FINAL
HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Sandy River Summer Steelhead Program**
Species or Hatchery Stock:	**Summer Steelhead (South Santiam Stock-24)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**North Willamette Watershed, NW Region**
Draft Submitted: **Submitted for ESA Consultation:**	**August 1, 2013** **May 16, 2011**
Date Last Updated:	**November 6, 2013**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery Program.

Sandy River Summer Steelhead Program

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

The Sandy River Summer Steelhead Program utilizes South Santiam stock (stock 024) summer steelhead, *Oncorhynchus mykiss*. The South Santiam stock summer steelhead originated from Skamania stock summer steelhead (see Section 6.1 for information on stock origin). The wild population of steelhead in the Sandy River Basin is part of the Lower Columbia River Steelhead Distinct Population Segment (DPS), and is listed as threatened under the Federal Endangered Species Act (ESA). The hatchery-produced summer steelhead population is not considered part of the Lower Columbia River Steelhead DPS and is not listed (Federal Register Notice 2004).

Summer-run steelhead are not considered indigenous to the Sandy River Basin, but evidence suggests naturally produced fish do exist in limited numbers that are thought to be primarily the result of natural production of hatchery fish (when hatchery fish were intentionally passed into the upper basin). Because of very limited numbers of naturally produced summer steelhead adults in the Sandy River, adult steelhead (South Santiam hatchery stock) returning to the South Santiam River are collected at the Foster Dam trap and used as broodstock for this program. Broodstock are held and spawned at the South Santiam Hatchery. Eggs are incubated through the eyed-stage at the South Santiam Hatchery, after which they are sent to Bonneville Hatchery Hatchery for egg incubation and rearing. Smolts are then sent to the Sandy Hatchery for final acclimation and release.

1.3) Responsible organization and individuals.

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

The National Oceanic and Atmospheric Administration Fisheries service (NOAA Fisheries; funding through the Mitchell Act), US Army Corps of Engineers (USACE) funding for the South Santiam and Bonneville hatcheries, US Fish and Wildlife Service (USFWS) funding through the Sport Fish Restoration Act, and the Bonneville Power Administration (BPA) funding for Bonneville Hatchery.

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

Sandy Hatchery:

Funding Sources:	NOAA Fisheries = 100%
Staffing Level:	3 Full Time Employees
Annual Budget:	Total budget for FY 2014 = $285,000 (no direct cost for summer steelhead program except staff time).

South Santiam Hatchery:

Funding Sources:	USACE = 70% ODFW = 30%
Staffing Level:	4.3 Full Time Employees
Annual Budget:	Total budget for FY 2010 = $572,396 (no direct cost for Sandy summer steelhead program except staff time).

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.

Broodstock collection, adult holding, and spawning take place at the South Santiam Hatchery. Eggs are transferred to and incubated at Bonneville Hatchery. All rearing takes place at Bonneville Hatchery. After rearing, the fish are transferred to the Sandy Hatchery for final acclimation and release.

Table 1.5. SandyRiver summer steelhead (stock-24) program summary.

Adult Collection	Adult Holding & Spawning	Egg Incubation	Rearing	Acclimation	Release
South Santiam H. (Foster Dam trap)	South Santiam H.	Bonneville H.	Bonneville H.	Sandy H. (Cedar Creek)	Sandy H. (Cedar Creek)

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

Summer steelhead program functions include:
Acclimation & Release

2) **South Santiam Fish Hatchery:** South Santiam Hatchery is located at RM 38.5 on the South Santiam River in the Upper Willamette River Basin, Linn County, Oregon. The facility is at an elevation of 500 feet above sea level, at latitude 44^{o} 24’ 57” N (44.41583) and longitude 122^{o} 40’ 21” W (122.6725). The regional mark processing code for South Santiam Hatchery is 5F33328 H28 21.

Summer steelhead program functions include:
Adult collection (Foster Dam trap)
Adult holding
Spawning & Egg incubation

4) **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^{o} 38’ 00” N (45.6334) and longitude 121^{o} 57’ 20” W (121.9568). The regional mark processing code for Bonneville Hatchery is 5F33201 H1 21.

Summer steelhead program functions include:

Egg incubation
Juvenile rearing

1.6) Type of program.

Isolated Harvest

1.7) Purpose of program.

The purpose of Sandy River summer steelhead program is harvest augmentation. The intent of the program is to produce a high quality, hatchery reared, summer-run steelhead to provide a fishery for sport anglers. This program aims to provide for harvest in the lower Columbia River and the Sandy River recreational fisheries. Although no numeric harvest goal has been adopted for this program the average smolt to adult survival of summer steelhead in the past 10 years (2.12%, see Table 1.12) has provided with good angling opportunities in the Lower Columbia and Sandy rivers. The numeric goal for this popular summer steelhead program is to release 75,000 smolts each year.

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

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

Objective 2: Contribute toward the sustainability of naturally produced native fish populations through the responsible use of hatcheries and hatchery-produced fish.

Objective 3: Maintain genetic resources of native fish populations spawned or reared in captivity.

Objective 4: Restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish and in natural environments by controlling egg and fish movements 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 5: Minimize adverse ecological impacts to watersheds caused by hatchery facilities and operations.

Objective 6: Communicate effectively with other fish producers, managers and the public.

1.8) Justification for the program.

The wild population of steelhead in the Sandy River Basin is listed as threatened under the Endangered Species Act (ESA), which restricts commercial and recreational fishing

of steelhead in the basin. The Sandy River summer steelhead program is managed to supplement regionally important steelhead fisheries while minimizing potential risks to wild Chinook, coho, and steelhead populations.

The Sandy River summer steelhead program is managed to supplement harvest in fisheries. Specifically, the program is managed to produce summer steelhead to sustain selective Columbia River and Sandy River sport fisheries. The Columbia and Sandy rivers are well regarded for recreational Chinook and steelhead angling. These fisheries receive a great deal of angler effort because of the close proximity to the Portland metropolitan area, and generate substantial economic benefits to the region.

The major concern about maintaining this sport fishery is the potential impact on listed fish. Summer-run steelhead are not considered indigenous to the Sandy River Basin, but evidence suggests naturally produced fish do exist in limited numbers that are thought to be primarily the result of natural production of hatchery fish (when hatchery fish were intentionally passed into the upper basin). However, harvest of hatchery-produced summer steelhead is managed to comply with the lower Columbia steelhead DPS Fisheries Management and Evaluation Plan (FMEP) that explains the management implications for holding a sport fishery where hooking mortality of listed fish may occur (ODFW 2001). Current fishing regulations in the Lower Columbia River DPS require that all unmarked adult steelhead be released back to the water unharmed. Only adult steelhead marked with an adipose fin clip may be retained in recreational fisheries.

Since the 1997 brood year, all summer steelhead of this program are clearly marked with an adipose fin clip to facilitate identification. Prior to the removal of Marmot Dam returning hatchery adults were segregated from the wild winter and summer steelhead population through sorting operations at the Marmot Dam fish collection facilities. ODFW evaluations determined that the majority (~70%) of natural spawning habitat for steelhead in the Sandy basin exists above the former Marmot Dam site, although a portion (~30%) of available spawning habitat in the basin exists in the lower mainstem and tributaries.

Marmot Dam was removed in 2007 and along with it the ability to physically sort returning adult salmonids. In anticipation of the removal of this dam, ODFW began implementing programmatic changes since 2001 to Sandy River hatchery programs to reduce the potential for returns to stray upstream of the dam site.

The following is a summary of key hatchery practices and management features in place to minimize the risk of potential impacts to listed salmonids:

- Smolts are released in a physical condition, and at times and locations (at or below Cedar Creek) 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.

- Returning hatchery adults were selectively excluded from the naturally spawning population above Marmot Dam through sorting practices to reduce the potential for interbreeding. While no hatchery fish were intentionally passed, some may have reached upper basin spawning areas due to errors in sorting and/or fin clipping operations.
- After Marmot Dam removal, adult steelhead abundance, distribution and hatchery-wild interbreeding will be monitored by conducting spawning surveys throughout the basin. ODFW conducted surveys upstream of the dam prior to removal to assess spawner distribution and success but also to calibrate surveys in anticipation of loss of the trapping/sorting facility at the dam.
- This program complies with ODFW's Fish Health Management Policy and Integrated Hatchery Operations Team (IHOT) standards for prevention, treatment, and transmission of fish diseases (IHOT 1996).
- 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 NOAA Fisheries and the State of Oregon.

