FINAL

HATCHERY AND GENETIC MANAGEMENT PLAN

(HGMP)

Hatchery Program:	**Sandy River Winter Steelhead Program**
Species or Hatchery Stock:	**Sandy River Winter Steelhead (stock 11)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Sandy River Basin**
Draft Submitted:	**March 6, 2002**
Submitted for ESA Consultation:	**August 1, 2013**
Date Last Updated:	**October 18, 2013**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery Program.

Sandy River Winter Steelhead Program (stock 11)

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

The Sandy River winter steelhead program utilizes hatchery-produced winter steelhead *Oncorhynchus mykiss* (ODFW stock 11) as brood for propagation. The natural population of winter steelhead in the Sandy River is part of the Lower Columbia River steelhead Distinct Population Segment (DPS), and was listed as threatened under the Endangered Species Act (ESA) on March 19, 1988. The hatchery-produced Sandy River winter steelhead (stock 11) is considered part of the DPS, included in the recent listing decision (September 29, 2006) by NOAA Fisheries, but hatchery-by-hatchery offspring are not considered essential for recovery. These fish are also a sensitive species under Oregon's Sensitive Species Rules (OAR 635-100-0040).

This program was developed by integrating naturally produced Sandy River winter steelhead in the hatchery brood from 2000-11. Prior to brood year 2000, all hatchery releases of winter steelhead into the Sandy River were out-of-basin Big Creek stock (stock 13). Naturally produced Sandy River winter steelhead were first collected as broodstock for this program in 2000. The first release of hatchery smolts from the Sandy River stock was in the spring of 2001. Broodstock conversion to the localized stock was complete by 2004 when the annual broodstock collection goal shifted to 30% naturally produced fish. In 2012 and 2013, only returning hatchery fish were used for broodstock. Currently, the winter steelhead 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 re-integrate wild winter steelhead into the brood to help off-set loss of heterozygosity and effects of domestication.

1.3) Responsible organization and individuals.

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Other agencies, co-operators, or organizations involved:
Funding for the program comes from the National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries; through the Mitchell Act), and the City of Portland..

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

Sandy Hatchery:

Funding Sources:	ODFW License Fund = 100%
Staffing Level:	3 Full Time Employees
Annual Budget:	Total hatchery budget for FY 2013 = $285,000 (no direct cost for winter steelhead program except staff time).

Oak Springs Hatchery:

Funding Sources:	Sports Fish Restoration Act = 63% BPA = 17% ODFW = 20%
Staffing Level:	7.75 Full Time Employee
Annual Budget:	Total hatchery budget for FY 2013 = $792,095 (~2.7% of the budget is spent for Sandy River winter steelhead program).

Bonneville Hatchery:

Funding Sources:	NOAA Fisheries = 48% USACE = 52%
Staffing Level:	14 Full Time Employee
Annual Budget:	Total hatchery budget for FY 2013 = $1,717,254 (~15.01% of the budget is spent for Sandy River winter steelhead program).

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

Table 1.5. Sandy Hatchery Winter Steelhead program summary.

Adult Collection	Adult Holding & Spawning	Egg Incubation	Rearing	Acclimation	Release
Sandy H.[a/]	Sandy H.	Sandy H. (through eyed egg)	Oak Springs H. (to 30fpp) Bonneville H. (to 6fpp)	Sandy H.	Cedar Cr. (at 6 fpp) Marsh Rd.[b/] (at 6 fpp)

[a/] Collection of hatchery broodstock may be conducted by hook and line.
[b/] Winter steelhead acclimated at Sandy Hatchery may be released at Marsh Road (approximately 0.5 mile upstream of the Bull Run River confluence) only when flows in Cedar Creek are too low to allow volitional movement out of the creek. There are no longer direct releases of non-acclimated fish at Marsh Road.

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° 24' 25" N (45.40694) and longitude 122° 15' 11" W (122.2531). The regional mark processing code for Sandy Hatchery is 5F33226 H26 21.

Activities: Adult collection, holding, spawning, and incubation up to the eyed stage take place at Sandy Hatchery. Eyed eggs are transferred in May to Oak Springs Hatchery for incubation and early rearing. Smolts are returned (Bonneville Hatchery below) for acclimation at Sandy Hatchery and released into Cedar Creek, a tributary of the Sandy River.

Oak Springs Hatchery:

Oak Springs Hatchery is located at RM 47.0 on the Deschutes River in the Deschutes River Basin, Wasco County, Oregon. The hatchery site is at an elevation of 850 feet above sea level, at latitude 45° 13' 32 N (45.22556) and longitude 121° 02' 54" W (121.0917). The regional mark processing code for Oak Springs Hatchery is 5F33420 H20 21.

Activities: Receives 190,000 eyed eggs from Sandy Hatchery. Eggs are incubated, hatched and reared to ~30fpp. Fingerlings are transferred to Bonneville Hatchery in October for final rearing.

Bonneville Hatchery:

Bonneville Hatchery is at RM 0.25 on Tanner Creek in the lower Columbia River Basin, Multnomah County, Oregon. The hatchery site is at an elevation of ~46 feet above sea level, at latitude 45° 38' 00" N (45.6334) and longitude 121° 57' 20" W (121.9568). The regional mark processing code for Bonneville Hatchery is 5F33201 H1 21.

Activities: Bonneville Hatchery receives ~165,000 fingerlings (30fpp) from Oak Springs Hatchery. Fish are reared through March to ~6fpp prior to transfer back to Sandy Hatchery for acclimation and release into the Sandy River.

1.6) Type of program.

Integrated Harvest - The primary objective of this program is to augment the Sandy River winter steelhead sport fishery with hatchery reared, basin-origin winter steelhead.

Mitigation – In the past, Sandy Hatchery utilized Mitchell Act funds that are intended to mitigate for hydropower operations on the Columbia River. These funds support hatchery monitoring, evaluation, and reform measures being implemented to reduce potential impacts to wild fish in the basin. The City of Portland provides funding for production as mitigation related to hydropower generation at their Bull Run dams (FERC Project #2821).

1.7) Purpose of program.

The Sandy Hatchery winter steelhead program is in place for harvest augmentation and mitigation. The primary goal of the Sandy winter steelhead program is to mitigate for the loss of winter steelhead catch in recreational fisheries due to habitat degradation and passage impairment resulting from dam construction and operation. The intent of the program is to produce winter steelhead that are genetically similar to wild winter steelhead in the Sandy River to provide a quality fishery for sport fishers. This program aims to provide fish for harvest in the Lower Columbia River and Sandy River recreational fisheries while minimizing unintended risks to naturally producing populations.

Wild adult winter steelhead are passed upstream of Sandy Hatchery in Cedar Creek to access high quality spawning habitat upstream and contribute to the natural spawning population in the Sandy Basin. Wild fish are sorted from hatchery returns and allowed to recover in a post-sort holding pond prior to being allowed to volitionally move through a concrete lined channel and back into Cedar Creek upstream of the adult diversion weir. The number of unmarked winter steelhead returning to Cedar Creek on an annual basis ranges from 10-45 adults in the recent past. All wild fish will be passed and hatchery fish will not be allowed to pass unless it is proven through monitoring and evaluation that too few adults are spawning in the habitat above the hatchery to produce a self-sustaining population. If it is proven that the habitat is being poorly seeded, ODFW will consider supplementing the natural population with hatchery adults. Smolt trap data combined with habitat assessment and adult return numbers will be used to evaluate supplementation options in the future.

The primary objectives of the Sandy Hatchery, as outlined in the Sandy Hatchery Operations Plan 2011, are:

Objective 1: Foster and sustain opportunities for sport 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 Sandy winter steelhead program is in place for both harvest augmentation and mitigation. The intent is to provide a sport fishery with fish that are similar to the wild fish in the Sandy to maintain a quality fishery that meets public demand while minimizing potential risks to wild spring Chinook, fall Chinook, coho and winter steelhead populations, consistent with Oregon's Lower Columbia River Salmon and Steelhead Conservation and Recovery Plan. The current hatchery winter steelhead program provides a fishery for winter steelhead that lasts up to four months due to the mimicking of the native Sandy River wild winter steelhead run timing. The Sandy River is a well-regarded and very popular fishery due to its quality and proximity to the Portland metropolitan area. It receives a great deal of angler pressure.

The Big Creek winter steelhead stock was discontinued in 2000.

The major concern regarding the sport fishery is its potential impact on the listed population of winter steelhead. Section 2.1 of the Fisheries Management and Evaluation Plan (FMEP) for the Lower Columbia Steelhead DPS (ODFW 2001) provides the evaluation of this sport fishery where hooking mortality can occur. The harvest of Sandy River hatchery-origin winter steelhead is managed to comply with this FMEP.

Current fishing regulations in the Lower Columbia River DPS require that all unmarked steelhead be released back to the wild unharmed. There is no retention of unmarked, listed steelhead in the DPS. Steelhead with an adipose fin clip may be retained in recreational fisheries targeting winter steelhead in the lower river downstream of the mouth of the Salmon River.

The best available scientific information suggests hook and release mortality of adult steelhead is low. Hooton (1987) found catch and release mortality of adult steelhead to be 3.4% (n= 3,715 fish) on average when using a variety of fishing tackle, including barbed and barbless hooks, bait and artificial lures. Hooton concluded that catch and release of adult steelhead was an effective mechanism for maintaining angling opportunity without negatively impacting stock recruitment. Reingold (1975) showed adult steelhead that were hooked, played to exhaustion, and released also returned to their target spawning stream along with steelhead that were not hooked and played to exhaustion.

The overall impact from recreational fishing should be assessed at the population level. Since it is very unlikely that every fish in a population will be caught, overall mortality rates are substantially lower than the estimated mortality rates. For example, if 50% of the steelhead population is caught and released with a 5% catch-and-release mortality rate, the overall impact from fishing to the population would be 2.5%. Information on the rate at which unmarked steelhead are encountered in mainstem lower Willamette and tributary recreational fisheries is limited. The best information suggests that encounter rates are most likely in the range of 10-30% (NMFS 1998). These encounter rates would result in an overall impact to a steelhead population of 0.5% to 1.5% from recreational fisheries.

In the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010) the total impact from all fisheries (commercial and recreational) that intercept winter steelhead was estimated to be 10%. This level of harvest was determined to be consistent with the recovery of the Steelhead DPS.

The Sandy Hatchery Winter Steelhead Program is managed as an integrated hatchery program. The program was developed utilizing hatchery and naturally produced Sandy River winter steelhead adults collected at Sandy Hatchery, or by hook and line, as broodstock. From 1997 until the 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 fish were allowed to pass upstream to the primary winter steelhead spawning areas of the Sandy basin. ODFW evaluations have identified that a majority (approximately 85%) of the remaining natural spawning habitat for winter steelhead 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 in place to minimize the risk of potential impacts to listed salmonids.

- Broodstock conversion to a Sandy basin origin took place between 2000 and 2002 and all (100%) of the fish captured for broodstock were naturally produced Sandy River winter steelhead.
- In 2004, conversion to the local broodstock was complete and hatchery-reared adults derived from naturally produced parents are now returning to the Sandy River.

- Wild winter steelhead were not collected for brood from 2011-2013. 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 winter steelhead would only be integrated in years when the expected return is > 650 adults and no more than 2% of the wild population would be collected. In the Sandy River, the number of naturally produced winter steelhead averaged 1,088 fish from 2000-2012.
- All portions of the run and all age classes (except precocious males) will be incorporated into the broodstock in order to maintain similar life histories as the wild population.
- Hatchery returns will be monitored to assess possible phenotypic divergence from the native Sandy River stock (e.g. run timing, spawn timing, fecundity, etc.).
- 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.
- All hatchery fish are fin-marked (adipose clipped) to allow for harvest in selective fisheries and to facilitate sorting of returning adults. Mean detectable ad clip marking rate is ~97%.
- Marked hatchery-origin adults were not allowed access to the natural spawning grounds in the upper Sandy River Basin between 1999 when all hatchery steelhead were first marked and 2007 when Marmot Dam was removed. Hatchery fish were removed from the population at Marmot Dam, although some limited natural spawning occurred below the former dam site.
- Wild adult winter steelhead are passed upstream of Sandy Hatchery in Cedar Creek to access high quality spawning habitat upstream and contribute to the natural spawning population in the Sandy Basin.
- Smolt releases will only occur in the lower basin (at or below Cedar Creek) to minimize straying of hatchery adults into primary winter steelhead habitats. The goal is to limit the proportion (stray rate) of returning hatchery-origin adults below 10% in natural spawning areas throughout the basin.
- This program complies with ODFW's Fish Health Management Policy and IHOT standards for prevention and treatment of fish diseases.
- This program complies with all other applicable IHOT standards.

1.9) List of program "Performance Standards".

See Section 1.10

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

1.10.1) Performance Indicators addressing "BENEFITS".

Legal Mandates:

Performance Standard (1): Contribute to mitigation requirements between the NMFS and the State of Oregon.

Indicator (1)(a): Number of fish released meets mitigation agreements (160,000-smolt production).

Monitoring and Evaluation: Monitor adult returns, smolt production, release, and survival rates. These metrics are reported annually in the ODFW Annual Fish Propagation Report (www.dfw.state.or.us/fish/hatchery/).

