HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Photo: Puget Sound Energy

Hatchery Program:	Baker River Coho Hatchery Program (Integrated)
Species or Hatchery Stock:	Baker River Coho (Oncorhynchus kisutch)
Agency/Operator:	Puget Sound Energy Washington Department of Fish and Wildlife
Watershed and Region:	Skagit River/ North Puget Sound
Date Submitted:	
Date Last Updated:	October 31, 2014

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1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Baker River coho program at Baker Lake Hatchery

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

Baker River (Skagit River) Coho (*Oncorhynchus kisutch)* – Puget Sound coho is not ESA listed.

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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

Baker River coho program is co-managed with the **Sauk-Suiattle Tribe** and **Swinomish Indian Tribal Community** (represented by Skagit River System Cooperative, (SRSC), and **Upper Skagit Indian Tribe.**

Puget Sound Energy (PSE) is the owner and operator of the hatchery facility, (with the exception of hatchery manager who is WDFW employee), and Baker River Upstream Fish Trap. PSE provides funding per the Baker License, for the program as directed by the Co-Managers, who conducts consultation, in regard of hatchery programs operations, and reports to the **Aquatics Resource Group** (ARG). The ARG annually evaluate and update fish release numbers, locations, times and size at release proposed by the Co-Managers. The ARG includes PSE, Upper Skagit Indian Tribe, SRSC, National Park Service, National Marine Fisheries Service (NMFS), local citizens, and all interested **Baker River Coordinating Committee** (BRCC) members. The BRCC includes WDFW, PSE, SRSC, USFWS, US Forest Service, National Park Service, and all Signatories of the Settlement Agreement. The BRCC has overarching authority over the license implementation for the Baker River hydroelectric project and function of associated resource groups, including the ARG.

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

Funding Sources	Operational Information (for FY 2015)
Puget Sound Energy	Full time equivalent staff – 6.0 PSE, 1.0 WDFW Annual operating cost - $535,425

PSE funds implementation of the Fish Propagation Facilities Plan as specified by conditions in Settlement Agreement Article 101 for Baker River Project, FERC No. 2150.

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1.5 Location(s) of hatchery and associated facilities.

Table 1.5.1:

Facility	Culturing Phase	Location
Baker River Upstream Fish Trap	Broodstock collection	Baker River (WRIA 04.0435) at RM 0.7, tributary to Skagit River (WRIA 03.0176) at RM 56.5.
Baker Lake Hatchery	Incubation, rearing,	Sulphur Creek (WRIA 04.0488), tributary to Lake Shannon (water reservoir behind Lower Baker Dam on Baker River (WRIA 04.0435) at RM 8.9. Baker River is a tributary to the Skagit River (WRIA 03.0176) at RM 56.5.
In-River (Lake Shannon)	Release	Water reservoir behind Lower Baker Dam on Baker River (WRIA 04.0435) at RM 8.9
In-River (Baker Lake)		Water reservoir behind Upper Baker Dam on Baker River (WRIA 04.0435) at RM 9.1.
In-River (Baker River)		Tributary to the Skagit River (WRIA 03.0176) at RM 56.5.

1.6 Type of program.

This in an integrated program with hatchery fish utilized for research and harvest.

1.7 Purpose (Goal) of program.

Mitigation.

1.8 Justification for the program.

The program is being incorporated in accordance with Settlement Agreement Article 101 for the Baker River Project. Mitigation and enhancement measures that address Baker River Project will be included in Baker River Co-Managers Fish Production Plan.

Fish from the program are utilized to

1) Supply smolts for experimental efficiency research study of Floating Surface Collectors (FSC) located on Baker Lake and Lake Shannon,
2) Supplement natural production in the basin.

To minimize impacts on listed fish by the Baker Lake facilities operation and the Baker Lake coho program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Baker Lake coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Usage of spring water is regulated through WDOE water right permits for Sulphur Spring (S1-25440) and Domestic Spring (G1-28743)
Intake Screening	4.2	Water for hatchery operation is withdrawn directly from natural spring, domestic spring or overflow water from Depression Lake. Fish are not present at the natural springs and domestic spring. Water available to the hatchery from the Depression Lake sips through the ground into the channel and land is not accessible to the fish.
Effluent Discharge	4.2	No NPDES permit is required for facilities with production of less than 20,000 pounds per year in accordance to criteria set by WDOE as the limit for concern in regard of hatchery effluent discharge effects. Baker Lake Hatchery production falls in this category.
Broodstock Collection & Adult Passage	2.2.3, 7.9	Two Baker River dams are too high for conventional fish ladders and permanently block natural access to Baker

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		River above Lower Baker Dam. All fish returning to Baker River are trapped, collected and sorted at the Baker River Upstream Fish Trap and transported to their release destination by truck. Coho broodstock is collected from fish marked with CWT that volunteer to the Baker River Upstream Fish Trap during routine fish collection operation, which would be held out regardless of coho broodstock collection and as such does not affect listed fish passage in any additional way.
Disease Transmission	2.2.3, 7.7, 9.2.7	The culturing operation at the hatchery is conducted in accordance with *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) to prevent introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size, life-history stage (smolts), and location to foster rapid downstream migration to marine waters.

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.

Table 1.10.1.1: "Performance indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in *US v WA.*	Contributes to co-manager harvest.	Fish contribution to fisheries will be estimated.
3.1.2- Program contributes to mitigation requirements.	This program provides mitigation benefits in accordance with Settlement Agreement Article 101 for the Baker River Project.	Survival and contribution to fisheries will be estimated.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Number of marks and estimated total proportion of this population in juvenile dispersal and in adults returning to the Baker River Upstream Fish Trap.	Fish released for FSC efficiency study are uniquely marked with adipose fin-clip (AD) and PIT tag (previously freeze brand) and monitored for these marked at FSC.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.1.1: "Performance indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring and Evaluation**
3.1.3 Program addresses ESA responsibilities.	ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been	First HGMP for this program was submitted to NOAA fisheries in March 2003. This HGMP has been updated to

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	determined sufficient under Section 4(d), as applicable.	reflect changes in the program and resubmitted to NOAA fisheries
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Number of marks and estimated total proportion of this population in juvenile dispersal and in adults returning to the Baker River Upstream Fish Trap.	Fish released for harvest are adipose fin-clipped only and can be only monitored for their hatchery origin.
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.
3.5.2 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 and sex composition data are collected and recorded annually.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population	Observed and estimated total numbers of naturally and artificially produced adults passing a counting station before passed to natural spawning areas.	Returning fish are annually examined for the external and internal marks at the Baker River Upstream Fish Trap.
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of release (on-station, acclimation pond, direct plant). Release type (forced, volitional or direct stream release).	Release information including location, method, and age is annually recorded in WDFW Hatcheries Headquarters Database.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Scientifically based experimental design, with measurable objectives and hypotheses.	The program is operated consistent with *the Co-Manager's Fish Health Policy* (WDFW and WWTIT 1998, updated 2006) and WDFW rearing standards. Data in regards of hatchery population growth, development, and return, including annual size and run timing, age and sex composition is monitored.
3.7.1 Hatchery facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (IHOT, PNFHPC, the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), INAD, MDFWP)	Annual reports indicating levels of compliance with applicable standards and criteria. Periodic audits indicating level of compliance with applicable standards and criteria.	Fish Health Section pathologists monitor program monthly. Exams performed at each life stage may include tests for viruses, bacteria, parasites and/or pathological changes, as needed. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