Indicator (1)(a): Mitigation criteria (e.g., harvest rates, escapement) as outlined in the mitigation agreement.

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 goals are aligned with authorized federal, state, regional, and local fisheries conservation and restoration initiatives.

Indicator (2)(a): Program complies with Oregon Native Fish Conservation Policy and the Sandy River Basin Plan, and the Oregon Hatchery Management Policy (OAR 635-007-0542 through 0548).

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

Harvest and Socio-Economic Effectiveness:

Performance Standard (3): Contribute to the Sandy River and the lower Columbia River sport fisheries.

Indicator (3)(a): Number of adult hatchery steelhead caught in the Sandy River and the lower Columbia River fisheries.

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

Performance Standard (4): Hatchery release groups are sufficiently marked to facilitate identification and track survival. Goal is 100% marking of hatchery smolts.

Indicator (4)(a): Number of program fish adipose fin clipped.

Monitoring and Evaluation: Sample all smolt release groups to verify that mark rate is in between 95% and 100%.

1.10.2) Performance Indicators addressing "RISKS":

Operation of Artificial Production Facilities:

Performance Standard (6): Sandy Hatchery is operated in compliance with all applicable fish health guidelines, facility operation standards, and protocols.

Indicator (6)(a): Number and type of pathogens observed, in both broodstock and rearing juveniles, are within accepted guidelines.

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

Indicator (6)(b): Survival rates (e.g. egg-to-fry/fry-to-smolt) are within guidelines.

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

Performance Standard (7): Effluent from Sandy Hatchery will not detrimentally affect natural in-river populations.

Indicator (7)(a): Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit.

Monitoring and Evaluation: Effluent water samples are analyzed for compliance. 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 (8):Minimize impacts to naturally produced adult salmonids.

Indicator (8)(a): Weir/trap operation at Sandy Hatchery, Cedar Creek, or tributary weirs/traps does not result in significant stress, injury, or mortality to naturally produced salmonids.

Monitoring and Evaluation: Monitor the number of mortalities in adult collection traps and weirs for each species.

***Performance Standard (9)*:** Minimize impacts to naturally produced juvenile salmonids.

Indicator (9)(a): Hatchery fish will be released in time and locations, and in a condition that minimizes the interaction with listed fish.

Monitoring and Evaluation: Monitor smolt development at the hatchery (using available indicators, e.g. age, size, and coloration of smolts) to assure that fish are released as full-term smolts. Utilize release locations at or downstream of Cedar Creek.

Life History Characteristics:

Performance Standard (10): Manage the Sandy Basin for hatchery and wild fish with emphasis on natural production of wild fish.

Indicator (10)(a): Minimize the number of hatchery summer steelhead adults that stray throughout the basin. Prior to removal of Marmot Dam, fish with fin clips were selectively excluded from passing upstream of the dam.

Monitoring and Evaluation: Only unmarked steelhead were passed above Marmot Dam. Conduct annual spawning ground surveys to assess the number of hatchery fish spawning in areas above Marmot Dam site following removal of the dam.

Indicator (10)(b): Prior to removal of Marmot Dam, all fish without fin clips were passed above Marmot Dam.

Monitoring and Evaluation: All fish trapped at Marmot Dam were examined for a hatchery mark and counted by ODFW and/or PGE staff. Only unmarked fish were passed above Marmot Dam.

1.11) Expected size of program.

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

Summer steelhead broodstock (stock-24) are not collected specifically for the Sandy River program. About 2,000 adult summer steelhead are collected annually at Foster Dam (on the South Santiam River) to meet egg requirements for all summer steelhead (stock-

24) propagation programs of the ODFW. Broodstock collection levels usually vary annually (Table 7.4.2).

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 River summer steelhead program.

Life Stage	Release Location	Number Released
Eyed Eggs	Na	Na
Unfed Fry	Na	Na
Fry	Na	Na
Pre-smolts	Na	Na
Smolts	Cedar Creek (Sandy Hatchery)	75,000 smolts @ 4.5/lb

NOTE: Currently, fish are released into Cedar Creek at the Sandy Hatchery, though in the past they have also been occasionally released into the mainstem after acclimation (e.g. at Marsh Road during low flow years in Cedar Creek). In the future, additional acclimation sites may be developed in the lower river to minimize straying into the primary natural production areas above the former Marmot Dam site. Total numbers released are expected to remain constant.

1.12) Current program performance, including estimated smolt-to-adult survival rates, adult production levels, and escapement levels.

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

The estimated number of total adult hatchery summer 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 summer 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 summer 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. There are no direct estimates of age composition for summer steelhead in the Sandy River. Therefore, the average age composition for South Santiam stock summer steelhead released into the South Santiam River was used to estimate the age of adults returning to the Sandy River. The historic average age composition (from 1992-2002) was 87% 2-salt and 13% 3-salt (Buchanan 1977, Buchanan et al. 1979, Wade and Buchanan 1983, and personal communication with Todd Alsbury, ODFW). 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. Estimated number of smolts released, returns to Marmot Dam and the Sandy Hatchery, and smolt-to-adult survival rates for Sandy Hatchery summer steelhead, brood years 1997-2009.

Brood Year	Smolts Released	Return Year	Adult Returns[c/]			Smolt-Adult Survival (%)
			Marmot Dam[a/]	Sandy H[a/]	Terminal Harvest[b/]	
1997	75,299	2000/01	115	327	746	1.58
1998	75,409	2001/02	410	586	991	2.64
1999	74,992	2002/03	68	483	1,364	2.05
2000	59,889	2003/04	50	327	1,097	2.51
2001	76,654	2004/05	55	503	1,113	2.13
2002	73,029	2005/06	20	515	557	1.61
2003	74,927	2006/07	20	787	1,040	2.44
2004	78,537	2007/08	21	1309	730	2.71
2005	83,646	2008/09	N/A	755	1,143	2.26
2006	70,635	2009/10	N/A	513	729	1.76
2007	92,719	2010/11	N/A	288	703	0.85
2008	81,221	2011/12	N/A	69	472	0.67
2009	81,283	2012/13	N/A	147	N/A	INC
2010	78,558	2013/14	N/A	N/A	N/A	N/A
2011	81,192	2014/15	N/A	N/A	N/A	N/A
2012	80,550	2015/16	N/A	N/A	N/A	N/A

[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).

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

Sandy Fish Hatchery began operation in 1951. Summer steelhead (Skamania stock 024) were first introduced into the Sandy River in 1975. Summer-run steelhead are not considered indigenous to the Sandy River Basin, but counts from the former Marmot trap indicate naturally produced summer steelhead do exist with numbers declining annually after passage of hatchery summer steelhead into the upper basin ceased in 1997.

1.14) Expected duration of program.

This program is ongoing, with no planned end date.

1.15) Watersheds targeted by the program.

Targeted watersheds include:

- Sandy River, below former Marmot Dam site.
- Lower Columbia River

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

1.16.1) Brief overview of key issues.

The Sandy River summer steelhead program is a segregated program that utilizes a non-endemic stock (Skamania stock origin), but summer steelhead are not considered endemic to this basin. The program involves the release of smolts produced from hatchery adults returning to Foster Dam (South Santiam River) and spawned at South Santiam Hatchery. Early incubation occurs at South Santiam, then eyed eggs are transferred to Bonneville Hatchery for final incubation and rearing. Fish from Bonneville (75,000) are reared for 13-14 months to the pre-smolt stage and then are transferred to Sandy Hatchery for acclimation prior to release. All summer steelhead released in the basin are adipose clipped. Some returning adult summer 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 to mitigate for the loss of habitat resulting from hydroelectric development in the basin.

Issue 1: The removal of Marmot Dam may have led to unintended straying of hatchery fish into the primary natural production areas in the Sandy due to lack of ability to sort and remove hatchery fish from the natural spawning population

Issue 2: Some summer steelhead may naturally reproduce in the Sandy River and the resulting production may end up in the primary natural production areas of the Sandy River upstream of the former Marmot Dam.

Issue 3: A portion of summer steelhead smolts released in the lower basin may not out-migrate as desired. No information is available to document or measure the extent of potential residualism.

Issue 4: Limited information is available to assess the effects of recycling adult summer steelhead in the lower river for fishery benefits (detailed info in Section 7.5). 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.

