HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Photo provided by WDFW Hatcheries Staff (left) and Seattle Public Utilities (right)

Hatchery Program:	Cedar River Sockeye Hatchery Program (Integrated)
Species or Hatchery Stock:	Sockeye (*Oncorhynchus nerka*)
Agency/Operator:	Seattle Public Utilities Washington Department of Fish and Wildlife
Watershed and Region:	Lake Washington / Puget Sound
Date Submitted:	
Date Last Updated:	October 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 Cedar River Hatchery sockeye 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 spring 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 WDFW and the Co-managers are now re-submitting an updated HGMP for the Cedar River Hatchery sockeye program to further update the description of the program and incorporate new information and analyses.

The Cedar River sockeye stock is not considered to be part of a recognized Evolutionarily Significant Unit (ESU) under the ESA.

Cedar River Hatchery Sockeye Program:
The purpose of the program is to produce Cedar River sockeye to mitigate for habitat lost to spawning above the Landsburg Dam and to augment natural spawning on the Cedar River within the framework of the *Hatchery Adaptive Management Plan* (AMP 2006). This is expected to provide and contribute to the potential for more regular sport and tribal harvest opportunities of the Lake Washington sockeye salmon fishery. Program fish will be produced at Cedar River Hatchery, located on the Cedar River, tributary to South Lake Washington. The program annually releases 34-million fry into the Cedar River-Lake Washington Basin.

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 other species produced through WDFW hatchery releases will be managed to minimize incidental effects to listed Chinook and steelhead. Lake Washington sockeye salmon are cooperatively managed by WDFW and the Muckleshoot, Suquamish, and Tulalip tribes, based on annual counts made as sockeye enter freshwater at the Ballard Locks. Traditionally the sport fishery in Lake Washington has opened when Ballard Locks escapement count were at or above 350,000 fish.

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.

Hatchery fish contribution to recreational fisheries in 2002 and 2004 was 23.3% and 19.3%, respectively.

Monitoring, Evaluation, and Adaptive Management:
The AMP includes technical basis for monitoring and evaluation of this hatchery program with the primary purpose to help hatchery program meet its mitigation goals by minimizing risks of long-term adverse impacts through effective monitoring and management.

In addition, the following monitoring programs provide information to adaptively manage the sockeye program.

WDFW conducts annual spawning ground surveys in Lake Washington tributaries, including Issaquah Creek and the Cedar River. Survey data are used to track annual trends in population abundance and

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spatial distribution. In addition, the Co-managers currently sample annually and monitor adult salmon and steelhead in the Hiram Chittenden fish ladder and locks (Ballard Locks), in fisheries, in hatchery returns, and on the spawning grounds.

WDFW continues to annually monitor natural production and smolt emigration timing via juvenile trapping near the mouth of the Cedar River (tributary to Lake Washington), and near the mouth of Bear Creek (tributary to the Sammamish River). The Bear Creek trap also captures production from its tributary, Cottage Lake Creek.

A number of monitoring activities are on-going or planned by Seattle Public Utilities (SPU), related to the *Cedar River Habitat Conservation Plan* and the sockeye hatchery and fish ladder at Landsburg Dam. Colonization of the watershed upstream of Landsburg Dam is being investigated through a variety of studies on Chinook and coho in this area.

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1 SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1 Name of hatchery or program.

Cedar River Hatchery Sockeye Program

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

Sockeye Salmon (*Oncorhynchus nerka*). Cedar River stock. ESA status – not 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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Email:	Aaron.Bosworth@dfw.wa.gov

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

1. **The Muckleshoot Indian Tribe (MIT)** and **Suquamish Indian Tribe** are the Co-managers for the Lake Washington watershed.
2. **Landsburg Mitigation Parties (LMA Parties)** provides the legal oversight of all management activities related to the Cedar Sockeye Hatchery. The LMA Parties referred to here, and for the purposes of the HGMP, include: City of Seattle, U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries Service, the WDFW, and the Muckleshoot Indian Tribe (by the powers provided in the MIT Settlement Agreement).
3. **Seattle Public Utilities (SPU)** provides oversight, funding, facilities, and staff support for the Cedar River hatchery program.
4. The **Adaptive Management Work Group** (AMWG), and the **Technical Work Group** (TWG) guide the *Cedar River Sockeye Hatchery Adaptive Management Plan* (AMP 2006) to define an operating and management framework for the hatchery program as a legal component of the Landsburg Mitigation Agreement.

   The AMWG makes recommendations for achievements of the AMP objectives to the LMA Parties and City of Seattle. The AMWG is composed of agency representatives and stakeholders with an interest in the Cedar River Sockeye Hatchery Program.

   The TWG serves as the primary source of scientific expertise for the AMWG and City of Seattle. TWG is responsible for overseeing research and monitoring under the AMP for the hatchery and implementation of a long-term research and monitoring program to addresses scientific uncertainties associated with the AMP. The TWG is composed of technical experts in salmon biology, hatchery science, fish disease, genetics and the Lake Washington Basin ecology.

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5. **Cedar River Anadromous Fish Committee (AFC)** serves as an advisory committee to the LMA Parties. Members of the AFC include representatives of the LMA Parties, the Muckleshoot Indian Tribe, stakeholders representing sport fishing and environmental interests and representative from King County.

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

Funding Sources	Operational Information
Water Fund (Seattle Public Utilities)	Annual operating cost (dollars) = $381,828.57 Full time equivalent staff – 3.0

1.5 Location(s) of hatchery and associated facilities.

Table 1.5.1: Location of culturing phases, by facility.

Facility	Culturing Phase	Location
Landsburg Dam	Broodstock collection.	Located on the Cedar River (WRIA 08.0299) at RM 21.8.
Cedar River Hatchery	Incubation, rearing, acclimation, release	Located on the Cedar River (WRIA 08.0299) at RM 21.7; tributary to Lake Washington, which connects to Puget Sound through Lake Union and Salmon Bay
In-river	Broodstock collection	Cedar River (WRIA 08.0299) at RM 1.7
	Release	Cedar River (WRIA 08.0299) at RMs 21.7, 13.5, and 2.1.

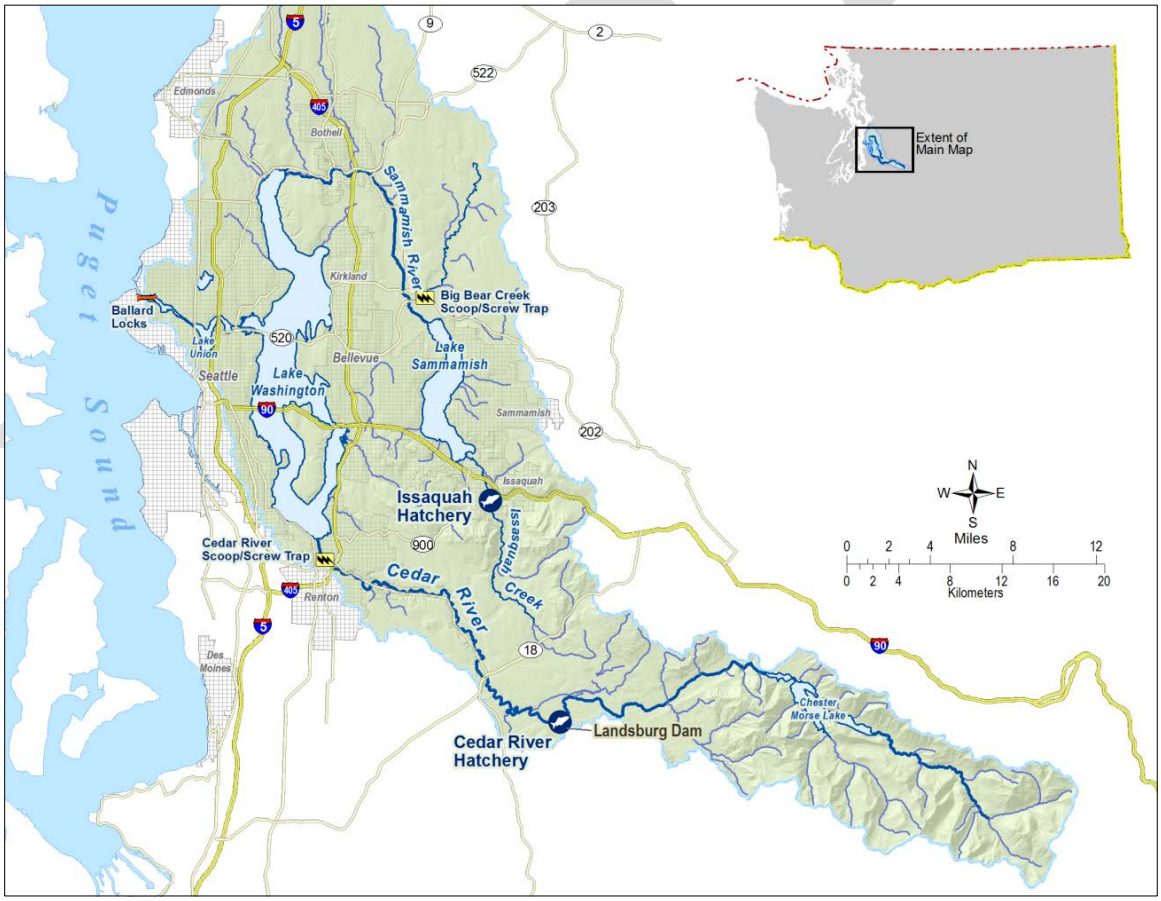

Figure 1.5.1: Lake Washington watershed - hatcheries and associated facilities. Source: WDFW GIS Unit 2014.

