HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Photo: Courtesy of the hatchery staff.

Hatchery Program:	Soos Creek Coho Hatchery Program (Integrated)
Species or Hatchery Stock:	Coho (*Oncorhynchus kisutch*) Green River stock
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Duwamish/Green River Puget Sound
Date Submitted:	
Date Last Updated:	May 20, 2014

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Executive Summary

ESA Permit Status:
On March 31, 2004, the Washington Department of Fish and Wildlife (WDFW) and the Puget Sound Treaty Tribes submitted a Hatchery Genetic Management Plan (HGMP) for the Soos Creek Hatchery coho program under Limit 6 of the 4(d) rule. In a letter from NOAA Fisheries dated August 4, 2004, the co-managers were informed that NOAA Fisheries anticipated completing a draft Environmental Impact Statement (EIS) by the summer of 2005. NOAA noted that "A final EIS may then be completed by winter 2005-2006, after which time NOAA Fisheries will release ESA 4(d) Rule determinations for the hatchery plans." The letter concluded by stating that "Your work on these hatchery plans is important, and will substantially contribute to on-going salmon recovery efforts within the region." The WDFW provided updated HGMPs to NOAA Fisheries in August 2005.

The co-managers are now re-submitting an updated HGMP for the Soos Creek Hatchery coho program to further update the description of the program and incorporate new information and analyses.

The Puget Sound coho Evolutionary Significant Unit (ESU) is not listed under the ESA.

Soos Creek Hatchery Coho Program:
The purpose of the program is to produce Green River coho for sustainable recreational and tribal fisheries. Program fish will be produced at the Soos Creek Hatchery, located on Soos Creek tributary to the Green River. The program will release 600,000 yearling smolts to the Green River annually. The TU-Des Moines Chapter coho programs will release 30,000 yearling smolts from the net pens, located in the Puget Sound at Des Moines Marina and 120,000 fed fry, released into Des Moines (54,000) Miller (33,000) and Walker Creeks (33,000), which are independent tributaries to the Puget Sound.

The program will be operated as an "integrated" program with the intent to minimize the genetic and reproductive fitness differences between the hatchery broodstock and the naturally spawning population from which they are derived.

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

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

Monitoring, Evaluation, and Adaptive Management:
WDFW conducts annual spawning ground surveys in selected Green River tributaries (Hill, Newaukum, Spring, Cress, and North Fork Newaukum creeks). Survey data are used to track annual trends in population abundance and spatial distribution. WDFW continues to annually monitor natural production and smolt emigration timing via juvenile trapping on the mainstem Green River, at RKm 34.5. These monitoring programs will provide information to adaptively manage the coho hatchery programs.

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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Soos Creek Hatchery Coho Program.

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

Green River Coho (*Oncorhynchus kisutch*) - not ESA-listed.

1.3) Responsible organization and individuals

Hatchery Operations Staff Lead Contact

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Fish Management Staff Lead Contact

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

The *Muckleshoot Indian Tribe* (MIT) has Co-management authority for the Green River system. They currently receive 600,000 sub-yearlings from Soos Creek hatchery to supplement the release of 500,000 yearlings from Crisp Creek rearing ponds, and 500,000 yearlings from Elliott Bay net pens. The Elliott Bay Net Pens are a joint project conducted between the Muckleshoot Indian Tribe and the Suquamish Indian Tribe.

Trout Unlimited (TU) *Duwamish/Green River Chapter #115* (*aka "Des Moines Chapter"*) operates net pens at the Des Moines Marina, and also the Coho Salmon Hatchery in Normandy Park (see HGMP section 1.5). This local group receives 120,000 eyed-eggs (released as fed fry) and 30,000 sub-yearlings (released from their Des Moines net pens) (see also **Table 1.3.1**).

Trout Unlimited Contact

Name (and title):	Darrell Miller, Net Pen Project Leader Russell Welker, Hatchery Project Manager Ron DeSilva, Chapter President
Agency or Tribe:	Duwamish/Green River Chapter #115 – Trout Unlimited
Address:	P.O. Box 98046; Des Moines, WA 98198
Telephone:	(425) 254-0793 (Ron DeSilva)
Fax:	NA
Email:	rwelker@q.com (Hatchery Project Manager) desilvarandy2@comcast.net (current Chapter President)

The Southwest Suburban Sewer District (SWSSD) provided Trout Unlimited the space, power and water at their Miller Creek Water Treatment Plant (WTP) for the Miller Creek Salmon Hatchery faciltiy. Senior Operator at the SWSSD WTP is Darren Hill.

City of Des Moines allows space in the Des Moines Marina for the net pen program.

Puget Sound Anglers – South King County Chapter: co-sponsors the net pen project.

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King County Department of Natural Resources &Parks (DNRP) Ecological Restoration and Engineering Services Unit: Laura Hartema, Ecologist, oversees watershed/riparian restoration and stream survey/fish counts in the Des Moines Creek Drainage.

King County Department of Natural Resources & Parks (DNRP) Central Puget Sound Watershed:. Elissa Ostergaard, Miller/Walker Creek Basin Steward, coordinates the *Community Salmon Investigation (CSI)*: Highline watershed/riparian restoration program for the Miller/Walker creeks drainage. This community volunteer program conducts stream surveys and fish counts in the fall. The program also works on riparian restoration and native plant re-vegetation to improve fish habitat and water quality.

In addition, eyed-eggs, fry and sub-yearlings are provided to local school groups, Seattle Aquarium (1,000 juveniles - reduced from 25,000 in 2004) and other local co-operative enhancement projects (approximately 85,000 eyed eggs - reduced from 200,000, and 31,000 fish/unfed fry) as listed in **Table 1.3.1**.

Table 1.3.1: Juveniles and eggs for off-station co-operative enhancement program releases provided from Soos Creek Hatchery coho program.

Facility	Number	Fpp	Life Stage
Keta Creek Complex (MIT)	600,000	80.0	Sub-yearlings
TU – Des Moines Chapter	30,000	25.0	Sub-yearlings
Seattle Aquarium	1,000	25.0	Sub-yearlings
Subtotal Sub-yearlings	631,000		
Vashon Sportsmen	30,000	500.0	Fry
Wordan Project	1,000	500.0	Fry
Subtotal Fry	31,000		
NWSSC – Des Moines	120,000	---	Eyed eggs
Friends of ISH	6,650	---	Eyed eggs
City of Tukwila	80,000	---	Eyed eggs
Marine Tech Center	5,000	---	Eyed eggs
Subtotal eyed-eggs	211,650		
Total Enhancement Co-ops	873,650		

Source: WDFW Future Brood Document 2013.

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

Facility	Funding Sources	Operational Information (FY 2011)[a]
Soos Creek Hatchery	Puget Sound Recreational Enhancement Fund (PSRE) Wildlife Fund – State DJ-Federal Local	FTEs = 4.33 Annual operating cost (dollars) $411,152
TU Co-op Program	Aquatic Lands Enhancement Account (ALEA)[b]	$1,675 (feed costs)

[a] The above information for annual operating cost applies to all species produced at this facility.

[b] Funds to provide and maintain the net pens at Des Moines Marina are the responsibility of TU - Des Moines. Staffing is provided through volunteer labor. There are no other significant regular operational costs.

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

Broodstock Collection:

Soos Creek Hatchery: Located on Big Soos Creek (WRIA 09.0072) at RM 0.6, tributary to the Green River (WRIA 09.0001) at RM 33.6.

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Incubation and Early Rearing Locations:
Soos Creek Hatchery

Trout Unlimited (TU) Miller Creek Coho Salmon Hatchery:
Located at approximately R.M. 1 on Miller Creek (WRIA 09.0371), on the grounds of the Southwest Suburban Sewer District (SWSSD) Miller Creek Plant (1015 SW 174th Pl., Normandy Park WA, 87166-3465).

Rearing; Release and Acclimation Locations:
Soos Creek Hatchery

Des Moines Net Pen: Des Moines Marina, Central Puget Sound.

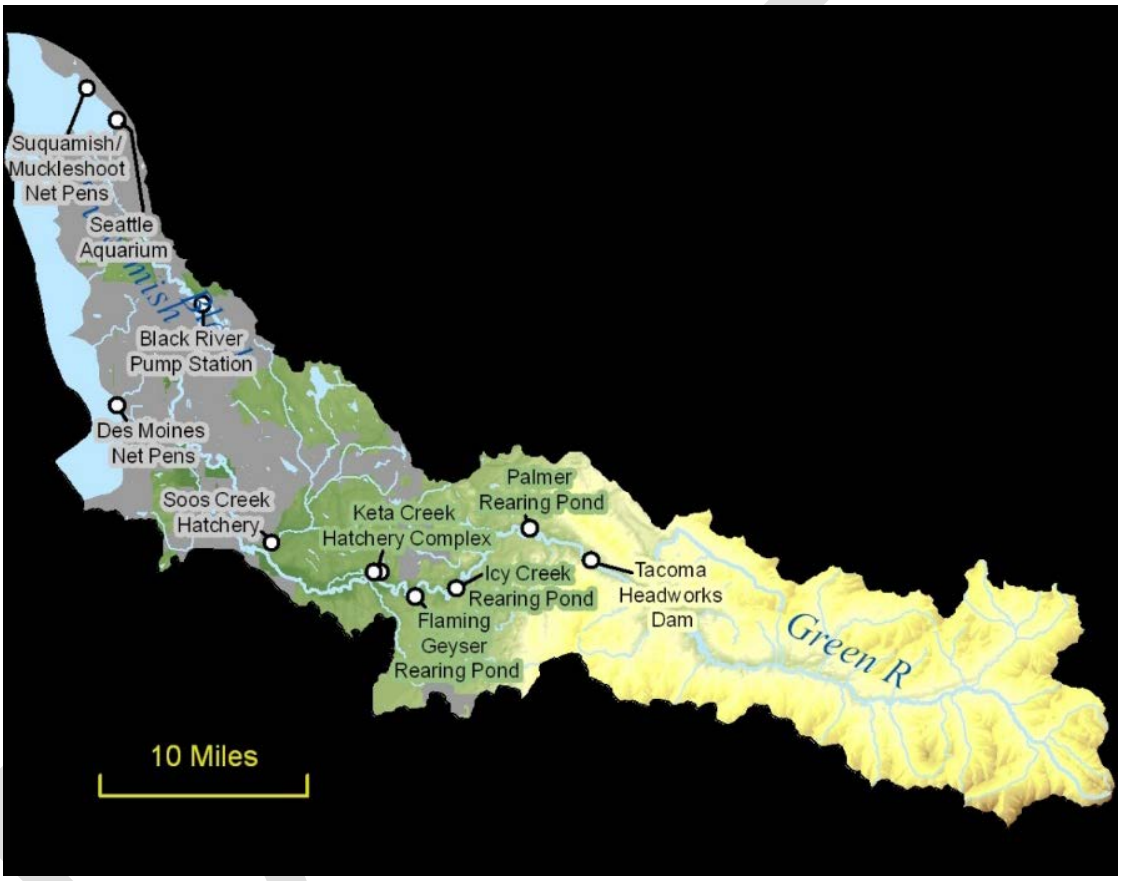

Figure 1.5.1: Green /Duwamish watershed Hatcheries and associated Rearing, acclimation and release facilities. Source: WDFW GIS Staff.

1.6) Type of program.

Integrated Harvest.

1.7) Purpose (Goal) of program.

Harvest Augmentation.

1.8) Justification for the program.

The purpose of the program is to provide adult fish for sustainable fisheries (Magnuson/Stevens Act) and Treaty Indian fishing right entitlements (*U.S. v Washington*). Habitat loss and degradation in the Green-Duwamish Basin limits the potential for natural production at self-sustaining and harvestable levels (see HGMP section 3.4).

The Soos Creek Hatchery coho program is used as a Double-Index Tag (DIT) group. The DIT group serves as an index group for wild coho, and provides data on catch contributions, run

timing, total survival, migration patterns and straying into other watersheds. With the exception of the DIT group, all releases are consistently mass-marked (see HGMP section 10.7). The Soos Creek Hatchery coho on-station program, has been managed as “integrated” since 2007.