Performance Standard (2): Program complies with the following programs, plans, policies:

- Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (LCRCRP)
- Oregon Native Fish Conservation Policy (NFCP)
- Oregon Fish Hatchery Management Policy
- Oregon Fish Health Management Policy
- Lower Columbia River Steelhead Fisheries Management Evaluation Plan.

Indicator (2)(a): Meets recovery/de-listing criteria established under the LCRCRP, basin habitat conditions described in the Sandy River Subbasin Plan and Oregon Fish Management Policies and also the Lower Columbia River Winter Steelhead Fisheries Management Evaluation Plan (LCRStWFMEP). Fish rearing and disease control methods are followed at all rearing facilities.

Monitoring and Evaluation: Conduct periodic program policy and goal reviews in relation to the LCRCRP, NFCP, LCRStWFMEP, and hatchery program management, practices, and facilities.

Harvest:

Performance Standard (3): Hatchery winter steelhead (stock 11) produced for the lower Sandy River sport fishery are released in a manner that enables effective harvest (as described in the Lower Columbia River Steelhead Fishery Management Evaluation Plan (FMEP), while minimizing harvest impacts on wild winter steelhead and generating social and economic benefits within the State of Oregon.

Indicator (3)(a): Number of adult hatchery winter steelhead produced, and the number of adult hatchery winter steelhead caught in the lower Sandy River sport fishery.
Indicator (3)(b): Number of recreational angler days in the lower Sandy River.

Monitoring and Evaluation: River and dock-side creel samples, and harvest card records.

Performance Standard (4): Hatchery releases are externally marked to enable determination of impacts to natural and hatchery-reared steelhead in the fisheries with a 100% mark-rate goal.

Indicator (4)(a): Verify that mark retention rate, at release, is close to, or at the industry standard of >95% for all release groups.

Indicator (4)(b): Quantify the number of marks observed in the fishery, and the estimated contribution of the hatchery winter steelhead population to the lower Sandy River sport fishery.

Monitoring and Evaluation: Sample all smolt release groups to verify that mark rate is >95%.

Performance Standard (5): Yearlings (smolts) are released on-station after a 2-3 week acclimation period to maximize homing potential to the lower Sandy River basin and to the Sandy River Hatchery.

Indicator (5)(a): Verify that smolts are released into locations and in condition that promotes homing to Sandy Fish Hatchery (and/or lower Sandy River basin acclimation sites).

Monitoring and evaluation: Assess condition (size and smolt characteristics) of juveniles prior to release. Conduct spawning surveys throughout the basin to determine distribution of naturally spawning fish.

1.10.2) Performance Indicators addressing "RISKS".

Life History Characteristics:

Performance Standard (6): Life history characteristics of the hatchery population do not significantly diverge from characteristics of the wild winter steelhead population.

Indicator (6)(a): Compare temporal distribution of broodstock collection vs. natural spawner escapement timing.

Indicator (6)(b): Specific life history characteristics measured (in the hatchery-reared population) include:
Adult returns

- Adult run timing
- Adult size, and sex composition at return
- Fecundity and egg size
- Age at maturity
- Smolt to adult survival rates

Monitoring and Evaluation: Prior to the removal of Marmot Dam in 2007, life history characteristics for both hatchery and wild fish were monitored by ODFW and/or PGE staff at the Marmot Dam facility. Currently, life history characteristics of hatchery-origin and wild winter steelhead are monitored through analysis of hatchery returns (run timing and age composition), spawning ground surveys, and juvenile outmigrant monitoring (USFS, City of Portland, and ODFW).

Performance Standard (8): The level of hatchery origin spawners (pHOS) found in natural spawning habitat for winter steelhead in the Sandy Basin does not exceed 10% of the total spawning population.

Indicator (8)(a): The number of hatchery winter steelhead (stock 011) spawning in the natural spawning habitat of winter steelhead in the Sandy Basin shall remain below 10%.

Indicator (8)(b): Confirm that no hatchery winter steelhead are released upstream of Cedar Creek unless it is determined after three generations that adequate seeding of available habitat is not occurring with the limited number of wild adults returning to Cedar Creek.

Monitoring and evaluation: Conduct spawning surveys throughout the basin to confirm stray rate of hatchery winter steelhead into natural spawning habitat.

Operation of Artificial Production Facilities:

Performance Standard (9): Sandy Hatchery is operated in compliance with all applicable fish health guidelines and facility operation standards and protocols: IHOT, PNFHPC, and the Oregon Fish Health Policy.

Indicator (9)(a): Verify level of compliance with applicable standards and criteria.

Monitoring and Evaluation: ODFW fish pathologists, along with hatchery staff, regularly monitor fish health and conduct fish disease examinations. Monitoring efforts include sampling for viral infections, abnormal fish loss investigations, monthly fish health checks, and pre-transfer and pre-liberation fish health inspections.

Performance Standard (10): Effluent from Sandy Hatchery will not detrimentally affect the water quality of the Sandy River and its natural populations.

Indicator (10)(a): Verify that hatchery effluent is in compliance with the existing NPDES permit.

Monitoring and Evaluation: Effluents are monitored and samples are analyzed for compliance with the NPDES permit requirements. The NPDES permit is mandated by the EPA in accordance with the Clean Water Act, and regulated by the Oregon Department of Environmental Quality.

Performance Standard (11): Water withdrawals and in stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or cause unacceptable levels of mortality to juvenile salmonids.

Indicator (11)(a): Verify that water withdrawal complies with accepted fish passage criteria and with current NMFS fish screening criteria.

Monitoring and Evaluation: Monitor the number of fish handled, frequency of trap operation, and mortalities in the adult collection trap for both hatchery and naturally produced fish of each species. Record data and monitor unmarked winter steelhead passed upstream in order to assess success of reintroduction effort. Monitor outmigration of juvenile salmonids produced upstream of Sandy Hatchery through smolt trap operation. Periodically evaluate fish screens to assure they are in compliance with NMFS criteria.

Performance Standard (12): Juvenile releases do not introduce new pathogens and do not significantly increase the level of existing pathogens in the Sandy River basin.

Indicator (12)(a): Verify that juvenile fish health inspections have occurred prior to release, and only certified fish were released.

Indicator (12)(b): Evaluate juvenile densities during hatchery rearing.

Monitoring and Evaluation: Regular monitoring efforts by ODFW fish pathologists and hatchery staff include sampling for viral infections, abnormal fish loss investigations, and pre-transfer and pre-liberation fish health inspections.

Performance Standard (13): Stream nutrient enrichment (carcass placement) is compliant with appropriate disease control regulations and guidelines, including state, tribal and federal carcass distribution guidelines.

Indicator (13)(a): Track the number and location(s) of carcasses distributed 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. ODFW's Fish Pathology Section screens carcasses for possible disease and gives final approval for all nutrient enrichment projects prior to project initiation.

Performance Standard (14): Weir/trap operation at Sandy Hatchery does not result in significant stress, injury, or mortality to the wild winter steelhead population.

Indicator (14)(a): Track the number of annual mortalities captured in adult collection facilities.

Indicator (14)(b): Track the pre-spawning mortality rate of trapped fish in the hatchery.

Indicator (14)(c): Evaluation of fallback returning adults.

Indicator (14)(d): Evaluate reintroduction of winter steelhead and coho passed upstream of the hatchery

Monitoring and Evaluation: Monitor the number of fish handled, frequency of trap operation, and mortalities in the adult collection traps/weirs for both hatchery and naturally produced fish of each species. Record data and monitor unmarked winter steelhead passed upstream of Sandy Hatchery in order to assess success of reintroduction effort. Conduct spawning surveys upstream of the hatchery to assess natural production of fish passed upstream of the hatchery. Monitor outmigration of juvenile salmonids produced upstream of Sandy Hatchery through smolt trap operation. Assess fallback of wild steelhead passed upstream through placement of external tag (floy).

Socio-Economic Effectiveness:

Performance Standard (15): Sport fishery benefits for which the program is designed are achieved.

Indicator (15)(a): Use harvest card information as well as data collected through creel surveys to determine effectiveness of hatchery program.

1.11) Expected size of program.

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

A minimum of 132 adults are required to meet the smolts production goal of 160,000. This number allows for an adult mortality of up to 22 fish, and is expected to yield a total of 160,000 smolts for release. 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 up to 26 wild adults and incorporating them into the broodstock. No more than 2% of the natural spawning population will be collected for broodstock integration.

The number of wild adults incorporated into the brood (up to 26) will remain constant. See Attachment 1 *(page 89)* for information regarding levels of integration proposed based on varying abundance of adult returns.

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

Table 1.11.2. Proposed annual fish release levels for the Sandy Hatchery winter steelhead program.

Life Stage	Release Location	Proposed Release Numbers
Eyed Egg	na	na
Unfed Fry	na	na
Fry	na	na
Pre-smolt	na	na
Smolt [a/]	Cedar Creek (Sandy Hatchery)	160,000

[a/] Currently, fish are released into Cedar Creek at the Sandy Hatchery and into the lower mainstem Sandy River (after 2-3 week acclimation at Sandy Hatchery) if low flows prevent successful release from the hatchery. The maximum number released at an individual or combined locations will not exceed 176,000 smolts (+/-10% of the target release number; IHOT standard).

1.12) Current program performance.

Performance estimates, including adult production levels and smolt to adult survival rates, for the Sandy Hatchery winter steelhead program are presented in Table 1.12.

The estimated number of total adult hatchery winter steelhead produced was derived from a variety of data sources. The number of smolts released into the Sandy River each year was obtained from Sandy Hatchery release records stored in HMIS (Hatchery Management Information System). The "Adult Return" columns depict the actual count of program-specific adult hatchery winter steelhead returns to both the Sandy Hatchery and Marmot Dam (from HMIS). The "Harvest Rate" column is based on an expanded harvest card estimate of winter steelhead in the Sandy River (ODFW, http://www.dfw.state.or.us/resources/fishing/sportcatch.asp, 2011).

To relate adults produced to smolt release numbers it was necessary to estimate the age composition of the returning adults. Age composition data (from *M.W Chilcote (2001) Conservation Assessment of Steelhead Populations in Oregon. Pg. 66)* was used to estimate smolt to adult survival rates since age data for adult returns from the integrated broodstock program is not currently available. All adults returning to the Sandy River (Marmot dam, Sandy Hatchery, and Terminal Harvest) were apportioned to a brood year based on the average age composition. A smolt to adult survival proportion was then estimated for each brood year by dividing the total number of returning adults by the number of smolts released.

Table 1.12. Total release numbers and estimated smolt-to-adult survival rates for the Sandy River winter steelhead program (Brood year 1997-2009)**.**

Brood Year	Smolts Released	Return Year	Adult Returns			Smolt-Adult survival (%)[c/]
			Marmot Dam[a/]	Sandy H[a/]	Terminal Harvest[b/]	
1997	206,012	2000/01	0	43	1812	0.90
1998	231,107	2001/02	68	83	2996	1.36
1999	194,291	2002/03	459	460	1600	1.30
2000	158,916	2003/04	19	684	1584	1.44
2001	163,002	2004/05	8	669	931	0.99
2002	178,293	2005/06	6	546	961	0.85
2003	166,239	2006/07	9	371	1175	0.94
2004	173,299	2007/08	11	488	1994	1.44.
2005	149,670	2008/09	N/A	724	2094	1.88
2006	174,902	2009/10	N/A	649	1625	1.30
2007	184,222	2010/11	N/A	256	572	0.45
2008	156,385	2011/12	N/A	1548	INC	INC
2009	169,095	2012/13	N/A	1846	INC	INC

Source: HMIS, Corvallis Research Lab
[a/] Sandy Hatchery and Marmot Dam data obtained from the HMIS database.
[b/] Terminal harvest is estimated using harvest card data.
[c/] Catch and returns to Sandy H and Marmot Dam in a given run year are apportioned to brood years based on age composition data described above.
The 1999 return year was the first year that all returning hatchery and wild fish could be distinguished.
INC: Incomplete data for a brood year.
N/A: data not available (dam removed).
1997-99 broodstock was a mix of stock 13 and 20.
2000 brood year release was a mix of stock 11W and 13 (118,718 stock 11W and 40,198 stock 13)
2001 brood year release was first year that all smolts were derived from wild broodstock

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

The first hatchery program for winter steelhead in the Sandy River basin started in 1898 with the collection of 22,000 eggs from the Salmon River. Collection of steelhead eggs occurred intermittently from 1898 through 1945 for these early hatchery programs (Mattson 1955). The present-day Sandy Hatchery started producing winter steelhead in 1955 and over the years released fish from a variety of stocks including Big Creek, Eagle Creek, Alsea and Sandy.

In 2000, the first wild winter steelhead adults were collected for the current in-basin broodstock program, and in 2001 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.

This is an ongoing program.

1.15) Watersheds targeted by the program.

Targeted watersheds include:

Lower Sandy River including Cedar Creek, below the former Marmot Dam site (smolt release, migration, harvest, adult return); Columbia River, below Sandy River confluence (migration, harvest).

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

The following ALTERNATIVES have been considered for this program:

1) Use of out-of-basin Big Creek stock as broodstock for this program. In 1991, the Commission adopted the Wild Fish Management Policy. This document provided the initial motivation to convert the program to the exclusive use of in-basin locally adapted broodstock. The choice to move to an endemic origin brood ultimately expanded the timing of the recreational fishery by over two months, while protecting the genetic base of the Sandy winter steelhead.

