

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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|---------------------------------------|--|
| Hatchery Program: | NF Nooksack River Fall Chum Hatchery Program (Integrated) |
| Species or Hatchery Stock: | Chum Salmon (<i>Oncorhynchus keta</i>) NF Nooksack River |
| Agency/Operator: | Washington Department of Fish and Wildlife and Lummi Nation |
| Watershed and Region: | Nooksack/ North Puget Sound |
| Date Submitted: | May 1, 2013 |
| Date Last Updated: | December 4, 2015 |

Executive Summary

An ongoing objective of the Kendall Creek Hatchery integrated Chum Program is to mitigate for the lost salmon production associated with habitat degradation in the Nooksack River Basin and its tributaries. Habitat degradation in the Nooksack and in Bellingham Bay/Strait of Georgia has reduced the natural production of salmon and steelhead and support to sustainable fisheries. The Puget Sound Salmon Recovery Plan for the Puget Sound Chinook ESU states that estimates of “historic Chinook abundances are an average of 26,000 and 13,000 respectively for the North Fork and the South Fork populations. Now, natural-origin Chinook return in the low hundreds...”.

Concerns for continued salmon existence have resulted in listing of the Puget Sound Chinook Evolutionarily Significant Unit (ESU) and the Puget Sound Steelhead ESU as threatened under the Endangered Species Act (ESA). The co-managers have vigorously pursued actions to recover Nooksack Early Chinook Salmon. These actions include working with local governments to protect and restore habitat, hatchery programs to conserve and rebuild the North/ Middle Fork and South Fork Chinook populations. A Fishery Resource Management Plan approved by NOAA Fisheries places tight constraints on the allowable fishery impacts on Nooksack Early Chinook and severely limits fisheries.

The resource goals of the Kendall Creek Chum Hatchery program are to operate consistent with the well-being of ESA listed species, and to mitigate lost natural salmon production due to habitat degradation by supporting fisheries with hatchery production until healthy and harvestable natural salmon production is restored. The tribal and WDFW hatcheries support fishing opportunities throughout the west coast, including international fisheries managed under the Pacific Salmon Treaty and coastal US fisheries managed under the Magnuson-Stevens Act.

This HGMP identifies many risk control measures to manage the Kendall Creek Hatchery Chum program in the most effective manner to meet production goals and to address potential hazards to ESA-listed species such as ecological interactions, disease transmission, and facility effects.

The program is a benefit to the ecosystem and sustainable fisheries as it provides a risk control measure against extreme natural conditions that may negatively impact the natural chum production in the Nooksack basin. Chum may also provide a food source for any ESA-listed fish that may be in the river estuary at the time they are released. Preliminary information from the Lummi Smolt trap indicates that chum fry are preyed upon by coho and steelhead in the river. Nearshore studies suggest that chum will contribute to the food supply of cutthroat. Chum adults that return to the river also provide a source of marine derived nutrients to promote and stimulate ecosystem 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).

This HGMP also includes specific criteria (Table 1) related to harvest opportunities that are consistent with sustainable naturally produced salmonid runs. The main fisheries benefitting from this program are the Nooksack Samish terminal area, 7 and 7A Commercial and Tribal fisheries, as well as Strait of Juan de Fuca Tribal commercial fisheries and recreational sport.

Under the following assumptions we expect to see the harvest objectives in Table 1:

Assumptions:

Kendall Creek Chum program:

- a. 0.63% return rate (SAR) to the terminal area in both stages.
- b. Maturity rates of 10%, 90%, and 100% for ages 3, 4, and 5 respectively.
- c. Minimum of 40% terminal harvest rate in all stages.
- d. Stray rate of 20%

Table 1. Summary of key conservation and fishery resource objectives for the Kendall Chum Hatchery program.

| Stage | Smolt Release Targets | Minimum Criteria for moving between Stages | Terminal Harvest |
|---|-----------------------|---|------------------|
| 1 Current Broodstock ¹ | 1,000,000 | 1) Operating funds provided for 200% increase in production. 2) Hatchery capacity available. 3) Monitoring and methodology determined and funding secured to conduct sampling and analysis necessary to estimate the proportion of hatchery origin spawners. 4) Stray contribution estimates less than 30% ² and a PNI > 67%. | 2,520 |
| 2 Increased Production | 3,000,000 | | 7,560 |

¹ Maintenance/continuation of current/future program dependent on sufficient available operational funding.