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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	No NPDES permit is required for facilities with production of less than 20,000 pounds per year in accordance to criteria set by WDOE as the limit for concern in regard of hatchery effluent discharge effects. Baker Lake Hatchery production falls in this category.
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	The current barriers and intake structures have been evaluated and needed changes has been recommended and 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).	Release and/or transfer exams for pathogens and parasites	Fish to be releases are examined 1 to 6 weeks prior to transfer or release, in accordance with the *Co-managers Fish Health Policy* (WDFW and WWTIT 1998, updated 2006).
	Inspection of adult broodstock for pathogens and parasites	Lots of 60 adult broodstock are examined for pathogens at spawning.
	Necropsies of fish to assess health, nutritional status, and culture conditions	Adult broodstock is annually inspected by Fish Health Section pathologist for pathogens. Juvenile fish are monitored monthly for health assessment. WDFW's Fish Health Section pathologist recommends preventative or remedial measures to prevent or treat disease, with administration of therapeutic or prophylactic treatments as deemed necessary. A fish health database is maintained to identify trends in fish health, diseases and treatments.
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.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). No surplus hatchery adults are collected. Disposition of carcasses are recorded in the WDFW Hatchery Adult Database and

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		disposed in an approved manner.
3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.	Annual run timing and spawning areas are monitored 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.	Annual release dates, type of release and location are recorded annually.

1.11 Expected size of program.

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

Around 200 adult coho are needed for broodstock to fulfill egg take goal of 240,000 eggs (FBD 2014). On average, 182 fish were collected for broodstock within last 12 years, with the maximum collection of 229 fish (see **Table 1.12.1**).

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

Table 1.11.2.1: Annual release goals

Life Stage	Release Location	Annual Release Level	Goal
Yearling	Baker Lake	Up to 10,000	FSC Study
	Lake Shannon	Up to 10,000	FSC study
	Baker River (WRIA 04.0435)	Up to 40,000	Harvest
Fry	Lake Shannon	Up to 160,000	Harvest

Source: Future Brood Document 2014

Release numbers, locations, times and fish size at release are evaluated and updated annually by Aquatic Resources Group.

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

The natural coho population in the Skagit River is biologically significant and has been assigned a key wild management unit status (one of five) in Puget Sound (CCMP 1998).

Current short- and long-term population trend and growth rate estimates, as presented by Ford (2011), indicates a self-replacing population. The Baker River hatchery coho population has been assigned an auxiliary status (CCMP 1998).

The average marine survival rate for wild Baker River coho population for years 1992-2008 was estimated 8.10% (Zimmerman 2009). The passage efficiency of the migrating juveniles has improved with the installation of the FSCs (2008 in Baker Lake and 2013 in Lake Shannon) that can currently collect estimated 90% of the migrants in comparison to previously used gulpers that collected estimated 50%.

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Table 1.12.1: Coho escapement to the Baker River Upstream Fish Trap, broodstock and Baker Lake transfers.

Year	Total Trap Collection	Hatchery origin collection	Broodstock Transfer	Baker Lake Transfer
2002	7,648	2,822	151	7,480
2003	7,335	4,506	212	7,119
2004	4,305	1,555	199	4,090
2005	3,968	1,918	189	3,758
2006	965	514	63	899
2007	5,212	1,472	194	4,994
2008	2,247	949	166	2,077
2009	3,994	1,762	203	3,777
2010	3,282	320	217	3,055
2011	2,783	757	157	2,620
2012	5,543	1,100	201	5,330
2013	4,106	1,373	229	3,842
Average	**4,282**	**1,587**	**182**	**4,087**

Source: Puget Sound Energy, 2014.

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

This program began in 1992.

1.14 Expected duration of program.

This program is ongoing and is expected to continue long-term.

1.15 Watersheds targeted by program.

The program targets the Skagit River watershed (WRIA 03 and 04).

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

In order for any alternative actions to be considered for attaining program goals, the affected parties (co-managers) must approve any changes. In the Skagit River watershed any changes in the production at the Baker Lake Hatchery have to be reviewed and approved by WDFW and Sauk-Suiattle Tribe, Swinomish Indian Tribal Community and Upper Skagit Indian Tribe.

Alternative 1: Modification or termination of program. The Co-managers did not pursue this alternative until the Co-managers replace the coho program with other production, as per the Baker Settlement Agreement Article 101, SA 101 (e):

> *"Licensee shall continue the existing programs described below, unless modified or terminated at the direction of the Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, Upper Skagit Tribe, and Washington Department of Fish and Wildlife ("Fish Co-managers"). Licensee shall fund and implement fish propagation and enhancement programs, when and if directed by the Fish Co-managers according to the following: 1) fisheries management objectives provided to license by the co-managers, 2) weight and production targets established by the co-managers, within the capacity and production limits (maximum 20,000 pounds for no more than three months annually) of the facilities required by this article, 3) species mix, life stages, and quantities, based on Co-managers' direction, within the capacity and production limits of the facilities required by this article, and 4) facility production is limited to the space available to the Sulphur Springs site" (Fish*

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Propagation Facilities Plan, Baker Settlement Agreement Article 101, Baker River Project, FERC No. 2150).

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

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

This HGMP was previously submitted to NOAA in March of 2003; however it was never acted on by NOAA. This HGMP is submitted to NOAA Fisheries for ESA consultation, and determination regarding compliance of the plan with ESA Limit 6 of the 4(d) rule criteria for joint state/tribal hatchery resource management plans affecting listed species.

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

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

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

None directly.

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

Puget Sound Chinook (*Oncorhynchus tshawytscha*): Listed as *Threatened* on March 24, 1999 (64FR14308); *Threatened* status reaffirmed on June 28, 2005 (70FR37160); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The Puget Sound Chinook salmon ESU is composed of 31 historically quasi-independent populations, of which 22 are believed to be extant currently. The ESU includes all naturally-spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington (Ford 2011), as well as twenty-seven artificial propagation programs (NMFS 2013 78FR38270). In the Skagit basin, the Technical Recovery Team (TRT) has identified demographically independent populations (DIPs) in the Lower Skagit River, Upper Skagit River, Upper Cascade River, Lower Sauk River, Upper Sauk River and Suiattle River (Ruckelshaus et al. 2006).

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

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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.

Skagit River spring Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2001-2012) have averaged 660 for natural spawners in the Upper Sauk River DIP, 351 for the Suiattle River DIP and 371 for the Cascade River DIP. During this same period, the Upper Sauk DIP has shown and increasing population trend, while the Suiattle has decreased and the Cascade has remained relatively stable (SaSI, WDFW 2013).

Skagit Summer/ Fall Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2001-2012) have averaged 10,695 for natural spawners in the Upper Skagit River DIP, 700 for the Lower Sauk River DIP and 2,403 for the Lower Skagit River DIP. All populations have shown declining population trends during this same period (SaSI, WDFW 2013).

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

See Marblemount Chinook HGMPs for Chinook viability criteria.

