1 Fish produced for harvest are propagated and released in a	Hatchery fish are otolith marked to allow differentiation of	Fish are released 100% otolith-marked, with a differential mark

manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	hatchery and natural-origin fish.	between brood years. Harvests occur in time periods when listed adult salmon and steelhead are not present in significant numbers. The Tribal fishery will be sampled to determine the contribution rate of hatchery produced fish. Harvests and hatchery returns are monitored by agencies to provide up-to-date information.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Hatchery produced fish are otolith marked to allow for their differentiation from naturally-produced fish.	Annual estimates of mass-mark rate (otoliths) of all hatchery releases. Monitor size, number, date of release and mass mark quality. Returning fish will primarily be sampled in fisheries and at the hatchery for otolith identification of program fish to estimate program effectiveness.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Collection of broodstock is done randomly throughout the entire return period. Adhere to WDFW spawning guidelines. (Seidel 1983).	Annual run timing, age and sex composition and spawning escapement timing data are collected.
3.5.5 Juveniles are released at a stage to benefit juvenile to adult survival rates, and reduce the likelihood for negative ecological interactions with natural-origin/listed fish.	Status (size fpp/mass CV and condition factor) and behavior are monitored in the hatchery.	Condition of fish monitored in the hatchery throughout rearing stages. Monitor size, number, date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is properly sized to meet harvest objectives; program fish are fully utilized in target fisheries.	Harvests and hatchery returns are monitored annually throughout the run.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Adhere to WDFW spawning guidelines (Seidel 1983). Apply minimal monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Annual run timing, age and sex composition data are collected upon adult return. Growth rates, mark rates and size at release and release dates are recorded annually.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefit that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal commercial, subsistence and ceremonial use.	Annual harvest estimated from Co-manager data, and Catch Record Card (CRC) estimates.

1.10.2: "Performance Indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities.	This HGMP has been submitted for program authorization under auspices of the ESA. Risks have been addressed through best available science hatchery management actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Monitor juvenile hatchery fish size, number, and date of release and monitor contribution of returning adult fish to fisheries and escapement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while minimizing by-catch of non-target species.	Harvest is regulated to meet appropriate biological assessment criteria. Mass-mark juvenile hatchery fish prior to release to differentiate hatchery - from natural-origin fish and enable state agencies to implement selective fisheries.	Harvests and escapements are monitored by agencies to provide up-to-date information on estimates of hatchery contribution.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Percentage of total hatchery releases are identifiable as hatchery-origin fish.) Hatchery produced fish are otolith marked to allow for their differentiation from naturally produced fish.	Fish are released 100% otolith-marked. Annual harvest of hatchery fish assessed based on Co-manager data, CRC estimates and creel surveys.
3.3.1 Hatchery program contributes to an increasing number of spawners returning to natural spawning areas.	Total number of spawners, categorized by origin, are monitored (pHOS, spawner-recruit ratios).	Spawning is monitored in side channels of the South Fork and mainstem Nooksack River and its tributaries, and also in North Fork Nooksack River sloughs, side channels and in large tributaries (SaSI).
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production and to evaluate effects of the program on the local natural population.	All hatchery production is identifiable in some manner (fin-marks, tags, otolith, etc.) consistent with information needs.	Annual estimates of mass-mark (otolith) rate of all hatchery releases.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and return timing data are collected from fisheries and hatchery rack returns. Co-managers will develop a sampling program prior to 2015 to monitor impacts of program on natural spawners (see HGMP section 11.1).
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Integrated harvest – collection of NOB does not significantly reduce potential juvenile production in the system.	During the initial period of Brood stocking from the NORs, harvest and spawner escapement will be monitored

		and harvest will be adjusted to ensure escapement goal is met.
3.4.3 Life history characteristics of the natural population do not change as a result of this hatchery program.	Life history patterns of juvenile and adult NOR are stable.	The size and timing of chum leaving the river will be obtainable from Lummi smolt trap catches.
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.	As funding becomes available samples from other areas of the watershed will be evaluated to determine genetic variation within the basin.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and return timing data are collected.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish.	Will be monitored as HORs return to the terminal area.
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Fish are released from the Kendall Creek Hatchery.	Fish are released on-station. Annual release information, including method and age class are recorded in hatchery data systems.
3.5.5 Juveniles are released at a stage that encourages rapid outmigration from the system.	Size, number and date of release.	Annually monitor size, number, and date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is sized appropriately for harvest goals. Numbers of surplus hatchery returns are calculated annually.	Numbers of adults returning to the hatchery, broodstock collected, and surplus returns are recorded annually.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, 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.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDOE water right permit compliance.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Barrier and intake structure compliance assessed and needed fixes are prioritized.

rearing environment.		
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow Co-managers Fish Health Disease Policy (WDFW and WWTIT 1998, updated 2006).	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.
	Release and/or transfer exams for pathogens and parasites.	1 to 6 weeks prior to transfer or release, fish are examined in accordance with the Co-managers Fish Health Policy.
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy.
3.7.5 Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal and federal carcass distribution guidelines.	All applicable fish disease policies are followed. See HGMP sections 7.5 and 7.8.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to Co-managers Fish Health Disease Policy. Disposition of carcasses are recorded in the WDFW Hatchery Adult Data.
3.7.6 Adult brood stock 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.	Broodstock will be collected with weirs and with seine nets as a backup initially and from hatchery entrants eventually. Both collection methods are non-lethal and selective.
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.	Co-managers will develop a program to use hatchery- and natural-origin fish at spawning to evaluate the proportions of each in the spawning population. Data will be reported annually.
3.8.1 Cost of program operation does not exceed the net economic	Total cost of operation.	Annual operational cost of program compared to calculated

value of fisheries in dollars per fish for all fisheries targeting this population.		fishery contribution value.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefits that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal ceremonial use.	Co-managers to provide up-to-date information needed to monitor harvests.

1.11) Expected size of program.

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

Lummi Natural Resources staff will collect wild broodstock to meet 1.2-million egg take goal, until returning program fish can sustain the population.

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

Table 1.11.2.1: Proposed annual releases.

Life Stage	Release Location	Annual Release Level
Fed Fry	Kendall Creek (WRIA 01.0406)	1,000,000*

Source: Future Brood Document 2012

* Established for the initial program objective and may be adjusted in consultation with the appropriate officials at NOAA as warranted by the evaluation of the initial program operations.

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

Table 1.12.1: Kendall Creek Hatchery chum returns 2002-2011.

Year	Returns
2002	2,270
2003	4,528
2004	NA
2005	3,117
2006	856
2007	950
2008	53
2009	15
2010	0
2011	0

Data source: WDFW Hatchery Data Unit.

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

Program re-initiated in 2011; program existed in the past and was terminated in 2004.

1.14) Expected duration of program.