² Contribution from the Kendall Hatchery on average of 30% or less of the Nooksack chum population of natural spawners.

Results of research, monitoring and evaluation activities will be reviewed at annual program review workshops where hatchery program adjustments will be considered in coordination with habitat and harvest management. The purpose of adaptively managing the program is to improve harvest benefits and reduce identified risks. The criteria for changing between stages of the program will be based on averages evaluated over 5 years and will be addressed in annual staff workshops.

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*); ESA status – not listed.

1.3) Responsible organization and individuals

WDFW Hatchery Operations Staff Lead Contact

Name (and title): Ed Eleazer, Region 4 Hatchery Operations Manager
Agency or Tribe: Washington Department of Fish and Wildlife
Address: 16018 Mill Creek Boulevard, Mill Creek WA 98012
Telephone: (425) 775-1311 ext 109
Fax: (425) 338-1066
Email: edward.eleaser@dfw.wa.gov

WDFW Fish Management Staff Lead Contact

Name (and title): Brett Barkdull, Region 4 District Biologist
Agency or Tribe: Washington Department of Fish and Wildlife (WDFW)
Address: 111 Sherman Street, La Conner WA 98257
Telephone: 360-466-4345 Ext 270
Fax: 360-466-0515
Email: Brett.Barkdull@dfw.wa.gov

Lummi Natural Resources Staff Contact

Name (and title): Thomas Chance, Hatchery Biologist
Alan Chapman, ESA coordinator
Agency or Tribe: Lummi Natural Resources (LNR)
Address: 2665 Kwina Road, Bellingham WA 98226
Telephone: (360) 384-2221
(360) 384-2202
Fax: (360) 384-4737
Email: thome@lummi-nsn.gov
alanc@lummi-nsn.gov

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

Co-manager policies are in effect for all Puget Sound hatchery programs. The *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

General Fund – State
DJ – Federal
Federal Restoration program
ALEA
Local Restoration program

Operational Information

Full time equivalent staff (Kendall Creek) – 4.29
Annual operating cost (dollars) - \$676,144

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

Lummi Nation Resources Budget

Operational Information

Hatchery staff – 1 FTE
Full time staff - 4
Chum program costs \$15,000

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

Table 1.5.1: Location of culturing phases, by facility.

| Facility | Culturing Phase | Location |
|------------------------|--|--|
| In-river | Broodstock collection | NF Nooksack River (WRIA 01.0120) |
| Kendall Creek Hatchery | Broodstock collection, incubation, rearing, acclimation, release | 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 to replace natural production lost due to habitat loss.

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 | Well water rights are formalized through trust water right permit # G1-10562c & G1-23261c. Surface water right permit# is S1-00317. Monitoring and measurement of water usage is reported in monthly NPDES reports. |
| Intake Screening | 4.2 | Kendall Creek gravity water intake screens are not in compliance with state and NOAA Fisheries screening criteria (NMFS 2011). Intake screens are identified for replacement, but are a lower priority in comparison to other facilities since Kendall Creek habitat does not support environmental conditions required for presence of listed fish and they are not passed above the hatchery rack. In most years, the creek is very low or dry during the time of spring Chinook spawning and the low elevation setting does not support spawning and early rearing of bull trout due (USFWS 2004). |
| Effluent Discharge | 4.2 | This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System administered by the Washington Department of Ecology (DOE) - WAG 13-3007. |
| Broodstock Collection & Adult Passage | 2.2.3, 7.9 | Chum broodstock collection takes place after Chinook spawning is completed and before natural steelhead return. Broodstock collection in-river takes place in the areas where Chinook redds are not present. Chum at the hatchery is observed present between November and January. Chinook runs from previous years have terminated by that time. Natural origin steelhead, if encountered and identified by presence of an adipose fin, will be returned back to the river. Sorting at collection facilities and release may result in some physical damage but little or no mortality has been observed by staff as no natural origin steelhead have recently recruited to the hatchery.. |
| Disease Transmission | 9.2.7 | The <i>Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State</i> (WDFW and WWTIT 1998, updated 2006) details hatchery practices and operations designed to stop the introduction and/or spread of any diseases. |
| Competition & Predation | 2.2.3, 10.11 | Fish are released at a time, size, and life-history stage 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.

