DRAFT

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Clackamas 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:	**Clackamas River, Willamette River Basin**
Date Submitted: **First Update Submitted:**	**June 29, 2006** **May 2016**
Date Last Updated:	**May 2016**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery Program.

Clackamas River summer steelhead program

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

The Clackamas Hatchery summer steelhead program utilizes South Santiam River stock (stock 24) 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 Clackamas River Basin is part of the Lower Columbia River Steelhead Evolutionarily Significant Unit (ESU), 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 ESU and is not listed (Federal Register Notice 2004).

Summer Steelhead are not indigenous to the Clackamas River Basin. Therefore, adult South Santiam hatchery stock Steelhead 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 the eggs are sent to Bonneville Hatchery. Further egg incubation and juvenile rearing takes place at Bonneville Hatchery. Smolts (at ~5 fish/lb) are then sent to the Clackamas Hatchery and Foster Acclimation Pond for final acclimation and release.

1.3) Responsible organization and individuals.

Name and Title:	Scott Patterson, Fish Propagation Program Manager
Organization:	Oregon Department of Fish and Wildlife
Address:	3406 Cherry Ave NE, Salem, OR97303
Telephone:	503-947-6218
Fax:	503-947-6202
Email:	Scott.D.Patterson@state.or.us

Name and Title	Todd Alsbury, District Fisheries Biologist
Organization:	Oregon Department of Fish and Wildlife
Address:	17330 SE Evelyn St., Clackamas, OR97303
Telephone:	503-657-2000
Fax:	503-657-2050
Email:	Todd.Alsbury@state.or.us

Hatchery Contacts:

Name and Title:	Daniel Straw, Hatchery Manger, Clackamas Hatchery
Organization:	Oregon Department of Fish and Wildlife
Address:	24500 S Entrance Rd., Estacada, OR 97023
Telephone:	503-630-7210

Fax:	503-630-4566
E-mail:	Clackamas.Hatchery@state.or.us

Name and Title:	Greg Davis, Hatchery Manger, Bonneville Hatchery
Organization:	Oregon Department of Fish and Wildlife
Address:	70543 NE Herman Loop, Cascade Locks, OR 97014
Telephone:	(541) 374-8393
Fax:	(541) 374-8090
E-mail:	Bonneville.Hatchery@state.or.us

Name and Title:	Brett Boyd, Hatchery Manger, South Santiam Hatchery
Organization:	Oregon Department of Fish and Wildlife
Address:	43182 N. River Dr., Sweet Home, OR97386
Telephone:	(541) 367-3437
Fax:	(541) 367-4399
E-mail:	SouthSantiam.Hatchery@state.or.us

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 of the South Santiam and Bonneville hatcheries, US Fish and Wildlife Service (USFWS) funding through the Sport Fish Restoration Act.

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

Clackamas Hatchery:

Funding Sources:	Oregon Department of Fish and Wildlife (ODFW) = 29.6% NOAA Fisheries = 29.6% Portland General Electric (PGE) = 22% City of Portland = 18.8%
Staffing Level:	4.5 Full Time Employees
Annual Budget:	$732,359 (Total budget for 2005. There is no money budgeted specifically for the Summer Steelhead program)

South Santiam Hatchery:

Funding Sources:	USACE = 70-80% ODFW = 20-30%
Staffing Level:	4.2 Full Time Employees
Annual Budget:	$583,000 (Total budget for 2005, specific budget for Summer Steelhead unavailable)

Bonneville Hatchery:

Funding Sources:	USACE = 45% NOAA Fisheries = 55%
Staffing Level:	19.5 Full Time Employees

Annual Budget: $1,675,000 (Total Budget for 10/04-9/05)
10.3% of total budget (or $172,525) is budgeted specifically for the Summer Steelhead program.

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

Below is a summary table (Table 1.5) outlining program facilities and general operation.

Table 1.5. Clackamas River Summer Steelhead program summary.

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

1) **Clackamas Hatchery** (regional mark location code: 5F33307 H7 21) is located at RM 22.6 on the Clackamas River in the Lower Willamette River Basin, Clackamas County, Oregon.

Summer Steelhead program functions at Clackamas Hatchery include:
Acclimation
Release

2) **South Santiam Fish Hatchery** (regional mark location code: 5F33328 H28 21) is located at RM 38.5 on the South Santiam River in the upper Willamette River Basin, Linn County, Oregon.

Summer Steelhead program functions at South Santiam Hatchery include:
Adult collection (Foster Dam trap)
Adult holding
Spawning
Egg incubation

3) **Bonneville Hatchery** (regional mark location code: 5F33201 H1 21) is located at RM 0.25 on Tanner Creek in the lower Columbia River Basin, Multnomah County, Oregon.

Summer Steelhead program functions at Bonneville Hatchery include:
Egg incubation
Juvenile rearing

4) **Foster Creek Acclimation Facility:** Foster Creek is a tributary of the Clackamas River at RM 11, and the acclimation facility is located at RM 0.25 on Foster Creek, at latitude 45.3838 and longitude -122.4476, Clackamas County, Oregon.

Summer Steelhead program functions at Foster Creek include:
Acclimation and release.

1.6) Type of program.

Isolated Harvest

1.7) Purpose of program.

Clackamas Hatchery began operation in 1979 and is operated from three funding sources: National Marine Fisheries Service (NMFS), Portland General Electric (PGE) and the City of Portland. The NMFS funding is part of the Columbia River Fisheries Development Program (Mitchell Act)—a program to enhance declining fish runs in the Columbia River Basin. PGE and the City of Portland provide funding as mitigation for fishery losses caused by hydroelectric development in the Sandy and Clackamas river systems.

The purpose of Clackamas 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 Clackamas 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%, see Table 1.12) has provided with good angling opportunities in the Lower Columbia, Willamette, and Clackamas rivers. The numeric goal for this popular Summer Steelhead program is to release 175,000 smolts each year.