1.6 Type of program.

Integrated Harvest

1.7 Purpose (Goal) of program.

Mitigation/Harvest Augmentation

1.8 Justification for the program.

The Hatchery Program is intended to mitigate for habitat lost to spawning above the Landsburg Dam and to augment natural spawning on the Cedar River within the framework of the AMP. As mitigation, the hatchery produces fry to replace those that could have been produced above the dam. To protect drinking water quality, sockeye are not allowed to pass the Landsburg Dam and hatchery fry supplement production below the dam. The Hatchery Program is designed to produce up to 34-million fry annually and result in a greater and more consistent number of returning adult sockeye than would result without it. This is expected to provide and contribute to the potential for more regular sport and tribal harvest opportunities of the Lake Washington sockeye salmon fishery.

To minimize impacts on listed fish by WDFW facilities operation and the Cedar River sockeye salmon program, the following Risk Aversions are included in this HGMP:

Table 1.8.1: Summary of risk aversion measures for the Cedar River sockeye program.

Potential Hazard	HGMP Reference	Risk Aversion Measures
Water Withdrawal	4.2	Water rights for the hatchery operations are held by City of Seattle and are formalized through trust water rights.
Intake Screening	4.2	Spring water intakes for Cedar River hatchery operations are screened and screens are in compliance with state and federal guidelines (NMFS 1995, 1996), and meet the current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011a) intended to minimize the risk of entrainment of juvenile natural-origin fish.
Effluent Discharge	4.2	This facility operates under the "Upland Fin-Fish Hatching and Rearing" National Pollution Discharge Elimination System administered by the Washington Department of Ecology (WDOE) – WDOE has approved the best management practices for disposal of effluent at the Cedar River Hatchery (see **Attachment 1**).
Broodstock Collection & Adult Passage	2.2.3, 7.9	Broodstock is collected at a temporary weir, constructed annually at RM 1.7. Protocols to minimize potential impacts to listed Chinook are in effect during sockeye broodstock collection. Protocol details are included at the end of this HGMP. To protect drinking water quality, sockeye are not allowed to pass the Landsburg Dam.
Disease Transmission	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

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		introduction and/or spread of infectious fish pathogens.
Competition & Predation	2.2.3, 10.11	Life history, feeding habits, and behavioral attributes of sockeye salmon are expected to result in limited competitive and predatory interactions with listed species. Sockeye are released as fry at a size of 2,000 fish per pound. The Species Interaction Workgroup (SIWG 1984) identified sockeye as posing a low risk of competition and predation to naturally produced Chinook in freshwater.

1.9 List of program "Performance Standards".

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

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

1.10.1 "Performance Indicators" addressing benefits.

Table 1.10.1.1: "Performance indicators" addressing benefits.

Benefits		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.1 Program contributes to fulfilling tribal trust responsibility mandate and treaty rights as described in US v WA.	Contributes to co-manager harvest	Participate in annual coordination between co-managers to identify and report issues of interest, coordinate harvest management, and review program (FBD process, North of Falcon).
3.1.2 Program contributes to mitigation requirements.	This program provides mitigation for lost fish production due to development of the Landsburg Diversion Dam and contributes to sport, tribal and commercial fisheries.	Estimate survival and contribution to fisheries for each brood year released.
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.	Estimate annual harvest contribution of hatchery fish.

1.10.2 "Performance Indicators" addressing risks.

Table 1.10.2.1: "Performance indicators" addressing risks.

Risks		
Performance Standard	**Performance Indicator**	**Monitoring & Evaluation**
3.1.3 Program addresses ESA responsibilities.	ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.	First HGMP for this program was submitted to NOAA fisheries in March 2003. This HGMP has been updated to reflect changes in the program and resubmitted to NOAA fisheries.

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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.	Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.	Estimate harvest and escapement to provide up-to-date information.
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.	Monitor spawner escapement and juvenile production with emphasis of fish origin through smolt trapping operation.
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.	Monitor fish health by WDFW pathologist and follow proper health recommendations for cultured specie. Perform proper viral, bacterial and other pathological tests as needed and maintain proper documentation. Special protocols are in effect during egg takes to limit the risk of IHN outbreaks.
3.7.2 Effluent from hatchery facility will not detrimentally affect natural populations.	Discharge water quality compared to applicable water quality standards by NPDES permit. WDOE water rights permit compliance.	Monitor and report hatchery effluent and solid waste as requested in WDOE permit.
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.	Spring water intake structures were designed and built to comply with current requirements, (hatchery was built in 2011). The weir is operated in accordance with a protocol to avoid or minimize impacts on migrating Chinook and prevent migration delay, take or harassment of live fish or built redds. Protocols are provided in **Appendix A**.
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 pathologist inspects adult broodstock seasonally for pathogens and monitor juvenile fish health as frequently as required to assess health and detect potential disease problems. As necessary, fish pathologist recommends proper measures to treat or prevent disease, with administration of therapeutic and/or prophylactic treatments as necessary. A Fish Health database is maintained to identify trends in fish health implement fish health management plans based on findings. Due to the higher risk of

		IHN outbreaks in sockeye, special protocols to minimize the risk of disease transmission are used to separate adults and progeny, isolate incubation units and follow strict disinfection procedures. Infected eggs or fry are destroyed, sealed and removed after the end of the season to prevent further transmission.
	Inspection of adult broodstock for pathogens and parasites.	Annually sample 60 fish for pathogens, including kidney and spleen samples and weekly ovarian fluid.
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.	Control fish for specific pathogens through eggs/fish movements in accordance to *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006) Record information of carcass disposition in the WDFW Hatchery Adult Database.
3.7.6 Adult brood stock collection operation does not significantly alter spatial and temporal distribution of any naturally-produced population.	Spatial and temporal spawning distribution of natural populations above and below weir/trap currently compared to historic distribution.	Annually monitor present populations run timing, age and sex composition.
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.	Monitor daily weir operation timing, occurring difficulties and species migrating above the weir.

1.11 Expected size of program.

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

Up to 24,000 adult sockeye may be collected to fulfill current program egg-take goal of 37,400,000 for the release of 34-million fry (FBD 2014).

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

Table 1.11.2.1: Fish release levels by life stage and location.

Life Stage	Release Location	Annual Release Level
Fry	Cedar River (WRIA 08.0299)	34,000,000

Source: WDFW Future Brood Document 2014

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

Table 1.12.1: Sockeye fry entering Lake Washington from Cedar River 2002-2013 (rounded to nearest 100,000)

Brood Year	Hatchery Fry	Natural Fry
2002	17,100,000	27,900,000
2003	9, 800,000	38,700,000
2004	15,200,000	37,000,000
2005	6,300,000	10,900,000
2006	14,800,000	9,200,000
2007	2,700,000	25,100,000
2008	3,000,000	1,600,000
2009	4,700,000	12,500,000
2010	7,900,000	4,500,000
2011	6,000,000	14,800,000
2012	12,400,000	55,800,000
2013	NA	NA
Average	**9,000,000**	**21,600,000**

Source: WDFW, Kiyohara and Zimmerman, 2012, Kiyohara personal communication 2014

Table 1.12.2: Annual egg-to-emigrant fry survival rate of Lake Washington Basin sockeye salmon 2002-2013.

Brood Year	Cedar River (%)
2001	15.2
2002	8.5
2003	20.7
2004	19.7
2005	14.2
2006	6.1
2007	32.3
2008	6.1
2009	56.6
2010	4.9
2011	37.6
2012	36.4
Average	**21.5**

Source: WDFW, Kiyohara 2013

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Table 1.12.3: Cedar River sockeye annual escapement 2002- 2013.

Brood Year	Ballard Locks Index Counts (June 12 – July 31)*	Hatchery Component of the run (%)**	Cedar River Escapement*
2002	381,099	NA	192,395
2003	199,300	NA	109,164
2004	375,517	NA	114,839
2005	74,820	27%	49,846
2006	418,013	33%	105,055
2007	60,116	33%	45,066
2008	33,630	37%	17,300
2009	21,719	35%	12,501
2010	155,890	28%	59,795
2011	42,641	27%	23,655
2012	143, 318	41%	88,974
2013	177,349	27%	140,682
Average	**176,372**	**32%**	**79,939**

* Source: Eric Warner, Muckleshoot Tribe.

** WDFW, Schroeder at al report, 2005, 2006; Draft SPU data, September 2014, (Michele Koehler, personal communication), based on Ballard Locks sampling. % Population Sampled includes number of all fish sampled. % Population of Hatchery Origin = estimate based on collection of readable otolith.

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

Program was initiated in 1991.

1.14 Expected duration of program.

Ongoing.

1.15 Watersheds targeted by program.

Cedar River (WRIA 08.0299), Lake Washington watershed.

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

The outlines of this hatchery program are specified in the *Landsburg Mitigation Agreement* (2000), a legal agreement between the City of Seattle, the State of Washington (Governor and WDFW), the United States Department of Commerce-National Marine Fisheries (NMFS), and the U.S. Department of the Interior-Fish and Wildlife Service (FWS). The program mitigates for spawning habitat loss due to the construction of Landsburg Diversion Dam. Sockeye spawning is prohibited above the Landsburg Dam by the City of Seattle due to the potential for adverse effects to drinking water supplies. Any alternative actions to be considered for attaining program goals must be approved by the affected parties. This program utilizes adaptive management methods that are intended to increase knowledge of Lake Washington system, and provide flexibility to incorporate this knowledge into hatchery operations to avoid or minimize adverse impacts on the ecosystem.

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

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

This HGMP was previously submitted to NOAA Fisheries in March 2003, but was not acted on at the time. This updated HGMP is submitted to NOAA Fisheries for ESA consultation, and

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determination regarding compliance of the plan with ESA Limit 6 of the 4(d) rule criteria for joint state/tribal hatchery resource management plans affecting listed species.

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

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

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

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

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

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

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

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

Lake Washington (Sammamish River and Cedar River) fall Chinook in the Puget Sound Chinook ESU. Recent escapement levels (2000-2012) have averaged 1,001 for spawners in the Cedar River DIP and 1,279 for the Sammamish River DIP. Both DIPs have shown an increasing population trend during this same period (SaSI, WDFW 2014).