Alternative 1:*If summer steelhead straying to the upper basin (above the former Marmot Dam site) cannot be minimized , investigate options for program changes to reduce stray rates including reducing smolt release numbers, developing alternate release sites, and*

developing adult trapping facilities in the lower Sandy (such as in the Bull Run River), etc. {Issue 1}

Pros & Cons: If needed, 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 may 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 summer steelhead in the Sandy basin (below 10% in the last 5 years of Marmot trap operation), interaction between winter and summer steelhead on spawning grounds should be minimal in the upper Sandy basin. Spawning ground surveys conducted since removal of Marmot Dam show limited stray of steelhead (2.6% in 2010) throughout the natural spawning habitat for steelhead in the basin (ODFW Spawning Ground Survey 2006-2007, and Appendix C of ODFW Lower Columbia River Conservation and Recovery Plan 2010).

Alternative 2: *Eliminate the summer steelhead program in the Sandy basin. {All Issues}*

Pros & Cons: Eliminating the program would eliminate all potential risks to the wild winter steelhead population due to potential interactions with summer steelhead. This action would impact a recreational fishery and result in significant opposition from the sports fishing industry and anglers. There is currently no information to document that the summer steelhead program is impacting wild winter steelhead in the basin. Historic fish passage data indicated a relatively low number of hatchery summer steelhead migrated upstream to Marmot Dam.

Alternative 3: *Investigate, through genetic sampling and analysis, whether genetic information can be used to distinguish summer steelhead from the wild winter steelhead population. Based on this information, determine whether naturally produced summer steelhead exist within the basin and, specifically, whether natural production is occurring in the upper basin. If natural production of summer steelhead is occurring, develop management strategies to eliminate potential interactions between summer steelhead and the naturally produced winter steelhead population. {Issue 2}*

Pros & Cons: Implementation of a scientific study would provide information to validate whether summer steelhead are naturally producing, and would provide a basis for future management decisions to reduce risk to native winter steelhead populations. The information could ultimately result in improved conservation of the winter steelhead population. The study requires a financial investment, but no source of funding has been identified. If warranted by the study, elimination or reduction of the program could impact a popular recreational fishery and result in opposition from the sports fishing industry and anglers.

Alternative 4: *Investigate whether summer steelhead smolts are failing to migrate after release, determine the rate of residual rearing, and identify the spatial distribution and*

temporal presence of residual fish, and if found, determine if negative interactions with wild salmonids may be occurring. Based on this information, develop management strategies to reduce potential interactions between summer steelhead and the naturally produced winter steelhead population. {Issue 3}

Pros & Cons: Implementation of the scientific study would provide information to determine if summer steelhead smolts are residualizing, whether this occurrence is significant, and would provide a basis for future management decisions to reduce risk to native winter steelhead populations. As a result, management decisions would be based on information rather than speculation. The information could ultimately result in improved conservation of the winter steelhead population. The study requires a financial investment, but no source of funding has been identified. If warranted by the study, elimination or reduction of the program could impact a popular recreational fishery and result in opposition from the sports fishing industry and anglers.

Alternative 5: *Conduct an investigation to determine the fate of summer steelhead that are recycled through the lower river fishery, and evaluate the extent and location of natural spawning by recycled summer steelhead. Based on the information obtained, develop management strategies to reduce potential interactions between summer steelhead and the naturally produced winter steelhead population. {Issue 4}*

Pros & Cons: Implementation of this study would provide better information to determine if recycled summer 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 a 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 opposition from the sports fishing industry and anglers.

1.16.2) Potential Reforms and Investments.

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

Reform/Investment 1: To reduce interactions between hatchery summer steelhead and wild winter steelhead populations above the former Marmot Dam site, 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 #1}

Reform/Investment 2: Conduct a genetics study to determine if summer steelhead can be distinguished from the wild winter steelhead population, whether summer steelhead

are naturally producing, if naturally produced summer steelhead are present in natural production areas for wild winter steelhead, and identify potential management strategies to reduce interactions between these populations. The cost of the study is currently undetermined. {Issue #2}

Reform/Investment 3: Conduct a study to determine if summer steelhead smolts are residing in the Sandy River following release from the hatchery, estimate the rate of residual rearing, measure the characteristics of residual fish, and determine the temporal and spatial distribution of these fish relative to wild salmonids populations if residualism is occurring. Based on this information, identify management strategies to reduce interactions between these populations. The cost of the study is currently undetermined. {Issue #3}

Reform/Investment 4: Conduct a study to evaluate the fate of summer 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 locations), or (4) migrate out of the basin or become mortalities after recycling. Based on the information collected and if warranted, identify management strategies to reduce potential interactions between summer steelhead and the wild winter steelhead populations. The cost of the study is currently undetermined. {Issue #4}

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS

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

Fish production activities conducted by the Sandy River summer steelhead program are covered by the following:

- Section 7 (Consultation) - 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999).
- Section 4d - Lower Columbia River Steelhead FMEP
- A Section 7 Biological Opinion and Incidental take Statement was issued for this program on September 28, 2012

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

All Columbia River anadromous salmonids that successfully return to spawn must migrate through the lower Columbia River and estuary twice during their life cycle. Thus, hatchery programs in the lower Columbia have the potential to affect the 12 listed 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 sub basin where the program's brood fish are collected (South Santiam River) and smolts are released (Sandy River). The listed populations in the target area include:

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

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 federally listed as threatened under the Endangered Species Act, effective July, 2005. This ESU is listed as endangered by the State of Oregon.

The Columbia River chum salmon (*Oncorhynchus keta*) ESU is federally listed as threatened under the ESA, effective May 24, 1999. The ESU includes all naturally spawning populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.

The Upper Willamette River Chinook ESU was listed as threatened under the ESA on March 24, 1999. This ESU includes all naturally spawned populations of spring-run Chinook salmon upstream from Willamette Falls and in the Clackamas River. Natural populations include spring Chinook in the North Santiam, the McKenzie, the Middle Fork Willamette, and the Clackamas basins.
The Upper Willamette River Steelhead DPS was listed as threatened under the ESA on March 25, 1999. This ESU includes native winter-run populations from Willamette Falls

to, and including, the Calapooia River. Significant natural populations of steelhead occur in the North Santiam, the South Santiam, the Molalla, and the Calapooia rivers. Additionally, smaller and dependant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, and Rickreall).

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

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

No listed populations will be directly affected by the Sandy Hatchery Summer Steelhead program.

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

All listed species occupying habitats in the lower Sandy River and the lower Columbia River migration corridor(s) may be impacted by the presence of Sandy River (hatchery) summer 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 Steelhead - The Lower Columbia River steelhead DPS contains both winter and summer steelhead, and was listed as threatened under the ESA on March 19, 1998. This DPS contains tributaries to the Columbia River between the Cowlitz and Wind Rivers Washington, inclusive, and the Willamette and Hood Rivers in Oregon, inclusive. Excluded are steelhead in the upper Willamette River Basin above Willamette Falls, and steelhead from the Little and Big White Salmon Rivers in Washington.

- Upper Willamette River Steelhead - The Upper Willamette River Steelhead DPS includes native winter-run populations from Willamette Falls to, and including, the Calapooia River. Significant natural populations of steelhead occur in the North Santiam, the South Santiam, the Molalla, and the Calapooia rivers. Additionally, smaller, but still significant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, and Rickreall).

Steelhead are rainbow trout that migrate to and from the ocean. Lower Columbia River steelhead include summer and winter runs. Summer steelhead return from the ocean between May and November and generally spawn between January and June. Winter steelhead return to freshwater between November and April and generally spawn sometime during the months of March to June. Some adult steelhead return to the ocean after spawning and may survive a second freshwater migration to spawn twice during the life cycle. Juvenile steelhead typically rear one to two years in freshwater before emigrating to the ocean during spring and summer. The factors that cause some fish to remain in freshwater to adulthood (i.e. resident rainbow trout) or that motivate others to migrate to the ocean (i.e. steelhead) are not completely understood.

- 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.

- Lower Columbia River Coho – The Lower Columbia River coho salmon ESU is listed as threatened under the ESA and endangered by the State of Oregon. Lower Columbia River coho salmon are present in numerous Oregon tributaries to the lower Columbia. Evidence suggests that most coho observed in tributaries below the Clatskanie sub basin are of hatchery origin and few wild fish are present. But, other Lower Columbia tributaries above and including the Clatskanie do have modest natural production of wild coho (personal communication with Todd Alsbury, ODFW).

- Lower Columbia River Chum - The Lower 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.