The primary objectives of the Clackamas Hatchery, as outlined in the 2016 Clackamas 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 Clackamas River Basin is listed as threatened under the Endangered Species Act (ESA), which prohibits commercial and recreational harvest of wild Steelhead in the basin. The Clackamas River Summer Steelhead program is managed to supplement regionally important Steelhead fisheries while minimizing potential risks to wild Chinook, Coho, and Steelhead populations.

The Clackamas River Summer Steelhead program is managed to supplement harvest in fisheries impacted by the construction and operation of hydropower dams in the Columbia River basin. Specifically, the program is managed to produce Summer Steelhead to sustain selective Columbia River, Willamette River, and Clackamas River sport fisheries. The Willamette and Clackamas 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 holding this sport fishery is the impact on listed fish. Summer-run Steelhead are not considered native to the Clackamas River Basin. However, harvest of hatchery-produced Summer Steelhead is managed to comply with the current lower Columbia Steelhead ESU 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 ESU 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. Commercial fisheries are also actively investigating different techniques to enable the safe release of unmarked fish.

Since the 1997 brood year, all Summer Steelhead of this program are clearly marked with an adipose fin clip to facilitate identification. Returning hatchery adults are segregated from the wild population through sorting operations at the North Fork Dam fish collection facilities. Information provided through spawning surveys, dam and smolt trap counts, and radio-telemetry studies indicate that the majority of natural spawning habitat for salmonids in the Clackamas basin exists above the North Fork Dam although there is substantial available spawning habitat in the lower mainstem and tributaries that has been heavily impacted by development in the basin. The upper Clackamas (above North Fork Dam) is therefore managed as a wild fish sanctuary, with only wild (unclipped) Steelhead allowed access to the spawning grounds in the upper river to prevent interbreeding and competition between wild and hatchery-produced Steelhead. 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 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 Summer Steelhead adults (marked and unmarked) are selectively excluded from the naturally spawning population above North Fork Dam through sorting practices. The intent is to maintain a spawning population basin-wide comprised of less than 10% hatchery produced fish. While no Summer Steelhead are intentionally passed, a limited number may reach upper basin spawning areas due to errors in sorting and/or fin clipping operations.
- Hatchery Summer Steelhead returning to Clackamas Hatchery and North Fork fish trap are sorted and recycled downstream during the early part of the run (April-September) or released into Faraday Lake (October-February) to limit potential interactions with native fish while providing additional angling opportunity.
- This program complies with ODFW's Fish Health Management Policy and the Integrated Hatchery Operations Team (IHOT) standards for prevention and treatment of fish diseases.
- This program complies with all other applicable IHOT standards.

1.9) List of program "Performance Standards".

See Section 1.10.

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

1.10.1) Performance Indicators addressing "BENEFITS".

Legal Mandates:
Performance Standard (1): Contribute to mitigation requirements between 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, and survival rates.

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 Oregon Conservation and Recovery Plan for Salmon and Steelhead Populations in the Lower Columbia River (LCCRP), and the Oregon Hatchery Management Policy (OAR 635-007-0542 through 0548).

Monitoring and Evaluation: Conduct periodical program policy and goal reviews in relation to hatchery program management, practices, and facilities. Monitor fish populations to ensure compliance with criteria established under the LCCRP and NFCP.

Harvest and Socio-Economic Effectiveness:

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

Indicator (3)(a): Number of adult hatchery Steelhead caught in the Clackamas River and the Lower Columbia River sport fisheries.

Monitoring and Evaluation: River and dock-side creel samples, and punch cards.

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 >95%.

1.10.2) Performance Indicators addressing "RISKS".

Operation of Artificial Production Facilities:
Performance Standard (6): Clackamas 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 detection of viral infections, abnormal fish loss investigations, monthly health checks, and pre-transfer and 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 release.

Performance Standard (7): Effluent from the Clackamas 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 existing NPDES permits.

Monitoring and Evaluation: Effluent water samples are analyzed for full compliance with the permit. Permits are 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 and juvenile salmonids.

Indicator (8)(a): Weir/trap operation at the North Fork Dam ladder and the Clackamas Hatchery do not result in significant stress, injury, or mortality to naturally produced salmonid populations.

Monitoring and Evaluation: Monitor the number of mortalities in the adult collection trap for each species. Communicate and coordinate with Portland General Electric regularly to assess passage numbers and conditions.

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

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

Monitoring and Evaluation: Monitor smolt development (using available indicators) at the hatchery to assure smolts are full-term at release. Utilize release locations downstream of River Mill Dam. Release smolts at a time and development stage that allows for the greatest survival and outmigration from the Clackamas system. Monitor potential impacts from predator attraction to release sites or natural rearing areas downstream of release sites. Monitor potential residualism of smolts released to determine if unintended competitive interactions are occurring between hatchery juvenile Summer Steelhead and wild Winter Steelhead.

Life History Characteristics:

Performance Standard (10): Manage the Clackamas 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. Maintain a proportion of hatchery origin Steelhead (combined summer and winter run) spawners below 10% basin-wide.

Monitoring and Evaluation: Trap operations at North Fork Dam limits the potential for hatchery fish passage upstream. ODFW will continue to coordinate with PGE staff to ensure that hatchery fish passage is limited to that which is practical under current trap operation. Conducting annual spawning ground surveys for hatchery Steelhead above North Fork Dam would be very costly and of little benefit since fish are already sorted and enumerated at North Fork fish trap. Upper basin spawning areas for Steelhead are difficult to access leading to difficulty finding fish that are known to have passed North Fork Dam.

Indicator (10)(b): All Summer Steelhead trapped at North Fork Dam are recycled back down to Barton, Riverside, or Carver Park, placed in Faraday Reservoir to provide for additional angling opportunity, or taken to Clackamas Hatchery.

