FINAL

HATCHERY AND GENETIC MANAGEMENT PLAN

(HGMP)

Hatchery Program:	**Sandy Hatchery Spring Chinook**
Species or Hatchery Stock:	**Sandy River Spring Chinook (Stock 11)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Sandy River, Lower Columbia River Basin**
Draft Submitted: **Submitted for ESA Consultation:**	**October 15, 2008** **August 1, 2013**
Date Last Updated:	**October 18, 2013**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Sandy River Spring Chinook Program

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

The Sandy Hatchery Spring Chinook Program utilizes Sandy River spring Chinook salmon, *Oncorhynchus tshawytscha* (stock 11) in the hatchery broodstock. The natural population of Spring Chinook in the Sandy River is part of the Lower Columbia River Chinook Evolutionarily Significant Unit (ESU), and is listed as threatened under the Endangered Species Act (ESA). The hatchery-produced spring Chinook is considered part of the ESU and is included in the recent listing decision (September 29, 2006) by NOAA Fisheries.

This program was developed from an integrated broodstock program utilizing naturally produced Sandy River spring Chinook in the hatchery brood. Prior to brood year 2002 all hatchery releases of spring Chinook into the Sandy River were Clackamas River stock spring Chinook (stock 19). Naturally produced Sandy River spring Chinook were first collected as broodstock for this program in 2002. The first release of hatchery smolts from the Sandy River stock was in the spring of 2004. Broodstock conversion to the localized stock was complete in 2008, with up to 30% of the broodstock consisting of naturally produced fish in 2009 and 2010. Currently, the spring Chinook population in the Sandy Basin is considered healthy and abundant enough to withstand removal of naturally produced adults for incorporation into the hatchery broodstock. ODFW is proposing to integrate wild spring Chinook into the brood to help off-set loss of heterozygosity and effects of domestication.

1.3) Responsible organization and individuals.

Lead Contacts:

Name and Title:	Scott Patterson, Fish Propagation Program Manager
Organization:	Oregon Department of Fish and Wildlife
Address:	3406 Cherry Ave NE, Salem, OR 97303
Telephone:	(503) 947-6218
Fax:	(503) 947-6202
Email:	Scott.D.Patterson@state.or.us

Name and Title	Todd Alsbury, District Fisheries Biologist
Organization:	Oregon Department of Fish and Wildlife
Address:	17330 SE Evelyn St., Clackamas, OR 97015
Telephone:	971-673-6011
Fax:	971-673-6071
Email:	todd.alsbury@state.or.us

Hatchery Contact:

Name and Title:	Daniel Straw, Hatchery Manger, Clackamas Hatchery
Organization:	Oregon Department of Fish and Wildlife
Address:	24500 S Entrance Rd., Estacada, OR 97023
Telephone:	503-630-7210
Fax:	503-630-4566;
E-mail:	clackamas.hatchery@state.or.us

Name and Title:	Tim Foulk, Sandy Hatchery Manger
Agency:	Oregon Department of Fish and Wildlife
Address:	39800 SE Fish Hatchery Rd., Sandy, OR 97055
Telephone:	503-668-4222
Fax:	503-668-4572
E-mail:	sandy.hatchery@state.or.us

Name and Title:	Brett Requa, Oxbow Hatchery Manager (Acting)
Organization:	Oregon Department of Fish & Wildlife
Address:	1200 SE Frontage Rd. Cascade Locks OR 97014
Telephone:	541-374-8540
Fax:	541- 374-8827
E-mail:	oxbow.hatchery@state.or.us

Name and Title:	Mark Traynor, Cascade Hatchery Manager
Agency:	Oregon Department of Fish & Wildlife
Address:	74152 NE Eagle Creek Loop, Cascade Locks, OR 97014
Telephone:	541-374-8381
Fax:	541-374-8191
E-mail:	cascade.hatchery@state.or.us

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

Funding for the program comes from state license funds, the National Oceanic and Atmospheric Administration Fisheries service (NOAA Fisheries; through the Mitchell Act) and the City of Portland.

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

Facility	Funding Source	Staffing Level	Annual Budget
Sandy Hatchery	ODFW Other Fund (License) – 100%	2.6 FTE	$285,000 (no indirect) FY2014*
Clackamas Hatchery	NOAA Fisheries – 66.0% PGE – 17.0% City of Portland – 17.0%	4.5 FTE	$544,096 FY 2014*
Oxbow Hatchery	NOAA Fisheries – 100%	4.0 FTE	$536,400 FY 2014*
Cascade Hatchery	NOAA Fisheries – 100%	5.75 FTE	$716,880 FY 2014*

FTE=Full-Time Equivalent staff.
*Total annual budget for all programs.

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

Broodstock collection takes place at temporary weir/trap locations in the upper Sandy Basin and the Bull Run River. Temporary weirs in the upper basin are located on the Salmon River (RM 1.0) and the Zigzag River (RM 4.0). The primary broodstock collection site will be in the Bull Run River and the weir/trap located at RM 0.3 just upstream from the confluence with the Sandy River. The purpose of these weir/trap facilities is not solely broodstock collection, but more importantly they provide the ability for ODFW to remove returning hatchery fish from the primary wild spring Chinook spawning areas in the upper Sandy Basin. See section 7.2 for additional detail on location and operation of temporary weirs/traps in the Sandy Basin.

Collected brood fish are then transported to the Clackamas Hatchery for spawning. Eggs are incubated at the Clackamas Hatchery through the eyed-egg stage. At the eyed stage, eggs are sent to the Oxbow Hatchery for early rearing (to ~80 fish/lb). Fish are then transported to the Cascade Hatchery for additional rearing (to ~18 fish/lb). Fish are then sent back to Sandy Hatchery for rearing to the smolt stage (~12 fish/lb). Currently, 132,000 fish are then sent from the Sandy Hatchery to the Bull Run River for final acclimation and release from an acclimation pond located approximately RM 1.5.

Prior to the 2006 release, 100,000 smolts were transported from the Clackamas Hatchery and released directly into the lower Sandy River without acclimation at the Sandy Hatchery. In 2011, approximately 45,600 smolts were acclimated and released at the Bull Run Acclimation Pond. Starting with the 2013 release, up to 132,000 smolts will be acclimated and released from the acclimation pond in the lower Bull Run River. Future release numbers at the Bull Run River acclimation site will be based on monitoring results of measures currently being implemented to reduce the number of hatchery fish found in the natural spawning habitat of spring Chinook. Release numbers will only be increased beyond 132,000 smolts up to a maximum of 300,000 smolts if monitoring

demonstrates that stray reduction measures are effective at maintaining the basin-wide pHOS rate below 10%. (See Section 10.0 for description of release protocols).

Table 1.5. Sandy Hatchery spring Chinook program summary.

Adult Collection	Adult Holding/ Spawning	Egg Incubation	Rearing	Acclimation	Release
Sandy H.[a/]	Clackamas H.	Clackamas H.	OxbowH.		
Upper Sandy/ Bull Run River weir/trap sites[b/]		(through eyed egg)	(to 80 fpp)		
		Oxbow H.	Cascade H.		
		(through hatch)	(to 18 fpp)		
			Sandy Hatchery	Bull Run Acclimation Pond[c]	Bull Run Acclimation Pond[c/]
			(to 12 fpp)	(to 11 fpp)	(at ~10 fpp)

[a/] Adult collection will be conducted at Sandy Fish Hatchery while adult fish are returning to the facility from past releases from the facility. Sandy Hatchery will only be used in the future if collection from off-station weirs/traps do not collect sufficient numbers of adults for the hatchery brood.
[b/] The primary collection point for spring Chinook broodstock will be from temporary weirs in the Upper Sandy basin and in the Bull Run. The Bull Run weir will become the primary collection point beginning in 2016 when adults are primarily returning to the Bull Run River.
[c/] Spring Chinook (up to 132,000 smolts) are acclimated and released from the acclimation pond in the lower Bull Run River. Total number released in the future will be based on evaluation of stray reduction measures and achievement of goals for pHOS in the basin

1) **Sandy Hatchery:** Sandy Hatchery is located at RM 0.75 on Cedar Creek in the Sandy River Basin, Clackamas County, Oregon. The hatchery is at an elevation of 500 feet above sea level, at latitude 45^{o} 24’ 25” N (45.40694) and longitude 122^{o} 15’ 11” W (122.2531). The regional mark processing code for Sandy Hatchery is 5F33226 H26 21.

Spring Chinook program at Sandy Hatchery include:
Adult collection, adult holding (short-term), and late-term rearing.

2) **Clackamas Hatchery:** Clackamas Hatchery is located at RM 22.6 on the Clackamas River in the Willamette River Basin, Clackamas County, Oregon. The hatchery site is at an elevation of 313 feet above sea level, at latitude 45^{o} 17’ 46” N (45.30528) and longitude 122^{o} 21’ 37” W (122.3686). The regional mark processing code for Clackamas Hatchery is 5F33307 H7 21.

The activities of Sandy River spring Chinook program at Clackamas Hatchery include:
Adult holding, spawning, and incubation of eggs to eyeing.

3) **Oxbow Hatchery:** Oxbow Hatchery is located approximately 1 mile east of Cascade Locks, Oregon, off Interstate 84. The site is at an elevation of 100 feet above sea level, at latitude 45^{o} 40’ 32” N (45.67556) and longitude 121^{o} 51’ 31” W (121.8586). The site area is 33.5 acres, owned by ODFW.

The hatchery obtains its water supply from Oxbow Springs through gravity flow. The water rights are for 40.05 cfs.

Herman Creek Ponds (upper and lower) are operated as satellite facilities. The Upper Herman Creek facility is located on Herman Creek about 1/4 mile east of the main hatchery. The site is at an elevation of approximately 85 feet above sea level, at latitude 45° 40' 38" N and longitude 121° 51' 13" W.

The Lower Herman Creek facility is located near the mouth of Herman Creek approximately ½ mile north of the main hatchery. The site is at an elevation of 80 feet above sea level, at latitude 45° 40' 49" N and longitude 121° 51" 36" W.

The activities of Sandy River spring Chinook program at Oxbow Hatchery include:
Egg incubation and early juvenile rearing.

4) **Cascade Hatchery:** Cascade Hatchery is located along Eagle Creek, 2.5 miles west of Cascade Locks, Oregon, off of Interstate 84 (Exit 41). The site is located at an elevation of 100 feet above sea level, at latitude 45° 38' 30" N (45.64167) and longitude 121° 55' 33" W (121.9258). The area of the site is 3.8 acres, owned by US Forest Service, Mt. Hood National Forest District.

Activities of Sandy River spring Chinook program at Cascade Hatchery include:
Juvenile rearing and marking of 100% of juvenile production with an adipose fin-clip and CWT.

5) **Bull Run Acclimation Site**
The acclimation pond is located at the Bull Run Powerhouse (RM 1.5) on the south bank of the river immediately adjacent to the powerhouse. The pond (10'-wide x 60'-long x 4'9"-high) is above ground and constructed of poly-vinyl lining with galvanized steel frames. The intake is screened with NMFS compliant 3/32" mesh screening with backwash cleaning system. The 6" intake pipeline carries water up to the pond (approximately 20-feet up from the river) and an 8" outfall pipeline falls back down to a deep pool adjacent to the intake.

Activities of Sandy River spring Chinook program at the Bull Run Acclimation site include:
Juvenile acclimation and release.

7) **Upper Sandy River temporary weir/trap sites**
Temporary weirs in the upper basin are located on the Salmon River (RM 1.0) and the Zigzag River (RM 4.0).Activities include sorting of wild and hatchery spring Chinook, removal of hatchery spring Chinook, and collection of broodstock necessary for maintenance of the program. Temporary weirs/traps will be installed annually in May/June, and will be operated through early October. The traps will be monitored at least daily but more frequently during periods of high adult salmonid migration. Wild

salmonids (all species) will be removed and promptly passed upstream of the trap site unless being retained for broodstock. Any wild fish removed for broodstock will come from one of the two upper basin weirs/traps while they are in operation. Collection of wild fish in the future (when temporary traps are removed from the upper basin) will come from short term installation of weirs in the upper basin or from angler caught fish. All hatchery fish will be removed from the system and transported to Sandy Hatchery or directly to Clackamas Hatchery for holding and spawning in September.

Activities of the Sandy spring Chinook program at Upper Sandy Basin weirs and traps include:
Collection and sorting of hatchery and wild spring Chinook migrants. Wild adult spring Chinook (and any other native migratory fish collected) are selectively passed and enumerated in addition to hatchery spring Chinook that are removed from the system.

8) **Bull Run Weir/Trap**
ODFW operates a weir/trap at the mouth of the Bull Run River (RM 0.3) under agreement with the City of Portland. Activities include collection of returning hatchery spring Chinook (for broodstock collection and reduction of potential strays), and sorting of wild and hatchery spring Chinook. The weir/trap will be installed annually in May or June (depending on arrival of spring Chinook adults and flows in the Bull Run River that allow safe and effective installation of the weir) and will be operated through at least September (actual date dependent on numbers of hatchery spring Chinook and upstream movement of coho). The facility will be monitored at least daily, but more frequently during periods of high adult salmonid migration. Wild salmonids (all species) will be removed and promptly passed upstream of the trap site. All hatchery fish will be transported to Sandy Hatchery or directly to Clackamas Hatchery for holding and spawning in September.

Activities of the Sandy spring Chinook program at Bull Run weir and trap include:
Collection and sorting of hatchery and wild spring Chinook migrants. Wild adult spring Chinook (and any other native migratory fish collected) are selectively passed and enumerated in addition to hatchery spring Chinook that are removed from the system.

1.6) Type of program.

Integrated Harvest - The primary objective of this program is to augment the Sandy River, Lower Columbia, and ocean spring Chinook fisheries with hatchery reared, in-basin-origin spring Chinook. We are proposing to re-initiate integration of wild spring Chinook into the broodstock as soon as authorization is provided by NMFS.

Mitigation – Sandy Hatchery currently releases 132,000 spring Chinook smolts per year as part of a mitigation agreement with the City of Portland (and formerly Portland General Electric). Sandy Hatchery also utilizes Mitchell Act funds that are intended for mitigation for development in the Columbia River for monitoring, evaluation, and reform of hatchery operations.

1.7) Purpose of program.

The Sandy Hatchery Spring Chinook program is in place for harvest augmentation and mitigation. The primary goal of the Sandy Spring Chinook program is to mitigate for the loss of spring Chinook catch in sport and commercial fisheries that was lost due to habitat degradation and passage impairment resulting from PGE (Marmot Dam-removed in 2007 and no longer requires mitigation) and City of Portland (Bull Run dams) construction and operation of dams on the Bull Run River. The intent of the program is to produce quality hatchery spring Chinook that are genetically similar to wild spring Chinook in the Sandy River and provide a fishery for sport and commercial fishers while minimizing impacts to wild spring Chinook. This program aims to provide fish for harvest in the Lower Columbia River commercial and recreational fisheries and the Sandy River recreational fishery.

The primary objectives of the Sandy Hatchery, as outlined in the Sandy Hatchery Operations Plan 2013, are:

Objective 1: Foster and sustain opportunities for sport, commercial, and tribal fishers consistent with the conservation of naturally produced native fish.

Objective 2: Maintain genetic resources of native fish populations spawned or reared in captivity.

Objective 3: Restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish and in natural environments by controlling egg and fish movement and by prescribing a variety of preventative, therapeutic and disinfecting strategies to control the spread of disease agents in fish populations in the state.

Objective 4: Minimize adverse ecological impacts to watersheds caused by hatchery facilities and operations.

Objective 5: Communicate effectively with other fish producers, managers and the public.

1.8) Justification for the program.

The wild population of spring Chinook in the Sandy River Basin is listed as threatened under the Endangered Species Act (ESA), which prohibits commercial and recreational harvest (take) of wild spring Chinook salmon in the basin. This program was started to provide spring Chinook fishing opportunities in the Sandy River and the Lower Columbia River. The Sandy Hatchery spring Chinook program is managed to augment harvest for spring Chinook fisheries while minimizing potential risks to wild Chinook, coho, and

steelhead populations.

The Sandy River spring Chinook program is managed to supplement harvest in fisheries impacted by the construction and operation of hydropower and water supply dams in the Sandy and Columbia River basins. Specifically, the program is managed to produce spring Chinook to sustain selective Columbia River and Sandy River terminal sport and commercial fisheries. The Columbia and Sandy rivers are well regarded for recreational Chinook and steelhead angling. These fisheries receive a great deal of angler effort because of the close proximity to the Portland metropolitan area and generate substantial economic benefits to the region.

The major concern regarding the sport fishery is its potential impact on listed fish. The harvest of the Sandy River hatchery-origin spring Chinook is managed to comply with the Fisheries Management and Evaluation Plan (FMEP) for Lower Columbia River Chinook that explains the management implications for holding a sport fishery where hooking mortality of listed fish may occur. Current fishing regulations in the Lower Columbia River ESU require that all unmarked adult spring Chinook be released back to the water unharmed. Only adult spring Chinook marked with an adipose fin clip may be retained in recreational fisheries. Commercial fisheries are also actively investigating different techniques to facilitate the safe release of unmarked fish.

The Sandy Hatchery Spring Chinook Program is currently managed as a segregated program and the proposed program will be operated as an integrated harvest hatchery program. The current program utilizes hatchery origin Sandy River spring Chinook returning to the Sandy River, adults are collected at temporary weirs/traps in the upper Sandy Basin and Bull Run River and the Sandy Fish Hatchery adult trap. Prior to removal of Marmot Dam in 2007, returning hatchery-origin adults were segregated from the natural spawning population through sorting operations at the Marmot Dam fish collection facilities and only naturally produced (unmarked) fish were allowed to pass upstream to the primary spring Chinook spawning areas of the Sandy basin. ODFW evaluations have identified that a majority (over 90%) of the remaining natural spawning habitat for spring Chinook in the Sandy basin exists in the primary production areas above the confluence of the Salmon and Upper Sandy rivers.

The following is a summary of key hatchery practices and management features specifically implemented to minimize the risk of potential impacts to listed salmonids.

- Broodstock conversion from Willamette stock to local stock occurred between 2002 and 2007. All (100%) of the fish captured for broodstock during this time were naturally produced Sandy River spring Chinook.
- In 2008 conversion to the local broodstock was complete and only hatchery-reared adults derived from naturally produced parents of Sandy Basin origin are now returning to the Sandy River.
- Wild spring Chinook were not collected for brood from 2011-2013. As part of the proposed program, ODFW has developed a plan for reinitiating integration in order to

avoid changes/drift in neutral genetic markers - provided the wild population can support removal of wild adults to integrate into the hatchery broodstock. Wild spring Chinook would only be integrated in years when the expected return is > 650 adults. In the Sandy River, the number of naturally produced Spring Chinook averaged 1,654 fish from 2002-2012.

- All portions of the run and all age classes (except precocious males) will be incorporated into the broodstock to maintain genetic diversity. Hatchery returns will be monitored to assess possible phenotypic divergence from the native Sandy River stock (e.g. run timing, spawn timing, fecundity, and age at maturity).
- Smolts are released in a physical condition, and at times and locations that promote rapid out-migration to reduce potential interactions with wild salmonid populations.

~~1.~~• All hatchery fish are fin-marked (adipose clipped) to allow for harvest in selective fisheries and to facilitate sorting of returning adults. Unmarked hatchery adults can be identified by analysis of otoliths collected from post-spawn adults during spawner surveys.

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~~2.~~• Beginning with the 2012 brood, all hatchery fish will receive an internal coded-wire tag (CWT) in addition to the external adipose fin-mark. The internal tag will allow for detection of potentially mismarked hatchery spring Chinook at weirs/traps in the upper basin and Bull Run River.

~~3.~~• Marked hatchery-origin adults are removed from the natural spawning population to the maximum extent possible through effective operation of weirs/traps in various locations in the upper basin, in Cedar Creek, and at a site in the lower Bull Run River.

~~4.~~• Marked hatchery-origin spring Chinook adults were not allowed access to the natural spawning grounds in the upper Sandy River Basin from 2002 to 2007 when Marmot Dam was removed from the system. Hatchery fish were selectively removed from the population at Marmot Dam, although some limited natural spawning occurred below the former dam site.

~~5.~~• The goal of the Lower Columbia River Recovery Plan is for adult escapement into natural production areas throughout the Sandy Basin to be composed of at least 90% wild Chinook and no more than 10% hatchery-origin adults (pHOS). The program fish (smolts) shall be released from an acclimation site in the lower Bull Run River located at the former Bull Run Powerhouse. It is assumed that this release strategy will achieve the goal.

~~6.~~• This program complies with ODFW's Fish Health Management Policy and IHOT standards for prevention and treatment of fish diseases.

~~7.~~• This program complies with all other applicable IHOT standards.

1.9) List of program "Performance Standards".

See Section 1.10.

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

1.10.1) Performance Indicators addressing "BENEFITS".

Legal Mandates:

Performance Standard (1): Contribute to mitigation agreements between the NOAA Fisheries, City of Portland, and the State of Oregon.

Indicator (1)(a): Achieve a smolt to adult survival rate (SAR) adequate to collect sufficient adult broodstock to produce 132,000 spring Chinook smolts for release into the Sandy River Basin, while providing for consumptive fisheries in the Sandy River, Lower Columbia River, and Pacific Ocean.

Monitoring and Evaluation: Monitor adult returns, fishery catch, smolt production, and hatchery survival rates. These metrics are reported annually in the ODFW Annual Fish Propagation Report (www.dfw.state.or.us/fish/hatchery/) or the Salmon Catch Statistics (www.dfw.state.or.us/resources/fishing/sportcatch.asp). Perform best rearing strategies to meet spawning and production goals.

***Performance Standard (2)*:** Program goals are aligned with authorized federal, state, regional, and local fisheries conservation and restoration initiatives.

Indicator (2)(a): Program complies with Oregon Native Fish Conservation Policy (NFCP), the Sandy River Basin Plan, and the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010).

Monitoring and Evaluation: Conduct periodic program policy and goal reviews in relation to the Lower Columbia River Conservation and Recovery Plan, NFCP, Sandy Basin Plan, and hatchery program management, practices, and facilities.

Harvest and Socio-Economic Effectiveness:

Performance Standard (3): Contribution of Sandy Hatchery spring Chinook to the Sandy River sport fishery, the Lower Columbia River sport and commercial fisheries, and the ocean sport and commercial fisheries.

Indicator (3)(a): Number of adult hatchery-origin spring Chinook caught in the Sandy River sport fishery, the Lower Columbia River sport and commercial fisheries, and the ocean sport and commercial fisheries.

Monitoring and Evaluation: Collect catch data from fish buyers, CWT recoveries from commercial and sport sampling programs, dock side and on-river creel samples, and harvest cards.

Performance Standard (4): Hatchery release groups are sufficiently marked and tagged to facilitate identification and track survival. Goal is 100% external marking of hatchery smolts. Begin marking all spring Chinook releases (2012 brood) with internal coded wire

tag (CWT) for the purpose of identifying unmarked hatchery fish on the spawning grounds.

Indicator (4)(a): Number of program fish adipose fin clipped, differentially marked, and/or Coded Wire Tagged.

Monitoring and Evaluation: Sample all smolt release groups to verify the mark rate. Conduct creel and spawning surveys to assess contribution to fisheries and effectiveness of hatchery stray reduction measures.

Performance Standard (5): Naturally spawning hatchery fish do not significantly impact wild spring Chinook in the Sandy Basin.

Indicator 5(a): Release hatchery smolts from the Bull Run River acclimation pond. Selection of a single or multiple release sites will be based on scenario that leads to achieving goal of reducing hatchery fractions on the spawning grounds (pHOS) to less than 10%.

Indicator 5(b): The number of hatchery spring Chinook in the natural spawning population throughout the basin remains below 10%.

Monitoring and Evaluation: Conduct annual spawning ground surveys to assess the number of hatchery fish spawning in areas throughout the natural range of spring Chinook in the Sandy River basin. Spring Chinook survey annual reports are available at ODFW's Corvallis Research web-site (http://nrimp.dfw.state.or.us/crl/default.aspx?pn=WSCreports)

Life History Characteristics

Performance Standard (6): Maintain similar life history characteristics between hatchery broodstock and wild spring Chinook in the Sandy River basin.

Indicator (6)(a): Hatchery broodstock shall be monitored to assess similarities to wild spring Chinook in regard to run timing, size, sex composition, fecundity, adult:jack ratio, and age. Integrate wild spring Chinook into the broodstock annually when adult return numbers allow in order to reduce the loss of heterozygosity in the hatchery population (see Section 6.2.3). Integration will also help prevent divergence between the hatchery and wild populations in the Sandy basin.

Monitoring and Evaluation: Life history characteristics of hatchery-origin and wild spring Chinook will be monitored through analysis of hatchery and wild returns to weirs and traps (run timing and age composition), spawning ground surveys, and juvenile outmigrant monitoring.

Ecosystem function:

***Performance Standard (7)*:** Provide nutrient enrichment and food web benefits in natural salmon spawning streams of the Sandy River Basin.

Indicator 7(a): Hatchery fish in excess of broodstock requirements may be placed in streams for nutrient enrichment.

Monitoring and Evaluation: Track the number and location(s) of carcasses distributed for nutrient enrichment. Monitor ability to consistently respond to planned nutrient enhancement needs as appropriate for Oregon watersheds.