2) Maintaining a winter steelhead hatchery brood that is comprised of 20% wild adults and 80% hatchery adults when the wild population's health can sustain the removal of adults.

3) Creating a hatchery brood that uses wild brood exclusively. This alternative was not chosen because of the practicality of collecting all wild fish for the program. Also considered is the possible damage it could pose to a stock of winter steelhead that was declining in numbers.

4) Discontinue a hatchery winter steelhead program in the Sandy River basin, and sustain the lower river sport fishery with natural (wild) winter steelhead; and/or discontinue the lower river sport fishery. Choosing this alternative would have eliminated or greatly reduced a very popular existing sport fishery as well as negated mitigation agreements between the department and NMFS, and with the City of Portland. Due to the protective actions by the Department for the wild Sandy winter steelhead, such as the elimination of the release of hatchery catchable trout, harvest of marked steelhead only, catch and release trout regulation, and limiting to less than 10% the proportion of hatchery adults on the spawning grounds, the sport fishery could continue and the genetics of the wild Sandy winter steelhead would be protected

1.16.1) Brief Overview of Key Issues.

The Sandy River winter steelhead program is an integrated program that utilizes hatchery and natural origin fish from the Sandy River for the brood. The program transitioned to an integrated stock in 2000 to increase angler benefits by prolonging the winter steelhead

season at least two months more than the former (Big Creek) hatchery stock. The program involves the release of smolts produced from hatchery adults returning to Cedar Creek, a tributary of the Sandy River and potentially hatchery adults collected by hook and line in lower river fisheries. Early incubation occurs at Sandy Hatchery, eyed eggs are transferred to Oak Springs Hatchery for final incubation and early rearing. Fingerlings are transferred to Bonneville Hatchery in October for further rearing prior to being transferred to Sandy Hatchery for final acclimation and release. Some returning adult winter steelhead may be recycled through lower river fisheries on a limited basis. The purpose of the program is to provide recreational harvest opportunities in the lower Sandy River while reducing potential risk to wild winter steelhead in the Sandy Basin.

Issue 1: Out-of-basin rearing may impede imprinting of the hatchery stock to Cedar Creek and increase the incidence of straying.

Issue 2: Future changes to the program may be necessary to control adult stray rates into the upper basin, now that Marmot Dam has been removed, if the rates exceed the ODFW standards adopted for the basin.

Issue 3: Information is not available to assess the effects of recycling hatchery winter steelhead in the lower river. Some of these fish may stray and spawn in the lower river and tributaries.

1.16.2) Potential Alternatives to the Current Program.

The following draft alternatives were identified during public workshops and are not necessarily being endorsed by the managing agency or the author of this document.

Issue 1; Alternative 1: *Rear all Sandy winter steelhead hatchery smolts within the Sandy basin.*

Pros & Cons: Adaptation of the hatchery stock would be driven by local watershed conditions if all smolts were reared exclusively at Sandy Hatchery. This change may cause stray rates to decline, though no current stray problem has been documented. Sandy Hatchery lacks the rearing space and water supply to fully rear all winter steelhead smolts at the facility for the entire year. 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 passage (Issue 5): 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. Some operational cost reductions would

occur due to decreased expenses to transport fish. Annual operational 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 late winter steelhead hatchery smolts.*

Pros & Cons: This alternative does not require additional financial investments in capital construction and water supply development at the facility, and the highly popular winter steelhead fishery would continue in the Sandy Basin. However, adaptation of the hatchery stock would not be fully driven by local watershed conditions, and stray rates could potentially continue to be influenced by out-of-basin rearing.

Issue 2; Alternative 1: *If Sandy winter steelhead stray rates exceed ODFW adopted standards, investigate options for program changes to reduce stray rates including reducing smolt release numbers, developing alternate acclimation and release sites, and developing adult trapping facilities in the lower Sandy (such as in the Bull Run River).*

Pros & Cons: If determined to be necessary, an evaluation would be required to identify alternate program management strategies and (potentially) related facility development needs; funds are not available for the evaluation. If successful, program changes that limit stray rates could reduce risks to naturally produced winter steelhead populations in the upper basin. Implementing an option of alternate release sites and adult trapping facility development could have minimal effects to recreational anglers and may create new fishing areas in the vicinity of the new release/trap site. This option could require capital investments for facility development, but funds are not available. If a reduction in smolt releases is required, the recreational fishery could be impacted and angler opposition would occur. Due to the current low stray rate observed for hatchery winter steelhead in the Sandy basin (below 10% in the last 5 years of Marmot trap operation; 2.6% basin-wide in 2010 based on spawning surveys), interaction between wild and hatchery winter steelhead on spawning grounds should be minimal throughout the Sandy Basin.

Issue 3; Alternative 1: *Conduct an investigation to determine the fate of hatchery winter steelhead that are recycled through the lower river fishery, and evaluate the extent and location of natural spawning by recycled winter steelhead. If necessary, based on the information obtained, develop management strategies to reduce potential interactions between hatchery winter steelhead and the naturally produced winter steelhead population.*

Pros & Cons: Implementation of this study would provide information to determine how well recycled hatchery winter steelhead are contributing to recreational fisheries, and whether natural spawning by un-harvested fish is occurring in the lower basin. This information could provide a basis for future management decisions to reduce risk to native winter steelhead populations, and management decisions would be based on information rather than speculation. The information obtained could ultimately result in improved conservation of the winter steelhead population. The study requires financial investment, though, and no source of funding has been identified. If warranted by the study, elimination or reduction of the program could occur which would impact a popular

recreational fishery and result in significant opposition from the sports fishing industry and anglers.

1.16.3) Potential Reforms and Investments.

Reform/Investment 1: Conduct a feasibility study to determine if additional rearing space development and associated increases to the facility water supply could be completed to allow all steelhead smolts to be reared at the facility. Determine if other conditions (e.g. water quality) would affect the ability to fully rear all steelhead smolts at the facility. Assess the costs of increasing rearing space and developing additional water supply infrastructure. The cost of the study is currently undetermined but a portion of the information needed may be available from the planning and design process being completed for the fish passage restoration project. The cost of constructing additional rearing space and developing the infrastructure for increased water supplies to rear fish for the entire year would be determined by the study. {Issue #1}

Reform/Investment 2: If needed to reduce interactions between hatchery and wild winter steelhead populations in the upper Sandy basin, conduct a feasibility study to identify alternate smolt release locations in the lower Sandy basin where adult trapping facilities could be constructed. Assess the costs of constructing, operating and maintaining a remote trapping facility. The cost of the study is currently undetermined. The cost of constructing, operating and maintaining a remote trapping facility would be determined by the study. {Issue #2}

Reform/Investment 3: Conduct a study to evaluate the fate of winter steelhead recycled through the lower Sandy River fishery. The study should determine the proportion of recycled fish that: (1) are harvested by anglers, (2) subsequently return to trapping facilities, (3) spawn naturally (including identification of spawning activity locations), or (4) migrate out of the basin or become mortalities after recycling. Based on the information collected, identify management strategies to reduce potential interactions between recycled hatchery winter steelhead and the wild winter steelhead population. The cost of the study is currently undetermined. {Issue #3}

SECTION 2. PROGRAM EFFECTS ON NMFS 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 winter steelhead program are covered by the following:

- Section 7 (Consultation) - 1999 Biological Opinion on 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. Portland, Oregon.
- Section 4d - Lower Columbia River Steelhead FMEP.
- An ESA Section 7 Biological Opinion and Incidental Take Statement authorizing this program was issued September 28, 2012.

2.2) Provide descriptions, status, and projected take actions and levels for NMFS 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 Sandy Basin 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 NMFS 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.

Lower Columbia River winter steelhead (Threatened)-

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, Sandy, 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 winter steelhead population may be directly affected by the program due to weir exclusion and brood collection activities.

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- Identify the NMFS ESA-listed population(s) that may be incidentally 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) winter steelhead. While the potential exists for negative impacts, no direct effect has yet to be quantified regarding which, if any, of these populations are affected, and in what way. However, it is believed that any incidental impact to listed species will be minimal, based upon risk aversion measures of the hatchery program identified in this HGMP. These listed species include:

Lower Columbia River Chinook - The Lower Columbia River Chinook salmon ESU was listed as threatened under the ESA effective May 24, 1999. This ESU includes all naturally spawned 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.

Columbia River Bull Trout - 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.

Columbia River Chum - 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.

Lower Columbia River Coho - Lower Columbia River coho are listed as endangered by the State of Oregon (Oregon populations only) 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.

Indirect take of or impact on above listed fish may occur due to competition for food and space during outmigration of the hatchery program fish. All juvenile fish are released as full-term smolts in order to facilitate rapid outmigration which minimizes potential competitive interactions.

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

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

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 winter steelhead program (McElhany et al. 2007). The MAT values were based on modeling over a 100 year period and reflect a 100 year average abundance. To be considered a certain risk level, a population must meet the abundance and productivity criteria defined by the WLC-TRT or the MAT – whichever is greater. 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 current 100-year modeled average abundance of 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 and above the "critical" level respectively at 144 and 714. The Sandy winter steelhead assessed abundance (100-year modeled average of 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 (Source: Table 9-3 of the Recovery Plan).

Table 2.2.2a. Sandy-specific Recovery Plan actions addressing the winter steelhead hatchery program (Source: Table 9-3 of the Recovery Plan).

Action ID	Action	Status in the Sandy Basin
219-SY	Provide / improve fish passage at Sandy Hatchery	In process of being implemented
241-SY	Implement a sliding scale for take of wild winter steelhead 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.	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
243-SY	Explore adding a life-cycle monitoring site in the Sandy population on Cedar Creek or in the Sandy River	Action under review

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 (taken 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. Summary of the current status and Delisting Scenario for Oregon Populations of Salmon and Steelhead in the Lower Columbia River (Source: *Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead-Table 6-36*). *Note: Abundances presented here (both current and delisting) are modeled and represent 100 year averages.*

		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	---

Table 2.2.2c. Summary of the percent improvement required for each threat category in order to achieve the delisting desired status (shared popns w/WA indicated by 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 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 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 prior to dam removal in 2007. Prior to 1999 wild and hatchery steelhead could not be distinguished and all fish were passed upstream. All hatchery coho starting in 1999 and spring Chinook starting in 2002 were marked with an adipose fin-clip, so only wild fish were intentionally passed upstream of Marmot Dam. Data of total number of salmon and steelhead counts at Marmot Dam since 1992 are provided in Table 2.2.2d.

Spawning ground surveys were completed in the Sandy basin in 2004, 2006 and 2007, and Marmot Dam counts of steelhead passing into the upper basin were utilized as the sole method to measure trends in winter steelhead escapement. These counts do not account for natural spawning in the lower basin, though this area does not contain a significant portion of the potential spawning habitat. In 2006-07, and again in 2010-12, spawning ground surveys were conducted throughout the basin, and it is expected this basin-wide inventory will be completed in future years.

2010 Winter Steelhead spawner survey data available at:
http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/summaries/10/STWReddEstimate2010LC.pdf

2011Winter Steelhead spawner survey data available at:
http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/summaries/11/STWReddEstimate2011LC.pdf

2012 Winter Steelhead Annual Report
http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/reports/12STWAnnualReport.pdf

Table 2.2.2d. Total numbers of salmon and steelhead counted at Marmot Dam (Sandy River), 1992-2007, and estimated from spawning ground surveys (2008-2013).

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 coho and steelhead and 1992-2002 estimate of spring Chinook from Appendix C of LCRCRP (ODFW 2010) (*indicated by dashed line). Number of coho and steelhead from 1999-2007 and number of spring Chinook from 2002-07 from actual counts at Marmot Dam. 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.

[d/] Partial count due to Marmot Dam removal on October 17, 2007.

Data from 1999-2007 are from ODFW-Marmot Dam counts.

Marmot Dam data prior to 1999 obtained from Doug Cramer-PGE

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

The natural spawning grounds in the upper Sandy Basin (above Marmot Dam) was managed as a wild fish sanctuary from 1999 to 2007 (no marked fish were passed above Marmot Dam). However, ODFW has observed that a limited number of hatchery fish spawn naturally in the lower mainstem Sandy River. ODFW staff estimate that approximately 85% of the currently accessible natural spawning habitat for winter steelhead exists upstream of the former Marmot Dam site. Limited quantified data exist for the total number or proportion of hatchery and wild fish spawning naturally below Marmot Dam site but it is assumed to be low based on surveys conducted prior to Marmot removal in 2006 and 2007 as well as ongoing surveys started in 2010.

The estimated proportion of hatchery steelhead in the natural spawning escapement upstream of the former Marmot Dam is presented in Table 2.2.2e. On the Sandy River, hatchery steelhead were not passed above Marmot Dam since 1999 and hence have been excluded from the primary spawning areas. Prior to 1999, the proportion of hatchery fish on the spawning grounds (above Marmot Dam) are based on Marmot Dam counts and CWT recoveries (Chilcote 2001).

Table 2.2.2e. Estimated percentage of hatchery steelhead in the natural spawning escapement (pHOS), Sandy River 1999-2013.