Monitoring and Evaluation: All fish trapped at the North Fork Dam are examined for a hatchery mark and counted by ODFW and/or PGE staff. Only unmarked Winter Steelhead are passed above the North Fork 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 Clackamas River program. About 2,000 adult Summer Steelhead are collected 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 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 Clackamas River Summer Steelhead program.

Life Stage	Release Location[a/]	Number Released[b/]
Eyed Eggs	Na	Na
Unfed Fry	Na	Na
Fry	Na	Na
Pre-smolts	Na	Na
Smolts	Clackamas Hatchery Foster Creek	125,000 smolts @ 5.0/lb 50,000 smolts @ 5.0/lb

[a/] Additional release locations may be identified in the future for the purpose of increasing angler harvest while minimizing impacts to native fish populations.
[b/] The actual number released from individual release sites may differ from above but total number released will not exceed 175,000 yearling smolts.

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 Clackamas River Summer Steelhead program are presented below in Table 1.12.

The estimated number of adult hatchery Summer Steelhead produced was derived from a variety of data sources. The number of smolts released into the Clackamas River each year was obtained from Clackamas Hatchery release records. The "Adult Return" columns depict the actual count of program-specific adult hatchery Summer Steelhead returns to both the Clackamas Hatchery and North Fork Dam. The "Freshwater Harvest"

column is based on data from harvest card returns (ODFW, 2014). Summer Steelhead are not considered indigenous to the Clackamas River Basin, therefore all Summer Steelhead caught in this basin are assumed to be from this program or are naturally produced adults. The total number of returning adults ("Total Adults" column) was estimated as the sum of returns to the Clackamas Hatchery, North Fork Dam, and harvest within the Clackamas Basin [e.g. total adults = (returns to Clackamas hatchery + returns to NF Dam + Harvest]. This estimate is likely conservative due to not including harvest of Summer Steelhead in the Willamette and Lower Columbia rivers. We do not have the ability to estimate the number of fish harvested outside of the Clackamas so it is left out of the calculation of smolt to adult survival.

In order 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 Clackamas 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 Clackamas 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). Annual adult returns to the Clackamas River were then proportioned to brood year based on this average age composition ("Brood-Specific Adults" column). A smolt to adult survival rate was then estimated for each brood year by dividing the number of total adults returning from a given brood year by the number of smolts released for that brood year (e.g. smolt to adult survival for brood year 2000 = total adult returns from the 2000 brood year / number of smolts released from 2000 brood year).

Table 1.12. Estimated number of smolts released, returns to the North Fork Dam and the Clackamas Hatchery, and smolt-to-adult survival rates for Clackamas River Summer Steelhead, brood years 2000-2012.

Brood Year	Smolts Released	Adult Returns			Freshwater Harvest	Total Adults	Brood-Specific Adults	Smolt-to-Adult Survival
		Return Year	NF Dam	Clack. Hat.				
2000	137,921	2003	692	3,048	4,050	7,790	7,625	0.055
2001	176,106	2004	2052	3,310	1,163	6,525	6,273	0.036
2002	128,260	2005	290	732	3,564	4,586	4,293	0.035
2003	159,409	2006	600	935	796	2,331	2,443	0.015
2004	178,234	2007	238	811	2,141	3,190	3,125	0.018
2005	176,137	2008	83	599	2,013	2,695	2,694	0.015
2006	174,051	2009	79	711	1,894	2,684	2,692	0.016
2007	172,870	2010	80	640	2,028	2,748	2,756	0.016
2008	211,911	2011	241	1,071	1,499	2,811	2,955	0.014
2009	175,096	2012	498	1,116	2,300	3,914	3,893	0.022
2010	201,845	2013	711	957	2,082	3,750	3,869	0.019
2011	160,726	2014	1340	1,002	2,322	4,664	4,497	0.028
2012	169,103	2015	746	474	2,154[a/]	3,374	NA	NA

Source: HMIS, Annual Harvest Card Returns (ODFW). North Fork Dam data obtained from Garth Wyatt (PGE)

[a/] Harvest estimate based on average of previous 10 years of harvest data.

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

Clackamas Hatchery began operation in 1979. Hatchery Summer Steelhead (Skamania stock 024) were first introduced into the Clackamas River in 1974. Summer Steelhead are not considered indigenous to the Clackamas River Basin.

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:

- Clackamas River
- Lower Willamette River
- Lower Columbia River

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

The Clackamas River Summer Steelhead program is a segregated program that utilizes a non-endemic stock (Skamania stock origin); 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. Prior to release, the fish are transferred to Clackamas Hatchery and Foster Acclimation Pond for acclimation. The purpose of the program is to provide recreational harvest opportunities in the lower Clackamas River and to mitigate for the loss of habitat resulting from hydroelectric development in the Columbia basin. Spawning interactions between returning hatchery Summer Steelhead and the naturally produced Winter Steelhead population are minimized by releasing smolts only in the lower basin and through sorting fish at the PGE facility at North Fork Dam which allows management of the basin above this site as a wild fish sanctuary. After sorting, hatchery Summer Steelhead are recycled through the fishery in the lower Clackamas River, transferred to Faraday Lake or other standing waterbody, or taken to Clackamas Hatchery for disposition.

1.16.1) Brief Overview of Key Issues.

Issue 1: Summer Steelhead may be naturally reproducing in the lower Clackamas River and resulting production may be competing for rearing space with native salmonids. Returning unmarked adults from natural spawning hatchery Summer Steelhead are not currently subject to harvest, increasing the likelihood of further escapement.

Issue 2: Some Summer Steelhead smolts released in the lower basin may not be outmigrating as desired. These smolts could mature and subsequently migrate upstream

into the wild fish area. No information is available to document or measure the extent of the potential residual problem.

Issue 3: There is limited information available to assess the effects of recycling adult Summer Steelhead in the lower river. Some of these fish may stray and spawn in the lower river and tributaries.

