HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Photo: Courtesy of Marblemount Hatchery Staff

Hatchery Program:	Skagit River Summer Chinook Hatchery Program (Integrated)
Species or Hatchery Stock:	Skagit River Summer Chinook (*Oncorhynchus tshawytscha*)
Agency/Operator:	Skagit River System Cooperative Washington Department of Fish and Wildlife
Watershed and Region:	Skagit River / Puget Sound
Date Submitted:	
Date Last Updated:	October 31, 2014

DRAFT

DRAFT

1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Skagit River summer Chinook program – Marblemount Hatchery.

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

Skagit River summer Chinook salmon (*Oncorhynchus tshawytscha*).

ESA Status: *Threatened*. Puget Sound Chinook was listed as *threatened* on March 24, 1999 (64FR14308); *Threatened* status was reaffirmed on June 28, 2005 (70FR37160); and August 15, 2011 (76FR50448). Summer Chinook salmon from the artificial propagation through the Marblemount Hatchery program is included in Puget Sound Chinook Evolutionary Significant Unit (ESU) listing (78FR38270).

1.3 Responsible organization and individuals

Hatchery Operations Staff Lead Contact

Name (and title): Ed Eleazer, Region 4-North, Hatchery Reform and Operations Manager
Agency or Tribe: Washington Department of Fish and Wildlife
Address: 16018 Mill Creek Blvd., Mill Creek, WA 98012
Telephone: 206-719-3293
Fax: 425-338-1066
Email: Edward.Eleazer@dfw.wa.gov

Fish Management Staff Lead Contact

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

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

The summer Chinook program is co-managed with the Sauk-Suiattle Tribe, Swinomish Indian Tribal Community (both represented by Skagit River System Cooperative, SRSC), and Upper Skagit Indian Tribe. The Skagit River System Cooperative (SRSC) provides natural resource management services for the Sauk-Suiattle Indian Tribe and the Swinomish Indian Tribal Community.

SRSC collects fish for the broodstock. WDFW staff spawn, incubate, rear and release fish and monitor the program along with the SRSC.

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

Funding Sources	Operational Information (for FY 2015)
General Fund – State	Full time equivalent staff – 3.48
DJ – Federal	Annual operating cost - $395,844

The General Fund and DJ funding information applies cumulatively to the annual operating cost of the Marblemount Hatchery and cannot be broken out specifically by program.

Funding for this program is also provided by Pacific Salmon Treaty implementation and indicator stock tagging funds and Northwest Indian Fisheries Commission (NWIFC).

DRAFT

1.5 Location(s) of hatchery and associated facilities.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
In-River	Broodstock collection	Skagit River (WRIA 03.0176), between RM 80 and RM 84.
Marblemount Hatchery	Incubation, Rearing	Clark Creek (WRIA 04.1421) at RM 0.5; tributary to the Cascade River (WRIA 04.1411) at RM 1.1. The Cascade River is a tributary to the Skagit River (WRIA 03.0176) at RM 78.1.
County Line Ponds	Release	Adjacent to Skagit River (WRIA 03.0176) at RM 91.

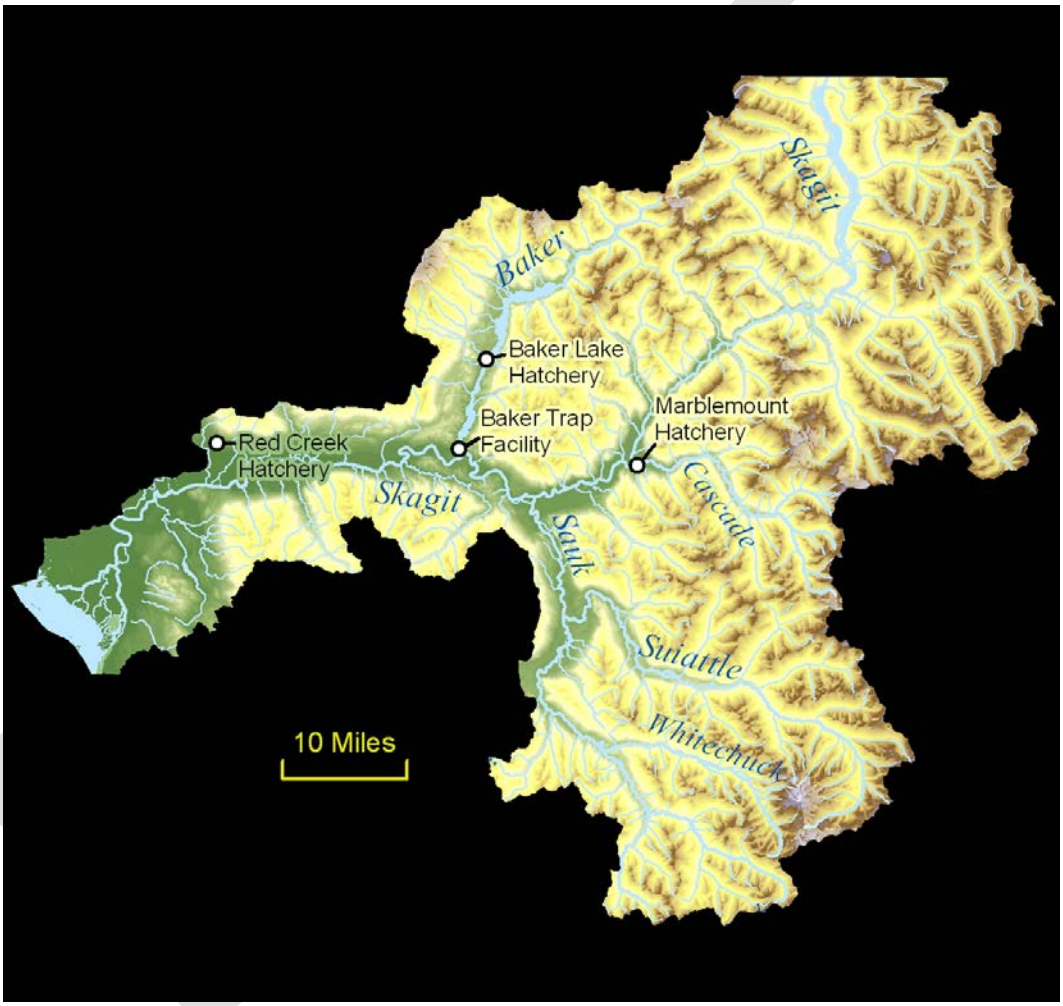

Figure 1.5.1. Map of the Skagit Basin hatchery and trapping facilities. Source: WDFW GIS Staff.

1.6 Type of program.

Integrated Research

1.7 Purpose (Goal) of program.

This summer Chinook research program was designed to be utilized as an indicator stock to provide information on exploitation and marine survival rates as well as to monitor and evaluate fish migration patterns, timing and distribution that is representative of Skagit River natural summer Chinook stock.

1.8 Justification for the program.

Skagit summer/fall stocks are not currently supplemented to a significant extent by hatchery production. The summer indicator stock program is used to collect data critical for managing the wild summer/fall Skagit Chinook stock aggregate. Specifically, total recoveries of adult Skagit summer/fall Chinook indicator stock (total catch + escapement) are enumerated on an annual basis to estimate the following metrics important for management of the wild Skagit Summer/Fall management unit.

1. Fishery exploitation rate by fishery (AK, BC, Southern US) to ensure compliance with the Pacific Salmon Treaty. These exploitation rates are used to validate the fisheries regulation and assessment model (FRAM).
2. Smolt to adult survival as an index of marine survival.

To minimize impacts on listed fish by WDFW facilities operation and the Marblemount summer Chinook sub-yearling program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Marblemount summer Chinook program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	Water rights are formalized through permits obtained from WDOE. Water rights permit numbers are provided in HGMP section 4.1. Monitoring and measurement of water usage is reported in monthly NPDES reports.
Intake Screening	4.2	The water intakes are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011 The current intakes on Clark and Jordan Creeks do not allow fish passage. The Jordan Creek intake project, designed to allow fish passage, is currently in the conceptual phase.
Effluent Discharge	4.2	The facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System administered by the Washington Department of Ecology (WDOE) and is regulated through NPDES permit # WAG 13-3015.
Broodstock Collection & Adult Passage	2.2.3, 6.2.3, 6.3, 7.2, 7.9	Adult broodstock is collected in the upper Skagit River between RM 80 and RM 84. Fish are collected by tangle net 2-3 times a week between late August and mid-September. Adult passage is not blocked during collection time.
Disease Transmission	9.2.7, 10.9	The *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), details hatchery practices and operations designed to stop the introduction and/or spread of any diseases.
Competition & Predation	2.2.3, 10.11	Fish are released at a time, size, 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).

DRAFT

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**
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery.	Returning fish are annually sampled for the adipose fin-clip and CWT presence and absence in fisheries. Number and codes of CWTs recovered from program fish are continually reported to RMIS database and available through their web site. Estimated total fisheries contribution of this population is presented in **Table 3.3.1.1.**
	Recreational angler days, by fishery.	WDFW uses Catch Record Cards as a tool to estimate recreational catch of salmon and selected other species.
	Annual escapement of natural populations that are affected by fisheries targeting program fish.	WDFW annually monitors returning Chinook by preforming spawning and carcass ground and air surveys and observing numbers of built redds, live fish count and collecting biological data from encountered carcasses. The data collection includes fish length, sex, scales, snouts, when coded-wire tags (CWTs) are present, DNA samples and information of external mark presence, pre-spawning mortalities and remaining eggs count. The monitoring results are used to estimate fish escapement, survival, diversity and origin.
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 on natural spawning grounds.	All juveniles released through this program are either adipose fin-clipped (AD) or coded-wire tagged. Fish released that are only coded-wire tagged and not adipose fin-clipped are part of the double index tag (DIT) group used to estimate non-retention mortality in mark selective sport fisheries. Size, number, date of release and mass-mark quality (AD rate) and tag rate of all hatchery releases are annually monitored and recorded in WDFW Hatcheries Headquarters Database.
		Returning fish are annually sampled for the adipose fin-clip and CWT presence and absence at the hatchery and natural spawning grounds. Numbers of estimated hatchery (marked/tagged) and natural (unmarked) fish are recorded annually.
3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.	Location of juvenile releases. Length of acclimation period. Release type, whether forced, volitional, or direct stream release.	Release information including location, method, and age is annually recorded in WDFW Hatcheries Headquarters Database.
	Proportion of adult returns to program's intended return location, compared to returns	Returning fish are annually sampled for the adipose fin-clip and CWT presence and absence at the hatchery and natural

DRAFT

	to unintended dams, fisheries, and artificial or natural production areas.	spawning grounds. Retrieved coded-wire tags enable evaluation of fish origin versus escapement location. CWT data releases and recaptured are annually reported to RMIS.
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 collected and recorded in WDFW Hatcheries Headquarters Database.
3.6.2 The artificial propagation program is monitored and evaluated on an appropriate schedule and scale to address progress towards achieving the experimental objective and evaluate beneficial and adverse effects on natural populations	Monitoring and evaluation framework including detailed time line.	As an indicator stock, survival and contribution to fisheries and escapement will be estimated for natural-origin fish each brood year released.
3.8.2 Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	Average total cost of activities with similar objectives.	Annual operational cost is recorded and can be compared to calculated fishery contribution value estimated be Wegge, (2009).