Indicator 7(b): Hatchery carcasses placed for nutrient enrichment will comply with ODFW and Oregon Department of Environmental Quality (DEQ) guidelines for disease control and water quality.

Monitoring and Evaluation: ODFW's Fish Pathology Department screens carcasses for possible diseases and gives final approval for all nutrient enrichment projects prior to project initiation.

1.10.2) Performance Indicators addressing "RISKS".

Operation of Artificial Production Facilities:

Performance Standard (9): Sandy, Clackamas, Oxbow, and Cascade Hatcheries will be operated in compliance with all applicable fish health guidelines and facility operation standards and protocols (i.e., IHOT, PNFHPC, and the Oregon Fish Health Management Policy).

Indicator (9)(a): Number and type of pathogens observed, in both broodstock and rearing juveniles, are within accepted guidelines.

Monitoring and Evaluation: ODFW Fish Pathologists, along with hatchery staff, regularly monitor fish health and conduct fish disease examinations. Monitoring efforts include virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation fish health inspections.

Indicator (9)(b): Survival rates during rearing (egg-to-fry and fry-to-smolt) are within guidelines.

Monitoring and Evaluation: Egg to fry and fry to smolt survival rates are estimated for each brood-year release.

Performance Standard (10): Effluent from hatcheries will not detrimentally affect natural in-river populations.

Indicator (10)(a): Hatchery effluent is managed to comply with conditions and water quality limits outlined in existing NPDES permits.

Monitoring and Evaluation: Effluent water samples are analyzed for compliance. Permits are mandated by the EPA in accordance with the Clean Water Act, and regulated by the Oregon Department of Environmental Quality.

Performance Standard (11): Juvenile releases do not introduce new pathogens and do not significantly increase the level of existing pathogens in the Sandy River Basin.

Indicator (11)(a): Juvenile fish health shall be certified prior to release.

Monitoring and Evaluation: Regular monitoring efforts by ODFW Fish Pathologists and hatchery staff include virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation fish health inspections.

Performance Standard (12): Minimize impacts to naturally produced adult spring Chinook.

Indicator (12)(a): Weir/trap operation in the upper Sandy basin , Bull Run River, and Sandy Hatchery operations do not result in significant stress, injury, or mortality to naturally produced salmonid populations.

Monitoring and Evaluation: Monitor the number of mortalities in all adult collection facilities for each species. Conduct monitoring specific to assessing potential impacts from operation of weirs in the basin.

***Performance Standard (13)*:** Minimize impacts to naturally produced juvenile spring Chinook.

Indicator (13)(a): Hatchery fish will be released in time and space, and in a condition that minimizes the interaction with listed fish.

Monitoring and Evaluation: Monitor smolt development using available indicators, e.g. age, size and coloration of smolts at the hatchery to assure smolts are full-term at release. Utilize distinct release locations downstream of Sandy Hatchery and the primary natural production areas in the upper basin. Conduct monitoring specific to determining if hatchery smolts are migrating out of the basin as intended (monitoring plan detailed in Section 11.1.1).

Life History Characteristics:

Performance Standard (14): Maintain genetic and ecological characteristics of wild population.

Indicator (14)(a): Reduce the proportion of hatchery spring Chinook in natural spawning areas to ≤ 10% through construction of off-station acclimation ponds, weirs/traps, and other stray reduction measures.

Monitoring and Evaluation: Corvallis Research along with local District staff currently conduct annual spawning surveys throughout the basin to determine distribution and spawning success. See Attachment 1 *(page 89)* for adaptive management measures intended to reduce pHOS if it is determined through monitoring that rates exceed that described in this HGMP and the LCRCRP.

Performance Standard (15): Maintain or improve the productivity of the wild, naturally spawning population.

Indicator (15)(a): The wild population trends toward the delisting abundance criterion in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (Chapter 8), or other measurements of health determined in the adaptive management process of the plan.

Indicator (15)(b): Reduce the proportion of hatchery spring Chinook in natural spawning areas to ≤ 10% through construction of off-station acclimation ponds, weirs/traps, and other stray reduction measures.

Monitoring and Evaluation: Conduct spawning ground surveys to quantify redd and spawner abundance, as well as proportion of naturally spawning hatchery fish. Obtain estimates of abundance for juvenile outmigrants from U.S. Forest Service smolt traps to assess trends in spring Chinook productivity from select sub-basins.

1.11) Expected size of program.

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

The goal of this program will be to collect 108 adults to meet the smolt production goal of 132,000. This number allows for an adult mortality of approximately 20 adults. Hatchery produced adults are collected beginning in May, mature over the summer and are spawned from mid-September through mid-October.

If collection of naturally produced adults and re-integrating the stock is approved under this HGMP, our goal will be to achieve a 20% rate of integration by removing of up to 22 wild adults and incorporating them into the broodstock. This level of integration would constitute removal of 1.09% of the natural spawning population (based on the 10-year average of 1,645 wild adults).

The number of wild adults incorporated into the brood (up to 22) would remain constant unless it is determined based on modeling and analysis that additional wild adults are needed to achieve the goal of maintaining the genetic characteristics of the hatchery population (reducing loss of heterozygosity and rare alleles). Up to 42 wild adults may be collected in the future if stray reduction measures prove to reduce pHOS to a rate that would allow release of up to 300,000 smolts. See Attachment 1 *(page 89)* for information regarding levels of integration proposed based on varying levels of production and abundance of adult returns.

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

Prior to the 2002 brood year, hatchery releases of spring Chinook into the Sandy River were approximately 460,000 smolts made up of Clackamas River stock. Since that time, hatchery releases of spring Chinook into the Sandy River were approximately 300,000 smolts made up entirely of hatchery-produced Sandy River stock. Under the current plan the hatchery release goal is 132,000 smolts annually. The annual smolt release may increase to a maximum of 300,000 when monitoring shows that the proportion of hatchery adults spawning naturally (pHOS) remains below 10% of the natural spawning population and modeling indicates that increasing release size will not increase pHOS above the target rate. The number of smolts released in the future will be based on modeling that indicates basin-wide pHOS can be maintained at levels identified in this HGMP and the LCRCRP (≤10%).

Table 1.11.2. Proposed annual fish release levels for the Sandy Hatchery spring Chinook program.

Life Stage	Release Location	Proposed Release Numbers
Eyed Eggs	na	na
Unfed Fry	na	na
Fry	na	na
Pre-smolts	na	na
Smolts [a/]	Cedar Creek (Sandy Hatchery)	0
Smolts [b/]	Lower Bull Run River acclimation site.	Up to 132,000

[a/] Currently, fish are released into the lower Bull Run River to minimize straying into the primary natural production area in the upper Sandy basin.

[b/] An acclimation site in the lower Bull Run River located at the former PGE Bull Run Powerhouse is currently being operated to meet the goal of reducing hatchery stray rates into the primary natural production areas in the upper basin. Total numbers released at an individual or combined locations will not exceed 132,000 smolts unless wild fish management goals cannot be met through implementation of stray reduction measures. The number may increase to a maximum of 300,000 as long as management goals can be maintained.

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

The first release of hatchery smolts under the current program using native Sandy River stock began in the spring of 2004. Therefore, we have 3 complete brood years' data for the new stock. Prior to 2004 releases of spring Chinook into the Sandy River were of Clackamas River stock. Hatchery smolt-to-adult survival rates for the Sandy River stock is presented in Table 1.12a. Release procedures (direct vs. acclimated) and associated adult return data are provided in Table 1.12b.

For all brood years smolt to adult survival rates were estimated from CWT recoveries.

Table 1.12a. Summary of CWT recoveries for Sandy hatchery spring Chinook released in the Sandy basin. Brood years 2008-2010 recoveries not yet complete. Only CWT groups from Age 1+ spring releases are included. * indicates release from Cedar Creek.

Brood Year	# smolts released within basin	number of Ad+CWT tagged juveniles released	% of release Ad+CWT tagged (mark rate)	Estimated from Expansion of Actual Recoveries			SAR to Hatchery (= spawner escapement)
				SAR (all recoveries)	Estimated Total Contribution to all Fisheries (%)	Estimated Total Contribution to FW Fishery (%)	
2002	282,310	22,416	7.9	0.43	0.41	0.02	0.04
2003	319,950	48,522	15.2	0.10	0.09	0.02	0.01
2004	295,088	51,669	17.5	0.27	0.22	0.03	0.03
2005*	258,571	48,353	18.7	0.21	0.14	0.01	0.04
2006*	298,172	48,304	16.2	1.07	0.88	0.12	0.13
2007*	271,683	43,408	16.0	0.68	0.54	0.09	0.08
2008*	207,583	46,499	22.4	tbd	tbd	tbd	tbd
2009*	289,712	54,176	18.7	tbd	tbd	tbd	tbd
2010*	281,343	50,642	18.0	tbd	tbd	tbd	tbd

Table 1. 12(b). Direct vs. acclimated hatchery releases and adult spring Chinook returns to Sandy Hatchery and Marmot Dam (Brood year 1991-2008).

Brood Year	Total Number Released	Direct Release	Acclimate	**Return Year	Marked ChS Returns to Sandy Hatchery	Marked ChS Returns to Marmot Dam	Unmarked ChS Returns to Marmot Dam
1991	471,445	371,484	99,961[h/]	1995	--	--	1,503
1992	484,542	344,896	139,646[h/]	1996	--	--	2,561
1993	459,578	309,972	149,606[h/]	1997	--	--	3,301
1994	421,768	395,558	93,895[h/]	1998	--	--	2,612
1995	429,117	429,117		1999	--	24	2,032
1996	452,715	360,609	92,106[h/]	2000	--	14	1,986
1997[a/]	468,486	369,153	99,333[h/]	2001	--	1,050	2,445
1998	455,584	455,584		2002	2	3,039	1,262
1999[/]	434,103	284,055[i/]	150,048	2003	211	2,683	1,197
2000	458,885[c/]	168,088	290,797	2004	2,944	2,587	2,699
2001	439,546[d/]	290,898	148,648	2005	1,822	2,115	1,814
2002[b/]	282,310[e/]	105,301	177,009	2006	975	1,070	1,383
2003	319,950[f/]	116,316	203,634	2007	6	790	1,627
2004	295,088[g/]		295,089	2008	112	n/a	n/a
2005	258,571		258,971	2009	186	n/a	n/a
2006	298,712		298,172	2010	526	n/a	n/a
2007	271,683		271,683	2011	152	n/a	n/a
2008	207,583		207,583	2012	0	n/a	n/a

Source: Data obtained from hatchery records and Doug Cramer, PGE.

**Return year for four year old fish.

[a/] Spring Chinook were not 100% marked until the 1997 brood year (2000-2002 return years). Prior to 2002, adults trapped and sorted at Marmot Dam could not be distinguished due to lack of mark on brood years prior to 1997. A small percentage of 6 year old adults (<3%) from the 1996 brood year could have returned as unmarked hatchery fish in 2002.

[b/] First year for current wild broodstock program. Fish from this brood were released in 2004 and the majority returned in 2006 as 4-year old fish.

[c/] 168,088 ChS were direct released into the Sandy at Marsh Road (3/19/02); 290,797 ChS were acclimated prior to release.

[d/] 152,797 ChS were direct released in Cedar Creek (3/18/03) and 138,101 were direct released into the Sandy River at Marsh Road (3/17/03); 148,648 ChS were acclimated for two weeks and released into Cedar Creek.

[e/] 105,301 ChS were direct released into Cedar Creek (3/9/04); 177,609 ChS were acclimated for two weeks prior to release into Cedar Creek (3/9/04).

[f/] 116,316 ChS were direct released into the Sandy River at Marsh Road (3/7/05); 203,634 ChS were released into the Sandy River at Marsh Road after a two-week acclimation at Sandy Hatchery (3/8/05).

[g/] 295,088 were released into Cedar Creek after a two week acclimation period (149,250 on 2/27/06 and 145,838 on 3/28/06).

[h/] ChS acclimated at Marmot Acclimation Pond.

[i/] 130,299 ChS were direct released into the Sandy River at Marsh Road (3/14/01); 153,756 ChS were direct released into the Sandy Hatchery adult holding pond (3/14/01).

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

The first hatchery program for spring Chinook in the Sandy River basin started in 1896 with the collection of 2,600,000 eggs from the Salmon River. Collection of Chinook eggs occurred annually from 1896 through 1912, then intermittently from 1913 through the early 1950's when the current Sandy Hatchery began operation (Mattson 1955). The first release of hatchery spring Chinook into the Sandy River consisted of 119,000 fry in 1900. From 1900-2003 fry, pre-smolts, and smolts (from Clackamas River stock) have been released throughout the Sandy River Basin.

In 2002, the first wild spring Chinook adults were collected for the in-basin, integrated broodstock program and in 2004 the first smolts from this stock were released into the Sandy River. See Section 6 for further detail regarding broodstock history.

1.14) Expected duration of program.

The project is ongoing, with no planned end date.

1.15) Watersheds targeted by program.

Targeted watersheds include the Sandy River below Cedar Creek and the Bull Run River, the Lower Columbia River, and the Pacific Ocean.

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

1.16.1) Brief Overview of Key Issues.

The Sandy River spring Chinook program was a segregated program using a non-local stock that converted to a locally adapted broodstock using naturally produced fish in 2004. During conversion the broodstock consisted entirely of natural origin Sandy River spring Chinook. In 2011 and 2012 the program used only hatchery adults for broodstock. Broodstock will be collected annually at weirs/traps in select upper basin tributaries and the lower Bull Run River. One of the concerns is that, due to space limitations and water quality/quantity issues at Sandy Hatchery, egg collection, incubation and rearing occur at other hatchery facilities outside the basin which may lead to increased straying in returning adults. Under the proposed program, adult holding, egg collection, and early incubation through the eyed egg stage occur at Clackamas Hatchery. Eyed eggs are then shipped to Oxbow Hatchery for rearing through June (until fish are approximately 80 fish per pound). The fish are then transferred to Cascade Hatchery where they are reared to a size of approximately 18 fish per pound, and are then transferred back to Sandy Hatchery for final rearing to the smolt stage. The fish are then transferred to the Bull Run acclimation pond for acclimation and release.

The purpose of the program is to provide harvest opportunities and to mitigate for the loss of habitat resulting from hydroelectric development. Spawning interactions between returning hatchery fish and the naturally produced population are minimized by acclimating 100% of the annual release at the Bull Run River acclimation pond for a 3-

week period and operating weirs/traps for selective removal of hatchery adults. From 2002 to when Marmot Dam was removed in 2007, wild fish were passed upstream of the dam into the upper Sandy River spawning grounds and marked hatchery fish were precluded from entering the natural spawning ground upstream of the dam. Removal of Marmot Dam has created an environment for upstream migration of hatchery spring Chinook into the natural spawning habitat of spring Chinook in the Sandy River. However, all hatchery fish continue to be adipose fin-marked for easy identification and to allow for selective fisheries and to assess the distribution of hatchery fish not returning to the Sandy Hatchery.

Issue 1: *Out-of-basin spawning, incubation, and rearing may impede local adaptation of the native hatchery stock and may increase the incidence of straying.*

Broodstock shall be collected annually at Sandy Hatchery, while adult spring Chinook are still returning to the facility and via weirs/traps in select upper basin tributaries and the lower Bull Run River. Due to space limitations and water quality/quantity issues at the Sandy Hatchery spawning, egg collection, incubation, and rearing occurs at other hatchery facilities outside the basin. Adult holding, egg collection, and early incubation through the eyed-egg stage occur at Clackamas Hatchery. Eyed eggs are then shipped to Oxbow Hatchery for rearing from February thru June (until approximately 80 fish per pound). They are then transferred to Cascade Hatchery for rearing to approximately 18 fish per pound and are then transferred back Sandy Hatchery for final rearing to the smolt stage. The fish are then transferred to Bull Run acclimation pond for a 2-3 week acclimation prior to release.

Issue 2: *Additional changes to the program may be necessary to control stray rates into the upper basin due to recently removed Marmot Dam (if the rates exceed the ODFW standards adopted for the basin).*

Between 2002 and 2007 when Marmot Dam was removed, spawning interactions between returning hatchery fish and the naturally-produced population were minimized by sorting hatchery and wild fish at the Marmot Dam trap, where only wild fish were passed upstream to access the spawning grounds in the upper Sandy River. Hatchery-produced fish returning to Marmot Dam were occasionally recycled through the lower river fishery or taken to Sandy Hatchery for disposition (hatchery spring Chinook are no longer recycled in the Sandy Basin due to concern with increasing potential stray). ODFW is now releasing all hatchery spring Chinook smolts from the Bull Run River acclimation pond in order to keep fish from straying into the primary natural production areas in the upper basin. We are also operating weirs/traps in the upper Sandy Basin to control strays while acclimation to lower basin tributaries is implemented.

Issue 3: Isolated hatchery program may diverge genetically from the wild population through time.

The Sandy Hatchery spring Chinook program integrated wild fish into the broodstock from 2002 to 2010 in an effort to keep the hatchery and wild populations genetically similar over time. We are proposing to re-initiate integration of wild fish as a small portion of the hatchery brood. This will occur in years when removal of a limited number

of adults (up to 22) will not reduce the effective wild population size below 500 (650 spawners returning).

1.16.2) Potential Alternatives to the Current Program.

The following potential alternatives were identified during public workshops, are for discussion purposes, and are not necessarily being endorsed by the managing agency or the authors of this document.

Issue 1; Alternative 1: *Rear all Sandy spring Chinook hatchery smolts within the Sandy basin*.

Pros: Adaptation of the hatchery stock would be driven entirely by local watershed conditions if all smolts were reared exclusively at the Sandy Hatchery. This change may cause stray rates to decline, but there is no assessment to the effectiveness of this strategy. The Sandy Hatchery lacks the rearing space and water supply to fully rear all spring Chinook smolts at the existing facility for the entire year. Some operational cost reductions would occur due to decreased expenses to transport fish. We are investigating the opportunity to incubate Sandy Hatchery spring Chinook at Sandy Hatchery as opposed to Clackamas Hatchery. This option may help further reduce the possibility of unintended stray into natural spawning areas.

Cons: Creating additional rearing facilities to meet this need would require substantial construction and financial investment. In addition, vacant land available at the current facility may not be adequate to construct the required pond space, and options to purchase additional land are very limited and may be cost prohibitive. Development of additional rearing space would also require the development of additional water supplies or water delivery infrastructure (i.e. a pump station) to facilitate rearing operations the entire year while also restoring fish passage; this facility is currently water quantity-limited during summer periods. Facility improvements to implement this alternative would require substantial financial investment, and funding is currently not available to implement this action. Even with capital improvements in rearing space and water supply, options to increase spring Chinook rearing at the facility are limited due to water quality issues during summer months. Annual operation costs would increase if a pump station is required to facilitate summer and early fall rearing.

Issue 1; Alternative 2: *Maintain the current program by continuing to utilize out-of-basin facilities to rear Sandy spring Chinook hatchery smolts*.

Pros: This alternative maintains the existing program design and does not require additional financial investment in capital construction and water supply development at the current facility. Straying of hatchery fish to the Willamette Basin (where the fish were reared) has not been a problem in the past, even when the broodstock were of Clackamas River origin. Therefore, if stray rates continue to be low, any benefit gained from in-basin rearing will most likely be small and may not be justified given the cost of implementation. The shift to 100% CWT will allow for assessment of potential risk from the current rearing scenario for Sandy hatchery spring Chinook.

Cons: Local adaptation of the hatchery stock would not be fully driven by local watershed conditions. Stray rates, as well as survival rates, could potentially continue to be influenced by the current out-of-basin rearing design.

Issue 2; Alternative 1: *Investigate options for program changes to reduce straying of hatchery fish into the upper basin.*

Pros: If successful, program changes that limit stray rates into the upper basin could reduce risks to naturally produced spring Chinook populations. Implementing an option of alternate release sites and adult trapping facility development should have minimal effects to recreational anglers and may create new fishing areas in the vicinity of the new release/trap site. The benefits of program changes, including changes in acclimation and release strategies, have not been fully realized since we do not have fish returning from all new release locations or release strategies. It is assumed that stray rates will be reduced substantially when fish that were fully acclimated and released from Sandy Hatchery and the new acclimation pond in a lower river tributary (i.e. the Bull Run River) begin to return.

Cons: If a reduction in smolt release numbers is required, recreational fisheries could be impacted and angler opposition would occur.

Issue3; Alternative 1: *The continuation of the program as an integrated program should reduce the divergence of the hatchery and wild populations*.

Pros & Cons: The action is intended to reduce the divergence of the two populations. The downfall is mining of wild adults for the spawning population and reduction of natural production when adult numbers are already low. This alternative is now being considered due to an increasing trend in natural production and modeling that shows that small numbers of wild brood can reduce the level of divergence (see Section 6.2.3).

1.16.3) Potential Reforms and Investments.

The following potential reforms and investments were identified in public workshops during original HGMP development, are for discussion purposes, and are not necessarily being endorsed by the managing agency or the authors of this document.

Reform/Investment 1: Conduct a study to evaluate the out of basin straying of Sandy Hatchery spring Chinook. The study would determine the extent of straying and the locations to which the fish stray. The study would provide insight to the debated effects of the current out of basin rearing strategy, and suggest if the current rearing protocol is sufficient or if changes need to be made. {Issue #1}.

Reform/Investment 2: Conduct a feasibility study to determine if additional incubation and rearing space development and associated increases to the facility water supply could be completed to allow all spring Chinook smolts to be incubated or fully reared at the Sandy Hatchery facility for the entire year. Determine if other conditions (e.g. water quality) would affect the ability to incubate or fully rear all spring Chinook smolts at the facility. Assess the costs of increasing rearing space and developing an additional water

supply (note: a portion of the information needed may be available from the planning and design process being completed for the fish passage restoration project). {Issue #1}.

Reform/Investment 3: Implement and evaluate the effectiveness of off-station smolt acclimation and adult weir/trap sites as methods for reducing the stray rate of hatchery-origin spring Chinook to upper basin spawning areas. {Issue #2}.

This reform measure is currently being implemented through operation of the Bull Run acclimation pond, installation of temporary adult weirs in the Salmon and Zigzag rivers, and a weir and trap on the lower Bull Run River. The acclimation pond began operation in 2011 with the release of approximately 50,000 spring Chinook smolts. Operation of the weir and trap in the Bull Run River began in 2013.

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS

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

Fish production activities conducted by the Sandy Hatchery spring Chinook program are covered by the following:

- Section 7 (Consultation) - 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin.
- Section 4d - Lower Columbia River Chinook FMEP.
- An ESA Section 7 Biological Opinion and Incidental Take Statement authorizing this program were issued September 28, 2012.

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

All Columbia River anadromous salmonids that successfully return to spawn must migrate through the lower Columbia River and estuary twice during their life cycle. Thus, hatchery programs in the lower Columbia have the potential to affect the 12 listed Evolutionarily Significant Units (ESUs) in the Columbia basin. However, it is more probable that any program affects would be most significant on ESA listed salmonid populations that occur in the subbasin where the program fish are collected and released. The Sandy River subbasin includes populations from the following ESA-listed species:

The Lower Columbia River Chinook salmon (*Oncorhynchus tshawytscha*) ESU is federally listed as threatened under the Endangered Species Act, effective May 24, 1999.

The Lower Columbia River coho salmon (*Oncorhynchus kisutch*) ESU is listed as threatened under the ESA, effective July, 2005. The Oregon portion of this ESU is listed as endangered by the state of Oregon.

The Columbia River chum salmon (*Oncorhynchus keta*) ESU is federally listed as threatened, effective May 24, 1999.

The Lower Columbia River steelhead (*Oncorhynchus mykiss*) DPS is federally listed as threatened under the ESA.

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

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

<u>Lower Columbia River Chinook</u> - The Lower Columbia River Chinook salmon ESU includes all naturally-produced Chinook populations residing below impassable natural barriers (e.g., long-standing, natural waterfalls) from the mouth of the Columbia River to the crest of the Cascade Range just east of the Hood River in Oregon and the White Salmon River in Washington. This ESU excludes populations above Willamette Falls, as

well as Clackamas River spring Chinook. Within this ESU, there are historic runs of three different Chinook salmon populations: spring-run, tule, and late-fall "bright" Chinook salmon. The Sandy River contains listed populations of spring-run Chinook, tule Chinook, and late-fall "bright" Chinook.

The LCR Chinook population could be directly effected through removal of wild adult spring Chinook for the purpose of re-integrating the Sandy spring Chinook program. The effect is considered minimal since such a small portion of the relatively healthy and abundant naturally produced population of spring Chinook in the Sandy will be incorporated into the brood. These males can be effectively returned to the Sandy Basin after milt is collected at the Clackamas Hatchery.

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

All listed species occupying habitats in the lower Sandy River and the lower Columbia River migration corridor(s) may be indirectly impacted by the presence of Sandy River (hatchery) spring Chinook. However, it is believed that any incidental impact due to competition for food and space between listed species and hatchery fish will be minimal, based upon risk aversion measures of the hatchery program identified in this HGMP.

These listed species include:

<u>Lower Columbia River Steelhead</u> - The Lower Columbia River steelhead DPS was listed as threatened under the ESA on March 19, 1998. This DPS contains tributaries to the Columbia River between the Cowlitz and Wind Rivers Washington, inclusive, and the Willamette and Hood Rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon Rivers in Washington. The Sandy River contains a population of winter steelhead.