Initial agreement for program duration is four years; Co-managers will develop a sampling program prior to 2015 to monitor impacts of program on natural spawners. Additional data for the evaluation of the program will be available once adults from one full cycle return (2019).

Program may continue based on evaluation of returns from program and if funding and management targets are being met.

1.15) Watersheds targeted by program.

Kendall Creek (WRIA 01.0406), Nooksack Basin, Strait of Georgia.

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

Alternative 1: Use Whatcom Creek Hatchery chum for broodstock. Broodstocking from NORs entering the hatchery are not currently sufficient to implement the program. Returns of Nooksack stock chum at Whatcom Creek Hatchery are only sufficient to meet the broodstock needs of the program; therefore, no surplus fish is available to supply the Kendall Creek chum program. Additionally, returns to Whatcom Creek Hatchery may have diverged sufficiently from the source population in the Nooksack basin and thus have reduced their compatibility with the natural population in the NF Nooksack. Therefore, the NF Nooksack population appears to be the best suited stock to use for a program at this site.

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

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

None currently. This HGMP is submitted to 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, as well as twenty-six artificial propagation programs (Ford 2011). In the Nooksack basin, the TRT has identified demographically independent populations (DIPs) in the North/Middle Fork Nooksack and South Fork Nooksack River (Ruckelshaus et al. 2006).

Puget Sound steelhead (*Oncorhynchus mykiss*): Were listed as *Threatened* under the ESA on May 11, 2007 (72FR26722); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The DPS includes all naturally spawned anadromous winter-run and summer-run *O. mykiss* (steelhead) populations, below natural migration barriers in the river

basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington (Ford 2011). This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), and also includes the Green River natural and Hood Canal winter-run steelhead hatchery stocks. In the Nooksack Basin, the TRT has preliminarily delineated one DIP of winter steelhead in the Nooksack River and one DIP of summer steelhead in the South Fork Nooksack River (PSSTRT 2011).

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.

Kendall Creek hatchery spring Chinook in the Puget Sound Chinook ESU. NMFS (1999) considered this hatchery stock to be part of the ESU, and listed with natural-origin Chinook salmon that are part of the North/Middle Fork Nooksack population (70 FR 37160, June 28, 2005; NMFS SHIEER 2004). The stock designation has been assigned to the Primary category by the Co-managers (WDFW, Nooksack and Lummi Tribes 2010), with a short term PNI benchmark goal of >.05, and a long term PNI goal of > .70. The hatchery program was started with natural-origin fish from the North Fork Nooksack River. The Kendall Creek Hatchery North/Middle Fork early Chinook supplementation program has increased abundances and largely maintains the North Fork population. Because the hatchery program has dramatically increased hatchery-origin Chinook, but natural-origin fish are only slowly increasing, a reasonable conclusion is that the main limiting factor for this population is poor habitat. Driven by chronically low natural escapements, a restoration program for this locally indigenous stock was developed using a strategy of increasing the numbers of juveniles released and subsequently increasing the number of returning spawners. Recent numbers of natural-origin spawners have been extremely low which emphasizes the importance of the hatchery component of this program as a reservoir for the genome while limiting factors are being addressed. Since that time, the program has relied totally on volunteer returns to the hatchery. In the past, hatchery and wild fish were not entirely differentiated with distinguishing marks, so it was possible that wild fish contributed to the broodstock at some level. Most spring Chinook salmon spawned in recent years have been of hatchery origin. The proportion of natural-origin fish typically used in the broodstock is low and averaged 3.2 Chinook per brood year (WDFW unpublished otolith data).

Nooksack spring Chinook in Puget Sound Chinook ESU. Recent escapement levels (2000-2011) have averaged 1,793 natural spawners in the North/Middle Fork Nooksack River DIP and 66 (2000-2010) for the South Fork Nooksack River DIP. Both populations have shown decreasing population trends during this same period (SaSI, WDFW 2012; Natasha Geiger WDFW 2012).

Puget Sound Chinook salmon: Updated Risk Summary. All Puget Sound Chinook populations are below the TRT planning range for recovery escapement levels. Most populations are also consistently below the spawner recruit levels identified by the TRT as consistent with recovery. Across the ESU, most populations have declined in abundance somewhat since the last status review in 2005, and trends since 1995 are mostly flat. Several of the risk factors identified by Good et al. (2005) are also still present, including 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).

Nooksack River steelhead in the Puget Sound steelhead DPS The glacial hydrology and landslide prone areas in this system makes it difficult to monitor data sufficiently for steelhead escapement estimates in this system. As such, data has only been collected for Nooksack winter steelhead in recent years and when conditions allow. The Nooksack has one proposed winter run steelhead population and one proposed summer run population. There are no abundance trend data for the South Fork Nooksack summer steelhead DIP and it is not currently monitored.

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

- 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.

Table 2.2.2.2: Nooksack River smolt trap catches and total out-migrant estimate 2004-2010.

Trap Year[a]	Sub-yearling Chinook[b]		% of Hatchery Chinook Mass-Marked	Steelhead[c]
	Wild	Hatchery		
2010	502 (114,236)	4,794	99.60%	277
2009	853 (206,231)	5,151	99.60%	570
2008	1,323 (420,194)	5,851	99.30%	351
2007	365 (63,088)	3,688	99.70%	149
2006	1,299 (275,975)	4,215	99.40%	NA
2005	885 (151,832)	3,618	100.00%	NA
2004	2,444 (59,216)	2,524	76.80%	NA

2004	5,708 (666,424)	2,120	80.90%	NA

Source: Lummi Tribe; Dolphin 2011

[a]Corresponds with the brood year from the preceeding year (i.e. trap year 2010 = brood year 2009 Chinook).

[b]The number caught in the trap, plus (wild only) the estimated total number of migrants to pass the trap location.

[c]Field crews did not actively differentiate hatchery and wild steelhead caught in the trap.

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	**1997-2001**		**2002-2006**		**Trend**	
Populations	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**
North + Middle Fork Nooksack	*0.55*	*0.31*	*0.32*	*0.11*	*-1.28*	*-0.58*
South Fork Nooksack	*1.66*	*0.94*	*2.99*	*0.92*	*0.23*	*0.03*
ESU	***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 that are not necessarily agreed to by WDFW and the Lummi and Nooksack Tribes.

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 Lummi and Nooksack Tribes. "Lambda" is a measure of population growth rate. See Ford (2011) for explanation of the meaning of the columns.