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1: "Performance indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities	ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.	First HGMP for this program was submitted to NOAA fisheries on August 23, 2002. This HGMP has been updated to reflect changes in the program and resubmitted to NOAA fisheries.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.	Genetic composition of naturally produced adults and co-occurring adults of this program measured annually. Within and between populations, genetic structure is not affected by artificial production.	Currently not monitored.
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Total number of spawners estimated to pass the collection facility to spawning areas compared to minimum effective population size (when established) required for those	The natural escapement and broodstock collection are monitored annually. For years 2001-12 the average escapement was 10,695 and average broodstock collection for years

DRAFT

	natural populations.	2002-2013 was 87 fish. Approximately 45 wild females and 45 males are collected to achieve an egg-take goal of 240,000.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population	The ratio of observed and/or estimated total numbers of artificially-produced fish on natural spawning grounds, to total number of naturally-produced fish (pHOS)	Returning fish are annually examined for the adipose fin-clip and CWT presence /absence and numbers of estimated hatchery fish present on natural spawning grounds are recorded. Because of the small nature of this program (release goal of 200, 000 fingerlings) and its primary purpose as in indicator stock, this program poses limited demographic risks to the wild population.
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 the 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 Co-Manager's Fish Health Policy* (WDFW and WWTIT 1998, updated 2006).
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations	Discharge water quality compared to applicable water quality standards by NPDES permit. WDOE water right permit compliance	Flow and discharge are reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults	The current barriers and intake structures have been evaluated and needed changes have 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).	Necropsies of fish to assess health, nutritional status, and culture conditions	Adult broodstock is annually inspected by Fish Health Section pathologists for pathogens. Juvenile fish are monitored monthly for health assessments. WDFW's Fish Health Section pathologists recommend preventative or remedial measures to prevent or treat disease, with administration of therapeutic or prophylactic treatments as deemed necessary. A fish health database is

DRAFT

		maintained to identify trends in fish health, diseases and treatments.
	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.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
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 the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Disposition of carcasses is reported in the WDFW Hatcheries Headquarter Database.
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.	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.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally produced Chinook (Seiler et al., 2002, 2003).

1.11 Expected size of program.

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

Up to 122 adults are needed annually for the broodstock.

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

Table 1.11.2.1: Annual release levels.

Life Stage	Release Location	Annual Release Level
Sub-yearling	County Line Ponds/Skagit River (WRIA 03.0176)	200,000

Source: Future Brood Document 2014.

DRAFT

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

Based on the average smolt-to-adult survival rate of 0.41% for brood years 2000-2009 (RMIS 2014; see also **Table 3.3.1.1**) and a program release goal of 200,000 sub-yearlings, the estimated adult production (goal) level would be 820 fish.

Table 1.12.1: Estimate of natural escapement of Summer Chinook hatchery program fish (indicator stock).

Return Year	Escapement
2002	1,515
2003	538
2004	560
2005	678
2006	1,066
2007	1,070
2008	654
2009	282
2010	340
2011	279
2012	402
Average	**671**

Source: Co-manager agreed-to data, 2014.

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

This program was initiated in 1994.

1.14 Expected duration of program.

The program is expected to be ongoing.

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. The *Puget Sound Salmon Management Plan* (PSSMP 1985), a federal court order, describes the co-management responsibilities of WDFW and the tribes with regard to fishery management and artificial production. The *PSSMP* explicitly states that "no change may be made to the Equilibrium Brood Document (program production goals) without prior agreement of the affected parties." In the Skagit watershed, any changes in the production at the Marblemount Hatchery have to be reviewed and approved by WDFW and the Sauk-Suiattle Tribe, Swinomish Indian Tribal Community and Upper Skagit Indian Tribe.

Alternative 1: Modify the program: Program modifications would be considered if it is determined that a current program cannot provide the indicator stock information more effectively; e.g. if adequate broodstock is not available, number of tag recoveries are not sufficient to carry out the purposes of this program; or the recruits/spawner rate of the indicator stock fish is less than that of the wild fish. The Co-managers did not pursue this alternative because it would not meet research objectives for the program as set by the Pacific Salmon Commission technical committees.

DRAFT

Alternative 2: Replace the program. If the summer Chinook program cannot provide the indicator stock information effectively, the program would be discontinued in favor of another program that can. The Co-managers did not pursue this alternative because it would not meet research objectives for the program as set by the Pacific Salmon Commission technical committees.

Alternative 3: Eliminate the program: If release numbers are too small for indicator stock use, then data from Stillaguamish summer Chinook tagging may be used to estimate fishing impacts on upper Skagit summers, or model run (FRAM) predictions of exploitation rates may be used. The Co-managers did not pursue this alternative because it would not meet research objectives for the program as set by the Pacific Salmon Commission technical committees.

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

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

The Marblemount summer Chinook HGMP was previously submitted to NOAA in August of 2002; however it was not 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.

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).

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

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

DRAFT

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).

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.

Marblemount Hatchery (Skagit River) spring Chinook in the Puget Sound Chinook ESU. NMFS (1999) considered this stock to be part of the ESU, but not essential for recovery. This stock is a Category 2c. This stock was founded from within the ESU and is native to the basin in which it is released. However, most of the broodstock was trapped in the Suiattle River and the program operates in the Cascade River. The Suiattle and Cascade River spring-run populations are recognized as distinct (SSHAG 2003). Genetic analyses indicate that although this stock was founded by native spring-run Chinook salmon, there has been moderate divergence between the hatchery broodstock and other spring run population in the Skagit River Basin (Marshall et al. 1995).

Marblemount Hatchery (Skagit River) summer Chinook in the Puget Sound Chinook ESU. NMFS (1999) considered this stock to be part of the ESU, but not essential for recovery. SSHAG (2003) designated this stock as Category 1a, due to recent founding from native natural-origin fish. Allozyme analysis has shown that Upper Skagit Chinook are not significantly different from Lower Skagit fall Chinook stock or from Upper Sauk spring Chinook (Marshall et al. 1995). The current program was established in 1995 using native Skagit River summer Chinook stock collected in the Upper Skagit River above Marblemount (between RM 80 and RM84).

Skagit River spring Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2000-2011) have averaged 540 for natural spawners in the Upper Sauk River DPS, 343 for the Suiattle River DPS and 353 for the Cascade River DPS. During this same period, the Upper Sauk DPS has shown and increasing population trend, while the Suiattle has decreased and the Cascade has remained relatively flat (SaSI, WDFW 2013).

Skagit Summer/ Fall Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2000-2011) have averaged 10,969 for natural spawners in the Upper Skagit River DPS, 688 for the Lower Sauk River DPS and 2,401 for the Lower Skagit River DPS. 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).

DRAFT

Table 2.2.2.1: Extant populations of Chinook salmon in the Skagit (Whidbey) Basin, Puget Sound Chinook ESU, grouped by geographic region, their minimum viability spawning abundance and abundance at equilibrium or replacement, and spawning A/P at MSY for a recovered state as determined by EDT analyses of properly functioning conditions and expressed as a Beverton-Holt function. The TRT minimum viability abundance was the equilibrium abundance or 17,000, whichever was less.

Region and population	TRT minimum viability abundance	Under properly functioning conditions (PFC)			NMFS Escapement Thresholds	
		Equilibrium abundance	Spawners at MSY	Productivity at MSY	Critical[a]	Rebuilding[b]
Skagit Summer/ Fall MU						
Upper Skagit	17,000	26,000	5,368	3.8	967	7,454
Lower Sauk	5,600	5,600	1,400	3	200	681
Lower Skagit	16,000	15,800	3,900	3	251	2,182
Skagit Spring MU						
Upper Sauk	3,000	3,000	750	3	130	330
Suiattle	600	600	160	2.8	170	400
Cascade	1,200	1,200	290	3	170	1,250[c]
ESU	**261,300**	**307,500**	**70,948**	**3.2**	3,875	**2,785**

Source: Ford 2011; NMFS 2011b.

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

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

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

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 2.2.2.2**).

Table 2.2.2.2: 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

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

DRAFT

Sound winter steelhead populations, relative to the average number of spawners for each population in the four year period up to the listing in 2007, increased from an average of 51% in 2009 to 141% in 2013 (**Figure 2.2.2.1**).

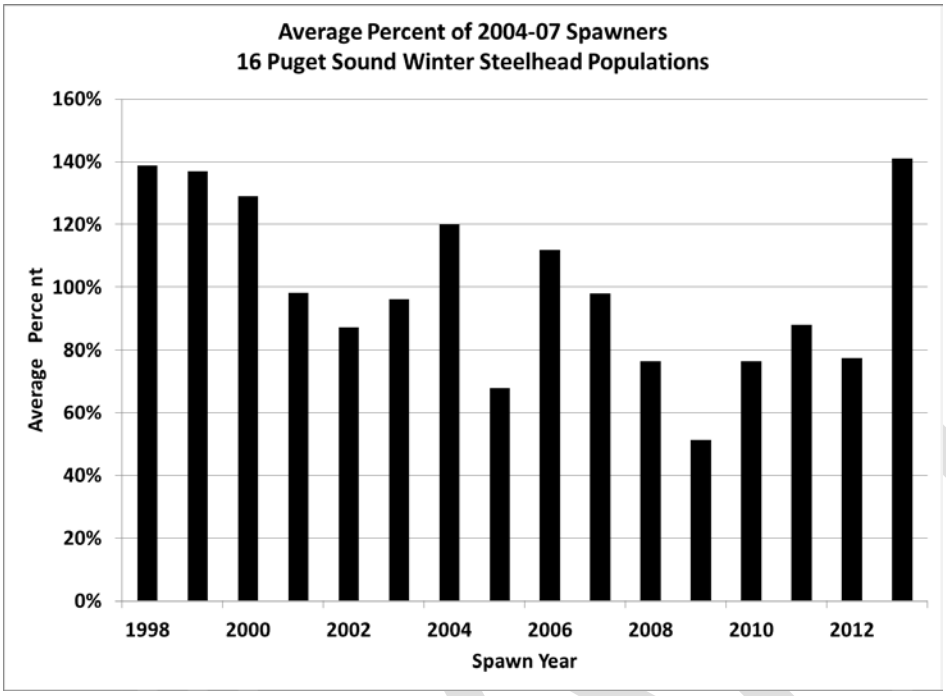

Figure 2.2.2.1. Relative to average percent of 2004-2007 spawners for 16 Puget Sound winter steelhead populations.