Run Year	Winter Steelhead
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008[a/]	n/a
2009[a/]	n/a
2010	28.5%
2011	0
2012	0
2013	6.4%

Source: Estimates from 1992-1998 based on data from Appendix C of the LCRCRP (ODFW 2010). No hatchery winter or summer steelhead have been passed above Marmot Dam since 1999. Estimates from 1999-2007 do not include potential for unintended passage of mis-marked hatchery winter and summer steelhead. Due to the low rate of stray for hatchery summer and winter steelhead, the proportion of hatchery fish in the natural spawning escapement is below 0.05 of the total escapement. 2010-13 estimates from surveys conducted by ODFW Corvallis Research (see page 27 for links to data).

[a/] No spawning surveys conducted.

Between 1999 and the removal of Marmot Dam in October 2007, all hatchery-produced marked steelhead captured at the Marmot Dam trap were brought to the hatchery for spawning and were not allowed to migrate upstream above the dam site. Unmarked winter steelhead that entered the Sandy Hatchery were recycled back into Sandy River or incorporated into the broodstock through 2011. Beginning in 2012, all unmarked winter steelhead that enter Sandy Hatchery will be passed upstream. The Marmot Dam counts are presented in Table 2.2.2d.

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

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

Broodstock collection (trapping and sorting) is the only hatchery activity that may lead to incidental take of listed fish. A description of these activities is provided in more detail in the following section.

Incidental take of listed juvenile salmonids is not expected to occur through activities associated with the hatchery winter steelhead program at Sandy Hatchery. The interactions of hatchery and naturally-produced smolts occur in the Sandy River, but these effects have not been quantified. Interactions between hatchery juveniles and wild juveniles are minimized by rearing and release strategies that promote rapid emigration and low stray rates.

a) Adult collection, sorting, and holding at Sandy Hatchery:

Unmarked adult steelhead and coho may be collected, sorted and released at Sandy Hatchery. The hatchery trap is operated daily and checked a minimum of once per day during adult returns. A limited number of wild winter steelhead have returned to Sandy Hatchery since the program started. Beginning in 2011, wild winter steelhead arriving at the hatchery will be passed into Cedar Creek upstream of the hatchery after sorting to exclude hatchery-origin (marked) fish. Hatchery steelhead that arrive early in the return year (December-February) are recycled to Lewis and Clark Park to provide additional angler opportunity. Winter steelhead will continue to be recycled through the lower river sport fishery provided stray rates remain at or below 10% in the natural spawning habitat for winter steelhead in the Sandy Basin. Additional information regarding the winter steelhead recycling program is provided in Section 7.5.

b) Broodstock collected by hook and line:

Broodstock for the Sandy winter steelhead program may be collected by hook and line in the middle and lower Sandy River between Dodge and Lewis and Clark parks. Anglers who volunteer to collect fin-clipped and un-clipped winter steelhead for the program receive specific instruction on proper handling, transporting or releasing of wild winter steelhead.

Adults are collected by this method starting in late December and continuing through early March in order to represent the natural run-timing of Sandy River wild winter steelhead. Anglers participating in the program are provided with an aerated live tank, instructions on proper handling and transport of fish, and written authorization to handle and transport hatchery or wild winter steelhead collected in the Sandy River.

- 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 winter steelhead adults to establish the integrated broodstock began at Marmot Dam in 2000 and ended in 2007. From 2008 through 2011, wild (unmarked) winter steelhead were collected at the hatchery, or by hook and line in the lower river and were incorporated into the broodstock. Data concerning the number of wild winter steelhead collected at Marmot Dam (2000-07), Sandy Hatchery, and by hook and line (2008-11), and their mortalities are presented in Table 2.2.3. No wild adults were collected in run years 2011-12 and 2012-13.

Table 2.2.3. Number of adult winter steelhead collected for broodstock at Marmot Dam (2000-2007), Sandy Hatchery, and by hook and line (2008-2011). Listed mortalities are due to handling, sorting, and/or transport.

Run Year	# Fish Collected[a/]		# Mortality	% Mortality of wild fish only
	Wild	Hatchery		
2000	140	0	2	1.4
2001	161	0	0	0
2002	167 (7)	0	0	0
2003	92 (5)	66	0	0
2004	87 (12)	108	2	2.7
2005	68 (5)	62	3	4.8
2006	88 (12)	94	0	0
2007	72 (9)	128	3	4.8
2008	43 (12)	143	0	0
2009	36 (4)	120	2	10
2010	38 (2)	119	1	3.2
2011	45	136	4	8.8
2012	0	265	0	n/a
2013	0	200	1	n/a

Source: Sandy Hatchery records/HMIS

[a/] Number in parentheses indicates wild fish collected at Sandy Hatchery for brood

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

See Section13, Attachment 2 for estimated annual take levels of listed salmonids from activities at Sandy Hatchery.

- 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 winter steelhead, coho, or fall Chinook are collected at the Sandy Hatchery, they will be sorted and allowed to pass upstream of the hatchery. Naturally produced, unmarked summer steelhead trapped at the hatchery between June 1 and September 30 will be sorted and transported back to the Sandy River and released at Lewis and Clark Park. If wild spring Chinook are collected at the Sandy Hatchery, they will be returned to the Sandy River to migrate upstream.

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.

- *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 through 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.

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

This document outlines the plans for selective fisheries for hatchery produced steelhead 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.

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

- Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead
- Section 7 Biological Opinion and Incidental Take Statement for Sandy Hatchery Winter Steelhead program issued September 28, 2012
- Fisheries Management and Evaluation Plan for the Lower Columbia Steelhead
- US vs. Canada Treaty
- Native Fish Conservation Policy
- Fish Hatchery Management Policy
- Fish Health Management Policy
- Biological Opinion on Artificial Propagation in the Columbia River Basin, 1999. Incidental Take of Listed Salmon and Steelhead from Federal and Non-Federal

Hatchery Programs that Collect, Rear and Release Unlisted Fish Species, Portland, Oregon.

- The Mitchell Act
- NPDES permit for hatchery operations.

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

3.3) Relationship to harvest objectives.

The Sandy River Basin Fish Management Plan (adopted in 1997) directed use of out-of-basin stock that has an early adult return to the Sandy River basin (December through March). However, endemic winter steelhead enter the Sandy basin from December through May. As the Sandy River winter steelhead program transitioned to the new localized stock, anglers were directed to change their fishing strategies to a later winter fishery to target and capture the new endemic hatchery brood.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1999-2011), if available.

Harvest management in the Sandy Basin is described in detail in the LCR steelhead FMEP.

" The primary focus of this FMEP is on fisheries that target hatchery adult winter and summer steelhead where the majority of fishery-related impact occurs. The modification of certain hatchery programs for winter and summer steelhead has significantly reduced, but not eliminated the potential fishery impacts on native winter steelhead adults and juveniles. The Oregon department of Fish and Wildlife proposes to continue the adult steelhead harvest regime currently in place in the Lower Columbia River ESU. This regime has been structured and implemented over a number of years to provide what we believe to be highly significant protection to both adult and juvenile winter steelhead. Our long-term intent is to provide consumptive fisheries for hatchery winter and summer steelhead while minimizing fishery-associated mortality on wild winter steelhead. We do not anticipate the re-establishment of consumptive fisheries for wild winter steelhead in the foreseeable future." (ODFW 2001).

The past winter steelhead fishery was comprised of both native and out of basin hatchery winter steelhead stocks. Harvest Card information shows variability in harvest year to year that is likely the result of variable ocean conditions (ocean survival) and size/condition of smolts upon release from Sandy Hatchery (Table 3.3.1). Adult returns from the new integrated broodstock program started in 2003 and 2004 (the first smolt release was in 2001). Data presented in Table 3.3.1 shows historical winter steelhead sport fishery data, in the lower Sandy River basin below the former Marmot Dam from 1995-2007 and in the Sandy Basin below the mouth of the Salmon River in 2008 and 2009.

Table 3.3.1. Sport harvest of Sandy winter steelhead within the Sandy River Basin, by run year, 1995-2011.

Run year	Sport Harvest
1995	1,850
1996	1,273
1997	1,290
1998[a/]	828
1999[a/]	1,009
2000	798
2001	2,837
2002	2,782
2003	1,545
2004	2,051
2005	957
2006	1,111
2007	1,175
2008	1,994
2009	2,094
2010	1,625
2011	572

[a/] Winter steelhead were not 100% marked until the 1996 brood year leading to unmarked hatchery fish returning through at least 1999. Sport catch data through 1997 includes harvest of unmarked wild or hatchery winter steelhead prior to ESA listing in 1998.

As proposed under Alternative 3 of the Sandy Basin Plan Amendment (ODFW 2001), the entire run will be comprised of in basin stock. It is known that it will change the fishery by moving it to later in the winter. However it is thought that it will become a stronger run and provide an excellent fishery. Refer to the lower Columbia River Steelhead FMEP for a comprehensive review of the Sandy River winter steelhead fishery.

3.4) Relationship to habitat protection and recovery strategies.

The Sandy River basin is a diverse system, containing important fish habitat that requires appropriate protection and recovery strategies to help improve native salmonid populations in the basin. The Bull Run River drainage is the water source for the City of Portland, which demands effective protection. 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, add in-channel debris barriers.

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

Objective 3. Inventory stream and watershed conditions using current methods to assess factors limiting 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.

In general, the Sandy Hatchery winter steelhead program is consistent with these habitat protection and recovery strategies. However the barrier/water intake at Sandy Hatchery (on Cedar Creek) is inconsistent with objectives 1 and 2 above. See Section 1.16.1 for a discussion of proposed alternative actions.

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).
- Native salmonids.
- Northern pikeminnow.
- Out-of-basin hatchery salmonid releases.
- Known or unknown aquatic non-indigenous (invasive) animals and plants.

The majority of the preceding species can be characterized as predators of juvenile salmonids, or competitors which may negatively affect Sandy Hatchery winter steelhead 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 winter steelhead. 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 winter steelhead. However, the winter steelhead 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. The smolts are also released in the lower portion of the Sandy River where limited wild juvenile rearing occurs, so there is likely to be minimal competition between hatchery and wild salmonids.

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:

Hatchery winter steelhead have the potential to spawn in mainstem and tributary reaches near or below their release site at Sandy Hatchery on Cedar Creek. The primary spawning and rearing habitats exist in the mainstem and tributaries above the former Marmot Dam (70%), although suitable habitat exists down river; hence, hatchery steelhead may breed with other hatchery fish or wild fish occupying the same habitat. Potential risks to wild winter steelhead include loss of genetic variation within and between populations, genetic drift, and domestication (resulting from hatchery selection). Spawning surveys and Marmot Dam counts indicate limited stray of hatchery winter steelhead but to address the potential risk, Department personnel conduct the following risk avoidance measures:

- Hatchery smolts acclimate and volitionally emigrate out of Cedar Creek, a tributary to the lower Sandy River. Smolts are released into targeted areas to promote adult homing to lower subbasin areas (to promote lower river fisheries) and to Cedar Creek (for adult collection).

- The hatchery brood was recently re-founded using adult returns to the Sandy River (refer to section 6 for historical details). The past early run winter steelhead hatchery stock (Big Creek (013)) was phased-out and replaced with a localized hatchery brood to avoid (or prevent) common effects of using non-local breeding stocks and/or long-term domesticated stocks; for example, juvenile and adult run timing, foraging patterns, spawning behavior, and natal stream homing may be altered due to potential spawning interactions between non-local early hatchery run winter steelhead and the local wild run (Note: Spawning interaction between the early and late run stock were thought to be minimal due to substantial difference in run and spawn timing between the stocks).

- We hope to maximize adult homing to the lower Sandy Basin, while reducing straying within the Sandy Basin and to nearby subbasins that support winter steelhead, such as the Clackamas River.

- The Department manages the hatchery program in accordance with the LCRCRP, which calls for limiting hatchery steelhead to less than 10% of the natural spawner population in the natural spawning habitat for winter steelhead in the Sandy River.

(b) <u>Broodstock Collection, Selection and Rearing</u>
Although hatchery protocols generally avoid intentional selection for particular traits (i.e. body composition, age, or size), some degree of domestication (or artificial selection) is unavoidable. Just as natural selection imposes certain environmental strains on in-river species, and culls certain segments of a population, hatcheries will impose certain strains (and survival advantages) to fish rearing within the hatchery, yielding a hatchery

population that differs from its wild counterparts. For example, fish culture techniques such as adjusted feed rates and length grading, are used to separate fish groups; smaller fish are put on an adjusted feed rate to promote rapid growth in the absence of competition with larger, perhaps more aggressive steelhead. Likewise, hatchery winter steelhead are released as one year old smolts, whereas in nature, steelhead rear for one to three years in freshwater prior to migrating to the ocean. Because of these types of fish culture techniques, hatchery winter steelhead may exhibit a more homogenized age and size composition (through adulthood); and may experience a narrower smolt migration period.

To avoid (or minimize) domestication (or selection) in the hatchery brood population, steps will be taken to maintain as many of the characteristics of the wild population as possible through broodstock selection and mating. The number of hatchery fish spawned in the hatchery will be maintained at a high enough level to avoid loss of heterozygosity. As run sizes allow, a small proportion (less than 2%) of the wild Sandy winter steelhead population will be integrated into the hatchery broodstock on an annual basis to keep the hatchery and wild populations genetically similar.