Nooksack System Steelhead: (*Oncorhynchus mykiss*) In 1996, the National Marine Fisheries Service (NMFS) listed a declining trend in the Nooksack River system of total escapement of –11.6 to –7.0, where trend is defined as percent annual change in total escapement or an index of total escapement (Busby et al. 1996). More recent expanded surveys conducted in this basin in 2003-2004, 2009/2010 & 2010/2011 indicated that a comparatively strong winter steelhead population exists (see escapement below). Summer steelhead spawn in the upper SF Nooksack River including upstream from RM 30.4, and are native with wild production and an unknown status(PSSTRT 2012 and SaSI, WDFW 2012). The level of hatchery winter run steelhead spawners in the Nooksack River is unknown, but thought to be low, as the program is modestly sized and there are no off station releases. Due to spawn timing differences between early Chambers stock steelhead and a majority of the existing wild winter population (being later February – June), interaction on the spawning grounds is unclear. Due to temporal and spatial separation from South Fork summer run steelhead, the potential for spawning ground interactions is even lower.

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

Population	1985-2009	1995-2009
Samish River winter-run	1.008 (0.972 - 1.045)	0.966 (0.934 - 0.998)

Source Data: Ford 2011.

- 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 1999-2011 (SaSI 2012).

Return Year	Escapement	
	S.F. Nooksack	N. F./MF Nooksack
1999	166	823
2000	284	1,242
2001	267	6,950[a] (2,185)
2002	289	3,741
2003	204	2,857
2004	130	1,719
2005	120	2,047
2006	355	1,184
2007	29[b]	1,438
2008	83[b]	1,266
2009	45[b]	1,903
2010	24[b]	2044
2011	NA	865
Average	**166**	**1,760**

Source: WDFW SaSI 2012 and Natasha Geiger WDFW 2012
[a]Additionally, 4,765 hatchery Chinook were returned to the N.F. Nooksack River.
[b]Represents S.F. native NORs only, everything else is NOR and HOR combined.

Nooksack System Steelhead (*Oncorhynchus mykiss*): Glacial conditions have limited past spawner surveys throughout the Nooksack watershed. A combination of aerial and ground survey have been conducted during clear water conditions to track abundance.

Table 2.2.2.7: Nooksack River winter steelhead escapement 2004-2011.

Return Year	Escapement
2004	1,574
2005	NA
2006	NA
2007	NA
2008	NA
2009	NA
2010	1,897
2011	1,774
Average	**1,748**

Source: SaSI (WDFW 2012)

- 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.

Table 2.2.2.8: Nooksack early Chinook spawners (*Oncorhynchus tshawytscha*) from 1998-2010.

Year	NF Nooksack River		
	Natural-Origin	Hatchery-Origin	% of Natural Origin
1998	37	333	10
1999	85	738	10.3
2000	160	1,082	12.8
2001	240	2,185*	10
2002	224	3,517	5.9
2003	210	2,647	7.3
2004	318	1,746	15.4
2005	210	1,837	10.3
2006	275	909	23.2
2007	334	1,104	23.2
2008	307	959	24.2
2009	269	1,634	14.1
2010	204	1804	10.2
Average	**221**	**1,577**	**13.6**

Source: SaSI, WDFW 2012 and Natasha Geiger WDFW 2012

* - Does not include the 4,765 hatchery "putbacks" to the NF Nooksack.

Table 2.2.2.9[a]: Puget Sound Chinook average natural (natural origin and hatchery) and natural origin only spawners and percent hatchery contributions for five year intervals. Spawning abundance averages are geometric means and hatchery contribution averages are arithmetic.

Return Years	1990-1994			1995-1999			2000-2004			2005-2009		
Populations	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**
North + Middle Fork Nooksack	101	47%	52	471	71%	96	3,464	93%	229	1,666	82%	276
South Fork Nooksack	171	24%	126	217	37%	133	398	38%	235	388	37%	244
ESU	**23,938**	**75%**	**17,905**	**27,392**	**63%**	**17,245**	**43,192**	**72%**	**31,294**	**34,486**	**69%**	**23,938**

Data Source: 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 Lummi and Nooksack Tribes.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NMFS listed fish in the target area, and provide estimated annual levels of take

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

Hatchery activities listed below were identified in the ESA Section 7 Consultation "Biological Opinion on Artificial Propagation in the Columbia River Basin" (March 29, 1999) as activities where take of listed species could occur. No listed fish are used in this hatchery program.

"Section 1" is a list of hatchery activities that may handle non-targeted listed fish during broodstock collection activities for the hatchery program or instances where structures exist permanently and listed fish are handled and released. HGMP section 2 is a discussion of "indirect" impacts (not measurable by take) on listed salmonids.

Broodstock Collection: Broodstock collection takes place after Chinook have finished spawning in the Nooksack, system, so impacts during collection of chum are low for Chinook. There are no summer chum in the Nooksack. Broodstock collection is prior to most wild steelhead entering the watershed, so anticipated impacts are low.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance or barrier blockages. The operation of the hatchery gravity intake is not compliant with current intake standards. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with main stem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect 'Take" associated with the operations of these facilities. No take of listed fish are reported by staff during the normal operation of the hatchery. If wild Steelhead or Bull Trout are encountered at the hatchery trap, they will be released back into Kendall Creek.

Disease Effects: Adults utilized for broodstock will be sampled for ovarian fluid and Kidney/spleen utilizing standard sampling procedures. Pathogens are not unique to hatcheries. Hatchery-origin fish may have an increased risk of carrying fish disease pathogens because higher rearing densities of fish in the hatchery may stress fish and lower immune responses. Under certain conditions, hatchery effluent has the potential to transport fish pathogens out of the hatchery, where natural fish may be exposed. These impacts are addressed by rearing the chum at lower densities, within widely recognized guidelines (Piper et al 1982), continuing well-developed monitoring, diagnostic, and treatment programs already in place (Co-manager's Fish Health Policy 1998).

Juvenile Releases: Results (2005, HSRG Research Workshop) from ongoing research being conducted by Duffy et al. (2002) in assessing the nearshore distribution, size structure, and trophic interactions of juvenile salmon and potential predators and competitors, in northern and southern Puget Sound indicate that the dominant predator of salmonids in the nearshore and estuary environments is cutthroat trout. Chinook were found to prey largely on herring, sand lance, chum, and when present, pink salmon.

Monitoring Activities: There are no monitoring activities directly associated with listed Chinook, steelhead or summer chum within this hatchery program outside of incidental trapping at hatchery weirs. Monitoring activities that are conducted in the basin by co-managers include smolt monitoring, spring Chinook and wild winter steelhead escapement spawner/carcass surveys or redd monitoring, which are not covered in this HGMP.

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

Effects are currently unknown; this is a new program, which started in 2011.

- 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.

- 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.

As indicated in HGMP section 11 monitoring and evaluation actions are taking place to determine possible ecological effects that may result from this type of program. If these studies show potential ecological risks to listed Chinook salmon then WDFW staff along with the affected party would determine an appropriate plan and consult with NOAA fisheries, if needed.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

WDFW hatchery programs in Puget Sound operate under and adhere to *U.S. v Washington* which provides the legal framework for coordinating these programs, defining artificial production;; and the Hatchery Action Implementation Plan (HAIP) for the watershed (see HGMP section 3.4).