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.

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

Table 2.2.2.3: Chinook smolts caught in Skagit River scoop (Scp) and screw (Scr) traps 1998-2007.

Species	1998		1999		2000		2001		2002	
	Scp	Scr	Scp	Scr	Scp	Scr	Scp	Scr	Scp	Scr
Chinook 1+ Natural	876	350	198	87	129	105	32	26	199	228
Hatchery	24	12	201	41	511	360	26	50	177	161
Chinook 0+ Natural	33,698	20,001	55,254	41,492	23,289	14,944	54,762	40,180	35,332	24,908
Hatchery	5,837	2,127	3,449	2,213	2,554	2,152	1,667	1,354	3,310	2,726
Species	**2003**		**2004**		**2005**		**2006**		**2007**	
	Scp	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**	**Scp**	**Scr**
Chinook 1+ Natural	95	94	342	205	59	57	51	42	364	296
Hatchery	170	122	172	212	33	24	158	108	604	390
Chinook 0+ Natural	51,316	34,498	13,009	6,694	44,737	34,470	61,493	39,767	32,058	17,213
Hatchery	2,033	1,611	[a]12,874	[b]6,600	657	440	8,294	8,129	8,202	5,410

Source: Kinsel et al. 2008.
[a] Includes 690 unmarked hatchery Chinook.
[b] Includes 341 unmarked hatchery Chinook.

Table 2.2.2.4: Puget Sound Chinook population average productivity for five-year intervals measured as recruits per spawner (R/S) and spawners per spawner (S/S) 1982-2006. Trend over the intervals is also given.

Brood Years	1982-1986		1987-1991		1992-1996		1997-2001		2002-2006		Trend	
Populations	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**	**R/S**	**S/S**
Lower Skagit	*5.34*	*1.08*	*1.55*	*0.39*	*3.33*	*1.58*	*4.8*	*3.03*	*0.9*	*0.66*	*-0.56*	*0.18*
Upper Skagit	*4.93*	*0.96*	*2.8*	*0.79*	*3.88*	*1.48*	*2.81*	*1.85*	*1.08*	*0.68*	*-0.77*	*0.05*
Upper Cascade	*8.02*	*1.49*	*2.88*	*1.08*	*2.41*	*1.31*	*3.21*	*1.73*	*1.76*	*0.86*	*-1.22*	*-0.06*
Lower Sauk	*5.45*	*1.28*	*1.54*	*0.4*	*4.04*	*1.82*	*3.69*	*2.35*	*1.43*	*1.12*	*-0.59*	*0.16*
Upper Sauk	*14.8*	*1.98*	*1.52*	*0.51*	*1.98*	*1.07*	*3.13*	*1.47*	*2.56*	*1.1*	*-2.29*	*-0.08*
Suiattle	*8.12*	*1.34*	*1.57*	*0.62*	*2.7*	*1.45*	*2.49*	*1.18*	*1.44*	*0.63*	*-1.24*	*-0.09*
ESU	***9.57***	***2.19***	***5.05***	***0.96***	***3.01***	***1.24***	***2.70***	***1.19***	***1.67***	***0.67***	***-1.81***	***-0.28***

Source: Ford, 2011. These are based on analyses reported by Ford (2011). These analyses incorporate assumptions for years where escapements were not sampled for hatchery: natural-origin ratios that are not necessarily agreed to by WDFW, the Sauk-Suiattle Tribe, Swinomish Indian Tribal Community, and the Upper Skagit Indian Tribe. Trend over the intervals is also given.

Table 2.2.2.5: Short and long term population trend and growth rate estimates for the Puget Sound Chinook ESU populations.

Regions and Populations	Years	Trend Natural Spawners w/Cl	Hatchery Fish Success = 0 Lambda w/Cl	p>1	Hatchery Fish Success = 1 Lambda w/Cl	p>1
Lower Skagit River Late Run	1995-2009	1.064 (0.976 - 1.158)	1.051 (0.404 - 2.733)	0.69	1.041 (0.394 - 2.748)	0.65
	1952-2009	0.987 (0.978 - 0.996)	1.003 (0.926 - 1.086)	0.53	0.993 (0.916 - 1.076)	0.42
Upper Skagit River Late Run	1995-2009	1.033 (0.968 - 1.103)	1.022 (0.59 - 1.77)	0.65	1.013 (0.574 - 1.787)	0.59
	1952-2009	1.004 (0.997 - 1.01)	1.004 (0.953 - 1.059)	0.57	0.996 (0.945 - 1.051)	0.44
Lower Sauk River Late Run	1995-2009	1.054 (0.981 - 1.133)	1.044 (0.443 - 2.458)	0.68	1.033 (0.437 - 2.441)	0.64
	1952-2009	0.994 (0.984 - 1.004)	1.007 (0.929 - 1.09)	0.57	0.999 (0.922 - 1.083)	0.49
Upper Sauk River Early Run	1995-2009	1.061 (0.995 - 1.131)	1.076	?	1.066	?
	1952-2009	0.977 (0.966 - 0.99)	0.991 (0.909 - 1.081)	0.41	0.984 (0.903 - 1.073)	0.35
Cascade River Early Run	1995-2009	1.035 (0.977 - 1.095)	1.02 (0.63 - 1.653)	0.66	1.015 (0.622 - 1.658)	0.62
	1981-2009	1.029 (1.01 - 1.049)	1.023 (0.968 - 1.082)	0.84	1.018 (0.962 - 1.077)	0.79
Suiattle River Early Run	1995-2009	0.955 (0.903 - 1.01)	0.946 (0.584 - 1.533)	0.19	0.939 (0.572 - 1.54)	0.18
	1952-2009	0.981 (0.974 - 0.989)	0.988 (0.926 - 1.055)	0.35	0.982 (0.919 - 1.048)	0.27

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. "Lambda" is a measure of population growth rate. See Ford (2011) for explanation of the columns.

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).

DRAFT

Table 2.2.2.6: Steelhead smolts and adults caught in Skagit River scoop (Scp) and screw (Scr) 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 2.2.2.7: Steelhead population exponential 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.

Table 2.2.2.8: Skagit River Chinook Escapement 2001-2012.

Return Year	Upper Sauk Spring	Suiattle Spring	Upper Cascade Spring	Upper Skagit Summer	Lower Sauk Summer	Lower Skagit Fall
2001	543	688	625	10,084	1,103	2,606
2002	460	265	340	13,815	910	4,866
2003	298	353	278	7,123	1,493	1,161
2004	700	495	380	20,040	443	3,070
2005	308	518	420	16,608	875	3,320
2006	1,043	375	478	16,165	1,095	3,508
2007	282	108	223	9,845	383	1,053
2008	983	203	284	8,441	538	2,685
2009	367	273	338	5,290	250	1,439
2010	768	263	330	6,644	356	1,017
2011	345	215	265	4,480	237	820
2012	1,826	460	488	9,808	715	3,295
Avg.	**660**	**351**	**371**	**10,695**	**700**	**2,403**

Source: SaSI, WDFW 2014

DRAFT

Table 2.2.2.9: Wild Skagit River steelhead escapement 2001-2012

Return Year	Winter Run*	Summer Run
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
2011/2012	6,185	NA
Average	**5,377**	**NA**

Source: SaSI, WDFW, 2014

*Total Escapement Data are total escapement estimates for all Skagit winter steelhead based on cumulative redd counts in the mainstem Skagit River from RM 22.5 to 94.1 and in Alder, Diobsud, Rocky, O'Toole, Cumberland, Day, Sorenson, Hansen and Jones creeks. Estimates include winter steelhead in the Sauk and Cascade Rivers.

- 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.

Skagit System Chinook (*Oncorhynchus tshawytscha*): In 2006, a study was initiated by WDFW and the Skagit River System Cooperative (SRSC), the management body for the Swinomish and Sauk-Suiattle tribes of Indians, to determine the number of hatchery spring Chinook spawning in natural spawning areas prior to the onset of native summer Chinook spawning. Surveys were conducted in the Lower Cascade River (RM 0.0 – 3.4), Boulder Creek (tributary to the Cascade River), upper Skagit tributaries Bacon, Illabot and Diobsud creeks (**Table 2.2.2.10**). Encountered carcasses were sampled for coded-wire tags to ascertain origin: carcass recoveries revealed redds built before September 1 in the all the sites surveyed could be reasonably expected to have been constructed by hatchery spring Chinook strays (WDFW and PSTIT 2008).

Table 2.2.2.10. Estimated Marblemount Hatchery spring Chinook strays in Skagit system natural spawning areas.

Survey		Observed Redds Before September 1		Estimated Stray Spawners*
Year	**Start Date**	**Cascade River**	**Tributary Indexes**	
2007	Jul 15	123	50	408
2008	Jul 31	188	43	578
2009	Jul 23	95	31	315
2010	Jul 15	197	38	580
2011	Jul 27	146	54	500
2012	Aug 1	326	35	903

Source: WDFW and PSTIT *Comprehensive Chinook Management Plan Annual Reports* 2008-2013.

* Expansion rate of 2.5 fish/redd.

DRAFT

Table 2.2.2.11. Puget Sound Chinook average natural (natural- and hatchery-origin) and natural-origin only spawners and percent hatchery contributions for five year intervals. Spawning abundance averages are geometric means and hatchery contribution averages are arithmetic.

Return Years	1990-1994			1995-1999			2000-2004			2005-2009		
Populations	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**	**Nat**	**%**	**NOR**
Lower Skagit	1,440	4%	1,385	1,006	4%	968	2,715	3%	2,626	2,163	4%	2,067
Upper Skagit	5,511	4%	5,304	6,087	2%	5,982	12,109	4%	11,678	10,345	6%	9,724
Upper Cascade	185	2%	181	208	2%	204	366	2%	359	336	2%	329
Lower Sauk	391	4%	377	415	4%	397	825	5%	785	777	5%	742
Upper Sauk	399	4%	384	262	4%	252	420	4%	405	504	4%	486
Suiattle	298	3%	288	381	3%	368	409	3%	397	259	3%	250
ESU	***23,938***	***75%***	***17,905***	***27,392***	***63%***	***17,245***	***43,192***	***72%***	***31,294***	***34,486***	***69%***	***23,938***

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.