<u>Lower Columbia River Coho</u> - Lower Columbia River coho in Oregon are listed as endangered by the State of Oregon and threatened by NOAA Fisheries. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon. The Sandy River contains a population of coho.

<u>Columbia River Chum</u> - The Columbia River chum salmon were listed as a threatened species on March 25, 1999. The ESU includes all naturally spawning populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon. It is uncertain if a chum population exists in the Sandy River.

<u>Columbia River Bull Trout</u> - The Fish and Wildlife Service issued a final rule listing the Columbia River population of bull trout as a threatened species on June 10, 1998. The Hood River Recovery Unit forms part of the range of the Columbia River population. The Hood River Recovery Unit encompasses the Sandy River Basin.

2.2.2) Status of 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.

The Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) determined minimum abundance thresholds (MATs) for the Oregon Lower Columbia fall/spring Chinook, chum, and coho populations in the vicinity of the Sandy Hatchery coho program (McElhany et al. 2007). The WLC-TRT established MAT values for both "critical" (very high risk of extinction) and "viable" (low risk of extinction) status. Thresholds for chum salmon were identified, but there was insufficient data to assess the status of chum populations in the Columbia River ESU, so they are not presented here. The MAT values for "critical" status for the Sandy populations of Chinook, coho and steelhead were 400, 1,800, and 425 respectively. The "viable" abundance levels defined for Chinook, coho and steelhead are 800, 3,300 and 750 respectively.

The MAT values identified by the WLC-TRT were used in the status assessment conducted as part of developing the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead. The status assessment found that the Sandy coho population was below the "critical" MAT at 1,800. The assessment found the Sandy late fall Chinook population was above the "viable" level at 1,764, whereas the fall Chinook and spring Chinook populations were below the viable level, but above the "critical" level respectively at 144 and 714. The Sandy winter steelhead assessed abundance (674) is above the critical level, but below the viable level.

- Current population status and de-listing scenarios identified in existing/current recovery plans.

The recently completed *Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead* (LCRCRP, ODFW 2010) adopts the biological criteria for achieving delisting that were established by the WLC-TRT (McElhany et al. 2007). The WLC-TRT criteria use a scoring system that is based on each population's 100-year probability of extinction, as categorized into "extinction risk classes." The criteria do not require each population to be "viable" (i.e., having a low extinction risk), but do require a specific number of viable populations and an aggregate level of extinction risks for all populations within strata and across ESUs that are intended to assure the ESU exists into the future.

Population assessments were completed, using the best available data and scientific inference, to determine current status, in terms of extinction risk class, and improvements necessary to lower extinction risk (i.e., "gaps" to other risk classes). Consistent with NMFS guidance, this extinction risk assessment took into account a number of biological population parameters related to salmonid viability, including abundance, productivity, spatial structure, and diversity. A sophisticated quantitative model was used to assess population abundance and productivity parameters relative to extinction risk. Assessments were done for all Oregon LCR populations, excluding chum, which are

considered functionally extirpated (i.e., locally extinct) from the Oregon portion of the ESU.

In light of the current status assessments and based on delisting criteria, the delisting desired status (in terms of extinction risk class) of each population was determined in an iterative process with ODFW, the LCRCRP Stakeholder Team (Stakeholder Team), and State of Washington recovery planners, with input from NMFS and the LCRCRP Planning Team (Planning Team). Once the desired status for each population was determined, ODFW and the Stakeholder Team, with input from the Planning Team on feasibility, determined the threat reduction scenario for each population (excluding chum) utilizing the current status and gap results from the population assessments.

The threat reduction scenario shows how each population will get from its current status to the desired status through the reduction of anthropogenic impacts within a threat category. The scenario also shows the level and relative priority of actions necessary to address each threat in a population. The threat categories represent areas where current anthropogenic mortality rates were able to be estimated and actions can be applied to reduce impacts. These categories include: tributary habitat, estuary habitat, hydropower, harvest, hatchery fish, and predation. An Expert Panel approach, followed by refinement with the Planning Team and threat-specific managers, was used to determine the limiting factors and threats for each life stage and for different life cycle locations for each population. This was used to identify much more specific impacts within each threat category, as well as to guide and structure specific strategies and actions for each threat reduction. Actions specifically related to the spring Chinook program at Sandy Hatchery can be found in Table 2.2.2a (Table 9-3 of the Recovery Plan).

Table 2.2.2(a). Sandy-Specific Recovery Plan actions addressing the spring Chinook hatchery program:

Action ID	Action	Status in the Sandy Basin
238-SY	Acclimate 100% of hatchery spring Chinook releases into the Sandy (Sandy Hatchery and Bull Run River or Gordon Creek)	On-going
239-SY	Trap and sort hatchery adults: Collect (weir and trap at or near acclimation sites) hatchery spring Chinook if stray rate is too high (mouth of Cedar Creek and Bull Run River or Gordon Creek)	In process of being implemented
240-SY	Increase water quantity in Cedar Creek for more attraction (end illegal diversions, increase outreach and coordination with OWRD, potentially purchase water rights).	To be completed
241-SY	Implement a sliding scale for take of wild winter steelhead and spring Chinook broodstock for the integrated hatchery programs based on the forecasted total returns of wild fish to the population (<500: no take; 500-1000: reduced take); develop forecast model as necessary.[a/]	In process of being implemented through submission and approval of this HGMP with modifications to the sliding scale and limit to the impact to the Sandy wild population.
242-SY	Eliminate the upper basin and Marmot Dam acclimation pond releases	Completed

Source: LCRCRP, ODFW 2010

[a/] A modified scenario for integrating wild fish into the broodstock is described in Section x.x.x

See Table 2.2.2b for a summary of the current status and Delisting Scenario for Oregon Populations of Salmon and Steelhead in the Lower Columbia River (from Table 6-36 of the Recovery Plan). Data and data inferences were used to develop recruitment curves for individual populations that were the basis for a population viability assessment (PVA) model in the Recovery Plan, called CATAS (Conservation Assessment Tool for Anadromous Salmonids; Chapter 4). CATAS was used to develop the current status in terms of extinction risk, and abundance and productivity (as a combined VSP parameter for simplicity). The abundance values in Table 2.2.2b are modeled abundances from CATAS for a 100 year period at current impact rates.

Table 2.2.2b. Current population status and de-listing scenarios identified in existing/current recovery plans.

		Current		Delisting Scenario				
Species / Stratum (Run)	Population	Abundance	Overall Risk Class	Contribution to Delisting	Abundance	A&P Gap	Overall Risk Class	Confidence
COHO								
Coast								
	Youngs Bay	4	VH	Stabilizing	7	3	VH	Exceed
	Big Creek	8	VH	Stabilizing	12	4	VH	Exceed
	Clatskanie	1,363	H	Primary	3,201	1,838	VL	Achieve
	Scappoose	1,942	M	Primary	3,208	1,266	VL	Exceed
Cascade								
	Clackamas	6,548	M	Primary	11,232	4,684	VL	Exceed
	Sandy	**1,622**	**VH**	**Primary**	**5,685**	**4,063**	**L**	**Achieve**
Gorge								
	*Lower Gorge**	22	VH	*Support WA (L)*	962	940	H (L)	Achieve
	Upper Gorge/Hood	41	VH	Primary	5,203	5,162	L	Unlikely
CHINOOK								
Coast (Fall)								
	Youngs Bay	379	H	Stabilizing	505	126	H	Exceed
	Big Creek	216	VH	Contributing	577	361	H	Achieve
	Clatskanie	6	VH	Primary	1,277	1,271	L	Exceed
	Scappoose	356	H	Primary	1,222	866	L	Exceed
Cascade (Fall)								
	Clackamas	558	VH	Contributing	1,551	993	M	Exceed
	Sandy	**144**	**VH**	**Contributing**	**1,031**	**887**	**M**	**Achieve**
Gorge (Fall)								
	*Lower Gorge**	74	VH	*Support WA (M)*	387	313	H (M)	Achieve
	*Upper Gorge**	17	VH	*Support WA (M)*	87	70	VH (M)	Achieve
	Hood	33	VH	Primary	1,245	1,212	L	Unlikely
Cascade (Late Fall)								
	Sandy	**1,794**	**L**	**Primary**	**3,858**	**2,064**	VL	**Achieve**
Cascade (Spring)								
	Clackamas	1,371	M	*N / A*	8,377	7,006	*(VL)*	Achieve
	Sandy	**714**	**M**	**Primary**	**1,230**	**516**	**L**	**Exceed**
Gorge (Spring)								
	Hood	327	VH	Primary	1,493	1,166	VL	Exceed
STEELHEAD								
Coast (Winter)								
	Youngs Bay	2,486	VL	*N / A*	4,733	2,247	*(VL)*	Achieve
	Big Creek	1,143	L	*N / A*	3,182	2,039	*(VL)*	Achieve
	Clatskanie	2,451	VL	*N / A*	3,982	1,531	*(VL)*	Achieve
	Scappoose	3,245	VL	*N / A*	5,169	1,924	*(VL)*	Achieve
Cascade (Winter)								
	Clackamas	3,897	M	Primary	10,671	6,774	L	Unlikely
	Sandy	**674**	**H**	**Primary**	**1,519**	**845**	VL	**Exceed**
Gorge (Winter)								
	*Lower Gorge**	550	M (H)	*Support WA (L)*	881	331	M (L)	Achieve
	*Upper Gorge**	151	VH (H)	*Support WA (H)*	235	84	VH (H)	Achieve
	Hood	1,127	M	Primary	2,079	952	L	Exceed
Gorge (Summer)								
	Hood	35	VH	Primary	2,008	1,973	L	Unlikely
CHUM								
Coast								
	Youngs Bay	E	VH	Stabilizing	TBD	---	VH	---
	Big Creek	E	VH	Stabilizing	TBD	---	VH	---
	Clatskanie	E	VH	Primary	TBD	---	L	---
	Scappoose	E	VH	Primary	TBD	---	L	---
Cascade								
	Clackamas	E	VH	Contributing	TBD	---	M	---
	Sandy	**E**	**VH**	**Primary**	**TB**	---	**L**	---
Gorge								
	*Lower Gorge**	E	VH (L)	*Support WA (VL)*	TBD	---	VL	---
	*Upper Gorge**	E	VH	*Support WA (M)*	TBD	---	M	---

Source: LCRCRP, ODFW 2010

Table 2.2.2c. Summary of the percent improvement required for each threat category in order to achieve the delisting desired status. Shared populations with Washington are indicated by an asterisk.

		% Improvement of Threats (Delisting Scenario)						
Species / Stratum (Run)	Population	Tributary Habitat	Estuary Habitat	Hydro	Harvest	Hatchery	Predation	Cumulative
COHO								
Coast								
	Youngs Bay	1.20%	22.33%	---	0.00%	0.00%	46.43%	0.02%
	Big Creek	0.94%	22.33%	---	0.00%	0.00%	46.43%	0.04%
	Clatskanie	18.04%	22.33%	---	28.57%	23.08%	33.33%	11.93%
	Scappoose	7.42%	22.33%	---	28.57%	0.00%	33.33%	6.26%
Cascade								
	Clackamas	0.00%	22.33%	24.05%	28.57%	71.43%	37.50%	10.18%
	Sandy	**37.11%**	**22.33%**	**100.00%**	**28.57%**	**0.00%**	**37.50%**	**22.54%**
Gorge								
	Lower Gorge *	33.47%	22.33%	---	28.57%	87.50%	37.50%	21.37%
	Upper Gorge/Hood	91.50%	22.33%	14.50%	85.71%	100.00%	31.51%	58.63%
CHINOOK								
Coast (Fall)								
	Youngs Bay	0.00%	19.25%	---	6.67%	0.00%	28.57%	0.85%
	Big Creek	27.54%	19.25%	---	7.69%	0.00%	28.57%	4.21%
	Clatskanie	20.26%	19.25%	---	41.67%	88.89%	23.08%	8.86%
	Scappoose	2.64%	19.25%	---	41.67%	88.89%	23.08%	7.12%
Cascade (Fall)								
	Clackamas	0.00%	19.25%	---	41.67%	66.67%	17.81%	4.51%
	Sandy	**31.15%**	**19.25%**	**100.00%**	**41.67%**	**66.67%**	**17.81%**	**14.55%**
Gorge (Fall)								
	Lower Gorge *	28.08%	19.25%	---	41.67%	33.33%	17.81%	10.76%
	Upper Gorge *	27.43%	19.25%	0.00%	38.46%	33.33%	23.08%	8.63%
	Hood	100.00%	100.00%	43.85%	100.00%	100.00%	100.00%	89.24%
Cascade (Late Fall)								
	Sandy	**27.86%**	**15.86%**	**100.00%**	**40.00%**	**80.00%**	**17.81%**	**25.15%**
Cascade (Spring)								
	Clackamas	34.73%	15.79%	76.47%	0.00%	84.62%	42.15%	26.64%
	Sandy	**0.94%**	**15.79%**	**100.00%**	**0.00%**	**81.48%**	**42.15%**	**1.97%**
Gorge (Spring)								
	Hood	8.84%	15.79%	65.62%	0.00%	88.89%	55.13%	7.92%
STEELHEAD								
Coast (Winter)								
	Youngs Bay	40.30%	15.79%	---	0.00%	50.00%	46.90%	28.42%
	Big Creek	55.73%	15.79%	---	0.00%	75.00%	46.90%	41.50%
	Clatskanie	32.02%	15.79%	---	0.00%	0.00%	40.17%	22.08%
	Scappoose	30.30%	15.79%	---	0.00%	0.00%	40.17%	21.03%
Cascade (Winter)								
	Clackamas	63.73%	15.79%	3.85%	0.00%	56.52%	42.15%	39.18%
	Sandy	**1.54%**	**15.79%**	**100.00%**	**0.00%**	**80.77%**	**42.15%**	**7.67%**
Gorge (Winter)								
	Lower Gorge *	33.02%	15.79%	---	0.00%	0.00%	42.15%	21.11%
	Upper Gorge *	40.25%	18.60%	0.00%	0.00%	0.00%	39.39%	17.60%
	Hood	0.00%	18.60%	55.31%	0.00%	66.67%	39.39%	35.34%
Gorge (Summer)								
	Hood	85.33%	18.60%	55.31%	0.00%	100.00%	45.58%	52.10%
CHUM								
Coast								
	Youngs Bay	---	---	---	---	---	---	---
	Big Creek	---	---	---	---	---	---	---
	Clatskanie	---	---	---	---	---	---	---
	Scappoose	---	---	---	---	---	---	---
Cascade								
	Clackamas	---	---	---	---	---	---	---
	Sandy	---	---	---	---	---	---	---
Gorge								
	*Lower Gorge**	---	---	---	---	---	---	---
	*Upper Gorge**	---	---	---	---	---	---	---

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

Analyses conducted in developing the LCRCRP estimated intrinsic productivity for several of the Sandy listed populations. The intrinsic productivity estimates for coho, winter steelhead, late fall Chinook and spring Chinook were 4.825, 1.687, 10.437 and 2.577 respectively.

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

All adult Sandy River Chinook, coho, and steelhead were counted at Marmot Dam until it was removed in 2007. Spring Chinook were not 100% marked until the 1997 brood year (2000-2002 return years). Prior to 2002, adults trapped and sorted at Marmot Dam could not be distinguished due to lack of mark on brood years prior to 1997. A small percentage of 6 year old adults (<3%) from the 1996 brood year could have returned as unmarked hatchery fish in 2002 and were inadvertently passed into the primary spawning habitats in the upper Sandy and Salmon rivers. Counts at Marmot Dam since 1992 are provided in Table 2.2.2d.

Table 2.2.2(d). Total numbers of salmon and steelhead counted at Marmot Dam (Sandy River), 1992-2007, and estimated from spawning ground surveys (2008-2012).

Run	Spring Chinook[a/]		Coho [a/]		Winter Steelhead [a/]		Summer Steelhead [a/]	
Year	Total [c/]	Wild [b/]	Total [c/]	Wild [b/]	Total[c/]	Wild[b/]	Total [c/]	No Mark
1992	4,451	1,255	790	790	2,916	2,563	2,914	
1993	3,429	967	193	193	1,636	1,438	1,865	
1994	2,309	653	601	601	1,567	1,377	1,979	
1995	1,503	418	697	697	1,680	1,477	1,313	
1996	2,561	697	179	179	1,287	1,131	1,164	
1997	3,301	935	116	116	1,426	1,253	1,859	
1998	2,612	700	261	261	745	655	837	
1999	2,032	581	162	162	928	928	681	20
2000	1,986	564	742	730	784	741	173	110
2001	2,445	988	1,176	1,176	974	902	723	262
2002	1,262	1,035	367	367	1,529	1,031	544	473
2003	1,197	1,053	1,348	1,348	692	671	278	230
2004	2,698	2,294	1,209	1,209	877	869	403	343
2005	1,653	1,405	856	856	632	626	148	128
2006	1,349	1,209	923	923	651	643	126	107
2007	1,410	1,304	753	687	858	845	162	138
2008	4,965	2,721	1,277	1,277	n/a	n/a	n/a	n/a
2009	1,821	856	1,667	1,493	n/a	n/a	n/a	n/a
2010	6,076	1,391	1,029	901	2,096	1,498	n/a	n/a
2011	3,434	1,150	3,813	3,494	681	681	n/a	n/a
2012	4,024	3,070	1,198	1,165	508	508	n/a	n/a
2013	n/a	n/a	n/a	n/a	3,747	3,509	n/a	n/a

[a/] Spring Chinook were not 100% marked until the 1997 brood year (2002 -2005 adult return years). Coho were not mass marked until the 1996 brood year (1999-2000 adult returns). Summer and winter steelhead have been 100% marked since 1996.
[b/] 1992-1998 estimate of wild fish from LCRCRP (ODFW 2010). Wild fish count prior to 2008 does not include unmarked fish found below the former Marmot Dam.
[c/] Hatchery fish identified by adipose fin-clip were removed from the system beginning in 1998. Count corrected for estimated proportion of unmarked hatchery fish found upstream of the former Marmot Dam. Data from 1999-2007 are from ODFW-Marmot Dam counts.
Marmot Dam data prior to 1999 obtained from Doug Cramer-PGE

The ODFW-Corvallis Research Lab has surveyed the Sandy River basin above Marmot Dam (removed in 2007) from September–October to recover carcasses and count redds since 2002 (Schroeder et al. 2002-07). Peak spawning generally occurred in early to mid-October. Tables 2.2.2e and 2.2.2f below provide spawning survey data for 2012 (with comparisons to 2002-2011). All data in Table 2.2.2(e-k) are from Schroeder et al. (2013) and personal communication with R.K. Schroeder, July, 2013)

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Table 2.2.2(e). Estimated number of spring Chinook salmon spawners of wild and hatchery origin in the upper Sandy River Basin, 2002–2012. Spawner number was estimated by redds and 2.5 spawners per redd. Origin was estimated from presence or absence of adipose fin clips in recovered carcasses and from presence or absence of induced thermal marks in otoliths of carcasses without an adipose fin clip. Totals may not match those in Table 2.2.2(f) because of rounding.

Basin	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Wild											
Salmon	409	268	1,482	626	586	416	988	415	541	453	1,171
Zigzag	164	115	414	260	369	170	688	242	390	382	840
Tributaries[a]	6	18	50	18	21	15	27	16	0	2	34
Hatchery											
Salmon	66	50	18	104	41	62	754	183	1,594	760[b]	254[c]
Zigzag	31	15	39	67	44	0	784	383	1,470	573[b]	225[c]
Tributaries[a]	9	0	0	9	7	15	43	10	25	103	139

[a] *Lost, Clear Fork, and Clear creeks.*
[b] *Does not include trapped or netted fish removed in the Salmon (273) and Zigzag (183) rivers.*
[c] *Does not include trapped fish removed in the Salmon (247) and Zigzag (188) rivers.*

Table 2.2.2(f). Estimated number of wild and hatchery spring Chinook salmon in the upper Sandy River Basin (upstream of Marmot Dam site), 2002–2012. Origin of fish was based on recovery of carcasses and presence or absence of an adipose fin clip, and presence of absence of induced thermal marks in fish without a fin clip or with unknown fin clip status.

	Marmot Dam[a]		Redd Counts[b]	
Return year	Wild	Hatchery	Wild	Hatchery
2002	919	201	580	105
2003	871	125	400	65
2004	2,416	88	1,946	57
2005	1,335	250	905	180
2006	1,070	114	976	92
2007	1,302	108	601	77
2008	2,721	2,244	1,703	1,582
2009	856	965	672	576
2010	1,391	4,685	930	3,090
2011	1,150	2,284	836	1,436
2012	3,070	954	2,045	618

[a] *Dam counts through 2007. Estimated from relationship of redds to counts or fish/redd to counts* (see Methods, Schroeder, et al.(2013)).

[b] *Estimated redd counts and 2.5 fish per redd* (see Methods, Schroeder, et al.(2013)).

Table 2.2.2(g). Redd counts and red density (redds/mi) of spring Chinook salmon in the upper Sandy River Basin, 2002-2012.

Basin, section	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
						Redds					
Salmon River:											
Final Falls–Forest Rd 2618	53	60	233	84	139	79	395	139	387	173	314
Forest Rd 2618– ArrahWanna–mouth	68	29	188	62	45	54	181	61	299	151	89
	69	38	179	146	67	58	121	39	168	161	167
Zigzag River:											
Still Creek	62	28	108	79	117	28	405	162	550	152	291
Above Still Creek & Camp	11	5	25	21	12	13	75	52	135	108	55
Still Creek–mouth	5	19	48	31	36	27	109	36	59	122	80
Other streams:											
Lost Creek	6	7	20	11	9	9	27	9	5	32	45
Clear Fork Creek	0		0				1	1	2	10	24
Clear Creek	0	0	0	0	2	3	0	0	3		
TOTAL	**274**	**186**	**801**	**434**	**427**	**271**	**1,314**	**499**	**1,608**	**909**	**1,065**
						Redds/mi					
Salmon River:											
Final Falls–Forest Rd 2618	16.6	17.8	69.1	26.3	43.4	24.7	117.2	43.4	114.8	54.1	93.2
Forest Rd 2618– ArrahWanna–mouth	12.6	3.9	25.4	11.5	8.3	10.0	33.5	8.2	40.4	20.4	12.0
	13.8	7.6	35.8	29.2	13.4	11.6	24.2	7.8	33.6	32.2	33.4
Zigzag River:											
Still Creek	18.8	5.6	32.7	15.8	35.5	8.5	81.0	32.4	109.2	30.4	58.2
Above Still Creek & Camp	2.8	1.3	6.3	5.3	3.0	3.3	41.7	8.8	22.9	18.3	9.3
Still Creek–mouth	2.3	8.6	21.8	14.1	16.4	12.3	49.5	16.4	26.8	55.5	36.4
Other streams:											
Lost Creek	3.0	3.5	10.0	5.5	4.5	4.5	13.5	4.5	2.5	16.0	22.5
Clear Fork Creek	0.0		0.0				1.7	1.7	3.3	16.7	40.0
Clear Creek	0.0	0.0	0.0	0.0	4.0	6.0	0.0	0.0	6.0		

Table 2.2.2(h). Percentage of spring Chinook salmon carcasses that were hatchery origin in six areas of the Sandy River Basin, 2012.

Basin	Area	Percent hatchery	N (sample size)
Salmon	Upstream of weir	12.1	516
	Downstream of weir	53.4	77
	Total	**19.7**	**593**
Zigzag	Upstream of weir	14.4	376
	Downstream of weir	56.1	99
	Total	**20.3**	**475**
Lost & Clear Fork creeks	All surveyed areas	78.8	105
Bull Run River	Dam–mouth	40.0	5

-Provide the most recent 12 year estimate of annual proportions of the direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

The natural spawning grounds in the upper Sandy Basin had been managed as a wild fish sanctuary since 1999; and no marked fish were intentionally passed above Marmot Dam prior to dam removal in 2007. Spring Chinook were not 100% marked until the 1997 brood year (2000-2002 return years). Prior to 2002, adults trapped and sorted at Marmot Dam could not be distinguished due to lack of mark on brood years prior to 1997 which led to an unknown number of hatchery fish inadvertently being passed into the primary spawning areas for spring Chinook in the upper Sandy and Salmon rivers. A small percentage of 6 year old adults (<3%) from the 1996 brood year could have returned as unmarked hatchery fish in 2002 and were inadvertently passed into the upper basin. However, ODFW has observed that varying numbers of hatchery fish spawn naturally in the lower mainstem Sandy River. No quantified data exist for the total number or proportion of hatchery and wild fish spawning naturally below Marmot Dam. ODFW staff estimate that more than 90% of the suitable spring Chinook habitat remaining in the Sandy Basin is upstream of the former Marmot Dam, with the vast majority of habitat being found in the Salmon and Still Creek/Zigzag rivers.

