HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Whatcom Creek Pink Salmon Hatchery Program (Segregated)
Species or Hatchery Stock:	Pink Salmon (*Oncorhynchus gorbuscha*) Nooksack River Stock
Agency/Operator:	Bellingham Technical College
Watershed and Region:	Whatcom Creek/ North Puget Sound
Date Submitted:	January 4, 2013
Date Last Updated:	January 4, 2013

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Whatcom Creek Hatchery Pink Salmon Program

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

Nooksack River Pink Salmon (*Oncorhynchus gorbuscha*) - not listed

1.3) Responsible organization and individuals

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

Co-manager policies are in effect for all Puget Sound hatchery programs. The Bellingham Technical College Whatcom Fish Hatchery/Educational facility works closely with WDFW's Kendall Creek Hatchery, often sharing both labor and equipment between the two facilities.

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

Bellingham Technical College provides the hatchery facilities through a lease with the City of Bellingham Parks Department, which owns the property. The college also provides most operational costs and provides one full-time hatchery manager and student labor. Funding for fish feed is through Aquatic Lands Enhancement Account (ALEA) funding provided to WDFW for Co-op fish production. No exact figures are available at this time as labor may heavily be school and or volunteer provided

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

Broodstock Collection, Incubation, Rearing and Release Location:

Whatcom Creek Hatchery: Located at Whatcom Creek (WRIA 01.0566) at RM 0.5. Whatcom Creek enters into Bellingham Bay, Washington.

Incubation Location:

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

1.6) Type of program.

Segregated Harvest.

1.7) Purpose (Goal) of program.

Harvest Augmentation/Education.

1.8) Justification for the program.

Whatcom Creek Hatchery curriculum has been part of the Bellingham Technical College Fisheries/Aquaculture programs since 1979. The fish hatchery curriculum and associated facilities lends itself to valuable hands-on training for natural resource students while the college provides funds for operations and staff. Whatcom Creek has not been identified by the PSTRT (Ruckelshaus et al. 2006) or PSSTRT (2011) as a watershed where an indigenous Chinook, summer chum or steelhead population was historically present. Potential impacts from this program, if they occur, would occur in the nearshore environment.

To minimize impacts on listed fish by WDFW facilities operation and the Whatcom Creek chum program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Whatcom Creek pink program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Incubation: Well water and surface water rights at Kendall Creek are formalized through trust water right permit #s G1-10562c, G1-23261c and S1-00317. The usage of surface water from Whatcom Creek is regulated under the water rights permit S1-28591C. Surface water and city water used for incubation and rearing. No listed species are known to occur in Whatcom Creek.
Intake Screening	4.2	The intake screens at Kendall Creek and Whatcom Creek hatcheries are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011). The screens at Kendall Creek Hatchery are identified for replacement but are a lower priority than others since listed Chinook do not occur above the intake on Kendall Creek. In most years, the creek is very low or dry during the time of adult spring Chinook spawning. No listed species are known to occur in Whatcom Creek.

Effluent Discharge	4.2	Effluent from Kendall Creek is regulated through NPDES permit # WAG 13-3007. No listed species are present within Whatcom Creek. No NPDES permit is required because the Whatcom Creek facility produces less than the 20,000 pounds per year criteria set by WDOE as the limit for concern regarding hatchery effluent discharge effects.
Broodstock Collection & Adult Passage	7.9, 2.2.3	Pink salmon are collected at Whatcom Creek. No listed species are known to occur in Whatcom Creek.
Disease Transmission	9.2.7	The program is operated consistent with the Co-managers Fish Health Policy (WDFW and WWTIT 1998, updated 2006).
Competition & Predation	2.2.3, 10.11	Releases occur in Whatcom Creek where the Puget Sound Technical Recovery Team (TRT) has not identified a Chinook or summer chum salmon population. Life history and feeding habits of fall chum are expected to result in limited competitive and predatory interactions with listed Chinook and summer chum, if present.

1.9) List of program "Performance Standards".

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

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

1.10.1) "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in applicable agreements (US v WA).	Contribution to co-manager harvest.	Participate in annual coordination between co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process, North of Falcon, HAIPs).
3.1.2 Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development within the Nooksack basin and contributes to sport, tribal and commercial fisheries.	Survival and contribution to fisheries will be estimated for each brood year released.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all	Annual number of fish produced by program caught in all fisheries, including estimates of fish released.	Harvests occur in periods when listed salmon and steelhead are not present. Harvests and hatchery returns

applicable fisheries management plans, while avoiding overharvest of non-target species.		are monitored by agencies to provide up-to-date information.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Collection of broodstock is done randomly throughout the entire return period. Adhere to WDFW spawning guidelines. (WDFW 1983).	Annual run timing, age and sex composition and return timing data are collected.
3.5.5 Juveniles are released at fully-smolted stage.	Status (size fpp/mass CV and condition factor) and behavior are monitored in the hatchery.	Condition of fish monitored in the hatchery throughout rearing stages. Monitor size, number, date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is properly sized to meet harvest objectives; program fish are fully utilized in target fisheries.	Harvests and hatchery returns are monitored throughout the run.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Adhere to HSRG (2004) and WDFW spawning guidelines (WDFW 1983). Apply minimal monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Annual run timing, age and sex composition data are collected upon adult return. Growth rates, mark rate and size at release and release dates are recorded annually.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefit that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal commercial, subsistence and ceremonial use.	Annual harvest of hatchery fish based on estimated from Co-manager data, Catch Record Card (CRC) estimates and creel surveys.