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

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

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

The MAT values identified by the WLC-TRT were used in the status assessment conducted as part of developing the Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead (ODFW 2010). The status

assessment found that the Sandy coho population was below the "critical" MAT at 1,600. 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 (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) adopts the biological criteria for achieving delisting that were established by the WLC-TRT. 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 distribution, 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 (See Tables 7.1 and 7.3 in Lower Columbia River Conservation and Recovery Plan, ODFW 2010).

Table 2.2.2(a) 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*).

		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 2.2.2(b) Summary of the percent improvement required for each threat category in order to achieve the delisting desired status. Shared popns. with Washington are indicated by an asterisk.

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

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

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

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

All adult Sandy River Chinook, coho, and steelhead were counted at Marmot Dam prior to dam removal in 2007. Prior to 1999 wild and hatchery fish could not be distinguished and all fish were passed upstream (with the exception of steelhead). 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 2.2.2(c).

Table 2.2.2(c). 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 estimate of annual proportions of the direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

The natural spawning grounds in the upper Sandy Basin (above Marmot Dam) were managed as a wild fish sanctuary from 1999 (no marked fish were passed above Marmot Dam) to 2007 when Marmot Dam was removed. However, ODFW has observed that a limited number of hatchery fish spawn naturally in the lower mainstem Sandy River. 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 (ODFW Spawning Ground Survey, 2007 and Appendix C of the Lower Columbia River Conservation and Recovery Plan, ODFW 2010).

The estimated proportion of hatchery steelhead in the natural spawning escapement upstream of the former Marmot Dam is presented in Table 2.2.2(d). 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 2.2.2(d). Estimated percentage of hatchery steelhead in the natural spawning habitat of the, Sandy River 1990-2010.

Run Year	Winter Steelhead
1992	12.1%
1993	12.1%
1994	12.1%
1995	12.1%
1996	12.1%
1997	12.1%
1998	12.1%
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	n/a
2009	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). Number between 1999 and 2007 from Marmot Dam trap counts. 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 assumed to be below 0.05 of the total escapement.

[a/] Estimate based on surveys conducted by ODFW.

[b/] No spawning surveys conducted.

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

See Section 13, Attachment 2.

- 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.

Summer steelhead broodstock for the program are collected at South Santiam Hatchery, which may affect listed Chinook and steelhead due to trap operation at Foster Dam.

Trapping and sorting of summer steelhead at Sandy Hatchery may also lead to incidental take of listed fish. Unmarked winter steelhead and coho that enter the trap at Sandy Hatchery will be passed upstream in order to seed 12 miles of vacant habitat upstream of the hatchery.

Hatchery summer steelhead smolts are only acclimated and released at the Sandy Hatchery. Adult collection, spawning, incubation, and rearing take place at other locations. Therefore, incidental take of juvenile salmonids is not expected to occur through activities associated with the hatchery summer steelhead program at the Sandy Hatchery. While there may be competition between hatchery smolts and naturally-produced smolts in the mainstem Sandy River, 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.

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

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

Adult fish trapping and sorting operation at Marmot Dam trap was mainly conducted to provide upstream passage to the listed fish above the barrier, where hatchery fish were retained and prevented from entering the primary natural production areas for wild fish. Data of wild- and hatchery-origin fish encountered at the trap and their mortalities are presented in Table 2.2.3a.

Table 2.2.3(a). Wild (unmarked) adult fish passed at Marmot Dam, 1999 – 2007.

Year	Summer Steelhead	Winter Steelhead	Coho	Spring Chinook[a/]	Observed Mortalities
1999	20	928	160	581	0
2000	110	741	730	564	0
2001	262	902	1,380	988	0
2002	473	1,031	310	1,035	0
2003	230	671	1,173	1,053	0
2004	343	869	1,025	2,294	0
2005	128	626	745	1,542	0
2006	107	643	835	1,239	0
2007	138	845	687	1,505	0

[a/] Wild and hatchery Spring Chinook could not be completely distinguished until 2002 return year.
Source: PGE and Marmot Dam records.

Table 2.2.3(b). Numbers of wild winter steelhead collected, mortality and number released at South Santiam Hatchery since 1993-2010.

Brood Year	Fish Collected	Fish Released	Mortalities	%Mortality
1993	256	256	0	0
1994	234	234	0	0
1995	294	294	0	0
1996	131	131	0	0
1997	334	332	2	0.6
1998	355	355	0	0
1999	328	328	0	0
2000	331	331	0	0
2001	783	782	1	0.13
2002	1008	1008	0	0
2003	888	885	3	0.34
2004	1016	1016	0	0
2005	628	628	0	0
2006	419	419	0	0
2007	209	209	0	0
2008	256	256	0	0
2009	192	192	0	0
2010	426	426	0	0
2011	315	315	0	0
2012	326	326	0	0
2013	286	286	0	0

Source: South Santiam Hatchery records, HMIS

- 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 Table 2 2.3b and Table 2.2.3c for take associated with broodstock collection at South Santiam Fish Hatchery.

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

- 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 the NOAA Fisheries if projected take levels may be exceeded. If wild winter steelhead or coho show up at the Sandy Hatchery, they will be sorted and allowed to pass upstream of the hatchery. Naturally spawning unmarked summer

steelhead (with no hatchery-origin marks) 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.

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

These documents provide 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 restrict fisheries on steelhead adults in ways consistent with rebuilding wild populations. The measures outlined in the plans are designed to maintain viable populations in the Sandy River.

- *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 for 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. These conservation plans are to contain an assessment of the status of each native stock, 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 policy 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 Program (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.

•*US vs. Oregon*

This program aids in fulfillment of annual management agreements between the states of Oregon and Washington, the Federal Government, and the Columbia River Treaty Tribes under the jurisdiction of the US District Court.

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
- An ESA Section 7 Biological Opinion and Incidental Take Statement was issued for the Sandy Hatchery Summer Steelhead Program on September 28, 2012.
- Sandy River Basin Fish Management Plan
- Fisheries Management and Evaluation Plan - Lower Columbia River Steelhead
- US vs. Oregon
- 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, Or.
- 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.

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

This program is managed to provide steelhead production to supplement harvest in the Sandy River sport fishery. Sandy Hatchery summer steelhead are an important contributor to the Sandy River sport fishery.

Total fishery harvest estimates for Sandy Hatchery summer steelhead are listed in Table 3.3.1.

Table 3.3.1. Harvest of summer steelhead in the Sandy River below Marmot Dam, 1995-2011.

Return Year	Number Caught
1995	238
1996	418
1997	341
1998	280
1999	335
2000	836
2001	1,282
2002	1,364
2003	1,097
2004	1,113
2005	557
2006	1,040
2007	730
2008	1,143
2009	729
2010	703
2011	472

Source: ODFW Harvest Card data (expanded) 20011. Data for 2012 are not available at time of update.

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, at 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 summer steelhead program is consistent with these habitat protection and recovery strategies. However the barrier/water intake at the 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 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 summer steelhead juvenile survival after release. Recent estimates of annual Caspian tern predation on salmonid smolts 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 dolomeiui*) 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 native salmonids and large out-of-basin hatchery salmonid releases represent potential sources of competition to juvenile Sandy Hatchery summer 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 summer steelhead. However, the summer 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.

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 natural spawning habitat of wild fish. This impact is minimized through the following actions:

- All hatchery fish are marked and returning hatchery adults with visible fin clips will be sorted and removed from the spawning population of upstream migrants by ODFW staff through sorting operations at a weir/trap located at the mouth of Cedar Creek, weirs/traps in select upper basin tributaries, or deployment of seines/tangle nets in select areas of the upper basin. While these activities are conducted to collect hatchery spring Chinook, hatchery summer steelhead encountered during these operations will be removed.

- Summer steelhead smolts are acclimated for at least a 2-3 week period. Acclimation allows fish to imprint on Cedar Creek water and return to the Sandy Hatchery as adults.

(b) *Competition* - Freshwater carrying capacity may be compromised if hatchery summer steelhead competitively displace wild fish in their natural rearing habitats. Although there are little data to substantiate whether competitive interactions are occurring in the Sandy basin, there is a chance that it may occur now that Marmot Dam no longer allows for sorting and removal of hatchery summer steelhead. The following are several strategies ODFW uses to avoid or minimize risks associated with hatchery and wild summer steelhead competitive interactions and carrying capacity concerns:

- Summer steelhead smolts are released in the lower river at a target size that supports swift emigration and reduces the tendency for fish that do not meet the target size to residualize. This should minimize spatial and temporal overlap, thereby reducing competition with wild juveniles for food and cover.