Table 1.10.1.1: “Performance Indicators” addressing benefits.

| Benefits | | |
|---|---|---|
| Performance Standard | Performance Indicator | Monitoring & Evaluation |
| 3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights in US v WA. | Contribution to Co-manager harvest. | Annual monitoring of program fish harvest contribution, participation in annual coordination between co-managers to identify and report issues of interest, coordinate management, and review program (EBD process, annual fisheries management plans). |
| 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. | Annual monitoring of program fish survival and contribution to fisheries. |
| 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. Marking is applied to hatchery fish prior to release to enable differentiation from natural-origin fish and enable state agencies to estimate harvest contributions. | Monitor program fish harvests and escapements contributions. |
| 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.

Table 1.10.2.1: “Performance Indicators” addressing risks.

| Risks | | |
|--|---|---|
| Performance Standard | Performance Indicator | Monitoring & Evaluation |
| 3.1.3 Program addresses ESA responsibilities. | ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable. | HGMP for this program was submitted to NOAA fisheries in May 2013. This HGMP has been updated to reflect changes in the program and resubmitted to NOAA fisheries |
| 3.2.2 Release groups are sufficiently marked in a manner | Percentage of total hatchery releases are identifiable as | Fish are released 100% otolith-marked. |

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| consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries. | hatchery-origin fish.) Hatchery produced fish are otolith marked to allow for their differentiation from naturally produced fish. | 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 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 | Fish are released from the | Fish are released on-station. |

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| acclimation to maximize homing ability to intended return locations. | Kendall Creek Hatchery. | 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 rights permit compliance. | Flow and discharge reported in monthly NPDES reports. |
| 3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment. | Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults. | Barrier and intake structure compliance assessed and needed fixes are prioritized. |
| 3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow 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- |

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| | | 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 value of fisheries in dollars per fish for all fisheries targeting this population. | Total cost of operation. | Annual operational cost of program compared to calculated fishery contribution value. |

1.11) Expected size of program.

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

The goal for the Stage 1 of the program is to collect 1,100 adults (550 males and 550 females).

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

Release objectives established for the program (outlined in table 1.11.1.1) may be adjusted in consultation with the appropriate officials at NOAA as warranted by the evaluation of the initial program operations. The current release goal of 1,000,000 will eventually be as high as 3,000,000 fry. Either goal depends on funding.

Table 1.11.2.1. Summary of key conservation and fishery resource objectives for the Kendall Chum Hatchery program.

| Stage | Smolt Release Targets | Minimum Criteria for moving between Stages | Terminal Harvest |
|--------------------------------------|-----------------------|---|------------------|
| 1 Current Broodstock ¹ | 1,000,000 | 5) Operating funds provided for 200% increase in production. 6) Hatchery capacity available. 7) Monitoring and methodology determined and funding secured to conduct sampling and analysis necessary to estimate the proportion of hatchery origin spawners. 8) Stray contribution estimates less than 30% ² and a PNI > 67%. | 2,520 |
| 2 Increased Production | 3,000,000 | | 7,560 |

¹ Maintenance/continuation of current/future program dependent on sufficient available operational funding.