Operating the Sandy Hatchery trap may harass (or indirectly impact) wild steelhead adults by blocking or delaying natural migrations. As a result adults may reject the collection trap, fallback, and spawn downstream in non-native (or less suitable) spawning grounds. In addition, handling by hatchery personnel may induce stress, which may inadvertently affect natural spawning behaviors. The combined result of these actions may displace adult spawning (temporal and spatial distributions). To avoid these risks, the Department does the following:

- Wild winter steelhead and coho are being passed upstream of the hatchery in an effort to re-colonize over 12 miles of quality spawning habitat. NMFS compliant screens are now in place to protect downstream migrating juveniles from being entrained in the hatchery intake.

- ODFW recently installed new adult pond screens and gates to allow simultaneous acclimation of smolts and collection of adults in the adult holding pond. This prevents over-crowding of adult winter steelhead in the hatchery ladder and entrance pool which can cause stress and increase the risk of disease transmission.

- ODFW staff use special care when handling adult fish, to ensure that fish are released unharmed.

- Sandy Hatchery trap will be checked daily. All non-fin clipped adult steelhead will be sorted and volitionally released back into Cedar Creek upstream of adult diversion weir.

(c) Competition and Carrying Capacity

Carrying capacity is a function of both a population and its environment, and can be defined as the "upper limit on the steady-state population size that an environment can support" (Brannon et. al. 1999). Hence, freshwater carrying capacity may be compromised if hatchery steelhead displace wild fish in their natural rearing habitats. For example, wild juveniles can be displaced as a result of residing hatchery fish and experience premature emigration, increased vulnerability to predators (from being in more exposed areas), and competition for food and space. Although there is little data to substantiate whether competitive interactions are occurring in the Sandy basin, there is chance that it may occur in lower river reaches, below the former Marmot Dam. The following are several strategies the Department uses to avoid (or minimize) risks associated with hatchery and wild steelhead competitive interactions and carrying capacity concerns.

- **Size at release** – To minimize competitive impacts (or density dependent effects), ODFW releases large (180-250 mm) steelhead as recommended by the NMFS (1999 NMFS) to promote swift emigration and prevent residualization; and subsequently minimize temporal and spatial overlap for food and cover. [However, it should be noted that length is a non-specific smolt character that does not indicate whether a fish has begun to physiological smoltification (Beckman 1999). A study of spring Chinook showed that smoltification and eventual adult survival was more closely linked to smolt attributes such as accelerated spring growth rate, elevated gill NA+, K+ -ATPase, and elevated plasma insulin growth factors-I (IGF-1) (Beckman 1999). Previous studies conducted by Ewing and Birks (1982) and Zaugg and Mahnken (1991) showed similar results.]

- **Type and location of release** – Winter steelhead are acclimated for 2-3 weeks and volitionally released into Cedar Creek over a one week period (detailed info in Section 10.6). Acclimated release (versus direct release of large groups of fish) is believed to reduce density dependent effects; steelhead leave voluntarily from Sandy Hatchery, while experiencing on-site environmental cues and conditions, such as stream flow, temperature, light and weather condition. In addition, these basin specific environmental cues, along with pre-migration imprinting are believed to encourage spatial adult homing. Further, these hatchery releases are not known to significantly overlap with naturally occurring wild steelhead; hence, hatchery steelhead are spatially segregated from primary rearing habitats (above Marmot Dam). See Section 10.4 for detailed release protocol.

- **Number of fish released** – The number of winter steelhead released from this program is 160,000. This number of fish released 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 (USFWS 1999). Fish releases will be coordinated such that total basin-wide hatchery releases do not overlap, or do not "swamp" natural production.

- **Adult removal** – The Department believes that over 85% of the natural spawning habitat of winter steelhead in the Sandy basin occurs above the former Marmot Dam (primarily in the Salmon River and Still Creek basins). Adult hatchery fish and adult wild fish may coexist (and spawn) in the lower Sandy basin; however, since the majority of steelhead spawn and rear in the upper Sandy basin and hatchery winter steelhead have high affinity for their release point in Cedar Creek, interactions are believed to be minimal.

(d) Disease Transmission

Disease transmission and their effects on fish populations result from multiple environmental factors and interacting causes; establishing definitive cause and effect relationships is difficult (McIvar 1997). However, because hatchery steelhead are reared, acclimated, released and return to the Sandy River basin, they can be a source of pathogen and disease transmission to residing fish populations. The Department recognizes the importance and magnitude of fish disease and health, and hatchery steelhead are managed to minimize disease transmission to wild populations.

Fish health goals at Sandy Hatchery are to maximize survival at all life stages using disease control and disease prevention techniques. To prevent introduction, spread or amplification of fish pathogens, all activities are conducted in accordance with guidelines developed under the Pacific Northwest Fish Health Protection Committee and according to protocols outlined by the Integrated Hatchery Operations Team (IHOT 1995). Further, Department 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 (see Appendix D and Appendix F).

(e) Predation

Hatchery steelhead released into nursery habitats may residualize within the subbasin and directly prey on naturally producing salmon and steelhead fry. Due to their location, size and time of emergence, newly emerged Chinook salmon fry and fingerling are likely to be the most vulnerable to predation by hatchery released fish (NMFS 1999). Salmonids are believed to prey on fish less than or equal to 1/3 their body length (USFWS 1994). 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. Indirect mortality resulting from the presence of hatchery fish has not been quantitatively demonstrated to-date.

To minimize direct mortality (or consumption) on wild fish, NMFS directed ODFW via the 1999 Biological Opinion to release large winter steelhead smolts at 171-237 mm forklength (mean forklength = 209 mm) to promote swift emigration, prevent residualization and subsequent predation on residing fish species. Within the Sandy River Basin, winter steelhead naturally migrate at 120-220 mm forklength (mean forklength = 139 mm (USFS, 2001)). Hence, hatchery steelhead are skewed from the natural population size structure by approximately 33%. The benefits of having swift

emigration versus managing releases to match natural population size structure is an impact that the Department will investigate as resources become available.

The above risk management practices and strategies may polarize (or further diverge) the wild population from the hatchery population. All are conscious management decisions, intended to optimize sport fishery opportunities, which is the primary purpose of the program.

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 Sandy Hatchery is Cedar Creek, a tributary to the Sandy River. Water rights total 12,577 gpm. Water is supplied to the hatchery by gravity flow. Cedar Creek's average water temperature is 45°F during the acclimation period. The intake system in Cedar Creek is 100% screened and is considered compliant to 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

Bonneville Hatchery – Bonneville Hatchery operates on a mixture of well water supply (13,000 gpm) and Tanner Creek surface water. Water from Tanner Creek is supplied by gravity. However, it sometimes freezes in December and January so it is not a reliable water supply during these months. Both water sources meet or exceed the recommended IHOT water quality guidelines for temperature, ammonia, carbon dioxide, chlorine, pH, copper, dissolved oxygen, hydrogen sulfide, dissolved nitrogen, iron, and zinc. Water withdrawal from Tanner Creek is covered under Oregon water permit # S1310.

Table 4.1(b). Summary of water temperatures, and water usage at Bonneville Hatchery.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	500	500	500	500	500	500	500	500	500	500	500	500
Temp	53	53	53	53	53	53	53	53	53	53	53	53

Oak Springs Hatchery – The water source for the Oak Springs Hatchery is Oak Springs, a tributary to the Deschutes River. Water rights provide for 53 cfs from 15 different certified points of the spring. The present water delivery system can deliver ~24,062 gpm to the hatchery. Intake screens at the hatchery do not meet current NOAA screening criteria but no listed species are known to exist in the water source. Oak Springs water meets IHOT guidelines for water quality.

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 the hatchery water withdrawal, screening, or effluent discharge:

Sandy Hatchery – The intake system in Cedar Creek is 100% screened and is considered compliant to NOAA Fisheries fish screening criteria. Over 250 coho were passed for the first time in over 50 years during the fall of 2010 and all unmarked coho and winter

steelhead will be transported upstream of the hatchery for release until trap modifications can allow for volitional release after sorting of marked and unmarked fish. Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit.

Bonneville Hatchery – The intake screens at Bonneville Hatchery meet NOAA Fisheries screening criteria. Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit.

Oak Springs Hatchery – Intake screens at the Oak Springs Hatchery do not meet NOAA Fisheries screening criteria. However no listed fish are reported to be present in the water source. Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock collection for this program occurs both by volitional return to an adult trap at Sandy Hatchery and hook-and-line collection by volunteer anglers. For volitional collection, adults swim up the fish ladder from Cedar Creek and into a pre-sort holding pool within the entrance pen of the adult holding pond. Staff are able to open additional holding space when adult return numbers outpace staff's ability to effectively handle all returning adults safely and efficiently. Returning fish are handled individually in soft mesh nets, identified, sorted by gender, counted and held for later spawning. Naturally produced fish are safely and efficiently passed upstream as soon as possible after sorting operations.

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

Adult Transportation -

- Most of the broodstock are collected at Sandy Hatchery and enter the facility volitionally, therefore no additional transportation is necessary. Adults that are collected by hook-and-line or are recycled to the lower river are transported by a portable tank of 300-gallon capacity with oxygenation facility. Normal handling and transit time is < 1 hour.

Egg/Fry Transportation -

- Eyed eggs are transported from Sandy Hatchery to Oak Springs Hatchery. Eyed eggs are placed in screened trays in groups of 8,000-10,000, covered in wet burlap and placed in coolers with an ice tray on top to maintain moisture and cool temperature for transfer to Oak Springs Hatchery. Fry from Oak Springs Hatchery are transported to Bonneville Hatchery in fish transportation/liberation trucks equipped with supplemental oxygen.

Smolt Transportation –

- Smolts are transported from Bonneville Hatchery to Sandy Hatchery. Bonneville Hatchery utilizes a 1,000-gallon transportation truck equipped with supplemental oxygen. Additionally, a 200-gallon portable tank mounted in a pickup truck is also used to transport fish at the hatchery. This portable tank is equipped with supplemental oxygen.

5.3) Broodstock holding and spawning facilities.

Adult winter steelhead used for broodstock are held in an adult holding pond (raceway) at Sandy Fish Hatchery. The holding pond is approximately 12' x 75' with an average water depth of 3 feet (~2,700 ft^3). The holding pond is lined with poly-vinyl plastic sheeting to reduce potential injury and stress of adults held for spawning. All adults are spawned under a covered platform at the Sandy Fish Hatchery.

5.4) Incubation facilities.

Sandy Hatchery – Incubation through the eyed stage takes place at Sandy Hatchery in two flow-through concrete troughs (Table 14). Eggs are placed in open baskets at 25,000 to 30,000/basket. Water flows through the incubators at 12 gpm. The temperature of the water during early incubation is ~52°F. Average initial egg size is approximately 205 green eggs/ounce. Once eggs develop a well-formed eye, the eggs are shocked, cleaned, counted and approximately 190,000 to 200,000 eyed eggs are transferred to Oak Springs Hatchery for further incubation and early rearing.

Oak Springs Hatchery –The incubation room at Oak Springs is approximately 35' x 75' and contains 192 vertical incubators (up to 10,000 eggs/unit) and 16 Canadian style troughs. A chiller unit is available for cooling incubation water. Depending on usage, chilled water can be maintained at 36-41°F, with ambient water at 53°F. Water is supplied from springs and both chilled and ambient water is plumbed to the incubators and the troughs. A chemical treatment system is plumbed to each of the incubators. Water from the incubator room is discharged into a pollution abatement pond and ultimately goes into the Deschutes River. All head boxes are equipped with low water alarms.

5.5) Rearing facilities.

Sandy Hatchery -

Table 5.5(a). Incubation and rearing facilities at 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

Oak Springs Hatchery:

Table 5.5(b). Incubation and rearing facilities at Oak Springs Hatchery.

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft^3)	Number Units	Total Volume (ft^3)	Construction Material
Brood Ponds	140.5	22	3.5	10,819	2	21,637	concrete
Burrow Ponds	50	19.5	3	2,680	2	5,360	concrete
Circular Ponds		30	3	2,120	5	10,600	concrete
Lower Ponds	46.8	38.5	4	7,207	7	50,450	concrete
U-Ponds	50.5	40	4.67	9,433	9	84,901	concrete
Raceways	113	9.25	3.33	3,481	12	27,845	concrete
Vertical Incubators					192		plastic
Rearing Troughs	16	3	1.5	72	16	1,152	fiberglass

Bonneville Hatchery:

Table 5.5(c). Incubation and rearing facilities at Bonneville Hatchery.

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft^3)	Number Units	Total Volume (ft^3)	Construction Material
Two Adult Holding/ Rearing Ponds	123	76	7	65,436	1	65,436	concrete
Adult Holding/ Rearing Pond	165	27	6	26,730	1	26,730	concrete
Raceways	75	16.8	3	3,780	28	105,840	concrete
Raceways	80	20	3	4,800	30	144,000	concrete
Deep Troughs	14	1.08	1.42	21	60	1,288	fiberglass
Vertical Incubators					1216		fiberglass
Vertical Incubators					1216		plastic
Rearing Troughs	16	3	3	144	9	1296	fiberglass
Rearing Troughs	16	2.6	2	85	3	256	fiberglass

5.6) Acclimation/release facilities.

Winter steelhead smolts for this program are transported from Bonneville Hatchery to Sandy Hatchery for acclimation for a period of approximately 3 weeks prior to release. Smolts are acclimated in the adult holding pond (8,190 ft^3) or multiple raceways (5,600 ft^3) at Sandy Hatchery. See Section 10.6 for a description of the acclimation and release process.