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

(c) *Disease Transmission* – Because hatchery summer steelhead are reared outside the Sandy basin, but are acclimated, released, and return to the Sandy River basin, they are potentially a source of pathogen and disease transmission to wild fish populations. ODFW recognizes the importance and magnitude of fish disease and health, and hatchery summer steelhead are managed to minimize disease transmission to wild populations.

To prevent introduction, spread, or amplification of fish pathogens, all hatchery activities are conducted in accordance with guidelines developed under the Pacific Northwest Fish Health Protection Committee (PNFHPC) and according to protocols outlined by the Integrated Hatchery Operations Team (IHOT 1996) and ODFW Fish Health Management Policy. ODFW fish pathologists, along with hatchery staff, regularly monitor fish health and conduct fish disease examinations. Monitoring efforts include virus sampling, abnormal fish loss investigations, and pre-transfer and pre-liberation fish health inspections, and only certified fish are released in the river.

(d) *Predation* - Hatchery summer steelhead released into nursery habitats may residualize within the sub basin and directly prey on naturally produced salmon and steelhead fry. Due to their location, size, and time of emergence, newly emerged Chinook salmon fry and fingerlings are likely to be the most vulnerable to predation by hatchery released fish

(NMFS 1999). However, direct predation by hatchery fish on naturally produced fish in migration corridors is believed to be low (NMFS 1999). In addition to direct predation, large groups of hatchery fish may attract alternate predators in rearing habitats and migration corridors, such as pinnepeds, birds, and other fish species.

(3) Species that could positively impact the program include: any hatchery or wild fish that dies or is deposited within the sub basin for the purposes of stream enrichment. Decaying carcasses of salmonid species may contribute nutrients that increase productivity in the sub basin.

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

SECTION 4. WATER SOURCE

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

Sandy Hatchery - The water source for 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 hatchery intake on Cedar Creek is 100% screened throughout the year, however the screens are considered non-compliant to current NOAA Fisheries fish screening criteria. ODFW, in cooperation with the City of Portland, is pursuing a project to upgrade the intake screens to current NOAA Fisheries standards and provide passage to naturally produced fish in Cedar Creek. Project designs are nearly complete and initial implementation of the project is expected to occur during the 2012 in-water work period. Water withdrawal is covered under Oregon water permit # 23300 (12/3/1954).

Table 4.1. 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

South Santiam Hatchery - The main water source at South Santiam Hatchery is Foster Reservoir. A total of 8,400 gpm is available for the rearing units. An additional 5,500 gpm is used in the adult holding pond. ODFW does not currently hold a water right for withdrawal from Foster Reservoir. A secondary, smaller water source is a well that is commonly used for early summer steelhead egg incubation. This withdrawal has a permit. Currently the intake screens for the South Santiam Hatchery at Foster Reservoir do not meet NOAA Fisheries screening criteria.

Foster Reservoir provides excellent rearing water for most of the year. During fall and winter months, however, upstream freshets historically resulted in long periods (5-10 days) of high turbidity. During this time very fine suspended clay makes hatching of fry and early rearing of fingerlings very difficult. Consequently, all egg incubation past the "eyed" stage and early rearing of fingerlings is accomplished at other hatcheries. Since the late 1990's, however, these freshets have been less frequent and of shorter duration (2-3 days typically).

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.

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 with wire mesh, rotating screens. The intake is considered non-compliant to NOAA Fisheries fish screening criteria. The City of Portland provided a significant portion of funding to upgrade screens to current NOAA Fisheries standards and provide passage to naturally produced fish in Cedar Creek. Providing passage for wild winter steelhead and coho above the structure is identified as one of the highest priority hatchery reform measures in the entire lower Columbia River. Project designs are nearly complete and implementation is expected to occur during the 2012 in-water work period. 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.

South Santiam Hatchery - Currently the intake screens for the South Santiam Hatchery at Foster Reservoir do not meet NOAA Fisheries screening criteria. 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 the NOAA Fisheries screening criteria. 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).

South Santiam Hatchery - All broodstock for this program are collected at Foster Trap, located at the base of Foster Dam on the South Santiam River. A fish ladder provides access to the approximately 12' x 40' trap which has a mechanical sweep to crowd fish into an anesthetic tank. From the anesthetic tank (CO_2 is used), fish are manually placed into a mechanical loading bell or slid down 10-inch plastic pipes to the holding ponds. A grate can be lowered to close the ladder to fish passage and is used to control the numbers of adults migrating into the trap during peak run times. Overloading of the trap is possible without this device. Adults held for broodstock are inoculated with oxytetracyclene at collection and, again, approximately three months prior to spawning. Furunculosis is the disease of concern. Flow-through treatments of formalin (prior to 2000) or hydrogen peroxide (since 2001) are applied in the adult holding pond for one-two hours, three days per week, throughout the holding period to control fungus.

5.2) Fish transportation equipment.

Sandy Hatchery – Smolts are not normally transported off-station once they arrive at the Sandy Hatchery.

Adults that are recycled to the lower river are transported in a fish liberation truck utilizing a small portable tank (~300 gallon) equipped with supplemental oxygen. Normal handling and transit time is < 1 hours.

South Santiam Hatchery – The South Santiam Hatchery utilizes two 1,000-gallon transportation trucks located at the hatchery. Both trucks are equipped with supplemental oxygen. Additionally, a 300-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.

Bonneville Hatchery – Bonneville Hatchery utilizes one 1,000-gallon transportation truck located at the hatchery. This truck is 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 spawning and holding facilities.

South Santiam Hatchery - An oval concrete broodstock holding pond, measuring 148' x 47', is used for adult holding at the South Santiam Hatchery. The pond holds approximately 199,000 gallons when full. Approximately 1,400 adult spring Chinook are held along with 1,300 adult summer steelhead in this pond. Water-flow is about 5,000 gpm during heavy loading periods. A center divider allows separation of species and a cross divider allows separation of males and females.

Spawning facilities at South Santiam Hatchery are crude and small. A flat working area of approximately 8' x 10' is exposed when the pond volume is lowered. All live fish are handled manually and spawned carcasses are carried or thrown from the spawning area above to ground level. The sloping side of the pond complicates the use of mechanical means for removing fish.

5.4) Incubation facilities.

South Santiam Hatchery - The incubation room in the South Santiam Hatchery is approximately 18'x 24' and contains 30, 16-tray vertical incubators (4,000-9,000 eggs/unit) and two six-foot fiberglass picking troughs. A 120-gallon hot water tank is available for heating incubation water but is expensive to operate (water heater will be removed in 2005). All incubators and both troughs are plumbed with reservoir and well water. Water-flow through the incubators is approximately 4 gpm. A chemical treatment system is also plumbed to each incubator. Water from the incubation room mixes with surplus water before it discharges to the river to satisfy chemical dilution requirements. All incubators are equipped with low water alarms. Summer steelhead eggs are incubated through the "eyed" stage prior to shipment to Bonneville Hatchery.

Bonneville Hatchery - The incubation room in the Bonneville Hatchery contains 2,432 vertical incubators (4,000-9,000 eggs/unit) and 60 deep troughs. At Bonneville Hatchery water temperature is monitored via a thermograph that measures water temperature of all water coming into the hatchery. The water source is well water, so water temperatures consistently vary from 49-51ºF. Dissolved Oxygen (D.O.) levels are not monitored during incubation. Incubating eggs are kept at low densities so that D.O. is not of concern. Use of well water ensures that siltation is not an issue. Each incubator stack of trays has a low flow alarm, and the head box is also equipped with a low-flow alarm to alert the hatchery personnel of a water loss or other low-flow situations.

5.5) Rearing facilities.

Bonneville Hatchery -

Table 5.5a. Rearing facilities at the Bonneville Hatchery.

Unit Type	Unit Length (ft)	Unit Width (ft)	Unit Depth (ft)	Unit Volume (ft3)	Number Units	Total Volume (ft3)	Construction Material
Adult Holding/ Rearing Ponds	165	27	6	26,730	1	26,730	concrete
Adult Holding/ Rearing Ponds	123	76	7	65,436	1	65,436	concrete
Raceways	75	17	3	3,780	28	105,840	concrete
Raceways	80	20	3	4,800	30	144,000	Concrete
Circular Tanks		9	2.5	636	4	2542	fiberglass
Deep Troughs	14	1	1.5	21	60	1,288	fiberglass

5.6) Acclimation/release facilities.

Sandy Hatchery - All summer steelhead yearlings for this program are transported to the Sandy Hatchery for a 2-3 week acclimation period prior to release. Smolts are acclimated in the adult holding pond (8,190 ft^3) or multiple raceways (5,600 ft^3)at the 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 Fish Hatchery.