Skagit River summer and winter-run steelhead in the Puget Sound Steelhead DPS. The number of natural-origin winter steelhead has substantially increased in the last five years. From a low point in 2008-2009 of 2,502 spawners, the number of spawners increased to 3,981 in 2009-2010, 5462 in 2010-2011, to 6,182 in 2011-2012, and to 8,272 in 2012-2013. Ford (2011) used spawner data collected through 2008 and concluded the following: "Steelhead counts in the Skagit River have declined steadily since the 1980s. The estimated probability that this steelhead population would decline to 10% of its current estimated abundance (i.e., to 504 fish) is high—about 80% within 75 years. With an estimated mean population growth rate of −0.037 ($\lambda = 0.964$) and process variance of 0.005, NOAA was confident ($P < 0.05$) that a 90% decline in this population will not occur within the next 30 years, and that a 99% decline will not occur within the next 60 years. However, beyond the next 50 years NOAA was uncertain about the precise level of risk." Based on a habitat-based intrinsic potential (IP) estimate by the PSSTRT (2013), the capacity for summer and winter steelhead in Skagit system ranges from 6,478 to 129,551 for the mainstem Skagit DIP, 2,323 to 46,460 for the Sauk DIP, 503 to 10,056 for the Baker River DIP and between 123 and 2,462 for the Nookachamps Creek winter steelhead DIP (**Table 2.2.2.1**).

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

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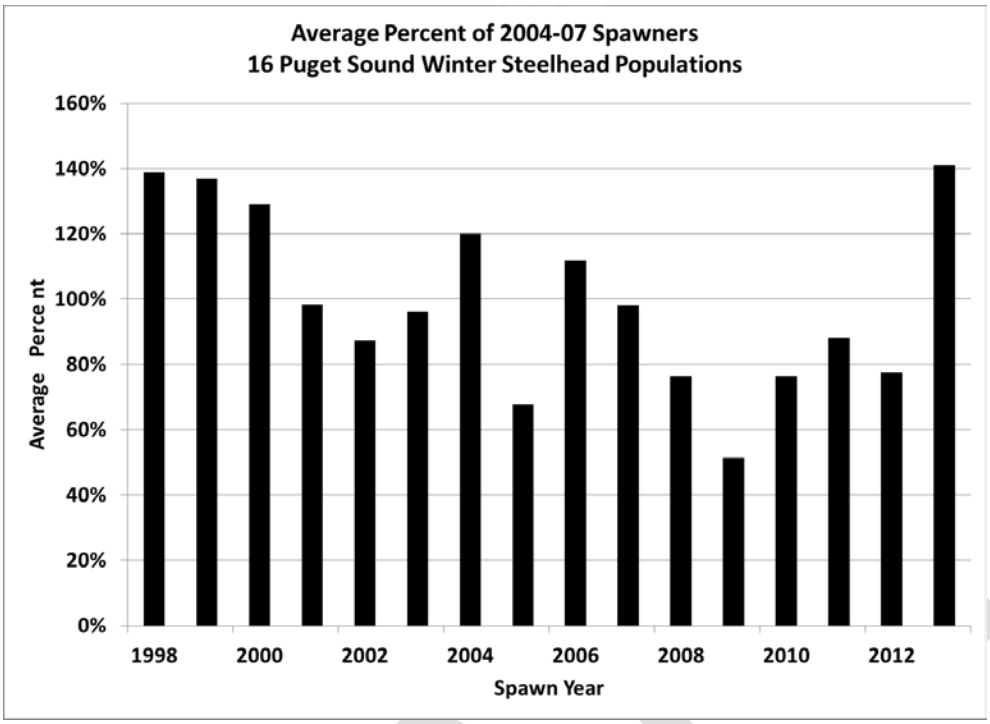

Figure 2.2.2.1. Average percent of 2004-2007 spawners for 16 Puget Sound winter steelhead populations.

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

Table 2.2.2.1: Estimated DIP abundance thresholds of wild steelhead in the Skagit basin. Abundance goals for summer-run fish (*italics*) are still under review. QET, quasi extinction threshold; SAS, smolt to adult survival. Minimum abundance = 100 (Low Abundance), 250 (Viable).

Population Basin				Quasi Extinction Threshold	Low Abundance	Viable	Capacity
Population Name	Area km^2	Mean Elevation (m)	Total Stream Length (m)		1% SAS	5% SAS	20% SAS
Nookachamps Creek	183	252	159,503	27	123	616	2,462
Skagit River	5,543	1,098	2,815,113	157	6,478	32,388	129,551
Sauk River	1,897	1,132	1,079,263	103	2,323	11,615	46,460
Baker River	771	999	421,859	36	503	2,514	10,056
Puget DPS Total				**1,462**	**30,449**	**153,194**	**613,662**

Source: Hard et al. 2014

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

See Marblemount Chinook HGMPs for Chinook productivity data.

Skagit System Steelhead (*Oncorhynchus mykiss*): Smolt monitoring traps utilized in larger river systems cannot successfully trap steelhead smolts. Smolt monitoring for Chinook and coho salmon in the Skagit River system indicates low numbers of wild steelhead smolts incidentally caught (Kinsel et al. 2008).

Table 2.2.2.2: Steelhead smolts and adults caught in Skagit River scoop and screw traps 1998-2007.

Species	1998		1999		2000		2001		2002	
	Scp	Scr	Scp	Scr	Scp	Scr	Scp	Scr	Scp	Scr
Steelhead 1+										
Natural	389	1,100	99	334	95	597	32	317	118	437
Hatchery	446	2,325	122	511	75	736	23	465	75	534
Steelhead Adult	1	3	11	1	1	2	0	0	1	2
Species	**2003**		**2004**		**2005**		**2006**		**2007**	
	Scp	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**
Steelhead 1+										
Natural	32	366	337	1,287	45	289	36	293	179	746
Hatchery	26	474	213	2,401	16	183	17	624	114	1,932
Steelhead Adult	0	0	0	0	2	0	0	0	0	3

Source: Kinsel et al. 2008.

Table 2.2.2.3: Steelhead Exp Population. Trend ln(nat. spawners) (95% CI)

Population	1985-2009	1995-2009
Skagit River winter-run	0.969 (0.954 - 0.985)	0.978 (0.931 - 1.029)

Source: Ford 2011. These are based on analyses reported by Ford (2011) that are not necessarily agreed to by WDFW, the Sauk-Suiattle Tribe, Swinomish Indian Tribal Community, and the Upper Skagit Indian Tribe.

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

See Marblemount Chinook HGMPs for Chinook escapement data.

Table 2.2.2.8: Wild Skagit River steelhead escapement 2000-2011.

Return Year	Winter Run*	Summer Run
1999/2000	3,780	NA
2000/2001	4,584	NA
2001/2002	5,394	NA
2002/2003	6,818	NA
2003/2004	7,332	NA
2004/2005	6,382	NA
2005/2006	6,757	NA
2006/2007	4,242	NA
2007/2008	4,887	NA
2008/2009	2,502	NA
2009/2010	3,981	NA
2010/2011	5,462	NA
Average	**5,177**	**NA**

Source: SaSI, WDFW 2012

* Total Escapement Data are total escapement estimates for all Skagit Basin winter steelhead and include winter steelhead in the Sauk, Suiattle, White Chuck and Cascade Rivers. Estimate is based on AUC redd counts from flights in the mainstem Skagit River from RM 22.5 to 94.1 and in the Sauk River from 0.0 to the forks, including up to RM 2.5 on the SF Sauk. Mainstem areas not surveyed are expanded for. Tributaries Alder, Diobsud, Rocky, O'Toole, Cumberland, Day, Sorenson, Hansen and Jones creeks, White, Dan's, Murphy, and Falls are surveyed and cumulative redd counts are tallied in order to calculate expansions for unsurveyed tributaries .