See Issaquah Fall Chinook HGMP for Chinook escapement data.

Puget Sound Chinook salmon: Updated Risk Summary. All Puget Sound Chinook populations are well below the TRT planning range for recovery escapement levels. Most populations are also consistently below the spawner recruit levels identified by the TRT as consistent with recovery. Across the ESU, most populations have declined in abundance somewhat since the last status review in 2005, and trends since 1995 are mostly flat. Several of the risk factors identified by Good et al. (2005) are also still present, including high fractions of hatchery fish in many

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

See Issaquah Fall Chinook HGMP for viability criteria.

Lake Washington winter-run steelhead in the Puget Sound steelhead DPS. The counts have been very low since 2000. The estimated mean population growth rate is −0.23 (λ = 0.794) and process variance is 0.380. The estimated probability that the Lake Washington steelhead population would decline to 10% of its current estimated abundance (<1 fish) is high—approximately 90% within 40 years. An extinction risk envelope could not be calculated for this population from the data.

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

Table 2.2.2.1: Interim DIP abundance goals for steelhead in Puget Sound, based on a four-year average. Abundance goals for summer-run fish *(italics*) are still under review. QET, quasi extinction threshold; SAS, smolt to adult survival. Minimum abundance = 100 (Low Abundance), 250 (Viable).

Population Basin				Quasi Extinction Threshold	Low Abundance	Viable	Capacity
Population Name	Area km^2	Mean Elevation (m)	Total Stream Length (m)		1% SAS	5% SAS	20% SAS
North Lake WA Tributaries	978	119	441,887	36	527	2,634	10,536
Cedar River	650	461	402,349	35	597	2,975	11,899
Puget DPS Total				**1,462**	**30,449**	**153,194**	**613,662**

Source: Hard et al. 2014.

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

See Issaquah Fall Chinook HGMP for Chinook productivity data.

Table 2.2.2.2: Steelhead Population Exp. Trend ln(nat. spawners) (95% CI).

Population	1985-2009	1995-2009
Lake Washington winter-run	0.807 (0.770 - 0.845)	0.731 (0.656 - 0.815)

Source: Ford 2011. These are based on analyses reported by Ford (2011) that are not necessarily agreed to by WDFW and the Muckleshoot and Suquamish Tribes.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

See Issaquah Fall Chinook HGMP for Chinook escapement data.

Table 2.2.2.3: Total escapement of Lake Washington winter steelhead natural spawners, 2001-2012.

Year	Escapement
2002	38
2003	20
2004	44
2005 [a]	22
2006 [a]	32
2007 [b]	8
2008 [c]	4
2009	0
2010	2
2011	4
2012	0
2013	8
Average	**15**

Source: SaSI, WDFW 2013; Aaron Bosworth WDFW 2013.

[a] All redds were in the Cedar, there were no redds located in any other tributaries.

[b] There were five redds in the Cedar, there were no redds found in any other tributaries.

[c] There were two redds located in the Cedar River. No other Lake Washington tributaries were surveyed.

- 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 Issaquah Fall Chinook HGMP for Chinook hatchery-origin and natural-origin fish estimates.

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

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

Broodstock Collection and Adult Passage: Sockeye broodstock collection for Cedar River program has a potential to take listed Chinook salmon, through migration delay, capture, handling, and upstream release. Protocol to minimize potential impacts to listed Chinook is in effect during sockeye broodstock collection. Protocol details are included in **Appendix A**. In order to best achieve the dual goals of collecting sufficient sockeye broodstock while minimizing impacts on upstream migration for adult salmon, the operational protocol is annually reviewed and, if deemed necessary, revised by the interagency Cedar River Sockeye Hatchery Adaptive Management Workgroup (Burton 2013).

Originally, the weir used for broodstock collection was located at RM 6.5, where it remained until 2008. In 2008, the location was moved to the reach immediately above I-405 at RM 1.7. The design of the weir was also changed from a wood framed vertical weir to an aluminum inclined plane hydraulic weir. In 2009, the addition of a tip gate on the deepest side of the weir allowed Chinook to be passed without capture or dropping the weir (Burton 2013).

The vast majority of Chinook redds observed in surveys conducted between 1999 and 2013 were located above the SBCF (**Table 2.2.3.1**), which demonstrates that most Chinook are successfully migrating through and spawning above the weir. Very few redds have been observed within 0.5 miles of the weir between 1999 and 2013. These observations suggest that the weir protocols are

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relatively successful in preventing substantial delay and obstruction of Chinook spawning migrations in the Cedar River (Burton, 2013).

Table 2.2.3.1: Weir (sockeye broodstock collection facility, SBCF) installation and removal dates with proximal Chinook redd observation by year, 1999-2013

Return Year	SBCF Installation Date	SBCF Removal Date	# Chinook Redds w/in 25m downstream of SBCF	% Chinook redds located of Below Landsburg	
				Between Landsburg and RM 6.5	Between Landsburg and RM 6.5 and Lk Washington
1999	Sept. 23	Nov. 15	0	81	19
2000	Sept. 7	Nov. 14	0	96	4
2001	Sept. 6	Nov. 13	1	91	9
2002	Sept. 11	Nov. 12	1	93	7
2003	Sept. 9	Nov. 17	2	94	6
2004	Sept. 9	Nov. 18	0	94	6
2005	Sept. 14	Nov. 8	2	90	10
2006	Sept. 16	Nov. 2	3	88	12
2007	Sept. 11	Nov. 7	0	95	5
2008	Sept. 17	Nov. 5	2	90	10
2009	Sept. 17	Nov. 5	1	92	8
2010	Sept. 10	Nov. 5	1	93	7
2011	Sept. 9	Nov. 10	2	92	8
2012	Sept. 9	Oct. 28	1	88	12
2013	Sept. 6	Nov. 12	0	98	2
		Average	**1**	**92**	**8**

Source: Burton 2013.

*Disease Transmission: S*ockeye are carriers of IHNV, and strict disinfection and isolation procedures must be and are in effect. Although hatchery population can be considered reservoir for disease pathogens due to elevated stress resulting from high rearing densities, there is little evidence to suggest that diseases are routinely transmitted from hatchery to wild fish (Steward and Bjornn 1990). To minimize possible negative impacts to natural populations, hatchery fish are reared at lower densities, continuing well-developed monitoring, diagnostic, and treatment programs in accordance with guidelines developed under the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State (*WDFW and WWTIT 1998, updated 2006).

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

Operation of Hatchery Facilities: Potential facility operation impacts on listed fish include: water withdrawal, hatchery effluent, and intake compliance. Monitoring and maintenance are conducted along with staff observations. Hatchery operations are conducted within permitted guidelines (see HGMP sections 4.1 and 4.2). All permit requirements are followed in order to minimize the potential indirect 'Take" associated with the operations of these facilities.

Predation and Competition: Sockeye life history, feeding habits, and behavioral attributes are not expected to result in competitive and predatory interactions with listed species. Sockeye raised at Cedar River Hatchery are released as fry at the size of 2,000 fpp, the size that would likely make them prey, rather than predators, and serve as food source to other species. The Species Interaction Workgroup (SIWG 1984) identified sockeye as posing a low risk of competition and predation to naturally produced Chinook in freshwater.

Sockeye redd superimposition. Spawn timing for Cedar River sockeye salmon and Chinook salmon are somewhat similar and spawning habitat characteristics for both species can overlap, which could lead to redd superimposition between the species. Superimposed sockeye redds could potentially increase mortality rates for incubating Chinook especially if the resulting disturbance to the Chinook redd occurs prior to Chinook egg hardening or if eggs are physically

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displaced from the redd. In 1999, observations of sockeye redd superimposition on incubating Chinook redds generated questions regarding the potential for sockeye spawning activity to affect the survival rates for incubating Chinook. For example: how would increases in sockeye abundance associated with the hatchery affect the incidence of sockeye redd superimposition, and, as a result, would there be an increase in egg to fry mortality for incubating Chinook via egg disturbance. Each year since 2000, a portion of Cedar River Chinook redds are, to varying degrees, affected by sockeye spawning (**Table 2.2.3.2**). Superimposition rates are typically low in years with low sockeye escapement numbers (e.g. 2007-2009) and higher in years with large sockeye returns (e.g. 2001-2004, 2012, 2013). In all years for which the degree of superimposition has been estimated, the percent of Chinook redds with high sockeye superimposition rates has been low (less than 25%), averaging approximately 7%. It is important to note that estimates of sockeye superimposition on incubating Chinook redd mounds are minimum estimates because typically 20% of the sockeye population continues to spawn after Chinook salmon have completed spawning (Cascades Environmental Services, 1995) and Chinook redd surveys have ended. Observations of redd superimposition in the Cedar River demonstrate that sockeye do construct redds on incubating Chinook redds, but the incidence of high superimposition rates does not occur frequently. There is currently no data on actual disturbance of Chinook eggs by sockeye, only geographical overlap. Chinook eggs may be deeper in the gravel than sockeye disturbance reaches since they are deposited by significantly larger fish. In addition, egg to emigrant survival rates for juvenile Chinook in the Cedar River are not significantly correlated to superimposition levels" (Burton 2013).

Table 2.2.3.2: Sockeye superimposition rates on Chinook redd mounds, Cedar River 2000-2013.

Return Year	Sampled Chinook Redds	% of Chinook Redds with Sockeye Superimposition			Total % of Chinook Redds with Observed Sockeye Superimposition
		Low Degree	Medium Degree	High Degre	
2000	52	NA	NA	NA	12
2001	385	NA	NA	NA	35
2002	265	35	29	23	87
2003	302	15	10	12	37
2004	470	26	10	3	39
2005	322	18	7	4	29
2006	560	14	8	5	27
2007	762	8	5	4	17
2008	753	5	4	2	11
2009	258	7	2	5	14
2010	226	11	9	3	23
2011	280	9	6	4	19
2012	362	14	11	9	34
2013	638	22	13	12	47
Average	**403**	**15**	**10**	**7**	**31**

Source: Burton 2013

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

No known directed takes in previous years, however in 2013 three Chinook were found dead under the weir. As a result a modification to the weir design has been incorporated to prevent entrapment.