Estimates of the origin (i.e. hatchery or wild) of spring Chinook passed above Marmot Dam for the 1996-2007 run years were based on CWT/carcass recoveries, Marmot Dam observations, analysis of otolith microchemistry, and mark rates of hatchery releases into the Sandy River (ODFW 2012, ODFW 2003, and personal communication with R.K. Schroeder). Estimates in those years ranged from 8-73% hatchery fish (Table 2.2.2g). No estimate was available for 2001. Analysis of otolith microchemistry in 2002 estimated that 18% of the unclipped fish passed above Marmot Dam were of hatchery origin (Schroeder et al. 2003). In 2003, an estimated 12% of the unclipped fish passed above Marmot Dam were of hatchery origin (Personal Communication with R.K. Schroeder, ODFW) (Table 2.2.2f).

Table 2.2.2(j). Estimated proportion of hatchery spring Chinook in the natural spawning escapement, Sandy River 1996-2010.

Run Year	% Hatchery Fish	Run Year	% Hatchery Fish	Run Year	% Hatchery Fish
1996	72.8%	**2004**	15.0%	**2012**	23.7
1997	71.7%	**2005**	15.0%		
1998	73.2%	**2006**	10.4%		
1999	71.4%	**2007**	7.5%		
2000	71.6%	**2008**	45.2%		
2001	59.6%	**2009**	53.0%		
2002	18.0%	**2010**	77.1%		
2003	12.0%	**2011**	68.5		

Source: Appendix C, LCRCRP (ODFW 2010)
2002-2009 estimates based on otolith analysis of unclipped fish spawning above Marmot Dam (Schroeder et al. 2004, 2005, 2007, personal communication.
2010 est. based on clipped fish (76% of carcasses) and average % of unclipped hatchery origin fish (11%).

Table 2.2.2(k). Effect of trapping and removing fin-clipped spring Chinook salmon at weirs in the lower Zigzag and Salmon rivers on the proportion of hatchery spawners in the Salmon and Zigzag River basins and in the upper Sandy River Basin, 2012.

		Hatchery spawners (%)	
Basin	Number removed	With trapping	Without trapping
Salmon	247	19.7	42.4
Zigzag	188	20.3	43.1
Upper Sandy River-Total	435	23.7	44.3

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of 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.

The only hatchery activity that will result in direct take is collection of wild fish for broodstock. However, direct take will be limited to any wild adult male that may die prior to being spawned at Clackamas Hatchery or being transported back to the Sandy River after being spawned. We are not planning to incorporate wild females at this time. Spring Chinook broodstock are primarily collected at temporary weirs/traps in the Zigzag and Salmon rivers, the weir/trap at the mouth of the Bull Run River and, Sandy Hatchery (swim-in trap) when spring/early fall flows are suitable for adult spring Chinook migration and while adult spring Chinook continue to return to the facility. Few wild spring Chinook adults swim into the Sandy Hatchery trap. Collected wild adults are released promptly. See Section 7 for details.

Weir operations in the Upper Sandy and Bull Run rivers is not expected to result in significant indirect take as a result of stress, delay, or sorting operations. We have not encountered any direct mortalities as a result of trapping operations and pre-spawn mortality was lower than average in 2012 than the previous 4 years. These data indicate that weir/trap operations appear to have limited impact on naturally produced spring Chinook in the basin. Spawner surveys will continue to monitor the potential for an increase in pre-spawn mortality in addition to other potential impacts from weir operations. The risk of mortality is low as a result of measures ODFW staff employ to reduce stress or handling related injuries. These measures include: utilizing soft mesh dip nets, crowders for reducing trap size, covering all edges inside trap, cover trap with shade cloth, and operating 1-3x daily depending on passage of adult spring Chinook.

Incidental take of listed juvenile salmonids is not expected to occur through activities associated with acclimation, and release of hatchery spring Chinook at the Sandy Hatchery. There may be competition between hatchery reared smolts and naturally-produced smolts in the mainstem Sandy River, however these effects have not been quantified. Interactions between hatchery Chinook smolts and wild juveniles are minimized by release strategies which promote rapid emigration.

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

The collection of unmarked returning adults to establish the integrated broodstock began at Marmot Dam in 2002 and ended in 2006. Since 2007, hatchery fish returning to the facility or collected in upriver areas are incorporated into the broodstock. See Table 2.2.3(a) and 2.2.3(b) for data on spring Chinook brood collection from Marmot Dam (2002-07) and upper basin weir/trap (2008-10). See Table 2.2.3(c) for information relating to the number of wild fish collected for brood, mortalities, and percentage of total wild fish utilized for brood. The data are as follows:
Marmot Dam - Counts include adult spring Chinook only. No trap mortalities of wild/unclipped fish were reported. Wild/unclipped fish collected for brood were taken to Clackamas Hatchery for broodstock.

Table 2.2.3(a). Brood Collection at Marmot Fish Trap.

Return Year	Total	Wild/Unclipped	Collected for Brood[a/]
2002	4,326	1,262	204
2003	3,880	1,197	192
2004	5,285	2,699	195
2005	3,923	1,814	200
2006	2,452	1,383	184
2007	2,417	1,627	96

Source: Sandy Hatchery records
[a/] Number includes all fish collected. Fish not utilized for spawning were returned to the Sandy River upstream of the former Marmot Dam site.

Post-Marmot Dam –Hatchery component of brood collected at Sandy Hatchery or seine/tangle net in mainstem or upper basin tributary (Salmon River, Still Creek, Zigzag River). Wild component collected by seine/tangle net in mainstem or upper basin tributary. See Table 2.2.3b. for specific numbers of fish collected by site after the removal of Marmot Dam. Section 7.2 provides additional detail on location and operation of temporary weirs/traps for collection of wild spring Chinook post-Marmot removal.

Table 2.2.3(b). Brood Collection post-Marmot Dam removal.

	Sandy Hatchery			Upper Basin		
Run Year	Hatchery ChS	Hatchery ChS for brood	Wild ChS for brood	Hatchery ChS	Unmarked ChS	Total Collected for brood
2008	25	25	1	60	50	85H/51W
2009	72	72	8	89	51	161H/59W
2010	406	61	14	131	54	192H/68W
2011	8	8	0	285	0	293
2012	0	0	0	199	0	199

Source: Sandy Hatchery and North Willamette Fish District records

Table 2.2.3(c). Abundance of naturally produced Spring Chinook, percent wild collected and percent wild utilized (spawned) for broodstock 2002-10.

Run Year[a/]	Total CHS	Wild CHS	Wild brood collected	Wild for brood[b/]	% of wild spawned
2002	4,326	1,035	204	192 (48)	15.2%
2003	3,880	1,053	192	185(45)	15.5%
2004	5,285	2,294	195	164(20)	6.1%
2005	3,923	1,542	200	164(24)	9.0%
2006	2,452	1,239	184	159(17)	11.5%
2007	2,417	1,505	96	81(32)	5.0%
2008	4,965	2,721	51	47(7)	1.7%
2009	1,821	856	59	42(4)	6.0%
2010	6,181	1,330	68	53(11)	4.8%

Source: ODFW Corvallis Research, Sandy Hatchery records
[a/] 2002-07 counts from Marmot Dam, 2008-10 estimate from spawning surveys
[b/] Wild for brood number includes fish actually spawned or mortality (in parentheses) prior to spawning and does not include unspawned fish returned to the Sandy River.

Table 2.2.3(d). Number of spring Chinook salmon at traps in the Salmon and Zigzag rivers, 2011 and 2012. Fin-clipped fish were removed and unclipped fish were passed upstream. Traps were installed by ODFW District biologists to capture and remove fin-clipped salmon.

	Zigzag		Salmon	
	2011	2012	2011	2012
Dates	Aug 19–Sep 27	Jul 4–Oct 14	Sep 14–Oct 4	Jun 18–Oct 14
Fin-clipped	183	188	229[a/]	247
Not clipped	91	432	94	1,108
Mortalities	0	0	0	0

[a/] *An additional 44 clipped Chinook were netted and removed prior to the trap installation.*

- 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).

Annual take levels are not expected to exceed those outlined in the Take Authorization for broodstock collection activities (hook and line angling, weir/trap operation, seine/tangle net deployment in the upper Sandy and Salmon rivers), as relatively few wild fish enter the trap at the Sandy Hatchery on Cedar Creek. The take estimate below is for activities specifically associated with trapping, sorting, and collection of spring Chinook broodstock in the Sandy River

Monitoring and Evaluation Take Authorizations

Weir/Trap, hook and line

Species	Life Stage	Expected Encounter[d/]	Indirect Mortality	Direct Mortality
Steelhead	Adult	100[a/]	3	0
Chum Salmon	Adult	5	1	0
Bull Trout	Adult	5	1	0
Coho Salmon	Adult	200[a/b/c/]	5	0
Fall Chinook	Adult	250[a/]	1	0
Spring Chinook (broodstock)	Adult	4,250[a/b/c/]	40	0

Collection Locations:
[a/] LowerBull Run River weir/trap
[b/] Zigzag River weir/trap
[c/] Salmon River weir/trap
[d/] The expected encounter is associated with fish encountered during broodstock collection activities and weir/trap operation.

See Section 13, Attachment 2 for estimated annual take levels of listed salmonids from activities at Sandy Hatchery and Cedar Creek.

- 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.

ODFW will consult with NOAA Fisheries if projected take levels may be exceeded. If wild spring Chinook show up at the Sandy Hatchery, they will be captured and returned to the Sandy River to migrate upstream. If wild fall Chinook show up at Sandy Hatchery, they will be passed along with coho and winter steelhead since a small amount of natural spawning of late fall Chinook does occur in the lower reach of Cedar Creek below Sandy Fish Hatchery.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan or other regionally accepted policies. Explain any proposed deviations from the plan or policies.

~~7.~~ • *Fisheries Management and Evaluation Plan- Lower Columbia River Chinook in Oregon Freshwater Fisheries of the Lower Columbia River Tributaries Between the Pacific Ocean and Hood River* (ODFW, 2003).

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This document outlines the plans for selective fisheries for hatchery produced Chinook in tributaries of the lower Columbia River, and plans for evaluation of the effectiveness of the fishery regulations in protecting natural spawning populations. The Fishery Management and Evaluation Plan (FMEP) calls for a comprehensive monitoring and evaluation program assessing the catch of wild fish, the abundance of wild and hatchery fish, and angler compliance throughout the basin. The results of the monitoring program are to be assessed annually. Review of the FMEP occurred in 2005 after three years of the selective fishery (which began in 2003), and every five years thereafter.

- *Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead* (ODFW 2010)

The Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (LCRCRP) contains an assessment of the status of each native stock, and a description of the desired biological status relative to measurable biological attributes, a description of short and long term management strategies to address the primary limiting factors, short and long term monitoring and research needs, and a description of measurable "trigger" criteria which would indicate a change in status or a need to modify or expand recovery efforts.

- *Sandy River Basin Fish Management Plan* (ODFW, 1997) and *Sandy River Fish Management Plan Amendment* (ODFW, 2001).

The Sandy Basin Plan and Amendment provided direction for the management of fish populations to protect and enhance naturally spawning populations in the Sandy River Basin by identifying and addressing factors that impact those populations. The plans also restricted fisheries and changed management direction of spring Chinook in ways consistent with rebuilding wild populations. The measures outlined in the plans are designed to maintain viable populations in the Sandy River. These plans are now superseded by adoption of new Oregon Administrative Rules that were recently incorporated through completion of the LCRCRP

- *Native Fish Conservation Policy* (OAR 635-007-0502 through -0509), and
- *Fish Hatchery Management Policy* (OAR 635-007-0542 though 0548)

The policies outlined in these documents further refine the objectives of conservation of native fish stocks and limiting the impacts of hatchery produced fish on those native stocks. The Native Fish Conservation Policy (NFCP) defines ODFW's principle obligation for fish management as the conservation of naturally produced native fish in the geographic areas to which they are indigenous. The policy is based on the concept that locally adapted populations provide the best foundation for maintaining and restoring sustainable naturally-produced fish. The NFCP requires a conservation plan for each native stock (i.e. the LCRCRP). These conservation plans are to contain an assessment of the status of each native stock, and a description of the desired biological status relative to measurable biological attributes, a description of short and long term management strategies to address the primary limiting factors, short and long term monitoring and research needs, and a description of measurable "trigger" criteria which would indicate a change in status or a need to modify or expand recovery efforts.

The Fish Hatchery Management Policy (FHMP) compliments the NFCP in providing direction for the application of hatcheries as a fisheries management tool. The FHMP promotes the use of best management practices to ensure conservation of both naturally-produced native fish and hatchery-produced fish in Oregon. The policy requires a hatchery management plan for each program, and requires effective coordination planning be done cooperatively with other state, federal, and tribal management partners, as well as with university programs and the public. The policy provides general fish culture and facility guidelines and measures to maintain the genetic resources of native fish populations spawned or reared in captivity.

- *Fish Health Management Policy* (OAR 635-007-0960 to 635-007-1000)

This was developed to "minimize the impact of fish diseases on the state's fish resources." The policy applies to all forms of fish hatchery operations, including Salmon and Trout Enhancement (STEP) projects, and to all importation, transportation, release, and rearing of non-aquaria species within the state of Oregon. The goal is to inspect and detect disease agents in order to contain and treat them, and thus curtail potential impacts on existing fish populations.

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

- Sandy River Basin Fish Management Plan.
- Fisheries Management and Evaluation Plan- Lower Columbia River Chinook in Oregon Freshwater Fisheries of the Lower Columbia River Tributaries Between the Pacific Ocean and Hood River.
- Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead
- US vs. Canada Treaty.
- Native Fish Conservation Policy.
- Hatchery Management Policy.
- Fish Health Management Policy.

- Section 7 Biological Opinion and Incidental Take Statement for Sandy Hatchery Programs issued September, 28, 2012.
- Biological Opinion: Artificial Propagation in the Columbia River Basin -- Incidental Take of Listed Salmon and Steelhead from Federal and Non-Federal Hatchery Programs that Collect, Rear and Release Unlisted Fish Species (NMFS 1999).
- The Mitchell Act.
- Mitigation Agreement with City of Portland (for the Bull Run Project).
- NPDES permit for hatchery operations.

This HGMP is consistent with the above policies, plans, agreements and permits.

3.3) Relationship to harvest objectives.

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

This program is managed to provide spring Chinook salmon production to supplement harvest in ocean, Columbia River, and Sandy River commercial and sport fisheries to mitigate for lost salmon production related to habitat loss and degradation in the Sandy River Basin. Sandy Hatchery spring Chinook are an important contributor to west coast ocean fisheries, to lower Columbia River sport and commercial fisheries, and to the Sandy River sport fishery. Recovery of coded wire tagged fish indicate that the contribution to fisheries of Sandy Hatchery spring Chinook is highest in Alaskan and Canadian (West Coast Vancouver Island and North Central British Columbia) ocean commercial fisheries and Oregon freshwater sport fisheries.

Total fishery harvest estimates for Sandy Hatchery spring Chinook are listed in Table 3.3.1.

Table 3.3.1a. In-basin harvest of spring Chinook in the Sandy River below Marmot Dam, 1995-2011.

Return Year	Number Caught
1995	1,551
1996	1,749
1997	1,734
1998	1,406
1999	2,032
2000	1,524
2001	2,684
2002	2,579
2003	1,580
2004	4,436
2005	1,816
2006	892
2007	389
2008	861
2009	324
2010	788
2011	1,352

Source: ODFW Harvest Card data (2012 Harvest card data not available at time of update).

Table 3.3.1b. Harvest (Ocean, Columbia, Terminal) of Sandy Hatchery spring Chinook (Brood Years 1994-2004) by brood year.

Brood Year	Total Released	Estimated Harvest		
		Ocean	Columbia	Terminal
1994	421768	526	155	1,406
1995	429117	147	91	2,032
1996	358769	1405	205	1,524
1997	468301	498	331	2,684
1998	455584	2898	1408	2,579
1999	434084	1666	522	1,580
2000	290797	3146	569	4,436
2001	439548	2128	597	1,816
2002	281310	563	552	892
2003	319950	104	121	389
2004	295088	285	87	861
2005	258,971			324
2006	298,172			788
2007	271,683			1,352
2008	207,583			n/a

Source: Corvallis Research, NWWD

3.4) Relationship to habitat protection and recovery strategies.

The Sandy River basin is a complex, diverse, and essential river to protect and recover. The Bull Run River drainage is the water source for the City of Portland, which demands effective protection of water quality. This basin holds urban areas, agricultural areas, National Forest, a Wilderness Area, and its corridor in the lower basin is classified as a

Scenic River. The Sandy River Basin Fish Management Plan (ODFW, 1997) offers a thorough description of what the basin is, the uses that take place in it, and the habitat protective measures that are being employed by ODFW. The goal for habitat management is: "Protect, restore, and improve fish habitat throughout the basin to improve healthy native fish populations that provide ecological function and diversity to the Sandy watershed, and greatly benefit people in the region." This goal is supported by five Objectives:

Objective 1. Maintain and improve upstream and downstream passage for fish in the Sandy River basin at dams, water diversions, existing fishways, culverts, and where needed, at in-channel debris barriers.

Objective 2. Protect, enhance, and restore fish habitat in the Sandy River Basin.

Objective 3. Inventory stream and watershed status using current methods that assess factors that limit fish production in the Sandy basin.

Objective 4. Reduce artificial introductions of sediment into the Sandy River and basin tributaries.

Objective 5. Restore natural stream flows where possible, and protect existing stream flows and water quality from degradation associated with operation of dams, water diversions, effluents, mining, recreation and other in-stream activities.

The habitat goal and objectives outlined in the Sandy River Basin Fish Management Plan are consistent with what is outlined in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead. Specific habitat-related actions for the Sandy Basin can be found in Table 9-3 of the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead.

3.5) Ecological interactions.

(1) Species that could negatively impact the program include:

- Avian predators, such as great blue herons, Caspian terns, cormorants, and gulls.
- Mammalian predators such as river otters, harbor seals, or sea lions.
- Introduced fish species (American shad, walleye, smallmouth bass, and channel catfish).
- ~~7.~~ Native salmonids.
- Northern pikeminnow.
- Out-of-basin hatchery salmonid releases.
- Known or unknown aquatic non-indigenous animals and plants.

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The majority of the preceding species can be characterized as predators of juvenile salmonids, or competitors which may negatively affect Sandy Hatchery spring Chinook juvenile survival after release. Recent estimates of annual Caspian tern predation on salmonid smolts in the Columbia River estuary have been as high as about 25 million

(Roby et al. 1998). Caspian tern predation is highest on large smolts, such as steelhead or coho that spend 1-2 years rearing in freshwater; predation is lower on ocean-type salmonids such as fall Chinook and chum salmon that emigrate as sub-yearlings. Northern pikeminnow (*Ptychocheilus oregonensis*) have been estimated to annually consume millions of juvenile salmonids in the Lower Columbia River. Pikeminnow abundance in the Lower Columbia River mainstem is likely high; therefore pikeminnow effects may be significant. Walleye (*Sander vitreus*) and smallmouth bass (*Micropterus dolomieu*) have been estimated to consume substantial numbers of emigrating juvenile salmonids in some areas. However, in general their predation on salmonids in the lower Columbia River and the estuary is considered relatively low.

River otters (*Lutra canadensis*), Harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and California sea lions (*Zalophus californianus*) are present in the lower Columbia region and may represent a substantial natural predation source on juvenile and adult salmonids. These mammals are often attracted to concentrated fishing effort and can be troublesome to both sport and commercial fishers by taking hooked or net-caught fish before they can be landed.

American shad (*Alosa sapidissima*), as well as large native and out-of-basin hatchery salmonid releases represent potential sources of competition to juvenile Sandy Hatchery spring Chinook. Studies have found overlap in habitat use and diet items in juvenile American shad and both sub-yearling and yearling salmonids (McCabe et al. 1983). Similarly, the potential exists for large-scale hatchery releases of fry and fingerling Chinook salmon to affect the production capacity of estuaries (Lichatowich and McIntyre 1987). Thus, food availability may be negatively affected by the temporal and spatial overlap of juvenile salmonids from different locations (Bisbal and McConnaha 1998).

Aquatic non-indigenous species introductions in the lower Columbia River represent permanent alterations of the biological integrity of the ecosystem Several nonnative invertebrate species have expanded their populations dramatically since introduction, particularly the Asian bivalve, *Corbicula fluminea*, and the New Zealand mud snail, *Potamopyrgus antipodarum*.

(2) Species that could be negatively impacted by the program include:

- Lower Columbia River Chinook
- Lower Columbia River steelhead
- Lower Columbia River coho
- Columbia River chum
- Out-of-basin wild salmonids using the Columbia River estuary

Wild juvenile salmonids using the Columbia River may be affected by releases of Sandy Hatchery spring Chinook. However, the spring Chinook are released as full-term yearling smolts so they are expected to promptly out-migrate through the Sandy River and the lower Columbia River with a minimum of ecological interaction with other species.

Management efforts are taken to reduce the negative ecological interaction of hatchery fish on wild fish. Potential negative interactions that may occur are (a) genetic introgression, (b) competition, (c) disease transmission, and (d) predation. Although risks associated with this fish propagation program are not completely known, a brief

summary of the potential risks, and the activities taken to avoid, minimize, or monitor such risk is described below.

(a) Genetic Introgression - Genetic introgression may occur if hatchery adults spawn in the wild environment. This impact is minimized through the following actions:

~~9.~~ With few exceptions, all hatchery fish are marked and returning hatchery adults with visible fin clips will be sorted and removed from naturally produced upstream migrants to the extent possible by ODFW staff through sorting operations at a weir/trap located at the mouth of Cedar Creek, weirs/traps in select upper basin tributaries and in the lower Bull Run River. Beginning with the 2012 brood, all smolts released will receive an internal coded wire tag to facilitate identification of mismarked hatchery fish on spawning grounds and at weirs/traps throughout the basin.

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~~10.~~ An acclimation site has been developed in the lower Bull Run River to reduce potential for fish to stray upstream. This location was chosen because low flows in Cedar Creek during times when adult spring Chinook are present and migrating can prevent these fish from accessing the stream and returning to the hatchery. It is expected that smolts acclimated in the Bull Run River will effectively home to, and enter, this system when they return as adults due to the unique water source and greater summer/early fall flows. Returning hatchery adults will be removed from the Bull Run using a weir/trap system (implemented in 2013) preventing them from interacting with wild fish.

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Hatchery brood originate from local Sandy Spring Chinook and are currently taken across the adult return period to the extent possible in proportion to returns in order to limit selection for specific run timing. These measures should help limit the impacts of any hatchery fish which do happen to spawn in the wild. Early returning adults are not collected for brood due to relatively low survival found in fish collected and transferred prior to June 15. Opportunities to reduce risk of mortality in adults collected prior to June 15 will be investigated and could lead to changes to adult collections. We plan to re-initiate integration of wild adults in 2013 with approval of this HGMP. The addition of wild adults will help reduce the loss of genetic heterozygosity and ultimately domestication of the hatchery stock.
Since 2002 (2000 brood year), spring Chinook released from Sandy Hatchery were acclimated for a 2-3 week period prior to release. Acclimation allowed fish to imprint on Cedar Creek water and return to the Sandy Hatchery as adults. Beginning with the 2011 release, spring Chinook smolts will be acclimated in the Bull Run acclimation pond (lower Bull Run River) for approximately 3 weeks.

(b) Competition - Freshwater carrying capacity may be compromised if hatchery spring Chinook competitively displace wild fish in their natural rearing habitats. Although there are little data to substantiate whether competitive interactions are occurring in the Sandy basin, there is a chance that it may occur in lower river reaches. The following are several strategies ODFW uses to avoid (or minimize) risks associated with hatchery and wild spring Chinook competitive interactions and habitat carrying capacity concerns:

- Spring Chinook smolts are released at a size that supports swift emigration and little residualization. This should minimize spatial and temporal overlap, thereby reducing competition with wild juveniles for food and cover.

- The number of hatchery spring Chinook released from this program is considered "moderate in magnitude relative to other Columbia River production programs and is not expected to cause serious density dependent effects in the Sandy Basin or lower Columbia River reaches" (NMFS 1999).

(c) Disease Transmission – Because hatchery spring Chinook are reared at other hatchery facilities, but are acclimated, released, and return to the Sandy River basin, they are potentially a source of pathogen and disease transmission to wild fish populations. ODFW recognizes the importance and magnitude of fish disease and health, and hatchery spring Chinook are managed to minimize disease transmission to wild populations. To prevent introduction, spread, or amplification of fish pathogens, all hatchery activities are conducted in accordance with guidelines developed under ODFW Fish Health Management Policy, the Pacific Northwest Fish Health Protection Committee and according to protocols outlined by the Integrated Hatchery Operations Team (IHOT 1996). Further, ODFW Fish Pathologists, along with hatchery staff, regularly monitor fish health and conduct fish disease examinations. Monitoring efforts include virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation inspections.

(d) Predation - Hatchery spring Chinook released into nursery habitats may residualize within the sub-basin and directly prey on naturally produced salmon and steelhead fry. Due to their location, size, and time of emergence, newly emerged Chinook salmon fry and fingerlings are likely to be the most vulnerable to predation by hatchery released fish (NMFS 1999). However, direct predation by hatchery fish on naturally produced fish in migration corridors is believed to be low (NMFS 1999). In addition to direct predation, large groups of hatchery fish may attract alternate predators in rearing habitats and migration corridors, such as pinnepeds, birds, and other fish species.