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

See Marblemount Chinook HGMPs for hatchery- and natural-origin Chinook estimates.

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: Two Baker River dams are too high for conventional fish ladders and permanently block natural access to Baker River above Lower Baker Dam. Salmonids existence above the dams depends on human intervention. All fish returning to Baker River are trapped, collected and sorted at the Baker River Upstream Fish Trap for transportation above the dams and/or distribution in accordance with adult salmon species management protocol, updated as required by Co-managers. Coho broodstock is collected from volunteers (marked with CWT) returning to the Baker River Upstream Fish Trap during routine fish collection operation, which would be held out regardless of sockeye broodstock collection effort and as such does not affect listed fish passage in any additional way. No broodstock collection takes place at the Baker Lake Hatchery.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include: water withdrawal, hatchery effluent, and intake compliance. Hatchery operation, monitoring and maintenance are conducted within and in accordance to permitted guidelines (see HGMP sections 4.1 and 4.2). Permit requirements are followed to minimize potential indirect 'Take" associated with the operations of hatchery facilities. No take of listed fish have been reported by staff during the normal operation of this hatchery.

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

Predation/Competition: Although coho have been documented to prey on other salmonids (primarily pink, chum and sockeye salmon) (Hawkins and Tipping 1999; Seiler et al. 2002; Hargreaves and LeBrasseur 1986), any predation potential to listed populations should be minimized by the size, timing and proximity of the releases. Coho released through this hatchery program may encounter rearing and emigrating listed Chinook juveniles, however are unlikely to pose significant risk to listed fish. To minimize predation and competition potential to listed populations, coho are released in June, after majority of the Chinook left the system. Trapping studies on the Skagit River (Seiler et al. 1999) showed that by mid-May, over 80% of the natural-origin listed Chinook migration had passed the trap site. Coho are also released at the average size of 21 fpp (20 fpp corresponds with 133 mm fork length). Assuming the "1/3 size rule" (USFWS 1994), Chinook salmon smaller than 44 mm fork length (f.l.) may be susceptible to predation by the average size hatchery coho released through this program. The size of age 0 juvenile Chinook emigrating out of the Skagit River in late-May average ~60 mm f.l. (Seiler at all, 1999), and is larger than the predation susceptibility size thus less likely to be preyed upon by

the migrating hatchery coho. The duration of interaction between the two species may also be limited. Data from Seiler et al. (1998; 2000) indicated that coho smolts released from the Marblemount Hatchery emigrated quite rapidly, approximately 11.2 river miles per day, reaching the trap site (located at RM 17) within days of release. Steward and Bjornn (1990) also concluded, that hatchery fish kept in the facility for extended periods before release as smolts (e.g. yearlings) may have different food and habitat preferences than listed natural-origin fish making it less likely to out-compete the latter.

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

No direct mortality of listed fish is associated with this hatchery program. Broodstock is collected at the Baker River Upstream Fish Trap, where all retuning fish are collected for transportation around the dams, and only non-listed fish are raised at the hatchery.

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

See "Take" table at end of HGMP.

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

There is no take of listed fish projected for this program.

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

This HGMP is a component of the co-managers comprehensive resource management plan for Puget Sound coho.

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

PSE received a new 50-year operating license for the Baker River Hydroelectric Project in October 2008 from the Federal Energy Regulatory Commission (FERC). Four years earlier, PSE and twenty-three other parties including State and Federal Agencies, and Indian Tribes submitted a comprehensive settlement agreement to FERC for what later became the updated project license. The Settlement Agreement describe a comprehensive and long-term operating agreement that will provide significant and wide-ranging public benefits and provide for the protection, mitigation and enhancement of species affected by the Baker River Hydroelectric Project.

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

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

3.3 Relationship to harvest objectives.

Skagit River coho harvest management is directed on wild fish; however, fish produced through the Baker River hatchery program also contribute to a variety of fisheries including Canadian, Washington sport, Treaty and Non-Treaty commercial fisheries especially in the Skagit River.

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

Each year state and tribal Co-managers plan and agree to a package of recreational and commercial salmon fisheries in consultation with Federal and Canadian fishery managers. These pre-season planning processes, known as the Pacific Fishery Management Council (PFMC), North of Falcon (NOF), and Pacific Salmon Commission (PSC) planning processes, involve a series of public meetings between domestic and international federal, state, tribal and industry representatives and other concerned citizens.

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.

Adults from the Baker Lake coho program contribute to the Washington sport, non-tribal commercial and tribal harvest at an average rate of 10%. They contribute to the Canadian harvest at an average rate of 21%. Escapement back to the trap/hatchery is at an average rate of 69%.

3.4 Relationship to habitat protection and recovery strategies.

Habitat protection and restoration strategies are paramount to the self-sustaining, natural populations. Habitat protection and recovery strategies are addressed in documents developed for the Puget Sound area and individual watersheds. Different groups are involved in planning, funding and realizing restoration projects through the region as listed below.

Baker River Coordinating Committee: Implements the terms of the Settlement Agreement and coordinates the work of Aquatic Resource Group (ARG) and the Terrestrial Resource Implementation Group (TRIG) in regards of habitat protection and restoration.

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

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

State of Our Watershed: Individual member Tribes have worked with the NWIFC and SSHIAP to create the State of Our Watersheds report. This document examines key indicators of habitat quality and quantity across more than 20 watersheds in western Washington that lie within tribal Usual and Accustomed fishing areas as defined by *U.S. v Washington* (1974 Boldt Decision).

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

Lead Entities **-** The Skagit Watershed Council is the Lead Entity for the Skagit basin that includes the lower and upper Skagit River (WRIAs 3 & 4). The Skagit Basin is the largest watershed in Puget Sound. The land use in the lower portion is 64% forestry, 22% agriculture, 5% urban, 4% range and 5% other. In the uplands, land use is 73% forestry, 12% range and 15% other (see also http://www.rco.wa.gov/salmon_recovery/lead_entities.shtml).

Regional Fisheries Enhancement Groups (RFEGs). **S**everal citizen based groups work in conjunction with local governments on habitat actions to benefit both listed and non-listed stock in the system. In the Skagit River system this includes the Skagit Fisheries Enhancement Group.

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

3.5 Ecological interactions.

(1) *Salmonid and non-salmonid fishes or other species that could negatively impact the program.* Negative impacts by fishes and other species on the Baker Lake Hatchery coho 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 coho survival rates through predation on newly released, emigrating juvenile fish in the freshwater and marine areas. Certain avian and mammalian species may also prey on juvenile coho while the fish are rearing at the hatchery site, if these species are not excluded from the rearing areas. Species that could negatively impact juvenile coho 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 adult coho originating from the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Skagit River to the detriment of population abundance and the program's success in monitoring and evaluating the wild stock and harvest augmentation. 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 (focus is on listed and candidate salmonid species).