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

Sandy Hatchery: There have not been any significant fish losses resulting from hatchery operations at Sandy Hatchery.

Oak Spring Hatchery: The hatchery has not had any major operational difficulties recently. In the past, cold water had been a problem, but hatchery practices have

alleviated those problems. Problems have also occurred because of bacterial problems associated with agriculture in the watershed of the stream source. That problem was alleviated by modifying the inflow/outflow strategies in the rearing ponds. New strategies have resulted in higher and more complete water turnover in the rearing ponds, allowing for greater circulation of clean water.

Bonneville Hatchery: In 2001, an IHNV outbreak caused significant fish mortality. The source of the outbreak was traced back to IHNV positive adult steelhead upstream in the water source. Following that production year, the majority of water used for rearing was changed from Tanner Creek to well water, and problems associated with IHNV in the water source appear to have been alleviated. The 2001 IHNV outbreak was the only major problem to date.

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 – Sandy 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. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at Sandy Hatchery.

Oak Springs Hatchery – Oak Springs Hatchery staff is on-call 24 hrs/day to address emergency (or unexpected) events. The water supply system is equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied in this facility.

Bonneville Hatchery – Bonneville Hatchery staff is on-call 24 hrs/day to address emergency (or unexpected) events. All water systems are equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied in this facility.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

The broodstock for the current Sandy Hatchery winter steelhead program (stock 11) originated entirely (100%) from un-marked adult "wild" winter steelhead captured at the Marmot Dam trap. Non-fin clipped winter steelhead were assumed to be of wild-origin and used for the foundation of this local Sandy Basin origin broodstock. Development of the localized stock began in 2000. The first release of smolts from these wild parents occurred in the spring of 2001. The current program uses hatchery-produced Sandy River-origin winter steelhead returning to Sandy Hatchery, but this HGMP proposes to integrate wild Sandy winter steelhead into the broodstock on an annual basis as long as it does not significantly impact the wild population (see Section 6.2.3). Prior to development of the localized stock, various stocks were used as brood for the Sandy River winter steelhead program.

6.2) Supporting information.

6.2.1) History.

The Sandy Hatchery winter steelhead program began in 1955 through an approval by the Oregon State Game Commission. Since then, broodstocks of different origin were used including: Big Creek; Eagle Creek; Alsea; and Sandy. Table 6.2.1 shows release of winter steelhead of different broodstock origin.

Table 6.2.1. Smolt allocations and releases of hatchery winter steelhead into Sandy River from 1985-1994.

Hatchery	Stock	Average Allocation	Release Size	Release Numbers
Eagle Cr	Eagle Cr	30,000	@6-10/lb	30,200 (1989-94)
Gnat Cr	Big Cr	299,000	@5/lb	195,452 (1985-94)
Total		230,000		220,965 (1985-94)

Source: Sandy River Basin Plan (ODFW 1994).

The brood year 2000 marked the first year that wild winter steelhead from the Sandy Basin were collected for broodstock for the current program. In 2000, 140 wild steelhead were collected and spawned to comprise the founding Sandy River wild winter steelhead hatchery brood (stock 011W), using 62 males and 78 females.

6.2.2) Annual size.

The program goal is to collect 132 adult (66 pairs) winter steelhead for broodstock. Wild winter steelhead (up to 26) would be included in the total if integration of wild adults is approved under this HGMP.

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

From 2000 to 2002, the hatchery broodstock was comprised of 100% wild fish. From 2003 to 2010, the goal was to incorporate 30% of the broodstock with wild steelhead.

Provided re-integrating the stock is approved under this HGMP, our goal will be to achieve a 20% rate of integration by using up to 26 wild adult males. No more than 2% of the natural spawning population will be collected for broodstock annually.

ODFW is proposing to incorporate wild Sandy winter steelhead into the broodstock on an annual basis as long as the expected run of wild adult winter steelhead into the Sandy is forecasted to be greater than 650 fish. This is 65% of the MAT defined for the Sandy winter steelhead population by the WLC-TRT, and 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 collect 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, or return to spawn in subsequent years.

6.2.4) Genetic or ecological differences.

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

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. According to the NOAA Biological Opinion requirements (NMFS 1999), the brood fish for Sandy River hatchery program shall originate from the Sandy River wild stock. This indigenous stock of winter steelhead 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.

Refer to sections 6.2.3 and 3.5 (part b) 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 selection.

From 2000-2002, broodstock was comprised of 100% local wild Sandy River winter steelhead. 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 2005 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 by hook and line.

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 Broodstock Integration Plan found in Appendix 1 of this HGMP. The number of wild adults (males) incorporated into the brood under the current production level of 160,000 smolts will be up to 26 depending on timing of collection and fish condition. No wild adults will be taken if the wild adult winter steelhead 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 winter steelhead population will be minimized by limiting the number of wild adults collected for broodstock to less than 2% of the naturally spawning population.

SECTION 7. BROODSTOCK COLLECTION

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

Only Sandy origin adult hatchery and wild winter steelhead will be collected and used for broodstock.

7.2) Collection or sampling design.

The goal of this program is to collect hatchery adults throughout the run in order to mimic the natural run-timing of wild winter steelhead in the Sandy River. Hatchery-origin broodstock will be collected primarily at Sandy Hatchery. These fish enter the hatchery volitionally (see Section 5.1). Wild winter steelhead used for broodstock will be collected primarily by hook-and-line by anglers (see Section 2.2.3 (b)). The adults may be held in a raceway for up to three months prior to spawning in March/early April. Adults will be floy tagged as they are collected for brood to document their time of return and may be removed from the broodstock population later in order to match the return timing of the broodstock with the natural run-timing of wild winter steelhead in the Sandy River.

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

7.3) Identity.

Naturally produced winter steelhead are identified by the presence of an intact adipose fin. All hatchery-origin winter steelhead smolts are fin clipped (adipose fin removed) so they can be distinguished as adults from wild winter steelhead. All hatchery-origin summer steelhead (stock 24) are also adipose fin clipped to facilitate differentiation from wild winter steelhead by both run timing and the hatchery-applied mark.

7.4) Proposed number to be collected.

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

The program goal is to collect 132 adult (66 pairs) winter steelhead for broodstock. Wild winter steelhead (up to 26) would be included in the total if integration of wild adults is approved under this HGMP.

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. 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 (1988-1999), or for the most recent years available.

Data summarizing broodstock collection since the inception of this localized broodstock program (stock 11), 2000-13 is found in Table 7.4.2(a). The proportion of brood removed from the wild population is found in (Table 7.4.2(b)).

Table 7.4.2(a). Number of winter steelhead spawned for broodstock from 2000-2013.

	Female			*Male*			**Total # spawned**	
Year	Hatchery	Wild	**Total**	Hatchery	Wild	**Total**	Hatchery	Wild
2000	0	78	78	0	62	62	0	140
2001	0	68	68	0	69	69	0	137
2002	0	69	69	0	66	66	0	135
2003	30	30	60	29	30	59	59	60
2004	45	28	73	55	24	79	100	52
2005	21	14	35	21	14	35	42	28
2006	47	23	70	46	25	71	93	48
2007	55	22	77	52	25	77	77	47
2008	59	14	73	50	17	67	109	31
2009	60	9	69	48	21	69	108	30
2010	54	10	64	40	24	64	94	34
2011	56	8	63	47	14	61	103	22
2012	64	0	64	64	0	64	128	0
2013	83	0	83	83	0	83	166	0

Source: HMIS, Sandy Hatchery Records

Table 7.4.2(b). Proportion of wild winter steelhead population spawned or died prior to spawning. Counts from 2000-2007 from Marmot Dam, 2010 count from basin-wide spawning surveys.

Run Year	Wild StW [a/]	# Wild StW Collected [b/]	Wild for brood [c/]	% of wild
2000	741	140	140	18.9%
2001	902	161	137	15.2%
2002	1,031	167 (7)	135	13.1%
2003	671	92 (5)	60	8.9%
2004	869	87 (12)	52	6.0%
2005	626	68 (5)	28	4.5%
2006	643	88 (12)	48	7.5%
2007	845	72 (9)	47	5.6%
2008	n/a	43 (12)	31	n/a
2009	n/a	36 (4)	30	n/a
2010	1,498	38 (2)	34	2.3%
2011	681	45	22	3.2%
2012	508	0	0	0
2013	3,509	0	0	0

Source: HMIS, Sandy Hatchery records; Appendix C of LCRCRP.

[a/] Wild winter steelhead count does not include unmarked fish below the former Marmot Dam with exception of 2010 when spawning surveys were conducted downstream Surveys are ongoing

[b/] Wild brood from 2008-10 collected by hook and line. Number in parentheses indicates wild fish collected at Sandy Hatchery for brood.

[c/] Wild for brood number shows number of fish spawned or died prior to spawning. Wild fish collected that were not spawned or died prior to spawning were returned to the river at the former Marmot Dam site.

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

All hatchery winter steelhead surplus to broodstock needs at Sandy Hatchery are either recycled to the lower river for additional angling opportunities, given to food banks (e.g. Oregon Food Bank) if in suitable condition, used for stream nutrient enrichment, or disposed of if not fit for human consumption. Fish that are disposed of are done so in accordance with ODFW policies and procedures and IHOT guidelines, which include freezing, rendering, and/or burying.

Fish that return to Sandy Hatchery or other lower basin collection facilities in a condition suitable for angler use from December through mid-February may be recycled once through the lower river fishery to provide additional angling opportunities. Recycled fish are released at Lewis and Clark Park. All recycled fish are distinctly marked (e.g. caudal punch or floy tag) prior to release. Fish will only be recycled once; all fish that are collected a second time are permanently removed from the Sandy River by either killing

the fish or transferring them to isolated standing waters (e.g. Salish Ponds) to provide additional angling opportunity associated with trout fisheries. No fish will be recycled to the lower river after February 16. No hatchery winter steelhead collected in upper basin weirs/traps will be recycled; these fish will be removed from the Sandy River. Recycling will be discontinued if stray rates exceed the level established in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010).

Hatchery winter steelhead in excess of broodstock needs may be passed upstream of Sandy Hatchery in the future if it is found that current passage of the limited number of wild winter steelhead is not sufficient to adequately seed available habitat. We will assess the establishment of a self-sustaining population of steelhead through counts of adult fish passed upstream and juvenile counts from a smolt trap located immediately upstream of the adult diversion weir at Sandy Fish Hatchery. After three complete generations, if it is found that habitat upstream of the hatchery is not being adequately seeded by passage of wild adult winter steelhead, ODFW will consider supplementing the natural population with hatchery produced adults. ODFW will request authorization from NMFS prior to supplementing the natural population in Cedar Creek.

7.6) Fish transportation and holding methods.

Hatchery-origin broodstock are collected at Sandy Hatchery where holding, and spawning take place, and no additional transportation is required.

Adult winter steelhead used for broodstock are held in an adult holding pond at Sandy Hatchery (See Section 5.5 for details regarding the adult holding facilities). Wild coho and winter steelhead that enter the trap at the Sandy Hatchery are sorted and allowed to pass upstream of the hatchery into Cedar Creek.

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 hatchery adults of high quality may be given to food banks. Spawned fish carcasses determined to be low in IHNV may be utilized in stream nutrient enrichment.

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.

Refer to sections 6.2.3 and 3.5 (part b) 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 winter steelhead 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 into the future to select brood randomly from the entire run for mating.

Steelhead will be spawned at a one-to-one, male-to-female spawning ratio. Fish are selected and paired at random from the pooled broodstock population at Sandy Hatchery. See Section 7.2 for details regarding broodstock collection procedures.

8.2) Males.

All males will be spawned at a 1:1 ratio with females.

8.3) Fertilization.

- Eggs and sperm are fertilized according to a predetermined 3 X 3 spawning matrix. For example, eggs are taken from three females, each female's egg-take is divided into thirds, and then 3 different males fertilize each egg group. The second and third females eggs are divided into three groups, and are fertilized by the same three males that fertilized the first female. If the proposed spawning matrix is met, equal sex ratios are maintained throughout fertilization.
- Up to 26 male wild winter steelhead will be used to fertilize eggs from up to 26 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. All wild males utilized for broodstock will be returned to the Sandy River as soon as practical after spawning to potentially spawn with other wild females in the natural environment.

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 fish resulting from the mating scheme.

- A factorial-mating scheme (as described in section 8.3) is used to reduce the risk of loss of within population genetic diversity, for this type of small hatchery program. Samples of milt, ovarian fluid as well as tissue samples are taken during spawning operations for later pathological analysis.
- Fish are selected and spawned randomly (while maintaining a 1:1 male to female spawning ratio) from the broodstock population.

SECTION 9. INCUBATION AND REARING

9.1) Incubation.

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

Table 9.1.1. Annual egg take and survival of winter steelhead eggs to eyed state at Sandy Hatchery, 2000-2010.

Brood Year	Egg Take	Green to Eyed Egg Survival
2000	254,673	93%
2001	256,349	95%
2002	252,201	95%
2003	243,865	96%
2004	277,347	94%
2005	130,766	97%
2006	248,615	94%
2007	252,838	90%
2008	279,619	95%
2009	320,900	97%
2010	279,831	93%
2011	315,121	90%
2012	248,132	93%
2013	228,385	95.5%

Source: HMIS record.