1.10.2) <u>"Performance Indicators" addressing risks.</u>

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while minimizing by-catch of non-target species.	Harvest is regulated to meet appropriate biological assessment criteria. Mass-mark juvenile hatchery fish prior to release to differentiate hatchery - from natural-origin fish and enable state agencies to implement selective fisheries.	Harvests and escapements are monitored by agencies to provide up-to-date information.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, etc., depending on	Fish are released 100% otolith-marked. Annual harvest of hatchery fish assessed based on Co-manager

natural- and hatchery-origin fish in fisheries.	species) produced fish to allow for their differentiation from naturally produced fish.	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.
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.	Number of spawners of natural-origin removed for broodstock.	No native natural-origin population exists in the basin that could be impacted by the hatchery program. pHOS not monitored (segregated program).
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.	Annually monitored for production levels – age and size data collected. Or Unknown.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Within and between populations, genetic structure is not affected by artificial production.	Currently not monitored
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Collection of broodstock is done randomly throughout the entire return period.	Annual run timing, age and sex composition and return timing data are collected.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish.	pHOS not monitored. (segregated program).
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return	Fish are released in lower river locations after acclimation.	Fish are released on-station. Annual release information, including method and age class are recorded in hatchery data

locations.		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.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Adhere to HSRG (2004) and WDFW spawning guidelines (Seidel 1983). Apply minimal monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Annual run timing, age and sex composition data are collected upon adult return. Growth rates, mark rate and size at release and release dates are recorded annually.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, WDFW Fish Health Policy, INAD, MDFWP).	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed.
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDOE water right permit compliance.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile 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-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.	No native natural-origin Chinook population exists in basin that could be impacted by the hatchery program.
3.7.7 Weir/trap operations do not result in significant stress, injury or mortality in natural populations.	All observations of natural-origin fish at hatchery facilities are recorded and reported annually.	Trap checked daily. Natural- and hatchery-origin fish abundances recorded and reported annually.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Fish released at 600 fpp.
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.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefits that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal ceremonial use.	Co-managers to provide up-to-date information needed to monitor harvests.

1.11) Expected size of program.

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

Proposed collection level is 1,000 adult pink salmon.

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

Table 1.11.2.1: Proposed annual releases.

Life Stage	Release Location	Annual Release Level
Fry	Whatcom Creek	500,000*

Source: Future Brood Document 2012
*Program goal was set at 1,000,000 fry (based on egg availability) in BY 2003. Was scaled back to 500,000 in 2006 (FBD 2005).

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

Due to a lack of coded-wire tag (CWT) studies and limitations that not all fish can be accounted for as being harvested or as back-to-rack counts, smolt-to-adult survival rates (SAR) cannot be accurately estimated.

Table 1.12.1: Whatcom Hatchery pink salmon escapement 1999-2011.

Return Year	Escapement
1999	No hatchery returns
2001	2,568
2003	7,001
2005	3,325
2007	687
2009	2,767
2011	257
Average	**2,768**

Data source: Bellingham Technical College, 2011

This program began with a small initial release of fish in 1998. Fish were first collected in 1997 (10) and 1999 (423) from the Nooksack River.

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

1997.

1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Whatcom Creek (WRIA 01.0566).

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

The reforms and investments have not been developed at this time. It is expected that individual hatchery programs in the Nooksack River basins will be consistent with recommendations and policies that are agreed upon by the co-Managers.

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

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

None currently. This HGMP is submitted to NOAA Fisheries for ESA consultation, and determination regarding compliance of the plan with ESA section 4(d) rule criteria for joint state/tribal hatchery resource management plans affecting listed Chinook salmon and steelhead.

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

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

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

None directly.

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

Puget Sound Chinook (*Oncorhynchus tshawytscha*): Listed as *Threatened* on March 24, 1999 (64FR14308); *Threatened* status reaffirmed on June 28, 2005 (70FR37160); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The Puget Sound Chinook salmon ESU is composed of 31 historically quasi-independent populations, of which 22 are believed to be extant currently. The ESU includes all naturally-spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington, as well as twenty-six artificial propagation programs (Ford 2011). In the Bellingham Bay area, the TRT has identified demographically independent populations (DIPs) in the North/Middle Fork Nooksack and South Fork Nooksack River, there is no evidence that an independent population of Chinook salmon existed in the Samish River (Ruckelshaus et al. 2006).

Puget Sound steelhead (*Oncorhynchus mykiss*): Were listed as *Threatened* under the ESA on May 11, 2007 (72FR26722); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The DPS includes all naturally spawned anadromous winter-run and summer-run *O. mykiss* (steelhead) populations, below natural migration barriers in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington (Ford 2011). This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), and also includes the Green River natural and Hood Canal winter-run steelhead hatchery stocks. In the Bellingham Bay area, the TRT has preliminarily delineated two DIPs of winter steelhead (Nooksack River and Samish River) and one DIP of summer steelhead in the South Fork Nooksack River (PSSTRT 2011).