South Santiam Hatchery – There have not been any significant fish losses resulting from hatchery operations at the South Santiam Hatchery.

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.

South Santiam Hatchery – The South Santiam hatchery is staffed 24 hours a day and is equipped with alarm systems that notify personnel of water supply system failures. Rearing ponds and incubation stacks are equipped with water height alarms. IHOT guidelines are followed for holding, loading density, water quality, alarm systems and predator control measures to provide necessary security. Fish health monitoring and disease prevention standards consistent with ODFW and IHOT protocols are applied at the South Santiam Hatchery.

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 Skamania summer steelhead stock originated from eggs obtained from Skamania Hatchery on the Washougal River in southwest Washington. Eggs collected from Washougal River returns were used at South Santiam Hatchery from 1967 to 1973. After which time, adults returning to Foster Dam (on the South Santiam River) have been used for broodstock (South Santiam stock). Only known hatchery reared fish are used for broodstock. Adults collected at Minto Dam, on the North Santiam River, may be used as a back-up brood source, although there has not been a need for this option.

6.2) Supporting information.

6.2.1) History.

The Skamania Hatchery summer steelhead stock was originally derived from wild fish taken from the Washougal and Klickitat rivers. For decades the Skamania Hatchery summer steelhead broodstock had been obtained directly from adults returning to the Skamania Hatchery on the Washougal River. The Skamania stock is the source for the majority of hatchery summer steelhead smolts released into the lower Columbia River and the upper Willamette River basins.

The first fish captured for broodstock at the Skamania Hatchery occurred in 1956. The first returns of fish reared at the hatchery were in 1959. Both Cowlitz and Skamania Hatchery stocks were introduced into the Washougal Basin in the late 1950s and are assumed to have interbred with the wild stock (WDFW, 1990).

ODFW historically maintained two stocks of Skamania summer steelhead, stock-23 at Leaburg Hatchery on the McKenzie River and stock-24 at South Santiam Hatchery. Since these were of the same origin, and frequently exchanged eggs, the stocks were combined in the early 1990s to form the single South Santiam stock-24. Subsequently the stock has come to be spawned exclusively at South Santiam, with transfers for rearing and release to other locations (including back to South Santiam Hatchery after early rearing elsewhere).

6.2.2) Annual size.

While actual adult collection numbers vary annually depending upon broodstock needs, the number of broodstock collected at Foster Dam in 2010 was 420 males and 444 females. These broodstock are used to produce eggs for all summer steelhead (stock-24) programs of the ODFW. See Section 7.4.2 for details regarding annual broodstock collection levels from 1995-2010.

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

Listed fish are not used as broodstock for the summer steelhead program (stock-24). Returns of unmarked summer steelhead to the Foster trap have typically been < 1% of the total. Unmarked summer steelhead (naturally produced fish of hatchery origin) may be incorporated into the broodstock each year. However, no more than 10% of the broodstock can be composed of unmarked fish.

6.2.4) Genetic or ecological differences.

Summer-run steelhead are not considered indigenous to the Sandy River Basin and actual genetic differences between returning marked hatchery fish and the listed wild steelhead population are unknown. However, substantial genetic, ecological, and behavioral differences do (or are assumed to) exist between natural steelhead in the Sandy Basin and hatchery Skamania (i.e. South Santiam) stock steelhead. These differences include life history traits associated with the different steelhead races (summer versus winter); hatchery rearing, domestication and artificial selection; and life history traits associated with the different areas of ancestral origin (Washougal and Klickitat rivers versus Willamette basin).

6.2.5) Reasons for choosing.

The Skamania stock originally was chosen to support the Willamette Basin and lower Columbia summer steelhead fishery for three primary reasons: 1) because of its lengthy run time distribution which provides an extended fishing season; 2) because of its relatively large size fish which is appealing for sport harvest; and 3) because of the local availability of broodstock.

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

No listed fish are used as broodstock for this program. Summer steelhead are not considered indigenous to any sub basin on the Oregon side of the lower Columbia River or the upper Willamette River basin above Willamette Falls. All hatchery program fish are externally marked by removal of the adipose fin prior to release. This mark distinguishes returning adults as either a naturally produced fish or a hatchery produced fish. Currently all hatchery summer steelhead smolts are fin clipped. Therefore, hatchery summer steelhead can be distinguished from wild winter steelhead by both their run timing and the applied mark.

SECTION 7. BROODSTOCK COLLECTION

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

Adult summer steelhead returning to the South Santiam are collected for broodstock. Adult summer steelhead returning to Sandy Hatchery or collected at associated traps/weirs in the Sandy basin are not used for broodstock purposes.

7.2) Collection or sampling design.

All marked adults volitionally entering the trap at the South Santiam Hatchery are collected for brood. Adults are randomly selected for broodstock from the entire run, without bias for size, run timing, or any other characteristics.

7.3) Identity.

Summer steelhead are not considered indigenous to any sub basin on the Oregon side of the lower Columbia River or the upper Willamette River basin above Willamette Falls, but evidence suggests they do exist but not at self-sustaining numbers. Currently all hatchery summer steelhead smolts are fin clipped. Therefore, hatchery summer steelhead can be distinguished from wild winter steelhead by both run timing and the hatchery-applied mark (adipose fin clip).

7.4) Proposed number to be collected.

7.4.1) Program goal.

Adult collection goals vary depending upon annual broodstock needs. To satisfy the cumulative smolt production goal for all summer steelhead (stock-24) programs of ODFW, the green-egg take at South Santiam Hatchery is expected to be approximately 1.5 million (ODFW Hatchery Production Schedules 2011). In 2010, a total of 864 brood was collected (420 males and 444 females) to meet the production goal.

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

Table 7.4.2. Broodstock collection levels at the South Santiam Hatchery for all summer steelhead (stock 24) programs of ODFW, 1995-2010.

Brood Year	Adults Collected at Foster Dam	Adults Spawned			Egg take (in 1,000's)
		# Males Spawned	# Females Spawned	Spawning Ratio (M:F)	
1995	3,121	392	402	1:1.0	1,607
1996	2,806	470	473	1:1.0	1,704
1997	2,101	175	328	1:1.9	1,205
1998	3,676	532	872	1:1.6	3,058
1999	4,217	574	687	1:1.2	2,478
2000	4,107	592	608	1:1.0	2,418
2001	4,933	597	597	1:1.0	2,208
2002	6,621	523	523	1:1.0	1,971
2003	7,507	519	519	1:1.0	1,977
2004	4,488	500	500	1:1.0	1,600
2005	6,279	285	429	1:1.7	1,523
2006	6,937	356	450	1:1.3	1,486
2007	10,345	362	494	1:1.4	2,001
2008	6,394	464	464	1:1.0	1,645
2009	3,814	354	367	1:1.0	2,171
2010	7,621	420	444	1:1.1	1,568
2011	6,212	399	399	1:1	1,548
2012	4,608	426	426	1:1	1,254

Source: South Santiam Hatchery records.

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

All surplus hatchery fish that enter the trap at South Santiam Hatchery are collected and are either given to local food banks or Oregon Food Bank, or recycled to the lower river for additional angling opportunities, or disposed of if not fit for human consumption. Fish that are to be disposed of are done so in accordance with ODFW policies and procedures, which include freezing, rendering, and/or burying.

The disposition of hatchery summer steelhead returning to Sandy Hatchery is the same as described previously for South Santiam Hatchery. Fish that return to Sandy Hatchery or other lower basin collection facilities in a condition suitable for angler use prior to August 1 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. No fish will be recycled to the lower river after July 31. No hatchery summer steelhead collected in upper basin weirs/traps will be recycled; these fish will be removed from the Sandy River. Surplus fish may also be recycled to isolated standing

waters (e.g. Salish Ponds) to provide additional angling opportunity associated with trout fisheries. Fish that are to be disposed of are done so in accordance with ODFW policies and procedures, which include freezing, rendering, and/or burying.

7.6) Fish transportation and holding methods.

Captured adults are anesthetized using carbon dioxide gas introduced into the sorting tank at the Foster trap. Adults are placed into a loading "bell" or, 10-inch plastic pipes, for placement into the transport trucks and transported approximately 10 minutes to the adult holding pond at the South Santiam Hatchery.

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, which include freezing, rendering, or burying. Surplus hatchery adults of high quality are given to local charities and food banks after recycling is discontinued for the season. Spawned fish carcasses determined to be low in IHNV may be utilized in various nutrient enrichment programs.