- Puget Sound Chinook
- Puget Sound steelhead
- Bull trout

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Fish species that could positively impact the program may include other salmonid species and trout present in the Skagit River watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the coho during their downstream migration

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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 Chinook. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) stimulation of primary productivity through the release of nutrients from decaying carcasses (Wipfli et al. 1998); 2) enrichment of the aquatic invertebrate food base from decaying carcasses (Mathisen et al. 1988); and 3) direct consumption of carcasses by juvenile salmonids (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 coho program could positively impact freshwater and marine fish species that prey on juvenile fish. Nutrients provided by decaying coho carcasses may also benefit fish in freshwater. These species include:
- Northern pikeminnow
- Coho salmon
- Cutthroat trout
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

4 SECTION 4. WATER SOURCE

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

Table 4.1.1: Water sources available for Baker Lake coho program.

Water Source	Water Right		Available Water Flow	Water Temp. (F°)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Big/Sulphur Springs	S1-25440C	----	40 cfs	47	Adult holding, Rearing	Unstable source due to sliding materials, sediment infusion.
Domestic spring	G1-28743	-----	1,150 gpm	47	Incubation	None
Depression Lake (Drainage tunnel)	G1-160818CL	----	Inactive	45-55	Emergency only, can be supplied to artificial beaches only	Overflow depends on Baker Lake water level

Source: Phinney 2006, WDOE Water Resources Explorer 2014, WDFW hatchery data.
[a] Water right permit held by WDFW.
[b] Water right permit held by Seattle Public Utilities.

Water from three sources available to supply Baker River Hatchery is gravity-fed to the facility.

The hatchery and Spawning Beach 4, located at Sulphur Creek, receives their primary water supply from groundwater springs. Turbidity events are monitored by an alarm system. Intake screens are installed to reduce the amount of organic debris entering the system.

Natural water spring, Sulphur Springs, is located in the higher elevation ¾ mile from the hatchery. Water flow from the spring can be disrupted by naturally caused (extensive rain periods) hill slides above the collection site. Due to sliding materials water supply to the hatchery

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was disrupted in 2003, 2005 and 2012 for up to two weeks at the time. Sliding material also elevates sediment content and before reaching ponds water flows through sand separators that are designed to provide sediment protection and removal capabilities. PSE is developing a plan to control sediment infusion and prevent sliding material from moving into water supply.

Domestic Spring supplies the potable water to entire Baker Lake compound. Water collected in excess of need for domestic use, before chlorine treatment, is directed into the hatchery and used for incubation.

Both springs are the source of good quality pathogen-free water at constant temperature of 47ºF.

When Baker Lake water level is above 705 feet, water seeps through the earthen dike and fills Depression Lake. The overflow water from Depression Lake can be used to supply spawning beaches during emergency situations but water availability from this source is dependent upon Baker Lake levels and is not always available.

Water rights at Baker River Hatchery are formalized through the Washington Department of Ecology (WDOE) for fish propagation. Surface water rights were obtained by Puget Sound Power & Light Co. for S1-25440 in 1989; water rights for the domestic spring (G1-28743) were obtained by Puget Sound Energy in 2012.

NPDES permits:
Annual hatchery production does not exceed the WDOE standard of 20,000 pounds per year regarding hatchery effluent discharge effects and no NPDES permit is required.

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.

There are no immediate risks to the listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge. Fish are not present at the springs. The principle hatchery water intake structures are in compliance with NOAA Fisheries screening criteria (NMFS 1995, 1996).

5 SECTION 5. FACILITIES

Currently operating Baker Lake Hatchery rebuilding and renovation (including modifications to sockeye spawning beach 4) was completed in 2011 as part of the settlement agreement (FERC). The facility operation before renovation was described in a previously submitted HGMP.

5.1 Broodstock collection facilities (or methods).

Adult coho for broodstock are collected at the Baker River Upstream Fish Trap located on the Baker River at RM 0.7, half a miles downstream from Lower Baker Dam. The state-of-the-art facility is owned and operated by Puget Sound Energy. It was built to collect all fish returning to the Baker River for transportation above two Baker River dams (see video of Baker River Upstream Fish Trap). A weir blocks the river and directs all fish into the trap where they can be enumerated, identified, segregated by species, and transported and distributed according to the Baker River Upstream Fish Trap operations protocol.

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

Table 5.2.1: Trucks available for transportation at Baker Lake Hatchery.

Facility	Type	Capacity	Fish Transported
Baker River Upstream Fish Trap and Baker River Hatchery	Truck-mounted tanks	2,000 gallon	Adults, fry and juveniles
		1,400 gallon	
		500 gallon	

All transport trucks are equipped with aerators and oxygen tanks.

5.3 Broodstock holding and spawning facilities.

Adult coho are held in two 8’W x 5'D x 80’L raceways supplied with Sulphur Springs water. Spawning takes place at the pond site.

5.4 Incubation facilities.

Table 5.4.1: Incubation vessels available at Baker Lake Hatchery.

Type	Number	Size
Vertical stack incubators	840	15" W x 2.5"D x 18"L
Shallow troughs	4	1’W x 1’ D x 24’L

Incubation area is divided into 5 separated rooms, each with separated water supply system disease transmission prevention. Four rooms are used for sockeye and one for coho incubation.

5.5 Rearing facilities.

Table 5.5.1: Rearing ponds available at Baker Lake Hatchery.

Type	Number	Dimensions
Swim up troughs	22	2’W x 2’D x 12’L
Intermediate troughs	6	3’W x 3’D x 24’L
Circular ponds	8	16’ Diameter x 4’D
Rearing raceways	4	8’W x 4’D x 80’L
Rectangular raceways	8	4’W x 4’D x 15’L
Adult holding ponds	4	20’W x 5’to 6’D x 65’L
Adult raceways	2	8’W x 5’D x 80’L
Spawning Beach	1(divided into 4 sections)	150’W x 6’D x 50L (each section)
Trout pond*	1	22,791 cubic feet

* Trout pond is the only pond kept from the old hatchery with consideration of potential use.

Table 5.5.2: “Stress Relief Ponds: available at the Baker River Upstream Fish Trap

Type	Number	Dimensions
Stress relief ponds	4	12’W x 72’’D x 40’L

5.6 Acclimation/release facilities.

All fish are reared primarily on Sulphur Springs water the entire time at the hatchery. No fish are released on-station, but transported by truck to release destinations into Baker Lake (five release sites), Lake Shannon (two release sites), and Baker River. Fish destined for Baker River release are held, in “stress relief ponds” located at the Baker River Upstream Fish Trap, for 24-hours before release.

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

None.

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.

The facility is equipped with low water alarms, turbidity alarm system, a back-up generator in case of power loss, and gas powered pumps. The Baker Dam operator receives alarm calls and contacts appropriate personnel in case of emergency.

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

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 Source.

Adult coho salmon returning to Baker River Upstream Fish Trap. Puget Sound coho are not ESA listed.

6.2 Supporting information.

6.2.1 History.

Baker River coho derived from adults captured at the Baker River trap beginning in 1924. In 1973 Baker River coho were first planted from Marblemount Hatchery. Coho adults from other stocks were released into Baker River system and therefore stock hybridization may have occurred before introduction to Marblemount hatchery. Additional hybridization might have occurred at the hatchery where both Baker and Clark Creek stocks were held together in the adult pond and however cut-off dates were used for stocks separation it might not been enough to adequately prevent stocks mixing (Fuss and Ashbrook, 1995).