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

See "Take" table.

- Indicate contingency plans for addressing situations where take levels within a - 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.

The collection protocol at the broodstock collection weir is designed to minimize impacts on listed fish. If significant numbers of listed fish are observed to be impacted by weir operation, WDFW District Biologist and Hatchery Operation Manager would determine an appropriate plan and consult with NOAA fisheries, if needed.

3 SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

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* 1985), 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 Cedar River watershed.

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 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).

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

This program operates in accordance to conditions specified in the *Landsburg Mitigation Agreement* (LMA 2000), a legal agreement between the City of Seattle, State of Washington (Governor and WDFW), United States Department of Commerce (NMFS) and the U.S. Department of the Interior-Fish and Wildlife Service (FWS). While the agreement was incorporated into the *Cedar River Habitat Conservation Plan* (HCP 2000), the sockeye hatchery was removed from the HCP in 2007. The Cedar River Anadromous Fish Committee and the Adaptive Management Work Group oversee implementation of the LMA and the *Cedar River Hatchery Adaptive Management Plan*, respectively. The 2006 Cedar River Agreement between

the Muckleshoot Tribe and the City of Seattle supported the completion of the new hatchery facilities (2011) and continuous operation of this hatchery.

The sockeye hatchery has no impact on Chinook habitat protection. As part of the LMA (of which the sockeye hatchery is one piece), safe upstream and downstream fish passage as well as watershed protection are provided at Landsburg Dam for Chinook, steelhead, and coho salmon, and trout.

Cedar River Sockeye Hatchery Adaptive Management Plan (2006). The Adaptive Management Plan (AMP), provides a framework for the hatchery program to meet its' mitigation goals and implement the Cedar River HCP and LMA.

All WDFW anadromous salmon hatchery programs within the Puget Sound ESU, operate under *U.S. v Washington* (1974) and the *Puget Sound Salmon Management Plan* (PSSMP 1985) which provide the legal framework for coordinating these programs, defining artificial production objectives, and maintaining treaty-fishing rights through the court-ordered PSSMP.

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

3.3 Relationship to harvest objectives.

WDFW general harvest goals are to provide fishing opportunities consistent with the mandate of the agency for restoration and recovery of wild indigenous salmonid runs, the Pacific Salmon Treaty, the Puget Sound Salmon Management Plan, *U.S. v Washington*, and other state, federal, and international legal obligations. Tribal and non-tribal commercial and recreational fisheries directed at salmon and other species produced through WDFW hatchery releases will be managed to minimize incidental effects to listed salmon and steelhead.

The annual pre-season planning process for northwest recreational and commercial salmon fisheries, known as "North of Falcon", involves a series of public meetings between federal, state, tribal and industry representatives and other concerned citizens. North of Falcon coincides with meetings of the *Pacific Fishery Management Council*, which sets the ocean salmon seasons at these meetings.

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

Traditionally the sport fishery in Lake Washington has opened when Ballard Locks escapement count were at or above 350,000 fish. The sockeye recreational fishery in Lake Washington was open in 1996, 2000, 2004 and 2006. The harvest of hatchery sockeye in the 1996 and 2000 recreational fisheries is not known. Hatchery fish contribution to recreational fisheries in 2002 and 2004 was 23.3% and 19.3%, respectively. The recreational fishery in 2006 was not sampled for hatchery fish contribution due to lack of funding.

In order to minimize impacts of sockeye fisheries to migrating Chinook, fishing openings will be scheduled in July and early-August, well before Chinook presence peaks in the lake. Sockeye typically migrate through the locks from late May to October with the peak migration from early-June through August. The Chinook run typically lasts from mid-July through the end of September, with smaller numbers arriving in June and October (SPU, 2008). During the openings of sockeye fisheries in Lake Washington, recreational anglers will be required to release any caught Chinook. Tribal net fisheries directed at sockeye generally occur during relatively short time periods during the early portions of the Chinook run to minimize Chinook encounters. Both fisheries will be monitored to assure that takes are within acceptable limits.

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Table 3.3.1.1: Cedar River sockeye fishery contributions.

Return Year	Tribal Harvest		Sport Catch Lake Washington	Total Harvest
	10, 10A**	10B,C,D,F,G**		
2000	6,396	50,438	62,597	119,431
2001	214	3,603	0	3,817
2002	1,275	28,826	36,356	66,457
2003	2	3,916	76	3,994
2004	924	27,048	27,626	55,598
2005	1	1,350	0	1,351
2006	1,356	54,849	59,355	115,560
2007	1	467	0	468
2008	1	2,117	0	2,118
2009	1	0	0	1
2010	0	2,803	0	2,803
2011	0	619	0	619
2012	742	3,475	0	4,217
2013	481	6,372	0	6,853

Source: Aaron Default, WDFW

* Includes Cedar River broodstock transfers;**Area 10, 10A, and half of 10F are marine areas, and not a subset of the Locks Count estimate.

3.4 Relationship to habitat protection and recovery strategies.

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.

Cedar River Watershed Habitat Conservation Plan (*HCP*). The HCP (2000) is a 50-year, ecosystem-based plan prepared to address the declining populations of salmon, steelhead and other species of fish and wildlife in the Cedar River basin.

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

Lead Entities: The Lead Entity for the Cedar River is King County (WRIA 8). It also covers the Lake Sammamish watershed and Lake Washington. As work is completed (state and local resource management jurisdictions) on assessing the habitat factors limiting natural production and identifying and implementing habitat restoration and protection strategies in the Lake Washington watershed, WDFW will incorporate relevant information into this document (available online at: http://www.rco.wa.gov/salmon_recovery/lead_entities.shtml).

Regional Fisheries Enhancement Groups (RFEGs): Several citizen based groups in conjunction with local governments work on habitat actions to benefit both listed and non-listed stock in the system including the Mid Sound Fisheries Enhancement Group (available online at: http://www.midsoundfisheries.org/about/).

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

State of Our Watersheds: Individual member Tribes have worked with the NWIFC and SSHIAP to create the State of Our Watersheds report. This document examines key indicators of habitat

quality and quantity across more than 20 watersheds in western Washington that lie within tribal Usual and Accustomed fishing areas as defined by *U.S. v Washington* (1974). The Lake Washington habitat section is available online under the Muckleshoot chapter at: http://maps.nwifc.org:8080/sow2012/.

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

(1) *Salmonid and non-salmonid fishes or other species that could negatively impact the program.* Negative impacts by fishes and other species on the Cedar River sockeye salmon 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 sockeye salmon survival rates through predation on newly released, emigrating juvenile fish in the marine and nearshore areas. Certain avian and mammalian species may also prey on juvenile sockeye while the fish are at the hatchery site, if these species are not excluded from the area. Species that could negatively impact juvenile sockeye through predation include the following:

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

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

- Orcas
- Sea lions
- Harbor seals
- River otters

(2) Salmonid and non-salmonid fishes or other species that could be negatively impacted by the program (focus is on listed and candidate salmonid species).

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

(3) *Salmonid and non-salmonid fishes or other species that could positively impact the program.* Fish species that could positively impact the program may include other salmonid species present in the Issaquah Creek and Lake Washington watershed through natural and hatchery production. Juvenile fish of these species may serve as prey items for the salmon during their downstream freshwater migration. Decaying carcasses of spawned adult fish may contribute nutrients that increase productivity in the watershed, providing food resources for the emigrating salmon.

(4) *Salmonid and non-salmonid fishes or other species that could be positively impacted by the program.* Freshwater and marine fish species that prey on juvenile fish could be positively impacted by the hatchery program. Mass spawning by sockeye cleans and conditions spawning gravels used by multiple species Nutrients provided by decaying hatchery salmon carcasses may also benefit fish in freshwater. These species include:

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- Northern pikeminnow
- Coho salmon
- Cutthroat trout
- Chinook salmon
- Steelhead
- Bull trout
- Pacific staghorn sculpin
- Numerous marine pelagic fish species
- Warmwater species (e.g. smallmouth bass)

4 SECTION 4. WATER SOURCE

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

Table 4.1.1: Water sources available at Cedar River Hatchery.

Water Source	Water Right Record/Cert. No.	Available Water Flow	Water Temp. (F°)	Usage	Limitations
Unnamed Spring[a]	S1-23174	1.7 cfs	48	Incubation, rearing	No limitations.
Cedar River (surface)[b]	-----	4.46 cfs	38-55	Adult holding	
Unnamed Stream (surface)[b]	S1-28457P	1.3 cfs	38-55		
Unnamed Spring[b]	S1-28458P	2.0 cfs	48	Incubation, rearing	
Unnamed Stream (Surface)[b]	S1-28500P	0.9 cfs	38-55		

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

Cedar River Hatchery is supplied with spring water and surface water from Cedar River. Spring water, used to incubate and briefly rear the juvenile sockeye, is pumped from a series of springs on the south side of the Cedar River and piped over the Landsburg Dam to the hatchery. Surface water, used in holding ponds, is gravity fed and diverted from Landsburg Dam "V" screen structure. Surface water is also used for water tempering and pumped through a strainer assembly to the two heat exchangers and immediately returned to the river.

Surface water rights at Cedar River Hatchery are formalized through the Washington Department of Ecology (WDOE), and were obtained by Seattle Public Utilities in 2006 and 2007 for the purpose of fish propagation. WDFW secured its water right in 1978. Water withdrawals diverted from the Cedar River at Landsburg Dam are covered under Seattle Public Utilities domestic water supply claim.