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

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

Kendall Creek hatchery spring Chinook in 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 Fork Nooksack population (70 FR 37160. June 28, 2005; NMFS SHIEER 2004). The program was started with natural-origin fish from the North Fork Nooksack River, although some Sol Duc Hatchery Chinook salmon were released from Kendall Creek in

the late-1970s (SSHAG 2003). 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. All spring Chinook salmon spawned in recent years have been of hatchery origin. The proportion of natural-origin fish typically used in the broodstock is unknown and may be quite low, leading to the possibility of some divergence from the natural population (SSHAG 2003).

Nooksack spring Chinook in Puget Sound Chinook ESU. Recent escapement levels (2000-2011) have averaged 865 or natural spawners in the North Fork Nooksack River DIP and 166 (2000-2010) for the South Fork Nooksack River DIP. Both populations have shown decreasing population trends during this same period (SaSI, WDFW 2012; Natasha Geiger WDFW 2012).

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

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

Source: Ford 2011; NMFS 2011

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

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

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

Samish River hatchery fall Chinook in Puget Sound Chinook ESU. NMFS (1999) considered this stock to be in the ESU but not essential for recovery. This stock was designated Category 3b; although the stock originated from within the ESU, it is not native to the area in which it is released. Historically, it is believed that the Samish River did not support a self-sustaining population of Chinook salmon. Further, there appears to be limited interaction between Samish River fish and native populations in the Nooksack and Skagit Basins (SSHAG 2003).

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 high fractions of hatchery fish in many populations and widespread loss and degradation of habitat. Many of the habitat and hatchery actions identified in the Puget Sound Chinook recovery plan are expected to take years or decades to be implemented and to produce significant improvements in natural population attributes, and these trends are consistent with these expectations. Overall, the new information on abundance, productivity, spatial structure and diversity since the 2005 review does not indicate a change in the biological risk category since the time of the last BRT status review (Ford 2011).

Nooksack River steelhead in Puget Sound steelhead DPS. The glacial hydrology in this system makes it difficult to monitor data for steelhead stocks in this system As such data has only been collected for Nooksack winter steelhead stocks, when conditions allow. Consequently stock status

is rated unknown in 2012 (SaSI, WDFW 2012). It is thought that the status of Nooksack winter DPS may be depressed because of recent flooding and habitat instability. There are no abundance trend data for the South Fork Nooksack summer steelhead DPS and it is not currently monitored so the status remains unknown (SaSI, WDFW 2012). Based on a preliminary intrinsic potential (IP) estimate by the PSSTRT (2011), the capacity for winter steelhead in the Nooksack DPS is 5,422 adults, and for the South Fork Nooksack summer steelhead DPS the capacity is estimated at 4,253 adults (PSSTRT 2011).

Samish River steelhead in Puget Sound steelhead DPS. Steelhead counts in the Samish River have declined sharply in recent years. Assuming these counts are a reasonable reflection of spawner abundance, the estimated probability that this steelhead population would decline to 10% of its current estimated abundance (i.e., to 43 fish) is high—about 80% within 25 years. With an estimated mean population growth rate (u est) of −0.037 ($\lambda = 0.964$) and process variance (Q est) of 0.140, we can be highly confident ($P < 0.05$) that a 90% decline in this population will not occur within the next 5−10 years, and that a 99% decline will not occur within the next 15 years. However, beyond the next 25 years we are highly uncertain about the precise level of risk. Based on a preliminary IP estimate by the PSSTRT (2011), the capacity for winter steelhead in the Samish River DPS is 2,005 adults.

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

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

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

Trap Year[a]	Sub-yearling Chinook[b]		% of Hatchery Chinook Mass-Marked	Steelhead[c]
	Wild	Hatchery		
2010	502 (114,236)	4,794	99.60%	277
2009	853 (206,231)	5,151	99.60%	570
2008	1,323 (420,194)	5,851	99.30%	351
2007	365 (63,088)	3,688	99.70%	149
2006	1,299 (275,975)	4,215	99.40%	NA
2005	885 (151,832)	3,618	100.00%	NA
2004	2,444 (59,216)	2,524	76.80%	NA
2003	5,708 (666,424)	2,120	80.90%	NA

Source: Lummi Tribe; Dolphin 2011

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

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

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

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

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

Source Data: Ford 2011

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

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

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

Source Data: Ford 2011

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

Nooksack system steelhead (*Oncorhynchus mykiss*): Current Co-manager smolt monitoring for Chinook and coho productivity incidentally captures some wild steelhead smolts, but due to the evasive ability of steelhead smolts in large systems, no methodology has been developed to estimate total productivity (see HGMP Table 2.2.2.2).

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

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

Source Data: Ford 2011

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

Table 2.2.2.6: Nooksack River Chinook (early) escapement from 1999-2011

Return Year	Escapement	
	S.F. Nooksack	**N. F./MF Nooksack**
1999	166	823
2000	284	1,242
2001	267	6,950[b] (2,185)
2002	289	3,741
2003	204	2,857
2004	130	1,719
2005	120	2,047

2006	355	1,184
2007	29[a]	1,438
2008	83[a]	1,266
2009	45[a]	1,903
2010	24[a]	2,044
2011	NA	865
Average	**166**	**1,760**

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

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

Table 2.2.2.7: Nooksack River winter steelhead and Samish River winter steelhead escapement 2000-2011.