1.16.2) Potential Alternatives to the Current Program.

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

Alternative 1: *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 1}*

Pros & Cons: Genetic sampling and analysis conducted over 10 years ago in the Clackamas basin above North Fork Dam determined that natural production of hatchery Summer Steelhead was occurring in the upper basin. Even though hatchery Summer Steelhead had limited productivity, the sheer number of spawners led to the potential for significant competition between naturally produced juvenile Summer Steelhead and wild juvenile Winter Steelhead. This information led to the decision not to pass any Summer Steelhead into the upper basin. Currently, all Summer Steelhead are identified based on migration timing and body condition upon arrival at North Fork Dam and are prevented from passing upstream.

Natural production of Summer Steelhead may be occurring in the lower basin and could potentially lead to negative interactions with wild Winter Steelhead. Natural production in the lower basin appears to be limited based on the limited nature of natural spawning that occurs early in winter when Summer Steelhead are known to spawn. Also, there is little evidence of unmarked Summer Steelhead being collected at traps throughout the basin including North Fork, Clackamas Hatchery, and the former Clear Creek trap (ODFW 2015). Potential management strategies may include providing a fishery on unmarked Summer Steelhead to limit natural production in the lower basin.

Alternative 2: *Eliminate the Summer Steelhead program in the Clackamas basin. {Issues 1 and 2}*

Pros & Cons: Eliminating the program would eliminate all potential risks to the wild Winter Steelhead population from interaction with Summer Steelhead, but would impact a popular recreational fishery. Significant opposition from the sports fishing industry and anglers would be expected. There is no information available to document that the current Summer Steelhead program is impacting wild Winter Steelhead in the basin. Elimination of the program may not be consistent with existing mitigation agreements. This action

would reduce workload associated with sorting returning fish at the North Fork Dam sorting facility.

Alternative 3: *Continue the current Summer Steelhead program in the Clackamas basin but decrease smolt numbers to reduce potential risks to the wild Winter Steelhead population. {Issues 1 and 2}*

Pros & Cons: The action could potentially reduce risks to naturally produced Winter Steelhead in the basin if interactions with Summer Steelhead are negatively affecting the population (though impacts have not been documented at this time in the basin below Rivermill Dam). A Summer Steelhead fishery would still exist in the basin, but at a reduced level. It is currently unknown how much the program should be decreased. Reductions to the program would impact a popular recreational fishery and potentially result in opposition from the sports fishing industry and anglers. The action may reduce workload associated with sorting returning fish at the North Fork Dam sorting facility if adult returns to the facility decline.

Alternative 4: *Continue the current Summer Steelhead program in the Clackamas basin with no changes. {Issues 1 and 2}*

Pros & Cons: Potential risks to naturally produced Winter Steelhead in the basin would continue if interactions with Summer Steelhead are negatively affecting the population (though impacts have not been documented at this time in the basin below Rivermill Dam). The Summer Steelhead recreational fishery would continue in the Clackamas River. There would be no effect on existing mitigation agreements.

Alternative 5: *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 if found. Determine whether residual fish are migrating into the upper basin above North Fork Dam. Based on this information, develop management strategies to reduce potential interactions between Summer Steelhead and the naturally produced Winter Steelhead population. {Issue 2}*

Pros & Cons: Implementation of the scientific study would provide information to validate whether 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. Current hatchery practices may have an impact on rate of residualism, but constraints at hatchery facilities limit our ability to make changes that could potentially reduce residualism in hatchery reared fish. Interactions between hatchery juvenile Steelhead and wild juvenile Steelhead could be reduced by allowing a retention fishery on adipose fin-clipped Steelhead that residualize in the lower river.

Alternative 6: *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 3}*

Pros & Cons: Implementation of the study would provide 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 could ultimately result in improved conservation of the Winter Steelhead population. ODFW conducted a limited study (ODFW 2015) to investigate whether or not recycled hatchery Summer Steelhead were straying into lower basin tributaries and found little evidence that hatchery Summer Steelhead (recycled or not) strayed into Clear Creek, one of the primary Winter Steelhead producing tributaries in the lower river. A larger scale study requires significant financial investment, but no source of funding has been identified. If warranted by the study, elimination or reduction of the program could impact a recreational fishery and result in opposition from the sports fishing industry and anglers.

1.16.3) Potential Reforms and Investments.

The following draft 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: Conduct genetic analysis to determine if Summer Steelhead are naturally producing in the lower basin at a level higher than currently known, if naturally produced Summer Steelhead are present in the wild Winter Steelhead sanctuary (i.e. "fall-run" Steelhead), and identify potential management strategies to reduce potential interactions between these populations in the lower Clackamas River. The cost of the study is currently undetermined. {Issue #1}

Reform/Investment 2: Conduct a study to determine if Summer Steelhead smolts are residing in the Clackamas River following release from the hatchery or acclimation pond, estimate the rate of residual rearing, measure the characteristics of residual fish, and determine the temporal and spatial distribution of these fish 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 #2}

Reform/Investment 3: Conduct a study to evaluate the fate of Summer Steelhead recycled through the lower Clackamas River fishery. The study should determine the proportion of recycled fish that: (1) are harvested by anglers, (2) subsequently return to trapping facilities, (3) spawn naturally (including identification of spawning activity locations), or (4) migrate out of the basin or become mortalities after recycling. Based on

the information collected, identify management strategies to reduce potential interactions between Summer Steelhead and the wild Winter Steelhead populations. The cost of the study is currently undetermined. As mentioned above, ODFW conducted a limited study (ODFW 2015) to investigate whether or not recycled hatchery Summer Steelhead were straying into lower basin tributaries and found little evidence that hatchery Summer Steelhead (recycled or not) strayed into Clear Creek, one of the primary Winter Steelhead producing tributaries in the lower river. {Issue #3}

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 Clackamas 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
- Section 10 - Incidental Take Permits for the operation of North Fork ladder sorting facility
- Submission of this HGMP to NOAA Fisheries will serve as take authorization for ESA-listed fish.