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

The construction of the new Cedar River Hatchery was finished in 2011. The spring water intakes are in compliance with state and federal guidelines (NMFS 1995, 1996), and meet current Anadromous Salmonid Passage Facility Design criteria (NMFS 2011).

WDOE has approved the best management practices for disposal of effluent at the Cedar River Hatchery (see **Attachment 1**).

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5 SECTION 5. FACILITIES

The Cedar River Sockeye Hatchery has the capacity to incubate up to 37-million eggs and produce up to 34-million juvenile fish.

5.1 Broodstock collection facilities (or methods).

Broodstock is collected from the returning adults trapped at two Cedar River locations:

1. RM 1.7 by utilization of floating resistance board weir (RBW); and
2. Landsburg Dam fish passage facility, located at RM 21.8

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

Table 5.2.1: Tanks available for fish transportation at Cedar River Hatchery.

Type	Number	Capacity (gallons)
Truck-mounted tanks	2 tanks mounted on 1 truck	500
	2 tanks mounted on 1 truck	350

Adults are transported from the two broodstock collection locations to the facility in either 350- or 500-gallon tanks depending on numbers trapped. Tanks are equipped with aerators and oxygen tanks. Same trucks are used for transportation of juveniles.

5.3 Broodstock holding and spawning facilities.

Broodstock is held in four 5' x 65’ x 6' concrete raceways supplied with surface water. Raceways are equipped with sprinklers. Spawning takes place at the raceways’ side.

5.4 Incubation facilities.

Hatchery is equipped with 140 upwelling Kitoi metal box incubators (2'x2'x3').

5.5 Rearing facilities.

Hatchery is equipped with 47 fiberglass troughs (3'x19'x3'), intended for fish rearing.

5.6 Acclimation/release facilities.

Fry are released into Cedar River at three separate locations: directly from the hatchery and two sites located in the middle (RM 13.5) and lower (RM 2.1) river.

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

None

5.8 Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

Although listed fish are not reared in this program, risk aversion measures are in place to protect the hatchery stock. A hatchery employee is on stand-by at the hatchery at all times to monitor hatchery operations and respond to any unexpected events. Facility is equipped with low water alarms, back-up generator in case of power loss and duplex pumps at each pump station.

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.

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6 SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1 Source.

Adult sockeye salmon returning to and collected from the Cedar River.

6.2 Supporting information.

6.2.1 History.

The Lake Washington/Cedar River sockeye were introduced from various sources beginning in 1917 (Adjwani, 1956) with subsequent introductions in1935 from Baker Lake and from Cultus Lake, Canada, in 1944, 1950 and 1954. The Issaquah Hatchery started as a sockeye hatchery in 1937, and continued releases through at least 1962. The population has maintained itself, without further introductions, since 1955. It is the only population in the Cedar River Sockeye GDU, (HSRG 2003).

WDFW began a supplementation program in the Cedar River in 1991, in response to declining sockeye population in the Cedar River basin. After a few years of minimal success with an egg box program that operated between 1975 and 1982, WDFW began operation of the interim hatchery at Landsburg Dam near Ravensdale, Washington. The interim hatchery was situated on Seattle Public Utilities (SPU) property at the bottom of the Cedar River Watershed parcel on the south side of the Landsburg Diversion Dam. It was built in stages over 19 years of operation, and consisted mostly of temporary structures and facilities and was capable of incubating up to 18.7-million eggs. The interim hatchery program had three primary objectives: (1) to slow the rate of decline in the sockeye population by augmenting fry production from the Cedar River; (2) to test the efficacy of recently developed sockeye salmon culture techniques in the Cedar River (McDaniel 1994); and (3) to provide a large number of differentially marked fish to support the second program component, the Lake Washington Ecological Studies. The primary objective of the Lake Washington Ecological Studies Program was to determine the factors contributing to reduced juvenile sockeye salmon survival in Lake Washington and to make recommendations for improving in-lake fry-to-smolt survival. Information gathered during the emergency recovery effort has been, and will continue to, be used to guide the development of the long-term mitigation program, (HCP, 2000).

For the first two years of the program adult broodstock were captured by gillnet in the lower river at various locations. From 1993 to 2007, WDFW collected broodstock at a temporary trap or weir at Cavanaugh Ponds Park (RM 6.4). In fall 2008, SPU completed a new access road and other amenities to allow for the installation of a new floating resistance-board weir and trap near the Renton Community Center (RM 1.7).

After almost 20 years in the interim hatchery, the construction of the permanent hatchery at Landsburg began in July 2010, and was completed during fall 2011. The new facility has the capacity to incubate, rear, and release up to 34-million fry, and provides the flexibility to adjust operations in accordance with the implementation of the *Cedar River Sockeye Hatchery Adaptive Management Plan* (AMP). The AMP addresses key concerns about the impacts and capability of the Cedar River sockeye program by utilizing experts in pertinent fields like fish health and hatchery reform to guide hatchery operations. The new hatchery has systems designed to limit stress on the fish, produce hatchery fish more similar to their wild cohorts, and further reduce the risk of pathogen transfer between fish and eggs. The new hatchery is also significantly less vulnerable to component failure from freezing, tree falls, flooding, and exposure to the elements. Additionally, the new components allow staff to more easily monitors key operational functions. All fry production are fed and otolith-marked.

6.2.2 Annual size.

Up to 24,000 adults collected annually.

6.2.3 Past and proposed level of natural fish in broodstock.

Fish for broodstock have been and will be collected randomly regardless of origin, and past and future levels of natural-origin fish incorporated into the broodstock were and will be random. All hatchery releases are 100% otolith-marked, and post-season broodstock identification is based on sampling its 20% portion to determine spawners origin proportions based on otolith-markings.

6.2.4 Genetic or ecological differences.

The Cedar River program is designed to integrate the hatchery- and natural-origin spawning segments of the population such that they freely interbreed with one another, and that domestication and other effects of hatchery culture are minimized. The hatchery broodstock is planned to include both and is designed so that hatchery-origin recruits will contribute to natural reproduction without detriment to the natural-origin segment of the population (HSRG 2003).

Because the origin of the sockeye run in the Cedar River is believed to be from the Baker River in northern Washington State, NMFS does not consider the Cedar River stock to be part of a recognized Evolutionarily Significant Unit (ESU) under the ESA (Fed. Reg., Vol. 63, No. 46, pp. 11749-11771). Thus, potential adverse genetic changes in the Cedar River population potentially caused by artificial production are of concern for the well-being of wild spawning sockeye, but are not an issue under ESA.

6.2.5 Reasons for choosing.

Cedar River sockeye, an already locally-adapted stock, was chosen for the hatchery program. This stock maintains a long entry and spawning time in the Cedar River.

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. Cedar River sockeye are not listed.

7 SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2 Collection or sampling design.

Adults are collected with a **floating resistance board** weir and an 8' x 10' trap located at RM 1.7. The weir contains removable picket sections that are lifted to pass all species of fish when sockeye collection is not necessary. The weir is typically installed in September, after Labor Day, and typically operates until Thanksgiving. Every effort is made to capture a full representation of the run when environmental conditions allow. In years where the weir is lost to floods or high water, fish with the later run timing are not well represented in the broodstock. Gillnets and hook-and-line method have been used in the past to supplement collection at the weir or to capture fish at the beginning and end of the run. SPU is evaluating options to improve broodstock collection to meet this goal. The resolution may likely be a new capital project for a new broodstock weir.

Broodstock is also collected at the **Landsburg Dam** fish passage facility. The facility focuses on passing fish above the dam. Sockeye are not passed above the dam, to protect the water supply, but are collected for broodstock when present. Migrating fish at the Landsburg Dam enter the the holding raceway via a fish ladder, where they are crowded to one end and lifted via a pescalator

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to a sorting table. Sockeye are sorted into two raceways (males and females), loaded via hopper into two 500-gallon tanks on a truck, and transported to the hatchery.

Equally important to broodstock collection is minimization of adverse effects of that collection to the upstream migration of adult Chinook. Protocols to minimize potential impacts to listed Chinook are in effect during sockeye broodstock collection. Protocol details are included in **Appendix A**.

7.3 Identity.

All sockeye released through this program have been otolith-marked since the program began. Because it is an internal mark and not externally visible, fish origin is not identified at the time of broodstock collection, but are evaluated post-season (see also HGMP section 6.2.3).

7.4 Proposed number to be collected:

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

Up to 24,000 adults collected annually.

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

Table 7.4.2.1: Sex composition of sockeye broodstock spawned at Cedar River Hatchery.

Brood Year	Total Spawned		
	Males	Females	Jacks
2002	5,142	5,370	0
2003	2,366+257	3,267	0
2004	4,458+154	5,092	0
2005	2,344	2,451	17
2006	4,203+283	4,626	0
2007	828	832	4
2008	882+48	930	0
2009	1,458	1,458	0
2010	3,109	3,109	0
2011	2,156	2,717	0
2012	5,599	5,692	0
2013	2,312	2,299	0
Average	**2,967**	**3,154**	**2**

Source: WDFW Hatcheries Headquarters Database 2014.
Note: "+" indicates live spawned fish

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

There is no surplus available. All fish collected are used for broodstock.

7.6 Fish transportation and holding methods.

Adults are transported from the two broodstock collection locations to the facility in either 350- or 500-gallon tank depending on numbers trapped. Tanks are equipped with aerators and oxygen tanks. Transportation time from the weir and Landsburg Dam is 25 and 2 minutes, respectively.

Broodstock is held in four 6'x65'x4' concrete raceways supplied with river water.

7.7 Describe fish health maintenance and sanitation procedures applied.

Sockeye are carriers of IHNV, so strict disinfection and isolation procedures are in effect. All hauling and spawning gear is disinfected with a 100 parts per million (ppm), iodophor or 1%

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Virkon® solution to control the virus. The holding and spawning areas are isolated from the incubation area.

7.8 Disposition of carcasses.

All spawned carcasses are returned to the Cedar River for nutrient enhancement. Pre-spawn mortalities are disposed of in a local landfill.