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

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

This program is contingent on the signing an agreement of a contract between Lummi Nation and WDFW that will stipulate funding requirements and production levels.

The Lummi Nation and Nooksack Tribe along with WDFW will prepare an annual fishery management plan for the harvest of Nooksack River system Chum Salmon produced from this program. Emergency in-season regulations may restrict fishing when hatchery escapement shortfalls are anticipated.

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

The salmon resource co-management process affirmed through these court orders, and under the court approved plan, requires that both the State of Washington and the Puget Sound Tribe(s) develop Equilibrium Broodstock Programs. Hatchery salmon and steelhead production levels are detailed in the annual Future Brood Document. The Future Brood Document (FBD) is a pre-season planning document for fish hatchery production in Washington State for the upcoming brood stock collection and fish rearing season (July 1 – June 30).. Hatchery production by volunteers, schools, and Regional Fisheries Enhancement Groups are represented by WDFW.

3.3) Relationship to harvest objectives.

WDFW general harvest goals are to provide fishing opportunities consistent with the mandate of the agency for restoration and recovery of wild indigenous salmonid runs, the Pacific Salmon Treaty, the Puget Sound Salmon Management Plan, the Pacific Fishery Management Council (PFMC) a North of Falcon (NoF) annual fisheries management planning process, *US v. Washington (1974)*, and other state, federal, and international legal obligations.

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

The main fisheries benefitting from this program are terminal area Tribal gillnet fisheries. Area 7 and 7A commercial fisheries, as well as Strait of Juan de Fuca commercial fisheries.

Table 3.3.1.1: Chum harvest and escapement, Lummi tribal fisheries, 2003-2011. [a]

Year	Escapement	Catch	Terminal Run	% Exp
2011	71,703	49,759	121,462	41.0%
2010	21,786	17,817	39,603	45.0%
2009	18,485	5,482	23,967	22.9%
2008	11,771	10,754	22,525	47.7%
2007	16,849	27,048	43,897	61.6%
2006	16,285	37,333	53,618	69.6%
2005	42,082	19,036	61,118	31.1%
2004	36,697	34,144	70,841	48.2%
2003	95,898	18,353	114,251	16.1%

Data Source: Alan Chapman, Lummi Tribe, personal communication, 2012.
[a] Natural and hatchery fish cannot be broken out in the catch.

3.4) Relationship to habitat protection and recovery strategies.

The Kendall Creek Hatchery chum salmon program HGMP is part of WDFW-managed plans under the Co-Manager's Non-Chinook Resource Management Plan (RMP) for Puget Sound region non-Chinook salmon hatchery programs.

The WRIA 1 Salmon Recovery Plan The WRIA 1 Salmon Recovery Board was identified as the Lead Entity in the Nooksack River basin, with the passage of resolutions by the Nooksack Tribe, Lummi Nation, Cities of Ferndale, Everson, Lynden, Sumas, Nooksack, Blaine and Bellingham; and Skagit and Whatcom counties. The WR1A 1 SRFB has developed a long-term strategy to ensure the protection and restoration of healthy salmon populations. The WRIA 1 Salmon Recovery Plan (WRIA 1 SRB, 2005 is integrated into the regional salmon recovery plan (Shared Strategy for Salmon Recovery). This "Shared Strategy" is the official ESA recovery plan.

RFEGs. Several citizen based groups in conjunction with local governments work on habitat actions to benefit both listed and non-listed stocks in Puget Sound. In the Nooksack, the Nooksack Salmon Enhancement Association is the active Regional Enhancement Group (RFEG).

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 in the 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 salmon survival rates through predation on newly released, emigrating juvenile fish in freshwater, estuarine and marine areas. Certain avian and mammalian species may also prey on juvenile salmon while the fish are rearing at the hatchery site, if these species are not excluded from the rearing areas. Species that could potentially negatively impact juvenile Chum through predation include the following:

- Avian predators, including mergansers, cormorants, belted kingfishers, great blue herons, and night herons
- Mammalian predators, including mink, river otters, harbor seals, and sea lions
- Cutthroat trout

Rearing and migrating juvenile and adult Chinook originating through the program may also serve as prey for large, mammalian predators in nearshore marine areas, the estuary and in freshwater areas downstream of the hatchery in the watershed to the detriment of population abundance and the program's success in augmenting harvest. Species that may negatively impact program fish through predation may include:

- Orcas
- Sea lions
- Harbor seals
- River otters

With the proposed size of the program, there is potential for competition with naturally produced chum and pink salmon during their emigration through the river and rearing time in the estuary.

(2) *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 watershed through natural and hatchery production*. Juvenile fish of these species may serve as prey items for listed Chinook during their downstream migration in freshwater and into the marine area. Decaying carcasses of spawned adult fish contribute nutrients that increase productivity in the watershed, providing food resources. This includes for the emigrating listed Chinook. Salmonid adults that return to the basin and any seeding efforts using adult salmon carcasses may provide a source of nutrients and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

(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 Nooksack River watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the salmonids during their downstream migration in freshwater and into the marine area. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating salmonids. Chinook adults that return to the river may provide a source of nutrients and stimulate stream productivity.

Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including:

a) The releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998);

b) The decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and

c) Juvenile salmonids have been observed to feed directly on 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).

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

- Northern pikeminnow
- Cutthroat trout
- Bull trout
- Steelhead
- Coho salmon
- Pacific staghorn sculpin
- Numerous marine pelagic fish species
- Chinook

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 Sandy Point Incubation Facility.

Water Source	Available Water Flow (gpm)	Water Temp (°F)	Usage	Limitations
Well	450 gpm	48-50	Incubation	none

Sandy Point Incubation Facility: Eggs are incubated at an auxiliary facility at Sandy Point on Lummi Bay. Water is provided from a from the Vern Johnson well, to a 25,000 gallon storage tank and discharges to the Strait of Georgia. The flow to the incubation facility is gravity-fed. Maximum well water allocation to the facility is 110 gpm, but the effective flow in the recirculation system is 450gpm.

Table 4.1.2: Water sources available at Kendall Creek Hatchery.

Water Source	Available Water Flow (gpm)	Water Temp (°F)	Usage	Limitations
Wells (5)	Up to 12,200	47	All	No limitations
Kendall Creek (surface)	Up to 10,700	30-50	Broodstock holding, rearing, acclimation.	Limited summer usage.

Kendall Creek Hatchery: Water from the (5) wells is of excellent quality, pathogen free, and has a constant year round temperature of 47°F. It is passed through a de-nitro tower to improve dissolved oxygen content.

Kendall Creek surface water levels can be very low in the summer time. When available, creek water is mixed with well water and used for rearing.

The water rights are regulated through permits G1-10562c, G1-2361c and S1-00317.