TU Des Moines Co-op: A total of 150,000 locally-adapted juvenile coho (30,000 smolts through the net pen program, and 120,000 fed fry from TU’s Miller Creek Coho Salmon Hatchery program) are released through this program. Fry are released into three local streams after they button-up. Net pen fish are mass-marked and acclimated to the release site for several months, before being released as smolts in in late-May or June. The net pens are located in Des Moines Marina, just south of the mouth of Des Moines Creek. Anecdotal evidence suggests that the returning adult coho will stage at the marina, before moving up Des Moines Creek after high tide (personal communication, Laura Hartema, King County). This provides a "bubble" fishery in the area (see HGMP section 3.3.1). Yearling coho smolts are released from the net pen in late-May or June to minimize the likelihood for interaction with natural Chinook salmon juveniles, which migrate seaward as sub-yearling smolts predominately between March/April and mid-May/June.

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

Table 1.8.1: Summary of risk aversion measures for the Soos Creek Hatchery coho program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.1	*Soos Creek Hatchery*: Surface water rights are formalized through trust water right #S1-21122. Spring water rights at Soos are formalized though trust water right #S1-000382CL. Monitoring and measurement of water usage is reported in monthly NPDES reports. *TU Des Moines Co-op*: The water right for the well water used at Miller Creek Salmon Hatchery is held by the SWSSD Miller Creek water treatment plant.
Intake Screening	4.2	Intake screens at Soos Creek Hatchery are in compliance with state and federal guidelines (NMFS 1995, 1996), but do not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011a) intended to minimize the risk of entrainment of juvenile natural-origin fish. The 2012 budget provided WDFW with funding to replace/renovate the existing intake to meet current fish passage and screening requirements.
Effluent Discharge	4.2	*Soos Creek Hatchery*: This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System administered by the Washington Department of Ecology (DOE) - WAG 13 – 3014. *TU Des Moines Co-op*: The net pen and Miller Creek Hatchery facilities meet guidelines which do not require the “Upland Fin-Fish Hatching and Rearing” National Pollution Discharge Elimination System (NPDES) general permit (>20,000 lbs total on site production and > 5,000 lbs of fish feed per

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		month).
Broodstock Management & Adult Passage	7.9	Coho salmon voluntarily enter a trap in Soos Creek during a time period (October through December) when few wild steelhead and Chinook salmon are present. Any unmarked (adipose intact or non-CWT) steelhead or Chinook that enter the trap will be passed upstream or trucked to the mainstem Green River after broodstock needs are met for the integrated Chinook program.
Disease Transmission	7.7, 9.2.7	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 infectious fish pathogens.
Competition & Predation	2.2.3, 10.11, 11.1	Fish are released at a time, size, and life-history stage (smolts) to foster rapid migration to marine waters. Studies are/will be conducted in riverine, estuarine, and nearshore areas to evaluate the ecological risks posed by the release of coho salmon smolts. *TU Des Moines Co-op*: Fry are released in the independent mid-Puget Sound tributaries in which there have been no listed salmon populations identified.

1.9) List of program "Performance Standards".

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

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

1.10.1) "Performance Indicators" addressing benefits.

Table 1.10.1.1. "Performance Indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in *U.S. v Washington*.	Contributes to co-manager harvest.	Participate in annual coordination between co-managers to identify and report on issues of interest, coordinate management, and review programs (FBD process, North of Falcon).
3.1.2 Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development within the Green River Basin and contributes to sport, tribal and commercial fisheries.	Estimate survival and contribution to fisheries for each brood year released.
3.1.3 Program addresses ESA responsibilities.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP updated and re-submitted to NOAA with significant changes or under permit agreement.

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3.2.1 Fish produced for harvest are propagated and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Externally-marked hatchery fish differentiate hatchery from natural-origin fish and enable mark-selective fisheries, which can reduce directed harvest mortality on wild fish.	Agencies monitor harvests and hatchery returns to provide up-to-date information.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults. Production fish are mass-marked and/or tagged (~ 96% adipose fin-clips and/ or tags and 4% in double index tag groups with no external mark) to allow for their differentiation from naturally-produced fish to allow for their differentiation from naturally-produced fish.	Annually monitor and record size, number, date of release and mass-mark quality (adipose fin-clip rate) of all hatchery releases. Annually sample returning fish for the fin-mark in fisheries and at the hatchery; record numbers of estimated hatchery (marked) and natural (unmarked). The double index tag (DIT) group (CWT-only) provides data on estimated wild coho catch contributions, run timing, total survival, and migration patterns.
3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Broodstock collection is conducted representatively and systematically throughout the entire return period.	Annual run timing, age and sex composition and spawning escapement timing data are collected. Adhere to WDFW spawning guidelines. (HSRG 2004 and Seidel 1983).
3.5.5 Juveniles are released at fully-smolted stage to benefit juvenile to adult survival rates, and reduce the likelihood for residualism and negative ecological interactions with natural-origin fish.	Smoltification status (size fpp/mass CV and condition factor) and behavior are monitored in the hatchery (17 fpp coho yearling).	Monitor fish condition in the hatchery throughout all rearing stages. Annually monitor and record size, number and date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is properly sized to meet harvest objectives; program fish are fully utilized in target fisheries.	Monitor harvests and hatchery returns throughout the run.
3.6.1 The hatchery program uses standard scientific procedures to evaluate various aspects of artificial propagation.	Adhere to HSRG (2004) and WDFW spawning guidelines (Seidel 1983). Apply minimal monitoring standards in the hatchery: food conversion rates, growth trajectories, mark/tag rate error, weight distribution (CV).	Collect annual run timing, age and sex composition data upon adult return. Annually record growth rates, mark rate and size at release and release dates.
3.8.3 Non-monetary societal benefits for which the program is designed are achieved.	Contributes to the cultural benefit that fishing provides. Recreational fishery angler days, length of season, number of licenses purchased. Fish available for tribal ceremonial use.	Assess annual harvest of hatchery fish based on CWT recovery estimates and creel surveys.

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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.	Program complies with Federal ESA-listed fish take authorizations for harvest and hatchery actions.	HGMP is updated to reflect any major changes in program and resubmitted to NOAA fisheries. Program risks have been addressed in this HGMP through best available science hatchery management actions. Monitor juvenile hatchery fish size, number, date of release and mass-mark quality; monitor contribution of hatchery adult fish to fisheries and hatchery escapement.
3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while adequately minimizing by-catch of non-target species.	Number of marks released and estimated proportion of marks in out-migrant juveniles and returning adults on the spawning ground. Production fish are mass-marked to allow for their differentiation from naturally-produced fish.	Harvest is regulated to meet appropriate biological assessment criteria. Agencies monitor harvests and hatchery escapements to provide up-to-date information. DIT groups (CWT-only) provide data on catch contributions, run timing, total survival, migration patterns.
3.2.2 Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.	Percentage of total hatchery releases are identifiable as hatchery-origin fish. Mass-mark (adipose-fin clip, CWT, otolith-mark, etc., depending on species) produced fish to allow for their differentiation from naturally produced fish for selective fisheries.	On-station releases have been 100% marked (adipose clip and/or CWT) since the 1998 release year (brood year 1996). Annually monitor and record size, number, date of release and mass-mark quality (adipose fin-clip rate) of all hatchery releases. Assess annual harvest of mass-marked hatchery fish based on CWT recovery estimates and creel surveys. DIT groups (CWT-only) provide data on catch contributions, run timing, total survival, migration patterns.
3.3.1 Hatchery program contributes to an increasing number of spawners returning to natural spawning areas.	Index numbers of spawners,are monitored.	Annual natural spawning based on AUC live fish counts in selected Green River tributaries (SaSI). Managed as a "Stabilizing" population.
3.3.2 Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production	All hatchery production is identifiable in some manner (fin-marks, tags, otolith, etc.) consistent with information	On-station releases have been 100% marked (adipose clip and/or CWT) since the 1998

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and to evaluate effects of the program on the local natural population.	needs.	release year (brood year 1996). Annually monitor and record size, number, date of release and mass-mark quality (adipose fin-clip rate) of all hatchery releases Examine returning fish encountered for the fin-mark at the hatchery. Annually record numbers of estimated hatchery (marked and/or tagged) and natural (unmarked and untagged) fish.
3.4.1 Fish collected for broodstock are collected throughout the return or spawning period in proportions approximating the timing and age distribution of population from which broodstock is taken.	Temporal and age distribution of broodstock collected, compared to that of naturally-produced population at collection point.	Collect annual run timing, age and sex composition and return timing data.
3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas	Integrated harvest – collection of NOB does not significantly reduce potential juvenile production in the system.	Managed as a "Stabilizing" population.
3.4.3 Life history characteristics of the natural population do not change as a result of this hatchery program.	Life history patterns of juvenile and adult NOR are stable.	WDFW monitors salmon escapement to the natural spawning areas above and below the hatchery release sites to estimate the number of tagged, untagged, and marked fish escaping each year. Some smolt emigration rates post-release, timing of emigration and predation assessment are evaluated via smolt trapping in the mainstem Green River for WDFW wild juvenile salmon production monitoring.
3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production	Within and between populations, genetic structure is not affected by artificial production.	Currently not monitored
3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally-spawning population.	Timing of broodstock collection compared to overall run timing.	All hatchery production is identifiable in some manner (fin-marks, tags, etc.). Collect annual run timing, origin, age and sex composition and return timing data.
3.5.3 Hatchery-origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.	N/A	Managed as a "Stabilizing" population.
3.5.4 Juveniles are released on-	Fish are released in lower river	Annually record release

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station, or after sufficient acclimation to maximize homing ability to intended return locations.	locations after acclimation.	information, including location, method, and age class in WDFW Hatcheries Headquarters Database.
3.5.5 Juveniles are released at fully-smolted stage.	Level of smoltification at release. Release type (forced, volition or direct).	Monitor size, number, and date of release.
3.5.6 The number of adults returning to the hatchery that exceeds broodstock needs is declining.	Program is sized appropriately for harvest goals. Numbers of surplus hatchery returns are calculated annually.	Annually record numbers of adults returning to the hatchery, broodstock collected, and surplus returns.
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.	Pathologists from WDFW's Fish Health Section monitor program monthly. Exams performed at each life stage may include tests for virus, bacteria, parasites and/or pathological changes, as needed. The program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDOE water right permit compliance.	Flow and discharge reported in monthly NPDES reports.
3.7.3 Water withdrawals and in-stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	Water withdrawals compared to NMFS, USFWS and WDFW applicable passage and screening criteria for juveniles and adults.	Barrier and intake structure compliance assessed and needed fixes are prioritized.
3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. Follow the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006),	Necropsies of fish to assess health, nutritional status, and culture conditions.	WDFW Fish Health Section inspects adult broodstock yearly for pathogens and monitor juvenile fish on a monthly basis to assess health and detect potential disease problems. As necessary, WDFW's Fish Health Section recommends remedial or preventative measures to prevent or treat disease, with administration of therapeutic and prophylactic treatments as deemed necessary. A fish health database will be maintained to identify trends in fish health and disease and implement fish health management plans based on findings.

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	Release and/or transfer exams for pathogens and parasites.	Examine fish 1 to 6 weeks prior to transfer or release, in accordance with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006),
	Inspection of adult broodstock for pathogens and parasites.	At spawning, lots of 60 adult broodstock are examined for pathogens.
	Inspection of off-station fish/eggs prior to transfer to hatchery for pathogens and parasites.	Controls of specific fish pathogens through eggs/fish movements are conducted in accordance to 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. See HGMP sections 7.5 and 7.8.	Conduct controls of specific fish pathogens through eggs/fish movements in accordance to the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006), Record disposition of carcasses in the WDFW Hatcheries Headquarters 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.	Annual run timing, age, and sex composition and return timing data are collected.
3.7.7 Weir/trap operations do not result in significant stress, injury or mortality in natural populations.	All observations of natural-origin fish at hatchery facilities are recorded and reported annually.	Trap checked daily. Natural- and hatchery-origin fish abundances recorded and reported annually.
3.7.8 Predation by artificially produced fish on naturally – produced fish does not significantly reduce numbers of natural fish.	Hatchery juveniles are raised to smolt-size and released from the hatchery at a time that fosters rapid migration downstream.	Hatchery smolt release size and time are monitored to quantify/minimize predation effects on naturally produced Chinook and steelhead (Seiler et al. 2000, 2002).
3.8.1 Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	Total cost of operation.	Compare annual operational cost of program to calculated fishery contribution value (Wegge 2009).