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: This is an integrated program that targets natural-origin summer adult Chinook for broodstock collection in numbers adequate to secure egg-take goal. Excess fish are not collected. Broodstock is taken in-river, where fish are netted 2-3 times a week September 1-30. A small tangle net is used that generally does not cause harm to fish. Sections of the river not targeted for broodstock collection are not physically impeded, and will not delay or interrupt migration. However, the process of collecting broodstock may delay or interrupt the migration of certain individuals. The collection occurs during absence of winter steelhead presence in the system and steelhead are not encountered during these activities.

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include; water withdrawal, hatchery effluent, and intake compliance. Monitoring and maintenance are conducted along with staff observations. Effluent at outfall areas is rapidly diluted with mainstem flows and operation is within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect 'Take" associated with the operations of these facilities. No take of listed fish are reported by staff during the normal operation of the hatchery.

Genetic Effects: This hatchery program is managed to be fully-integrated to reduce the risk of genetic divergence between the propagated and natural-origin components.

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

Hatchery Production/Density-Dependent Effects: Hatcheries can release numbers of fish that can exceed the density of the natural productivity in a limited area for a short period of time, and can

DRAFT

compete with listed fish. Fish are released as in a fully smolted stage in order to minimize negative effects of the release. Indirect take from density-dependent effects is unknown.

Predation/Competition: Juvenile summer Chinook salmon produced through the program may interact with emigrating natural-origin Chinook salmon in the Skagit River basin freshwater and estuarine areas, after the hatchery fish are released in June. The release of hatchery juveniles coincides near the end of the annual natural Chinook salmon emigration period in the Skagit River Basin. The sub-yearlings average size at release of 117 fpp in 2003-2014 correlates with fish sizes between 76 mm and 82 mm fork length (f.l.), while the size of natural-origin Chinook salmon is ~60 mm f.l. (Seiler et al., 1999-2001). The USFWS (1994) suggested that juvenile salmonids can consume fish which are one-third or less of their own body length. Based on this suggestion natural-origin Chinook are larger than the predation susceptibility size. Hatchery juveniles are also released as smolts, a practice to foster rapid seaward migration and reduce the duration of interaction with natural-origin Chinook present in the river. Juvenile Chinook trapping data from Seiler et al. (2000, 2001 and 2002), indicated rapid fish exit. The degree to which the hatchery-origin Chinook salmon may compete with natural-origin Chinook salmon for food resources in the Skagit River basin is unknown.

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

Natural–origin fish have been targeted for the broodstock collection since the inception of the program and are annually removed from the spawning grounds in numbers adequate to secure egg-take to fulfill program release goal. For numbers of past takes refer to the **Table 7.4.2.1.**

- 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" Tables at the end of this document.

- 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.

In the case when take levels will exceed or will be projected to exceed the take levels in this plan, NOAA Fisheries will be consulted to develop a contingency plan.

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 Chinook.

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

This hatchery program, and all other WDFW anadromous salmon hatchery programs within the Puget Sound Chinook ESU, operates under *U.S. v Washington* (1974) and the *Puget Sound*

Salmon Management Plan (PSSMP 1985). These provide the legal framework for coordinating hatchery programs, defining artificial production objectives, and maintaining treaty-fishing rights.

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

3.3 Relationship to harvest objectives.

The primary purpose of this program is research, as it is an indicator stock allowing estimates of total exploitation rates and marine survival to be made for the wild summer/fall aggregate. This allows for more robust and informed management of the harvest of the wild stock. Some incidental harvest of this indicator stock occurs during treaty and non-treaty terminal area sockeye, pink, and coho fisheries, as well as directed summer/fall chinook fisheries (should the wild stock be of sufficient abundance to allow such fisheries to occur).

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

Table 3.3.1.1. Marblemount Hatchery Summer Chinook Fishery Contributions

Brood Years: 2000-2009		
Fishery Years:2004-2013		
	Average SAR%[a]	**0.41**
Agency	***Non-WA Fishery***	***% of total Survival***
ADFG	All	*6.07*
CDFO	All	*16.59*
ODFW	All	*0.01*
NWFSC	All	*0.91*
Agency	***WA Fishery***	***% of total Survival***
WDFW	10- Ocean Troll	*0.03*
MAKA	15- Treaty Troll	*0.14*
WDFW	15- Treaty Troll	*0.39*
MAKA	23- PS Net	*0.02*
SSC	23- PS Net	*1.73*
WDFW	23- PS Net	*7.87*
WDFW	42- Ocean Sport- Private	*0.02*
WDFW	45- PS Sport	*0.98*
WDFW	45- PS Sport - Winter Blackmouth[b]	*0.32*
WDFW	46- Freshwater Sport[c]	*4.70*
WDFW	46- Freshwater Sport (Strays)[d]	*0.06*
WDFW	50- Hatchery Escapement	*0.62*
WDFW	50- Hatchery Escapement (Strays)[e]	*0.05*
SSC	52- Fish Trap[f]	*0.01*
STIL	53- Wild Broodstock Collection[g]	*0.01*

DRAFT

NIFC	54- Spawning Grounds	*0.31*
SSC	54- Spawning Grounds	*0.59*
STIL	54- Spawning Grounds[g]	*0.06*
WDFW	54- Spawning Grounds[h]	*58.35*
WDFW	54- Spawning Grounds (Strays)[i]	*0.35*
	Total	***100.00***

Source: RMIS 2014.
[a] Average SAR% = (tags recovered/tags released)
[b] Winter Blackmouth fishery occurs between October and April.
[c] Freshwater Sport based on WDFW Catch Record Card (CRC) data; no CRC data for BY 2000
[d] Based on tag recoveries from strays in the Skykomish River (WRIA 7).
[e] Based on tag recoveries at Wallace River and George Adams Hatcheries (WRIA 7 and 16).
[f] Based on tag recoveries at the Baker River Trap (Skagit Basin WRIA 3).
[g] Based on tag recoveries in the Stillaguamish River (WRIA 5).
[h] Based on tag recoveries in the Skagit Basin (WRIA 3 and 4).
[i] Based on tag recoveries in the Snohomish Basin (WRIA 7).

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.

Puget Sound Salmon Recovery Plan (2005): Describes habitat related challenges (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 (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).

*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 that benefit both listed and non-listed stocks in the system. In the Skagit River system, this includes the Skagit Fisheries Enhancement Group.

DRAFT

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 (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 this Marblemount Hatchery summer Chinook program could occur directly through predation on program fish, or indirectly through food resource competition, genetic effects, or other ecological interactions. In particular, fishes and other species could negatively impact Chinook survival rates through predation on newly released, emigrating juvenile fish in the freshwater and marine areas. Certain avian and mammalian species may also prey on juvenile salmonids 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 hatchery Chinook through predation include the following:

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

Rearing and migrating adult Chinook originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Skagit River. This would act towards the detriment of population abundance and the program's success in monitoring and evaluating the wild stock. 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

ESA-listed Chinook, steelhead and bull trout from the Skagit River System may be adversely affected by hatchery-origin salmonids produced by the Marblemount Hatchery program. Juvenile fish of the these listed species may serve as prey for newly released hatchery salmon in areas where the species co-occur if the listed juvenile fish are of a small size and vulnerable to predation by sub-yearling Chinook. The hatchery fish may also affect the listed species through competition for any limited resources, including food and space for juvenile fish, and spawning areas for adult fish.

(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 natural and hatchery origin salmonid species and trout present in the Skagit River watershed. Juvenile fish of these species may serve as prey items for the Chinook during their downstream migration in freshwater and into the marine area. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating 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

DRAFT

found to elevate stream productivity in several ways, 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). The 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 Chinook program could positively impact freshwater and marine fish species that prey on juvenile and adult fish. Nutrients provided by decaying Chinook carcasses may also benefit fish in freshwater. These species include:
- Southern Resident Killer Whale
- 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 at Marblemount Hatchery.

Water Source	Water Right		Available Water Flow	Water Temp. (F°)	Usage	Limitations
	Record/Cert. No.	Permit No.				
Wells (5)	G1-23230C WRIS	-----	10 cfs	46	Incubation, rearing	Wells are sanding in and needs to be redeveloped
Clark Creek (surface)	S1-*06773C WRIS/ 03506	06152	10 cfs	40-45	Broodstock collection rearing, acclimation	Low flow in summer
	S1-*21701C WRIS/ 10939	15832	5 cfs			
	S1-20241C WRIS	----	10 cfs			
Cascade River (surface)	S1-00419C WRIS	16698	30 cfs	38-58	Rearing,	No limitations
Jordan Creek (surface)	S1-*06774C WRIS/ 03507	06153	15 cfs	38-65	Rearing	High winter flows and high summer temperatures

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

Water to the hatchery is supplied from five wells, gravity flow from Jordan Creek, and pumped water from Clark Creek and Cascade River (Fuss and Ashbrook, 1995). Wells supply hatchery with stable temperature, pathogen free water that is used for incubation and rearing. Spring fed Clark Creek provides stable flow of water used for broodstock collection (fish attraction) and holding, and juveniles rearing and acclimation. Cascade River is the most utilized water source and is used for rearing, however heavy bed loads movement in the river cause channel shifts and increased silt loads (Fuss and Ashbrook, 1995), resulting in necessity to use settling pond before water is pumped to the hatchery. Gravity-fed water from Jordan Creek is also used for rearing. The utilization of this water source however is limited by creeks high water temperatures in summer and high flows in winter. Also land management practices in the area have exacerbated an on-going-problem with historically unstable watershed conditions; transportation of huge rocks during high flow events that pose a threat of damaging capital structures at the hatchery (Fuss and Ashbrook 1995).

DRAFT

The water right permits at the Marblemount Hatchery are formalized through the Washington Department of Ecology (WDOE), and were obtained for Clark Creek in 1945, 1969 and 1972; for Jordan Creek in 1945; for the Cascade River in 1971; and for the wells in 1978.

NPDES Permit:
This facility operates under the "*Upland Fin-Fish Hatching and Rearing*" *National Pollution Discharge Elimination System* (NPDES) general permit which conducts effluent monitoring and reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE), WAG 13-1015. Monthly and annual reports on water quality sampling, use of chemicals at this facility, compliance records are available from DOE.

Discharges from the cleaning treatment system are monitored as follows:

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

No listed fish are passed above Clark Creek. Jordan Creek is utilized only from April through November.

Table 4.1.2. Record of NPDES permit compliance at Marblemount Hatchery.