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

All Columbia and Willamette River anadromous salmonids that successfully return to spawn must migrate through the Columbia River estuary and the lower Columbia and Willamette rivers twice during their life cycle. Thus, hatchery programs in the lower Willamette and 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 subbasin where the program fish are collected (South Santiam River) and released (Clackamas River). These populations include:

The Lower Columbia River Steelhead (*Oncorhynchus mykiss*) ESU was federally listed as threatened under the ESA on March 19, 1998.

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

The Lower Columbia River Coho salmon (*Oncorhynchus kisutch*) ESU is listed as threatened under the Endangered Species Act, effective July, 2005. This ESU is listed as endangered by the State of 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 ESU 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, but still significant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, Rickreall).

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

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

- Lower Columbia River Steelhead - The Lower Columbia River Steelhead ESU contains both Winter and Summer Steelhead, and was listed as threatened under the ESA on March 19, 1998. This ESU 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 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, but still significant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, 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 March. 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 three 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.

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

All listed species occupying habitats in the Clackamas River, the Willamette River, and the lower Columbia River migration corridors may be indirectly impacted by the presence of Clackamas 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 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 Willamette River Recovery Unit forms part of the range of the Columbia River population. The Willamette River Recovery Unit encompasses the Clackamas River Basin.

- Lower Columbia River Coho – The Lower Columbia River Coho Salmon ESU is listed as endangered by the State of Oregon and threatened by NOAA Fisheries, effective July, 2005. 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, Lower Columbia tributaries upstream of and including the Clatskanie River have modest natural production of wild Coho (OASIS 2015).

- Lower Columbia River Chum - 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.

- Upper Willamette River Chinook – This 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.

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.

-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
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

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
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%

- 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 Clackamas listed populations. The intrinsic productivity estimates for Coho, Winter Steelhead, late Fall Chinook and Spring Chinook were 6.196, 5.008, 4.149, and 9.927 respectively.

Table 2.2.2(c) Recruitment model parameter values for lower Columbia River and Willamette Basin Steelhead and Salmon populations estimated either directly from a data set (highlighted) or estimated as described in the LCCRP Appendix C.

ESUs or SMUs	Species	Population	New IP	Ph	alpha base	α	β	γ	SDresid	Serial Corr
LCR	Coho	Youngs	570	0.860	11.578	1.015	3879	1.6665	0.754	0.372
		Big	332	0.860	11.578	1.015	2260	1.6665	0.754	0.372
		Clatskanie	514	0.130	11.578	8.014	3502	1.6665	0.754	0.372
		Scappoose	679	0.050	11.578	10.050	4625	1.6665	0.754	0.372
		Clackamas	**1611**	**0.354**		**6.196**	**18433**	**1.6174**	**0.882**	**0.401**
		Sandy	**602**	**0.093**		**4.825**	**5381**	**1.7156**	**0.625**	**0.343**
		Lower Gorge	136	0.800	11.578	1.203	923	1.6665	0.754	0.372
		Up Gorge/Hood	271	0.800	11.578	1.203	1846	1.6665	0.754	0.372
	Steelhead	Youngs	631	0.200	13.664	8.915	4295	1.9471	0.395	0.352
		Big	368	0.400	13.664	5.817	2503	1.9471	0.395	0.352
		Clatskanie	569	0.050	13.664	12.281	3878	1.9471	0.395	0.352
		Scappoose	752	0.050	13.664	12.281	5122	1.9471	0.395	0.352
		Clackamas	**1285**	**0.238**		**5.008**	**7911**	**2.0818**	**0.616**	**0.536**
		Sandy	**709**	**0.497**		**1.687**	**2652**	**0.4537**	**0.169**	**0.060**
		Lower Gorge	129	0.100	13.664	11.037	876	1.9471	0.395	0.352
		Up Gorge	38	0.100	13.664	11.037	260	1.9471	0.395	0.352
		Hood WinterR	**232**	**0.177**		**13.829**	**1873**	**2.0326**	**0.441**	**0.628**
		Hood SummerI	**151**	**0.791**		**1.750**	**2329**	**2.9193**	**0.644**	**0.736**
	Fall Chinook	Youngs	528	0.900	11.431	4.149	3599	0.9894	0.401	0.476
		Big	307	0.900	11.431	4.149	2092	0.9894	0.401	0.476
		Scappoose	502	0.900	11.431	4.149	3418	0.9894	0.401	0.476
		Clatskanie	**438**	**0.900**		**3.576**	**111**	**1.0033**	**0.471**	**0.363**
		Clackamas	789	0.900	11.431	4.149	5370	0.9894	0.401	0.476
		Sandy	218	0.900	11.431	4.149	1485	0.9894	0.401	0.476
		Sandy Late	**218**	**0.460**		**10.437**	**5447**	**0.9168**	**0.433**	**0.412**
		Lower Gorge	104	0.900	11.431	4.149	709	0.9894	0.401	0.476
		Up Gorge	29	0.900	11.431	4.149	196	0.9894	0.401	0.476
		Hood	49	0.900	11.431	4.149	331	0.9894	0.401	0.476
	Sp Chinook	**Sandy**	**525**	**0.497**		**2.577**	**2820**	**0.9509**	**0.162**	**0.155**
		Hood	293	0.950	11.431	3.922	1998	0.9894	0.401	0.476
Willamette	Steelhead	**Molalla**	**2057**	**0.219**		**11.901**	**2993**	**2.2128**	**0.328**	**0.091**
		N. Santiam	**1133**	**0.155**		**7.951**	**6492**	**1.9835**	**0.270**	**0.138**
		S. Santiam	**1565**	**0.026**		**23.663**	**4824**	**1.2652**	**0.357**	**0.545**
		Calapooia	**812**	**0.000**		**11.404**	**1263**	**2.6277**	**0.339**	**0.081**
	Sp Chinook	**Clackamas**	**613**	**0.418**		**9.927**	**3467**	**1.1104**	**0.369**	**0.694**
		Molalla	1926	0.950	11.431	3.922	13116	0.9894	0.401	0.476
		N. Santiam	484	0.900	11.431	4.149	3299	0.9894	0.401	0.476
		S. Santiam	1084	0.900	11.431	4.149	7382	0.9894	0.401	0.476
		Calapooia	770	0.950	11.431	3.922	5247	0.9894	0.401	0.476
		McKenzie	**842**	**0.355**		**5.768**	**3367**	**0.9655**	**0.571**	**0.756**
		Mid Fk Willam	446	0.950	11.431	3.922	3040	0.9894	0.401	0.476