1.11) Expected size of program.

1.11.1) <u>Proposed annual broodstock collection level (maximum number of adult fish).</u>

Approximately 2,300 adults are needed for all on-station and off-station program needs; approximately 740 adults (1:1 females to males) are needed for the on-station release. This is based upon an average fecundity of 1,892 eggs per female, an egg-to-smolt survival of 86%.

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

Table 1.11.1: Proposed annual on-station fish releases.

Life Stage	Release Location	Annual Release Level
Yearlings	Soos Creek (09.0072)	600,000[a]

Source: WDFW Future Brood Document 2013.

[a] The program size is dependent on funding availability. WDFW has funds available for release of only 300,000 coho; additional production must be funded by funding sources external to WDFW. MIT has provided funds to support release of an additional 300,000 coho in 2010, 2011 and 2012.

Table 1.11.2.1. Proposed fish release levels by life stage and location for the Trout Unlimited Des Moines Chapter co-op program.

Life Stage	Release Location	Annual Release Level
Yearling	Des Moines Marina	30,000
Fry	Des Moines Creek (WRIA 09.0377)	54,000
	Miller Creek (WRIA 09.0371)	33,000
	Walker Creek(WRIA 09.0372)	33,000

Source: WDFW Future Brood Document 2013.

See also **Table 1.3.1** for other off-station releases.

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

For brood years 2001 through 2005, the average smolt-to-adult survival rate was 7.84% (RMIS 2012). Based on the average smolt-to-adult survival rate, and a program release of 600,000, the estimated adult production (goal) level would be 47,040. (See also HGMP section 3.3.1).

Table 1.12.1: Soos Creek Hatchery coho adult and jack escapement (hatchery-only) 2001-2013.

Year	Escapement
2001	6,328
2002	40,394
2003	9,675
2004	27,342
2005	13,499
2006	4,951
2007	17,585
2008	17,346
2009	13,908
2010	9,279
2011	19,587
2012	33,985
2013	20,815
Average	**18,053**

Source: WDFW Hatcheries Headquarters Database 2013.

Trout Unlimited Des Moines Chapter Co-op: Coho from this program have not been coded-wire tagged since the program's inception; as such, no smolt-to-adult survival rates have been estimated. See also HGMP section 3.3.1 for harvest data.

King County Community Salmon Investigation (CSI): Highline has been conducting adult salmon monitoring in the Miller-Walker creeks watershed since 2010 (see HGMP section 11.1). Pre-spawn mortality observed in female coho was 50% (N=6) in 2010 and 39% (N=89) in 2011.

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Surveys in 2012 began October 10; preliminary results indicate a pre-spawn mortality of 88% (N=115) (personal comm, Elissa Ostergaard, 2013).

Table 1.12.1. Coho salmon observations, in Miller and Walker creeks, 2010-2012.

Year	Dates Observed	Miller Creek		Walker Creek		Total	
		Live	Carcass	Live	Carcass	Live	Carcass
2010	10/13-12/10	23	20	12	1	[a]35	[b]21
2011	10/12-12/11	83	69	46	20	129	[b]89
2012	10/10-12/24	216	196	216	44	[c]432	240

Source: King County CSI: Highline-Miller/Walker Creeks Stewardship program, 2013.
[a] A total of 10 "unidentified" fish were assumed coho based on time of return.
[b] Does not include "unidentified" fish.
[c] Estimates from surveys conducted in 2012are preliminary, and do not include "unidentified fish."

Table 1.12.2: Percent of total carcasses, by origin, Miller and Walker creeks, 2010-2011.

Year	Total (N)	[a]Ad-clipped	[b]Unclipped	Unknown
2010	21	57%	19%	24%
2011	89	62%	27%	11%
2012	240	54%	44%	2%

Source: King County CSI: Highline-Miller/Walker Creeks Stewardship program, 2013.
[a] Hatchery "strays" into the basin.
[b] Adipose fin was present, indicating that they were either natural-origin or returns from the TU Miller Creek Coho Hatchery fry outplants.

King County Ecological Restoration and Engineering Services Unit received special funding to conduct adult salmon monitoring in Des Moines Creek in 2012 and 2013 (see HGMP section 11.1). Surveys were conducted October 8 to December 23, 2012, in the lower 0.38 miles of Des Moines Creek. No post-spawn females were observed in 2012, and most females had 50-100% egg retention (personal comm. Laura Hartema, 2013).

Table 1.12.4: Live and dead coho identified in pre-spawn mortality survey, Des Moines Creek 2012 (King County data).

Coho	Number	Dates Observed
Live	74	10/14-11/18
Dead	77	10/15-11/26

Source: Laura Hartema, Ecological Restoration and Engineering Services Unit, February 2013.

Table 1.12.5: Percent of total carcasses, by origin, Des Moines Creek 2012.

Year	Total (N)	Ad-clipped	[a]Unclipped	Unknown
2012	77	60%	34%	6%

Source: Laura Hartema, Ecological Restoration and Engineering Services Unit, February 2013.
[a] Adipose fin was present, indicating that they were either natural-origin or returns from the TU Miller Creek Coho Hatchery fry outplants

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

The Soos Creek coho program began in 1901.

Trout Unlimited Des Moines Chapter Co-op fry releases: Program was initiated with unfed fry releases in 1983. The first RSI was installed in Miller Creek 1984; Des Moines Creek plants began in 1986. The permanent TU Coho Salmon Hatchery was constructed at the SWSSD Miller Creek Plant in 1987. Program was changed to fed-fry as of the 2014 releases.

Des Moines Net Pens: Program was initiated in 1981; the first coho release was in 1982.

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1.14) Expected duration of program.

Ongoing.

1.15) Watersheds targeted by program.

Soos Creek (WRIA 09.0072), a tributary to the Duwamish/Green River (WRIA 09.0001).

Trout Unlimited Des Moines Chapter Co-op: These fish are intended to contribute to Puget Sound sport and net fisheries (tribal and non-tribal).

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

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 Green River watershed any changes in the production at the Soos Creek Hatchery have to be reviewed and approved by WDFW and the Muckleshoot Tribe.

Alternative 1: *Reduce coho release numbers as a measure to decrease ecological risks to natural-origin Chinook salmon*. To reduce ecological interactions with listed species coho fry plants were discontinued in 2006. Further reductions will not be pursued because the program would not meet enhancement or harvest objectives, and would not meet the Co-managers goals including providing recreational, cultural and subsistence, ceremonial, religious, commercial and non-commercial benefits, nor be compatible with Treaty Indian fishing rights (*US v WA*) or the Magnuson/Stevens Act for sustainable fisheries.

TU Des Moines Chapter Co-op:

Alternative 1: Replace unfed fry releases with fed-fry. Fish would be released at a later date at a larger size to facilitate higher survival to migration from the system. Fed-fry releases were initiated in 2014.

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

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

This HGMP was previously submitted to NOAA in 2005, but was never acted upon. This HGMP is submitted to the NOAA Fisheries for ESA consultation, and determination regarding compliance of the plan with ESA section 4(d) rule criteria for joint state/tribal hatchery resource management plans affecting listed Chinook salmon and steelhead.

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

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

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

None.

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

Puget Sound Chinook (*Oncorhynchus tshawytscha*): Listed as *Threatened* on March 24, 1999 (64FR14308); *Threatened* status reaffirmed on June 28, 2005 (70FR37160); reaffirmed

Threatened by five-year status review, completed August 15, 2011 (76FR50448). The Puget Sound Chinook salmon ESU is composed of 31 historically quasi-independent populations, of which 22 are believed to be extant currently. The ESU includes all naturally-spawned populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Strait of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington (Ford 2011), as well as twenty-seven artificial propagation programs (NMFS 2013 78FR38270). In the Duwamish/ Green River basin, the Technical Recovery Team (TRT) has identified one demographically independent population (DIP) (Duwamish/ Green River Chinook) (Ruckelshaus et al. 2006).

Puget Sound steelhead *(Oncorhynchus mykiss*): Listed as *Threatened* under the ESA on May 11, 2007 (72FR26722); reaffirmed *Threatened* by five-year status review, completed August 15, 2011 (76FR50448). The DPS includes all naturally-spawned, anadromous winter-run and summer-run *O. mykiss* (steelhead) populations, below natural migration barriers in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington (Ford 2011). Also includes steelhead from six artificial propagation programs: Green River Natural; White River Winter Steelhead Supplementation; Hood Canal Steelhead Supplementation Off-station Projects in the Dewatto, Skokomish, and Duckabush Rivers; and the Lower Elwha Fish Hatchery Wild Steelhead Recovery (NMFS 2013 78FR38270)This DPS is bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive), and also includes the Green River natural and Hood Canal winter-run steelhead hatchery stocks. In the Duwamish/ Green River basin, the TRT has preliminarily delineated one demographically independent population (DIP) of winter steelhead; (Green River), no summer run populations were identified in the basin (PSSTRT 2013a).

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 .

Soos Creek (Green/Duwamish) fall Chinook in the Puget Sound Chinook ESU. NMFS (1999) considered this stock to be in the ESU, but not essential for recovery. The stock was designated Category 2a, as the hatchery population is derived from a native, local population (SSHAG 2003). The NMFS subsequently listed hatchery production in the Green because these hatchery stocks are not significantly divergent from naturally-spawning fish in the watershed (70 FR 37160. June 28, 2005; NMFS SHIEER 2004, NMFS 2005).

Green/ Duwamish fall Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2003-2011) have averaged 1,860 for natural spawners in the Green/Duwamish DIP. During this same time period, the population has shown declining trend (SaSI, WDFW 2012).

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.

See Soos Creek Fall Chinook HGMP for Viability Criteria.

Green River steelhead in the Puget Sound steelhead DPS. Steelhead counts in the Green River have declined steadily since the 1980's and most sharply since 2005. The estimated probability

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that this steelhead population would decline to 10% of its current estimated abundance (i.e., to 45 fish) is high—about 90% within 80 years. With an estimated mean population growth rate of -0.042 ($\lambda = 0.959$) and process variance of 0.001, NOAA was highly confident ($P < 0.05$) that a 90% decline in this population will not occur within the next 20 years, and that a 99% decline will not occur within the next 45 years. However, beyond the next 50 years NOAA was highly uncertain about the precise level of risk (Ford 2011). Based on a preliminary intrinsic potential) estimate by the PSSTRT (2013), the capacity for winter steelhead is between 1,977 and 39,537 in the Green River Basin.

*Puget Sound steelhead: Updated Risk Summary***.** Steelhead populations in Puget Sound have shown a slight upward trend in spawners since 2009. The average number of spawners increased from 59% in 2009, to 77% in 2010, to 102% in 2011, and to 90% in 2012 relative to the four years leading up to the ESA-listing in 2007. These recent, short-term increases in spawners are a positive development, but do not negate the longterm risks facing Puget Sound steelhead DPS. Using spawner data collected through 2008 or 2009, Ford (2011) concluded that the status of the listed Puget Sound steelhead DPS has not changed substantially since the 2007 listing, and that steelhead in the Puget Sound DPS remain at risk of extinction throughout all or a significant portion of their range in the foreseeable future, but are not currently in danger of imminent extinction.

See Soos Creek Winter Steelhead HGMP for Viability Criteria.

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

See Soos Creek Fall Chinook HGMP for Chinook Productivity data.

See Soos Creek Winter Steelhead HGMP for Productivity data.

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

See Soos Creek Fall Chinook HGMP for Chinook Escapement data.

See Soos Creek Winter Steelhead HGMP for Escapement data.

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

See Soos Creek Fall Chinook HGMP for Chinook pHOS and pNOS estimates.

See Soos Creek Winter Steelhead HGMP for steelhead geneflow data.

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

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

Broodstock Program: See also HGMP section 5.5.1.

Broodstock Collection: Coho broodstock collection/spawning takes place between October and December overlapping the latter part of the Chinook run and early part of the steelhead run. Surplus adult Chinook may be passed upstream in both upper Soos Creek or trucked to the mainstem Green River (see Soos Creek Fall Chinook HGMP). Unmarked steelhead returning during the coho broodstock collection period will also be passed upstream of the weir.