Facility/ Permit #	Reports Submitted Y/N			Last Inspection Date	Violations Last 5 yrs (see Table 4.1.3)	Corrective Actions Y/N	Meets Compliance Y/N
	Monthly	Qtrly	Annual				
Marblemount WAG13-1015	Y	Y	Y	5/23/2005	1	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2014.

Table 4.1.3. List of NPDES violations at Marblemount Hatchery, over the last five years (2009-2013).

Monitoring Month	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
September 2011	N/A	N/A	N/A	DMR due to Ecology by July 30, 2010	Late DMR to Ecology	Explanation to personnel to correct procedures

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

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

The surface water intakes at Marblemount Hatchery are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet current *Anadromous Salmonid Passage Facility Design* criteria (NMFS 2011). Improvements have been identified as a high-priority project and are on the WDFW's 20-year Capital Plan to bring into compliance. The 2012 Legislature passed the "Jobs Now" bill, which provided WDFW with funding for hatchery capital improvements in addition to our Capital Budget request (see **Table 5.8.1**). This included bringing the intakes into compliance and improvements to the Jordan Creek water supply line. The pipeline project was completed in 2013. The new intake project is currently in the conceptual design phase.

DRAFT

5 SECTION 5. FACILITIES

5.1 Broodstock collection facilities (or methods).

Adults for broodstock are collected the upper Skagit River between RM 80 and RM 84.

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

Two tanker trucks (1,000- and 300-gallons), equipped with aerators and oxygen tanks, are available at the facility for transportation needs.

5.3 Broodstock holding and spawning facilities.

Table 5.3.1: Adult holding facilities at Marblemount Hatchery.

Type	Number	Size (ft)
Adult pond (Pond-22)	1	200x10x4
Concrete raceways	3	100x10x3

Depending on the species, broodstock may be held in the concrete raceway ponds or a separated section of the adult holding pond. Summer Chinook broodstock is held in a 10'x100'x3' concrete raceway, supplied with well water. Spawning takes place at the end of the raceway.

5.4 Incubation facilities.

Table 5.4.1. Incubation vessels available at Marblemount Hatchery.

Type	Number	Size
Vertical stack incubators	1,056 Trays	24"x25"x3"
Removable Shallow troughs	8	16'x11"x6"

5.5 Rearing facilities.

Table 5.5.1. Rearing ponds available at Marblemount Hatchery.

Type	Number	Dimensions
Indoor Fiberglass Starter Tanks	16	16'x3'x28"
Gravel bottom pond	1	273'x53'x36"
Asphalt bottom adult pond	1	249'x89'x48"
Asphalt bottom pond	4	37'x350'x54"
Concrete ponds	21	10'x100'x36"

Table 5.5.2. Rearing pond utilized at County Line Ponds

Type	Number	Dimensions
Earthen pond	1	200' X 200' X 4'

5.6 Acclimation/release facilities.

Gravel borrows pits located along the Skagit River near the Skagit/Whatcom county border, filled with water and became "County Line Ponds." One pond is used for summer Chinook juvenile acclimation and release site.

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

A water supply failure in the Incubation Room in 2009, resulted in a ponding loss of 48.3% of the fry. No other operational difficulties have led to significant summer Chinook loss.

DRAFT

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 following risk aversion measures are in place at Marblemount Hatchery or County Line Pond:

- A crew member is on stand-by at the Marblemount Hatchery at all times to monitor hatchery operations and respond to any unexpected events.
- The facility is equipped with low water alarms, a back-up generator in case of power loss, and gas powered pumps in case of pump failure.
- County Line pond is checked twice a day by hatchery personnel when fish are present. Screens are checked and cleaned when needed to keep water from overflowing.
- Fish rearing is conducted in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (1998, updated 2006). Adherence to artificial propagation, sanitation and disease control practices defined in the policy should reduce the risk of fish disease pathogen transfers.

6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 Source.

Adult summer Chinook salmon collected from the upper Skagit River.

6.2 Supporting information.

6.2.1 History.

The current hatchery program stock originates from wild brood stock collected annually from the main stem Upper Skagit River beginning in 1994. An earlier summer Chinook program was also founded from native populations in the late-1970s. Releases from that program were not consistently marked. Over the subsequent 15 years, the native summer Chinook hatchery strain mixed with introduced Green River fall Chinook strain, which were also released annually from Marblemount Hatchery, and had overlapping spawning periods. The mixed summer strain was eliminated from production beginning with the 1993 brood.

6.2.2 Annual size.

Up to 122 adults are collected for broodstock annually to meet the egg-take needs for the joint WDFW- SRSC Chinook program.

6.2.3 Past and proposed level of natural fish in broodstock.

With the program inception in 1995, natural-origin fish were captured for hatchery broodstock and following releases were 100% marked enabling fish origin to be identified.

DRAFT

Table 6.2.3.1. Summer Chinook Integration Results at Marblemount Hatchery 2008-2013.

Year	pNOB	pHOS	PNI
2008	0.89	0.10	0.90
2009	0.96	0.11	0.90
2010	0.90	0.06	0.94
2011	0.91	0.08	0.92
2012	0.93	0.04	0.96
2013	1.00	In progress	In progress
Average	**0.92**	**0.09**	**0.91**

Source: Hatchery Evaluation and Assessment Team Broodstock Tracking Tables 2014.
Note: All pHOS estimates provided by Brett Barkdull, WDFW District 14 Biologist, 2014.

6.2.4 Genetic or ecological differences.

There are no genetic differences between the hatchery and natural populations. Monitoring and evaluation of the genetic and ecological effects of the program are ongoing (WDFW 2003g; and for e.g., Seiler et al., 2002), and the data will be used to adjust the hatchery program to meet its fish production and research objectives (WDFW 2003g) (SHEER, NOAA, 2004).

6.2.5 Reasons for choosing.

This Chinook stock was chosen for the hatchery program 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.

Natural-origin adults are incorporated into the hatchery broodstock with the intent of maintaining the genetic composition of the natural population and reducing the risk of divergence between hatchery and naturally produced fish.

Broodstock is collected randomly September 1-30, when summer run Chinook are present on the spawning grounds in the Upper Skagit River mainstem. Specifically, adults are sampled randomly in the Upper Skagit River mainstem on a weekly basis throughout the entire month of September.

Based on data collected from the Blake's test fishery (Area 78C) conducted by SRSC staff, the presence of summer Chinook in the lower river tends to peak in late-July/early-August (**Figure 6.3.1**). Random weekly adults sampling in the Upper Skagit River throughout the entire month of September indicates that spawning of the Skagit summer run Chinook in upper Skagit tributaries typically doesn't peak until after mid-September and that summer run Chinook tend to remain in the lower reaches of the Skagit River for at least a month prior to distributing to tributaries and mainstem of the upper Skagit to spawn.

DRAFT

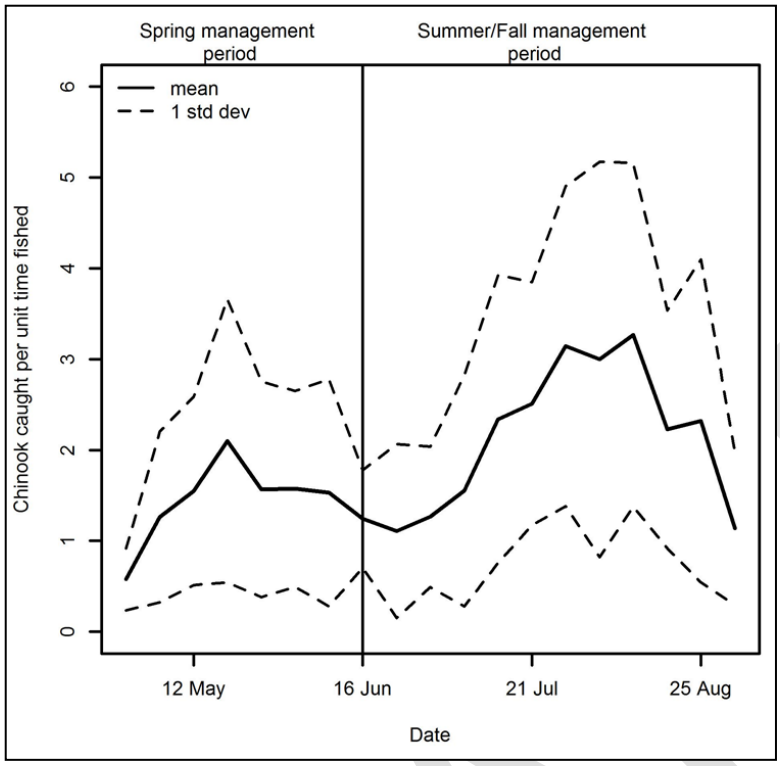

Figure 6.3.1. Chinook catch per unit time fished (mean ± 1 standard deviation) from the Blake's test fishery conducted in the lower Skagit River (Area 78 C) for years 1994 – 2013. Peaks demonstrate the average run timing of spring and summer/fall management units through the lower Skagit River.

7 SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2 Collection or sampling design.

Natural-origin (unmarked) adults are targeted for broodstock and collected from the upper Skagit River between RM 80 and RM 84. Fish are netted 2-3 times a week September 1-30. The timing and location (spring Chinook don't utilize this part of the river) was selected to ensure collection of summer run (see also HGMP section 6.3).

During years where adult broodstock is difficult to collect and egg-take goal isn't met, a small number of returning indicator Summer Chinook can be collected for supplementation. If Chinook from indictor stock are incorporated into the broodstock, tags are read before spawning takes place to ensure recruits are from summer run.

7.3 Identity.

All fish released through this hatchery program has been consistently 100% mass marked; on average, 98% of releases have been CWT'd since the program's inception (1994). See also HGMP section 10.7.

7.4 Proposed number to be collected:

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

Up to 122 adults are needed annually for the broodstock.

7.4.2 Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7.4.2.1. In-river collection, fish origin and sex composition of broodstock spawned and mortalities of summer Chinook collected for hatchery program at Marblemount Hatchery.

Brood Year	In-River Collection	Spawned						Mortalities
		Hatchery			Unmarked			
		Male	Female	Jack	Male	Female	Jack	
2002	82	8	5	0	25+2	30	0	8
2003	100	5	4	0	30+11	42	0	9
2004	95	1	1	0	35	35	0	13
2005	97	18	20	0	21	20	0	15
2006	102	9	4	0	30+3	39	0	6
2007	91	4+3	7	0	33+1	37	0	2
2008	86	29	31	0	12	10	0	0
2009	94	2	1	0	33	34	0	6
2010	69	2	4	0	29	27	0	1
2011	67	1	4	0	22	30	0	2
2012	82	2	3	0	36	35	0	3
2013	73	0	0	0	34	36	0	3
Avg.	**87**	**7**	**7**	**0**	**30**	**31**	**0**	**6**

Source: WDFW Hatchery Headquarters Database 2014.
Note: "+" indicates live spawned males.