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.

Sandy Point Incubation Facility: Hatchery effluent is operated, monitored and reported according to Washington Department of Ecology (DOE) NPDES permit #WAG130018.

Kendall Creek Hatchery: Surface water intake structure is in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current "Anadromous Salmonid Passage Facility Design criteria" (NMFS 2011). Intake screens are identified for replacement but are at

lower priority than screens at other hatcheries, since listed Chinook is not present above hatchery rack on Kendall Creek.

These facilities operate under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington DOE, WAG 13-3007. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE.

Discharges from the cleaning treatment system are monitored as follows:

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

Table 4.2.1. Record of NPDES permit compliance at Kendall Creek Hatchery.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs (see Table 4.2.2)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Kendall Cr WAG13-3007	Y	Y	Y	5/23/2005	1	N	Y

Source: Ann West, WDFW Hatchery Data Unit.

Table 4.2.2. List of NPDES violations at Kendall Creek Hatchery over the last five years (2008-2012).

Monitoring Month	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
September 2011	N/A	N/A	DMR due to Ecology by July 30, 2011	N/A	Late DMR to Ecology	Explanation to personnel to correct procedures

Source: Ann West, WDFW Hatchery Data Unit.
Note: These violations did not result in non-compliance with NPDES permit.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

During the initial period of the program the brood stock will be collected through weirs and seines in the NF Nooksack, as the return to the hatchery increases it will be supplemented by brood stock from the NF Nooksack spawning grounds.

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

Unfertilized eggs and milt collected from the broodstock at Kendall Creek are transported to the Sandy Point Incubation facility in five gallon buckets, where they are fertilized and placed into incubators. When the eggs are eyed, they are transported to Kendall Creek Hatchery.

5.3) Broodstock holding and spawning facilities.

Initial broodstock is collected by weir or seine in the NF Nooksack River at various sites.

Unfertilized eggs and milt collected from the broodstock in the NF Nooksack are transported to the Sandy Point Incubation facility in five gallon buckets, where they are fertilized and placed into incubators.

As the program evolves, brood stock will be eventually collected from chum entering the hatchery facility from Kendall Creek. A weir placed along Kendall Creek diverts fish into the ladder and subsequent holding pond.

5.4) Incubation facilities.

Lummi Bay Complex: Incubation is at the Sandy Point Incubation Facility. The Sandy Point Incubation Facility is located in a building, adjacent to the Lummi Nation Sandy Point Wastewater Treatment Plant), 300 yards inland from the Strait of Georgia on Sandy Point. It was constructed in 1991 to provide an improved incubation environment, without the limitations imposed by the Nooksack River water source at the main facility. There are 1,736 square feet of sheltered floor space. It has an auxiliary generator and a 25,000 gallon water storage tower associated with its independent well supply. This facility is equipped to rear and hatch up to 6-million eggs using a combination of vertical stack incubators and twenty-four NoPad incubators. The facility is allocated a maximum of 110 gpm of well water, but the effective flow in the recirculation system is 450gpm.

Eyed eggs are transported to the Kendall Creek Hatchery for otolith marking, hatching and rearing.

Kendall Creek Hatchery

Table 5.4.1: Incubation vessels available at Kendall Creek Hatchery.

Type	Number	Size
Vertical stack incubators	336 trays	24" x 25" x 3"
Freestyle troughs	24	24" x 31" x 17"

5.5) Rearing facilities.

Kendall Creek Hatchery

Table 5.5.1: Rearing ponds available at Kendall Creek Hatchery.

Type	Number	Size
Asphalt-lined rearing ponds	3	Half-acre
Standard raceways	12	10' x 100' x 4'
Super-raceways	3	21’ x 130’ x 6’
Fiberglass circular ponds	2	20' diameter x 4'deep
Fiberglass circular ponds	8	16' diameter x 4'deep
Fiberglass circular ponds	6	6' diameter x 4'deep
Aluminum Capilano troughs	8	20' x 3' x 2'
Fiberglass intermediate troughs	6	11' x 3' x 36'
Fiberglass shallow troughs	34	14' x 12" x 7 .5"
Fiberglass “ugly trough”	1	15' x 5' x 42'

5.6) Acclimation/release facilities.

Fish are reared on well water the entire time while at the hatchery, and are released directly into Kendall Creek from rearing ponds.

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.

Lummi Bay Complex: Facilities are all located in areas not subjected to flood events. The water supply is gravity fed and remotely with hatchery staff on standby when not on duty. A fish health specialist regularly monitors the health of fish in held in the facilities and prescribes loss to minimize loss and avoid transmission of disease to natural-origin fish in the watershed. Hatchery discharge is monitored according to NPDES permits.

Kendall Creek Hatchery: A hatchery employee is on stand-by at the hatchery at all times to monitor hatchery operations and respond to any unexpected events. The facility is equipped with low water alarms and a back-up generator in case of power loss, gas powered pumps in case of pump failure. Gravity-fed creek water, when available, can be used as a backup in the event of power loss.

Fish rearing is conducted in compliance with the co-managers Fish Health Policy (WDFW and WWTIT 1998, updated 2006). Adherence to artificial propagation, sanitation and disease control practices defined in the policy should reduce the risk of fish disease pathogen transfers.

The 2012, the Legislature passed a jobs creation bill that provided WDFW with funding for hatchery capital improvements in addition to our capital budget request.

Table 5.8.1: Hatcheries capital improvement projects funded under the "Jobs Now Act" (2012).

Projects
Re-design and renovate current water distribution system.
Construct new two-bay pollution abatement ponds.
Renovate the current fish handling facilities

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.

Initially adult chum salmon collected by seining and or a side channel weir in the NF Nooksack River. This stock is not ESA-listed. Eventually the broodstock will be taken from fish entering the hatchery through the fish ladder at Kendall Creek, with additional fish from spawning grounds as needed to meet broodstock HOR/NOR targets.

6.2) Supporting information.

6.2.1) History.

This program was re-initiated in 2011 and the first broodstock was collected in the fall of the same year.

6.2.2) Annual size.

An estimated 1,100 adults are needed for an egg take goal of 1,200,000, based on a fecundity of 2,000 eggs per female, the fecundity derived from the first year of broodstock collection in 2011. Fish collected from river spawning areas often are in various stages of spawning and may not be as fecund as pre-spawn fish. Broodstock numbers may need to be adjusted based on information obtained in future years of the program.

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

This chum programs started in 2011 and entire broodstock was recruited form natural-origin fish. Since the first release occurred in 2012 and chum may spend 2-3-years in the ocean, most likely

no hatchery origin fish will be included in the hatchery broodstock for the first four years of collection.

Initially wild broodstock will be collected in the river. In future years, fish returning to the hatchery may be incorporated into the broodstock, with the intention of operating a well-integrated program.

6.2.4) Genetic or ecological differences.