Current coho program is maintained from adult fish returning to the Baker River Upstream Fish Trap with intent to maintain the program utilizing naturally-produced adults.

6.2.2 Annual size.

Around 200 adult coho are needed for broodstock to meet the egg-take goal of 240,000 (FBD 2014). On average, 182 fish were collected for broodstock within last 12 years, with the maximum of 229 fish (see **Table 1.12.1**).

6.2.3 Past and proposed level of natural fish in broodstock.

Broodstock entirely selected from natural origin fish with present coded wire tags is the goal of this program, however in years where not enough fish with CWTs can be collected, the remaining broodstock may be selected from fish with just intact adipose fin. Some of these fish may represent progeny of hatchery released unmarked fry.

6.2.4 Genetic or ecological differences.

Baker coho were identified as a stock based on their distinct spawning distribution, river entry timing (July through early August) which is earlier than that of Skagit coho (September to October), somewhat late spawn timing and small average size (two to four pounds) compared to Skagit coho (six to seven pounds), (SaSI 2002). Over the years adult coho from non-native stocks were released into Baker Lake and resulted in stock hybridization. Baker River stock coho were also planted from Marblemount Hatchery during the 1970s, when additional hybridization occurred. Both Baker and Clark Creek stocks were held together in the adult pond and however cut-off dates were used for stock separation, it did not prevent stocks mixing. Coded-wire tag analysis indicated that adults tagged as Baker River juveniles were spawned and classified as Clark Creek stock. This stock is considered as of mixed origin with composite production (SaSI 2002).

No genetic analysis has been done on Baker coho.

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6.2.5 Reasons for choosing.

The stock was chosen based on its indigenous origin.

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

No listed fish are selected for broodstock through this program and no adverse genetic or ecological effects to listed natural-origin fish occur as a result of broodstock selection practices.

7 SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2 Collection or sampling design.

Each year 25,000-30,000 natural origin juvenile coho are collected at the Baker Lake FSC and inserted with coded wired tags for use as an indicator stock of wild coho in the basin (see video of Baker Lake Floating Surface Collector). When returning to the Baker River Upstream Fish Trap, twenty percent (every fifth) of the fish with CWT presence are retained for stock indicator monitoring and utilized for hatchery broodstock. Fish collected in excess of broodstock needs are sacrificed for stock indictor monitoring and, depending on condition, can be distributed to the tribes or used for nutrient enhancement. If not enough fish for broodstock needs can be recruited from that group, remaining broodstock is collected from returning fish with intact adipose fin. Some of this fish may represent progeny of hatchery released unmarked fry.

7.3 Identity.

Yearling fish released from the Baker Lake Hatchery has been adipose fins clipped since program inception. In addition smolts destined for FSC study has been PIT tagged since 2013, and marked with freeze brand before that. Hatchery fry are released unmarked, (see also **Table 10.7.1**).

7.4 Proposed number to be collected:

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

Around 200 adult coho are needed for broodstock to fulfill egg take goal of 240,000 eggs (FBD 2014). On average, 182 fish were collected for broodstock within last 12 years, with the maximum collection of 229 fish (see **Table 1.12.1**).

Table 7.4.2.1: Broodstock spawned at Baker Lake Hatchery for coho program.

Brood Year	Natural Origin Broodstock[a]		Total
	Male[b]	Female	
2002	74	81	155
2003	212 adults total; no breakdown available		212
2004	199 adults total; no breakdown available		199
2005	85	104	189
2006	34	31	65
2007	93	101	194
2008	84	82	166
2009	107	96	203
2010	109	94	202
2011	81	76	167

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2012	98	97	195
2013	108	100	208
Average	**93**	**93**	**180**

Source: Puget Sound Energy, 2013, WDFW Hatcheries Headquarters Database 2014.

[a] In 2011 not enough coded wire tagged fish returned and unmarked fish were used for the broodstock including 48 males and 48 females. 10 males with CWT were live spawned. In 2010, one female with no CWT was selected for broodstock.

[b] Jacks are also selected for broodstock and included as males.

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

Hatchery-origin fish, identified by absence of adipose fin, are not collected for the broodstock but transported directly from Baker River Upstream Fish Trap to Baker Lake and released to spawn naturally (see also HGMP section 7.2.).

7.6 Fish transportation and holding methods.

Coho collected at the Baker River Upstream Fish Trap can be transported by any of the trucks available at the facility. Tank size is chosen based on number of transported fish. Fish destined to the Baker Lake Hatchery and for Baker Lake releases are transported separately. Transportation time to the hatchery takes about 35 minutes. Broodstock is held in one of the adult holding ponds, supplied with water from Sulphur Springs.

Adults destined for Baker Lake are released at two different locations (Kulshan boat launch and "old resort" site – lake level permitting). Transportation time to the lake is about 45 minutes to each location.

7.7 Describe fish health maintenance and sanitation procedures applied.

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

Adult coho are treated every other day with formalin as a precaution for fungus infection. No other chemical treatment has been admitted for last five years.

7.8 Disposition of carcasses.

All carcasses of spawned-out adults and adult mortality are distributed into Baker Lake tributaries for nutrient enhancement.

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

Two Baker River dams are too high for conventional fish ladders and permanently block natural access to Baker River above Lower Baker Dam. Salmonids existence above the dams depends on human intervention. All fish returning to Baker River are trapped, collected and sorted at the Baker River Upstream Fish Trap for transportation above the dams and/or distribution in accordance with adult salmon species management protocol, updated as required by the Co-managers. Coho broodstock is collected from volunteers returning to the Baker River Upstream Fish Trap during routine fish collection operation, which would be held out regardless of sockeye broodstock collection effort and as such does not affect listed fish passage in any additional way.

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8 SECTION 8. MATING

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

8.1 Selection method.

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

8.2 Males.

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

In 2011 (a low return year), 10 males were live-spawned to assure that enough males were available for fertilization. As a general rule, if live spawned males are used, they are marked with an operculum punch, separated for easy identification and, when possible, used no more than twice.

8.3 Fertilization.

Eggs pooled from 2 to 5 females (depending on availability) are equally spread into same number of buckets and eggs in each bucket are fertilized with milt from one male (matrix spawning). After 60 seconds of fertilization time, milt from secondary male is added to ensure successful fertilization. The secondary male became a primary male for eggs in next bucket. After fertilization all eggs are combined into one bucket and moved to the incubation room.

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.

Listed fish are not included in mating scheme through this program. Puget Sound coho are not ESA listed.

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9 SECTION 9. INCUBATION AND REARING -

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

9.1 Incubation:

The egg-take goal for the program is 240,000 (FBD 2014).

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 coho eggs at Baker Lake Hatchery

Brood Year	Egg-Take	Survival Rates (%)	
		Green-to-Eye Up	Eye-Up-to-Ponding
2002	165,000	98.0	85.4
2003	110,826	99.0	63.0
2004	205,475	88.8	97.8
2005	170,206	96.2	99.9
2006	86,323	88.9	95.4
2007	173,939	96.6	99.8
2008	240,556	98.0	98.0
2009	220,589	95.4	98.4
2010	318,677	91.9	97.9
2011	179,836	96.5	99.2
2012	233,201	97.5	99.1
2013	249,756	93.6	95.7
Average	**196,199**	**95.0**	**94.1**

Source: WDFW hatchery records, 2014.