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

Fish collected in surplus to broodstock needs for this program (regardless of mark) are released back to the Skagit River from the Marblemount boat lunch at RM 78. Mortalities are used for nutrient enhancement or buried in land fill.

7.6 Fish transportation and holding methods.

Adults netted in the river are placed in rubber fish tubes and held near the boat launch for up to five hours, until the broodstock collection has concluded for the day. Fish are then placed in the 1000-gallon tanker truck and transported to Marblemount Hatchery. Transportation time to the hatchery is about 5-10 minutes. Transported fish are held until spawning in the concrete pond supplied with well water.

7.7 Describe fish health maintenance and sanitation procedures applied.

Standard fish health protocols, as defined in the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006) are adhered to. No antibiotics or formalin treatment is applied. Adult broodstock fish are treated with formalin every other day, at a rate 1:10,000, as a precaution against fungal infection.

7.8 Disposition of carcasses.

Mortalities are used for nutrient enhancement, if approved by the Fish Health Specialist, or buried in land fill. Spawned carcasses are buried on fill.

DRAFT

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

This integrated program targets natural-origin summer adult Chinook for broodstock and a collection takes place in-river using a small tangle net that generally does not cause harm to fish health or pose lethal risks. Utilized net has a mesh size of 7.5 inches, which prevent fish from being lethally trapped), but occasionally fish can get hurt in the process. All collected fish are sorted immediately after netting and either kept for broodstock or released. In-river activities are minimized to reduce negative impacts on actively spawning fish and already built redds. The collection occurs during absence of winter steelhead presence in the system and steelhead are not encountered during these activities.

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. Females ripe at the day of the capture are spawned the same day.

8.2 Males.

All males collected, regardless of size, are considered for spawning and selected randomly on spawn days. Males may be live-spawned (see **Table 7.4.2.1**), only when necessary, to ensure that enough gametes are available. If live-spawned, males are marked, and kept separated.

8.3 Fertilization. If live-spawned, males are marked, and kept separated.

Eggs and milt are collected separately from each individual fish. Eggs from one female are mixed with milt from one male and water is added to activate milt. After 30-60 seconds of fertilization, milt from a second (back up) male is added. The secondary male was used as a primary male for fertilization of previous female.

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.

Adults to be spawned are chosen at random from the available gene pool, to ensure that the egg-take is representative of the entire summer run. To minimize directed, artificial selection of traits that could have negative effects, proper spawning protocols are implemented to maximize the representation of each individual adult into the entire brood.

9 SECTION 9. INCUBATION AND REARING -

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

9.1 Incubation:

The current egg-take goal for Marblemount summer Chinook program is to collect up to 275,000 eggs (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 rates, Marblemount Hatchery summer Chinook.

Brood Year	Eggs Collected	Survival Rates (%)	
		Green-to-Eyed Up	Eyed-Up-to-Ponding
2002	222,400	92.0	98.0
2003	258,000	90.1	98.0
2004	232,200	90.7	98.0
2005	216,700	94.4	98.0
2006	259,100	96.1	98.0
2007	240,800	93.4	98.0
2008	234,100	93.1	98.0
2009	214,600	94.4	98.0
2010	181,900	96.5	98.0
2011	207,300	94.8	98.0
2012	230,100	93.9	98.0
2013	226,000	95.9	98.0
Average	**226,933**	**93.8**	**98.0**

Source: WDFW Hatchery Records, 2014.

9.1.2 Cause for, and disposition of surplus egg takes.

No excess eggs are collected for this program. Current management approach do not allow for the taking of eggs in surplus of program goal. If hatchery losses exceed the expected levels, then program goals for release are not met.

9.1.3 Loading densities applied during incubation.

Fertilized eggs from each female are placed in separate trays. Once eyed, egg loss is picked and remaining eggs are reloaded at around 5,000 eggs per tray.

9.1.4 Incubation conditions.

All eggs are incubated in trays supplied with well water at the rate of 3.5gpm. Well water has constant temperature of 46°F. Dissolved oxygen levels are monitored and usually remain constant at 12 mg/l in water flowing in and 9.5 mg/l in water flowing out. Vexar® layers are placed in trays as a substrate substitute.

9.1.5 Ponding.

When approximately 95%+ buttoned up (January/ February), fish are moved from trays into shallow troughs (see also HGMP section 5.4). The troughs are located in hatchery building, and are supplied with well 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), throughout incubation to just prior to hatching. Once eyed (~ 500 TUs), 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.

To maximize survival Chinook eggs are retained in the trays at relatively low loading densities. Trays are supplied with pathogen free water, which limits pathogen problems. Mortality due to fungal infection is controlled and water temperatures and dissolved oxygen levels are monitored.

DRAFT

All water systems are connected to 24-hr/day low water alarms and an emergency backup generator.

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. Ponding-to-release survival of summer Chinook Marblemount Hatchery

Brood Year	Survival Rates (%)
2002	99.8
2003	99.5
2004	84.3
2005	99.9
2006	99.6
2007	98.3
2008	51.7
2009	98.4
2010	99.9
2011	99.2
2012	94.9
2013	87.5
Average	**92.3**

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 the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006). Fish rearing densities are maintained at a maximum of less than 3 lbs. of fish /gpm at release and under 0.35 lbs./ft^3.

9.2.3 Fish rearing conditions

Buttoned up fish are initially reared in troughs. When fry reach ~400 fpp (usually in April), they are moved to 10'x100'x36" concrete ponds supplied with water from Clark Creek and/or Jordan Creek. Fish are marked and tagged at the size of 120 fpp (May). At the end of May or beginning of June juveniles are transported to County Line pond, where they stay for approximately 3 days before start of release. County Line Ponds are gravel borrows pits located along Skagit River near Skagit/Whatcom counties border that filled with river water and became ponds.

Table 9.2.3.1. Monthly average surface water temperature (°F) at Clark Creek, Jordan Creek and Cascade River.

Month	Average Water Temperature (ºF)		
	Clark Creek	Jordan Creek	Cascade River
January	45	33	40
February	45	34	38
March	46	40	48
April	47	45	48
May	47	48	50
June	48	50	50

DRAFT

July	48	55	50
August	49	60	52
September	50	55	52
October	48	50	50
November	47	46	50
December	46	36	45

Source: WDFW hatchery records 2012.

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

Table 9.2.4.1. Average size (fpp), by month, of summer Chinook reared at Marblemount Hatchery.

Month	Subyearlings
February	900
March	600
April	300
May	150
June	100

Source: WDFW hatchery records 2012.

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

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

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

Chinook are fed a variety of diet formulations including starter, crumbles and pellets; the food brand used may vary, depending on cost and vendor contacts. Feeding frequencies vary with fish size and water temperature and usually begin at eight feedings/seven days a week and end at two feedings/seven days a week. Feed rates vary from 2.0% to 3.5% B.W./day. The overall feed conversion rate (feed fed/weight gained) for the season is approximately 0.8:1.

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

Fish health is monitored on a daily basis by hatchery staff and at least monthly by a 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 will be applied through the program.

DRAFT

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.

All reasonable and prudent measures are employed to minimize incubation and rearing losses. These include the use of high quality feeds for rearing, rearing densities and loadings that conform to best management practices and frequent fish health inspections, and the presence of professionally-trained personnel to operate the facilities. Hatchery fish are reared to achieve a size and condition factor at a time of release that represent the best chance for their survival. 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 and size at release.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Sub-yearling	200,000	100	June	Skagit River

Source: Future Brood Document 2014.

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

Stream, river, or watercourse: County Line Ponds (Skagit River WRIA 03.0176)
Release point: River Mile (RM) 91
Major watershed: Skagit River
Basin or Region: Puget Sound

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

Table 10.3.1. Numbers released, by year, size and date, Marblemount Hatchery summer Chinook program.

Release Year	Sub-yearling	Avg. size (fpp)	CV	Date(s)
2003	200,202	127	6.6	5/23-26
2004	230,593	110	6.6	5/24-28
2005	192,000	110	6.6	5/27
2006	210,643	134	5.7	5/23
2007	248,047	128	5.6	5/25
2008	221,211	136	8.4	5/27
2009	109,284	110	4.5	5/28-31
2010	211,196	142	6.2	5/28
2011	184,894	110	7.2	6/7-14
2012	190,823	103	5.2	6/8-12
2013	198,597	95	6.8	6/19
2014	185,764	100	8.4	6/25
Average	**198,605**	**117**	**6.5**	

Source: WDFW Hatcheries Headquarters Database 2014
Note: 100 fpp ~ 82 mm fork length (f.l.); 120 fpp ~76 mm f.l.; 140 fpp ~72 mm f.l.

DRAFT

10.4 Actual dates of release and description of release protocols.

Summer Chinook juveniles are released off-station from County Line pond to promote adult contribution to natural escapement. Fish leave County Line pond volitionally after screens are removed at the end of May/beginning of June (FBD 2014). Actual release dates are summarized in **Table 10.3.1.**

10.5 Fish transportation procedures, if applicable.

Fish are reared at Marblemount Hatchery and released from County Line pond. They are transported to the release destination in a 1000-gallon truck, equipped with aerators and bottled oxygen tanks. The dissolved oxygen levels in the transportation tank are controlled and set between 8 and 10mg/l. Fish are loaded to not exceed 0.5 pound of fish per gallon of water. Salt is also added during juvenile transportation to minimize stress. The transportation time is about one hour.

10.6 Acclimation procedures.

The program goal is for the released fish to return to summer Chinook natural spawning grounds. Fish are reared on well water at Marblemount Hatchery to reduce their ability to imprint and return to the hatchery. They are acclimated to the Skagit River water when transferred and placed in County Line pond (adjacent to summer Chinook spawning areas in the upper Skagit River) prior to release.

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

All of the summer Chinook fish (used as an indicator stock) are intended to be released 100% adipose-fin-clipped and coded-wire tagged (AD+CWT). For mark/tag combinations specific to this program see **Table 10.7.1.**

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

Brood Year	Sub-yearlings	Marks
2014	200,000	AD+CWT

Source: Future Brood Document 2014.

Due to regeneration of a partially-clipped adipose fin or unclipped fin (missed clip), and rejected coded-wire tags, some hatchery adults may return with an intact adipose fin and/or no tags. WDFW monitors clipping and tagging rates during the marking process and records partial or missed clips as “bad clip” and missed tags as “no tag”, (see **Table 10.7.2**).