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.

All broodstock are collected from hatchery fish returning to the Foster trap on the South Santiam River. Listed fish are not used as broodstock for this program. All hatchery program fish are marked by removal of the adipose fin prior to release. This mark, as well as the run timing, identifies returning adults as either a hatchery produced fish or a naturally produced fish. No hatchery-produced summer steelhead are passed above Foster Dam. Adults not held at the hatchery for broodstock are recycled downstream and back into the fishery. Beginning October 1st, all summer steelhead entering the trap are removed from the river to minimize numbers that may potentially spawn naturally in the mainstem below Foster Dam.

SECTION 8. MATING

8.1) Selection Method.

Adults of all sizes are collected randomly from throughout the temporal distribution of the run to avoid any timing and size bias. Fish are spawned from January through March.

8.2) Males.

Jacks or residual males are not used in the broodstock program.

8.3) Fertilization.

Male-to-female spawning ratios have not been consistently applied over the past decade. Prior to 1994, the number of male adults spawned was not recorded. Since then, spawning ratios have varied slightly from year to year. The South Santiam Hatchery maintains a 1:1 fertilization goal.

Sanitation procedures include disinfection of personnel between handling of females, foot baths, and a 15 minute iodophore treatment for eggs prior to incubation. Fertilized eggs from 1 or 2 females are kept in each incubation tray, and eggs are culled if diagnosed IHNV positive. See Section 9.1.6 for details regarding fish health monitoring, maintenance, and sanitation.

Table 8.3. Spawning ratio (M:F) at the South Santiam Hatchery for summer steelhead broodstock, 1994-2012.

Brood Year	Spawning Ratio (M:F)
1994	1:1.3
1995	1:1.0
1996	1:1.0
1997	1:1.9
1998	1:1.6
1999	1:1.2
2000	1:1.0
2001	1:1.0
2002	1:1.0
2003	1:1.0
2004	1:1.0
2005	1:1.7
2006	1:1.3
2007	1:1.4
2008	1:1.0
2009	1:1.0
2010	1:1.1
2011	1:1.0
2012	1:1.0

Source: South Santiam Hatchery records

8.4) Cryopreserved gametes.

No cryopreserved gametes are used in this program.

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.

This is an isolated harvest program of hatchery stock, with no listed natural fish used as broodstock. Therefore it is unlikely that the mating scheme will have any direct adverse genetic or ecological impacts on listed natural fish. However, to maintain within hatchery-population genetic diversity (regarding run timing, size, etc.), broodstock are collected from the entire run and spawned randomly (while maintaining a 1:1 male to female spawning ratio) from the pooled broodstock population. All fish are sampled for IHNV during spawning. Eggs and sperm from fish that test positive for IHNV are destroyed.

SECTION 9. INCUBATION AND REARING

9.1) Incubation.

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

South Santiam Hatchery:

Table 9.1.1a. Annual egg take (for all stock-24 summer steelhead programs of ODFW) and survival of eggs to eyed stage at the South Santiam Hatchery, 1992-2012.

Brood Year	Egg Take	Green to Eyed Egg Survival
1992	1,650,679	93%
1993	1,981,958	93%
1994	1,717,992	92%
1995	1,607,204	93%
1996	1,704,138	94%
1997	1,205,200	89%
1998	3,058,056	94%
1999	2,478,490	94%
2000	2,417,560	94%
2001	2,207,711	84%
2002	1,970,650	87%
2003	1,977,200	93%
2004	1,699,700	93%
2005	1,523,285	92%
2006	1,486,450	93%
2007	1,745,100	94%
2008	1,644,800	95%
2009	2,170,700	91%
2010	1,567,900	96%
2011	1,548,000	94%
2012	1,254,000	93%

Source: South Santiam Hatchery records.

Bonneville Hatchery:

Table 9.1.1b. Annual survival rates (eyed-egg to fry) of summer steelhead eggs at Bonneville Hatchery, 1996-2012.

Brood Year	Eyed-egg to Fry Survival
1996	97.3%
1997	98.3%
1998	99.1%
1999	95.1%
2000	96.6%
2001	98.4%
2002	98.5%
2003	98.8%
2004	98.2%
2005	97.0%
2006	98.7%
2007	97.5%
2008	99.0%
2009	91.9%
2010	99.4%
2011	97.9%
2012	98.6%

Source: Bonneville Hatchery records.

Oak Springs Hatchery: (**Summer steelhead are no longer incubated at Oak Springs)

Table 9.1.1c. Annual survival rates (eyed-egg to fry) of summer steelhead eggs at Oak Springs Hatchery, 1995-2012.

Brood Year	Eyed-egg to Fry Survival
1995	85.2%
1996	95.2%
1997	93.7%
1998	94.3%
1999	92.0%
2000	94.7%
2001	95.6%
2002	87.6%
2003	97.5%
2004	99.4%
2005	99.3%
2006	98.9%
2007	99.0%
2008	97.9%
2009	98.1%
2010	98.7%
2011	98.5%
2012	99.2%

Source: Oak Springs Hatchery records.

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

South Santiam Hatchery - Current egg take goals allow for up to 520,000 surplus eggs, if IHNV is not encountered. Surplus eyed-eggs, if not needed by any other program, are destroyed by freezing and burying in a landfill according to ODFW and IHOT guidelines.

Bonneville Hatchery -The hatchery requests 10,000 eggs more than required for program goals to compensate for potential losses incurred through the incubation and rearing process. Surplus fish are reared to the transfer stage, and if numbers present are in excess of goals, other hatcheries with the same stock are contacted to see if they require supplemental fish. If the excess fish are not needed at other hatcheries, they are destroyed according to ODFW and IHOT guidelines.

9.1.3) Loading densities applied during incubation.

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

South Santiam Hatchery: Incubation facilities at this hatchery utilize 30 incubator stacks with 14 trays/stack. Each tray can hold 3,000-8,000 eggs. Average egg size is 152 eggs/oz. The hatchery maintains flow in incubators at 4 gpm.

Bonneville Hatchery: Incubation facilities at this hatchery utilize 160 incubator stacks with 16 trays/stack for a total of 2,560 trays. Each tray holds approximately 7,000 eyed eggs (egg size data were not available). Water flow through each incubator stack is 4 gpm.

9.1.4) Incubation conditions.

Eggs are monitored when needed to determine fertilization efficiency and embryonic development. Eggs are incubated under conditions that result in equal survival of all segments of the population to ponding. Families are not incubated individually, but rather may be mixed with other families from the same spawn group.

South Santiam Hatchery - At South Santiam Hatchery, initial incubation (through eyed-egg) occurs on a mix of well water and reservoir water for a portion of the fish, while other eggs are reared through eye-up solely on reservoir water. Families are initially incubated individually to allow culling for disease. Families are combined after eye-up and culling for shipment to other hatcheries for incubation from eyed egg to hatch. Incubation temperatures are monitored by thermographs or digital thermometers at each stack. Temperature is regulated via mixing of water from the two water sources. Typical temperature range throughout incubation is 42-56ºF, with an average of 48ºF. Dissolved oxygen is not monitored during incubation, but the hatchery has not experienced problems during incubation associated with super-saturation or low D.O. The hatchery also does not have problems with siltation in the incubators.

Bonneville Hatchery - Water temperature in the incubators is monitored via a thermograph that gauges water temperature of all water coming into the hatchery. The water source is well water, so water temperatures consistently vary between 49°F and 51ºF. D.O. levels are not monitored during incubation. Incubation densities are kept low enough and therefore D.O. level is not of concern. The use of well water ensures that siltation is not an issue.

9.1.5) Ponding.

Eyed-eggs incubated at South Santiam Hatchery are transferred in February to Bonneville Hatchery (290,000 eggs for the Sandy and Clackamas StS programs) for further incubation and ponding. No ponding or rearing of summer steelhead for this program occurs at South Santiam Hatchery.

Bonneville Hatchery - Ponding of fish at Bonneville Hatchery is forced. Ponding typically occurs at a size of 2,100-2,200 fpp in mid-March to early April, after fish have accumulated 1,100-1,200 CTU. Button up is estimated to be 99% at the time of ponding.

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 prespawning 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.

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

South Santiam Hatchery - IHNV positive eggs may be used for shipment to Bonneville Hatchery with pathology approval since Bonneville's water source is already infected with IHNV. Disinfection procedures are implemented during incubation that prevents pathogen transmission between stocks of fish on site. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed.