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

The upper Clackamas (above the North Fork Dam) is managed as a wild fish sanctuary. No hatchery fish are allowed to pass above the North Fork Dam. Counts of wild Winter Steelhead at the North Fork Dam since 1992 are provided in Table 2.2.2b.

Table 2.2.2(d). Total numbers wild Winter Steelhead counted at the North Fork Dam (Clackamas River) and via spawning surveys in the lower basin, 2004-2015.

Return Year	North Fork Dam	Total Wild StW
2004	2110	2110
2005	937	937
2006	429	1,164[a/]
2007	435	1,208[a/]
2008	499	499
2009	6635	635
2010	2175	2175
2011	1242	1242
2012	1249	2,733[a/]
2013	869	2,427[a/]
2014	1248	3,404[a/]
2015	1616	3,740[a/]

Source: Garth Wyatt(PGE), Jacobsen 2015

[a/] Wild fish count includes estimates from GRTS spawning surveys in the lower basin combined with count of wild StW at North Fork Dam. Spawning survey data not available for all other years.

-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.

Returning hatchery Steelhead adults (fin marked) have not been allowed access to wild Steelhead production areas upstream of the North Fork Dam on the Clackamas River since 1999. The estimated proportion of hatchery Steelhead in the natural spawning escapement above North Fork Dam of Clackamas River fish is presented in Table 2.2.2c.

Table 2.2.2(e). Estimated fraction of hatchery Steelhead in the natural spawning escapement, Clackamas River 2004-2015.

Spawn Year	% Hatchery Fish
2004	NA
2005	NA
2006	34.0%
2007	16.7%
2008	NA
2009	NA
2010	NA
2011	NA
2012	2.0%
2013	10.1%
2014	0.5%
2015	7.0%

Jacobsen 2015. Data not available in some years due to lack of funding to conduct spawning surveys.

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.

Collection and sorting of fish at Clackamas Hatchery is the only hatchery activity that may lead to the take of listed fish. Listed fish may enter the trap at Clackamas Hatchery while the trap is open to receiving fish. Any listed fish entering the trap will be returned to the mainstem Clackamas River at the upper boat ramp in McIver Park as soon as possible after collection. Hatchery fish are not allowed above North Fork Dam. All hatchery fish entering the trap at North Fork Dam are recycled downstream or brought to Clackamas Hatchery for disposal. The fish trap and associated sorting operations at North Fork Dam are "state of the art" and are designed to have minimal impact on wild fish during the process of sorting and removing hatchery fish from the spawning population.

Hatchery Summer Steelhead smolts are only acclimated and released at Clackamas Hatchery and the Foster Creek acclimation pond. Adult collection, spawning, incubation, and rearing take place at other locations. Therefore, incidental take of listed juvenile salmonids is not expected to occur through activities associated with the hatchery Summer Steelhead program at the Clackamas Hatchery. While there may be limited competition between hatchery released smolts and naturally-produced smolts in the lower mainstem Clackamas 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 from the system reducing unintended competition.

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.

Table 2.2.3(a). Wild adult fish passed at North Fork Dam, 2004-2015.

Run Year	Winter Steelhead	Coho	Spring Chinook	Observed Mortalities
2004	2083	2311	5308	0
2005	913	1776	2958	0
2006	392	1223	1113	0
2007	419	2510	1699	0
2008	472	3199	1821	0
2009	622	835	941	0
2010	2175	5461	1432	0
2011	1242	1338	1833	0
2012	1249	1780	1909	0
2013	869	1315	2306	0
2014	1248	2337	1088	0
2015	1616	8244	2574	0

Source: Garth Wyatt (PGE).

Table 2.2.3(b). Numbers of wild Winter Steelhead collected, mortality and number released at South Santiam Hatchery since 2004-2015.

Brood Year	Fish Collected	Fish Released	Mortalities	%Mortality
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
2014	215	215	0	0
2015	127	127	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 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.

Annual take levels are not expected to exceed those outlined in the take authorization for the North Fork Dam fish trap, as relatively few wild fish enter the trap at the Clackamas Hatchery. Hatchery fish and all Summer Steelhead collected at the North Fork Dam are sorted and recycled downstream. Wild fish collected at North Fork Dam are passed above the dam.

- 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 fish show up at the Clackamas Hatchery, they are captured and returned to the river at the upper McIver boat ramp or above River Mill Dam. At the North Fork trap, all fish are sorted and only wild fish passed above to maintain a wild fish sanctuary. If projected take levels are exceeded at the North Fork trap, ODFW would consult with NOAA Fisheries.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan 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)
- *Clackamas River Basin Fish Management Plan* (ODFW 1997)

These documents provide direction for the management of fish populations to protect and enhance naturally spawning populations in the Clackamas 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 Clackamas 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
- Clackamas Subbasin Fish Management Plan
- Fisheries Management and Evaluation Plan - Lower Columbia River Chinook in Oregon Freshwater Fisheries of the Lower Columbia River Tributaries Between the Pacific Ocean and Hood River
- 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 (NMFS 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 (2002-14), if available.