Table 10.7.2. Summary of annual releases of Marblemount Hatchery summer indicator Chinook, by mark status.

Brood Year	AD+CWT	CWT only	Ad clip only
2001	186,640	190	3,228
2002	199,401	0	801
2003	226,702	3,459	432
2004	191,654	0	346
2005	206,009	1,685	2,949
2006	231,662	0	16,385
2007	216,200	872	4,139
2008	108,180	437	667
2009	206,128	2,534	2,534
2010	182,176	1,091	1,627
2011	187,388	1,908	1,527
2012	197,773	0	824

Source: Co-manager agreed-to data, 2014.

DRAFT

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

Egg-take is carefully managed to minimize the likelihood of collecting surplus eggs or raising surplus fry. Annual fluctuation in survival rates may result in higher-than-expected production levels. Regional staff and NOAA Fisheries will be informed and consulted if actual fish production results in excess of 10% of the proposed level.

No program surplus exists in this research program.

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, conditions critical to fish health will be monitored and if necessary to prevent loss, fish may be released prematurely.

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

10.11 Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.

Production and release of only smolts and volitional release practices fosters rapid seaward migration with minimal delays in the rivers, limiting interactions with listed species.

Summer Chinook from the Marblemount Hatchery program are released volitionally and are closely visually monitored for smolting activities to ensure they are released fully smolted. Coefficient of variation (CV) for length at release is also monitored. An average CV value of 10.0% or less is desirable to confirm the likelihood that most fish are ready to migrate (Fuss and Ashbrook 1995). The average CV, for release years 2003-2014, was 6.5% (see **Table 10.3.1**) indicating fish were released in migratory stage. Juvenile Chinook trapping data from Seiler et al. (2000, 2001, 2002), indicated rapid fish exit.

Hatchery releases are also timed near the end of the annual natural Chinook salmon emigration period in the Skagit River Basin. The average size at release of 119 fpp for years 2002-2013 correlates with fish size at 76 mm f.l., which is similar to natural-origin Chinook salmon (~ 60 mm f.l.; Seiler et al., 1999-2001) making predation by Marblemount Hatchery summer Chinook

DRAFT

on natural-origin Chinook encountered in the river and estuary an unlikely event. The degree to which the hatchery-origin Chinook salmon may compete with natural-origin Chinook salmon for food resources in the Skagit River basin is unknown.

For monitoring and evaluation purposes fish are released properly marked to allow identification.

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 summer Chinook program was designed to be used as an indicator stock with an objective to collect representative harvest and marine survival data of summer Chinook that conclude effects on wild Chinook population as well as stock migration patterns, timing and distribution information. The goal is to be achieved by monitoring 200,000 sub-yearling summer Chinook smolts, marked with adipose fin-clip and exclusive coded-wire tag, released annually from the Marblemount Hatchery.

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

Annually a statistically significant number of summer Chinook releases from the hatchery are both marked and tagged with CWTs to allow monitoring and evaluation of juvenile out-migrants (Seiler et al., 1998-2002) and adult returns. CWTs are also used to assess temporal separation during hatchery spawning between springs, summer and fall Chinook stocks.

Basin-wide Chinook spawner and carcass surveys are conducted annually by Co-managers. Mainstem habitat on the Skagit and Sauk River downstream of the White Chuck River are surveyed by helicopter, while tributaries are surveyed on foot and by raft. Surveys are conducted from late July until late October or early November each year, typically on a weekly basis but the frequency is weather, river condition and crew availability dependent. Foot and boat surveyors count redds, live fish, and collect biological data (fish length, sex, scales, otoliths, snouts when coded-wire tags are present, DNA samples, information of external mark presence and pre-spawning mortalities, depending on sampling priorities) from carcasses in standardized river sections. Data from spawner and carcass surveys provides information necessary for estimates of escapement, spawn timing and distribution, age composition, origin, stray rates and life history strategies that provide for informing management and restoration of Skagit Chinook.

WDFW's Wild Salmonid Production/Evaluation Unit (WSP/E) has been annually monitoring juvenile migration since the spring of 1990 when Skagit River juvenile salmon trapping project was initiated. Since then two juvenile migrant traps are operated annually in the mainstem Skagit River, 17-miles upstream of the river mouth from late-January through late-July. The project started with the goal to estimate natural-origin coho smolt production, but was later expanded to include estimates of natural-origin juvenile Chinook production, and to enumerate all juvenile salmonid migrants as well as collect data to determine fish size, age and origin. Collected data has been used to estimate migrant abundance, survival and diversity.

This monitoring and research will be regularly evaluated by the co-managers with the intent of adjusting as appropriate the HGMPs consistent with stock recovery and fishing objectives.

Mark-Selective monitoring of recreational Chinook fisheries in the marine catch areas of Puget Sound: WDFW' Puget Sound Sampling Unit (PSSU) has been implementing sampling and monitoring program to collect data needed to evaluate each mark-selective Chinook fishery and its impact on unmarked salmon. As per state-tribal agreement (e.g., WDFW and NWIFC 2009), WDFW have developed area-specific sampling plans consisting of several comprehensive and

DRAFT

complementary sampling components, including dockside creel sampling, test fishing, on-water or aerial effort surveys, and angler-completed voluntary trip reports (VTRs).

Annually, all commercial salmon fisheries conducted in Skagit Bay and River are sampled and monitored, and the catch is reported on Fish Receiving Tickets. Treaty, or Non-treaty. Catch from recreational fisheries are reported on Catch Record Cards (CRC), or from creel surveys. Electronic sampling is required for all commercial Chinook catch to detect CWTs from marked and tagged and DIT groups enabling managers to estimate the total selective fishery release mortality. Chinook non-retention fisheries are monitored by representatives from the organization conducting the fishery. Commercial Chinook encounters in a non-retention fishery are estimated either by commercial fishery monitoring, or test fishery catches used as surrogate for commercial fishery encounter rates.

Skagit River test fishery: SRSC annually perform Chinook (Blake's Drift), coho (at Blake's, Spudhouse, and the Highway 9 Bridge), and chum (Jetty and in Skagit Bay) test fisheries. Data collected during test fisheries are used to estimate run timing distribution and its wild and hatchery components, including CWT groups. CWT recoveries contribute to estimates of terminal run size, exploitation rate, and total CWT recruitment.

In river recreational fisheries monitoring: WDFW annually estimates recreational harvest on salmon and selected other species using Catch Record Cards and creel surveys as needed. All recreational fishermen are required to fill and submit CRC to WDFW with information regarding their catch.

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

Funding and resources are currently committed to monitor and evaluate this program as detailed in the *Resource Management Plan for Puget Sound Chinook Salmon Hatcheries* (PSTT and WDFW 2004, revised 2010).

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

Monitoring and evaluation will be undertaken, with consultation with NOAA Fisheries, in a manner that does not result in an unauthorized take of listed species.

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.

DRAFT

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.

DRAFT

13 SECTION 13. ATTACHMENTS AND CITATIONS

Bilby R.E., B.R. Fransen, and P.A. Bisson. 1996. Incorporation of nitrogen and carbon from spawning coho salmon into the trophic system of small streams: evidence from stable isotopes. Canadian Journal of Fisheries and Aquatic Sciences 53:164–173.

Ford, M.J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-113, 281 p.

Fuss, H. and C. Ashbrook. 1995. Hatchery operation plan and performance summaries (HOPPS). Washington Department of Fish and Wildlife. Olympia, Washington.

Gibbons, R.G., P.K.J. Hahn, and T.H. Johnson. 1985. Methodology for determining MSH steelhead spawning escapement requirements. Fisheries Management Division, Washington State Game Department. Report 85-11. Olympia, Washington.

Gregory, S.V., G.A. Lamberti, D.C. Erman, K.V. Koski, M.L. Murphy, and J.R. Sedell. 1987. Influence of forest practices on aquatic production. *In* Salo, EO and Cundy TW. (editors), Streamside management: forestry and fishery interactions. Institute of Forest Resources, University of Washington. Seattle, Washington.

Hard, J. J., J. M. Myers, E. J. Connor, R. A. Hayman, R. G. Kope, G. Lucchetti, A. R. Marshall, G. R. Pess, and B. E. Thompson. 2014. Viability criteria for steelhead within the Puget Sound Distinct Population Segment. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-NWFSC-XXX, 390 p.

Kinsel, C., M. Zimmerman, L. Kishimoto, and P. Topping. 2008. 2007 Skagit River salmon production evaluation: Report to Salmon Recovery Funding Board. Washington Department of Fish and Wildlife. Olympia, Washington. 74 pp.

Kinsel, C.W., S.E. Vincent, M.S. Zimmerman, and J.H. Anderson. 2013. Abundance and age structure of Skagit River steelhead smolts: 2012 Annual Report. Washington Department of Fish and Wildlife. Olympia, Washington. 43 pp.

Kline, T.C. Jr., J.J. Goring, Q.A. Mathisen, and P.H. Poe. 1997. Recycling of elements transported upstream by runs of Pacific salmon: I _^{15}N and _^{13}C evidence in Sashin Creek, southeastern Alaska. Canadian Journal of Fisheries and Aquatic Sciences 47(1): 136-144.

Levy, S. 1997. Pacific salmon bring it all back home: Even in death these fish fuel life in their natal streams. Bio Science 47(10): 657-660.

Mathisen, O.A., P.L. Parker, J.J. Goering, T.C. Kline, P.H. Poe and R.S. Scalan. 1988. Recycling of marine elements transported into freshwater systems by anadromous salmon. International Association of Theoretical and Applied Limnology 23: 2249-2258.

NMFS (National Marine Fisheries Service). 1995. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/nmfscrit1.htm.

NMFS (National Marine Fisheries Service). 1996. Juvenile fish screen criteria for pump intakes. Available from: http://www.nwr.noaa.gov/1hydrop/pumpcrit1.htm.

NMFS (National Marine Fisheries Service). 1999. Endangered and threatened species: Threatened status for three Chinook salmon Evolutionarily Significant Units in Washington and Oregon, and Endangered status for one Chinook salmon ESU in Washington; final rule. Partial 6-month extension

DRAFT

on final listing determinations for four Evolutionarily Significant Units of West Coast Chinook salmon; proposed rule. Federal Register 64:14308-14328.

NMFS (National Marine Fisheries Service). 2000. A risk assessment procedure for evaluating harvest mortality of Pacific salmonids. National Marine Fisheries Service, Sustainable Fisheries Division, Northwest Region. May 30. 33pp.