Capture, handle and release effects: The Soos Creek Hatchery adult weir is capable of trapping 100% of the adult coho and other salmonids returning to Soos Creek at RM 0.8. The collection and handling of these fish may result in takes of listed fish through migration delay, injury during holding or through handling and incidental mortality through trapping or handling.

Rearing Program:

Operation of Hatchery Facilities: Potential impacts from facility operations at Soos Creek Hatchery include water withdrawal, hatchery effluent, and intake compliance. Monitoring and maintenance are conducted along with staff observations.

Entrainment effects: Upstream of the Soos Creek Hatchery weir is the hatchery pump intake that may cause a very low take risk to adults passing the intake dam. The pump intake screens are believed to pose a low level risk to juvenile migrants due to the small screen size and the high volume of bypass water associated with the structure. The weir and hatchery intake has been identified for improvements in the WDFW capital budget process.

Release:

Predation and Competition: Soos Creek Hatchery coho are unlikely to pose significant predation and competition risks to listed steelhead and Chinook juveniles. Monitoring and evaluation actions, and potential adaptive management measures that will be implemented to determine, and then (as appropriate) respond to, ecological effects of the program on listed steelhead and Chinook salmon are described in HGMP section 11.

Although coho have been documented to prey on other salmonids (primarily pink, chum and sockeye salmon) (Hawkins and Tipping 1999; Seiler et al. 2002; Hargreaves and LeBrasseur 1986), any predation potential to listed populations should be minimized by the timing and proximity of the release. Soos Creek Hatchery coho are released in April, usually during or right after a freshet, to foster rapid migration and minimize freshwater residence. Juvenile sampling in the lower Duwamish showed that yearling coho abundance declined rapidly throughout May, indicating that coho likely spend less than a week in the lower river and estuary (Ruggerone et al. 2006). The most extensive studies of the migration timing of naturally produced juvenile Chinook salmon in the Puget Sound ESU have been conducted in the Skagit River, Bear Creek, Cedar River, and the Green River (Seiler et al., 1998-2002). Although distinct differences are evident in the timing of migration between watersheds, several general patterns are beginning to emerge:

1) Emigration occurs over a prolonged period, beginning soon after emergence (typically January) and continuing at least until July;
2) Two broad peaks in migration are often present during the January through July time period; an early season peak (typically in March) comprised of relatively small Chinook salmon (40-45 mm), and a second peak in mid-May to June comprised of larger Chinook salmon;

Data shows that approximately 64% of the emigrating Chinook have passed out of the system prior to the release of the coho (Seiler et al. 2002). While wild Chinook smaller than 44 mm may be susceptible to predation by the average size hatchery coho the average size for emigrating Chinook salmon during April is larger (56.3 mm) and are not likely to be preyed upon by the hatchery coho because of their larger size.

Disease Effects: The risk of disease transmission to wild salmonids in the area (Puget Sound) is low. Transmission of hatchery-origin diseases from the hatchery to wild fish in areas where they co-occur is an unlikely event. Although hatchery populations can be considered to be reservoirs for disease pathogens because of their elevated exposure to high rearing densities and stress, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). These impacts are addressed by rearing fish at lower densities, within widely recognized guidelines, continuing well-developed monitoring, diagnostic, and treatment programs already in place per the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

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Genetic Effects: There are no known genetic effects on listed fish from this program.

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

We are not aware of any past takes of listed fish associated with this hatchery program. All Coho broodstock collection/spawning takes place between October and December overlapping the latter part of the Chinook run and early part of the steelhead run. Current Chinook program at the hatchery is managed as integrated and natural origin Chinook returning to the rack are retained for broodstock needs. Unmarked Chinook that arrive during coho broodstock collection and after Chinook broodstock collection has been concluded for the season are passed upstream of the hatchery or may be trucked to the Green River. The latter part of coho broodstock collection potentially overlaps with steelhead return timing, and any unmarked fish are passed upstream of the hatchery.

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

There is no take of listed species associated with this hatchery program. 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.

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

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

WDFW hatchery programs in Puget Sound operate under, and adhere to Co-manager priorities and legal requirements of the *Puget Sound Salmon Management Plan* (*PSSMP*), and the Terms and Conditions of Permits issued under the Endangered Species Act (ESA). Legal requirements, Co-manager priorities and general principles for hatchery management are adapted to the unique genetic and ecological conditions of the Green/Duwamish watershed. Hatchery programs operate in conjunction with harvest management, habitat restoration and protection to achieve near- and long-term goals for natural and hatchery production of salmonids in the Snohomish watershed (see HGMP section 3.4).

Comprehensive Coho Management Plan (CCMP): provides an overarching co-manager agreed to plan, which seeks to develop and implement improved coho management approaches that support the maintenance and restoration of wild stocks in a manner that reflects the regions fisheries objectives (resource protection, allocation, and harvest stabilization), production constraints, and production opportunities (PSTT and WDFW 1998).

Washington Department of Fish and Wildlife Commission Policy C-3619. WDFW adopted the Hatchery and Fishery Reform Policy C-3619 in 2009. Its purpose is to advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of

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hatchery reform. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries. WDFW Policy C-3619 works to promote the conservation and recovery of wild salmon and steelhead and provide fishery-related benefits by establishing clear goals for each state hatchery, conducting scientifically defensible-operations, and using informed decision making to improve management. It is recognized that many state operated hatcheries are subject to provisions under *U.S. v Washington* (1974) and *U.S. v Oregon* and that hatchery reform actions must be done in close coordination with tribal co-managers (available at http://wdfw.wa.gov/commission/policies/c3619.html).

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

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

This 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) which provides the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered Puget Sound Salmon Management Plan (PSSMP 1985).

The program is implemented in accordance with the legislatively-mandated Puget Sound Recreational Enhancement Program.

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

Des Moines Chapter TU Co-op: This program will be operated in accordance with a Cooperative Fish Production Agreement between TU - Des Moines and WDFW. That agreement will be consistent with the Future Brood Document and with this HGMP.

See also HGMP section 3.1.

3.3) Relationship to harvest objectives.

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

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

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public meetings between domestic and international federal, state, tribal and industry representatives and other concerned citizens.

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

Table 3.3.1.1: Soos Creek Hatchery Coho Fishery Contributions.

Brood Years: 2001-2005 Fishery Years: 2004-2008		
	Average SAR%[a]	**7.73**
Agency	***Non-WA Fishery***	***% of total Survival***
ADFG	All	*0.1*
CDFO	All	*2.5*
NMFS	All	*0.0*
ODFW	All	*0.8*
UNK	All	*0.1*
Agency	***WA Fishery***	***% of total Survival***
WDFW	10- Ocean Troll	*0.1*
WDFW	15- Treaty Troll	*1.4*
WDFW	23- PS Net	*39.0*
WDFW	41- Ocean Sport- Charter	*1.0*
WDFW	42- Ocean Sport- Private	*3.0*
WDFW	45- PS Sport	*7.4*
WDFW	46- Freshwater Sport[a]	*2.0*
UW	50- Out of Basin Hatchery Escapement (Strays)[c]	*0.0*
WDFW	50- Hatchery Escapement	*42.5*
WDFW	50- Out of Basin Hatchery Escapement (Strays)[c]	*0.2*
	Total	*100.0*

Source: RMIS 2012
[a] Average SAR% = (tags recovered/tags released)
[b] Freshwater Sport based on WDFW Catch Record Card (CRC) data
[c] Strays recovered at Grovers Creek, Keta Creek, Minter Creek and Portage Bay Hatcheries.

Des Moines Chapter TU Co-op: Des Moines net pen yearling coho and the fry releases into Des Moines, Walker and Miller Creeks are not coded-wire tagged. There is therefore no current data available for determining the fisheries contributions of the program.

Table 3.3.1.2: Estimated coho harvest, marked and unmarked catches, in Marine Area 10 recreational fisheries.

Year	Marked	Unmarked	Unknown
2004	2,048	1,492	2,083
2005	1,056	1,046	1,000
2006	1,019	916	656
2007	2,342	1,210	742
2008	1,113	351	165
2010	366	176	110
2011	707	554	246

Source: WDFW Catch Record Card Unit data, February 2013.

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3.4) Relationship to habitat protection and recovery strategies.

In Duwamish/Green River watershed, Howard Hanson Dam, an impassable barrier to fish migration, prevents natural production of salmonids into 106 lineal miles of stream habitat of the Upper Green River. The lower portion of the Green River basin is highly developed, channelized, diked and industrialized. Agriculture and urban development have degraded the hydrology, water quality, channel diversity, and riparian areas of most lowland streams in the basin. Toxic stormwater runoff from developed lands and roads is associated with high pre-spawning mortality in coho salmon and this effect is predicted over a large portion of the historic coho distribution in Central Puget Sound (Feist et. al. 2011; Spromberg and Scholz 2011). These factors have degraded or eliminated habitat important for Chinook and coho salmon, adversely affecting the survival and productivity of the natural population in the watershed. (See also http://www.rco.wa.gov/salmon_recovery/lead_entities.shtml).

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. vs. Washington* (1974 Boldt Decision). The Green River habitat section can be found under the Muckleshoot chapter at http://maps.nwifc.org:8080/sow2012/.

Salmon Recovery Funding Board (SRFB): 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). SRFB has helped finance over 500 projects. The Board supports salmon recovery by funding habitat protection and restoration projects. It also supports related programs and activities that produce sustainable and measurable benefits for fish and their habitat.

Lead Entities: community and watershed-based groups that develop local salmon habitat recovery strategies and recruit organizations to do habitat protection and restoration projects that will implement the strategies. Lead entities perform an essential role in salmon recovery in Washington State. The Lead Entity for the Green River/Duwamish River watershed is King County (WRIA 9).

Regional Fisheries Enhancement Groups (RFEG): Citizen based groups in conjunction with local governments work on habitat actions to benefit both listed and non-listed stock in the system including the Mid Puget Sound Regional Enhancement Group (RFEG).

Miller and Walker Creeks Basin Plan (2006). Provides technical information and analysis that is used to decide how best to address surface water management problems, such as flooding, poor water quality, erosion, and aquatic habitat degradation. The King County Department of Natural Resources & Parks Water and Land Resources Division (Des Moines and Miller/Walker drainages) works closely with the Trout Unlimited – Duwamish/Green Chapter #115 (TU-Des Moines) to conduct local stream restoration activities. These plans address fish habitat issues, surface water quality, flooding, and stormwater infrastructure in the Miller/Walker and Des

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Moines drainages. See also http://www.kingcounty.gov/environment/watersheds/central-puget-sound/miller-walker-creeks.aspx.

Monitoring Sampling and Analysis Plan (*SAP*) (2011). Also referred to as a *Quality Assurance Project Plan.* In 2008, King County initiated workshops to create a coordinated monitoring program to assess water quality, flow and habitat conditions in Miller and Walker creeks. This collaborative effort attempts to solve surface water, drainage and erosion problems in creeks south of Seattle, near SeaTac Airport. In 2009, recommendations from these workshops were forwarded to a project management team that included King County, the Port of Seattle, and the cities of Burien, Normandy Park, and SeaTac. SAP was developed, and completed in 2011. It addresses what, why, where, who and how monitoring will be accomplished, and how data will be managed and analyzed. Current and past monitoring includes hydrology (quantity and flow), water quality (WDOE), habitat quality and fish use (annual fall stream surveys). See also http://www.kingcounty.gov/environment/watersheds/central-puget-sound/miller-walker-creeks/monitoring.aspx#recommendations.

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. vs. Washington* (Boldt decision). The Green River habitat section can be found under the Muckleshoot chapter at http://maps.nwifc.org:8080/sow2012/.

WDFW Authorized Net Pen Project SEPA# 10040 (June 17, 2010) covers the installation and removal of fish net pens (both WDFW operated and cooperator operated) at 25 locations throughout Washington State.

3.5) Ecological interactions.