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

Measures are taken to only collect the number of eggs necessary to meet annual production goals. However, to compensate for possible mortality or to maintain an effective breeding population size at the hatchery, additional hatchery adults can be collected. The intent is to provide enough eggs for fertilization that allows for some excess necessary to meet the smolt release goal (160,000). This is based on the IHOT criteria of plus or minus 10% egg take of the target smolt production level. Surplus eggs, not needed by any other program, will be destroyed by freezing and disposed of in a landfill according to IHOT guidelines. Surplus winter steelhead eggs will be culled in equal proportion from all family groups.

9.1.3) Loading densities applied during incubation.

Sandy Hatchery:

Egg size	= ~ 200 eggs per oz.
Loading per tray	= 12,000/tray (from green egg to eye-up)
Standard flows in incubator	= 12 gpm/stack

Oak Springs Hatchery:
Egg size = 152 eggs/oz
Loading per tray = 10,000 eggs
Flow in each incubator = 5 gpm

9.1.4) Incubation conditions.

Sandy Hatchery:
Incubation through the eyed stage takes place at Sandy Hatchery in two flow-through concrete troughs. Flow through the incubators is 12 gpm. The temperature of the water used for early incubation is approximately 52°F. Water temperatures are checked and recorded daily. Dissolved oxygen levels are monitored weekly and are generally within 10-11 ppm. Egg mortalities are removed on a daily basis. Once eggs develop a well-formed eye, the eggs are shocked, cleaned, counted and transferred to Oak Springs Hatchery for further incubation and early rearing.

Oak Springs Hatchery:
Incubation from the eyed egg stage through hatching takes place at Oak Springs Hatchery. Temperatures in the incubators are checked daily with a hand-held thermometer. Temperatures during incubation are held at either 37°F or 53°F. When eggs arrive in multiple shipments, or at multiple developmental stages, eggs that are further progressed are held on water chilled to 37°F until the remainder of the eggs catch up. Once all eggs are at similar development stage, all eggs are held in ambient water at 53°F. Ambient water is spring source and has a constant temperature of 53°F. Dissolved oxygen levels are not monitored during incubation, and silt levels are not an issue because the supply water comes from natural springs. Waters flows through the incubators at 5 gpm.

9.1.5) Ponding.

Oak Springs Hatchery:
Ponding of fish at Oak Springs Hatchery is forced, and is based primarily on visual inspection of the fish, though cumulated temperature units (CTU) is used as a general guideline. Button up is estimated to be nearly 100% at ponding. Fish are reared until October and then transferred to Bonneville Hatchery at a size of 30fpp.

Bonneville Hatchery:
Bonneville Hatchery receives 165,000 winter steelhead in October from Oak Springs Hatchery which are forced ponded, and reared until March of the following year. Bonneville Hatchery transfers 160,000 smolts to Sandy Hatchery at a size of 6fpp for acclimation and release into the Sandy River.

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 (2003) 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 are increasing. 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 a 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, a minimum of 60 ovarian fluids and 60 kidney/spleen/pyloric caeca are examined for viral pathogens from each brood 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 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.

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.

- Winter steelhead eggs for this program are incubated both at Sandy and Oak Springs hatcheries, where water quality meets the IHOT standards for egg incubation.
- Disinfection procedures are implemented during incubation that prevents pathogen transmission between stocks of fish on site, as well as to the watershed.
- Dead or culled eggs are discarded in a manner that prevents transfer to the receiving watershed. Also, pathogen free spring water used at Oak Spring Hatchery for egg incubation minimizes the risks of fish disease occurrence.
- Water and power supplies at both facilities (Sandy and Oak Springs) are equipped with alarm systems to notify hatchery personnel if a failure occurs. Water supplies at Oak Springs are hooked to a back-up generator, in case of a power failure; and hatchery staffs at both facilities are available 24 hr/day, 7 days a week to address any emergency or critical situations.
- See Section 9.1.6. for disinfection, fish health and sanitation procedures.

9.2) Rearing.

9.2.1) Provide survival data (average program performance) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-1999) or for years dependable data are available.

In the past, rearing of Sandy Hatchery winter steelhead took place at Oxbow, Irrigon and Bonneville hatcheries. Therefore, all previous and the latest available fish survival data are presented in Table 20.

Table 9.2.1. Survival rates of Sandy River winter steelhead by different life stages at different hatcheries for brood years 2000 – 2013.

Brood year	Oxbow H.	Irrigon Hatchery		Bonneville Hatchery		Oak Springs H.
	Fry to fingerling survival (%)	Fry to fingerling survival (%)	Fingerling to smolt survival (%)	Fry to fingerling survival (%)	Fingerling to smolt survival (%)	Fry to fingerling survival (%)
2000	97.8	97.5	99.2	n/a	96.3	n/a
2001	99.1	99.0	99.1	n/a	85.5	n/a
2002	98.5	98.8	99.7	n/a	98.1	n/a
2003	97.8	99.2	99.4	n/a	98.0	n/a
2004	96.8	97.9	99.0	n/a	98.6	n/a
2005	n/a	86.4	99.2	n/a	n/a	n/a
2006	n/a	97.5	99.7	80.7	99.3	n/a
2007	n/a	n/a	n/a	81.6	99.2	n/a
2008	n/a	n/a	n/a	92.4	98.9	n/a
2009	n/a	n/a	n/a	n/a	98.5	95.2
2010	n/a	n/a	n/a	n/a	93.6	94.4
2011	n/a	n/a	n/a	n/a	100	71.2
2012	n/a	n/a	n/a	n/a	98.0	53.0
2013	n/a	n/a	n/a	n/a	97.0	n/a

Source: HMIS

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

Fry and fish rearing for this program take place at Oak Springs and Bonneville hatcheries. Fish rearing density and loading criteria are:

Oak Springs Hatchery:

The juvenile rearing density and loading guidelines used at Oak Springs Hatchery are based on: standardized agency guidelines, life-stage specific survival studies conducted at other facilities, staff experience (e.g. trial and error) and other criteria. The IHOT standards are followed for: water quality, density and loading criteria, alarm systems, predator control measures to provide the necessary security for the cultured stock. The target rearing density is 0.33 lbs/ft^3, and the loading criterion is 10 lbs/gpm.

Bonneville Hatchery:
The target rearing density at Bonneville hatchery is 1.0 lb/ft^3 and target loading criteria is 5 lbs/gpm inflow. 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, staff experience (e.g. trial and error) and other criteria.

9.2.3) Fish rearing conditions.

In all the hatcheries, IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, 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.

Oak Springs Hatchery:
Temperature is not monitored in the rearing ponds, as the supply water for the hatchery comes from springs with a constant temperature of 53°F. Dissolved oxygen is not monitored in rearing ponds because the rearing densities for this program fish are low enough that D.O. is not a concern. Water flows through the rearing units range from 100-700 gpm depending on fish densities and water availability. Lower flow rates are used when the fish are initially ponded and do not require the higher flows. Ponds are cleaned two times per week initially, but as development progress, once per week. Ponds are visually inspected daily for any signs of disease, abnormal behavior or mortalities. Mortalities are removed daily and buried per IHOT protocol.

Bonneville Hatchery:
Water temperature is monitored via a thermograph gauging all water coming into the hatchery. The water source is well water, which provides water at a consistent temperature of 49-51°F. D.O. is only monitored when rearing densities are high, at which time it is monitored with a portable D.O. meter. Ponds are cleaned weekly or bi-weekly depending on the time of year. Early in the rearing phase, the ponds are cleaned weekly. Later in the phase ponds may be cleaned bi-weekly. Mortalities are picked daily, and ponds are inspected by pathologists monthly. Flow in the rearing ponds is 700 gpm. Flow in the Canadian ponds is 60 gpm. Flow in the circular ponds is 75 gpm. The IHOT standards are followed for: water quality, alarm systems, predator control measures to provide the necessary security for the cultured stock, loading and density. Settleable solids, unused feed and feces are removed periodically to ensure proper cleanliness of rearing containers.

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.

Oak Spring Hatchery:

Table 9.2.4(a). Average monthly growth data (fish weight) for winter steelhead (stock 11) reared at Oak Springs Hatchery.

Rearing Period	Size (fish/lb)
June 1	2000
July 1	550
August 1	145
September 1	70
October 1	50
Mid- Oct: Transfer	36

Source: HMIS record

Bonneville Hatchery:

Table 9.2.4(b). Average monthly growth data (fish weight) for winter steelhead (stock 11) reared at Bonneville Hatchery.

Rearing Period	Size (fish/lb)
November 1	31
December 1	25
January 1	16
February 1	12
March 1	8.5
April 1: Transfer	6.4

Source: HMIS record.

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

Fish growth (biomass/weight gain) is measured each month for ponded fish. These data are reported monthly and are archived in ODFW standard Monthly Ponded Fish Reports. See Tables 23 and 24 for monthly weight gain of winter steelhead at Oak Springs and Bonneville hatcheries, respectively. No data for energy reserve are available

9.2.6) Indicate food type used, daily application schedule, feeding rate range, and estimates of total food conversion efficiency during rearing (average program performance).

Oak Springs Hatchery:

Table 9.2.6(a). Feeding protocol of winter steelhead at Oak Springs Hatchery.

Food Type/Size	Daily Application	Size Range of Fish (fish/lb)
BioVita Starter #0, #1, #2	4-6 times/day	2000 - 300
MicroVita 0.6, 0.9	4-6 times/day	300 - 120
BioVita Fry 1.5, 2.0	3-4 times/day	120 - 40
Silver Cup NSS 2.0	3-4 times/day	40 – 36
Average food conversion efficiency is 0.81		

Bonneville Hatchery:

Table 9.2.6(b). Feeding protocol of winter steelhead at Bonneville Hatchery.

Food Type/Size	Daily Application	Size Range of Fish (fish/lb)
BioVita Fry 2.0	2 times/day	35 - 7
BioClark's Fry 2.0	2 times/day	7 – 6
Average food conversion efficiency is 0.89		

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

All Hatcheries- Fish health is monitored daily by hatchery staff and monthly by an ODFW fish health specialist. If any problems arise, appropriate actions, including drug or chemical treatments, are applied. ODFW's Fish Health Management Policy and IHOT fish health guidelines are followed to prevent 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 protocols.

9.2.8) Smolt development indices (gill ATPase activity, growth factor, etc.).

Fish are deemed ready to transfer to Sandy hatchery based on age, size, behavior, and physical appearance. Weight samples of the fish are taken monthly to ensure proper growth rate. See Section 9.2.4 for growth data. No ATPase activity studies are conducted at any of the program hatcheries.

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

Sandy Hatchery – This program uses conventional hatchery rearing techniques, and does not use any of the new "natural" type hatchery rearing strategies. Smolts are acclimated on ambient Cedar Creek water for 2-3 weeks and released from Sandy Hatchery. 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. Fish that do not out-migrate volitionally may be transferred to trout fisheries in standing waterbodies (see Section 10.6).

Oak Springs Hatchery - "Natural" rearing is only obtained through rearing at ambient water temperature and photoperiod.

Bonneville Hatchery- “Natural" rearing is only obtained through rearing at ambient water temperature and photoperiod.

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.

- To minimize the potential for adverse impacts of niche-displacement on listed fish (or density-dependent effects) ODFW rears program fish to achieve the size of 180-250 mm prior to release as recommended by the NMFS (1999 Biological Opinion). Specifically, since 1999, over 90% of the Sandy River winter steelhead have been released between 171mm and 238mm (average fork length). The release of large sized smolts is believed to promote swift emigration and prevent residualization; and subsequently minimize potential temporal and spatial overlap for food and space (with co-existing juvenile winter steelhead).

- Acclimated release (versus direct release of large groups of fish) is believed to reduce the impact of density-dependent effects. Fish are allowed to leave voluntarily from the acclimation site, while experiencing on-site environmental cues and conditions; such as, flow, temperature, light, and weather conditions. In addition, these basin specific environmental cues, along with pre-migration imprinting are believed to encourage adult homing to release areas.

- Fish culture techniques, such as adjusting feed rates and length grading, have been used to separate fish groups (by size) at the hatchery. Smaller fish are put on an adjusted feed rate, to promote rapid growth in the absence of competition with larger, more aggressive, steelhead. The belief is that these large smolts will emigrate swiftly.

- To minimize the risks of transmission of disease agents/pathogens from hatchery reared fish to listed natural fish strict fish health management protocol is applied at all the hatchery facilities (see Section 9.1.6).

SECTION 10. RELEASE

10.1) Proposed fish release levels.

Table 10.1. Proposed winter steelhead release levels.

Age Class	Number Released *	Fish/lb.	Release Date	Release Location
Yearling	160,000	6.0	April/May	Cedar Creek (Sandy Hatchery)

* The maximum number released should not exceed 176,000 smolts (+/- target release number per IHOT standard).

10.2) Specific location(s) of proposed releases.

In the Sandy River (and its tributaries) all release sites will be in the lower river (between river mile 0 and 30). Numbers of fish released at different locations may vary. Below (Table 10.2) are listed the historic release sites, though others may be incorporated for management purposes. In particular, with the removal of Marmot Dam in 2007, additional acclimation sites (e.g., Bull Run River, Gordon Creek, and Trout Creek) may need to be established in the future to limit straying if the rate exceeds the standard established in the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW, 2010).