No genetic or ecological differences can be determined at this phase of the program. Currently broodstock is collected exclusively from natural-origin fish. A strong natural return helps minimize the potential of genetic impacts from this program.

6.2.5) Reasons for choosing.

The program goal is to supply fish for harvest. The local stock was selected as the most appropriate.

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

No listed fish are selected for broodstock through this program. Kendall Creek chum are not ESA listed.

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Beginning in 2011, broodstock is collected from the NF Nooksack River using weirs and seines. Weirs will be checked daily by LNR staff. Seining may be employed in the event that weirs are not able to collect fish due to poor water conditions.

7.3) Identity.

Natural-origin broodstock are captured in the NF Nooksack River and naturally enter the hatchery facility.

7.4) Proposed number to be collected:

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

1,100 (550 males: 550 females).

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 Nooksack chum program.

Brood Year	Male	Female	Jack
2011	242	231	NA
2012	NA	NA	NA

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

There will be no surplus adults during the initial 4 year evaluation period. At evaluation the co-managers will agree to the disposition of any surplus adults entering the hatchery.

7.6) Fish transportation and holding methods.

No adults are transported. Green eggs and milt are transported from the to the Sandy Point Incubation facility in five gallon buckets. Transportation time will vary from 1 to 3 hours depending on the amount of fish spawned on each spawning day, and at which site they are spawned. Eggs and milt will be kept in separate coolers until their arrival at the hatchery where fertilization and disinfection will occur.

7.7) Describe fish health maintenance and sanitation procedures applied.

Adults are not certified. Eggs are certified prior to transport to Kendall Creek Hatchery in accordance with the Co-Managers Fish Health Policy (WDFW and WWTIT 1998, updated in 2006). Standard fish culture techniques and sanitation procedures are applied during spawning time. Eggs are water hardened in iodophor solution to minimize the chance of disease transmission. All tools are disinfected between each use.

7.8) Disposition of carcasses.

During the initial adult broodstocking in the NF Nooksack, carcasses will be left in the area of collection for nutrient enhancement. The co-managers will agree on the disposition of carcasses from those spawned at the hatchery, for various uses such as donation to food banks, or nutrient enhancement.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

No listed fish are collected for broodstock through this program. Nooksack River chum are not ESA listed.

Impacts during collection of fall chum stock are virtually non-existent for listed Chinook. Broodstock collection occurs after Chinook have moved through the system and spawning is complete.

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 spawned in the NF Nooksack are selected throughout the spawning period based upon ripeness.

8.2) Males.

Milt will be collected in a separate container for each male. Once fertilized, eggs will be pooled into buckets.

8.3) Fertilization.

Males and females will be spawned in accordance to a 1:1 spawning ratio.

Fertilized eggs are water hardened and treated with a 5% iodine solution in the spawning buckets to reduce disease incidence

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used.

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

No listed fish are included in mating scheme through this program. Nooksack River chum are not ESA listed.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation:

Current egg-take goal (FBD 2012) for NF Nooksack fall chum program at Kendall Creek Hatchery is 1,200,000. Broodstock and initial incubation takes place at Lummi Bay. Eyed eggs are transported to Kendall Creek Hatchery for further incubation, rearing and release.

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

Table 9.1.1.1.: Egg collection-to–ponding survival of chum eggs at the Sandy Point Incubation Facility and Kendall Creek Hatchery.

Brood Year	Eggs Collected	Survival Rates (%)	
		Lummi	Kendall Creek
		Green-to-Eye-Up	Eye-Up-to-Ponding
2011	463,000	95.0	98.0
2012	Not yet available	Not yet available	Not yet available

This program was initiated in 2011 and survival data are limited to one year of the production.

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

Current management approach does not allow for the taking of eggs in surplus of program goal, and there are no plans to collect surplus eggs for this program. During the evaluation after four years the Co-managers will consider the potential for the use of surplus eggs to initiate segregated hatchery programs throughout the terminal area where appropriate.

9.1.3) Loading densities applied during incubation.

Sandy Point Incubation Facility: Green eggs are loaded at 90 pounds per NoPad tray.

Kendall Creek Hatchery: Eyed eggs are placed in vertical incubators at ~10,000 per tray.

9.1.4) Incubation conditions.

Sandy Point Incubation Facility: Green eggs are incubated in NoPad incubators in pathogen-free well water. Temperatures range between 48-50°F. Dissolved oxygen levels are monitored.

Kendall Creek Hatchery: Eyed eggs received from the Lummi Bay Facility in February are incubated in trays supplied with high-quality, pathogen-free well water at constant temperature of 47°F and water flow of 3.5 gpm. Dissolved oxygen levels are monitored. Vexar layers are placed in trays as a substrate substitute. Chillers are used to lower water temperature to create otolith marks.

Eyed eggs are received in batches, and are incubated, reared and released separately due to differences in developmental stage.

9.1.5) Ponding.

When chum are 100% buttoned up (end of March, early-April), they are moved to and reared in any combination of raceways, intermediate and Capilano troughs, all supplied with well water

9.1.6) Fish health maintenance and monitoring.

Lummi Bay Complex (Sandy Point Incubation Facility): Eggs are visually monitored several times daily. Water temperature is constant at 48-50°F. Dissolved oxygen is measured twice daily and given the well water source there is no silt management procedures necessary for either influent or effluent. Eggs receive no treatment until they are eyed. At that time, they are physically shocked by siphoning and dead eggs are removed by hand or Gen-Sorter machine. UV-sterilizers are used to reduce the incidence of fungal infections.

Kendall Creek Hatchery: Fish transferred to Kendall Creek Hatchery are placed in freestyle troughs and flushed for 10 minutes with iodophor solution (0.5 per 100) before being placed in incubation trays. Opportunistic fungus that grows on dead eggs in the incubators is controlled by formalin drip treatments (15-minutes per day at a target dose of 1,667-ppm formalin) throughout incubation to just prior to hatching. Eyed egg-to-ponded fry loss is picked at the time of ponding and then fry mortalities are removed daily afterward.

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

No listed fish are incubated through this program. Kendall Creek chum are not ESA listed.

9.2) Rearing:

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

Table 9.2.1.1: Fry-to-release survival rate of chum reared at Kendall Creek Hatchery, by brood year.

Brood Year	Fry-to-Release
2011	99.9

This program was initiated in 2011 and survival data are limited to one year of the production.

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 co-managers Fish Health Policy (WDFW and WWTIT 1998, updated 2006). Fish rearing densities are maintained at maximum less than 3 lbs of fish /gpm at release and under 0.35 lbs/cu.ft. flow until they have reached a size of 100 fpp.

9.2.3) Fish rearing conditions

Fish are reared in standard raceways and intermediate and Capilano troughs, supplied with well water at constant temperature of 47°F, until release.

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 chum reared at Kendall Creek Hatchery.