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

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

Rearing and migrating adult coho originating through the program may also serve as prey for large, mammalian predators in marine areas, nearshore marine areas and in the Green River and Soos Creek to the detriment of population abundance and the program's success in harvest augmentation. Species that may negatively impact program fish through predation may include:

- Orcas
- Porpoises
- 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
- Puget Sound bull trout

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Fish species that could positively impact the program may include trout and other salmonid species present in the Green River watershed through natural production. Juvenile fish of these species may serve as prey items for the 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. Salmonid adults that return to the creek and any seeding efforts using adult salmon carcasses may provide a source of nutrients and stimulate stream productivity. Many watersheds in the Pacific Northwest appear to be nutrient-limited (Gregory et al. 1987; Kline et al. 1997) and salmonid carcasses can be an important source of marine derived nutrients (Levy 1997). Carcasses from returning adult salmon have been found to elevate stream productivity through several pathways, including: 1) the releases of nutrients from decaying carcasses has been observed to stimulate primary productivity (Wipfli et al. 1998); 2) the decaying carcasses have been found to enrich the food base of aquatic invertebrates (Mathisen et al. 1988); and 3) juvenile salmonids have been observed to feed directly on the carcasses (Bilby et al. 1996). Addition of nutrients has been observed to increase the production of salmonids (Slaney and Ward 1993; Slaney et al. 2003; Ward et al. 2003).

(4) *Salmonid and non-salmonid fishes or other species that could be positively impacted by the program.* The program could positively impact freshwater and marine fish species that prey on juvenile fish. Nutrients provided by decaying carcasses might also benefit fish in freshwater. These species include:
- Northern pikeminnow
- Cutthroat trout
- Bull trout/Dolly Varden
- Steelhead
- Pacific staghorn sculpin
- Numerous marine pelagic fish species

SECTION 4. WATER SOURCE

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

Table 4.1.1: Water sources available at Soos Creek Hatchery.

Water Source	Available Water Flow (gpm)	Temp. (ºF)	Usage	Limitations
Spring	50	47	Adult holding, incubation, rearing	Available in small volume
Big Soos Creek (surface)	Up to 13,000	32-70	Adult holding, incubation, rearing	No limitation

Soos Creek Hatchery: is supplied by surface water from Soos Creek. Water is withdrawn via four pumps at the hatchery site. Pumps produce 13,000 gallons per minute (gpm). In addition, a small spring water supply (50 gpm) can be utilized in the incubation building. Soos Creek responds quickly to heavy rainfall and is prone to rapid fluctuations. Heavy bed loads and winter floods are becoming an increasingly common occurrence (Perry 2005). In 2012, the Legislature passed a jobs creation bill that provided WDFW with funding for hatchery capital improvements in addition to our capital budget request. These projects include replacing the water distribution tower and main supply lines to the tower (see also **Table 5.8.1**).

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The facility is supplied with surface water from Soos Creek. Water rights are regulated through permit # S1-21122. Spring water withdrawal is regulated through permit #S1-00382CL.

Table 4.1.2. Record of NPDES permit compliance at Soos Creek 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				
Soos Creek WAG13-3014	Y	Y	Y	1/10/2012	3	N	Y

Source: Ann West, WDFW Hatcheries Headquarters Database 2013.

Table 4.1.3. List of NPDES violations at Soos Creek Hatchery over the last five years (2008-2012).

Monitoring Month	Parameter	Sample Type	Result/ Violation	Permit Limit	Comment	Action
September 2008	TSS	Avg. Net Composite	21.6 mg/L	5.0 mg/L	River mixing with effluent sample and possible salmon in discharge pipe.	None
	TSS	Max Net Composite	29.0 mg/L	15.0 mg/L		
January 2009	TSS	Avg. Net Composite	13.0 mg/L	15.0 mg/L	Due to flooding.	
May 2009	SS	Avg. Net Composite	Unreported	0.1 ml/L		

Source: Ann West, WDFW Hatcheries Headquarters Database 2013.
Note: These violations did not result in non-compliance with NPDES permit.

Des Moines Marina Net Pen: The net pen passively uses the saltwater/freshwater mix in Puget Sound at the Des Moines Marina.

TU Miller Creek Coho Salmon Hatchery: Eggs and fish are reared on pathogen-free well water provided by the SWSSD Miller Creek water treatment plant, which also holds the water right. Water is pumped from one well via one of two pumps. Water temperature ranges from 52-56°F (about 10°F warmer than the creek), with an average pH of around 8.0. Flow through the incubator and deep troughs are kept high (6 gpm for incubator, 12-16 gpm through troughs) to compensate for low levels of dissolved oxygen and nitrogen. TU is working with WDFW Hatchery and SWSSD staff to improve water flow through the hatchery. Renovations will include an increased line size and improved valve system to increase and better control water flow and improve oxygenation. TU and SWSSD are also looking into a chiller to help reduce water temperatures during incubation and early-rearing, though this may be cost and space-prohibitive.

On occasion, when SWSSD switches water pumps, the water contains a black residue from oxidized iron from the pipes, and may cause egg mortality in the incubators.

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.

Soos Creek Hatchery: The hatchery water intake is in compliance with state and federal guidelines (NMFS 1995, 1996), but does not meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011a). The 2012 budget provided WDFW with funding to replace/renovate the existing intake to meet current fish passage and screening requirements.

Monitoring and reporting of effluent discharge results have been in compliance with NPDES permit (see **Table 4.1.2**). The 2012 Legislature provided WDFW with funding to build a new two-bay pollution abatement pond system.

The facility operate under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit which conducts effluent monitoring and

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reporting and operates within the limitations established in its permit administered by the Washington Department of Ecology (DOE), WAG 13-3014. 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.

TU – Des Moines Chapter Co-Op: Total on-site production for both the net pen and the hatchery facility is <20,000 lbs and < 5,000 lbs of fish feed per month; therefore, these programs do not require an "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System (NPDES) general permit. Water from the Miller Creek Hatchery facility is released through a pipe to a short ditch directly into Miller Creek.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock is collected from Soos Creek adjacent to Soos Creek Hatchery. Upstream-migrating adult coho are trapped in an in-stream, run-of-the-river pond framed by two semi-temporary weirs, with a "V"-entry into the lower weir.

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

Depending on the size of the fish transferred, two tanker trucks (300 and 1,500-gallons), equipped with aerators and oxygen tanks are available for fish transportation.

Eyed-eggs for co-op enhancement programs are transported in burlap bags, placed on ice in coolers.

5.3) Broodstock holding and spawning facilities.

Broodstock returning to Soos Creek Hatchery are trapped and held in an in-stream, run-of-the-river pond. It is the natural stream channel framed by a two semi-temporary weirs, with a "V"-entry at the lower one. The pond created by the weirs measures approximately 150-ft x 200-ft.

Adults selected for broodstock at are seined, sorted, killed and spawned at pond-side.

Funding has been provided in 2012 to construct new adult handling facilities and ponds (see HGMP section 5.8).

5.4) Incubation facilities.

Table 5.4.1: Incubation vessels available at Soos Creek hatchery.

Type	Number	Size
Shallow troughs	160	15' x 1' x 4"
Deep troughs	24	15' x 1.5' x 1'

Deep troughs are used exclusively for Chinook. Funding has been provided in 2012 to construct a new hatchery/incubation building outside the 100-year flood plain (see HGMP section 5.8).

Des Moines Marina Net Pens: Incubation takes place at Soos Creek Hatchery.

Table 5.4.2: Incubation facilities available at Trout Unlimited's (TU's) Miller Creek Coho Salmon Hatchery.

Type	Number	Size
Vertical Heath incubators	32 trays	24" x 25" x 3"

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TU Miller Creek Coho Salmon Hatchery: Eyed-eggs are transferred from Soos Creek Hatchery in mid-December. Fish are incubated on well water provided by the SWSSD Miller Creek water treatment plant.

5.5) Rearing facilities.

Table 5.5.1: Rearing facilities available at Soos Creek Hatchery.

Type	Number	Size
Asphalt lined rearing ponds	3	0.14 acre
Standard concrete raceways	8	10’ x 80’ x 3’
Lower standard concrete raceways	8	17.5’ x 95’ x 3’
Fiberglass raceways	12	16’ x 3 x 3’
Fiberglass circular ponds	2	16-ft diameter
Fiberglass circular ponds	6	6-ft diameter
Shallow troughs	160	15' x 1' x 4”
Deep troughs	24	15' x 1.5' x 1'

Ponds and raceways are surrounded by bird netting and otter fences to minimize predation losses.

See also **Table 5.8.1** for planned pond renovations/upgrades.

Miller Creek Salmon Hatchery:

Table 5.5.2: Rearing facilities available at TU’s Miller Creek Coho Salmon Hatchery

Pond Type	Number	Dimensions
Fiberglass deep troughs	2	15’ x 1.5’ x 1’

Des Moines Net Pen: The net pen (1) is 20’ x 20’ x 10’. The pen is located on the west side of the Des Moines Marina, anchored on all four corners of its pontoons with nylon rope to the dock below the sling launch,. It floats freely in the brackish water of the marina, and is covered with 1-inch mesh predator netting.

5.6) Acclimation/release facilities.

Coho are reared and acclimated on Soos Creek (surface) water during their entire time at the hatchery, and are released directly from the ponds into the creek.

Des Moines Net Pen: Fish are acclimated in and released from one net pen (see HGMP section 5.5). The net pen is fallowed from June to December. TU-D/G thoroughly pressure washes and cleans the net and the frame, before storage in a locked facility at the marina (see also HGMP section 9.2.7).

TU Miller Creek Coho Salmon Hatchery: Fish are reared on well-water provided by the SWSSD Miller Creek water treatment plant. Fed-fry are transported in coolers into Des Moines, Miller, and Walker creeks in January.

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

Soos Creek Hatchery is subject to flooding during high flow events, which causes the pump intake screens to become plugged frequently with heavy debris loads. In addition, flood risks limit the use of eight low-lying, standard (17.5’ x 95’ x 3’) raceways. Flood waters can inundate the lower raceways, which may allow the premature release of the fish; they are therefore unusable between November and March. Funding has been provided in 2012 to replace/renovate the existing intake and also construct new ponds necessary for the hatchery to operate properly and in compliance with current requirements (see HGMP section 5.8).

Des Moines Net Pen: No significant losses have been reported. The site regularly experiences bird and marine mammal (specifically sea lions and otter) predation.

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TU Miller Creek Coho Salmon Hatchery: No significant losses due to hatchery operations. In 2012, during the power outage due heavy snow, the back-up generator to at the SWSSD plant failed and water was cut off.

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.

A crew member is on stand-by at all times to monitor hatchery operations and respond to any unexpected events. Facility is equipped with low water alarms and a back-up generator in case of power loss

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

The 2012, the Legislature passed a jobs creation bill that provided WDFW with funding for hatchery capital improvements in addition to our capital budget request. At Soos Creek Hatchery, this allowed for the following improvements (see also HGMP section 4).

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

Project
Renovate or replace existing intake to meet current fish passage and screening requirements.
Construct new hatchery/ incubation building outside the 100 year flood plain.
Construct six new 120' x 20" ponds.
Demolish north side ponds and current adult handling facilities.
Construct new adult handling facilities and ponds.
Construct a new incubation settling pond.
Construct new two bay pollution abatement ponds.
Replace water distribution tower.
Replace main supply line to distribution tower.

Des Moines Net Pens: Volunteer staff check the fish and net pens daily. If any fish issues arise, Soos Creek Hatchery is contacted and a biologist comes out to check. Mortalities are removed and enumerated on a daily basis.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Adult coho salmon returning to Soos Creek Hatchery trap. Puget Sound coho are currently not ESA-listed.

6.2) Supporting information.

6.2.1) History.

The coho program was initiated in 1901 with native adults collected from the Green River and Soos Creek. Although additional stocks were occasionally imported in the early days of the hatchery's operation, their contribution is not believed to be significant and the hatchery stock has

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remained, to a very large extent, a local Soos Creek broodstock. The program has been maintained by adult returns to the hatchery for many decades (HSRG 2003).

6.2.2) Annual size.

Up to 2,300 adult coho are needed for an egg-take goal of 1,705,000 (FBD 2013). This program provides eggs for on-station releases and transfers to the Keta Creek Complex, Des Moines net pen, and other co-operative projects (see **Table 1.3.1**). Up to 740 adults are needed for on-station program needs.