² Contribution from the Kendall Hatchery on average of 30% or less of the Nooksack chum population of natural spawners.

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 2002-2014.

| Year | Returns |
|------|---------|
| 2002 | 2,270 |
| 2003 | 4,528 |
| 2004 | 5,233 |
| 2005 | 3,117 |
| 2006 | 856 |
| 2007 | 950 |
| 2008 | 53 |
| 2009 | 15 |
| 2010 | 0 |
| 2011 | 0 |
| 2012 | 31 |
| 2013 | 12 |
| 2014 | 1,036 |

Source: WDFW Hatchery Database 2008, *FishBooks* 2015.

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 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 (Ford 2011), as well as twenty-seven artificial propagation programs (NMFS 2013 78FR38270). In the Nooksack basin, the Technical Recovery Team (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. This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive) (Ford 2011). It also includes steelhead from six artificial propagation programs: Green River Natural; White River Winter Steelhead Supplementation; Hood Canal Steelhead Supplementation Off-station Projects in the Dewatto, Skokomish, and Duckabush Rivers; and the Lower Elwha Fish Hatchery Wild Steelhead Recovery (NMFS 2013 78FR38270). 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 2013).

2.2.2) Status of NMFS ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds.

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 (2005-2013) have averaged 1,427 natural spawners in the North Fork Nooksack River DIP and -70 (2000-2013) for the South Fork Nooksack River DIP.

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).

See [North/Middle Fork Nooksack Chinook HGMP](#) for Viability Criteria.

Nooksack River steelhead in the Puget Sound steelhead DPS. Suspended sediment due in part to the glacial hydrology makes it difficult to monitor steelhead spawners in this system. Adult spawner data has only been collected for Nooksack winter steelhead in recent years and when conditions allow. The limited recent years when populations escapement estimates were determined suggest population abundances are relatively stable. There are no abundance trend data for SF Nooksack summer steelhead; this stock is not monitored and it is difficult to monitor. The status remains unknown in 2012 (SaSI, WDFW 2012). Based on a habitat-based intrinsic potential (IP) analysis by the PSSTRT (2013), the estimated historic capacity for winter steelhead in this system was between 2,205 to 44,091 fish and between 114 to 2,273 for summer steelhead in the South Fork Nooksack.

Puget Sound Steelhead: Updated Risk Summary. The number of winter steelhead spawners has increased for many populations in Puget Sound since 2009. The number of spawners for 16 Puget Sound winter steelhead populations, relative to the average number of spawners for each population in the four year period up to the listing in 2007, increased from an average of 51% in 2009 to 141% in 2013.

These recent, short-term increases in spawners are a positive development, but do not negate the long-term risks facing Puget Sound steelhead DPS. Using spawner data collected through 2008 or 2009, Ford (2011) concluded that the status of the listed Puget Sound steelhead DPS has not changed substantially since the 2007 listing, and that steelhead in the Puget Sound DPS remain at risk of extinction throughout all or a significant portion of their range in the foreseeable future but are not currently in danger of imminent extinction.

See [Kendall Creek Winter Steelhead HGMP](#) for Viability Criteria.

- 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.

See [North/Middle Fork Nooksack Chinook HGMP](#) for Productivity Data.

See [Kendall Creek Winter Steelhead HGMP](#) for Productivity Data.

- 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.

See [North/Middle Fork Nooksack Chinook HGMP](#) for Escapement Data.

See [Kendall Creek Winter Steelhead HGMP](#) for Escapement Data.

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

See [North/Middle Fork Nooksack Chinook HGMP](#) for pHOS and pNOS Estimates.

See [Kendall Creek Winter Steelhead HGMP](#) for Geneflow Data.