Return Year	Nooksack River	Samish River
2000	NA	698
2001	NA	881
2002	NA	859
2003	NA	915
2004	1,574	930
2005	NA	592
2006	NA	818
2007	NA	494
2008	NA	432
2009	NA	434
2010	1,897	697
2011	1,774	1,028
Average	**1,748**	**732**

Source: SaSI (WDFW 2012)

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

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

Year	NF Nooksack River		
	Natural-Origin	**Hatchery-Origin**	**% of Natural Origin**
1998	37	333	10
1999	85	738	10.3
2000	160	1,082	12.8
2001	240	2,185*	10
2002	224	3,517	5.9
2003	210	2,647	7.3
2004	318	1,746	15.4

2005	210	1,837	10.3
2006	275	909	23.2
2007	334	1,104	23.2
2008	307	959	24.2
2009	269	1,634	14.1
2010	204	1804	10.2
Average	**221**	**1,577**	**13.6**

Source: SaSI, WDFW 2012 and Natasha Geiger WDFW 2012
* Does not include the 4,765 hatchery "put-backs" to the NF Nooksack.

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

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

Data Source: Ford 2011
[a]This is from analyses reported by Ford (2011). These are based on analyses reported by Ford (2011) that are not necessarily agreed to by WDFW and the Lummi and Nooksack Tribes.

Nooksack and Samish winter steelhead (*Oncorhynchus mykiss*): The level of hatchery winter run steelhead spawners in the Nooksack River, Whatcom Creek and Samish River is unknown. Due to timing differences between early Chambers stock steelhead and a majority of the existing wild winter or summer stocks (being later February – June), interaction on the spawning grounds is unclear.

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 Collection: Impacts during collection of pinks are low for Chinook, summer chum or steelhead, as no listed species are known to exist or have existed in Whatcom Creek (Ruckelshaus et al. 2006, PSSTRT 2011).

Broodstock Spawning/Pathology Sampling: Only hatchery-origin pink salmon are spawned for the Whatcom Creek program. After spawning, moribund females or fresh pond mortalities may be kidney/spleen sampled for thorough pathogen screening (Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State Policy) (WDFW and WWTIT 1998 and updated 2006). No listed fish are included in this program.

Rearing Program: Only hatchery pink salmon are reared on-station. Listed fish are not reared in this program.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance or barrier blockages. The operation of the

hatchery gravity intake is not compliant with current intake standards. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with main stem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect 'Take" associated with the operations of these facilities. No take of listed fish are reported by staff during the normal operation of the hatchery.

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

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

Competition/Niche-Displacement: Freshwater carrying capacity may be compromised if hatchery pink fry planted or those produced naturally from hatchery spawners competitively displace or compete with wild fish in their natural rearing habitats. Studies specific to competition or niche displacement in the Nooksack and Samish River systems and tributaries are not conducted.

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 (see HGMP section 11). Monitoring activities that are conducted in the basin by co-managers include smolt monitoring, Chinook and wild winter steelhead escapement spawner/carcass surveys or redd monitoring, which are not covered in this HGMP.

Predation: Hatchery pink fry are released at a size range that is too small for predation on listed species to be a concern.

- 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.

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

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; the

Summer Chum Salmon Conservation Initiative or SCSCI (Ames et al. 2000); the Hood Canal Summer Chum Salmon Recovery Plan (Brewer et al. 2005); the Hood Canal Salmon Management Plan (PNPTC et al. 1986); and the Hatchery Action Implementation Plan (HAIP) for the watershed (see HGMP section 3.4).

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

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

This program is operated in accordance with a Cooperative Fish Production Agreement between Earl Steele, representing the Bellingham Technical College, and WDFW. That agreement is consistent with the Future Brood Document (FBD) and with this HGMP.

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

WDFW hatcheries operate under *U.S. v Washington* that 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). This co-management process requires that both the State of Washington and the relevant Puget Sound Tribe(s) develop program goals and objectives and agree on the function, purpose and release strategies of all hatchery programs.

See also HGMP section 3.1.

3.3) Relationship to harvest objectives.

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

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

Table 3.3.1.1: Whatcom Creek Hatchery pink salmon fishery contributions.

Year	Whatcom Hatchery	4B-6C	7-7A	7C	7B
1999	21	72	8	29	1,473
2001	3,714	114	1,610	577	11,191
2003	7,264	144	1,102	515	1,101
2005	1,791	8	136	236	1,874
2007	276	0	372	351	318

2009	2,097	3	3,381	378	2,400
2011	285	120	4,081	384	5,136
Average	**2,207**	**66**	**1,527**	**353**	**3,356**

Source: Aaron Default, WDFW

[a]Wild and hatchery contributions cannot be accurately broken out. Whatcom Hatchery makes up only a very minor contribution to the overall escapement that's factored into this reconstruction.

A recreational fishery may occur if the adult return level to the hatchery exceeds that needed for egg take.

3.4) Relationship to habitat protection and recovery strategies.