Bonneville Hatchery - Safeguards are in place to protect any listed species that may occur on the hatchery site. Incubation of listed fish (not for this program) is done in a separate facility. Disinfection procedures are implemented during incubation that prevents pathogen transmission between stocks of fish on site. Dead or culled eggs are discarded in a manner that prevents transmission to receiving watershed. All eggs brought to the facility are surface-disinfected in buffered iodophor.

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 or for years dependable data are available.

Oak Springs Hatchery: (Summer steelhead are no longer reared at Oak Springs Hatchery)

Table 9.2.1a. Fry survival rates of summer steelhead (stock-24) reared at Oak Springs Hatchery, brood years 1995-2012.

Brood Year	Fry to Transfer Survival
1995	85.2%
1996	85.2%
1997	93.0%
1998	95.8%
1999	92.5%
2000	96.1%
2001	90.7%
2002	91.7%
2003	95.2%
2004	94.9%
2005	98.0%
2006	97.8%
2007	95.5%
2008	97.3%
2009	95.0%
2010	98.2%
2011	99.0%
2012	99.3%

Source: Oak Springs Hatchery records.

Bonneville Hatchery:

Table 9.2.1b. Fry survival rates of summer steelhead (stock-24) reared at Bonneville Hatchery, brood years 1996-2012.

Brood Year	Fry to Transfer Survival
1996	89.0%
1997	94.5%
1998	96.6%
1999	96.9%
2000	92.8%
2001	98.2%
2002	83.0%
2003	83.6%
2004	94.6%
2005	93.6%
2006	87.2%
2007	96.0%
2008	94.6%
2009	96.4%
2010	96.4%
2011	89.0%
2012	86.7%

Source: Bonneville Hatchery records.

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

Bonneville Hatchery - Target rearing density is 1.0 lb/ft^3. 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.

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.

Bonneville Hatchery -

Table 9.2.4b. Average monthly growth data (fish weight) for summer steelhead (stock-24) reared at Bonneville Hatchery.

Month	Size (fish/lb)
March	1500
April	750
May	250
June	150
July	75
August	50
September	30
October	20
November	15
December	12
January	10
February	8
March	6

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

Fish biomass (fish/lb) is measured each month for ponded fish. These data are reported monthly and are archived in ODFW standard Monthly Ponded Fish Reports. Energy reserve information is not available. Refer to section 9.2.4 for growth data.

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).

Bonneville Hatchery -

Table 9.2.6. Feeding protocol of summer steelhead at Bonneville Hatchery.

Food Type/ Size (mm)	Daily Application	Size range of fish (fish/lb)
Bio Vita #0, #1, #2	4-6 times/day	2000-125
Bio Clark's1.2, 1.5, 2.0	3-4 times/day	125-25
Bio Clark's 2.5	2 times/day	25-6

Average food conversion efficiency is 0.90.

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).

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 possible impacts on listed fish, ODFW acclimates and releases full-term smolts that exhibit swift emigration and low residualism (dependant on size at release), and strong homing. Minimizing potential temporal and spatial overlap reduces risk that could result from competition for food or other vital resources.

SECTION 10. RELEASE

10.1) Proposed fish release levels.

Table 10.1. Proposed release levels of summer steelhead from Sandy Hatchery into Cedar Creek.

Age Class	Number Released	Fish/lb.	Release Date	Release Location
Yearling	75,000[a/]	4.5-6	April/May	Cedar Creek (Sandy Fish Hatchery)

[a/] The maximum number released should not exceed 82,500 smolts (+/-10% 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 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 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).

Stream: Cedar Creek (waterbody code = 0300304000)
Release point: RM 0.75 (Sandy Hatchery)
Major watershed: Sandy R
Basin or Region: Columbia R

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.

Table 10.3. Annual release numbers and average size of summer steelhead released from the Sandy Hatchery into Cedar Creek, 1997-2012 brood year (1998-2013 release year).

Brood Year	Release Year	Number of Smolts Released	Average Size at Release (g)
1997	1998	75,299	5.50
1998	1999	75,409	5.60
1999	2000	74,992	5.87
2000	2001	59,889	5.23
2001	2001	76,654	5.77
2002	2003	73,029	5.64
2003	2004	74,927	5.70
2004	2005	78,573	5.84
2005	2006	83,646	5.10
2006	2007	70,635	5.03
2007	2008	92,719	5.81
2008	2009	81,221	6.13
2009	2010	81,283	5.45
2010	2011	78,558	5.67
2011	2012	81,192	4.80
2012	2013	80,550	4.86

Source: Sandy Hatchery Records.

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

Table 10.4. Past release dates of summer steelhead from the Sandy Hatchery into Cedar Creek (BY1997-2012).

Brood Year	Release Date(s)	Brood Year	Release Date(s)	Brood Year	Release Date(s)
1997	4/09/98	2004	3/28/05	2011	4/20/12
	4/14/98				
1998	3/30/99	2005	3/30/06	2012	4/23/13
	4/12/99		4/14/06		
1999	3/27/00	2006	3/16/07		
	4/14/00		4/16/07		
2000	4/16/01	2007	3/14/08		
			4/10/08		
2001	4/10/02	2008	3/18/09		
			4/17/09		
2002	4/09/03	2009	2/27/10		
	5/12/03				
2003	4/15/04	2010	4/8/11		

Source: Sandy Hatchery records.

10.5) Fish Transportation.

Fish are transported to the Sandy Hatchery (from Bonneville Hatchery) for final acclimation and release (See Section 5.2 for details regarding transportation). Once at the Sandy Hatchery, summer 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 summer steelhead for this program are transported from Bonneville Hatchery to Sandy Hatchery raceways for final acclimation and release. The fish are acclimated for at least 2-3 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 summer 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 (100%) of Sandy Hatchery summer steelhead smolts are fin marked (adipose fin-clip) prior to release to differentiate between natural and hatchery fish.

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

Surpluses are usually reduced to production levels well before transfer to the 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 that Sandy Hatchery summer steelhead smolts would be directly released into Cedar Creek.

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

- All Sandy Hatchery summer steelhead smolts are released into Cedar Creek, where it is believed that there is minimal overlap with wild juvenile coho or Chinook salmon.
- All Sandy Hatchery summer 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 summer steelhead smolts are acclimated on Cedar Creek water to promote adult homing to Cedar Creek and the Sandy Hatchery.
- All Sandy Hatchery summer steelhead smolts are released at or downstream of 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 Sandy Hatchery summer steelhead smolts are fin marked (ad-clip) to differentiate between natural and hatchery fish.
- Mark quality checks (to identify the percentage of unmarked fish) are performed on Sandy Hatchery summer steelhead smolts prior to release.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE STANDARDS AND 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 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.

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 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. The LCRCRP Implementation Team will prioritize monitoring activities.

11.1.3) 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 for monitoring and evaluation activities.

SECTION 12. RESEARCH

No research is being conducted in direct association with the Sandy Hatchery summer steelhead program.

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 - Citations

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Attachment 2 - Estimated listed salmonid take levels by hatchery activity.

Listed species affected: Sandy River Wild Winter Steelhead ESU/Population: Lower Columbia ESU Activity: Hatchery Trap				
Location of hatchery activity: Cedar Creek at RM 0.75	**Dates of activity: November-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/]		
Capture, handle, tag/mark/tissue sample, and release d)		500[a/]	200	
Removal (e.g. broodstock) e)				
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.

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.

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.

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.

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.

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).

	SPECIES/AGE CLASS	SIZE CRITERIA 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. Subsequently, the Fisher was placed 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 from the federal endangered species list; remained as threatened 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. On July 6, 1999 the USFWS proposed delisting bald eagles from the ESA. 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 1978).

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). Nest 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. 2001). 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). 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 (USFWS 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 Sauvies Island, Multnomah County. It was collected from Sauvies 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

(Ranununculusaquaticus), yellow water-lily (Nupharpolysepalum), bladderwort (Utricularia vulgaris), and pondweeds (Potamogeton spp.).

BradshawsLomatium (*Lomatiumbradshawii*, Endangered Species)
Bradshaw's lomatium was federally listed as endangered in 1988. A recovery plan was published in 1993 (USFWS 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 (Deschampsiacespitosa) 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 (*Speyeriazerenehippolyta*, Threatened Species)
The Oregon silverspot 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, Washington, 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 at 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 salt-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, North Willamette Watershed District Manager

Signature: _____Date:_____

Certified by: Scott Patterson, Fish Propagation Program Manager

Signature: _____ Date:_____