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

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

Broodstock Trapping/Holding: Chum broodstock collection takes place after Chinook spawning is completed and before natural steelhead return. Broodstock collection in-river takes place in the areas where Chinook redds are not present. The trapping facility at Kendall Creek Hatchery is a hatchery outlet to a small tributary entering the N.F. Nooksack River. Broodstock collection of fall chum takes place between November and January; however the trap is operated until March 15 or later as conditions allow, insuring removal of hatchery-origin steelhead adults. Chinook runs from previous years have terminated by that time. Natural origin steelhead, if encountered and identified by presence of an adipose fin, will be returned back to the river. Sorting at collection facilities and release may result in some physical damage but little or no mortality has been observed by staff as no natural origin steelhead have recently recruited to the hatchery. Additionally, a majority of the natural origin escapement occurs later in the season (WDFW Spawners Survey Database).

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance or barrier blockages. The intake screens at Kendall Creek are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current “Anadromous Salmonid Passage Facility Design” criteria (NMFS 2011a). Monitoring and maintenance of hatchery facilities is conducted regularly. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect “Take” associated with the operations of these facilities. Kendall Creek water flow significantly diminishes in the summer months, resulting in the hatchery relying primarily on well water to maintain adequate flow. Because of the low summer water conditions, very limited sustainable spawning habitat exists above the hatchery weir. No take of listed fish has been reported by staff during the hatchery operation.

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

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.

Listed Chinook or steelhead have not been encountered during chum program operations in the last 4 years. **- 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.

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).

Equilibrium and Future Brood Document (EBD and FBD): The PSSMP defines the EBD as the annual expression of the equilibrium brood document as it pertains to the coming year’s run of salmon and describes the standard mode of operation for existing facilities/functions, associated with fish culture activities. The FBD provide descriptions of facilities, species propagated, and fishery management, hatchery production, broodstock management, eggtake, rearing, and release goals for each facility. While it does not include all of the requirements of the EBD, the Future Brood Document (FBD) provides pre-season planning information for EBD fish hatchery production reporting information in Washington State for the upcoming brood stock collection and fish rearing season (July 1 –June 30). The FBD is coordinated between WDFW, Puget Sound and coastal treaty tribes, the Northwest Indian Fisheries Commission (NWIFC), eastern Washington treaty tribes, and Federal fish hatcheries. 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 natural origin indigenous salmonid runs, the Pacific Salmon Treaty, the *Puget Sound Salmon Management Plan*, the *Statewide Steelhead Management Plan*, annual fisheries management plans, *US v. Washington*, and other state, federal, and international legal obligations. The Lummi Nation and Nooksack Tribe along with WDFW prepare an annual fishery management plan for the harvest of Nooksack River system fall chum released from hatchery programs (WDFW et al. 2008 to present).

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 the Nooksack Samish terminal area, 7 and 7A Commercial and Tribal fisheries, as well as Strait of Juan de Fuca Tribal commercial fisheries and recreational sport fisheries.

Table 3.3.1.1: Nooksack-Samish run entering Area 4B, catch, and harvest rate, 2003-2014^a.

| Year | 4B Run | Catch | Harvest Rate |
|------|---------|--------|--------------|
| 2014 | 95,435 | 35,377 | 0.37 |
| 2013 | 68,170 | 19,670 | 0.29 |
| 2012 | 39,080 | 17,396 | 0.45 |
| 2011 | 151,703 | 51,424 | 0.34 |
| 2010 | 48,892 | 18,382 | 0.38 |
| 2009 | 32,007 | 5,739 | 0.18 |
| 2008 | 27,471 | 11,214 | 0.41 |
| 2007 | 48,632 | 27,060 | 0.56 |
| 2006 | 66,610 | 37,321 | 0.56 |
| 2005 | 67,657 | 20,013 | 0.30 |
| 2004 | 89,901 | 36,338 | 0.40 |
| 2003 | 133,680 | 20,998 | 0.16 |

Data Source: WDFW Run Reconstruction, November 24, 2015.

^a Natural and hatchery fish cannot be broken out in the catch.