(3) Species that could positively impact the program include: any hatchery or wild fish that dies or is deposited within the sub-basin for the purposes of stream enrichment. Collected hatchery-origin broodstock in excess of production needs may be distributed throughout the Sandy River in order to increase the nutrient supply. Decaying carcasses of salmonid species may contribute nutrients that increase productivity in the sub-basin.

(4) Species that may be positively impacted through the program include: any freshwater or marine species that depend on salmonids as a nutrient or food base. Pacific salmon carcasses are important for nutrient input back to freshwater streams (Cederholm et al. 1999). Many species are known to utilize juvenile and adult salmon as a nutrient food base (Groot and Margolis 1991; McNeil and Himsworth 1980). Declines in wild salmonid populations during the last few decades could have reduced overall ecosystem productivity. Hatchery production has the potential for playing a role in the population dynamics of predator-prey relationships and community ecology during low productivity and shifting climatic cycles.

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.

Sandy Hatchery - The water source for the Sandy Hatchery is Cedar Creek, a tributary to the Sandy River. Water rights total is 12,577 gpm. Water is supplied to the hatchery by gravity flow with a high flow of 8,000 gpm in March and a low flow of 1,800 gpm in July/August. Cedar Creek's average water temperature is 45°F during the rearing period. The hatchery intake on Cedar Creek is 100% screened throughout the year; and the screens are considered compliant with current NOAA Fisheries fish screening criteria. Water withdrawal is covered under Oregon water permit # 23300 (12/3/1954).

Table 4.1(a). Summary of Sandy Hatchery water temperature and water usage (averages).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	11,200	9,910	11,200	11,200	7,500	7,200	6,400	2,780	2,900	7,240	7,240	8,800
Temp	43.4	43.5	45	47.1	50.8	54.8	60.7	60.7	57.2	40.6	46.1	42.9

Bull Run Acclimation Pond- The water source for the Bull Run acclimation pond used in 2011 is the Bull Run River. Water (450-600 gpm) is supplied by a 7.5-10 hp. pump with intake screened to NMFS criteria (3/32" mesh w/spray wash cleaning system). The pond (10'9"-wide x 60'-long x 4'9"-high) is above ground and lined with 40 mil poly-vinyl line supported by galvanized steel panels and frames.

Clackamas Hatchery - The water source for the Clackamas Hatchery is the Clackamas River and a well. Water rights total is 44,354 gpm. Chinook are incubated and reared in 52°F well-water or with Clackamas River water that is pumped to the facility and treated with ultraviolet light (UV). River water intake is 100% screened with 3/16" mesh. Fish screens have been inspected (October 18, 2000) and were deemed non-compliant to current NOAA Fisheries fish screening criteria. ODFW is investigating alternatives to redesign this intake and water delivery system and will resolve the non-compliant screen issue as part of that project. River water withdrawal is covered under Oregon water permit numbers S49433 and S42105. Well water is withdrawn under permit number G8257. Discharge water is currently covered under NPDES individual permit number 102663.

Clackamas River water is limited by water quality (pathogens) during summer months. Exposing eggs, fry, and fingerlings to untreated river water may create a disease transmission concern. To avoid these problems, eyed-eggs are shipped to Oxbow Hatchery for final incubation and early rearing. Fingerlings from Oxbow are then transferred to Cascade Hatchery for further rearing. All fish from Cascade are then returned to Sandy Hatchery for rearing to smolt size.

Table 4.1(b). Summary of Clackamas Hatchery water temperature and water usage (averages).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	5,550	3,750	450	1,400	3,200	4,100	9,200	9,200	9,350	9,350	5,550	5,550
Temp	36	37	38	40	46	50	61	65	61	44	40	38

Source: Clackamas Hatchery Records

Oxbow Hatchery – The Oxbow Hatchery upper rearing ponds are supplied by gravity pipeline from a spring source located directly up from the ponds. The supply line is not screened to NMFS criteria due to the lack of presence of anadromous fish that could otherwise be drawn into the facility.

Table 4.1(a). Summary of Oxbow Hatchery water temperature and water usage (averages).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	2340	2689	2810	2520	2214	1916	1540	1133	800	585	617	1402
Temp	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0

Cascade Hatchery - Water rights for Cascade Hatchery total 20,205 gpm from Eagle Creek. All raceways are supplied with single-pass water. Water quality remains high throughout the year with problems only during flood events. Cascade Hatchery is currently under the NPDES permit with no effluent violations. Compliance with NMFS screening criteria needs to be addressed when funds are available. The water source meets IHOT guidelines (IHOT 1995).

Table 4.1(a). Summary of Cascade Hatchery water temperature and water usage (averages).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	9,381	9,695	8,435	9,050	7,005	9,127	9,553	10,132	7,617	9,631	9,407	9,258
Temp	40.4	39.3	39.5	41.9	45.7	50.3	57.4	59.7	54.8	48.7	44.4	40.5

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.

Sandy Hatchery - The intake system in Cedar Creek is 100% screened and compliant to NOAA Fisheries fish screening criteria. The City of Portland provided a significant portion of funding to upgrade screens in 2012 to current NMFS screening criteria and provide passage to naturally produced fish in Cedar Creek. Providing passage for wild winter steelhead and coho above the structure is identified as one of the highest priority hatchery reform measures in the entire lower Columbia River.

Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit. The permit is mandated by the EPA in accordance with the Clean Water Act, and regulated by the Oregon Department of Environmental Quality.

Clackamas Hatchery - The river intake system is 100% screened with 3/16th-inch wire mesh, rotating screens. The intake was inspected in October 2008 and was considered non-compliant to NOAA Fisheries fish screening criteria. Funding for design and replacement with a compliant intake system is partially secured in part through funding from Portland General Electric. Hatchery effluent is managed to comply with conditions

and water quality limits outlined in the existing NPDES permit. The permit is mandated by the EPA in accordance with the Clean Water Act, and regulated by the Oregon Department of Environmental Quality.

Oxbow Hatchery – The Oxbow Hatchery upper rearing ponds are supplied by gravity pipeline from a spring source located directly up from the ponds. The supply line is not screened to NMFS criteria due to the lack of presence of anadromous fish that could otherwise be drawn into the facility.

Cascade Hatchery - Water rights for Cascade Hatchery total 20,205 gpm from Eagle Creek. All raceways are supplied with single-pass water. Water quality remains high throughout the year with problems only during flood events. Cascade Hatchery is currently under the NPDES permit with no effluent violations. Compliance with NMFS screening criteria needs to be addressed when funds are available. The water source meets IHOT guidelines (IHOT 1995).

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock collection (both hatchery and wild adults) for this program occurs through a combination of operating temporary weirs/traps in the upper basin and Bull Run River in addition to volitional returns to an adult collection trap at Sandy Hatchery (Cedar Creek). If wild fish are incorporated into the broodstock they will be collected from upper basin weirs/traps due to the limited number of naturally produced adult spring Chinook returning to the Bull Run River.

All returning fish sorted at traps are handled individually in soft mesh dipnets, identified, sorted by gender, counted and held for future transfer to Clackamas Hatchery for spawning. Broodstock adults collected off-station at weirs/traps will be transported to Clackamas Hatchery using a portable tank (~300 gallon) equipped with supplemental oxygen. "Vidalife" will be mixed in with the tank's water to minimize stress. Fish health will be monitored throughout the summer to ensure that fish collected by all methods survive to be spawned in the fall.

See Section 7 for additional information of broodstock collection methods and protocols.

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

Sandy Hatchery – Adult spring Chinook captured for broodstock are transported to Clackamas Hatchery for spawning. Transportation occurs in a fish liberation truck utilizing a portable tank (~300 gallon) equipped with supplemental oxygen. "Pro-poly aqua" is mixed with the tank's water to minimize stress during transport. Normal transit time is approximately one hour.

Fish collected at weirs/traps located in the upper Sandy Basin, and in the lower Bull Run River may be transported from the trap to a fish liberation truck or Sandy Hatchery via a full-sized pickup truck equipped with ~250 gallon tank and supplemental oxygen, or smaller tanks equipped with supplemental oxygen and capable of handling 1-2 fish over short distances. All fish transported in the field via this method will be treated with "Vidalife" immediately upon placement into the fish liberation truck tank. These fish are then transported to Clackamas Hatchery as described previously.

Table 5.2(a). Sandy Hatchery Fish Transportation Equipment

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Normal Transit Time (minutes)
Tank Truck	350	Y	60 - 180
Portable Tank	250	Y	5-10
Portable Tank	10	Y	5-10

Clackamas Hatchery - Eyed eggs produced at Clackamas Hatchery are transported to Oxbow Hatchery in nylon bags covered with wet burlap. Smolts are transported to Sandy Hatchery using fish liberation trucks equipped with supplemental oxygen and aeration pumps.

Table 5.2(b). Clackamas Hatchery Fish Transportation Equipment

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Normal Transit Time (minutes)
Tank Truck	1,000	Y	60 - 180
Tank Truck	2,000	Y	60 - 180
Tank Truck	3,000	Y	60 - 180
Portable Tank	250	Y	60 - 180

Oxbow Hatchery –Cascade Hatchery transport vehicles will be used to transport fingerlings to Cascade Hatchery as Oxbow Hatchery does not have permanent fish liberation vehicles on-hand.

Cascade Hatchery - Cascade Hatchery fish transportation equipment consists of one 2,400-gallon tanker with supplemental oxygen and recirculation capabilities. In addition, the hatchery utilizes a 400-gallon portable unit for hauling small local loads or for on station movements. The hatchery uses one fish pump to load fish onto the tankers.

Table 5.2(d). Cascade Hatchery Fish Transportation Equipment

Equipment Type	Capacity (gallons)	Supplemental Oxygen (y/n)	Normal Transit Time (minutes)
Tank Truck	2,400	Y	Various
Portable Tank	400	Y	30

5.3) Broodstock holding and spawning facilities.

Clackamas Hatchery - All spring Chinook broodstock are held at Clackamas Hatchery in a 10'x 60' concrete holding pond with an average depth of 51" and approximate volume of 2,400 cubic feet. All adults are kept separate from other stocks and are spawned under a covered platform at the Clackamas Hatchery.

5.4) Incubation facilities.

Clackamas Hatchery - Eggs are incubated through the eyed-egg stage in vertical, Heath-style, incubator trays. Incubators can accommodate 17 stacks of 16 trays. Loading densities are approximately 8,000-10,000 eggs/tray. All water is pumped to a head tank, then distributed through the incubation trays and starting troughs via gravity flow. Water flow through each incubation tray is ~ 5 gpm.

Oxbow Hatchery - Eyed-eggs are received at the Oxbow Hatchery and incubated through hatching in vertical, Heath-style, incubator trays. Incubators can accommodate up to 26 stacks of 16 trays. Loading densities are approximately 4,000 eggs/tray. Flow through each incubation tray is fixed at 4 gpm.

5.5) Rearing facilities.

Oxbow Hatchery

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft^3)	Number Units	Total Volume (ft^3)	Construction Material
Oxbow							
Shallow Troughs	15.5	1.4	0.6	13	10	130	fiberglass
Deep Troughs	15.5	1.4	1.3	28	10	280	fiberglass
Canadian Troughs	16	2.5	1.5	49	2	98	fiberglass
Canadian Troughs	20	3.0	3.0	160	13	2,080	fiberglass
Raceways	80	20	3	4,695	12	56,340	concrete
Vertical Incubators					416		plastic
Vertical Incubators					272		plastic and fiberglass
Abatement Pond							concrete
Upper Herman Cr.							
Raceways	62	14	3	2,604	2	5,208	concrete
Rearing Ponds	200	50	6	46,900	2	93,800	asphalt
Lower Herman Cr.							
Raceways	100	36	3	10,800	3	32,400	concrete

Cascade Hatchery -

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft3)	Number Units	Total Volume (ft3)	Construction Material
Adult Holding Ponds				37,125	1		concrete
Raceways				2,880	30		concrete
Canadian Troughs					0		
Rearing Ponds	80	16	2.25		0		concrete

Sandy Hatchery -

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft3)	Number Units	Total Volume (ft3)	Construction Material
Adult Holding Pond	78	35	3	8,190	1	8,190	concrete
Incubation Troughs	14	1.4	1.17	223	24	552	concrete
Raceways	80	20	3.5	5,600	20	112,000	concrete

5.6) Acclimation/release facilities.

Off-Station Acclimation Pond - Starting with the 2012 release, 132,000 smolts will be acclimated in two groups for approximately 3 weeks each and released into the lower Bull Run River after late term rearing at Sandy Hatchery. Smolts are force-released into the Bull Run River from the acclimation pond after acclimation is complete.

The acclimation pond has been located at the former site of the PGE Bull Run Powerhouse (RM 1.5) on the left (south) bank of the river immediately adjacent to the powerhouse since 2011. The pond (10' wide x 60' long x 4'9" high) is an above-ground structure constructed of poly-vinyl lining with galvanized steel frame. The intake is screened with NMFS-compliant 3/32" mesh screening with a backwash cleaning system. The 6" intake pipeline carries water up to the pond (approximately 20-feet up from the river) and an 8" outfall pipeline falls back down to a deep pool adjacent to the intake.

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft3)	Number Units	Total Volume (ft3)	Construction Material
Rearing Ponds	60	10	4'9"	2,700	1	2,850	Poly-Vinyl

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

Sandy Hatchery – No significant fish mortalities have occurred at the Sandy Hatchery.

Clackamas Hatchery - Holding adult spring Chinook at Clackamas Hatchery can be difficult when water temperatures increase in summer months. In 2002, 36 adult pre-spawn mortalities occurred at Clackamas Hatchery. This mortality was caused by poor trapping facilities at Marmot Dam and by holding adults that entered the trap with serious abrasions and fungal infections. Marmot Dam has been removed so collections no longer occur at this site. Fish collected at the weirs/traps are rigorously observed, and "pro-poly aqua" is being used in the liberation tank to minimize stress during transport. Also in 2002, several lots (females) of the 413,116 green eggs taken at Clackamas Hatchery were discovered to have Bacterial Kidney Disease (BKD) and were destroyed.

Oxbow Hatchery – Due to age of the ponds Oxbow Hatchery did have significant loss in the past because of deterioration of joint sealant material. This has been repaired and is no longer an issue.

Cascade Hatchery - No significant fish mortalities have occurred at the Cascade Hatchery.

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.

Sandy Hatchery –Hatchery staff is on-call 24 hrs/day to address emergency or unexpected events. All ponds and head tanks are alarmed to notify hatchery staff if an equipment failure occurs. The acclimation pond is alarmed to notify hatchery staff if water supply is interrupted. Cedar Creek is the sole water source used during acclimation

and is gravity fed. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at Sandy Hatchery.
Bull Run Acclimation Pond – Sandy Hatchery and North Willamette Fish District staff is on-call 24 hrs/day to address emergency or unexpected events. The acclimation pond is alarmed to notify hatchery and district staff automatically via phone if the water supply is interrupted. A supplemental oxygen system activated by float alarm is in place in the event of intake/water delivery failure. The oxygen diffusers maintain dissolved oxygen at levels that will prevent potential loss related to intake failure. A propane generator capable of powering the intake pump is in place in case of power failure.

Clackamas Hatchery –Hatchery staff is on-call 24 hrs/day to address emergency or unexpected events. The hatchery uses well water and/or water filtration along with UV treatment to maintain proper fish health standards during incubation. All ponds and head tanks are alarmed to notify hatchery staff if an equipment failure occurs. Both water sources are hooked-up to back-up generators. River water is treated with UV light during incubation and to minimize disease transmission to hatchery reared fish. Monthly fish health monitoring is conducted by a fish health specialist to detect diseases at the early stage and provide prevention and control measures. Eyed eggs are transferred to Willamette Hatchery prior to the summer months to avoid exposure to pathogens and viruses present in the Clackamas River. The adult holding pond is locked at night and protected by a property guard to minimize disturbance to broodstock. The water supply is protected by flow alarms at intake(s), head box, and holding ponds. Netting installed in 2010 will significantly reduce loss related to avian predation which was estimated to range from 5-10% of fish in each asphalt pond. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at Clackamas Hatchery.

Oxbow Hatchery - The headbox supplying the rearing ponds is alarmed to notify hatchery staff if water supply is interrupted. Little Herman Creek is the sole water source used during rearing and is gravity fed. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT Hatchery staff is on-call 24 hrs/day to address emergency or unexpected events. All ponds and head tanks are alarmed to notify hatchery staff if an equipment failure occurs. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at Oxbow Hatchery.

Cascade Hatchery - Hatchery staff is on-call 24 hrs/day to respond to emergency or unexpected events. Eagle Creek is the hatchery's main water supply for rearing and incubation, with limited spring water for incubation and domestic use. Both sources are gravity fed and are of good quality. All ponds, incubation stacks, troughs, distribution boxes, and head tanks are alarmed to notify hatchery staff if an equipment failure occurs. Cascade hatchery has a back-up emergency pump capable of supplying 4,200 gpm to the facility in the event of an emergency. In addition, a back-up generator can be used if a power outage occurs. Monthly fish health monitoring is conducted by a fish health specialist to detect diseases at the early stage and provide prevention and control measures. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at Cascade Hatchery.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

The broodstock for the current Sandy Hatchery spring Chinook program originated entirely (100%) from un-marked adult "wild" spring Chinook captured at the Marmot Dam trap. Non-fin marked spring Chinook were assumed to be of wild origin and used in the foundation of this local Sandy Basin origin broodstock. Development of the localized broodstock began with the collection of wild adults in 2002. The first release of smolts produced from this local broodstock occurred in 2004. The current program uses hatchery-produced Sandy River spring Chinook returning to the Sandy basin. We plan to re-initiate integration of wild adults into the Sandy ChS hatchery program brood pending approval of this HGMP. The last releases of smolts from non-local Clackamas River stock adults into the Sandy River was in the spring of 2003 (2001 brood).

6.2) Supporting information.

6.2.1) History.

The broodstock for the current Sandy Hatchery spring Chinook program originated entirely (100%) from un-marked, "wild" adult spring Chinook captured at Marmot Dam. Wild broodstock collection at this site began in 2002, and ended in 2007 when the dam was removed. Non-fin marked spring Chinook were assumed to be of wild origin. The first release of smolts of the current program of local stock occurred in 2004. Prior to then, all hatchery spring Chinook released into the Sandy River were Clackamas stock. The last releases of smolts into the Sandy River from the Clackamas River stock was in 2003 (2001 brood).

6.2.2) Annual size.

The annual spring Chinook broodstock collection goal is 108 adults for the current program of 132,000 smolts released. The maximum number of adults that would be collected for the program if the total release was increased to 300,000 smolts would be 220 adults (42 of which could be wild fish if approved under this HGMP).

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

From 2002 to 2007, the hatchery broodstock was comprised of 100% wild fish (see table 2.2.3c). From 2008 to 2010, the goal was to incorporate 30% of the broodstock with wild spring Chinook. In 2011 and 2012 no wild fish were incorporated into the broodstock. Provided re-integrating the stock is approved under this HGMP, our goal will be to achieve a 20% rate of integration by removing of up to 22 wild adult males. This level of integration would constitute removal of 1.09% of the natural spawning population (based on the 10-year average of 1,645 wild adults). Up to 42 wild adults may be collected in the future if stray reduction measures prove to reduce pHOS to a rate that would allow release of up to 300,000 smolts.

ODFW is proposing to incorporate wild Sandy spring Chinook into the broodstock on an annual basis as long as the expected run of wild adult spring Chinook into the Sandy is greater than 650 fish. This is the run size expected to result in an effective population size of 500 fish (based on Waples (1990)). An effective population size of 500 has been widely accepted as the minimum population size to retain enough genetic variation in a population to maintain long-term adaptive potential (Allendorf et al. 1997, Williams et al. 2008), and was chosen as the minimum size at which we would mine wild fish for the hatchery broodstock.

The wild males will be live spawned and returned to natural spawning areas in the Sandy as soon as is feasible to potentially spawn with other females.

6.2.4) Genetic or ecological differences.

Due to the recent development of this broodstock from the wild spring Chinook population, the hatchery and wild populations are not thought to have diverged to any significant extent.

Despite descending from wild Sandy River spring Chinook, the hatchery population may exhibit slight ecological differences from the wild population. These differences will likely be due to the process of rearing in a hatchery environment.

6.2.5) Reasons for choosing.

The local Sandy River broodstock conversion was adopted as management direction by the Oregon Fish and Wildlife Commission in 2001 as part of the Sandy River Fish Management Plan Amendment (ODFW 2001) and is consistent with ODFW's Native Fish Conservation Policy and Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead as well as direction from NOAA Fisheries. This indigenous stock of spring Chinook was therefore chosen as brood source for this program.

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.

Until 2007, broodstock was comprised of 100% local wild Sandy River spring Chinook. Before the removal of Marmot Dam in 2007, wild fish entering the trap at Marmot Dam were selected for broodstock at random from throughout the entire run to avoid any timing and/or size bias. All other wild fish were immediately released above the dam. Thus, genetic and ecological effects to listed fish are intended to be minimal for this program. Between 2008 and 2010, a maximum of 30% of the broodstock was comprised of wild fish, and the remainder was taken from the hatchery-produced adults originated from Sandy River wild broodstock and collected at Sandy Hatchery or weirs/traps located throughout the Sandy Basin.

Currently, no wild adults are incorporated for brood stock, but if this updated HGMP is approved then wild adults will be incorporated at levels described in the Adaptive

Management Plan found in Appendix 1 of this HGMP. The number of wild adults (males) incorporated into the brood under the current production level of 132,000 smolts will be up to 22 depending on timing of collection and fish condition. No wild adults will be taken if the wild adult spring Chinook run into the Sandy is expected to be at or below 650 (the effective population size minimum). The potential for demographic impacts to the wild Sandy River spring Chinook population will be minimized by limiting the number of wild adults collected for broodstock to less than 2% of the naturally spawning population. Up to 42 wild adults may be collected in the future if stray reduction measures prove to reduce pHOS to a rate that would allow release of up to 300,000 smolts.

SECTION 7. BROODSTOCK COLLECTION

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

Adult spring Chinook will be collected and used for broodstock.

7.2) Collection or sampling design.

The goal of this program is to maintain an integrated localized broodstock. Hatchery-origin and natural-origin broodstock will be collected from weirs/traps located in the upper Sandy basin and Bull Run River. Additional hatchery origin broodstock may be collected at Sandy Hatchery while adults continue to return to the facility.

The goal for broodstock collection and management is to obtain broodstock from the entire temporal distribution of the run, and to avoid size bias by representing all size/age classes. Collection methods will be implemented to continue collection from the entire temporal distribution of the run and to avoid run size bias by representing all size/age classes. The potential for demographic impacts to the wild Sandy River spring Chinook population will be minimized by limiting the number of wild adults collected for broodstock to less than 2% of the naturally spawning population.

Upper Sandy River Weirs/Traps: Temporary weirs/traps that were first installed in 2011 are currently operating in the upper Sandy basin to collect broodstock and remove hatchery-origin fish from primary spring Chinook spawning habitats. The temporary weirs/traps are installed annually in June/early July and operated through at least the end of September. The traps are monitored at least daily, but more frequently during periods of high adult salmonid migration (late August/September). Surveys are periodically conducted immediately downstream of the traps to ensure the facilities are not significantly delaying the migration of native fish. Wild salmonids (all species) are promptly passed upstream of the trap sites, unless retained for broodstock. All hatchery-origin fish are removed from the system and transported to Clackamas Hatchery or possibly to Sandy Hatchery if surplus to broodstock needs (see Section 7.5). After collection, fish will be transported to Clackamas Hatchery using a portable tank (~300 gallon) equipped with supplemental oxygen. “Vidalife” will be mixed in with the tank’s water to minimize stress.

Bull Run Weir/Trap: ODFW has installed a weir/trap facility on the lower Bull Run River (see Section 1.5 for location information). Activities at this site include the collection of returning hatchery spring Chinook (for broodstock collection and reduction of potential strays), and sorting of wild and hatchery spring Chinook. The weir/trap will be installed annually in April or May (depending on arrival of spring Chinook adults) and will be operated through late September when adult coho arrive. The facility will be monitored at least daily, but more frequently during periods of high adult salmonid migration. Wild salmonids (all species) will be promptly passed upstream of the trap site. All hatchery fish will be transported to Clackamas Hatchery, or to Sandy Hatchery if surplus to broodstock needs (see Section 7.5). After collection, fish will be transported to Clackamas Hatchery using a portable tank (~300 gallon) equipped with supplemental oxygen. “Vidalife” will be mixed in with the tank’s water to minimize stress.

Sandy Hatchery: Broodstock collection at Sandy Hatchery occurs through volitional return. Spring Chinook adults swim up the fish ladder from Cedar Creek and into a pre-sort holding pool within the fish ladder or in the entrance pen of the adult holding pond. These returning fish are handled individually in soft mesh dipnets, identified, sorted by gender, counted and held for future transfer to Clackamas Hatchery for spawning. Broodstock collection will occur at Sandy Hatchery as long as hatchery adults continue to return to the facility.

Angling: Broodstock may also be collected by hook and line in the lower Sandy River, primarily downstream of Oxbow Park to Lewis & Clark State Park. Captured fish will be held in aerated, aluminum live-wells (44"-L x 12"-wide x 12"-tall) until collection at boat ramps or other areas designated by ODFW personnel. After collection, fish will be transported to Clackamas Hatchery using a portable tank (~300 gallon) equipped with supplemental oxygen. "Vidalife" will be mixed in with the tank's water to minimize stress.