This program is managed to provide Steelhead production to supplement harvest in the Clackamas River sport fishery to mitigate for lost salmonid production related to habitat loss and degradation in the Columbia River Basin. Clackamas Hatchery Summer Steelhead are an important contributor to the Clackamas River sport fishery.

Fishery harvest estimates for Clackamas Hatchery Summer Steelhead are listed in Table 3.3.1. The harvest estimate does not include all potential harvest as there is likely harvest outside of the Clackamas (Willamette and Columbia rivers) basin that we do not have an ability to apportion to one hatchery population or another.

Table 3.3.1. Harvest of Summer Steelhead in the Clackamas River below North Fork Dam, 2002-2014.

Return Year	Number Caught
2002	1,420
2003	4,050
2004	1,163
2005	3,564
2006	796
2007	2,141
2008	2,013
2009	1,894
2010	2,028
2011	1,499
2012	2,300
2013	2,082
2014	2,322

Source: Harvest card returns
Harvest estimates are expanded from harvest card returns. 2015 harvest data not available at time of publication.

3.4) Relationship to habitat protection and recovery strategies.

The Clackamas 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. This basin contains numerous and large urban areas, agricultural areas, and forested areas. The Clackamas River also serves as a municipal water source for the surrounding metropolitan area. The Clackamas River Salmon and Steelhead Production Plan (ODFW, 1990) offers a thorough description of the basin, the uses it receives, and the habitat protective measures that are being employed by various agencies and organizations. The subbasin plan presents five main habitat protection objectives; they are:

Objective 1. Maintain and improve upstream and downstream passage for anadromous fish at dams, diversions, power projects, and where appropriate, at natural barriers.

Objective 2. Provide necessary instream flows for fish production.

Objective 3. Reduce the impacts of reservoir management on fish production.

Objective 4. Protect existing stream habitat from degradation associated with timber harvest and other related activities on forested lands, with road construction, and with development on private and agricultural lands.

Objective 5. Inventory stream and watershed characteristics that affect fish production.

The Clackamas Hatchery Summer Steelhead program is consistent with these habitat protection and recovery strategies.

3.5) Ecological interactions.

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).
- 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, which may negatively affect Clackamas 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 (*Stizostedium vitreum*) 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. ODFW monitoring in the Willamette River recently demonstrated the potential for significant impacts to Salmon and Steelhead populations migrating through the Willamette River.

American Shad (*Alosa sapidissima*), as well as large out-of-basin hatchery salmonid releases represent potential sources of competition to juvenile Clackamas Hatchery Summer Steelhead. Some 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
- Out-of-basin wild salmonids using the Columbia River estuary

Wild juvenile salmonids using the Columbia River may be affected by releases of Clackamas Hatchery Summer Steelhead. However, the Summer Steelhead are released as full-term yearling smolts so they are expected to promptly out-migrate through the Clackamas River and the lower Columbia River with a minimum of ecological interaction with other species. Summer Steelhead smolts are also released at off-station sites to promote homing to areas where anglers will have better access and harvest fish at a higher rate.

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 measures taken to avoid, minimize, or monitor such risk is described below.

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

- With few exceptions, all hatchery fish are marked and returning hatchery adults with visible fin clips are sorted and removed from the upstream migrants by at the North Fork Dam on the Clackamas River. Hatchery and naturally produced summer-run adults are recycled back into the fishery through September. We do not recycle after September in order to reduce the potential for fish to stray as they approach spawn timing.

- Summer Steelhead are acclimated for up to three weeks in the Clackamas Basin prior to release. Acclimation allows fish to imprint on specific reaches in the lower Clackamas River and return to the reaches (i.e. below Foster Creek acclimation pond and Clackamas Hatchery) where anglers can target the hatchery adults.

- Operation of the North Fork Dam trap is such that delayed migration resulting in fallback and downstream spawning by wild fish is minimized. The trap is checked, and fish are sorted and released, frequently during the peak of adult migration.

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

- Steelhead smolts are released in the lower river at a size and time (corresponding to higher river flows) that supports swift emigration and limited residualization. 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 Clackamas Basin or lower Columbia River reaches (NMFS 1999). Summer Steelhead smolts are currently released from two different locations.

- All hatchery and naturally produced summer-run adult Steelhead are removed from the upstream migrating population at North Fork Dam. Thus, hatchery fish will not compete with wild fish during spawning in the upper basin. We are currently investigating the origin of "fall" Steelhead returning to the Clackamas Basin from September-November. These fish have unique run timing and are phenotypically distinct from other Steelhead in the basin. Genetic analysis may shed light on the origin of these fish that are possibly hybrid Summer/Winter Steelhead, Skamania stock Summer Steelhead, or a unique Steelhead native to the Clackamas basin that should be passed upstream.

(c) Disease Transmission – Because hatchery Steelhead are reared outside the Clackamas basin, but are acclimated, released, and return to the Clackamas 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 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's Fish Health

Management Policy. ODFW fish health staff, 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.

(d) Predation - Hatchery Steelhead released into nursery habitats may residualize within the subbasin and directly prey on naturally produced salmon and Steelhead fry. Due to their location, size, and time of emergence, newly emerged Chinook and Coho 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 subbasin for the purposes of stream enrichment. Collected broodstock in excess of production needs may be distributed throughout the Clackamas River in order to increase the nutrient supply. Decaying carcasses of salmonid species may contribute nutrients that increase productivity in the subbasin and positively contribute to the program.

(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 positive 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.