3.4) **Relationship to habitat protection and recovery strategies.**

The purpose of this joint state-tribal hatchery program is to provide harvest opportunity while remaining consistent with the Co-manager's primary management strategy and recovery objectives for listed salmonids populations. Habitat protection and restoration strategies are paramount to the recovery of self-sustaining, natural populations. If land use practices have been optimized to allow sufficient habitat protection and restoration, and harvest goals are being met, the remaining focus for the hatchery program will be to meet management criteria for population status, genetic brood stock management, ecological benefits and risks, and environment regulations. With habitat and harvest goals being met, the conservation objective will be the primary requirement. The alternative would be evaluated relative to policy goals for the watershed.

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

Lead Entities: Whatcom County, 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, was selected to be the Lead Entity in the Nooksack River basin. The Lead Entity was changed to the WRIA 1 Salmon Recovery Board in 2004 with the passage of an Interlocal Agreement that established the WRIA 1 Salmon Recovery Board, which is comprised of Nooksack Tribe, Lummi Nation, WDFW, Whatcom County, and Cities of Bellingham, Ferndale, Everson, Lynden, Sumas, Nooksack, and Blaine. Under the Interlocal Agreement, as the Lead Entity the WRIA 1 Salmon Recovery Board is the lead "for salmon recovery efforts and programs in WRIA 1 when cooperative and joint actions described within various federal, state, and local statutes and administrative programs are required." See also http://www.rco.wa.gov/salmon_recovery/lead_entities.shtml

Regional Fisheries Enhancement Groups (RFEs): Several citizen based groups in conjunction with local governments work on habitat actions to benefit both listed and non-listed stock in the system including the Nooksack Salmon Enhancement Association.

Puget Sound Partnership Action Agenda An ESU-wide ecosystem recovery planning effort is being undertaken by the Puget Sound Partnership, a state agency dedicated to restoring Puget Sound, including salmon and steelhead (online at <http://www.pugetsoundpartnership.org>).

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, harbor porpoises and sea lions
- Cutthroat trout and bull trout

Rearing and migrating juvenile and adult chum 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 and harbor porpoises
- 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 be negatively impacted by the program (focus is on listed and candidate salmonid species).*

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

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.*

Fish species that could positively impact the program may include other salmonid species and trout present in the watershed through natural and hatchery production. Decaying carcasses of spawned adult fish contribute nutrients that increase productivity in the watershed, providing food resources. 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).

(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 chum 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 Kendall Creek and Whatcom Creek hatcheries

| Facility | Water Source | Water Right | | Available Water Flow | Water Temp (F) | Usage | Limitations |
|------------------------|---------------------------------|-----------------------|------------|----------------------|----------------|--------------------------------|-----------------------|
| | | Record No Certificate | Permit No. | | | | |
| Kendall Creek Hatchery | Wells 1-2 (Infiltration trench) | G1-*10562C WRIS/06970 | 09733 | 4950 gpm | 47 | All | No limitations |
| | Wells (3,4,5) | G1-23273 | ---- | 11000 gpm | | | |
| | Kendall Creek (surface) | S1-00317C WRIS | ----- | 22.36 cfs | 30-50 | Broodstock holding, incubation | Limited summer usage. |

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

Kendall Creek Hatchery: Well and surface (when available) water can be used in chum production. Well water is of excellent quality, pathogen free, has a constant temperature of 47°F and is available year round. Well water is passed through a de-nitro tower to improve the dissolved oxygen content.

The surface water supply at the hatchery is limited by water flows. Kendall Creek is a seasonal stream that can run dry during summer and while it maintains flows throughout the spring months, it is not always possible to provide water from the creek for hatchery use. When available, creek water can be mixed with well water and used for adult attraction and holding, rearing and acclimation, however incubation and initial rearing of chum salmon at Kendall Creek is done strictly on well water.

The water right permit for Kendall Creek Hatchery is formalized through WDOE (see **Table 4.1.1**), and was obtained by WDFW in 1969, 1970, and 1978.

- 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.**

Kendall Creek Hatchery surface water intake structure is grandfathered in and 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, steelhead and bull trout are not present above hatchery rack in Kendall Creek.