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.

Only sockeye are collected for broodstock for this program. Collection takes place in the river where listed Chinook are present, and may affect the listed fish during trap operation by migration delay, capture, handling, and upstream release. Annually-updated and agreed-to by the Co-managers, the *Field Season Operational Guidelines for the Cedar River Weir and Fish Trap Protocols* describe in detail how and when broodstock will be collected during the upcoming season to minimize the impact on listed species (details included in **Appendix A**) migration and spawning activities.

8 SECTION 8. MATING

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

8.1 Selection method.

All collected fish are used for broodstock and are spawned, as they ripen, across the entire maturation time frame.

8.2 Males.

All males collected, including jacks, are considered for spawning.

8.3 Fertilization.

Eggs from each female are collected in individual bowls and mixed with milt. A teaspoon of water is used as a milt activator. Milt from a second male is used as a back-up.

All eggs are washed, disinfected, and water hardened in a 100 ppm iodophor solution before they are placed in the incubators, as a precaution against spread of IHNV.

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 part of this program.

Regardless, in an effort to minimize directed artificial selection of traits that could negatively affect this sockeye population, proper spawning protocols are implemented to maximize the representation of each individual adult into the entire brood.

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9 SECTION 9. INCUBATION AND REARING -

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

9.1 Incubation:

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

Table 9.1.1: Survival rates from egg-take to ponding, Cedar River hatchery, 2000-2012

Brood Year	Eggs Collected	Survival Rates (%)	
		Green-to-Eyed Up	Eyed-Up-to-Fry/Release
2002	17,044,000	90.1	95.0
2003	10,423,000	82.7	95.0
2004	16,286,000	90.0	95.0
2005	7,835,000	91.7	95.0
2006	14,794,000	91.6	95.0
2007	2,496,000	93.4	95.0
2008	2,971,000	95.2	95.0
2009	4,660,000	93.0	95.0
2010	9,948,800	94.7	95.0
2011	8,694,400	93.9	96.0
2012	18,214,400	94.7	98.9
2013	7,816,600	95.7	99.0
Average	**10,098,600**	**92.2**	**95.7**

Source: WDFW Hatcheries Headquarters Database 2014.

9.1.2 Cause for, and disposition of surplus egg takes.

There are no surplus eggs collected for this program.

9.1.3 Loading densities applied during incubation.

Fertilized and water hardened eggs are loaded into incubation boxes at 250,000 per Kitoi box.

9.1.4 Incubation conditions.

Incubators are supplied with spring water at 10 gpm. Water temperature is monitored daily, and ranges from 43-48°F during incubating period. Spring water is tempered/cooled via river water heat exchangers. Dissolved oxygen is monitored when needed. Bio-saddles are placed in boxes as a substrate substitute. Chillers are used once before and once after hatching for otolith-marking.

9.1.5 Ponding.

When fry can actively move, screens at the incubators are pulled and boxes and troughs are connected with the hose to allow fry to swim into the troughs. At this time, fry are typically around 2,800 fpp, and average 29 mm long (fork length). Fry are allowed nine days to out-migrate before the remaining fry are forced out (typically less than 10%). Temperature Units (TUs) average between 1,700 and 1,800. Ponding takes place between January and April.

9.1.6 Fish health maintenance and monitoring.

All fertilized eggs are water-hardened in an iodophor solution before placed in incubators. Fungus is controlled by formalin drip at a target dose of 1,667 ppm throughout incubation to just prior to hatching. Due to the high quality of the spring water supply, formalin treatments are only administered for 15 minutes, three days per week. Once eyed, eggs are shocked and loss removed.

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As sockeye are carriers of IHNV, all incubators are tested for the virus presence. Eggs tested positive are destroyed.

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

Listed fish are not incubated through this program.

9.2 Rearing:

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

Not applicable. Fish are released at fry stage.

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

Fish in troughs are loaded at 1 pound per cubic foot, or a flow index of 3.96, and a density index of 1.03.

9.2.3 Fish rearing conditions.

Fish are reared in 3'x19'x3' fiberglass raceways supplied with spring water for up to two weeks and released at about 2,000 fpp.

An important goal of the program is to keep hatchery and natural populations as similar as possible. The differences, if hatchery fry exhibited a handicap or an advantage compared with natural fry, could lead to shifts in the composite nature of the sockeye population and ultimately, affect the fitness of the sockeye population that spawns in the river (AMP 2006).

Operations at the interim sockeye hatchery resulted in the shorter hatchery incubation period than that of fry produced during natural spawning (Seiler and Kishimoto 1997). The utilization of spring water with slightly warmer temperature compared to river water temperature had ramifications in the tendency toward shorter development periods in hatcheries, and in subsequent in-lake fry survival rates due to concomitant effects on the timing of fry emergence, release, and entry into Lake Washington. Also, spawning, closely associated with emergence timing, was not aligned with that of the naturally spawning run. It has been also hypothesized that by rearing artificially produced sockeye fry for a short period of approximately two weeks, operators may be able to more closely simulate the condition and timing of naturally-produced fry emerging from the Cedar River, and will therefore enable hatchery fry to perform and behave in a manner more similar to naturally-produced fry, (HCP, 2000).

The design and construction of the new sockeye hatchery in 2011 addressed concerns raised during the operations at the interim hatchery:

1) Incubation times more closely match those of naturally-produced cohorts by providing ability to adjust incubation water temperature by tempering the spring water supply with river water;
2) The ability to hold adults on river water enabled aligning spawn timing/egg-take with adults in the river; and
3) Larger rearing units allowed hatchery staff to keep fish long enough to feed 100% of the production for up to two weeks, and their construction allowed for volitional emigration from the incubators.

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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.

Not available.

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

Not available.

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

Fry are fed 8 times daily a soft moist starter up to 16 days before release; food brand used may vary, depending on cost and vendor contacts. Depending on fish size and water temperature, feed rates may vary from 3% to 4% B.W./day.

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

Fish health is monitored on a daily basis by hatchery staff and by a WDFW Fish Health Specialist at release or as needed. Hatchery personnel carry out treatments prescribed by the Fish Health Specialist when necessary. Health monitoring, disease treatment and sanitation procedures are consistent with the *Salmonid Disease Control Policy of the Fisheries Co-Managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

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

Gill ATPase activity is not monitored.

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; however, all reasonable and prudent measures are employed to minimize rearing and incubation losses and disease outbreaks. These include the use of high quality feeds for rearing, rearing densities and loadings that conform to best management practices, and fish health monitoring and treatment in compliance with the *Salmonid Disease Control Policy of the Fisheries Co-managers of Washington State* (WDFW and WWTIT 1998, updated 2006).

10 SECTION 10. RELEASE

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

10.1 Proposed fish release levels.

Table 10.1.1: Proposed number and size at release.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fed Fry	34,000,000	2,000	January-May	Lake Washington

Source: WDFW, Future Brood Document, 2014
Note: 2000 fpp ~ 30 mm fork length (fl).

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

Stream, river, or watercourse: Cedar River (WRIA 08.0299)

Release point(s): RM 21.7; RM 13.5; RM 2.1

Major watershed: Lake Washington

Basin or Region: 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 release.

Release Year	Unfed Fry	Avg. size (fpp)	Date(s)	Fed Fry	Avg. size (fpp)	Date(s)
2003	14,809,000	2,739	1/24-4/3	1,149,000	1,894	2/12-18
2004	8,008,000	2,725	1/20-4/6	1,908,000	1,995	2/13-3/3
2005	15,255,000	2,868	1/24-4/4	No Release		
2006	2,295,000	3,018	2/22-4/12	4,298,000	2,423	2/6-4/12
2007	7,097,000	2,831	1/31-3/19	4,733,000	2,162	1/31-3/7
2008	No release			2,496,850	1,918	2/7-4/3
2009				2,629,000	2,019	2/17-4/2
2010				4,537,000	2,022	2/8-4/12
2011				8,777,000	2,340	1/26-4/1
2012				8,110,830	1,865	2/9-4/19
2013				18,776,618	1,878	2/4-4/30
2014				7,379,230	2,386	2/12-5/1
Average	**9,492,800**	**2,836**		**5,890,412**	**2,082**	

Source: WDFW Hatcheries Headquarters Database 2014.

10.4 Actual dates of release and description of release protocols.

Fish are either force-released directly into the Cedar River from the troughs, or transported to the releases sites in tanker trucks. Fry are released at the official posted sunset time to mimic the out-migration timing of naturally-produced fry and reduce predation. Releases typically occur between the third week in January through May, dependent on development stage.

The numbers of fry, locations, and schedule for releases were developed by the AMWG and the WDFW. Fry were released from the hatchery in the upper river (29%), at the trestle in the middle river (37%), and at Cedar Trails Park in the lower river (34%). This strategy was employed to accommodate for presumed better survival of fry released in the lower river while still encouraging anticipated wide spatial distribution throughout the river of adult recruits from fry released in the middle- and upper-river (C. Cuthbertson, WDFW, 2012). The release strategy was modified by AMWG through the adaptive management process and the percentages released at each location may continually be modified on annual basis. In 2013, 19% of the fry were released at the hatchery, 41% were released at the trestle, and 40% were released near the mouth (RM 2.1) at Riviera (Renton WA).

10.5 Fish transportation procedures, if applicable.

Fry released off site are transported in either 350-, or 500-gallon tanks, equipped with aerators and oxygen tanks. Transportation time to the middle and lower river is 15 and 30 minutes, respectively.

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

Not applicable.

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, Cedar River Hatchery sockeye.

Brood Year	Fed Fry	Marking
2014	34,000,000	Otolith

WDFW, Future Brood Document 2014.

All fry have been released otolith-marked since the program began in 1991.

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

There are no surplus fish available through this program.