River Name: Cedar Creek (waterbody code = 0300304000)
Release Point: Cedar Creek, RM 0.75 (Sandy Hatchery)
Major Watershed: Sandy River Basin
Basin or Region: Columbia River

The potential release sites as mentioned above may be analyzed and developed in the future if determined necessary to reduce unintended stray or augment important fisheries near lower river tributary sites.

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

Smolts of a size of 6 fish/lb are acclimated at Sandy Hatchery for a period of approximately 3 weeks and then released into the Sandy River. Past releases of winter steelhead into Cedar Creek/Sandy River are presented in Table 10.2.

Table 10.2. Previous release numbers, size, age class and release dates for the on-going Sandy River winter steelhead program, 2001-2010.

Year	Age Class	Number Released	Fish/lb.	Date	Release Location
2001	1+	118,718	5.03	5/14/2001	Cedar Creek
	2+	0[a/]			
2002	1+	102,641	5.13	5/14/2002	Cedar Creek
	2+	60,361	5.54	5/14/2002	Cedar Creek
2003	1+	103,592	5.35	5/6/2003	Cedar Creek
	2+	74,701	5.06	5/6/2003	Cedar Creek
2004	1+	103,040	4.6	5/17/2004	Sandy River
	2+	63,199	4.97	5/13/2004	Sandy River
2005	1+	103,276	4.28	5/11/2005	Cedar Creek
	2+	70,023	5.1	3/28/2005	Cedar Creek
2006	1+	85,700	3.97	5/8/2006	Cedar Creek
	2+	63,970	6.3	3/13/2006	Cedar Creek
2007	1+	49,661	5.3	4/2/2007	Cedar Creek
	1+	24,104	5.79	4/24/2007	Cedar Creek
	1+	78,079	7.03	5/2/2007	Cedar Creek
	1+	23,058	14.06	5/14/2007	Cedar Creek
2008	1+	184,222	9.63	4/9/2008	Cedar Creek
2009	1+	156,385	11.39	4/14/2009	Cedar Creek
2010	1+	169,095	7.32	4/27/2010	Cedar Creek
2011	1+	159,291	6.15	4/25/2011	Cedar Creek
2012	1+	141,063	6.3	4/12/12	Cedar Creek
2013	1+	89,964	6.2	4/15/13	Cedar Creek

[a/] 2001 was the last year Big Creek stock (stock 013) winter steelhead were released into the Sandy River. A release of 40,198 yearling smolts was in addition to the 118, 718 Sandy wild brood stock (stock 011) released from Sandy Hatchery.

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

The past release dates are presented in Table 10.2. Winter steelhead smolts are transported from Bonneville Hatchery to Sandy Hatchery, and are acclimated for at least 2-3 weeks beginning in mid-late April and ending by mid-May prior to release. See Section 10.6 for a description of the acclimation and release process.

10.5) Fish transportation procedures.

Fish are transported to Sandy Hatchery from Bonneville Hatchery for final acclimation and release (See Section 5.2 for details regarding transportation). Once at the Sandy Hatchery, winter steelhead smolts are not transported off-station prior to release. All hatchery steelhead are acclimated on site and released into Cedar Creek from the Sandy Fish Hatchery.

10.6) Acclimation procedures.

All winter steelhead for this program are transported from Bonneville Hatchery to Sandy Hatchery raceways for final acclimation and release at a size of 6fpp. The fish are

acclimated for at least approximately 3 weeks prior to release. 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. Based on long-term observations, approximately 80-90 percent of the steelhead smolts volitionally migrate during the first 24 hour period after screen removal, and nearly all have migrated by the end of the 48 hour period; usually less than 1,000 smolts remain after 48 hours.

ODFW will investigate the option of "holding back" juvenile steelhead that do not migrate during the volitional release period after necessary facility improvements are completed as part of the fish passage restoration project. Under this option, all fish remaining after the volitional release period would be transferred to trout fisheries in standing waterbodies after reaching legal (8") size. This option could reduce the potential for winter steelhead juveniles to residualize and compete with native fish species after release from the hatchery.

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

All Sandy winter steelhead smolts are fin marked (adipose fin-clip) to differentiate between natural and hatchery-origin fish. The adipose fin-clipping for the program fish is conducted at Bonneville Hatchery.

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

Broodstock collection and egg-take protocols will be reviewed periodically to evaluate consistency with producing the target smolt release numbers to avoid surplus production. Surpluses are usually reduced to production levels well before smolts are transferred to Sandy Hatchery. Under current policy, surplus juveniles are either destroyed per IHOT protocol or marked and released into a closed water system such as a lake, reservoir or pond where they contribute to angling opportunities.

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 any "reportable pathogens" as defined in the Pacific Northwest Fish Health Protection Committee (PNFHPC) disease control guidelines, within 3 weeks prior to release. Fish transfers into the sub 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's 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 winter steelhead smolts on-station at Sandy Hatchery would be directly released into Cedar Creek. If the emergency occurs at Bonneville, winter steelhead will be transported to Sandy Hatchery if possible. If the emergency occurs at Oak Spring Hatchery, efforts will be taken to transfer the fish to either Bonneville, Clackamas or Sandy hatchery wherever rearing space is available.

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 hatchery-reared winter steelhead smolts are released into Cedar Creek or the lower mainstem of the Sandy River where it is believed there is minimal overlap with wild juvenile winter steelhead, coho or spring Chinook rearing habitat.
- All Sandy Hatchery winter steelhead smolts are reared to and released at a size that is optimal for rapid emigration from Cedar Creek and the Sandy River.
- All Sandy Hatchery winter steelhead smolts are acclimated for approximately 3-week period to promote adult homing to the lower Sandy River and to Cedar Creek, Sandy Hatchery.
- All Sandy Hatchery winter steelhead smolts are released downstream of primary natural production areas and below the mouth of Cedar Creek.
- Future acclimation/release strategies may be employed to help to reduce potential stray into the primary natural production areas in the upper Sandy Basin and/or augment regionally important fisheries in the lower river.
- All (100%) of the Sandy Hatchery winter steelhead smolts are fin-marked (adipose fin-clip) to differentiate between natural and hatchery-origin fish.
- Mark quality checks (to identify the percentage of unmarked fish) are performed on Sandy Hatchery winter steelhead smolts prior to release.
- Only health certified fish will be released.

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.

Many policies 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 winter steelhead 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 winter steelhead program.

ODFW will submit an annual monitoring plan to NMFS on or before June 1st of the year that details protocol for conducting spawning ground and juvenile outmigrant monitoring in the Sandy Basin. Specific plans for spring Chinook, coho, and winter/summer steelhead will be submitted.

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 and ODFW Fish Division staff will ensure that the program details and direction are consistent with pertinent policies and native fish objectives.

ODFW North Willamette Fish District, ODFW Fish Division, and/or ODFW Columbia River Program staff will analyze catch information and conduct wild fish supplementation work. 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.

ODFW NWFD staff will collect wild juvenile outmigrant information from Cedar Creek using a rotary screw trap. To assess the success of the Cedar Creek wild fish restoration activities, a protocol with the objective of estimating the production of juvenile coho, steelhead, and trout that emigrate from Cedar Creek was developed. This protocol will use Rotary screw traps (RST) to monitor the production of juvenile salmonids. For our

purposes, the word "production" refers to the total number of juveniles that swam past the RST.

Smolt Trap Protocol

Beginning in March 2013, a 5-foot diameter RST was placed in Cedar Creek a short distance above the adult diversion weir to monitor the production of wild fish. The Cedar Creek RST will be integrated into the existing Sandy Basin monitoring plan (Strobel 2012). Forms, figures, and tables will be standardized to make it easier to compare temporal data and provide an ability to understand the quality and limitations of the data that are collected.

The RST will be checked frequently and fish will be anesthetized to determine species, fork length, fin mark, and life stage. Trap efficiency studies will be conducted throughout the trapping season to determine the proportion of the outmigration that is being captured in the trap. Following a modified mark-recapture protocol, up to 25 juveniles of each species each day are given a fin mark specific to the day of the week. Fins are marked with small clips. Marked fish are released upstream of the trap near the hatchery intake. Captured fish are then sorted daily looking for fin marks from previous days' releases. Smolt population estimation will be estimated using Darroch Analysis with Rank Reduction for R (DARR 2.0.2, Bjorkstedt 2010), a program provided by the National Marine Fisheries Service (NMFS: http://swfsc.noaa.gov/textblock.aspx?Division= FED&id=3346).

Operation and monitoring activities of the Cedar Creek RST from March 1 through June 30 will collect the bulk of the wild juvenile outmigration and provide biologists with production values that generate high quality data for the success of the wild fish reintroduction.

Hatchery 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 not surveyable 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 has been conducting steelhead spawning surveys in the Sandy and Clackamas River basins continuously since 2010. This monitoring is focused on wild winter steelhead 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 winter steelhead. These surveys can also result in data to evaluate the possible effects of the winter steelhead recycling program. ODFW will provide an updated monitoring plan annually that describes details of specific protocol used to implement surveys for that specific year.

Goals (Both Coho and Steelhead)

1. Provide annual estimates of abundance for natural and hatchery origin spawners within the Sandy River population.

2. Provide annual estimates of the proportion of hatchery origin spawners (pHOS) in the naturally spawning Sandy River population.
3. Provide information on the spatial distribution of spawning activity within the Sandy River, including information on both natural and hatchery-origin spawning.
4. Provide information on temporal patterns of spawning activity within the Sandy River, including information on natural and hatchery-origin spawning.

Steelhead Spawner Surveys

Because adult steelhead spawners are not reliably observable in spawning ground surveys, redd counts are used as a proxy for adult abundance (Susac and Jacobs 1998). Surveys will be conducted at least once every 14 days from February through May. Wadeable streams will be walked heading upstream, while non-wadeable surveys are conducted from river craft floating downstream. Redds will be marked with colored rocks and flagging to prevent re-counting during subsequent surveys. The survey interval of once every fourteen days is based on prior ODFW research (Susac and Jacobs 1998). Abundance will be estimated by expanding redd densities from random sites to the spawning frame, according to data analysis methods developed by Stevens (2002) and Susac and Jacobs (1998). Specific descriptions of project protocols can be found in the annual survey procedures manual (ODFW 2013).

Finally, other on-going monitoring of fish populations occurs through ODFW's Corvallis Research Lab (Generalized Randomized-Tessellation Stratified or GRTS monitoring protocol used for, 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 wild 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 because of monitoring activities.

SECTION 12. RESEARCH

No research, specific to this winter steelhead program is being proposed or currently being conducted other than the monitoring and evaluation activities identified in Section 1.10.

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 AND CITATIONS

ATTACHMENT 1 – BROODSTOCK INTEGRATION

Broodstock Management – Integration

If integration is approved as part of this HGMP, our goal will be to incorporate up to 26 wild adult males. The 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.

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 winter steelhead, approximately 4,000

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 or wild 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 160,000)

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 winter steelhead – 1,088 fish

7) The potential for demographic impacts to the wild Sandy River winter steelhead 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 160,000 program

Collect 220,000 eggs @ 4,000 eggs/female = 55 females

55 females + 55 males = 110 x 20% mortality = 131 total brood

pNOB (20%) Broodstock need = 26 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%
	2,000	1,000	650	
160,000 smolts	1.30%	2.60%	4.00%	26

Number of wild fish collected for Broodstock at Varied Run Sizes

Program Size	Run Size			# of wild fish needed for pNOB=20%
	2,000	1,000	650[a/]	
160,000 smolts	26	20[b/]	13[b/]	26

[a/] Minimum number necessary for collection of wild fish for brood

[b/] Collection of wild fish limited to 2% of forecasted run

ATTACHMENT 2- ESTIMATED LISTED SALMONID TAKE LEVELS BY HATCHERY ACTIVITY

Listed species affected: Winter steelhead ESU/Population: Lower Columbia Activity: Hatchery Trap Operations (Sort & Pass)				
Location of hatchery activity: Cedar Creek/Sandy Hatchery Dates of activity: December-June Hatchery program operator: ODFW				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)		3500[a/]	200[b/]	
Capture, handle, tag/mark/tissue sample, and release d)		500[a/]		
Removal (e.g. broodstock) e)			10[c/]	
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

[a/] Juvenile outmigrant (smolt trap) monitoring of coho and steelhead production upstream of Sandy Hatchery.
[b/] Wild fish encountered during trap operations at Sandy Fish Hatchery. Fish are passed upstream unless being incorporated into broodstock when sufficient numbers of wild adults are present.
[c/] Wild fish collected for broodstock at Sandy Hatchery if wild population is determined to be healthy and abundant enough for removal of adults. The total number of wild adults collected for broodstock will not exceed 26 adults for all locations and methods of collection.

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.

Listed species affected: Winter steelhead	**ESU/Population: Lower Columbia**		**Activity: Broodstock Collection**	
Location of hatchery activity: Sandy River	**Dates of activity: December-June**		**Hatchery program operator: ODFW**	
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)			200[a/]	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)			22[b/]	
Intentional lethal take f)				
Unintentional lethal take g)			4[b/]	
Other Take (specify) h)				

[a/] Capture, handle, and release of wild winter steelhead during focused broodstock collection events.
[b/] The total number of wild adults collected for brood at all locations and methods will not exceed 26 adults.

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 3. 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 4. 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 5: 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:_____