Month	Average Size (fpp)
March/April	1,200
April/May	600

This program was initiated in 2011 and growth rate data are limited to one year of the production.

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

See HGMP section 9.2.4. Energy reserve data are not available.

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

Chum are fed a starter feed formulation of Bio-Oregon brand. Feeding frequencies usually begin at three feedings/day, 7-days a week and end at two feedings/day, 7-days a week. Feed rates varies from 2.5% to 3.0% B.W./day. An overall season food conversion rate is approximately 0.6:1.

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 state Fish Health Specialist (FHS). Hatchery personnel carry out treatments prescribed by the FHS. Procedures are consistent with the Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (WDFW and WWTIT 1998, updated 2006).

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

Chum show migration behavior right after emergence. In the hatchery environment they are kept for about 30 days after ponding to be released as a fed fry to assure better survival.

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.

Listed fish are not propagated through this program. Nooksack River chum are not ESA-listed.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Table 10.1.1: Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fed Fry	1,000,000	400	April/May	Nooksack River

Source: Future Brood Document 2012

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

Stream, river, or watercourse: Kendall Creek (WRIA 01.0406)

Release point: RM 0.25 (Kendall Creek Hatchery)

Major watershed: Nooksack 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: Numbers released, by year, age and size.

Release Year	Fed-Fry	Avg. size (fpp)	CV	Date(s)
2011	417,000	600	7.7	5/1, 9

Source: Future Brood Document 2012

This program was initiated in 2011 and releases data are limited to one release year.

The goal is to raise fish to 400 fpp at the time of releases. The first year of this program, however, fish were released at 600 fpp.

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

Fish are forced-released directly into Kendall Creek. Water levels in raceways and intermediates are lowered to force fish out; fish reared in Capilano troughs are netted out (see also HGMP section 10.3).

10.5) Fish transportation procedures, if applicable.

Not applicable for juveniles; fish are released on-station.

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

Chum are reared on well water the while at Kendall Creek Hatchery.

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

Table 10.7.1: Marks applied to Nooksack River native fall chum releases.

Brood Year	Fed-Fry	Mark Type
2011	417,000	Otolith Mark
2012 (proposed)	1,000,000	Otolith Mark

Source: Future Brood Document 2012

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

Not applicable. There is no surplus fish associated with this program.

10.9) Fish health certification procedures applied pre-release.

A WDFW Fish Health Specialist prior to release or transfer, in accordance with the Co-managers Fish Health Policy, examines each lot of fish.

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

Flooding has not caused major fish losses in the past at Kendall Creek. Staff is on duty 24 hours a day to respond to alarms. Generators and creek water back up water supply system failure.

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

Chum may provide food for any listed fish that may be in the estuary at the time they are released. Preliminary information from the Lummi Smolt trap indicates that chum fry are preyed upon by coho in the river, nearshore studies suggest that chum will contribute to the food supply of cutthroat.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Prior to 2015, Co-managers will develop protocols, responsibilities and funding for a sampling program based on sampling at the hatchery and in the fisheries, to evaluate contribution and performance of hatchery production. The chum program will be included in the Nooksack HAIP, with contingency for regulating or expanding the program if the analyses support the value of the program to fishers and do not identify any adverse impacts on the natural-origin stock.

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

See HGMP section 11.1.1.

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

Monitoring and evaluation has/will be undertaken, with consultation with NOAA Fisheries, in a manner which does not result in an unauthorized take of listed salmon or steelhead.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Not applicable

12.2) Cooperating and funding agencies.

Not applicable

12.3) Principle investigator or project supervisor and staff.

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

12.10) Alternative methods to achieve project objectives.

Not applicable

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

Not applicable

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

Not applicable

SECTION 13. ATTACHMENTS AND CITATIONS

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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:_____

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.

Nooksack 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). Ten local populations have been identified in the Nooksack Core Area, based the distribution of suitable spawning and rearing habitat: Lower, Middle and Upper North Fork, Lower and Upper Middle Fork, Lower and Upper South Fork, Glacier Creek, Lower Canyon Creek and Wanlick Creek. The anadromous form is known to be present and it is possible that the fluvial and resident life history forms are also present in the core area. Anadromous outmigrants have caught in the lower mainstem from early April through mid-July (USFWS 2004). Bull trout spawning is known to occur throughout much of the upper watershed and is mainly confined to non-glacier tributary streams. Little, if any, comprehensive information exists concerning escapement levels, population size, or past harvest levels and as such the current status of the Nooksack bull trout is unknown (WDFW Bull Trout SaSI 2004). The recovered abundance level for bull trout in the Snohomish /Skykomish Core Area has been set at 2000 adult spawners, based on current habitat capacity (USFWS 2004).

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

Core Area Population	Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Nooksack River	Unknown	620-3000	Unknown	Moderate, imminent	Potential Risk

Source Data: USFWS 2008

Habitat— Past forest practices and related road networks and mass wasting have had some of the most significant impacts to bull trout habitat within this core area. These have resulted in the loss or degradation of a number of spawning and rearing areas within local populations, as well as foraging, migration, and overwintering habitats. Bellingham Diversion has significantly reduced if not precluded connectivity of the Upper Middle Fork Nooksack local population with the rest of the core area. Bellingham Diversion currently prevents most anadromous and fluvial bull trout returning to the Middle Fork Nooksack River from reaching spawning and rearing habitats in the upper watershed. Agriculture practices, residential development, the transportation network and related stream channel and bank modifications have resulted in the loss and degradation of foraging, migration, and overwintering habitats in mainstem reaches of the major forks, as well as in a number of tributaries. Marine foraging habitats for this core area have and continue to be

greatly impacted by urbanization along nearshore habitats in Bellingham Bay and Strait of Georgia. The presence of brook trout in many parts of the Nooksack core area and their potential to further increase in distribution is of significant concern given the level of habitat degradation that has occurred within the core area. The detection of brook trout/Dolly Varden hybrids further emphasizes this threat to bull trout. The absence of established spawner index areas or other repeatable means of monitoring bull trout population abundance and distribution within the core area, continues to hinder the identification, conservation, and restoration of remaining spawning and rearing reaches within the core area (USFWS 2004).

Several other listed and candidate species are found in Whatcom County; however the hatchery operations and facilities for this program do not fall within the critical habitat for any of these species. As such there are no effects anticipated for these species.

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

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

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

15.3) Analyze effects.

Hatchery activities, including in-river broodstock collection, hatchery trap, and water intake structures may pose a risk to system bull trout populations. Annual estimates of bull trout encounters through the hatchery activities are recorded and reported.

15.4 Actions taken to minimize potential effects.

Trap is checked at least daily. Any bull trout encountered at the trap are immediately returned to the stream. Bull trout may be encountered in other hatchery programs during broodstock collection activities (steelhead or coho) that would directly impact or create potential effects on bull trout in this system based on the current understanding of the status of these fish.