TU – Des Moines Chapter Co-op: Approximately 180 adults (90 females and 90 males) are needed to achieve the total program goal of 150,000 juvenile coho (120,000 fry and 30,000 yearlings).

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

On-station releases have been consistently mass-marked since brood year 1996 (1998 release). However, the Keta Creek and Elliott Bay Net Pen programs have not been consistently mass-marked until brood year 2005. Prior to consistent mass-marking, the level of natural-origin fish incorporated into the hatchery brood stock was unknown.

On-station coho production has been managed as an integrated program since 2009. This requires an annual inclusion of natural-origin fish into the hatchery broodstock (see **Table 7.4.2**). Natural coho in the Green River is currently managed by WDFW as a "Stabilizing" population, which requires the hatchery program integration (PNI, pNOB and pHOS values) to be maintained at current levels.

TU – Des Moines Chapter Co-op: Prior to mass-marking levels of natural-origin fish incorporated into the hatchery broodstock were unknown. Currently the Des Moines net pen coho releases are managed as integrated. The fed fry releases are managed as a segregated program, although fish received from Soos Creek Hatchery may be from integrated stocks

6.2.4) Genetic or ecological differences.

Allozyme analysis of a large sample of Soos Creek Hatchery coho taken in the mid-1990s indicates that these fish are significantly different from all other Washington coho stocks examined. Soos Creek Hatchery coho most closely resemble the Lewis Creek (Snohomish Basin) coho sample and are very dissimilar to Minter Creek Hatchery coho, the only other South Sound coho stock examined (David Teel, NMFS, personal communication).

6.2.5) Reasons for choosing.

The stock was chosen because it was the native Green River stock.

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

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

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Broodstock is collected from adults returning to Soos Creek trap throughout entire run. Peak spawning occurs in November, with the total return extending between October and December.

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7.3) Identity.

Releases from Soos Creek Hatchery have been consistently mass-marked (adipose fin-clip and/ or CWT) since brood year 1996 (1998 releases). Releases from Keta Creek and Elliott Bay Net Pen programs have been consistently marked since the 2005 brood (released in 2007), and from the return time of these fish the facilities staff have been able to differentiate between hatchery- and natural-origin returning coho.

7.4) Proposed number to be collected:

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

Up to 2,300 adults collected annually for Soos Creek releases, Keta Creek Complex, Des Moines and Co-op transfers (see **Table 1.3.1**).

TU – Des Moines Chapter Co-op: Approximately 180 adults collected at Soos Creek annually to provide broodstock for this program.

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. Coho broodstock collection at Soos Creek Hatchery[a], 2001-2013.

Year	Adults				Jacks	
	Females		Males			
	Hatchery	Natural	Hatchery	Natural	Hatchery	Natural
2001	926	225	843	405	0	0
2002	1,587	284	1,664	346	23	3
2003	1,733	81	1,805	223	2	33
2004	833	392	687	648	7	0
2005	686	589	615	524	2	0
2006	639	349	465	472	5	0
2007	1,143	88	1,154	138	40	0
2008	685	28	699	99	10	0
2009[b]	618	324	516	553	23	11
2010	891	116	864	223	38	0
2011	739	201	502	527	11	11
2012	1,002	305	734	713	20	2
2013	963	317	835	377	2	0
Average	**957**	**254**	**876**	**404**	**14**	**5**

Source: WDFW Hatcheries Headquarters Database 2013.
[a] Includes all fish spawned at the hatchery for on- and off-station releases.
[b] Broodstock for on-station releases-only has been integrated since 2009 (off-station releases may be H x H crosses).

See also HGMP section 7.3.

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

Spawned carcasses are utilized for nutrient enhancement or sold to a carcass buyer. Adults not spawned are either donated to local food banks or sold to the carcass buyer. Up to 3,000 adults surplus to broodstock needs will be released upstream to spawn naturally.

7.6) Fish transportation and holding methods.

Not applicable; adult coho are not transported.

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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 since fish are held in an in-river trap. The only maintenance is the removal of mortalities.

7.8) Disposition of carcasses.

Spawned carcasses are utilized for nutrient enhancement or sold to a carcass buyer. Un-spawned adults are either donated to local food banks or sold to the carcass buyer.

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

No listed fish are collected for broodstock through this program. Puget Sound coho are not ESA listed.

Listed Chinook are collected and retained at the hatchery for the integrated Chinook program. All fish returning to the hatchery trap remain in the same in-river pond. Chinook migration timing is August to late-October, with peak returns to the trap between early-September and mid-October. Coho broodstock collection/spawning takes place between October and December, overlapping the latter part of the Chinook run. Any unmarked (adipose inact and non-CWT tagged) Chinook encountered after integrated Chinook broodstock collection has concluded are passed upstream or trucked to the Green River.

The coho broodstock collection timing also overlaps with the early portion of the listed winter steelhead return. The Soos Creek Hatchery weir trap is the primary homing location for the hatchery releases and would not likely draw listed fish to that site. Any listed (unmarked) steelhead encountered in the trap are released above the rack at Soos Creek.

Trapping methods do not pose a lethal risk and do not harm collected fish.

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 are randomly selected as they ripen across the entire maturation time frame. All available unmarked fish are spawned when ripe.

Depending upon the magnitude of the returns, the goal is to spawn enough ripe females each spawn day to secure an adequate egg-take for the program. If the egg-take goal for the program is met, but later-spawning females are available, eggs will be collected to represent the later portion of the run; these will replace the portion of the eggs collected at the earlier timing. Eggs from natural-origin fish, or fertilized with milt from natural-origin males are not culled.

8.2) Males.

All males collected are considered for spawning operation. Jacks may represent up to 5% of the males used. Males used for spawning are selected randomly from the available spawners.

8.3) Fertilization.

Eggs from each female are collected in separate container and mixed with milt from one male (pairwise spawning). If the male used is not ripe or has very little milt, another male is used to assure fertilization. Eggs mixed with milt are allowed 30-60 seconds for fertilization and then moved to 5-gallon buckets for transportation to the incubation room. Once there, eggs are moved

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to the baskets, placed in shallow troughs and water hardened for 1-hour in an iodophor solution of 100 ppm.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used.

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

No listed fish are included in the mating scheme through this program. Puget Sound coho are not ESA-listed.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation:

The current egg-take goal (FBD 2013) for the program is 1,705,000, and includes collection for on-station releases and transfers to Keta Creek Complex, Des Moines net pen and various co-op programs.

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

Table 9.1.1.1: Survival from egg take to ponding, Soos Creek Hatchery coho, 2000-2012.

Brood Year	Eggs Collected	Survival Rates	
		Green-to-Eyed Up	Eyed-Up-to-Ponding
2000	2,906,000	94.2	95.0
2001	2,356,000	95.3	95.0
2002	4,033,600	NA	NA
2003	3,097,000	94.1	95.0
2004	2,650,200	94.0	95.0
2005	2,199,100	82.3	95.0
2006	1,700,000	92.5	95.0
2007	2,024,000	94.0	95.0
2008	1,810,000	92.0	95.0
2009	1,929,300	95.0	95.0
2010	2,123,200	78.0	95.0
2011	1,965,000	90.8	94.0
2012	2,018,000	76.0	95.0
Average	**2,370,108**	**89.9**	**94.9**

Source: WDFW hatchery records 2013.

TU – Des Moines Chapter Co-op: Incubation of fish destined to release from the Des Moines net pen takes place at Soos Creek Hatchery; see Soos Creek Hatchery Coho HGMP.

A total of 120,000 eyed-eggs are shipped to TU's Miller Creek Coho Salmon Hatchery in December. Dead eggs are culled daily.

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

On occasion, an egg surplus results from inaccurate green egg sampling at the time of egg-take. Extra eggs are normally taken as a safeguard against potential incubation loss. Surplus fry ≤10%

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are normally reared as part of the programmed releases. Additional excess was commonly released as unfed fry or short-term reared fry. Recently the emphasis is to not exceed the program release goals.

9.1.3) Loading densities applied during incubation.

Fertilized eggs are placed in baskets and in shallow troughs at 25,000 per basket. Eggs are shocked, picked, and enumerated at between 450 and 500 Temperature Units (TUs).

Des Moines Net Pen: Incubation of fish destined to release through the Des Moines Net Pen program takes place at Soos Creek Hatchery (see Soos Creek Hatchery Coho HGMP).

Miller Creek Coho Salmon Hatchery: Eyed eggs are currently loaded at around 3 lbs. (4,000 eggs) per tray. TU is working with Soos Creek Hatchery staff to optimize incubation protocols, and will increase loading densities in the future.

9.1.4) Incubation conditions.

All eggs are incubated at Soos Creek Hatchery using surface water (Soos Creek); flow in the shallow troughs is between 6 and 8 gpm. Water temperatures range from 34-50ºF. Baskets are periodically flushed to remove accumulated silt since Soos Creek water is subject to heavy silt loads.

Once eyed (December), a portion of the eggs are transferred to the Trout Unlimited (Des Moines) fed fry program (120,000), City of Tukwila (80,000), and Friends of Issaquah Salmon Hatchery (6,650 Green River system plants), and Marine Tech Lab (Burien) (5,000).

Eggs are transported in burlap sacks inside coolers. Transportation time is varies between 30 and 60 minutes.

Miller Creek Coho Salmon Hatchery: Initial incubation from green to eyed-eggs takes place at Soos Creek Hatchery. A total of 120,000 eyed-eggs are transferred to Miller Creek Hatchery in mid-December. Eggs are loaded into vertical Heath trays (four racks of eight trays) supplied with well water at a flow rate of 6 gpm. Water temperature and flow is monitored daily and ranges from 52-56°F, with a pH of around 8.0. Eggs are not treated in the incubators, so mortalities are culled daily to control fungus.

Staff from Soos Creek Hatchery have been working with TU to reduce egg-mortality and improve incubation and rearing conditions at the Miller Creek Hatchery facility. These include increasing egg density in the trays, higher flows through the rearing troughs, holding the eggs at Soos Creek longer for treatment against fungus, and reducing the temperature of the well-water used for incubation and early-rearing to better match stream temperatures at release.

9.1.5) Ponding.

When fish are 95% buttoned-up and ready for initial feeding (late-February- early March), they are moved to various 10” x 80’ x 4’ raceways supplied with Soos Creek surface water.

Miller Creek Coho Salmon Hatchery: After hatching, alevin are immediately moved into the two 15-ft fiberglass “deep” troughs (flow through the troughs is around 12-16 gpm). Fish are fed, and released in January) (see HGMP section 10).

TU-Des Moines is working with Soos Creek Hatchery staff to increase oxygenation of water through the troughs after ponding in an effort to increase fry survival after planting.

9.1.6) Fish health maintenance and monitoring.

All eggs are fertilized and water-hardened in an iodophor solution. Fungus in troughs is controlled by formalin drip, (15-minute injection per day at a target dose of 1,667-ppm formalin), throughout incubation to just prior to hatch. Once eyed (around 500 TU), eggs are shocked and dead eggs removed. Fry loss is picked at the time of ponding and then as needed.

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Des Moines Net Pen: Volunteer staff check the fish and pens daily. If any fish issues arise, Soos Creek Hatchery is contacted and a biologist comes out to check. Mortalities are netted out on a daily basis.

Miller Creek Coho Salmon Hatchery: Volunteer staff check facility daily. If any fish issues arise, Soos Creek Hatchery is contacted and a biologist comes out to check. Mortalities are culled daily.

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

No listed fish are incubated through this program. Listed Chinook are incubated at the hatchery at the same time, but both species are incubated separately.

9.2) Rearing:

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

Table 9.2.1.1: Fry-to-sub-yearling/yearling survival rates of Soos Creek Hatchery coho, 2000-2012.

Brood Year	Survival Rates (%)	
	Fry-to-Sub-yearling	Sub-yearling-to-Smolt
2000	95.0	94.0
2001	95.0	95.0
2002	NA	NA
2003	95.0	94.0
2004	95.0	95.0
2005	95.0	88.0
2006	95.0	92.0
2007	95.0	95.0
2008	95.0	95.0
2009	95.0	96.0
2010	95.0	96.0
2011	95.0	98.0
2012	89.0	Not yet available
Average	**94.5**	**94.4**

Source: WDFW hatchery records 2013.

Des Moines Net Pens and Miller Creek *Coho Salmon Hatchery*: No data available.