NMFS (National Marine Fisheries Service). 2005. Policy on the consideration of hatchery-origin fish in endangered species act listing determinations for Pacific salmon and steelhead. U.S. Department of Commerce, NOAA. Docket No. 040511148–5151–02; I.D. 050304B

NMFS (National Marine Fisheries Service). 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon.

NMFS (National Marine Fisheries Service). 2011. Evaluation of and recommended determination on a Resource Management Plan (RMP), pursuant to the salmon and steelhead 4(d) rule: Comprehensive management plan for Puget Sound Chinook: harvest management component. U.S. Department of Commerce, NOAA. FINWRl2010/06051.

NMFS (National Marine Fisheries Service). 2013. Endangered and Threatened wildlife; proposed rule to revise the code of Federal Regulations for species under the jurisdiction of the National Marine Fisheries Service. Federal Register 78FR38270.

NPPC (Northwest Power Planning Council). 2001. Performance standards and indicators for the use of artificial production for anadromous and resident fish populations in the Pacific Northwest. Portland, Oregon. 19 pp.

Phinney, D. 2006. Compendium of Water Rights documents for Hatcheries and Wildlife areas. Washington Department of Fish and Wildlife Habitat Program. Olympia, Washington.

Piper, R., I.B. McElwain, L.E. Orme, J.P. McCraren, L.G. Fowler, J.R. Leonard, A.J. Trandahl, and V. Adriance. 1982. Fish Hatchery Management. United States Dept of Interior, Fish and Wildlife Service. Washington, D.C.

PSSMP (Puget Sound Salmon Management Plan). 1985. *United States v Washington* (1606 F.Supp. 1405).

PSSTRT (Puget Sound Steelhead Technical Recovery Team). 2013. Identifying historical populations of steelhead within the Puget Sound Distinct Population Segment. Final Review Draft. 149 p.

RMIS (Regional Mark Information System). 2014. Retrieved September 2014.Available from: http://www.rmpc.org/

Ruckelshaus, M.H., K.P. Currens, W.H. Graeber, R.R. Fuerstenberg, K. Rawson, N.J. Sands, and J.B. Scott. 2006. Independent populations of Chinook salmon in Puget Sound. United States Department of Commerce, NOAA. Technical Memo. NMFS-NWFSC-78, Seattle, Washington. 125 pp.

Sanford, B. and W. Beattie. 2007. Chinook management report 2006-2007. Washington Department of Fish & Wildlife and Puget Sound Treaty Indian Tribes. Olympia, Washington.

Seidel, P. 1983. Spawning guidelines for Washington Department of Fish and Wildlife hatcheries. Washington Department of Fish and Wildlife. Olympia, Washington.

DRAFT

Seiler, D., L. Kishimoto, and S. Neuhauser. 1998. 1997 Skagit River wild 0+ Chinook production evaluation. Washington Department of Fish and Wildlife. Contract report to Seattle City Light. Olympia, Washington.

Seiler, D., L. Kishimoto, and S. Neuhauser. 1999. 1998 Skagit River wild 0+ Chinook production evaluation. Washington Department of Fish and Wildlife. Contract report to Seattle City Light. Olympia, Washington.

Seiler, D., S. Neuhauser, and L. Kishimoto. 2001. 2000. 1999 Skagit River wild 0+ Chinook production evaluation. Washington Department of Fish and Wildlife. Contract report to Seattle City Light. Olympia, Washington.

Seiler, D., S. Neuhauser, and L. Kishimoto. 2001. 2000 Skagit River wild 0+ Chinook production evaluation. Science Division, Washington Department of Fish and Wildlife. Annual Project Report. Olympia, Washington.

Seiler, D., L. Kishimoto and S. Neuhauser. 2002. 2001 Skagit River wild 0+ Chinook production evaluation. Washington Department of Fish and Wildlife, Contract report to Seattle City Light. Report FPA 02-11. Olympia, Washington.

Slaney, P.A. and B.R. Ward. 1993. Experimental fertilization of nutrient deficient streams in British Columbia. *In* Schooner, G. and S. Asselin, (editors). Le developpmente du saumon Atlantique au Quebec: connaitre les regles du jeu pour reussir. Colloque international e la Federation quebecoise pour le saumon atlantique, p. 128-141. Quebec, decembre 1992. Collection *Salmo salar* n°1.

Slaney, P.A., B.R. Ward and J.C. Wightman. 2003. Experimental nutrient addition to the Keogh River and application to the Salmon River in coastal British Columbia. *In* Stockner J.G. (editor). Nutrients in salmonid ecosystems: sustaining production and biodiversity. American Fisheries Society, Symposium 34(1): 111-126.

SSHAG (Salmon and Steelhead Hatchery Assessment Group). 2003. Hatchery broodstock summaries and assessments for chum, coho, and Chinook salmon and steelhead stocks within evolutionarily significant units listed under the Endangered Species Act. NOAA Fisheries, Northwest Fisheries Science Center, Seattle, Washington and Southwest Fisheries Science Center, La Jolla, California. 326pp.

U.S. District court of Western Washington. 1974. *United States v Washington*, 384 F, Supp. 312.

United States v Washington, No. 9213 Phase 1 (sub no. 85-2) Order Adopting Puget Sound Management Plan, 1985

Ward, B.R., D.J.F. McCubbing and P.A. Slaney. 2003. Evaluation of the addition of inorganic nutrients and stream habitat structures in the Keogh River watershed for steelhead trout and coho salmon. *In* Stockner J.G. (editor). Nutrients in salmonid ecosystems: sustaining production and biodiversity. American Fisheries Society, Symposium 34(1): 127-147.

WDF (Washington Department of Fisheries), WDW (Washington Department of Wildlife) and WWTIT (Western Washington Treaty Indian Tribes). 1992. Washington State salmon and steelhead stock inventory (SaSSI). Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife) and WWTIT (Western Washington Treaty Indian Tribes). 1998 (Updated 2006). Salmonid disease control policy of the fisheries Co-Managers of Washington State. Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes, Olympia Washington.

DRAFT

WDFW (Washington Department of Fish and Wildlife) and PSTT (Puget Sound Treaty Tribes). 2002. Puget Sound Chinook salmon hatcheries, resource management plan: a component of Comprehensive Chinook salmon management plan, Olympia, Washington. 103 pp.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2008. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2007-08 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 58 pp. Available from: http://wdfw.wa.gov/publications/00103/.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2009. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2008-09 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 136 pp. Available from: http://wdfw.wa.gov/publications/00104/.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2010. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2009-10 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 152 pp. Available from: http://wdfw.wa.gov/publications/00975/.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2011. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2010-11 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 125 pp. Available from: http://wdfw.wa.gov/publications/01541/.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2012. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2011-12 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 125 pp. Available from: http://wdfw.wa.gov/publications/01540/.

WDFW (Washington Department of Fish and Wildlife) and PSTIT (Puget Sound Treaty Indian Tribes). 2013. Comprehensive Management Plan for Puget Sound Chinook: Harvest Management Component - Annual Postseason Report 2012-2013 Fishing Season. Washington Department of Fish and Wildlife and Puget Sound Treaty Indian Tribes. Olympia Washington. 114 pp. Available from: http://wdfw.wa.gov/publications/01539/.

WDFW (Washington Department of Fish and Wildlife). 2014. Hatcheries Headquarters Database. Washington Department of Fish and Wildlife, Olympia, Washington.

WDFW (Washington Department of Fish and Wildlife). 2014. 2014 Future brood document. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/publications/01566/.

WDFW (Washington Department of Fish and Wildlife). 2012. Salmonid stock inventory (SaSI). Fish Program, Science Division. Washington Department of Fish and Wildlife. Olympia, Washington. Available from: http://wdfw.wa.gov/conservation/fisheries/sasi/.

WDOE (Washington Department of Ecology). 2014. Water Resources Explorer. Retrieved September 5, 2014, from: https://fortress.wa.gov/ecy/waterresources/map/WaterResourcesExplorer.aspx.

DRAFT

Wipfli, M.S., J. Hudson, and J. Caouette. 1998. Influence of salmon carcasses on stream productivity: Response of biofilm and benthic macroinvertebrates in southeastern Alaska, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences. 55(6): 1503-1511.

DRAFT

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:_____

DRAFT

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 USFWS 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. Primarily 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 15.2.1: Summary table 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

DRAFT

Table 15.2.2: 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).

Competition and Predation – Given the life history of bull trout and release strategies used in this hatchery program (see also HGMP section 10), predation and competitive interactions between hatchery fish and bull trout are likely to be limited (USFWS 2004). However with the listing of Puget Sound Chinook and steelhead hatchery fish may provide an important addition to the forage base for bull trout (see also HGMP section 3.5).

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

Listed or candidate species:

"No effect" for the following species:

Gray Wolf (*Canis lupus*) –Threatened
Grizzly bear (*Ursus arctos horribilis*) –Threatened

Canada Lynx (*Lynx canadensis*) –Threatened [critical habitat designated]
Northern Spotted owl (*Strix occidentalis caurina*) –Threatened [critical habitat designated]

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

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

15.3 Analyze effects.

There are no activities associated with this hatchery program that would directly impact the 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 trout in the Skagit River, 1990-2009. Washington State Department of Fish and Wildlife,. FPT 11-01. Olympia, Washington.

DRAFT

"Take" Tables

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

Listed species affected: Summer Chinook	**ESU/Population:** Lower Skagit River Puget Sound Chinook		**Activity:** Marblemount Summer Chinook Program	
Location of hatchery activity: Marblemount Hatchery, RM 0.5 Cascade River (04.1411)	**Dates of activity:** Sub-yearlings- July-June Yearlings- June-April		**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)			Up to 17	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			Up to 154	
Intentional lethal take f)			Up to 122	
Unintentional lethal take g)			Up to 15	
Other Take (specify) h)				

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

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

DRAFT

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

Listed species affected: Spring Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Lower Skagit River Puget Sound Chinook		**Activity:** Marblemount Summer Chinook Program	
Location of hatchery activity: Marblemount Hatchery, RM 0.5 Cascade River (04.1411).	**Dates of activity:** Sub-yearlings- July-June Yearlings- June-April		**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	-
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

DRAFT

Table 3. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Steelhead *(Oncorhynchus mykiss)*	**ESU/Population:** Skagit River / Puget Sound Steelhead		**Activity:** Marblemount Summer Chinook Program	
Location of hatchery activity: Marblemount Hatchery, RM0.5 Clark Creek (04.1421)	**Dates of activity:** December-May		**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	0	-
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	-	-
Other Take (specify) h)	-	-	-	-

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

DRAFT