9.1.2 Cause for, and disposition of surplus egg takes.

The objective is to not collect eggs above egg-take goal. If hatchery losses exceed the expected levels, then program goals for release will not be met. Occasionally an egg surplus may result from inaccurate green egg sampling at the time of egg-take. A surplus of up to 10% is acceptable; anything beyond 10% will be culled.

9.1.3 Loading densities applied during incubation.

Fertilized eggs are placed in vertical incubators at ~3.5 pounds per tray.

9.1.4 Incubation conditions.

All eggs are incubated in trays supplied with water from domestic spring at the rate of 3gpm per ½ stack. The water has constant temperature of 47ºF. Dissolved oxygen levels are checked when needed. The saturation levels average over 10 ppm. Vexar® layers are placed in the trays to provide substrate. Water supplied from domestic spring does not contain silt.

9.1.5 Ponding.

When approximately 100% buttoned up (March) and ready for initial feeding, fish are moved from trays into intimidate troughs supplied with Sulphur spring water.

9.1.6 Fish health maintenance and monitoring.

All fertilized eggs are water hardened in an iodophor solution. Fungus in incubators is controlled by formalin drip, (15-minute injection per day at a target dose of 1,667-ppm formalin),

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throughout incubation to just prior to hatch. Once eyed eggs are shocked and dead eggs are removed. Fry loss is picked at the time of ponding and then daily.

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

No listed fish are incubated through this program or at the hatchery.

9.2 Rearing:

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

Table 9.2.1.1. Coho survival rates at Baker Lake Hatchery coho, brood years 2002-2013.

Brood Year	Fry-to-Sub-yearling	Sub-yearling-to-Smolt
2002	91.1	99.0
2003	90.0	99.8
2004	80.5	98.3
2005	91.3	99.2
2006	88.3	98.0
2007	90.5	99.0
2008	90.8	99.0
2009	90.7	99.0
2010	96.0	99.0
2011	99.9	85.7
2012	98.1	97.1
2013	98.3	Not yet available
Average	**92.1**	**97.6**

Source: WDFW hatchery records, 2014.

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

Loading and density levels at WDFW hatcheries conform to standards and guidelines set forth in Fish Hatchery Management (Piper et. al. 1982) and 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 initially reared (two weeks) in the intermediate troughs, and later in the raceways, both supplied with water from Sulphur Springs. In May/June 160,000 fry at a size of ~200 fpp are released into Lake Shannon. Remaining fish, to be released as yearlings, are mass marked when y reach the size of ~70-80 fpp (November). In January, at the size of ~20 fpp, fish destined for release into Lake Shannon and Baker Lake for FSC calibration study are PIT-tagged and moved for final rearing to 14-ft glass circular ponds supplied with water from Sulphur Springs.

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

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

Month	Average Size (fpp)
March	1,500
April	759
May	359
June	153
July	82
August	68
September	52
October	43
November	40
December	35
January	30
February	24
March	23-28
April	19-20
May	17-19

Source: WDFW hatchery records, 2014.

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).

Coho are fed a variety of diet formulations including crumbles and pellets; the food brand used may vary, depending on cost and vendor contracts. Feeding frequencies vary depending on fish size and water temperature and usually begin at 8 feedings/7 days/week, and end at 1 feedings/ 5 days/week. Feeding rates vary from 1.0% to 4.0% body weight/day. The overall feed conversion rate (feed fed/weight gained) for the season is approximately 1-1.3:1.

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 WDFW Fish Health Specialist. Hatchery personnel carry out treatments prescribed by the Fish Health Specialist. Procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). See also HGMP section 10.9 for WDFW Standard Fish Health Procedures.

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

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

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

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

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

No listed fish are propagated through this program; however, all reasonable and prudent measures are employed to minimize rearing and incubation losses. These include the use of high quality spring or well water for incubation, high quality feeds for rearing, rearing densities and loadings that conform to best management practices, frequent fish health inspections and the presence of professionally trained personnel to operate the facilities. Hatcheries are designed to provide safe and secure rearing environment through the use of alarm systems, backup generators, and water re-use pumping systems to prevent catastrophic fish losses.

10 SECTION 10. RELEASE

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

10.1 Proposed fish release levels.

Table 10.1.1: Proposed number, size, date of release, and location of program releases

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fry	Up to 160,000	200	May/June	Skagit River
Yearling	Up to 60,000	20	June	

Source: Future Brood Document 2014

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

Stream, river, or watercourse:
1. Baker Lake,
2. Lake Shannon
3. Baker River

Release point:
1. USFS Panorama Point, Blue Tarp (a designated fish release site), USFS Swift Creek (formerly Baker resort), Seaplane launch and Kulshan launch – all located on the west shore of the lake
2. Boat launch, tailrace below hatchery.
3. Baker River (through Stress Relief Ponds) at Baker River Upstream Fish Trap

Major watershed: Skagit River

Basin or Region: Puget Sound

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

Table 10.3.1: Number, size and dates of release, by year, 2003-2014.

Release Year	Fry	Avg. size (fpp)	Date(s)	Yearling	Avg. size (fpp)	Date(s)	CV*
2002	144,814	416	5/30	67,212	21	4/17	NA
2003	79,099	396	6/2	60,176	22	4/13	NA
2004	-----	-----	-----	69,567	21	5/12	NA
2005	111,310	638	5/22	62,810	21	4/14	NA
2006	96,119	379	6/2	53,929	20	5/8	NA
2007	12,652	169	6/21	61,155	25	5/3	NA
2008	112,975	277	6/10	63,553	21	5/14	NA
2009	153,937	291	6/10	59,191	24	4/24	NA
2010	154,234	150	6/23	64,327	21	5/5	NA
2011	226,302	220	5/25; 6/8	68,360	20	4/12-5/25	NA
2012	116,536	189	5/30	59,776	20	3/13 - 5/9	NA
2013	132,220	461	5/15	62,420	21	4/9 - 4/17	NA
2014	156,390	247	6/11	90,228	21	3/19 - 5/1	NA
Average	**124,716**	**319**		**64,823**	**21**		

Source: WDFW Hatcheries Headquarters Database 2014.
* CV is not calculated for the programs at this hatchery.

10.4 Actual dates of release and description of release protocols.

Hatchery releases: All fish released through this program are transported by truck to their release destination. Releases into Lake Shannon and Baker Lake are forced. Fish destined for release into Baker River are transported in batches and released into one at the time (out of three) "stress relief ponds" for 24 hours before screens are lifted to allow volitional release for two days. After that fish are forced out of the ponds. Utilization of one pond at the time allows for ponds rotation and assures their availability when needed.

Fish released into lakes are collected at the FSC, transported into "stress relief ponds" and released in the same way as described above.

See **Table 10.3.1** for releases dates.

10.5 Fish transportation procedures, if applicable.

All fish released through this program are transported by truck to their release destinations. Tanks sizes are chosen based on the fish size and load. Transportation time varies between 5 and 35 minutes depending on the destination.

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

All fish at the hatchery are reared on Sulphur Springs water. All fry and portion of yearlings destined for study are released into the lakes directly from the trucks. Remaining portion of the yearlings is released for 24 hours into "stress relief ponds," supplied with Baker River water, before screens are pulled to allow volitional release.

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

Table 10.7.1: Marks applied and numbers of fish marked.