The Whatcom Creek programs are included as one of the WDFW-managed plans under the co-managers' Non-Chinook Resource Management Plan (RMP) for Puget Sound region non-Chinook salmon hatchery programs.

Hatchery Action Implementation Plans (HAIPs) are watershed-level documents developed by the western Washington Treaty Tribes (Tribes) and WDFW, which consolidate descriptions of hatchery programs from each watershed into a single document. This document addresses co-manager priorities, legal requirements of the Puget Sound Salmon Management Plan (PSSMP 1985) and Endangered Species Act (ESA), and recommendations of the Hatchery Scientific Review Group (HSRG). It describes the adaptation of general principles for hatchery management to the unique genetic and ecological setting of each watershed. The HAIPs also describe how hatchery programs will operate in conjunction with harvest management, habitat restoration, and habitat protection to achieve near- and long-term goals for natural and hatchery production of salmon in each watershed, as well as listing funded and unfunded capital and operating/monitoring needs for all state and tribal hatchery programs and facilities. Each HAIP will also outline the monitoring and evaluation needs and describe the co-manager's adaptive management approach.

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: (See also http://www.rco.wa.gov/salmon_recovery/lead_entities.shtml). 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 County is working on a long-term strategy to ensure the protection and restoration of healthy salmon populations. The local Watershed Recovery Plan developed will "rollup" into the regional salmon recovery plan (Shared Strategy for Salmon Recovery). This "Shared Strategy" is the official ESA recovery plan.

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

Shared Strategy Plan: An ESU-wide recovery planning effort was undertaken by Shared Salmon Strategy for Puget Sound, a collaborative group dedicated to restoring salmon throughout Puget Sound (online at http://www.sharedsalmonstrategy.org).

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

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

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

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

- Orcas
- Sea lions
- Harbor seals
- River otters

(2) *Salmonid and non-salmonid fishes or other species that could be negatively impacted by the program).*

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

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

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

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	Available Water Flow (gpm)	Water Temp (F)	Usage	Limitations
Whatcom Creek Hatchery	Whatcom Creek (surface)	Up to 2,600	34-74	Broodstock holding, incubation, rearing release	High summer temperatures, silt
Kendall Creek Hatchery	Wells (5)	Up to 12,200	47	All	No limitations
	Kendall Creek (surface)	Up to 10,700	30-50	Broodstock holding, incubation	Limited summer usage.

Whatcom Creek Hatchery is located on Whatcom Creek at RM 0.5, in the close proximity to Bellingham Bay, where creek water levels are tidally influenced and can be mixed with salt water. The hatchery is supplied with surface water gravity-fed to the ponds and pumped to the incubation room. Hatchery operations are limited by high water temperatures during summer and early fall months, and an excessive silt load present in the water. Due to the heavy silt loads incubation of eggs to the eyed stage for all Whatcom Creek programs takes place at Kendall Creek Hatchery to prevent egg suffocation.

Water rights for Whatcom Creek surface water is regulated under permit# S1-28591C (5.8cfs).

Kendall Creek: 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 rights are regulated through permits G1-10562c, G1-2361c and S1-00317.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Whatcom Creek Hatchery: The gravity water intake structure is in compliance with state and federal guidelines (NMFS 1995, 1996), but does not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011).

Annual hatchery production does not exceed the WDOE standard of 20,000 pounds per year regarding hatchery effluent discharge effects and as such no NPDES permit is required. Regardless, the hatchery has a settling pond that can be separated from the creek. The pond can hold up to 1,000,000 gallons of water, which can be recycled within the hatchery and used in emergency situations if the creek is contaminated.

There are no immediate risks to the listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge. Prior to the start of hatchery operations in 1979, there were no salmon or steelhead present in the Whatcom Creek. Fish currently present are thought to be the progeny of hatchery-origin spawners.

Kendall Creek Hatchery The surface water intake structure is in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011). Intake screens are identified for replacement but are at lower priority than screens at other hatcheries, since listed Chinook is not present above hatchery rack on Kendall Creek.

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

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

Source: Ann West, WDFW Hatchery Data Unit

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

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

Source: Ann West, WDFW Hatchery Data Unit

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock for all programs at the hatchery is recruited from volunteers returning to the hatchery. There is no weir blocking the river and forcing fish to the trap. Returning adults enter concrete pond via a 12-step fish ladder that rises10 vertical feet to a "V" trap.

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

A 100-gallon tanker truck, equipped with aerators and oxygen tanks is borrowed from WDFW if needed for fish transportation. Fish moved above the falls on Whatcom Creek are placed in a barrel filled with water and transported using a pickup truck. Pink salmon are not transported.

5.3) Broodstock holding and spawning facilities.

Collected broodstock is held in a 40'x30'x 4' concrete pond supplied with creek water. Spawning takes place at the side of the pond.

5.4) Incubation facilities.

Table 5.4.1: Incubation vessels available at Whatcom Creek Hatchery.

Type	Number	Size
Vertical stack incubators	576	24" x 25" x 3"
Wooden shallow troughs	6	10' x 6' x 16'
Moist-air incubators	4	6' x 4' x 2'
	165	Tray size: 9" x 5" x 3"

Due to the heavy silt loads incubation of eggs to the eyed stage for all Whatcom Creek programs takes place at Kendall Creek Hatchery to prevent egg suffocation.