7.3) Identity.

Naturally produced spring Chinook are identified by the presence of an intact adipose fin. All hatchery-origin spring Chinook smolts are fin clipped (adipose fin removed), otolith marked and coded-wire tagged so they can be distinguished as adults from wild spring Chinook. Spring Chinook with an adipose fin are also tested for CWTs. If no CWT is present then the spring Chinook are assumed to be wild.

7.4) Proposed number to be collected.

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

If integration is approved as part of this HGMP we would incorporate up to 22 wild adults . One option that will be evaluated would be to only utilize wild males that can be returned to the wild. This option would be used unless it is demonstrated through modeling and evaluation that female gametes are necessary for maintaining genetic heterozygosity of the hatchery and wild population. Up to 42 wild adults may be collected in the future if stray reduction measures prove to reduce pHOS to a rate that would allow release of up to 300,000 smolts.

See Attachment 1 for analysis of the proportion of natural origin fish (pNOB) that may be taken for brood based on estimated number of returning wild adults and program size. This analysis also includes a description of possible scenarios where production would be increased based on monitoring that indicates pHOS is below the target rate.

The brood population will be spawned at a 1:1 male to female spawning ratio. When unequal numbers of males and females are retained, the 1:1 spawning matrix shall be maintained.

7.4.2) Broodstock collection levels for the last twelve years or for the most recent years available.

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Data summarizing broodstock collection activities since the inception of the localized broodstock program in 2002 are presented in Table 7.4.2a, 7.4.2b, and 7.4.2c. The tables include information regarding the disposition of fish collected at Marmot Dam, Sandy Hatchery, or by seine/tangle net in the mainstem and upper Sandy Basin (i.e. number of fish collected by various methods, number of fish transferred to Clackamas Hatchery, actual number and sex of fish spawned, and number of fish returned to the river unspawned). The year 2002 was the first brood-year for this program. Prior to then, Clackamas River stock spring Chinook were collected and spawned at Clackamas Hatchery.

Table 7.4.2(a). Spring Chinook broodstock collected at the former Marmot Dam (2002-07), Sandy Hatchery, or by weir/trap, seine/tangle net, or hook and line (listed by method).

Return Year	Adults Collected at Marmot Dam	Adults Collected at Sandy Hatchery		Weir/Trap Seine/Tangle Net		Wild/unclipped adults transferred to Clackamas[a/]
	Wild/Unclipped	Hatchery	Wild/ Unclipped	Hatchery	Wild/ Unclipped	
2002	204	0	0	0	0	204
2003	192	143	0	0	0	192
2004	195	2848	102	0	0	195
2005	200	1726	71	0	0	200
2006	184	935	46	0	0	184
2007	101	3	0	0	0	96
2008	n/a	25	1	60	50	51
2009	n/a	72	18	67	51	59
2010	n/a	406	34	131	54	68
2011[b/]	n/a	152	0	141	0	0
2012	n/a	0	0	199	0	0

Source: Sandy Hatchery and North Willamette Watershed District records.

[a/] Wild/unclipped spring Chinook not transferred to Clackamas Hatchery were released at the former Marmot Dam site

[b/] The majority of fish collected in 2011 were from weir/trap. All fish collected in 2012 were from weir/trap.

Table 7.4.2(b). Proportion of wild fish taken for brood 2002-12.

Year	Total CHS	Wild CHS	Wild for brood	% of wild
2002	4,321	1,035	192	18.6%
2003	3,880	1,053	185	17.6%
2004	5,285	2,294	164	7.1%
2005	3,929	1,542	164	10.6%
2006	2,452	1,239	159	12.8%
2007	2,417	1,505	81	5.4%
2008	4,965	2,721	47	1.7%
2009	1,821	856	42	4.9%
2010	6,181	1,330	53	4.0%
2011	3,434	1,150	0	n/a
2012	4,024	3,070	0	n/a

Source: ODFW Corvallis Research, Sandy Hatchery records

Table 7.4.2(c). Spring Chinook broodstock spawned at Clackamas Hatchery for the Sandy Hatchery spring Chinook program (2002-2012).

Year[a/]	Females	Males	Jacks	Egg Take
2002	77	77		413,116
2003	70	70		394,506
2004	72	72		363,980
2005	70	70		377,240
2006	71	71		405,264
2007	79(20)	79(29)		409,967
2008	58(21)	58(19)		312,285
2009	72(29)	72(9)		397,735
2010	79(12)	79(30)		412,414
2011	82	82		394,774
2012	78	78		410,528

Source: Clackamas Hatchery records.

[a/] All brood spawned from 2002-07 were unmarked adult spring Chinook collected at former Marmot Dam

**Wild fish numbers from 2008-10 in parentheses

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

Table 7.5. Disposition of broodstock collected and transferred to Clackamas Hatchery for spawning:

Brood Year	Adults received		Mortalities		Spawned		Wild/unclipped ChS returned to Sandy River
	Hatchery	Wild	Hatchery	Wild	Hatchery	Wild	
2002		204		48		144	12
2003		192		45		140	7
2004		195		20		144	31
2005		200		24		140	36
2006		184		17		142	25
2007	174	96	32	32	109	49	15
2008	85	51	5	7	76	40	4
2009	161	59	5	4	106	38	17
2010	192	68	8	11	116	42	15
2011	293	0	61	n/a	164	n/a	n/a
2012	199	0	26	n/a	156	n/a	n/a

Source: Clackamas Hatchery records

Disposition of excess adult hatchery-origin fish will be carried out according to the mandates under the ODFW Fish Hatchery Management Policy. This includes, but is not limited to, supplying fish for tribal ceremonial and subsistence use, carcass sales to generate revenues to support hatchery programs, donations to charitable food share programs, and placement of carcasses in natural spawning and rearing areas.

7.6) Fish transportation and holding methods.

Information regarding the transportation of Sandy spring Chinook broodstock is presented in Section 5.2.

Information regarding broodstock holding facilities are presented in Sections 5.3 and 5.5.

7.7) Describe fish health maintenance and sanitation procedures applied.

See Section 9.1.6 for details regarding fish health monitoring, maintenance, and sanitation.

7.8) Disposition of carcasses.

Both spawned fish and excess fish that are to be disposed of are done so in accordance with ODFW policies and procedures and IHOT guidelines, which include freezing, rendering, or burying. Surplus adults of high quality may be sold or given to charitable food banks. Carcasses may also be utilized for stream nutrient enrichment (see Table 7.8 for past nutrient enrichment information).

Table 7.8. Nutrient Enrichment Projects in the Sandy River Basin (1997-2012).

Year	Stream	# of Carcass/Species	Miles Treated
1997	Still Creek	400 Coho	1.5
1998	Still Creek	400 Coho	1.5
1999	Still Creek	400 Coho	1.5
2000	Still Creek	396 Coho	1.5
2001	Salmon River	75 Chinook	13
	Sandy River	19 Chinook	2
	Camp Creek	1,213 Coho	5
	Clear Fork	1,212 Coho	5
	Clear Creek	1,212 Coho	5
2002	Salmon River	161 Chinook	13
	Sandy River	244 Coho	2
	Camp Creek	216 Chinook	5
		1,056 Coho	
	Clear Fork	1,300 Coho	5
	Clear Creek	1,381 Coho	5
	Lost Creek	244 Coho	2
2003	Camp Creek	815 Coho	3
	Clear Fork	1,400 Coho	4.5
	Clear Creek	470 Coho	1.5
2004	Lost Creek	250	1
	Clear Fork	2,914	3.75
	Camp Creek	1,949	3.5
2005	Lost Creek	750	2
	Clear Fork	3,250	3.75
	Camp Creek	2400	3
2006	Sandy River	6,269 coho	
2007	Sandy River	2,952 coho + 304 Chinook	
2008	Sandy River	4,657 coho + 212 Chinook	
2009	Sandy River	3,657 coho	
2010	Sandy River	6,512 coho + 379 Chinook	
	Cedar Creek	39 coho	
2011	Sandy River	3,095 coho	26
2012	Sandy River	2,217 coho	20

Source: HMIS record.

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.

None is expected due to standards being identified for when and if wild fish will be collected for broodstock. We will utilize run forecasting models, Bonneville Dam and Willamette Falls counts in addition to recent trends to predict the relative number of wild adults that may return to the Sandy Basin. The estimated number of wild adults will determine if wild fish will be incorporated into the brood. A minimum of 650 adults need to be forecast to return prior to removal of any wild adults.

Refer to Sections 6.3 and 3.5 of this document for a review of risk aversion measures that will be employed to minimize and reduce adverse genetic and ecological effects to listed natural populations that may occur as a result of broodstock collection.

SECTION 8. MATING

8.1) Selection method.

From the beginning of the current program, wild Sandy River spring Chinook of all sizes were collected randomly from throughout the temporal distribution of the run to avoid any timing and size bias. This method will be followed for hatchery origin adults into the future to select brood randomly from the entire run for mating.

8.2) Males.

All males are spawned at a 1:1 ratio with females.

8.3) Fertilization.

Spring Chinook adults will be selected and paired at random from the pooled brood population for spawning. Fish are spawned at a 1:1 (male-to-female) spawning ratio. If unequal numbers of males and females are collected throughout a season, equal mating ratios will be maintained. IHOT, PNFHPC, and state guidelines are followed during spawning. Disinfection procedures that prevent pathogen transmission between stocks of fish are implemented during spawning.

Under the current smolt production goal of 132,000, up to 22 male wild spring Chinook will be used to fertilize eggs from up to 22 hatchery females. Eggs fertilized using wild gametes will be kept in separate egg incubation trays from hatchery x hatchery matings that will make up the remainder of production.

8.4) Cryopreserved gametes.

No cryopreserved gametes are used in this program at this time.

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.

- Fish are selected and spawned randomly from the pooled broodstock population (while maintaining a 1:1 male-to-female spawning ratio).

- Broodstock in the pooled population are collected from the entire temporal distribution of the run, and represent all size/age classes.

- All females are sampled for BKD during spawning. Eggs from females that test positive will be destroyed. All brood are sampled for IHN. If there is no IHN present, continued rearing is authorized. If IHN is detected, eggs and fingerlings will be monitored to see if they contract the virus. If necessary, appropriate action will be taken as per recommendation of pathologist.

SECTION 9. INCUBATION AND REARING

~~10.1)~~9.1) **Incubation:**

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

The goal is to tray down 200,000 eggs to meet the production goal of 132,000 smolts. Egg incubation may shift to Sandy Hatchery in the future if there is sufficient spring water to effectively incubate the coho and spring Chinook production on station as opposed to being transferred to Clackamas Hatchery as is currently performed.

Table 9.1.1. Number of eggs taken, eyed eggs inventoried, and percent survival of spring Chinook for brood years 2002 – 2012.

Brood Year	Clackamas H.			Willamette H.	
	Egg Take	Eyed -egg Inventory	Green-egg to Eyed-egg Survival	Eyed-egg to Fry Survival	Fry to Fingerling Survival
2002	413,116	354,500	95.3%	97.7%	97.6%
2003	394,506	368,550	93.4%	98.4%	98.7%
2004	363,980	341,480	93.8%	98.8%	97.9%
2005	377,240	342,000	90.7%	97.5%	94.2%
2006	405,264	386,500	95.5%	99.0%	98.7%
2007	409,967	386,675	94.3%	99.4%	98.6%
2008	312,285	306,000	98.0%	92.6%	91.3%
2009	397,735	376,850	94.7%	97.7%	96.5%
2010	412,414	398,750	96.7%	n/a	n/a
2011	394,774	378,193	95.8%	96.3%	95.2%
2012	410,528	393,056	95.8%	97.4%	93.2%

Source: Clackamas and Willamette hatchery records. HMIS.

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

To maximize the effective population size of the hatchery population, more fish will be spawned than is necessary to meet production goals. This will require that only a portion of the eggs from each hatchery/hatchery mating be retained and reared. At the eyed egg stage, after the eggs have been shocked and dead eggs removed, equal proportions of each hatchery/hatchery mating will be retained for a total of 190,000 eggs. The remaining eggs from the hatchery/hatchery matings will be frozen and placed in a landfill.

All eggs from hatchery/wild matings will be retained and reared. There will be no surplus eggs that contain wild gametes.

To compensate for possible mortality at the hatchery, enough eggs are taken and fertilized to allow for up to 10% excess of the target smolt release goal. Eggs may be tested and culled for BKD and/or IHN throughout the incubation and rearing process. If

additional eggs are not needed, or if eggs are diseased, then they are destroyed by freezing and disposed of in a landfill according to IHOT guidelines.

9.1.3) Loading densities applied during incubation.

Clackamas Hatchery - Eggs are incubated through the eyed-egg stage in vertical, Heath-style, incubator trays. Incubators can accommodate 17 stacks of 16 trays. Loading densities are approximately 8,000-10,000 eggs/tray. All water is pumped to a head tank, then distributed through the incubation trays and starting troughs via gravity flow. Flow through each incubation tray is ~ 5 gpm. Individual matings using wild gamets are kept separate in individual trays. Two matings from hatchery x hatchery will be combined in single tray and kept separate from eggs using wild gametes to ensure only hatchery x hatchery crosses are culled to reduce production to 190,000 eyed eggs. Eggs from individual matings will be kept separate from each other to allow for BKD culling and to keep eggs fertlilized with wild gametes separate from eggs from hatchery parents.

Oxbow Hatchery - Eyed-eggs from Clackamas Hatchery are received at Oxbow Hatchery and incubated through hatching in vertical, Heath-style, incubator trays. Incubators can accommodate up to 26 stacks of 16 trays. Loading densities are approximately 4,000 eggs/tray. Flow through each incubation tray is fixed at 4 gpm.

9.1.4) Incubation conditions.

Clackamas Hatchery:

- Eggs are treated with formalin (to prevent fungus) from green egg through eyed-egg development. Treatments are administered every other day at 1,666 ppm, for 15 minutes.

- Water temperatures are monitored and recorded daily via thermograph. Well water averages 52°F. River water is coarsely filtered, treated with UV light, and ranges from 45-56°F. Temperatures may be reduced by 8°F to even-up development of different lots of eggs during early incubation.

- IHOT species-specific incubation recommendations are followed for water quality, flows, temperature, and incubator densities.

- Dissolved Oxygen is monitored weekly, and generally ranges from 9-10 ppm.

- After eye development (~550 T.U.), eggs are shocked, cleaned, counted, and shipped to Willamette Hatchery for further incubation and rearing.

Oxbow Hatchery:

- Eyed eggs received at Oxbow Hatchery are disinfected with iodophor upon arrival.

- Following eye-up stage, eggs are inventoried and dead or undeveloped eggs are removed and disposed of according to IHOT protocol.

- Water to the incubator trays is monitored for temperature with the use of a HOBO data logger seven days a week. The spring water is a constant 45oF.

- IHOT species-specific incubation recommendations are followed for water quality, flows, temperature, and incubator densities.

- Dissolved Oxygen is not routinely monitored. Loading densities are low enough to not cause problems with DO.

9.1.5) Ponding.

Oxbow Hatchery - Fry are ponded based on visual inspection of the amount of yolk remaining (80-90% utilized and contained within the body cavity), and on reaching a specified number of accumulated temperature units (about 1600-1700 T.U.) Fry are typically ponded in Mid-January with an average size at ponding of ~1400 fish/lb.

9.1.6) Fish health maintenance and monitoring.

ODFW has implemented both disease control and disease prevention programs at all of its facilities to achieve these objectives. These programs include the following standard elements:

Disease Control (Reactive)
- Perform necropsies of diseased and dead fish to diagnose the cause of loss.
- Prescribe appropriate treatments and remedies to disease. This includes recommending modifications in fish culture practices, when appropriate, to alleviate disease-contributing factors.
- Apply disease control policy as stated in the Oregon Administrative Rules which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
- Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)
- Routinely remove dead fish from each rearing container and notify ODFW Fish Pathology if losses due to mortality continue. Monthly mortality records are submitted to Fish Pathology from each hatchery.
- Routinely perform examinations of live fish to assess health status and detect problems before they progress to clinical disease or mortality.
- Implement disease preventative strategies in all aspects of fish culture to produce healthy and quality fish.
- Use a disease prevention policy that restricts the introduction of stocks into a facility.
- Use sanitation procedures that prevent introduction of pathogens into and/or within a facility.
- Conduct applied research on new and existing disease prevention techniques.
- Utilize pond management strategies to help optimize the quality of the aquatic environment and minimize fish stress that can be conducive to infectious and noninfectious diseases.

Health Monitoring

- Monthly health monitoring examinations of healthy and clinically diseased fish are conducted on each fish lot at the hatchery.
- All fish are given a health inspection no longer than 6 weeks before fish are released or transferred.
- Examinations for *Myxobolus cerebralis*, agent of whirling disease, are conducted annually.
- At spawning, samples of ovarian fluids and kidney/spleen/pyloric caeca from a minimum of 60 fish are examined for viral pathogens from each salmon lot. If pre-spawning mortality is above normal, necropsies are conducted on dead adult fish for bacteria, parasites and other causes of death.
- Whenever abnormal fish behavior is reported or observed, or mortality exceeds 0.1% per day over five consecutive days in any rearing container, the fish pathologist will examine the affected fish, make a diagnosis and recommend the appropriate remedial or preventative measures.
- Reporting and control of specific fish pathogens are conducted in accordance with the Fish Health Management Policy.

Fish and Egg Movements

- Movements of fish and eggs are conducted in accordance with the Fish Health Management Policy.

Therapeutic and Prophylactic Treatments

- Adult spring Chinook are injected with antibiotics for the control of bacterial diseases.
- At spawning, eggs are water-hardened in iodophor for disinfection.
- Juvenile fish are administered antibiotics orally as needed for the control of bacterial infections and for prevention of diseases.
- Only approved or permitted therapeutic agents are used for treatments.

Sanitation

- All eggs brought to the facility are surface-disinfected with iodophor.
- All equipment is disinfected with iodophor between uses with different fish/egg lots.
- Different lots of fish/eggs are physically segregated from each other by separate ponds, incubator units, and water supplies.
- Fish transport trucks are disinfected between the hauling of different fish lots.
- Spring Chinook juveniles are not held at Clackamas Hatchery from mid-September to early October to avoid potential exposure to IHN virus in the water supply.

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.

Clackamas and Oxbow Hatcheries:

It is unlikely that incubation processes will have adverse genetic effects on program fish. To minimize adverse ecological impacts, the following measures are taken:

- ODFW hatcheries are operated in compliance with ODFW's Fish Health Management Policy and the Integrated Hatchery Operations Team (IHOT) fish health guidelines.

- Disinfection procedures are implemented to ensure prevention of pathogen transmission between fish stocks.
- Eggs are incubated on well water or treated river water to prevent exposure to disease.
- Eggs are kept isolated by family group.
- Dead or culled eggs are discarded in a manner that prevents transmission of diseases to the natural water bodies.
- Water supplies and the power supply are tuned to alarmed system to notify hatchery personnel if a failure occurs. Water supplies are hooked to a back-up generator, in case of a power failure.
- Hatchery staff are available 24 hr/day, 7 days/week.

9.2) Rearing.

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

Table 9.2.1. Survival rates of spring Chinook by different life stages for brood years 2002-10.

Brood Year	Clackamas H.		Willamette H.		Marion Forks H.	Clackamas H.
	Egg Take	Green-egg to eyed-egg survival	Eyed-egg to fry survival	Fry to fingerling survival	Fingerling to fingerling survival	Fingerling to smolt survival
2002	413,116	95.3%	97.7%	97.6%	99.4%	99.7%
2003	394,506	93.4%	98.4%	98.7%	99.2%	99.7%
2004	363,980	93.8%	98.8%	97.9%	99.7%	99.8%
2005	377,240	90.7%	97.5%	94.2%	98.2%	99.3%
2006	405,264	95.5%	99.0%	98.7%	99.7%	99.9%
2007	409,967	94.3%	99.4%	98.6%	99.7%	99.9%
2008	312,285	98.0%	92.6%	91.3%	99.3%	99.9%
2009	397,735	94.7%	97.7%	96.5%	99.7%	99.6%
2010	412,414	96.7%	99.0%	99.5%	99.8%	99.9%
2011	374,774	95.8%	96.3%	95.2%	n/a	n/a
2012	410,528	95.8%	97.4%	93.2%	n/a	n/a

Source: Hatchery records, HMIS
**Sandy spring Chinook are now being incubated at Clackamas and Oxbow hatcheries then transferred to Cascade Hatchery for mid-term rearing then to Sandy Hatchery for late term rearing.

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

Oxbow Hatchery

~~1.~~ Density and loading levels differ by size of fish, size of pond, time of the year and water temperature.

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- Fingerling densities are calculated accordingly to IHOT loading densities for a 20' X 80' raceway.

- The juvenile rearing density and loading guidelines used at the facility are based on standardized agency guidelines, life-stage specific survival studies conducted at other facilities, and staff experience (e.g. trial and error).

- IHOT standards are followed for water quality, predator control measures, loading, and density.

Cascade Hatchery:

- IHOT standards are followed for: water quality, predator control to provide the necessary security for the cultured stock, loading and density.

- Program loading and density guidelines are lower than agency guidelines.

- Rearing densities are 0.9 lbs/cu. ft., and the loading criteria is 5.1 lbs/gpm. These values are equivalent to the hatchery goals.

Sandy Hatchery:

- Fish density information for spring Chinook reared at Sandy Hatchery from 2002-2013 are provided in Table 9.2.2b. Fish are no longer being reared at Sandy Hatchery after the 2013 release.

Bull Run Acclimation Pond:

- Fish density information for spring Chinook acclimated in the Bull Run acclimation pond prior to release is provided in Table 9.2.2c.

Table 9.2.2a. Fish rearing density at Clackamas Hatchery.

Year	lb/gpm	lb/ft^3
2000	6.9	0.48
2001	6.6	0.46
2002	4.9	0.34
2003	6.8	0.47
2004	8.0	0.44
2005	8.1	0.45
2006	6.1	0.37
2007	6.6	0.42
2008	4.7	0.38
2009	3.7	0.31
2010	4.9	0.30
2011	7.5	0.41
2012	6.8	0.72

IHOT standards are followed for water quality, predator control measures, loading, and density.

Table 9.2.2b. Fish rearing density at Sandy Hatchery

Year	lb/gpm	lb/ft^3
2000	NA	NA
2001	NA	NA
2002	7.37	2.76
2003	6.16	1.92
2004	7.54	2.11
2005	8.57	1.91
2006	6.03	1.69
2007	5.52	1.67
2008	5.38	1.68
2009	7.12	1.78
2010	5.61	1.75
2011	n/a	n/a
2012	6.44	2.06
2013	6.70	2.34

IHOT standards are followed for water quality, predator control measures, loading, and density..

Table 9.2.2c. Fish rearing density at Bull Run Acclimation Pond.

Year	lb/gpm	lb/ft^3
2011	8.3	1.20
2012	8.0	1.82
2013	13.1	2.99

IHOT standards are followed for water quality, predator control measures, loading, and density.

9.2.3) Fish rearing conditions.

In all the hatcheries, IHOT standards are followed for: water quality, alarm systems, predator control measures, loading and density. Settleable solids, unused feed, and waste are removed periodically to ensure proper cleanliness of rearing containers. The juvenile rearing density and loading guidelines used at the facilities are based on standardized agency guidelines, life stage specific survival studies conducted at other facilities, staff experience, and other criteria.

Cascade Hatchery – Fry are transferred from Oxbow Hatchery in June at 80 fpp. The fish are monitored for behavioral tendencies on a daily basis when mortality is removed and during feeding. Ponds are brushed weekly to remove settable solids and to ensure proper cleanliness of rearing containers. Temperature is monitored and recorded on a thermograph. Eagle Creek typically ranges between 35-65°F. Dissolved oxygen is at or near saturation incoming, and is usually at 8 ppm or greater leaving the ponds. Cascade hatchery doesn't experience difficulties with gas super-saturation in the source water.

Sandy Hatchery - Fingerlings returned from Cascade Hatchery are reared from 18 fish/lb to 10-12 fish/lb. All fish are reared on Cedar Creek water with temperatures ranging from 36-50^{o}F. During highest fish rearing densities, DO levels are monitored weekly and maintained at 6-9 ppm. Fish are reared in 80'-long x 20'-wide concrete raceway ponds with 4,500 gpm average flow. Pond monitoring is done daily. Pond mortalities are removed and recorded daily. Ponds are cleaned as necessary to maintain good fish health.

Bull Run Acclimation Pond – Smolts are transferred from Sandy Hatchery to the acclimation pond starting in late February at 10-12 fish/lb. Smolts are acclimated to Bull

Run River water for a 19-24 day period prior with water temperatures ranging from 36-50°F before being forced out no later than mid-May (target April 15). The pond (10'-wide x 60'-long x 4'9"-high) is above ground and constructed of poly-vinyl lining with galvanized steel frames. The intake is screened with NMFS compliant 3/32" mesh screening with backwash cleaning system.

Additional information regarding these facilities is provided in Section 5.

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

Oxbow Hatchery - Fish size is measured monthly as number of fish per pound. Data are recorded onto monthly ponded fish reports and entered into the ODFW Hatchery Management Information System (HMIS) database. Fish feed schedules are based upon fish size data. Length frequency data are only collected at the time of release/transport.