The facility operates under the “Upland Fin-Fish Hatching and Rearing” National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington 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 4.1.2: 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 Hatcheries Headquarters Database.

Table 4.1.3: 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 Hatcheries Headquarters Database.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

During the initial year of the program broodstock was collected utilizing weirs and seines in the NF Nooksack. As the return to the hatchery increased, broodstock has been collected at the hatchery and supplemented with fish collected from the NF Nooksack spawning grounds.

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

Adults for this program are not transported. Fish collected in-river are spawned at the river site. Unfertilized eggs and milt are transported to the hatchery in five-gallon buckets. The first year of the program operations, gametes were transported to Sandy Point Incubation facility, eyed and transferred to Kendall Creek hatchery for further incubation, rearing and release. After the first year gametes are transferred from the river directly to the Kendall Creek hatchery.

5.3) Broodstock holding and spawning facilities.

Fish collected in-river are spawned at the river site at the time of collection. Fish returning to the Kendall Creek hatchery are held in the holding pond, supplied with well or well/creek water mix when creek water is available, and spawned at the pond site.

5.4) Incubation facilities.

During the first year of program operations, collected in river gametes were transferred for fertilization and initial incubation to Sandy Point Incubation Facility (see any Lummi Nation HGMP for the facility details). Eyed eggs were transferred to Kendall Creek hatchery for final incubation, rearing and release. Currently the entire culturing process takes place at 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.

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. Surface water may be mixed with well water when needed/available.

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.

At Kendal Creek hatchery, an employee is on stand-by at the facility at all times to monitor the 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 *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) to minimize the likelihood for the take of listed natural fish that may result from disease transmission. Adherence to artificial propagation, sanitation and disease prevention, diagnosis, treatment and control practices defined in the policy prevent or reduce the incidence and intensity of disease during hatchery spawning, incubation and rearing, as well as control the transmission of infectious pathogens between hatchery fish and the potential to infect natural-origin salmonids from hatchery effluent or directly by preventing or reducing releases of infected hatchery fish.

The 2012 Legislature passed the "Jobs Now" bill, which provided WDFW with funding for hatchery capital improvements in addition to our capital budget request. At Kendall Creek Hatchery, this allowed the following improvements:

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

| Projects |
|--|
| 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.

The program was initially sourced from adult chum salmon collected in the NF Nooksack River. Currently broodstock is collected from fish collected in-river and returning to the Kendall Creek hatchery, as needed to meet broodstock HOR/NOR targets.

Puget Sound fall chum is not ESA-listed.

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 and favored sex ratio of 1:1. The fecundity value was 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 from 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 the 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.

In 2011, to reinitiate the chum program, LNR staff collected entire broodstock in-river from the NF Nooksack spawning grounds, utilizing weirs and seines. Broodstock was not collected in 2012. Since 2013, when needed in-river broodstock has been collected with the use of seine nets only. The collection has been taking place in three separate locations. Each location is seined up to three times per season. Currently program broodstock continues to be collected in-river by LNR staff as well as at Kendall Creek hatchery, where adults began to return.

7.3) Identity.

All fish released through this hatchery program have been consistently 100% otolith marked.

7.4) Proposed number to be collected:

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

The goal for the Stage 1 of the program is to collect 1,100 adults (550 males and 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 NF Nooksack chum program.

| Brood Year | In-river | | | At the hatchery | | |
|------------|---------------|--------|------|-----------------|--------|------|
| | Male | Female | Jack | Male | Female | Jack |
| 2011 | 242 | 231 | 0 | No collection | | |
| 2012 | No collection | | | | | |
| 2013 | 428 | 471 | 0 | | | |
| 2014 | 106 | 155 | 0 | | | |

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.

Adults for this program are not transported. Fish collected in-river are spawned at the river site. Fish returning to the Kendall Creek hatchery are held in the holding pond, supplied with well or well/creek water mix when creek water is available.