Table 5.4.2: Incubation vessels available at Kendall Creek Hatchery.

Type	Number	Size
Vertical stack incubators	336 trays	24" x 25' x 3"
Troughs	24	24" x 31" x 17"

5.5) Rearing facilities.

Table 5.5.1: Rearing ponds available at Whatcom Creek Hatchery.

Type	Number	Size
Fiberglass circular ponds	4	48' diameter x 4'deep
Concrete circular ponds	2	60' diameter x 4'deep
Concrete ponds	2	40' x 30' x 4'

The circular concrete ponds are covered with bird netting and surrounded by electrical fence to prevent predation.

5.6) Acclimation/release facilities.

Fish are incubated and reared on Whatcom Creek water the entire time at the hatchery and released on-station directly from the rearing pond into the creek.

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.

All of the hatchery ponds are supplied with gravity fed water and are not dependent on electricity. Water to the incubation room is pumped. The facility is equipped with low water alarms, connected to the hatchery manager's cell phone, back-up generator (in case of power loss), and back-up pump. The hatchery water system also allows for recycling water within the system in case of surface water quality deterioration (oil spills, etc.). One million gallons of water held in the settling pond may be used during emergency situations.

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 of the take of listed natural fish that may result from disease transmission. Adherence to artificial propagation, sanitation and disease control practices defined in the policy should reduce the risk of pathogen transfers.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Adult pink salmon returning to the Whatcom Creek Hatchery trap. Puget Sound pink salmon is not ESA listed.

6.2) Supporting information.

6.2.1) History.

The Whatcom Creek pink salmon program was initiated in 1997 with broodstock collected from Middle Fork Nooksack River the same year and again in 1999. Since 2001 enough fish return to the trap for the hatchery to be self-sufficient in collecting broodstock.

6.2.2) Annual size.

Up to 1,000 adults are collected annually to meet the needs of the Whatcom Creek Hatchery program release goal of 500,000 fry and 100,000 eyed-eggs transferred to Nooksack/Samish Regional Enhancement Group. Natural-origin fish are not included in the broodstock.

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

The pink salmon production is managed as a segregated program, with the intent to keep hatchery stock reproductively separate from naturally-spawning populations. As no listed pink salmon is known to exist or have existed in Whatcom Creek, there should be no inclusion of natural-origin fish into the broodstock.

6.2.4) Genetic or ecological differences.

No genetic or ecological differences are known.

6.2.5) Reasons for choosing.

Middle Fork Nooksack River indigenous stock was used as a local, available stock.

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.

As no listed species are known to exist or have existed in Whatcom Creek (Ruckelshaus et al. 2006), there should be no impact on listed Chinook or summer chum during selection.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Pink salmon broodstock is recruited from volunteers returning to the hatchery trap in odd years and collected through the entire run. The trap is open from June through March for steelhead, chum and pink salmon collection. Pink typically return from August through September. Returning adults enter concrete pond via a 12-step fish ladder that rises10 vertical feet to a "V" trap.

7.3) Identity.

Pink salmon has been released unmarked since the program inception in 1997.

7.4) Proposed number to be collected:

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

Up to 700 adults are collected annually.

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: Annual broodstock composition, by sex, Whatcom Creek Hatchery pink salmon, 1997-2011.

Brood Year	Females	Males
1997	5	5
1999	218	205
2001*	831	653
2003	664	645
2005	675	598
2007	119	91
2009	515	514
2011	**250**	**265**
Average	**410**	**372**

Data source: Earl Steele, Bellingham Technical College, 2012
*First year of on-station broodstock collection.

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

Pink salmon in surplus of broodstock needs are donated to SeaShare food bank or disposed of by a contracted fish buyer.

7.6) Fish transportation and holding methods.

Not applicable. Adults are not transported.

7.7) Describe fish health maintenance and sanitation procedures applied.

Adult broodstock are sampled for virus in accordance with the Co-Managers Fish Health Policy (WDFW and WWTIT 1998, updated in 2006) and spawning procedures follow the guidelines set forth in WDFW's Spawning Guidelines (Seidel 1983, HSRG 2004). Standard fish culture techniques and sanitation procedures are applied during spawning procedures. Chemicals are not used to treat adults.

7.8) Disposition of carcasses.

Food-grade carcasses may be donated to SeaShare food bank or disposed of by a contracted fish buyer. Both food-grade and non food-grade carcasses may also be used for nutrient enhancement in Whatcom Creek.

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.

Impacts during broodstock collection of fall chum for this program are low for Chinook or summer chum, as no listed species are known to exist or have existed in Whatcom Creek (Ruckelshaus et al. 2006).

SECTION 8. MATING

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

8.1) Selection method.

Broodstock is selected randomly from ripe fish across the entire maturation time frame. Spawning takes place one to two times per week.

8.2) Males.

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

8.3) Fertilization.

Eggs pooled from five or ten females are equally spread into five or ten buckets and fertilized with milt from one male (matrix spawning). After fertilization, eggs are combined into one bucket.

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 as part of the mating scheme.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation:

Current egg-take goal (FBD 2012) for pink salmon program at Whatcom Creek Hatchery is 600,000.