Typical fish growth (biomass increase) at Oxbow Hatchery is as follows:

Month	# of fish/lb	Life Stage
January	1,275	Fry
February	900	Fry
March	500	Fry
April	250-200	Fry

Cascade Hatchery - Fish size is measured monthly as number of fish per pound. Data are recorded onto monthly ponded fish reports and entered into the ODFW HMIS database. Fish feed schedules are based upon fish size data. Length frequency data are only collected at the time of release/transport. Typical fish growth or biomass increase is as follows:

Month	# of fish/lb (Spring Release)	Life Stage
April	n/a	
May	n/a	
June	n/a	
July	80	Pre-smolt
August	36	Pre-smolt
September	23	Pre-smolt
October	16	Pre-smolt

Clackamas Hatchery - Fish size is measured monthly as fish per pound. Data are recorded onto monthly ponded fish reports and entered into the ODFW HMIS database. Fish feed schedules are based upon fish size data. Length frequency data are only collected at the time of release/transport. Typical fish growth (biomass increase) is as follows:

Month	# of fish/lb (Spring Release)	Life Stage
October	20.1	Yearling

November	15.2	Yearling
December	13.7	Yearling
January	12.5	Yearling
February	11.1	Yearling/Pre-smolt
March-April	9.8	Yearling/Smolt

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

See Section 9.2.4 for growth rate information. Energy reserve data is unavailable.

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*).

Oxbow Hatchery - All fish are started on Bio Vita Starter and Bio-Clark's Fry feed and are fed a scheduled amount which can take up to 6 to 10 times a day to feed out.

Food Type	Daily Application	Range for Use (fish/lb)
#0 BioVita Starter	6-10	3000-500
#1 BioVita Starter	6-10	500-300
#2 BioVita Starter	6-10	300-150

Cascade Hatchery – All fish are fed Bio-Oregon dry feed five consecutive days per week according to schedule.

Food Type/ Size (mm)	Daily Application	Range for Use (fish/lb)
2.0 BioClark's Fry	1-2	60-25
2.5 BioClark's Fry	1-2	25-11

Clackamas Hatchery - All fish are fed Bio-Oregon dry feed 3 to 4 times daily on a demand basis.

Food Type/ Size (mm)	Range for Use (fish/lb)
2.0 BioClark's Fry	60-25
2.5 BioClark's Fry	25-11

Bull Run Acclimation Pond - All fish are fed Bio-Clarks dry feed 2 times daily on a demand basis.

Food Type/ Size (mm)	Range for Use (fish/lb)
2.5/3.0 mm Bio Clarks Feed	10-15 F/LB

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

All Hatcheries- Fish health is monitored daily by hatchery staff and on a monthly basis by an ODFW fish health specialist. If any problems arise appropriate actions, including drug or chemical treatments, are applied as per prescriptions. ODFW's Fish Health Management Policy and IHOT fish health guidelines are followed to prevent disease transmission between lots of fish on site or transmission or amplification to or within the

watershed. See Section 9.1.6 for details regarding fish health monitoring, sanitation, and treatment.

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

The migratory state of the release population is determined by age, size, behavior, physical appearance, and other criteria. Weight samples of the fish are taken monthly to ensure proper growth rate. See Section 9.2.4 for fish growth data. No ATPase activity studies are conducted.

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

Bull Run Acclimation Pond – All smolts released from the Bull Run acclimation pond will be acclimated for approximately 3 weeks prior to release from the pond. Release timing coincides with outmigration timing of naturally produced spring Chinook in the basin with smolts expected to swiftly migrate downstream limiting the potential competitive interactions with wild juveniles. These basin-specific environmental cues, along with pre-migration imprinting are believed to encourage adult homing to release areas. Fish are volitionally released from the pond at the end of the acclimation period.

Oxbow, Cascade & Sandy Hatcheries - "Natural" rearing is only obtained through rearing at ambient water temperature.

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.

Smolts shall be released at a size and at locations which will expedite outmigration and minimize interaction with listed juvenile spring Chinook. ODFW's Fish Health Management Policy, PNFHPC, and IHOT fish health guidelines are followed to prevent transmission of disease between lots of fish on site or transmission or amplification to or within the program watersheds.

Re-integration of the hatchery stock will help reduce the potential for domestication and loss of genetic heterozygosity in the hatchery population. Efforts to reduce the proportion of hatchery spring Chinook found on the spawning grounds may still leave a limited number of fish to stray and end up in the natural spawning habitat in the upper basin. The effort to re-integrate the program will help reduce the risk of the hatchery population impacting the natural population through matings that could possibly lead to low levels of inbreeding depression and loss of fitness in wild spring Chinook

SECTION 10. RELEASE

10.1) Proposed fish release levels.

Age Class	Target release #	Size (fpp)	Target Release Date	Location
Eggs				
Unfed Fry				
Fry				
Pre smolts				
Smolts	132,000[a/]	9-11	March 15-May 15	Bull Run River acclimation site

[a/] The target release number is 132,000 smolts. The maximum number released is 145,200 based on the IHOT criteria of plus or minus 10% of target release number. The number of fish released may increase in the future up to 300,000 smolts if monitoring determines that stray reduction measures are successful at reducing pHOS on the natural spawning grounds in the upper Sandy Basin.

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

All smolts produced for the Sandy spring Chinook program will be released in the Bull Run River. All smolts are acclimated for approximately 3 weeks prior to release. The Bull Run River acclimation pond was established to limit proportion of hatchery fish so that the proportion does not exceed the standard established in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010).

Stream, river, or watercourse: Cedar Creek (waterbody code = 0300304000)
Release point: RM 0.75 (Sandy Hatchery)
Major watershed: Sandy River
Basin or Region: Columbia River
**Former release location for Sandy spring Chinook (2003-2010)

Stream, river, or watercourse: Bull Run River (waterbody code = 0300310000)
Release point: RM 1.5
Major watershed: Sandy River
Basin or Region: Columbia River

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

The first releases for the current Sandy River stock occurred in the spring of 2004. Release numbers from 1992-2003 (Table 10.3) are for the previous Clackamas River stock released in the Sandy River Basin. Past release sites included Sandy Hatchery, Marmot Dam, Salmon River, and several mainstem sites (Dodge and Oxbow Parks, Marsh and Kubitz Roads, and Brightwood and Sleepy Hollow Bridges).

Table 10.3. Number and size of hatchery spring Chinook smolts released into the Sandy River during 1992-2013.

Release Date	Brood Year	Number Released	Total Released	# of fish per Pound
3/10/92	1990	459,829	459,829	8.9
3/16/93	1991	471,445	471,445	13.6
3/22/94	1992	484,542	484,542	12.3
3/15/95	1993	459,578	459,578	10.0
3/15/96	1994	421,768	421,768	9.3
3/20/97	1995	429,117	429,117	10.6
3/18/98	1996	452,715	452,715	10.2
3/16/99	1997	468,486	468,486	10.5
3/14/00	1998	455,584	455,584	9.8
3/14/01	1999	434,103	434,103	10.7
3/19/02	2000	458,885	458,885	12.7
3/17/03	2001	439,546	439,546	9.6
3/9/04	2002	282,310	282,310	9.3
3/8/05	2003	319,968	319,968	9.1
2/27/06	2004	149,250	295,089	12.5
3/28/06	2004	145,839		9.7
2/26/07	2005	136,629	258,571	10.2
3/14/07	2005	121,942		8.8
2/26/08	2006	160,072	298,172	12.5
3/13/08	2006	138,100		10.3
3/17/09	2007	271,683	271,683	13.6
3/9/10	2008	207,583	207,583	13.2
3/17/11	2009	244,352	289,962	13.2
4/11/11	2009	45,610		9.8
3/20/12	2010	50,146	97,546[a/]	13.0
4/11/12	2010	47,400		11.9
3/21/12	2010	149,042	149,042[b/]	13.6
2/26/13	2011	65,952	131,699[a/]	12.04
3/26/13	2011	65,747		10.7

Source: Sandy Hatchery records
[a/] Release from Bull Run acclimation pond
[b/] Release from Sandy Hatchery

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

Smolt releases are targeted for March and April (see Table 10.3 above for actual release dates). Smolts at off-station acclimation ponds (e.g. the Bull Run acclimation pond) are force released after the conclusion on the acclimation period. The release occurs by removing the standpipe from the pond to cause the water level in the pond to drop. A crowder is used to move the smolts toward the water outlet pipe for release

10.5) Fish transportation procedures, if applicable.

Fish are transported to the Bull Run acclimation pond from Sandy Hatchery for final acclimation and release (see Section 5.2 for details regarding transportation). Any smolts not directly released from acclimation ponds would be transported to the release location in 1000, 2000, or 3000 gallon liberation trucks complete with insulation, aeration, and additional oxygen supply.

10.6) Acclimation procedures.

Prior to the 2002 release, the majority of spring Chinook were direct released into the Sandy River at Marsh Road with no acclimation prior to release. Starting with the 2003 release, approximately 200,000 spring Chinook were acclimated at Sandy Hatchery for approximately 3 weeks prior to being volitionally released along with the remaining 100,000 spring Chinook production.

Beginning in 2006, all 300,000 smolts released for this program were acclimated for a minimum 2-3 week period at Sandy Hatchery. Smolts are acclimated in two groups starting in early March. Smolts are volitionally released from the acclimation ponds after the minimum 2-3 week acclimation period. Any fish not volitionally exiting the acclimation ponds after the acclimation period are forced out.

Beginning in the spring of 2012 all (132,000) smolts will be released from the Bull Run acclimation pond after a three week acclimation period. Spring Chinook juveniles are transferred from Sandy Hatchery to the Bull Run pond in late February/early March. The maximum number of smolts that can be reared at one time in the Bull Run pond is approximately 67,000 smolts. This leads to two groups being acclimated with the second group beginning acclimation immediately after the first group is released after approximately 3 weeks of acclimation. After acclimation is complete (late April), smolts are force-released from the pond as volitional release is not feasible from an above ground pond (see Section 10.4).

The spring Chinook release process at Sandy Hatchery (after acclimation in raceways) would be as follows *(**if smolts are ever to be released from Sandy Hatchery in the future*). Smolts are transferred from the raceways to the adult holding pond and allowed to recover for approximately 24 hours prior to release. The fish are then released from the adult holding pond by removing screens and partially lowering the water level in the pond to facilitate a gradual release and dispersed downstream migration of smolts. Fish are allowed to volitionally migrate from the pond for a 24 hour period. After 24 hours water levels in the pond are gradually dropped further to promote migration. After approximately 48 hours, water levels are dropped fully and any remaining fish are transported into Cedar Creek.

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

Sandy Hatchery spring Chinook smolts are fin marked (adipose fin-clip) to differentiate between natural and hatchery-origin fish. Mean detectable mark is ~97%. All smolts

released also receive an internal otolith mark that allows for identification of mis-marked hatchery reared fish. Beginning with brood year 2012, all spring Chinook smolts released in the Sandy Basin will also receive an internal coded wire tag (CWT).

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

Surpluses are reduced to target production levels before smolts are transferred to Sandy Hatchery for acclimation and release. Under current policy, surplus juveniles (in excess of 145,200 smolts) are either destroyed and disposed of per IHOT protocol or released into a closed water system where they will not interact with wild fish. Broodstock collection and egg-take targets will be reviewed periodically to evaluate consistency with producing the target smolt release numbers to avoid surplus production.

10.9) Fish health certification procedures applied pre-release.

ODFW Fish Pathology staff performs fish health inspections prior to smolt release. Results are reported on the ODFW fish health forms. All fish are examined to detect the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines, within 3 weeks prior to release. Fish transfers into the Sandy basin are inspected and accompanied by notifications as described in IHOT and PNFHPC guidelines. Fish are also inspected prior to each transfer from one facility to the next, as per ODFW Fish Health Management Policy.

See Section 9.1.6 for details regarding fish health monitoring, sanitation, and treatment protocols.

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

In the event of an emergency, hatchery staff is instructed to call the District Fisheries Biologist in Clackamas and Fish Propagation staff at ODFW headquarters in Salem, Oregon. After consultation, it is likely spring Chinook smolts on-station at Sandy Hatchery would be directly released into Cedar Creek. Smolts at an off-station Sandy River acclimation facility would likely be directly released into the acclimation stream. If the emergency occurs at Clackamas Hatchery, the spring Chinook will be transported to Sandy Hatchery if possible. If the emergency occurs at Willamette or Marion Forks hatcheries, efforts will be taken to transfer the fish to another facility where rearing space is available if feasible.

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.

- All Sandy Hatchery spring Chinook smolts are derived exclusively from a broodstock founded completely with wild Sandy River spring Chinook.

- All Sandy Hatchery spring Chinook smolts are acclimated for a minimum 3 week period prior to release to promote adult homing to the release location. Off-station acclimation site(s) will be selected to protect native fish by minimizing straying while

continuing to provide angler opportunity. The number of smolts acclimated and released from the Bull Run acclimation ponds will be based on the release strategy that better brings the program into compliance with current stray rate standards while providing the greatest return to anglers.

- All Sandy Hatchery spring Chinook smolt releases occur downstream of the primary spring Chinook natural production areas of the Sandy basin.

- Smolts are reared to and released at a size that is optimal for rapid emigration from Cedar Creek and the Sandy River.

- Sandy Hatchery spring Chinook smolts are fin-marked (adipose fin-clip) to differentiate between natural and hatchery-origin fish. An internal otolith mark on all smolts released allows for identification of mis-marked hatchery fish on spawning grounds.

- Beginning with BY2012 all spring Chinook smolts released in the Sandy Basin will receive an internal coded wire tag to facilitate identification of mis-marked hatchery origin adults.

- Mark quality checks are performed to identify the percentage of unmarked smolts prior to smolt acclimation and release. Mean rate is 97% for detectable marks at release.

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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.

A number of plans and policies (see Section 3.1 and 3.2) within the hatchery program are already in place to minimize and avoid risks to ESA listed species. Thus, much of the monitoring and evaluation of the Sandy Hatchery Spring Chinook Program are incorporated into routine ODFW operations within the program hatcheries, fish pathology, and fish management programs. See Section 1.10 for a listing of monitoring and evaluation efforts associated with each of the performance indicators for the Sandy Hatchery spring Chinook program.

ODFW Hatchery staff collect and record data concerning all aspects of the fish propagation program, including water quality, hatchery returns, spawners, eggs, rearing, and release. Data pertaining to fish numbers will be entered into ODFW's HMIS database. Water quality information will be reported to DEQ and kept on hand. Information about hatchery practices will also be collected and kept on hand. ODFW hatchery staff and fish health staff will test, treat, and record information related to fish disease.

ODFW North Willamette Fish District (NWFD) and ODFW Fish Division staff will ensure that the program details and direction are consistent with pertinent policies and native fish objectives. Corvallis Research Lab staff will lead spring Chinook spawner surveys.

Smolt Outmigrant Monitoring

NWFD staff will conduct monitoring of smolt outmigration in two sampling units downstream of Sandy Hatchery and Bull Run acclimation pond. Monitoring events will be conducted on two separate occasions with the first occurring approximately 21 days after the second release of spring Chinook smolts from the Bull Run acclimation pond and the second 21 days after the last release of winter steelhead smolts from Sandy Hatchery. Events will be scheduled as close as practical to the 21-day period identified in the incidental take statement.

As this was the first year of sampling, various methods were utilized and different habitat types were selected throughout both sample reaches. Glides, riffles, alcoves, and large pools were predominantly sampled with seines. The seine used was 80 feet long, six feet deep, had 3/16" mesh, and a lead line attached at the bottom. Pocket water within fast water units, steps, and pools were primarily sampled by angling and snorkeling. Electro-fishing was determined to be ineffective due to the large water being sampled.

Sampling reaches within the larger units are selected by identifying habitat types that had a high likelihood of holding juveniles and sampling these areas throughout the reach. Other habitat types will be selected to confirm fish are not in atypical areas. Sites are also selected by accessibility (i.e. some sites may not be accessible at all flows and/or could not be surveyed by any method). Examples of this are flows dropping and some sample sites becoming inaccessible or recreational anglers actively fishing a site. This may lead to some sites being sampled more than once while others only being sampled one time. Staff will select replacement sites near the previous sampling site if access is restricted due to low flows or recreational use. Our intent is to replicate survey sites during each sampling event

Sampling Units

Dodge Park downstream to Oxbow Park - Snorkeling and angling appear to be the most effective sampling techniques. The substrate in this area is large and coarse and the river is constrained for much of it. Riffle and pool sequences are the dominant habitat types. In pools, two or three snorkelers will concentrate their efforts at the head and along the margins. Angling with small spinners and flies will be a technique used in larger pools and glides where seining is ineffective. In fast water units, snorkelers will complete one or two passes, while anglers will start at the top of the unit and progress downstream until the unit ended. This reach will be accessed by pontoon boat and inflatable kayaks.

Oxbow Park to Lewis and Clark Park - Seining (seine used was 80 feet long, six feet deep, had 3/16" mesh, and a lead line attached at the bottom) appears to be the most effective technique as the river gradient decreases and begins to meander in the reach from Oxbow Park downstream to Lewis and Clark Park. Angling will also be employed in larger pools or any area where feeding fish are seen on the water surface. The dominant substrate changed to gravel and sand. Dominant habitat units transitioned to riffles, glides, and large slow deep pools. This reach will be accessed by jet boat, which will assist in deploying the seine.

Corvallis Research Lab staff conduct spring Chinook spawning surveys in the Sandy River basin. This monitoring focuses on wild spring Chinook spawning abundance and distribution as well as hatchery/wild interactions. Information collected through spawning surveys will be compared with research related to hatchery/wild fish relationships to gain insight into potential interactions that may be occurring between hatchery-origin and wild spring Chinook.

Spring Chinook Spawner Surveys

The following aspects of the Sandy Hatchery spring Chinook program will be monitored on an annual basis in order to effectively evaluate measures to reduce pHOS in the basin:

1. Hatchery and wild composition of the spawning population,

~~1.~~2. Effect of operating weirs and traps in the Salmon and Zigzag rivers on spawning distribution of naturally produced spring Chinook salmon,

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~~1.~~3. Effect of operating weirs and traps on pre-spawning mortality of naturally produced fish.

~~1.~~4. Effect of acclimating spring Chinook salmon in the Bull Run River on homing and removal of returning adults. This monitoring objective will include distribution of spring Chinook salmon downstream of the trap, potential effect on pre-spawning mortality, and the effect of removing hatchery fish at the Bull Run River trap on the hatchery fish composition in the Sandy River Basin.

ODFW North Willamette Fish District, ODFW Fish Division, and/or ODFW Columbia River Program staff will analyze catch information and conduct wild fish assessments. Creel surveys in the Sandy Basin started in 2010 and are expected to continue through at least 2013. Columbia River sport and commercial fisheries are sampled by the Columbia River Program (Ocean Salmon/Columbia River Program, OSCRP). The OSCRP also analyzes CWT returns. The North Willamette Fish District also coordinates and reports on carcass placement in the Sandy Basin, with the USFS and STEP volunteers performing most of the work.

Finally, other on-going monitoring of fish populations occurs through ODFW's Corvallis Research Lab, (Generalized Randomized-Tessellation Stratified or GRTS technique, spawning surveys for coho and winter steelhead, summer habitat & juvenile fish surveys, and focused research), the USFS (juvenile surveys, smolt trapping), City of Portland, and other entities. ODFW is also evaluating the potential to establish a life cycle monitoring station at Sandy Fish Hatchery to assess the effort to reintroduce winter steelhead and coho upstream of the hatchery. These monitoring efforts do not address any specific indicator, but information from them will be used by ODFW to evaluate and guide the overall hatchery program.

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

Current funding and staffing are adequately provided to allow implementation of the monitoring and evaluation activities identified in Section 1.10. Additional desired monitoring activities (currently unfunded) are identified in Section 1.16.

The Lower Columbia River Conservation and Recovery Plan (ODFW 2010) outlines monitoring activities to be conducted in conjunction with hatchery operations and future reform measures to reduce risk posed by hatchery operations in the Sandy Basin (Chapter 8 of the LCRCRP). The LCRCRP Implementation Team will prioritize monitoring activities.

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.

There are no additional risk aversion measures, beyond those identified earlier in this document (Sections 4.2, 5.8, 6.3, 7.9, 8.5, 9.1.7, 9.2.10, 10.11), applied specifically to monitoring activities.

SECTION 12. RESEARCH

No research specific to the Sandy Hatchery spring Chinook program is currently proposed or being conducted other than the monitoring and evaluation activities identified in Section 11.

12.1) Objective or purpose. N/A

12.2) Cooperating and funding agencies. N/A

12.3) Principle investigator or project supervisor and staff. N/A

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

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

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

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

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

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

12.10) Alternative methods to achieve project objectives. N/A

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

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. N/A

SECTION 13. ATTACHMENTS

ATTACHMENT 1- ADAPTIVE MANAGEMENT PLAN FOR SANDY HATCHERY SPRING CHINOOK

The primary threat from the hatchery spring Chinook program in the Sandy River is from hatchery fish on the natural spawning grounds. Over the last 10 years since the current program got underway pHOS (the proportion of the naturally spawning population comprised of hatchery-origin adults) has ranged between 25% and 75% basin-wide based on counts at the former Marmot Dam and more recently spawning ground surveys conducted throughout the basin.

Straying of hatchery spring Chinook is the result of several factors including the general life history of spring Chinook which leads them to utilize larger mainstem rivers for over-summering and medium to large sized tributaries typically, in the upper reaches of larger river systems for spawning. Flow in Cedar Creek, where the hatchery is located and where spring Chinook were released until 2013, can be very low during the spring Chinook migration period causing fish to stray into other suitable areas to spawn if flows do not come up early enough in fall to attract the majority of fish.

The Oregon Department of Fish and Wildlife is currently implementing several measures to adaptively manage the spring Chinook program as we find out more about the extent of the stray problem. This is in spite of a measure that was implemented in the past to reduce the level of straying: acclimation of smolts at Cedar Creek as opposed to direct release into the Sandy River. Acclimation of spring Chinook at Sandy Hatchery was effective at slowing fish down and encouraging them to attempt to enter Cedar Creek but if flows were not sufficient in late spring or early fall they were not able to make it all the way to the hatchery. Spring Chinook adult returns to Sandy Hatchery range from a low of 6 adults in 2007 to 3,070 in 2012 (the highest return of hatchery spring Chinook in over 20 years in the Sandy basin).

Due to the relative lack of effectiveness of acclimating fish at Cedar Creek, we chose to begin acclimating fish in the Bull Run River, a tributary of the Sandy that is known to historically contain spring Chinook as it has the flow and habitats (historically) that supported natural production of spring Chinook. Development of the Bull Run water supply has eliminated nearly 100% of the available spring Chinook habitat in that basin. Beginning in 2013 (BY11), we started acclimating 100% of the spring Chinook release (132,000 smolts) in the Bull Run acclimation pond located at the Bull Run Powerhouse in order to get as many returning adults to hold below the Bull Run where they can be harvested at a higher rate. Once adults start their pre-spawn migration they should move into the Bull Run as opposed to continuing upstream to the primary spawning habitat in the upper basin. Early indications from trapping in 2013 show hatchery adults returning to the Bull Run River.

The effects of the release of hatchery production from the Bull Run acclimation pond and the reduction in the total number released on the level of straying by hatchery spring Chinook into the upper basin will not be fully seen until 2016 when the majority of adults from the 2013 release are returning to the Sandy River. Indications that the releases from the Bull Run acclimation pond will be effective should be seen in 2014 and 2015 when adults from releases in 2011 and 2012 return. Adults returning in 2013 and a proportion of the adults in 2014 and 2015 will be from the large releases that occurred in 2009 and 2010 that were acclimated and released from the Sandy Hatchery. These are expected to stray into the natural spawning areas unless

flows in Cedar Creek are high enough to attract them back to the Sandy Hatchery. The operation of the weirs in the upper basin and in the Bull Run River will be necessary to remove hatchery adults that stray into the natural spawning areas. It is anticipated that if the measures implemented beginning in 2011 and fully implemented in 2013 are successful then fewer and fewer hatchery adults will be straying into these areas.

If the measures that have been implemented are found not to be ineffective at reducing the proportion of hatchery adults in the spawning population to less than 10%, ODFW may implement additional measures in order to reduce the potential threat. These actions include:

1) Increase acclimation time to the extent possible with existing facilities (4+ weeks instead of approximately 3).
2) Reduce out-of-basin transfers to the extent possible – utilize Oxbow/Cascade Hatchery for early rearing then transfer pre-smolts to Clackamas Hatchery for late-term rearing and acclimation in the Bull Run or move smolts directly from Oxbow/Cascade to the Bull Run.
3) Incubate eggs in water source intended for adult return (i.e. Bull Run River) – Recent research indicates that homing may be a combination of exposure of smolting juveniles to the specific water source they are rearing and eggs to specific water source where they were incubated. Research indicates fish tend to return to the watershed where juveniles smolt, but the specific location they return to for spawning may be controlled by where they were incubated as eggs.
4) Reduce program release to achieve 10% pHOS goal – Reduction beyond the current 132,000 smolts released would likely result in elimination of the program due to lack of angler support/interest.
5) Eliminate program if pHOS cannot be reduced to below 10% on a three year running average after all practical stray reduction measures have proven ineffective in controlling stray within the Sandy Basin.