Brood Year	Stage	Number	Marking
2014	Fry	All releases	Not Marked
	Yearlings	Up to 20,000	AD+PIT Tag
		Up to 40,000	AD Only

Source: Future Brood Document 2014

Yearlings released for FSC efficiency study were released ad clipped and either PIT tagged or freezes branded until brood year 2012 (including). Starting with brood year 2013, use of freeze brands was eliminated and replaced exclusively with PIT tags. The remaining yearling releases were/are 100% mass marked. Fry were/are released unmarked.

In addition to hatchery releases, each year 25,000-30,000 natural origin juvenile coho are collected at the Baker Lake FSC and inserted with coded wired tags for use as an indicator stock of wild coho in the basin. These fish are also utilized for hatchery broodstock.

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

Any fish in surplus to program release goal are released as fry into Lake Shannon.

10.9 Fish health certification procedures applied pre-release.

Standard Fish Health Procedures performed at the facility:

- *All fish health monitoring is conducted by a qualified WDFW fish health specialist.*
- *Juvenile fish examinations are conducted at least monthly and more often if necessary*. A representative sample (at the discretion of the fish health specialist) of healthy and moribund fish from each lot is examined.
- *Abnormal levels of fish loss are investigated if they occur*.
- *Fish health status is determined prior to release or transfer to another facility*. The exam may occur during the regular monthly monitoring visit, i.e. within 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 (drought or flooding) critical to the fish's survival, fish may be released early to prevent losses or moved to another facility if feasible. Up to date, when water supply to the hatchery was cut due to the hill slide, fish were relocated to the “Stress relief ponds”.

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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.

Coho released through this hatchery program may encounter rearing and emigrating listed Chinook. To minimize predation and competition potential to listed populations, coho are released in June, after majority of the Chinook left the system. Trapping studies on the Skagit River (Seiler et al. 1999) showed that by mid-May, over 80% of the natural-origin listed Chinook migration had passed the trap site. Coho are also released at the average size of 21 fpp (20 fpp corresponds with 133 mm f.l). Assuming the "1/3 size rule" (USFWS 1994), Chinook salmon smaller than 44 mm f.l. may be susceptible to predation by the average size hatchery coho released through this program. Zero-age juvenile Chinook emigrating out of the Skagit River in late-May average ~60 mm f.l. (Seiler at all, 1999), and are larger than the predation susceptibility size thus less likely to be preyed upon by the migrating hatchery coho. The duration of interaction between the two species may also be limited. Data from Seiler et al. (1998; 2000) indicated that coho smolts released from the Marblemount Hatchery emigrated quite rapidly, approximately 11.2 river miles per day, reaching the trap site (located at RM 17) within days of release. Steward and Bjornn (1990) also concluded, that hatchery fish kept in the facility for extended periods before release as smolts (e.g. yearlings) may have different food and habitat preferences than listed natural-origin fish making it less likely to out-compete the latter.

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

The monitoring process is used to verify if program goals are achieved and weight the program benefits against risks posed to wild populations (see HGMP section 1.10). This coho program was primarily designed to use program fish in an efficiency study of the FSC in Baker Lake and Lake Shannon. It is an ongoing program with goal to release up to 10,000 coho smolts marked with PIT tags (previously freeze brand) into each lake for annual FSC efficiency evaluation.

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

1. Up to 10,000 smolts per lake are annually ad clipped, marked with PIT tags and released into Baker Lake and Lake Shannon for FSC efficiency study.
2. Fish collected at FSC collectors are identified by marks, enumerated and efficiency of each FSC is calculated.
3. Fish with clipped adipose fin can be identified as hatchery origin fish at the traps

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

Funding opportunities exist in the framework of the Baker License.

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

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

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12 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.

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14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

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

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

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

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

Skagit Bull Trout *(Salvelinus confluentus):* Bull trout were listed as a threatened species in the Coastal-Puget Sound Distinct Population Segment on November 1, 1999 (64 FR 58910). The USFSW identified the Lower Skagit River below Diablo Dam as a core area with 19 local populations and two potential local populations (USFWS 2004). This core area supports all four life forms of bull trout: resident, fluvial, adfluvial, and anadromous. The adfluvial form is only found in the Baker River system in both Lake Shannon and Baker Lake. While spawning has been documented in the Baker River and its tributaries above Baker Lake, it is believed that bull trout in Lake Shannon originate from fish spilling over the upper Baker dam and that any natural spawning is extremely limited. Anadromous bull trout are found throughout the system and also make extensive use of the estuarine and nearshore waters foraging on juvenile salmon, smelt, sandlance and herring. Resident and fluvial forms are also found throughout the anadromous zones of the Lower Skagit core area. Primariy spawning areas are found in the upper portions of the watershed at an elevation of 1,000 to 3,000 feet. The Lower Skagit core area is thought to represent the largest population of bull trout in Washington State and the status of this stock is considered to be healthy (WDFW 2004). The recovered population level for the Lower Skagit core area has been set at 3,800 .

Table 15.1.1: Summary of core area rankings for population abundance, distribution and trend.

Core Area Population	Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Lower Skagit River	2,500-10,000	620-3,000	Increasing	Slightly	Low Risk

Source: USFWS 2008

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Table 15.1.2: Bull trout redd counts in the South Fork Sauk River spawning index area, and bull trout smolt counts at the lower Skagit River trap (representing entire core area), 1998 to 2009.

Year	Number of Redds	Smolts Captured
1998	62	358
1999	---	199
2000	---	246
2001	163	142
2002	318	189
2003	287	149
2004	433	186
2005	104	31
2006	143	90
2007	110	228
2008	208	146
2009	77	72
Average	**191**	**170**

Source: Zimmerman and Kinsel 2010

Habitat - Large portions of this core area fall within areas under National Park and Wilderness designation, so these areas have generally avoided many of the impacts from more intensive land management. Gorge Dam currently restricts connectivity between the Stetattle Creek local population and the majority of the core area. This has put the Stetattle Creek local population at increased risk, however this break in connectivity may be less significant to the core area as a whole due to the large number of connected local populations that exist below this barrier. The Baker Dams also restrict connectivity between the Baker Lake local population and Sulphur Creek potential local population and the rest of the core area. Operations of the Lower Baker Dam have at times significantly impacted water quantity in the lower Baker and Skagit Rivers. 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. Nearshore foraging habitats have and continue to be impacted by agricultural practices and development activities. Bull trout within this system were overharvested in the past, but the implementation of more restrictive regulations in the early 1990's have helped allow the population to increase in abundance from the low levels of the late 1980's. Recent spawning index area counts strongly indicate that this population is rebounding near or to recovered levels. (USFWS 2004).

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

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

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

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

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

15.3 Analyze effects.

There are no activities associated with this hatchery program that would directly impact the Skagit 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 above.

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.

Zimmerman, M. and Kinsel, C. 2010. Migration of anadromous juvenile bull yrout in the Skagit River, 1990-2009. Washington State Department of Fish and Wildlife,. FPT 11-01. Olympia, Washington.

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"Take" Table

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

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

* No broodstock collection takes place at the Baker Lake Hatchery. Broodstock for the program is collected at the Baker River Upstream Fish Trap operated by PSE.

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

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

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

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

* No broodstock collection takes place at the Baker Lake Hatchery. Broodstock for the program is collected at the Baker River Upstream Fish Trap operated by PSE.

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

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