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

Table 9.1.1.1.: Egg-to–ponding survival of pink salmon eggs at Whatcom Creek Hatchery

Brood Year	Eggs Collected	Survival Rates (%)	
		Green-to-Eyed Up	Eyed-Up-to-Ponding
1997	2,500	NA	NA

1999	256,000	NA	NA
2001	666,000	NA	NA
2003	900,000	NA	NA
2005	614,000	NA	NA
2007	94,394	NA	NA
2009	475,000	NA	NA
2011	65,000	NA	NA
Average	**384,112**	**82-85**	**97-98**

Source: Earl Steele, Bellingham Technical College, 2012

Annual survival rates data are not available. The average survival rate from green-to-eyed egg is estimated as 82-85%, and eyed-to-ponding as 97-98% (Earl Steele, personal communication, 2012).

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

No excess eggs are collected beyond the needs of the program. Current management approaches do not allow for the take of eggs in surplus of program goals. If losses are too high, then goals are not met.

9.1.3) Loading densities applied during incubation.

All eggs are fertilized and incubated at Kendall Creek hatchery. Fertilized eggs are placed in vertical trays at ~10,000 eggs per tray.

9.1.4) Incubation conditions.

Kendall Creek hatchery. Fertilized eggs are incubated in trays supplied with well water at constant temperature of 47ºF and at a flow rate of 4gpm. Temperature is monitored daily and dissolved oxygen when needed. Once eyed (October, November), eggs are shocked, and transferred back to Whatcom Creek Hatchery. Eyed eggs are transported in 5-gallon buckets placed on burlap and ice. The transportation time to Whatcom Creek Hatchery is ~40 minutes.

Whatcom Creek Hatchery. Eyed-eggs are placed in vertical trays supplied with surface water at a flow rate of 4 gpm. Water temperature is monitored daily and dissolved oxygen is added when needed. Vexar™ layers are placed in trays as a substrate substitute. The use of surface water causes silt problems and silt loads are monitored and removed as needed.

9.1.5) Ponding.

When buttoned up (January) based on visual observation, and at the size of around 2,000 fpp, fish are moved to a concrete pond supplied with creek surface water, where they remain until March release (600 fpp).

9.1.6) Fish health maintenance and monitoring.

All fertilized eggs are water-hardened in an iodophore solution. Fungal growth 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. Once eyed, eggs are shocked and dead eggs removed. Eyed egg-to-ponding fry loss is picked at the time of ponding and fry mortalities are removed daily.

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

Listed fish are not incubated through this program.

9.2) Rearing:

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

Annual survival rates data are not available. The average survival rate from ponding-to-releases is estimated as 99%, (Earl Steele, personal communication, 2012).

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 3lbs of fish /gpm at release and under 0.35lbs/ft^3.

9.2.3) Fish rearing conditions

Fish are reared, in concrete pond supplied with creek surface water, for one month, since January ponding till March release.

Table 9.2.3.1: Average surface water temperature (°F), by month, Whatcom Creek

Month	Average Water Temperature (ºF)
January	42
February	44
March	45
April	46
May	48
June	51
July	57
August	59
September	55
October	52
November	45
December	43

Source: Earl Steele, Bellingham Technical College, 2012

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

Table 9.2.4.1: Average size (fpp), by month, juvenile pink salmon reared at Whatcom Creek Hatchery.

Month	Average Size (fpp)
January	2,000
February	1,000
March	600

Source: Earl Steele, Bellingham Technical College, 2012

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

See Table 9.2.4.1 for growth information. No energy reserve data is available.

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

Pink salmon are given a starter feed formulation of Bio-Oregon brand. Feeding frequencies usually begin at eight feedings/day, 7-days a week and end at four feedings/day, 7-days a week. Feed rates varies from 1% to 6.0% B.W./day. The overall season food conversion rate is approximately 0.8:1

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, (Revised July 2006).

A drip of 0.5ppm of potassium permanganate is applied every other day for 60 minutes as a precaution for bacterial gill disease.

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

Pink salmon show migration behavior right after emergence. In the hatchery environment they are kept for approximately 60 days after ponding to be released as a fed fry to assure better survival. ATPase activity is not measured.

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

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

9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.

No listed fish are propagated through this program. Puget Sound pink salmon 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
Fry	500,000	600	March	Whatcom Creek

Source: Earl Steele, Bellingham Technical College, 2012

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

Stream, river, or watercourse: Whatcom Creek (01.0566)

Release point: RM 0.5 (Whatcom Creek Hatchery)

Major watershed: Whatcom Creek (Bellingham Bay)

Basin or Region: Puget Sound

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

Table 10.3.1. Number released by stage, size and date, Whatcom Creek Hatchery pink salmon, 1998-2012.

Release Year	Fry	Avg. size (fpp)	CV	Date(s)
1998	1,561	1,200	NA	03/28

2000	218,00	500	NA	04/07
2002	514,000	800	NA	03/22
2004	698,000	516	NA	04/08
2006	417,000	800	NA	03/20
2008	70,000	1,000	NA	03/30
2010	220,000	800	NA	4/25
2012	360,820	444	NA	4/21-25
Average	**320,094**	**802**	**----**	**----**

Source: WDFW fish plant database, 2011; Earl Steele, Bellingham Technical College, 2012

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

Pink salmon are forced released by draining the ponds. Fish are released at night, during high tide and exit the pond through 12-inch drain pipe.