If measures to reduce pHOS in the basin (i.e. acclimation and trapping in the Bull Run system) are successful, ODFW will consider increasing production to meet angler needs by providing a fishery where anglers can have better success catching hatchery spring Chinook. Production would only be increased in relation to a reduction in pHOS below the 10% criteria identified in this HGMP and the LCRCRP and modeling indicates that increasing releases will not risk increasing pHOS. Temporary weirs will be removed from the upper basin once it is determined that acclimation and trapping is successful in the Bull Run. We expect to make a decision on the need to continue operating weirs in the Zigzag and Salmon rivers when 100% of the hatchery production is returning from releases in the Bull Run River (2016).

Broodstock Management – Integration

If integration is approved as part of this HGMP, our goal will be to incorporate up to 22 wild adult males. One option that will be evaluated would be to only utilize wild males that can be returned to the wild. This option would be used unless it is demonstrated through modeling and evaluation that female gametes are necessary for maintaining genetic heterozygosity of the hatchery and wild population. Up to 42 wild adults may be collected in the future if stray reduction measures prove to reduce pHOS to a rate that would allow release of up to 300,000 smolts.

Wild males utilized for spawning will be returned to the Sandy Basin as soon as possible after spawning at a location as close as practical to where the fish was originally collected. Fish returned to the river will be floy-tagged in order to effectively track fish through spawning surveys conducted in the basin.

Assumptions:

1) Average fecundity of spring Chinook, approximately 4,500

2) Egg loss between collection and green eyed stage, 10%

3) Up to 20% mortality potential of adults collected for broodstock

4) 1:1 mating (wild x hatchery crosses would not be culled to meet integration goals; hatchery x hatchery crosses would be culled to reduce egg take at the green egg stage to accommodate the current target release of 132,000)

5) Utilizing only wild males for integration is sufficient to reduce potential domestication and loss of fitness in the hatchery population and subsequently, the naturally produced population if limited numbers of hatchery fish continue to spawn in the primary production areas in the upper basin.

6) Average run size over the last 10 years for Sandy wild spring Chinook – 1,645 fish

7) The potential for demographic impacts to the wild Sandy River spring Chinook population will be minimized by limiting the number of wild adults collected for broodstock to less than 2% of the naturally spawning population.

20% Integration Target

At CURRENT 132,000 program

Collect 200,000 eggs @ 4,500 eggs/female = 45 females

45 females + 45 males = 90 total x 20% mortality = 108 total brood

pNOB (20%) Broodstock need = 22 wild males

At FULL 300,000 program

Collect 400,000 eggs @ 4,500 eggs/female = 89 females

89 females + 89 males = 178 total x 20% mortality = 214 total brood

pNOB (20%) Broodstock need = 42 wild males

Magnitude (%) of Wild Fish "Take" for Broodstock at Varying Population Levels with 5% Integration

% of Natural Spawning Population Used for Broodstock at Varied Run Sizes

Program Size	Run Size			# of wild fish needed for pNOB=20%
	3,000	1,500	650	
132,000 smolts	0.73%	1.47%	3.39%	22
300,000 smolts	1.40%	2.80%	6.46%	42

Number of wild fish collected for Broodstock at Varied Run Sizes

Program Size	Run Size			# of wild fish needed for pNOB=20%
	3,000	1,500	650[a/]	
132,000 smolts	22	22	13[b/]	22
300,000 smolts	42	22	13[b/]	42

[a/] Minimum number necessary for collection of wild fish for brood
[b/] Collection of wild fish limited to 2% of forecasted run

ATTACHMENT 2 - CITATIONS

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Attachment 3 - Estimated listed salmonid take levels by hatchery activity.

Listed species affected: Spring Chinook Salmon ESU/Population: Lower Columbia Activity: Brood Collection/Trapping					
Location of hatchery activity: Bull Run River, RM 0.2 Dates of activity: May - October Hatchery program operator: ODFW					
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***				
	Egg/Fry	Juvenile/Smolt	Adult		Carcass
			Hatchery	Wild	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)				80	
Capture, handle, tag/mark/tissue sample, and release d)				20	
Removal (e.g. broodstock) e)			350		
Intentional lethal take f)			1000		
Unintentional lethal take g)					
Other Take (specify) h)					

Listed species affected: Steelhead ESU/Population: Lower Columbia Activity: Brood Collection/Trapping				
Location of hatchery activity: Bull Run River, RM 0.2 Dates of activity: May - October Hatchery program operator: ODFW				
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)				
Capture, handle, tag/mark/tissue sample, and release d)			200[a/]	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

[a/] Tissue collected from unmarked summer steelhead trapped during operation of the Bull Run weir

Listed species affected: Spring Chinook Salmon ESU/Population: Lower Columbia Activity: Weir/pHOS management Collection/Trapping/exclusion					
Location of hatchery activity: Zigzag R./Salmon R. Dates of activity: May - October Hatchery program operator: ODFW					
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***				
	Egg/Fry	Juvenile/Smolt	Adult		Carcass
			Hatchery	Wild	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)				3,000	
Capture, handle, tag/mark/tissue sample, and release d)					
Removal (e.g. broodstock) e)			300	22 [a/]	
Intentional lethal take f)			1,500[b/]		
Unintentional lethal take g)				30	
Other Take (specify) h)					

[a/] Take of wild fish for brood will only be implemented if approved through consultation on this HGMP. Up to 22 adults would be collected under a 132,000 smolt program and up to 42 would be collected under a 300,000 smolt program.
[b/] Lethal take listed is associated with removal and dispatching of hatchery spring Chinook collected at weirs/traps but not retained for broodstock.

Listed species affected: Chinook Salmon (Fall Run) ESU/Population: Lower Columbia Activity: Smolt Outmigrant Monitoring

Location of hatchery activity: Sandy River	**Dates of activity: March-May**		**Hatchery program operator: ODFW**		
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***				
	Egg/Fry	Juvenile/Smolt	Adult		Carcass
			Hatchery	Wild	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)	1000	100			
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)					

Listed species affected: Coho Salmon	**ESU/Population: Lower Columbia**		**Activity: Smolt Outmigrant Monitoring**		
Location of hatchery activity: Sandy River	**Dates of activity: March-May**		**Hatchery program operator: ODFW**		
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***				
	Egg/Fry	Juvenile/Smolt	Adult		Carcass
			Hatchery	Wild	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)	1000	200			
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)					

Listed species affected: Steelhead	**ESU/Population: Lower Columbia**	**Activity: Smolt Outmigrant Monitoring**

Location of hatchery activity: Sandy River	**Dates of activity: March-May**		**Hatchery program operator: ODFW**		
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***				
	Egg/Fry	Juvenile/Smolt	Adult		Carcass
			Hatchery	Wild	
Observe or harass a)					
Collect for transport b)					
Capture, handle, and release c)		100			
Capture, handle, tag/mark/tissue sample, and release d)					
Removal (e.g. broodstock) e)					
Intentional lethal take f)					
Unintentional lethal take g)					
Other Take (specify) h)					

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

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

ATTACHMENT 4. DEFINITION OF TERMS REFERENCED IN THE HGMP TEMPLATE.

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

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

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

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

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

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

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

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

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

Indigenous – Descended from a population that is believed to have been present in the same geographical area prior to the year 1800 or that resulted from a natural colonization from another indigenous population.

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

Integrated recovery program - An artificial propagation project primarily designed to aid in the recovery, conservation or reintroduction of particular natural population(s), and fish produced are

intended to spawn in the wild or be genetically integrated with the targeted natural population(s). Sometimes referred to as “supplementation”.

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

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

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

Native fish - Indigenous to Oregon, not introduced. This includes both naturally produced and hatchery produced fish.

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

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

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

Naturally produced - Fish that reproduce and complete their full life cycle in natural habitats.

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

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

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

Restoration - The use of artificial propagation to hasten rebuilding or reintroduction of a fish population to harvestable levels in areas where there is low, or no natural production, but potential

for increase or reintroduction exists because sufficient habitat for sustainable natural production exists or is being restored.

Stock - (see “Population”).

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

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

Wild fish - Any naturally spawned fish in the taxonomic classes, Agnatha, Chondrichthyes, and Osteichthyes, belonging to an indigenous population.

ATTACHMENT 5. AGE CLASS DESIGNATIONS BY FISH SIZE AND SPECIES FOR SALMONIDS RELEASED FROM HATCHERY FACILITIES.

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

		SIZE CRITERIA	
	SPECIES/AGE CLASS	**Number of fish/pound**	**Grams/fish**
X	**Chinook Yearling**	**<=20**	**>=23**
X	**Chinook (Zero) Fingerling**	**>20 to 150**	**3 to <23**
X	**Chinook Fry**	**>150 to 900**	**0.5 to <3**
X	**Chinook Unfed Fry**	**>900**	**<0.5**
X	**Coho Yearling 1/**	**<20**	**>=23**
X	**Coho Fingerling**	**>20 to 200**	**2.3 to <23**
X	**Coho Fry**	**>200 to 900**	**0.5 to <2.3**
X	**Coho Unfed Fry**	**>900**	**<0.5**
X	**Chum Fed Fry**	**<=1000**	**>=0.45**
X	**Chum Unfed Fry**	**>1000**	**<0.45**
X	**Sockeye Yearling 2/**	**<=20**	**>=23**
X	**Sockeye Fingerling**	**>20 to 800**	**0.6 to <23**
X	**Sockeye Fall Releases**	**<150**	**>2.9**
X	**Sockeye Fry**	**> 800 to 1500**	**0.3 to <0.6**
X	**Sockeye Unfed Fry**	**>1500**	**<0.3**
X	**Pink Fed Fry**	**<=1000**	**>=0.45**
X	**Pink Unfed Fry**	**>1000**	**<0.45**
X	**Steelhead Smolt**	**<=10**	**>=45**
X	**Steelhead Yearling**	**<=20**	**>=23**
X	**Steelhead Fingerling**	**>20 to 150**	**3 to <23**
X	**Steelhead Fry**	**>150**	**<3**
X	**Cutthroat Trout Yearling**	**<=20**	**>=23**
X	**Cutthroat Trout Fingerling**	**>20 to 150**	**3 to <23**
X	**Cutthroat Trout Fry**	**>150**	**<3**
X	**Trout Legals**	**<=10**	**>=45**
X	**Trout Fry**	**>10**	**<45**

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

ATTACHMENT 6: PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS.

ADDENDUM A.

(Anadromous salmonid effects are addressed in Section 2)

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

Section 7 biological opinions, Section 10 permits, 4(d) rules, etc.

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

General species description and habitat requirements.

Local population status and habitat use.

Site-specific inventories, surveys, etc.

Fisher (*Martes pennanti*, Candidate Species)

Status: The west coast population of the fisher was accorded federal candidate status on April 8, 2004. Fishers, found only in North America, occur in the northern coniferous and the mixed forests of Canada and the northern United States. Their range extends from the mountainous areas in the southern Yukon and Labrador Provinces southward to central California and Wyoming, the Great Lakes and Appalachian regions, and New England.

In Oregon, fishers occurred historically throughout the Coastal and Cascade mountains. Currently, the range of the fisher is severely reduced. Despite extensive surveys conducted in forested regions of Oregon, records dating from 1954 to 2001 show that the remaining populations of fishers are restricted to two separate and genetically isolated populations in southwestern Oregon; one in the northern Siskiyou Mountains and one in the southern Cascade Range. The population in the southern Cascades descended from reintroduced fishers that were translocated to Oregon from British Columbia and Minnesota.

The west coast population of the fisher is endangered mainly due to the loss and fragmentation of habitat due to timber harvest, roads, urban development, recreation, and wildfires. Other threats include small population sizes and isolation, predation, and human-caused mortality from vehicle collisions, poaching, and incidental capture and injury.

Habitat: Fishers select forests with high canopy closure, large trees, and a high percentage of conifers. The physical structure of this type of forest provides the fisher with reduced

vulnerability to predation and an abundance of prey. The distribution of the fisher is likely limited by elevation and snow depth.

Conservation Measures: In December 2000, the Fish and Wildlife Service (Service) received a petition to list the west coast population of the fisher as an endangered species in Washington, Oregon, and California. The Service concluded that the west coast fisher population was a distinct population segment and was warranted for listing, but precluded by other higher priority listing action, and subsequently placed the species on the federal list of candidates. Now the Service will begin conducting an annual review of the species status and may propose to list the species at a later date. The Service encourages state and federal agencies proposing activities within the historic range of the fisher to give consideration to the fisher during the environmental planning process, especially activities which alter or destroy mature and old growth forests.

Bald Eagle (Haliaeetus leucocephalus, Threatened Species)

Status: Bald Eagles were delisted in 2007 from the federal endangered species list; but it is still a Threatened species under the Oregon rule. Bald eagle populations have rebounded considerably within the last few years, with nearly all recovery goals met for Oregon, Washington, and other regions of the country. Bald eagles and golden eagles are, and will continue to, be protected under the Bald Eagle and Golden Eagle Protection Act of 1940 (as amended) and the Migratory Bird Treaty.

The northern bald eagle is closely associated with freshwater, estuarine, and marine ecosystems that provide abundant prey and suitable habitat for nesting and communal roosting (Watson et al. 1991). Breeding territories are typically located within one mile of permanent water in predominantly coniferous, uneven-aged stands with old-growth structural components (Anthony et al. 1982, Stalmaster 1987, Anthony and Isaac 1989). Bald eagles winter along ice-free lakes, streams, and rivers where food and perch sites are abundant and the level of human disturbance is low (USFS 1977, Steenhof 1978, Stalmaster 1980). Communal nights roosts are used by bald eagles primarily during the winter months. In the Pacific Northwest, communal roosts generally occur in multi-layered mature or old-growth conifer stands that provide protection from weather and human disturbance (Stalmaster and Newman 1979).

Home range size varies greatly according to food abundance and the availability of suitable nest and perch trees (Stalmaster 1987). Favored nest trees are usually the largest tree or snag in a stand that provides an unobstructed view of the surrounding area and a clear flight to and from the nest (Stalmaster 1987). Nests are usually built on limbs just below the crown, with the canopy above providing cover (USFS 1977). Nesting behaviors typically begin in January, followed by egg laying and incubation in February and March (Isaac et al. 1983). Young are reared throughout April, May, and June. Fledging occurs in July and August. Bald eagles are primarily predators but also opportunistic scavengers that feed on a variety of prey including salmon, other fish, small mammals, waterfowl, seabirds, and carrion (Snow 1981). Bald eagles usually forage in large open areas with a wide visual field and suitable perch trees near the food source (USFS 1985).

The bald eagle occurs throughout the United States and Canada. It winters primarily along rivers south of the Canadian border. The historic decline of the bald eagle has been attributed to the loss of feeding and nesting habitat, organochloride pesticide residues, shooting, poisoning, and

electrocution (Snow 1981, USFWS 1986). Human interference has been shown to adversely affect the distribution and behavior of wintering bald eagles (Stalmaster and Newman 1978).

Critical Habitat: Critical habitat for bald eagles has not been formally designated by USFWS.

Northern Spotted Owl (Strix occidentalis caurina, Threatened Species)

Status: The northern spotted owl was listed as a threatened species throughout its entire range in June 1990 (55 FR 26114). It ranges from southern British Columbia south to Marion County, California and east to the shrub steppe of the Great Basin in Oregon and California. In the Western Cascades, the northern spotted owl can be found from approximately sea level to 4000 feet in elevation (USFWS 1992). Most observations of spotted owl habitat use have been made in forests with a component of old-growth and mature forests consisting of western hemlock, Douglas-fir and western red cedar. However, the northern spotted owl has been observed to use a wide variety of habitat types and forest stand conditions, including managed stands, for nesting, feeding or roosting (USFWS 1992). In general, northern spotted owls preferentially use forests with greater complexity and structure. In the Western cascades, the home range of northern spotted owl pairs ranges in size from approximately 1,450 acres to 9,750 acres with a median home range size of 2,950 acres (USFWS 1992). Spotted owls do not build their own nests. They depend on suitable naturally occurring nest sites such as broken-top trees and cavities in older-age forests, abandoned raptor nests, squirrels nests and debris accumulations. Most northern spotted owl nest sites observed on public lands have been located in old-growth or mature forests (USFWS 1992). However, spotted owls are known to nest in managed stands, especially if residual old-growth characteristics are present. Owlets remain in the nest for three to five weeks and generally leave the nest before they can fly. They usually remain near the nest in nearby branches or on the ground where they are fed and tendered by both adults before dispersing in early fall (late September to early October) (USFWS 1992). Roosting habitat are typically areas of relatively dense vegetation (high canopy closure dominated by large-diameter trees). Spotted owls respond to variations in temperature and move within the canopy to find favorable microclimate conditions which are facilitated by multistoried stand structure of roost sites (USFWS 1992). Spotted owl foraging habitat is more varied but is generally characterized by high canopy closure and complex structure. Spotted owls are primarily nocturnal and eat small mammals, birds and insects. Both the woodrat (Neotoma fuscipes and N. cinerea) and the northern flying squirrel (Glaucomys sabrinus) compose the majority of the prey base of the spotted owl (USFWS 1992).

Habitat: Critical habitat is designated for the northern spotted owl solely on 6.9 million acres of federal lands (57 FR 1796). Areas managed by the U.S. Forest Service (USFS) in upper Eagle Creek watershed are part of the critical habitat designation for northern spotted owl. Northern spotted owls live in forests characterized by dense canopy closure of mature and old-growth trees, abundant logs, standing snags, and live trees with broken tops. Although they are known to nest, roost, and feed in a wide variety of habitat types, these owls prefer older forest stands with variety: multi-layered canopies of several tree species of varying size and age, both standing and fallen dead trees, and open space among the lower branches to allow flight under the canopy. Typically, forests do not attain these characteristics until they are at least 150 to 200 years old.

Conservation measures: The listing of the northern spotted owl as threatened and the designation of critical habitat are helping to reduce habitat loss on federal lands. Although the need for timber necessitates continued harvesting, new forest management practices now stress restricted

harvesting in old-growth forests and suggest alternate areas for harvest which are less preferred by spotted owls. Careful planning of timber sales and wise use of forest resources is necessary to halt the decline of the northern spotted owl and other old growth-associated species. The Northwest Forest Plan, created in 1994, creates a system of late-successional reserves (LSR) across the range of the species that are designed to provide suitable nesting habitat over the long term. The federal forest lands outside these reserves are managed to allow dispersal between the LSRs through riparian reserves and other land allocations.

Western Yellow Billed Cuckoo (*Coccyzus americanus occidentalis*, Candidate Species)

The yellow-billed cuckoo in the western United States was accorded candidate status in July 2001. The western yellow-billed cuckoo includes all members of the species found in Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas and Washington.

Status: Historically, the yellow-billed cuckoo bred throughout much of North America. Available data suggests that within the last 50 years the species' distribution west of the Rocky Mountains has declined substantially. Loss of streamside habitat is regarded as the primary reason for the population decline. The species was probably never common in Oregon. Historical records for the state show that breeding cuckoos were most often sighted in willow bottoms along the Willamette and Columbia Rivers; there are few records of cuckoo sightings in eastern Oregon. The last confirmed breeding records in Oregon were in the 1940's. Most of the recent records of cuckoos are from eastern Oregon at Malheur National Wildlife Refuge in Harney County, and from Malheur and Deschutes Counties.

Habitat: Western yellow-billed cuckoos breed in dense willow and cottonwood stands in river floodplains.

Water Howellia (*Howellia aquatilis*, Threatened Species)

Water howellia was federally listed as threatened without critical habitat in 1994 (U.S. Fish and Wildlife Service 1994). A recovery plan has not yet been published for this species.

Status: Water howellia is known to occur sporadically in Washington, Idaho, Montana, and California. There are no known extant occurrences in Oregon. However, the species has historically been collected (voucher specimens in herbariums) from at least four different places in the state. It was first collected in 1879 from Sauvie Island, Multnomah County. It was collected from Sauvie Island again in 1886, but not since then. It was also collected from Lake Oswego in Clackamas County in 1892. It was collected from two places in the Salem area, most recently in 1977. Numerous attempts to relocate these sites have been unsuccessful. The historic Oregon sites were all located within the Columbia River floodplain or the broad valley of the Willamette River.

Habitat: Information on herbarium labels or Oregon collections describe the habitat as "ponds in woods", "pond in shaded woods", and "stagnant ponds in the timber". Information from other locales indicate that this species is restricted to small, vernal, freshwater wetlands, glacial pothole ponds, or former river oxbows that have an annual cycle of filling with water over the

fall, winter and early spring, followed by drying during the summer months. These habitats are generally small (<1 ha [2.5 ac]) and shallow (<1 m [3 ft] deep). Bottom surfaces are reported as firm, consolidated clay, and organic sediments. Most locations were surrounded by deciduous trees and howellia was found in shallow water or around the edges of deep ponds. Associated species include duckweed (Lemna spp.), water starworts (Callitriche spp.), water buttercup (Ranununculus aquaticus), yellow water-lily (Nuphar polysepalum), bladderwort (Utricularia vulgaris), and pondweeds (Potamogeton spp.).

Bradshaws Lomatium (*Lomatium bradshawii*, Endangered Species)

Bradshaw's lomatium was federally listed as endangered without critical habitat in 1988 (U.S. Fish and Wildlife Service 1988). A recovery plan was published in 1993 (U.S. Fish and Wildlife Service 1993). Bradshaw's lomatium currently extends from Clark county, Washington, to the southern end of the Willamette Valley, Oregon. The greatest concentrations of remaining sites where plants occur is in and adjacent to the Eugene, Oregon metropolitan area.

Habitat: The majority of Bradshaw's lomatium populations occur on seasonally saturated or flooded prairies, adjacent to creeks and small rivers in the southern Willamette Valley. Soils at these sites are dense, heavy clays, with a slowly permeable clay layer located 15-30 cm (6-12 in) below the surface. This clay layer results in a perched water table during winter and spring, and is critical to the wetland character of these grasslands, known as tufted hair-grass (Deschampsia cespitosa) prairies. Bradshaw's lomatium occurs on alluvial (deposited by flowing water) soils. The species occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81).

Conservation: Endemic to and once widespread in the wet, open areas of the Willamette Valley of western Oregon, Bradshaw's lomatium is limited now to a few sites in Lane, Marion, and Benton Counties. Most of its habitat has been destroyed by land development for agriculture, industry, and housing. In addition, water diversions and flood control structures have changed historic flooding patterns, which may be critical to seedling establishment. Reductions in natural flooding and fire cycles also permit invasion of trees and shrubs, and eventual conversion of wet prairies to woodlands.

Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*, Threatened Species)

The Oregon silverspont is a medium-sized, orange and brown butterfly with black veins and spots on the dorsal (upper) wing surface, and a yellowish submarginal band and bright metallic silver spots on the ventral (under-side) wing surface. This subspecies is distinguished from other subspecies of silverspot butterflies be a somewhat smaller size and darker coloration at the base of the wings. These are morphological adaptations for survival in a persistently wind and foggy environment.

Status: The historical range of this subspecies extends from the Long Beach Peninsula, Pacific County, Washingto, south to Del Norte Count, California. All of these populations were restricted to the immediate coast, centered around salt-spray meadows, or within a few miles of the coastline in similar meadow-type habitat. At the time of listing the only viable population known was on the Siuslaw National Forest in Tillamook County, Oregon. Additional populations

have since been discovered ant Cascade Head, Bray Point and Clatsop Plains in Oregon, on the Long Beach Peninsula in Washington and in Del Norte County in California.

Habitat: The Oregon silverspot occupies three types of grassland habitat. One type consists of marine terrace and coastal headland salt-spray meadows (e.g., Cascade Head, Bray Point Rock Creek-Big Creek and portions of Del Norte sites). The second consists of stabilized dunes as found at the Long Beach Peninsula, Clatsop Plains, and the remainder of Del Norte. Both these habitats are strongly influenced by proximity to the ocean, mild temperatures, high rainfall, and persistent fog. The third habitat type consists on montane grasslands found on Mount Hebo and Fairview Mountains. Conditions at these sites include colder temperatures significant snow accumulations, less coastal fog, and no salt spray.

The most important feature of the habitat of the Oregon silverspot is the presence of the early blue violet. This plant is normally the only species on which the Oregon silverspot can successfully feed and develop as larva. This plant is apart of the sal-spray meadow vegetation and is an obligatory component of the butterfly's habitat Other features of optimum habitat include moderate grass cover, and a mixture of herbaceous plants used for nectaring by adults. Adults generally move out of the meadows into the fringe of conifers or brush for shelter, courtship and mating.

Analyze effects.

No take of USFWS trust species is expected to occur or be adversely affected by operation of the Sandy Fish Hatchery.

Adult hatchery fish in Cedar Creek could potentially serve as a forage base for bald eagles. Adult hatchery carcasses distributed in tributary streams can also enhance nutrients and ecosystem productivity of the stream (Cederholm et al. 1999).

Actions taken to minimize potential effects.

No actions are necessary to address effects for USFWS ESA trust species.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information 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 and Title of Applicant: Jeff Boechler, Northwest Watershed District Manager

Signature: _____Date:_____

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature: _____ Date:_____