15.5 References

USFWS (U.S. Fish and Wildlife Service). 2004. Draft recovery plan for the coastal-Puget Sound distinct population segment of bull trout (*Salvelinus confluentus*). Volume I (of II): Puget Sound management unit. Portland, Oregon. 389 + xvii pp.

USFWS (U.S. Fish and Wildlife Service). 2008. Bull trout (*Salvelinus confluentus*) 5-year review: Summary and evaluation. U.S. Fish and Wildlife Service. Portland, Oregon. 55 pp.

WDFW (Washington State Department of Fish and Wildlife). 2004. Washington State salmonid stock inventory bull trout/ Dolly Varden. Washington State Department of Fish and Wildlife. Olympia, Washington.

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

Listed species affected: **Chinook *(Oncorhynchus tshawytscha)***	**ESU/Population:** **Puget Sound/ Nooksack Chinook**		**Activity:** **Kendall Creek Fall Chum Program**	
Location of hatchery activity: **Kendall Creek Hatchery, RM 46 of NF Nooksack River (01.0120)**	**Dates of activity:** **January- May**		**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**	**0**	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	**0**	**0**	-
Other Take (specify) h)	-			-

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migration 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 1b. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: **Chinook *(Oncorhynchus tshawytscha)***	**ESU/Population:** **Puget Sound/ Nooksack Chinook**		**Activity:** **Kendall Creek Fall Chum Program**	
Location of hatchery activity: **Kendall Creek Hatchery, RM 46 of NF Nooksack River (01.0120)**	**Dates of activity:** **January- May**		**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**	**0**	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	**0**	**0**	-
Other Take (specify) h)	-			-

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migration 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.

Attachment 1. Definition of terms referenced in the HGMP template.

Augmentation - The use of artificial production to increase harvestable numbers of fish in areas where the natural freshwater production capacity is limited, but the capacity of other salmonid habitat areas will support increased production. Also referred to as "fishery enhancement".

Critical population threshold - An abundance level for an independent Pacific salmonid population below which: depensatory processes are likely to reduce it below replacement; short-term effects of inbreeding depression or loss of rare alleles cannot be avoided; and productivity variation due to demographic stochasticity becomes a substantial source of risk.

Direct take - The intentional take of a listed species. Direct takes may be authorized under the ESA for the purpose of propagation to enhance the species or research.

Evolutionarily Significant Unit (ESU) - NMFS definition of a distinct population segment (the smallest biological unit that will be considered to be a species under the Endangered Species Act). A population will be/is considered to be an ESU if 1) it is substantially reproductively isolated from other conspecific population units, and 2) it represents an important component in the evolutionary legacy of the species.

Harvest project - Projects designed for the production of fish that are primarily intended to be caught in fisheries.

Hatchery fish - A fish that has spent some part of its life-cycle in an artificial environment and whose parents were spawned in an artificial environment.

Hatchery population - A population that depends on spawning, incubation, hatching or rearing in a hatchery or other artificial propagation facility.

Hazard - Hazards are undesirable events that a hatchery program is attempting to avoid.

Incidental take - The unintentional take of a listed species as a result of the conduct of an otherwise lawful activity.

Integrated harvest program - Project in which artificially propagated fish produced primarily for harvest are intended to spawn in the wild and are fully reproductively integrated with a particular natural population.

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as "supplementation".

Isolated harvest program - Project in which artificially propagated fish produced primarily for harvest are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Isolated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), but the fish produced are not intended to spawn in the wild or be genetically integrated with any specific natural population.

Mitigation - The use of artificial propagation to produce fish to replace or compensate for loss of fish or fish production capacity resulting from the permanent blockage or alteration of habitat by human activities.

Natural fish - A fish that has spent essentially all of its life-cycle in the wild and whose parents spawned in the wild. Synonymous with *natural origin recruit (NOR).*

Natural origin recruit (NOR) - See *natural fish* .

Natural population - A population that is sustained by natural spawning and rearing in the natural habitat.

Population - A group of historically interbreeding salmonids of the same species of hatchery, natural, or unknown parentage that have developed a unique gene pool, that breed in approximately the same place and time, and whose progeny tend to return and breed in approximately the same place and time. They often, but not always, can be separated from another population by genotypic or demographic characteristics. This term is synonymous with stock.

Preservation (Conservation) - The use of artificial propagation to conserve genetic resources of a fish population at extremely low population abundance, and potential for extinction, using methods such as captive propagation and cryopreservation.

Research - The study of critical uncertainties regarding the application and effectiveness of artificial propagation for augmentation, mitigation, conservation, and restoration purposes, and identification of how to effectively use artificial propagation to address those purposes.

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

Take - To harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

Viable population threshold - An abundance level above which an independent Pacific salmonid population has a negligible risk of extinction due to threats from demographic variation (random or directional), local environmental variation, and genetic diversity changes (random or directional) over a 100-year time frame.

Attachment 2. Age class designations by fish size and species for salmonids released from hatchery facilities.

(generally from Washington Department of Fish and Wildlife, November, 1999).

	SPECIES/AGE CLASS	Number of fish/pound	SIZE/CRITERIA Grams/fish
X	Chinook Yearling	<=20	>=23
X	Chinook (Zero) Yearling	>20 to 150	3 to <23
X	Chinook Fry	>150 to 900	0.5 to <3
X	Chinook Unfed Fry	>900	<0.5
X	Coho Yearling 1/	<20	>=23
X	Coho Fingerling	>20 to 200	2.3 to <23
X	Coho Fry	>200 to 900	0.5 to <2.3
X	Coho Unfed Fry	>900	<0.5
X	Chum Fry	<=1000	>=0.45
X	Chum Unfed Fry	>1000	<0.45
X	Sockeye Yearling 2/	<=20	>=23
X	Sockeye Fingerling	>20 to 8000	0.6 to <23
X	Sockeye Fall Releases	>150	>2.9
X	Sockeye Fry	>800 to 1500	0.3 to <0.6
X	Sockeye Unfed Fry	>1500	<0.3
X	Pink Fry	<=1000	>=0.45
X	Pink Unfed Fry	>1000	<0.45
X	Steelhead Smolt	<=10	>=0.45
X	Steelhead Yearling	<=20	>=23
X	Steelhead Fry	>20 to 150	3 to <23
X	Steelhead Unfed Fry	>150	<3
X	Cutthroat Yearling	<=20	>=23
X	Cutthroat Fingerling	>20 to 150	3 to <23
X	Cutthroat Fry	>150	<3
X	Trout Legals	<=10	>=0.45
X	Trout Fry	>10	<0.45

1/ Coho yearlings defined as meeting size criteria and 1 year old at release, and released prior to June 1st.
2/ Sockeye yearlings defined as meeting size criteria and 1 year old.