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

Fish reared at Soos Creek, follow loading parameters set in *Fish Hatchery Management* (Piper et al. 1982). In all facilities within the Green River system, densities are kept at or below 11 lbs/gpm and a density index of 0.3. The final maximum loading per raceway is approximately 3200 lbs at 300 gpm (10.6 lbs/gpm).

Des Moines Net Pens. The 20ft x 20ft x 10ft. net pen receives up to 1,200 lbs of yearling coho at 25 fpp in February, and releases up to 2,000 lbs of smolts at 15 fpp in May/June.

9.2.3) Fish rearing conditions.

Coho are initially reared in 10' x 80' x 4' raceways. When fish reach 200 fpp (June), fish are adipose fin-clipped and moved into one of three 1/3 acre rearing ponds, where they remain until

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release. While in the 1/3 acre rearing ponds, the coho may be mixed with early summer or early winter segregated program steelhead.

Raceways and ponds are supplied with surface water. Flow index (FLI) is monitored monthly for all programs at Soos Creek Hatchery and would not exceeds 80% of the allowable loading (Piper et al. 1982). Ambient oxygen levels are monitored and range between 10-12 ppm entering to 8-10 ppm leaving the raceway, depending on ambient air temperature and number of fish in the raceway.

Fish transferred to off-station co-operative enhancement sites are listed in **Table 9.2.3.1**.

Table 9.2.3.1: Juvenile coho transfers from Soos Creek Hatchery.

Destination	Month	Number	Size (fpp)	Transportation	
				Vehicle	Time
TU-Des Moines Chapter	January	30,000	25	1500 gallon tanker	30 min
Seattle Aquarium	January	1,000	25	300 gallon tanker	1 hour
Wordan Project	March	1,000	500	Van	1 hour
Vashon Sportsmen	April	30,000	500	½ ton truck w/500 gallon tank	1 hour
Keta Creek Complex	August	600,000	80	1,500 gallon tank	30 min.

Source: WDFW Future Brood Document 2013.

Table 9.2.3.2: Monthly average surface water temperature (°F) at Soos Creek.

Month	Soos Creek Average Water Temperature (ºF)
January	41
February	41
March	45
April	49
May	51
June	56
July	58
August	58
September	56
October	50
November	43
December	41

Source: WDFW hatchery records 2012.

Miller Creek Coho Salmon Hatchery: see HGMP section 9.1.5.

Des Moines Net Pens: In February, around 30,000 juvenile coho at 25 fpp are transferred from Soos Creek Hatchery to the 20' x 20' x 10' net pen, where they remain until the June release.

Soos Creek Hatchery staff work closely with the TU Chapter to continue to improve facilities operations, rearing protocols, and to reduce costs and required man-hours.

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

Table 9.2.4.1: Average size (fpp), by month, Soos Creek Hatchery juvenile coho.

Month	Average Size (fpp)
January	n/a
February	1500
March	1000
April	600
May	400
June	200
July	100
August	80
September	60
October	40
November	30
December	27
January	25
February	20
March	18
April	17

Source: WDFW hatchery records 2012.

TU – Des Moines Chapter Co-op: Information not available for rearing at the salt-water net pen. Fed fry rear at the Miller Creek Salmon Hatchery for approximately a month before release.

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 available.

TU – Des Moines Chapter Co-op: Information not available for rearing at the salt-water net pen. Fed fry rear at the Miller Creek Salmon Hatchery for approximately a month before release.

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).

Soos Creek Hatchery: Coho are fed a variety of diet formulations including starter, crumbles and pellets of various brands. Feeding frequencies vary, depending on the fish size and water temperature; it usually begins with 7 feedings/7 days a week, and ends with 1 feedings/3 days a week. Feed rates vary from 1% to 2% B.W./day. An overall season food conversion rate is approximately 0.8-1.1:1.

Des Moines Net Pens: All feed is provided by Soos Creek Hatchery. The feed brand varies with contract prices. Feeding frequencies vary depending on fish size and water temperature, but fish are usually fed twice a day, in the morning and afternoon, from five to seven days/week, per instructions from Soos Creek Hatchery staff, until the feed runs out.

Miller Creek Coho Salmon Hatchery: All feed is provided by Soos Creek Hatchery. The feed brand varies with contract prices. Feeding frequencies vary depending on fish size and water temperature, but fish are usually fed twice a day, in the morning and afternoon, from five to seven days/week, per instructions from Soos Creek Hatchery staff, until the feed runs out.

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

Fish health is monitored on a daily basis by hatchery staff and at least monthly by a state Fish Health Specialist (FHS). Hatchery personnel carry out treatments prescribed by the FHS. Procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, Revised July 2006). See also HGMP section 10.9 for WDFW Standard Fish Health Procedures.

Miller Creek Coho Salmon Hatchery: Eggs are not treated in the incubator, so mortalities monitored closely and removed daily to prevent opportunistic fungal infections. Future protocols may include shipping them from Soos Creek Hatchery (where eggs are treated in the incubator) at a slightly later date. If any problems are noted, Soos Creek Hatchery is contacted, and WDFW staff are sent to check; no major issues have occurred.

Des Moines Net Pens: The coho net pen program is operated consistent with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006) to prevent any disease outbreaks within the pens.

Volunteers check the net pen on a daily basis; any observed mortalities are netted out and enumerated. If any problems are noted, Soos Creek Hatchery is contacted, and WDFW staff are sent to check; no major issues have occurred.

The net pen site is allowed to fallow after release (June to December), to flush any nutrient sediments from the area and reduce disease risks. The net and frame is pressure-washed and cleaned, then stored in a locked shed at the marina until the following season.

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

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

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

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

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

No listed fish are under propagation through this program; Puget Sound coho are not ESA-listed.

Listed Chinook and steelhead are also incubated at the hatchery while coho are present, but all species are incubated separately and all reasonable and prudent measures are employed to minimize rearing and incubation 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 presence of professionally trained personnel to operate facilities. Hatcheries are designed to provide a safe and secure rearing environment through the use of alarm systems, backup generators, and water re-use pumping systems to prevent catastrophic fish losses.

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 on-station release.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Yearling	600,000*	17	April	Green River

Source: WDFW Future brood Document 2013.

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The program size is dependent on funding availability. WDFW has funds available for only 300K coho. MIT has provided funds to support and additional 300,000 coho released in 2010, 2011 and 2012. Does not include off-station releases (see HGMP section 1.3)

Table 10.1.1: Proposed fish release levels.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fry	120,000	1500	January	Central Puget
Yearling	30,000	15	June	Central Puget Sound

Note: 1500 fpp = 31 mm fl; 15fpp = 146 mm fork length.
Program was changed from unfed fry releases to fed-fry releases in 2014.
Source: WDFW Future Brood Document 2013.

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

Stream, river, or watercourse:	Soos Creek (WRIA 09.0072)	Puget Sound	Miller Creek (WRIA 09.0371) Walker Creek (WRIA 09.0372) Des Moines Creek (WRIA 09.0377)
Release point:	RM 0.8 (Soos Creek Hatchery)	Des Moines Marina	Various
Major watershed:	Green River	Puget Sound	Independent tributaries to Central Puget Sound
Basin or Region:	Puget Sound	Puget Sound	Central Puget Sound

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

Table 10.3.1: Actual number and size at on-station release, Soos Creek Hatchery coho, 2000-2012.

Release Year	Fry[a]	Avg. size	CV	Date(s)	Yearling	Avg. size	CV	Date(s)
2000	No release				572,153	16	8.4	4/19;4/27
2001	349,872	591	NA	4/17	601,556	18	6.1	4/9;4/18;4/24
2002	297,258	481	NA	4/11	629,745	19	7.5	4/6
2003	279,500	559	NA	4/1	356,396	18	7.7	4/20-4/21
2004	367,800	600	NA	4/13	535,308	14	9.7	4/8;4/15
2005	125,000[b]	1,131	NA	2/17	785,100	15	7.6	4/20
2006	No release				399,000	15	5.9	4/20
2007					504,541	15	7.8	4/20
2008					212,000	16	7.1	4/21
2009					596,900	20	7.1	3/25-4/4; 5/1
2010					590,959	19	6.6	4/20; 5/3
2011					620,522	18	6.9	4/15; 5/4
2012					619,542	18	6.2	4/16-5/1
Average	**323,608[c]**	**558**	**NA**		**533,682**	**17**	**7.4**	

Source: WDFW Hatcheries Headquarters Database 2012
Note: 15 fpp = 146 mm fl; 17 fpp = 140 mm fl; 20 fpp =133 mm fl.
[a] Fry releases included: Hill, Spring Brook, Panther, Riverton and unnamed creeks, and Panther Lake.
[b] Released as Emergent fry into Covington Creek.
[c] Averages do not include emergent fry release in 2005.

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Table 10.3.2. Number released, by stage, size and date, TU-Des Moines coho programs.

Release Year	Yearlings			Unfed Fry					
	Number	Avg. size (fpp)	Date(s)	Miller Cr	Walker Cr	Des Moines Cr	Salmon Cr (Burien)[a]	Avg Size (fpp)	Date(s)
2000	30,000	15		45,000	35,000	15,000	----	1500	
2001	30,000	15		35,800	33,950	18,375	----	1500	
2002	30,000	15		45,500	45,500	21,000	----	1500	
2003	30,000	15		40,000	40,000	40,000	----	1500	
2004	30,000	15		39,600	36,300	29,700	----	1500	
2005	20,000	15		44,200	27,200	23,800	----	1500	
2006	30,000	15		40,385	34,600	23,200	----	1500	
2007	30,000	15		24,050	29,600	9,250	----	1500	1/20
2008	30,000	15	5/7	36,300	36,400	50,680	----	1500	1/19
2009	30,000	15		34,000	40,800	47,600	5,000	1500	1/17
2010	30,000	15		28,000	30,000	42,500	5,000	1500	1/23
2011	30,000	15	5/3	32,300	31,500	27,200	5,100	1500	1/22
2012	30,000	15		24,000	30,000	26,500	4,000	1500	2/04

Source: TU program data 2012.
Note: 1500 fpp = 31 mm fl; 15 fpp = 146 mm fl, CVs are not available.
[a] Discontinued after 2013.

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

Soos Creek Hatchery: Coho are volitionally-released for about a week or ten days before being force-released by removing the screens and lowering the water levels. Fish are released directly into the Soos Creek. Releases have begun as early as the end of March, but generally do not begin until the first week of April.

Des Moines Net Pens: Fish are force-released in early June (see HGMP **Table 10.3.2**).

Fry releases: When fish are buttoned-up (January), fry are placed in coolers with aerators, and released in various locations in Miller, Walker, and Des Moines creeks. In January, water temperatures in Des Moines, Miller and Walker creeks average 41°F, 45°F and 44°F, respectively (King County Hydrologic data, 2013). See **Table 10.3.2** for release dates.

Table 10.4.1: Actual release sites and estimated numbers released into the Miller-Walker Creeks Drainage, TU-Des Moines unfed coho fry program, 2007-2011.