10.5) Fish transportation procedures, if applicable.

Not applicable. Fish are released on station.

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

Fish are incubated and reared on Whatcom Creek water the entire time at the hatchery and released on-station directly from the rearing pond into the creek.

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

Table 10.7.1: Marks applied

Brood Year	Fed Fry	Marking
2012	500,000	Not Marked

Source: Future Brood Document 2012.

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

There is no surplus fish associated with this program.

10.9) Fish health certification procedures applied pre-release.

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

Standard Fish Health Procedures performed at the facility:

- All fish health monitoring are conducted by a qualified WDFW fish health specialist.
- Juvenile fish examinations are conducted at least monthly and more often if necessary. A representative sample (at the discretion of the fish health specialist) of healthy and moribund fish from each lot is examined.
- Abnormal levels of fish loss are investigated when occur.
- Fish health status is determined prior to release or transfer to another facility. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release or transfer.
- Appropriate actions, including drug or chemical treatments are recommended as necessary. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile is be generated when possible.
- Findings and results of fish health monitoring are recorded on a standard fish health reporting form and maintained in a fish health database.

- Fish culture practices are reviewed as necessary with facility personnel. Where pertinent; nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures and treatments are discussed.

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

In the case of a catastrophic event, conditions critical to the fish's health would be monitored and if necessary, fish could be released prematurely or moved to other facilities, if space available, to prevent loss.

Flooding has not been a problem since Whatcom Creek Hatchery started operations in 1979.

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.

The hatchery-produced pinks may serve as prey for larger migrating salmonids and other fish in the marine environment.

Preliminary 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, sandlance, chum, and when present, pink salmon. Released at the size of 400fpp, chum does not pose risk to any listed species at the time of releases; it may rather serve as the source of food.

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 purpose of monitoring is to identify and evaluate the benefits and risks from this hatchery program, elements of which are identified in HGMP section 1.10. The Co-managers conduct numerous ongoing monitoring programs, including catch, escapement, marking, tagging, smolt trapping and fish health testing. The focus of enhanced monitoring and evaluation programs will be on the risks posed by ecological interactions with listed species.

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.

Risk aversion measures will be developed, if funding is available, in conjunction with the monitoring and evaluation plans.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Not applicable

12.2) Cooperating and funding agencies.

Not applicable

12.3) Principle investigator or project supervisor and staff.

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

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

Not applicable

12.10) Alternative methods to achieve project objectives.

Not applicable

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

Not applicable

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

Not applicable

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

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

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

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

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

Nooksack Bull Trout *(Salvelinus confluentus):* Bull trout were listed as a threatened species in the Coastal-Puget Sound Distinct Population Segment on November 1, 1999 (64 FR 58910). Ten local populations have been identified in the Nooksack Core Area, based the distribution of suitable spawning and rearing habitat: Lower, Middle and Upper North Fork, Lower and Upper Middle Fork, Lower and Upper South Fork, Glacier Creek, Lower Canyon Creek and Wanlick Creek. The anadromous form is known to be present and it is possible that the fluvial and resident life history forms are also present in the core area. Anadromous outmigrants have caught in the lower mainstem from early April through mid-July (USFWS 2004). Bull trout spawning is known to occur throughout much of the upper watershed and is mainly confined to non-glacier tributary streams. Little, if any, comprehensive information exists concerning escapement levels, population size, or past harvest levels and as such the current status of the Nooksack bull trout is unknown (WDFW Bull Trout SaSI 2004). In Bellingham Bay, bull trout were observed in Squalicum Creek in the late 1970's and in lower Whatcom Creek more recently. In 2002, three sub-adult bull trout approximately 203 to 229 millimeters (8 to 9 inches) in length entered the Whatcom Creek Hatchery pond. These were reported to be the first bull trout observed at the facility in more than a decade, although formerly one to two a year were said to be observed at the facility. The recovered abundance level for bull trout in the Nooksack Core Area has been set at 2000 adult spawners, based on current habitat capacity (USFWS 2004).

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

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

Source Data: USFWS 2008

Habitat— Forest practices in the past, 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.

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

15.4) Actions taken to minimize potential effects.

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

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

15.5) References

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

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

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

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

Listed species affected: Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Puget Sound/ Nooksack Chinook	**Activity:** Whatcom Creek Fall Pink Salmon Program	
Location of hatchery activity: Whatcom Creek Hatchery, RM 0.5 of Whatcom Creek (01.0566)	**Dates of activity:** August-September	**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***		
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

Instructions:

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

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

Listed species affected: Steelhead *(Oncorhynchus mykiss)*	**ESU/Population:** Puget Sound/ Nooksack Steelhead		**Activity:** Whatcom Creek Fall Pink Salmon Program
Location of hatchery activity: Whatcom Creek Hatchery, RM 0.5 of Whatcom Creek (01.0566)	**Dates of activity:** August-September		**Hatchery program operator:** WDFW
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Stock - (see “Population”).

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

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

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

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

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

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