10.9 Fish health certification procedures applied pre-release.

- *All fish health monitoring is conducted by a qualified WDFW fish health specialist.*
- *Abnormal levels of fish loss are investigated if they occur*.
- *Fish health status is determined prior to release or transfer to another facility*. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release or transfer.
- *Appropriate actions, including drug or chemical treatments are recommended as necessary*. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile is be generated when possible.
- *Findings and results of fish health monitoring are recorded on a standard Fish Health reporting form and maintained in a Fish Health database*.
- *Fish culture practices are reviewed, as necessary, with facility personnel*. Where pertinent, nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures and treatments are discussed.

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

In the case of a catastrophic event (drought or flooding) critical to fish survival, fish could be released early to prevent loss. Flooding is not likely to affect this hatchery. Emergency release in response to flooding events would depend on the situation and fish developmental stage (eggs/fry).

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

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

Life history, feeding habits, behavioral attributes, and size at releases of sockeye salmon are expected to result in limited competitive and predatory interactions with listed salmon and steelhead. The SIWG (1984) identified sockeye as posing a low risk of competition and predation to naturally-produced Chinook in freshwater.

Little or no impact from naturally-spawning hatchery-origin sockeye would be expected on spawning steelhead because steelhead spawn well after the sockeye spawning season is over. Effects on chinook should be minor for several reasons. Chinook are very aggressive to other species, most individuals spawn in considerably deeper water than do most sockeye, and Chinook females typically place their eggs deeper in the gravel than do sockeye (Chambers et al. 1955). While there is potential for such interference between sockeye and coho, the majority of coho in the Cedar River spawn after most sockeye have completed spawning. Because coho, chinook and

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sockeye occur together naturally, they can be expected to have developed adaptations that tend to minimize the effects of interspecific competition during spawning, (HPC, 2000).

11 SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

The *Adaptive Management Plan* developed in 2006 for the Cedar River Sockeye Hatchery defines its operating and management framework. The AMP includes technical basis for monitoring and evaluation of this hatchery program with the primary purpose to help hatchery program meet its mitigation goals by minimizing risks of long-term adverse impacts through effective monitoring and management. Monitoring process focuses on evaluating potential risks to naturally spawning salmon and specifically identifies the following uncertainties specific to the hatchery.

1. Are hatchery and naturally produced fry similar in size, growth and migration timing, at a stable population composition?
2. Does the hatchery reduce the reproductive success of Cedar River sockeye?
3. Will the hatchery adversely affect sockeye populations outside of the Cedar River?
4. Will the hatchery produce adverse changes in the Chinook salmon population?
5. Will increased hatchery production alter aquatic community structure within Lake Washington system?

Answers to the questions above are explored through monitoring hatchery and natural fry migration timing, size, fry population composition, pre-smolt size and growth and population composition, smolt leaving Lake Washington, size and age at maturity, fecundity and egg size, spawning times and locations, reproductive success, genetic composition, harvest and straying. The monitoring activities include fry and adults trapping and sampling, spawning ground surveys and fishery sampling. Detailed descriptions of these activities are provided in AMP. The AMP is intended to be flexible and to be adjusted over time as necessary to reflect current knowledge and experience.

The Co-managers annually sample and monitor adult salmon and steelhead in the Hiram Chittenden fish ladder and locks (Ballard Locks), in fisheries, in hatchery returns, and on the spawning grounds. Sockeye at the locks are sampled weekly thorough the entire run. Sampling at the Locks includes collection of data on fish size (length and/or weight), age (scales and/or otoliths), hatchery vs. natural origin (otoliths), and stock origin (DNA samples). Twenty percent of the broodstock spawned at the hatchery is sampled in a similar manner.

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Table 11.1.1: Sockeye sampling effort at the Ballard locks 2002- 2014.

Return Year	Ballard Locks Count	Fish Sampled	% Population Sampled
2002	381,099	No sampling	
2003	199,300		
2004	375,517		
2005	74,820	696	0.9%
2006	418,013	1,702	0.4%
2007	60,116	789	1.3%
2008	33,630	480	1.4%
2009	21,719	231	1.1%
2010	155,890	816	0.5%
2011	42,641	416	1.0%
2012	143,318	758	0.5%
2013	177,349	1,544	0.9%
2014	58,422	392	0.7%
Average	**166,543**	**782**	**0.9%**

Source: WDFW, Schroeder at al report, 2005, 2006; Draft SPU data, September 2014, (Michele Koehler, personal communication).

WDFW, MIT, and SPU annually monitor sockeye upon return as adults to estimate the numbers of fish escaping to the Lake Washington watershed. Sockeye salmon escapement is estimated based on numbers of naturally-spawning fish in the Cedar and Sammamish river systems, tributary streams, and returns to the Cedar River Hatchery. Sockeye live counts are conducted once per week in the Cedar River from RM 0.7 to RM 21.8 (Landsburg Dam) via floating surveys during the sockeye spawning period, typically from mid-August to early-/mid-December. Live counts in all un-floatable side channels are enumerated by foot during each survey. Escapement estimates are generated separately for the lower river (RM 0.7 to RM 4.2) and upper river (RM 4.2 to RM 21.8). Live counts are also conducted weekly in Bear Creek (RM 1.3 to RM 7.1), once or twice per week in Cottage Lake Creek (RM 0.0 to RM 3.5), weekly on Issaquah Creek from RM 1.0 to RM 3.0 (Issaquah Hatchery), and on the East Fork of Issaquah Creek from its confluence with the Issaquah Creek mainstem (RM 0.0). The escapement estimate is calculated using an AUC methodology. On the Cedar, there is an adjustment for historic float survey/ counting tower regressions for surveys above RM 4.2. There is also an adjustment for broodstock removals.

All fish released through this program are otolith-marked to allow for evaluation of catch contribution, run timing, migration patterns, total survival and straying into other watersheds.

Ultrasonic and/or radio tagging studies as well as mark/recapture studies have been conducted on adult Chinook, sockeye, coho and steelhead for salmon research and monitoring of migration timing and distribution.

WDFW's Wild Salmon Production/Evaluation Unit (WSPE) operates two juvenile migrant traps in the Lake Washington Basin, one near the mouth of the Cedar River (since 1992), and another near the mouth of Bear Creek (since 1999). Future funding is uncertain. These traps enumerate Chinook, coho, sockeye, and steelhead, as well as facilitate collection of biological data on age, size and timing. These data are reported annually by WSPE. A trap was operated below the hatchery in Issaquah Creek in 2001 (Seiler et al. 2003). It is important to reinitiate operation of this trap location as funding becomes available in order to assess productivity of this tributary system.

The monitoring program will be refined and reexamined as necessary, based on existing knowledge and data, remaining unknowns and hypothesis as described in AMP. Results from the monitoring program will be used by the parties to the Landsburg Mitigation Agreement (LMA

2000), in consultation with the Cedar River Anadromous Fish Committee, to manage the implementation of the sockeye mitigation program and determination if changes should be made to achieve program objectives.

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 for this program is being provided by Seattle Public Utilities (SPU) through the *Cedar River Habitat Conservation Plan* (HCP 2000), as agreed to in the LMA. Funding and resources are currently committed to monitor and evaluate this program as detailed in the HCP, which describes, in detail, the dollar amount allocated for each monitoring activity, and the time table, in most cases, for a 50-year period. Monitoring and research activities are overseen by LMA Parties, in consultation with the Cedar River Anadromous Fish Committee. SPU provides up to $3,473,000 for monitoring and research to help ensure the success of the mitigation program and to reduce the risk of deleterious effects on naturally reproducing sockeye salmon. Budget agreements are detailed in LMA; SPU's monitoring budget is subject to limitations through the LMA.

The most significant unmet monitoring need in the basin is smolt sampling at the Ballard Locks (aka the "Ship Canal"). Juvenile fish are enumerated in two of the largest tributaries in the basin, and sockeye were traditionally sampled as pre-smolts in Lake Washington proper; however, recent evidence suggests that highly-dynamic or variable factors impact juvenile salmon and steelhead survival as they migrate through the system. These factors, including passage problems at the Locks, flow and temperature impairment in the Ship Canal, increased predation rates, changes in limnology, increased urbanization, etc., have made it difficult to separate freshwater mortality from marine mortality. In addition, in some years, significant numbers of sockeye migrate to sea as young-of-the-year smolts, thus biasing the pre-smolt surveys, which target yearlings. Enumerating and sampling out-migrating smolts at the Ballard Locks is a critical, unfunded monitoring need in this basin.

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.

12 SECTION 12. RESEARCH

Research is a critical part of this program monitoring and evaluation and it is described in details in AMP. See also section 11.

12.1 Objective or purpose.

Not applicable.

12.2 Cooperating and funding agencies.

Not applicable.

12.3 Principle investigator or project supervisor and staff.

Not applicable.

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

Not applicable.

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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".

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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13 SECTION 13. ATTACHMENTS AND CITATIONS

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Attachment 1: Washington Department of Ecology letter of approval for Landsburg, Cedar River Hatchery discharges.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

October 10, 2013

Mr. Paul L. Faulds
Landsburg Mitigation Manager
Seattle Public Utilities
Seattle Municipal Tower, 700 Fifth Ave.
PO Box 34018
Seattle, WA 98124-4018

RE: Landsburg, Cedar River Hatchery, Summary Table Approval

Dear Mr. Faulds:

Thank you for your time during our August 29, 2013 tour of the Landsburg Hatchery facility. I am very supportive of your approach to thoroughly analyze each discharge from the facility and all the processes contributing to the discharges. Your Summary Table for Chemical Use indicates you arrived at an environmentally sound solution for each discharge.

I have reviewed the Summary Table you submitted and proposed discharge practices for each effluent source. As we discussed during my visit to the hatchery, Ecology approves of your proposed changes to the discharge points.

Keeping flow- through water and non-domestic water out of your septic system is a goal we discussed. Additionally, the calculated concentrations of iodophore and disinfectants should be fine with upland sprinkling or discharge to the river (as listed in the specific discharge point discussion). Your hatchery practices concur with Ecology's Upland Fin-fish Hatching and Rearing General NPDES Permit.