Release Sites	2007	2008	2009	2010	2011	2012
Miller Creek at 17424 13th Ave SW	---	---	---	---	---	2,000
Miller Creek at S. 144th St.	---	3,600	6,800	7,000	10,200	3,000
Miller Creek at the Pet Lodge at S. 140th S.	7,400	14,500	6,800	---	---	---
Miller Creek at 269 S. 163rd Place	3,700	7,300	6,800	14,000	6,800	3,000
Miller Creek at Three Tree Community Church, 16261 First Ave. S.	---	7,300	6,800	3,500	6,800	8,000
Miller Creek at Fish House, 801 S.W. 168th St.	---	---	1,700	---	3,400	3,000
Elsey Creek (Miller Creek tributary) on at 6th Ave. S.W.	1,850	---	1,700	---	1,700	---
Miller Creek at hatchery at Southwest Suburban Sewer District	7,400	3,600	---	3,500	3,400	5,000
Miller Creek at Highway 518 ramp at Des Moines Memorial Way	3,700	---	3,400	---	---	---
Walker Creek at Des Moines Memorial Drive	---	---	3,400	---	6,000	3,000
Walker Creek at 4th Ave. S. and S. 171st St	3,700	7,300	6,800	---	---	6,000
Walker Creek at 17023 4th Ave. S.	3,700	7,300	6,800	---	---	---

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Walker Creek at Ambaum Blvd. at S. 172nd St.	7,400	7,300	6,800		10,200	---
Walker Creek at 16901 2nd Ave. S.W.	---	7,300	3,400	---	---	---
Walker Creek at S.W. 171st St. half a block west of First Ave. S.	7,400		6,800	7,000	3,400	3,000
Walker Creek at 12th Place. S.W and S.W. 178th St	3,700	3,600	---	---	---	---
Walker Creek at Ambaum Blvd. at S. 170th St.	---	---	---	2,000	---	3,000
Walker Creek at John Nelson property, 226 S.W. 171st St.	---	---	---	3,500	1,700	3,000
Walker Creek at "beaver pond" at the Cove			3,400	3,500	6,000	3,000
Sequoia Creek (Walker Creek tributary) behind the baseball diamond at Normandy Park City hall	---	---	---	---	3,400	---
Sequoia Creek (Walker Creek tributary) at S.W. 174th St. just downstream of the culvert	3,700	3,600	3,400	7,000	800	5,000
Total	**53,650**	**72,700**	**74,800**	**51,000**	**63,800**	**50,000**

Source: TU program data 2013 (detailed release data prior to 2007 not available).
Note: Release numbers are estimated by weight.

Around 5,000 unfed fry were released in late-January into Salmon Creek (Burien), an independent tributary to Central Puget Sound (N 47.49239, W 122.36175), from 2009 to 2013. These releases were in response to a fish passage issue on Salmon Creek, but were discontinued after 2013 (pers. comm. Ron DeSilva, TU-Des Moines, April 2013).

10.5) Fish transportation procedures, if applicable.

Soos Creek Hatchery: Not applicable. Fish are released on-station.

TU- Des Moines Chapter Co-op: The fish are released directly into Puget Sound. Juvenile coho are transported from the Soos Creek Hatchery to the net pen site in a 1,500 gallon tanker truck, equipped with aerators and oxygen tanks (see HGMP section 5.2).

Fry program: Volunteers transport the fry to the release sites in coolers.

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

Soos Creek Hatchery: Coho released from Soos Creek Hatchery are reared on Soos Creek surface water their entire time at the hatchery.

TU- Des Moines Chapter Co-op:

Net Pens: Fish will be released directly from the net pens after 4-6 months acclimation.

Fed fry program: Fish are received in December, and force-released when buttoned-up in January (see HGMP section 10.4).

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

Table 10.7.1: Number released, by mark type and age/location, Soos Creek Hatchery on-station coho program.

Brood Year	Release	Marking
2013	510,000	AD only
	45,000	AD+CWT
	45,000	CWT only

Source: WDFW Future Brood Document 2013.

Basin-wide releases have been consistently mass-marked since brood year 2006 (released in 2007), allowing identification of hatchery-origin fish. Soos Creek Hatchery releases have been mass marked since the 1998 release year.

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Table 10.7.2. Marks applied, and number of the total hatchery population marked for TU- Des Moines Co-op Program.

Brood Year	Yearling	Fed Fry	Marking
2012	30,000	-----	AD Only
	-----	120,000	Unmarked

Source: WDFW Future Brood Document 2013.

Net pen yearlings are 100% mass-marked (adipose fin-clip); Fed fry are released unmarked.

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 production levels above release goal and an actual release of up to 10% above release goal is acceptable. If fish are available for release in excess of the 10% acceptable level, affected Treaty Tribes, regional staff and NOAA Fisheries will be informed and consulted for proper action to be taken.

In previous years, significant numbers of surplus fish were not reared to full-term but were planted as fry; this is no longer the practice.

TU- Des Moines Chapter Co-op: Coho eggs and juveniles are transferred to TU's hatchery and net pens in the amount identified in the Future Brood Document. No surplus eggs or fish are available for this 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 one 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.

During severe flood events the screens are generally not pulled as floodwaters may rise to the point where they breach the ponds. Past experience has shown that the fish tend to lie on the bottom of the pond during flooding events and only those that are inadvertently swept out are able to leave.

TU- Des Moines Chapter Co-op: Coho eggs and juveniles are transferred to TU's hatchery and net pens in the amount identified in the Future Brood Document. No surplus eggs or fish are available for this program.

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

The production and release of only yearling smolts through fish culture and volitional release practices fosters rapid seaward migration with minimal delays in the rivers, limiting interactions with listed Chinook and steelhead. Coho at Soos Creek Hatchery 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 and 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). For release years 2000-2011, the average CV was 7.4% (see **Table 10.3.1**). Coho are volitionally released for approximately a week to ten days before they are force-released. At Soos Creek Hatchery, the goal is to release coho in April, at around 17 fpp. This size corresponds with average fork length (fl) of 131mm. Assuming the "1/3 size rule" (USFWS 1994), Chinook salmon smaller than 44 mm fl may be susceptible to predation by the average size hatchery coho released through this program. Juvenile Chinook salmon emigrating out of Soos Creek (Green River) during April, average 56.3 mm fl (Seiler et al., 2002), are larger than the threshold predation susceptibility size, and are thus less likely to be preyed upon by the hatchery coho.

Steward and Bjornn (1990) also concluded, that hatchery fish kept in the facility for extended periods before release as smolts (e.g. yearlings) may have different food and habitat preferences than listed natural-origin fish making it less likely to out-compete the latter.

Miller Creek Hatchery. Fry are released in January into three urban streams at 1500 fpp (around 31 mm) to decrease domestication effects, and to increase egg-to-fry survival. No listed Chinook or steelhead are known to inhabit Miller, Walker or Des Moines creeks (Ruckelshaus et al. 2006, PSSTRT 2011).

Net Pen. Yearling coho smolts are released from the net pen in as possible to June 1, to encourage residualization and maximize harvest opportunities. Release of fish from pens directly into marine waters eliminates freshwater juvenile interaction (see HGMP section 2.2.3).Release of fish from pens directly into marine waters eliminates freshwater juvenile interaction (see HGMP section 2.2.3).

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

Elements of the annual Monitoring and Evaluation plan for this program are identified in HGMP section 1.10. The monitoring program is designed to determine whether the hatchery is providing the benefits intended, while also minimizing or eliminating the risks inherent in the program. A key tool in any monitoring program is having a mechanism to identify each hatchery production group.

Each production group is identified with distinct otolith-marks, adipose fin-clips, coded-wire tags, blank wire tags or other identification methods as they become available, to allow for evaluation of each particular rearing and/or release strategy. This allows for: selective harvest on hatchery stocks when appropriate; monitoring of interactions of hatchery and wild fish wherever they co-mingle in riverine, estuarine and marine habitats; and assessment of the status of the target population. WDFW shall monitor annual salmon escapement to hatchery release sites within the watershed and in natural spawning areas to estimate the number and proportions of tagged, un-tagged and marked fish escaping each year. WDFW will also monitor straying of hatchery salmon to other Puget Sound watersheds through mark recovery programs conducted during routine spawning ground surveys and sampling at other Puget Sound hatcheries.

TU- Des Moines Chapter Co-op: As of fall 2010, King County's Community Salmon Investigation (CSI) team of volunteers (see HGMP section 3.4) have conducted annual stream

surveys in Miller and Walker creeks. CSI:Highline gathered data which included fish counts of returning adult coho and chum salmon, and necropsies of salmon carcasses to assess pre-spawn mortality (see HGMP section 1.12).

In 2012 and 2013, a special program allowed King County DNRP-WLRD Ecological Restoration and Engineering Services Unit to conduct daily Pre-Spawn Mortality Surveys in Des Moines Creek. These surveys included fish counts of returning adult coho and chum salmon, and necropsies of salmon carcasses to assess pre-spawn mortality (see HGMP section 1.12).

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

1. WDFW mass-marks (adipose fin-clip and/ or CWT) 100% of the coho releases from the Soos Creek Hatchery, of which 7.5% are double-index tagged (see HGMP section 10.7). This allows monitoring and evaluation of coho escapement to the Green River, which enables WDFW to assess the NOR/HOR spawning ground ratios and assessment of the status of the target population.
2. WDFW conducts annual spawning ground surveys in index areas of selected Green River tributaries (Hill, Newaukum, Spring, Cress, and North Fork Newaukum creeks). Survey data are used to track annual trends in population abundance and spatial distribution.
3. The Co-managers sample annually and monitor adult salmon and steelhead in fisheries, in hatchery returns, and on the spawning grounds. Sampling includes collection of data on fish size (length and/or weight), age (scales and/or otoliths), hatchery vs. natural origin (scales, otoliths, fin clips and/or coded wire tags), and stock origin (DNA samples). Monitoring includes catch and both hatchery and spawning ground escapement estimation (live fish counts, carcass counts and/or redd sampling/monitoring).
4. WDFW's Wild Salmon Production/Evaluation Unit (WSPE) operates a juvenile out-migrant trap at in the Green River mainstem at RKm 55, above the confluence with Soos Creek. This trap enumerates Chinook, coho, chum, pink, and steelhead, as well as facilitates the collection of biological data on age, size and timing. This juvenile trap can encounter hatchery fish during the spring outmigration. WSPE publishes their results annually. WDFW will continue to monitor smolt emigration rate post-release, timing of emigration and predation assessment via smolt trapping (Seiler et al. 2002).

   For one year (2000), WSPE operated a second trap in Soos Creek, just upstream of the Soos Creek Hatchery. This location provided wild juvenile production monitoring while reducing encounters with hatchery releases. In 2012, the Muckleshoot Tribe began operating a juvenile out-migrant in Soos Creek, upstream of the hatchery.

TU- Des Moines Chapter Co-op: King County's Des Moines Creek stream surveys were funded through a special project in 2012 and 2013; funding for this project beyond that is uncertain.

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 is currently available to mass-mark and coded-wire tag (see HGMP section 10.7) the entire program.

Biological staff continues to monitor the spawning grounds to determine natural spawning escapement and its composition. Additional funding will be required to expand assessment efforts and biological collections.

WSPE juvenile production monitoring receives local funding for their trap operations.

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

Risk aversion measures will be developed in conjunction with the monitoring and evaluation plans.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Research specific to the Soos Creek coho program is not currently conducted.

12.2) Cooperating and funding agencies.

Not applicable.

12.3) Principle investigator or project supervisor and staff.

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

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

Not applicable.

12.10) Alternative methods to achieve project objectives.

Not applicable.

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

Not applicable.

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

Not applicable.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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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.

Green (Duwamish) 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 Green River is considered critical habitat for bull trout and is thought to serve rearing, migration and overwintering purposes (USFWS 2004). Bull trout have been document in the Green River as far upstream as RM 41 in recent years and are consistently reported in the lower Duwamish River. It is unclear whether these fish represent a local spawning population or transients from other systems as there is no information on timing or distribution of spawning in the basin if any occurs (SaSI 2004).

Habitat--The Green River watershed has been heavily impacted by human activities, which include logging, road construction, flood control and municipal water supply diversion dams, agricultural development, river channelization, intensive industrial and residential development, and estuarine dredging and filling. Historically the contribution of the White and Black Rivers which accounted for two-thirds of the flow of the Duwamish would have greatly increased the amount of favorable bull trout habitat in the system. It is unknown if the current habitat can support bull trout, but suitable habitat may still be available in the upper watershed above Howard Hanson Dam. It is not known if bull trout occupied the upper watershed in the past; they do not appear to be present now (Watson and Toth 1994).

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

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

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

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

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15.3) Analyze effects.

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

15.4 Actions taken to minimize potential effects.

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

15.5 References

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

Listed species affected: Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Puget Sound/ Green River Chinook	**Activity:** Soos Creek Coho Program
Location of hatchery activity: Soos Creek Hatchery RM 1.0 Big Soos Creek (09.0072)	**Dates of activity:** October - 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.

Instructions:

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

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

Listed species affected: Steelhead *(Oncorhynchus mykiss)*	**ESU/Population:** Puget Sound/ Green River Steelhead	**Activity:** Soos Creek Coho Program
Location of hatchery activity: Soos Creek Hatchery RM 1.0 Big Soos Creek (09.0072)	**Dates of activity:** October - 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.

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