7.7) Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) are adhered to.

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. Natural origin steelhead, if encountered and identified by presence of an adipose fin, will be returned back to the river. Sorting at collection sites and release may result in some physical damage but little or no mortality has been observed by staff as no natural origin steelhead have recently recruited to the hatchery.

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 2015) for NF Nooksack fall chum program at Kendall Creek Hatchery is 1,200,000.

During the first year of the, initial egg incubation took place at Sandy Point Incubation facility and eyed eggs were transported to Kendall Creek Hatchery for further incubation, rearing and release. . Currently the entire culturing process takes place at Kendall Creek hatchery.

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

Table 9.1.1.1.: Survival rates from egg –take to ponding, NF Nooksack fall chum program.

| Brood Year | Eggs Collected | Green-to-Eye-Up | Kendall Creek Eye-Up-to-Ponding |
|------------|------------------------|-------------------|---------------------------------|
| 2011 | 463,000 | 95.0 ¹ | 98.0 |
| 2012 | No collection | | |
| 2013 | 748,400 | 97.4 | 98.0 |
| 2014 | 1,243,115 ² | 95.8 | 98.0 |

¹Survival at Sandy Point Incubation facility

² In-river and at the hatchery combined egg take

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.

Eyed eggs are placed in vertical incubators at ~10,000 per tray.

9.1.4) Incubation conditions.

Eyed eggs 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.

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.

Fertilized eggs are water hardened in an iodophor solution. 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 |
| 2012 | NA |

| | |
|------|------|
| 2013 | 92.8 |
| 2014 | 97.4 |

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 | 489 |

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 – 3,000,000 | 400 | April/May | Nooksack River |

Source: Future Brood Document 2015

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) |
|----------------|----------------|-----------------|------------|-----------|
| 2012 | 417,000 | 600 | 7.7 | 5/1- 9 |
| 2013 | No release | | | |
| 2014 | 650,895 | 410 | 6.3 | 4/19-5/9 |
| 2015 | 1,094,383 | 457 | 5.3 | 4/14-5/26 |
| Average | 720,759 | 489 | 6.4 | |

Source: WDFW Hatcheries Headquarters Database 2015.

Data reflects releases for broodstock combined of in-river and at the hatchery collection

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. Surface water maybe added when needed/available.

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 |
|------------|-----------|---------------------|
| 2015 | 1,000,000 | 100% Otolith Marked |

Source: Future Brood Document 2015

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 and steelhead 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.

The 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.

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.

No research is currently conducted for this program.

12.2) Cooperating and funding agencies.

Not applicable.

- 12.3) Principle investigator or project supervisor and staff.**
Not applicable.
- 12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.**
Not applicable.
- 12.5) Techniques: include capture methods, drugs, samples collected, tags applied.**
Not applicable.
- 12.6) Dates or time period in which research activity occurs.**
Not applicable.
- 12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.**
Not applicable.
- 12.8) Expected type and effects of take and potential for injury or mortality.**
Not applicable.
- 12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).**
Not applicable.
- 12.10) Alternative methods to achieve project objectives.**
Not applicable.
- 12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.**
Not applicable.
- 12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.**
Not applicable.

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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 R. | 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 (<i>Oncorhynchus tshawytscha</i>) | ESU/Population: Puget Sound/ Nooksack River System 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: November- May | | Hatchery program operator: WDFW | |
| Type of Take | Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>) | | | |
| | 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: Steelhead (<i>Oncorhynchus mykiss</i>) | ESU/Population: Puget Sound/ Nooksack River System Steelhead | | Activity: Kendall Creek Fall Chum Program | |
| Location of hatchery activity: Kendall Creek Hatchery, RM 46 of NF Nooksack River (01.0120) | Dates of activity: November- May | | Hatchery program operator: WDFW | |
| Type of Take | Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>) | | | |
| | 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: compensatory 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 | <u>SIZE/CRITERIA</u> 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.