If you have any questions, please contact me at (425) 649-7039.

Sincerely,

Lori LeVander
Water Quality Section

LL:ll

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14 SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

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

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

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

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

Chester Morse Lake Bull Trout *(Salvelinus confluentus):* Bull trout were listed as a threatened species in the Coastal-Puget Sound Distinct Population Segment on November 1, 1999 (64 FR 58910). The USFSW identified Chester Morse Lake in the Upper Cedar River watershed as a core area with four local populations and one potential local population (USFWS 2004). The local populations include Boulder Creek, the Upper Cedar River, Rack Creek and the Rex River and Shotgun Creek has been identified as a potential local population. Chester Morse Lake bull trout exhibit an adfluvial life history rear and forage in both Chester Morse Lake and Masonry Pool. The primary spawning areas for bull trout in this core area are in the Upper Cedar and Rex Rivers, with most spawning activity occurring from October to mid-December (WDFW 2004). The level of emigration of bull trout from the Chester Morse Lake core area into the lower Cedar River is currently unknown and only a few incidental sightings have been documented below Landsburg (USFWS 2004).The recovered abundance level for the Chester Morse Lake population has been set at 500 adults.

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

Core Area Population	Abundance Category (individuals)	Distribution Range Rank (stream length miles)	Short-term Trend Rank	Threat Rank	Final Rank
Chester Morse Lake	1000-2500	25-125	Increasing	Widespread, low-severity	Potential Risk

Source: USFWS 2008.

Lake Washington foraging, migration, and overwintering habitat - The Lake Washington foraging, migration, and overwintering habitat consists of the lower Cedar River below Cedar Falls, the Sammamish River, Lakes Washington, Sammamish and Union, the Lake Washington Ship Canal, and all accessible tributaries. The extent of use of this area and the status of the population are currently unknown and reports of bull trout in Lake Washington are relatively rare (USFWS 2004, WDFW 2004). Two bull trout were observed in the headwaters of Issaquah Creek in 1993, but is thought that they were likely anadromous migrants (WDFW 2004). The potential for spawning in the Lake Washington basin is believed to be very low as a majority of accessible habitat is low elevation, below 152 meters (500 feet), and thus not expected to have the proper thermal regime to sustain successful spawning (USFWS 2004). Due to observations of bull trout at the Ballard Locks it is believed that bull trout are migrating into this watershed from other core areas to take advantage of the abundance of forage fish.

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Habitat - Past forest practices and reservoir management have likely had the most significant impacts to bull trout habitat within the core area. Although the adult spawner abundance appeared to be at extremely low levels in the 1990's, recent returns strongly indicate that this population has likely rebounded near or to recovered levels. Past and current flood events have likely been exacerbated by the existing forest conditions, but are expected to improve over time given current forest management under the City of Seattle's Cedar River Habitat Conservation Plan. A number of actions being conducted under the habitat conservation plan are directed at restoring and protecting bull trout habitats within the core area, managing the reservoir to minimize negative impacts to bull trout, and monitoring the distribution and abundance of the bull trout population (USFWS 2004).

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*)

15.3 Analyze effects.

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

15.4 Actions taken to minimize potential effects.

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

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

15.5 References

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

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Take Tables

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

Listed species affected: Chinook *(Oncorhynchus tshawytscha)*	**ESU/Population:** Puget Sound/ Cedar River Chinook	**Activity:** Cedar River Sockeye Program	
Location of hatchery activity: Cedar River Hatchery, Cedar River (WRIA 08.0299) at RM 21.7	**Dates of activity:** August- April	**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***		
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	200	
Capture, handle, tag/mark/tissue sample, and release d)	-	-	-	-
Removal (e.g. broodstock) e)	-	-	-	-
Intentional lethal take f)	-	-	-	-
Unintentional lethal take g)	-	-	10	-
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/ Cedar River Chinook		**Activity:** Cedar River Sockeye Program	
Location of hatchery activity: Cedar River Hatchery, Cedar River (WRIA 08.0299) at RM 21.7	**Dates of activity:** August- April		**Hatchery program operator:** WDFW	
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	**Juvenile/Smolt**	**Adult**	**Carcass**
Observe or harass a)	-	-	-	-
Collect for transport b)	-	-	-	-
Capture, handle, and release c)	-	-	2	
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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Appendix A: 2014 Field Season Operational Guidelines for the Cedar River Weir and Fish Trap

These guidelines are based on the framework that was established for the 1999 field season in response to concerns regarding weir impacts to Chinook salmon. The guidelines are based on years of successful implementation during the 1999-2013 brood collection years. It is recognized that the Cedar River Anadromous Fish Committee and the Sockeye Hatchery Adaptive Management Work Group will have the opportunity to recommend changes to these guidelines if conditions change during the season. Such adaptive management will be documented and communicated through the committee chair. Since the implementation of this protocol and the adaptive management approach, the operation of the weir has been successful in avoiding impacts to Chinook salmon. Careful monitoring of fish behavior at the new weir will be necessary to be responsive to changing conditions and fish behavior. The number of Chinook salmon passing the weir and entering the trap in relation to the number of sockeye salmon entering the trap will dictate how the trap and weir will be operated.

GOALS

The weir and fish trap in the Cedar River are maintained and operated to collect sockeye broodstock. However, an additional goal of equal importance is to minimize the risks of adverse effects to upstream migrating adult Chinook salmon. These protocols are intended to satisfy both goals.

Due to ESA issues involving Chinook salmon in the Cedar River, the weir will be operated to avoid adverse impacts to adult Chinook salmon. There are two potential impacts that we will seek to avoid: 1) having Chinook spawn within 25 meters of the weir such that the eventual removal of the weir could impact those redds, and 2) significantly delaying (defined as more than 24 hours) the upstream migration of Chinook. It is recognized that operating the weir to avoid impacts to Chinook limits our ability to meet the objective of collecting sockeye broodstock.

Hatchery personnel and biological staff will communicate and work together to monitor Chinook activity in the area adjacent to the weir.

- Monitoring and documenting Chinook responses to the weir is very important.
- An open weir is defined as the condition that exists when fish have unrestricted access through one or more openings in the weir or trap.
- There will be no restrictions on fishing (closed weir) if there are no Chinook observed within 25 meters downstream of the weir for a 24-hour period, outside of the peak Chinook spawning period. However during the typical peak Chinook spawning period (typically September 25 through October 10) as determined by redd surveys and live counts, the weir will be opened for a 12-hour period following three consecutive days of fishing (no openings in the weir for passing fish) when conditions (e.g. turbidity, high flows, foul weather) prevent Chinook observation.
- If Chinook are observed holding within 25 meters downstream of the weir, the weir will be opened to allow Chinook to move upstream. The duration of the opening will be in response to the observed behavior of the Chinook, with the goal of keeping any potential delay of Chinook to less than 24 hours. This may be accomplished by opening the weir at night.
- If field biologists or field technicians see a significant[1] number of Chinook holding between the weir (trigger) and the Renton Library below the weir, they will discuss the situation with the hatchery manager and jointly determine a course of action (i.e., opening the weir).
- The weir is to be fished only when sockeye adults need to be collected.
- <u>Chinook that enter the trap will be passed upstream as quickly as possible.</u>

[1] Field biologists and technicians will use their own best judgment to determine if the number of Chinook holding in this area is considered significant. What is considered significant may change based on run size, environmental conditions and other factors.

If a Chinook female unavoidably constructs a redd within 25 meters of the weir, then the redd is to be immediately marked and a discussion will take place. This discussion will include, but is not limited to, the following types of actions: no action, early weir removal, staged weir removal, and modification of weir operations. Discussion will include at least these people or their designee: Paul Faulds and Michele Koehler (SPU), Hatchery Manager, Larry Fisher, Aaron Bosworth (WDFW), Eric Warner (MIT), Randy McIntosh (NMFS) and Hans Berge (KC).

BROODSTOCK COLLECTION

The 2014 preseason forecast for sockeye returns entering Lake Washington is 166,998. However, Locks counts as of July 31 were 58,422, indicating a much smaller return to the Cedar River. The adult collection goal remains at 24,000 regardless of the anticipated run size. All trapped sockeye adults will be kept for broodstock unless holding capacity is reached or if there is an excess of male broodstock.

Weir and trap installation is scheduled for September 3, 2014. Removal of the weir and trap is scheduled for November 21, 2014. Late November is a dynamic time period and likely to produce high flows and severe weather. An earlier removal date may be necessary if flows are expected to damage equipment or remain high for a prolonged period of time.

MONITORING

The following monitoring activities associated with the weir are to be conducted by hatchery personnel:

- Observe and enumerate Chinook and sockeye from the library to the weir three times daily; it is recognized that at times of high flow or turbidity, accurate observation and enumeration may be compromised. The observation times are as follows: once between 7 AM and 9 AM, once between 11 AM and 1 PM, and once between 3 PM and 5 PM. For sockeye, total estimated numbers are to be recorded.
- Record the number and sex of Chinook that are collected in the fish trap and passed upstream; notice and record any tags or marks observed on the fish. Provide data to the co-managers and include it in the Hatchery Annual Report.
- Record the number and sex (where possible) of all other species passed upstream. All Atlantic salmon will be killed and sampled by WDFW staff.
- Count and flag any Chinook redd within 25 m of the weir.
- Chinook carcasses that float onto the weir will be retrieved (placed on the bank) as workload allows. Carcass sampling will be coordinated with WDFW float crews.
- Request routine updates on redd surveys and live counts to validate monitoring results.

Field biologists and hatchery staff will communicate and discuss activities that are observed at the weir as they occur. All biologists and technicians will identify themselves and their respective agencies while making weir observations. Field biologists and hatchery staff will communicate and share information and observations via email.

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