Clackamas Hatchery - The water source for the Clackamas Hatchery is the Clackamas River and a well. Water rights total 44,354 gpm. Chinook are incubated and reared in 52^{o}F well-water or with Clackamas River water that is pumped to the facility and treated with ultraviolet light (UV). River water intake is 100% screened with 3/16" mesh. These screens are not in compliance with the current NOAA Fisheries fish screening criteria. ODFW will begin design of screen upgrades in 2007. Additional funding is currently being sought for the upgrade of screens to meet NOAA criteria. River water withdrawal is covered under Oregon water permit numbers S49433 and S42105. Well water is withdrawn under permit number G8257. Hatchery effluent is discharged as per NPDES individual permit number 102663.

Clackamas River water is limited by water quality (pathogens) during summer months. This means that exposing eggs, fry, and fingerlings to untreated river water may be a disease transmission concern. To avoid these problems, all incubation and rearing takes place at other hatchery locations (Bonneville Hatchery). Fish from Bonneville Hatchery are eventually returned to Clackamas Hatchery for final acclimation and release. All hatchery 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 during the time in which program fish are on site.

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

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	12,000	12,000	12,000	9,600	10,500	10,500	10,500	4,500	4,500	12,000	12,000	12,000
Temp	36	37	38	40	46	50	55	56	52	44	40	38

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, the water 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.

Foster Acclimation Pond – Foster Acclimation Pond receives water (~450 gpm) from Foster Creek, a tributary of the Clackamas River at RM 11. The water is supplied via a 7.5 hp pump with screened intake approximately 100 feet away from the pond.

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.

Clackamas Hatchery - The current intake screens for the Clackamas Hatchery do not meet NOAA Fisheries screening criteria. We are currently in the process of designing a new intake that will be located in Estacada Lake and allow for gravity feed and 100% compliant screening of intake water for the hatchery. Effluent is discharged through the pollution abatement pond to settle-out solid wastes prior to discharging into the Clackamas River. Hatchery effluent is managed to comply with conditions and water quality limits outlined in the existing NPDES permit.

South Santiam Hatchery – 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.

Foster Acclimation Pond – The intake screen at Foster Acclimation Pond is screened to meet NOAA Fisheries screening criteria.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Foster Fish Collection Facility - All broodstock of summer steelhead for this program are collected at Foster Trap, located at the base of Foster Dam on the South Santiam River. Only hatchery-origin summer steelhead returning to this facility are used as broodstock unless a low return year necessitates using returns from other traps. Adult fish collection facility consists of a 10-ft x 80-ft pre-sort pool, fish sorting area, five 10-ft x 80-ft long term holding ponds and four 10-ft x 25-ft short term holding ponds. All returning adults utilize fish ladder entrances at the base of Foster Dam. Attraction water at the ladder entrances is provided year round via four auxiliary water supply (AWS) pumps. Gates are available at both entrances to control densities during peak times of the run. Once adults enter the fish ladder they continue up the fish ladder until they reach the transport channel and ladder which will take them into the pre-sort pool.

The pre-sort pool has a mechanical sweep to crowd the fish towards the upper end of the trap. Once there, attraction water pumped over a false weir causes the fish to enter the flume. After entering the flume an operator may use switch gates to divert them into either one of the two short term pools without handling or send them directly to the anesthetic tank. Aqui-S has been approved for use as an anesthetic for fish intended for food when used at a facility like the Foster Trap.

From the anesthetic tank, fish are manually placed into loading tubes which transports them to either the long- or short- term ponds. Four of the five long-term ponds are used for holding adult broodstock. 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 provided 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.

Clackamas Hatchery - Acclimated fish are released directly from the hatchery and no additional transportation equipment is used at Clackamas Hatchery for this Steelhead program.

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 1000-gallon fish transportation trucks located at the hatchery. Both of these trucks are equipped with supplemental oxygen. Additionally, a 300-gallon portable tank mounted in a pickup truck

is also used for fish transportation at the hatchery. This portable tank is equipped with supplemental oxygen.

Bonneville Hatchery – Bonneville Hatchery utilizes one 1000-gallon fish 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 for fish transportation. This portable tank is equipped with supplemental oxygen.

5.3) Broodstock holding and spawning facilities.

Broodstock holding facility:
Adult summer steelhead for broodstock are collected at the Foster Fish Collection Facility, located at the base of Foster Dam. Only hatchery fish returning to this facility are used as broodstock. The facility consists of a 10-ft x 80-ft pre-sort pool, fish sorting area, five 10-ft x 80-ft long term holding ponds and four 10-ft x 25-ft short term holding ponds. The new long term ponds designed to hold brood are 10-ft x 80-ft and have 6' water depth. The ponds are designed for a flow of 1500 gpm but 2500 gpm is available. Integrated Hatchery Operations Team (IHOT 1995) adult holding guidelines are followed for holding, loading density, water quality, alarm systems and predator control measures to provide necessary security for broodstock.

Spawning facility:
Starting in 2014 all spawning takes place at the new Foster Fish Collection Facility. The fish sorting area is 30-ft x 60-ft and provides an overhead cover. Brood fish are mechanically crowded from the long term ponds into the transport channel then down to the fish lock located at the base of the fish sorting area. They are then lifted via mechanical brail into the fish sorting area and onto a stainless steel chute leading to the anesthetic tank. Once anesthetized fish are sorted for ripeness then they are humanely killed using an automated fish stunner, or returned to the holding pond. Fish killed for spawning are then placed on a rack before spawning takes place.

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 to 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 Oak Springs and Bonneville hatcheries.

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 49-51°F. Dissolved Oxygen (D.O.) levels are not monitored in 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 tray has a low flow alarm, and there is a flow alarm on the head box to alert personnel of water loss and 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	2543	fiberglass
Deep Troughs	14	1	1.5	21	60	1,288	fiberglass

5.6) Acclimation/release facilities.

Clackamas Hatchery – The majority (~125,000) of Summer Steelhead smolts are acclimated at the Clackamas Hatchery on water from the Clackamas River. Fish are held in a single asphalt rearing pond measuring 300' x 100' x 4.5' (135,000 ft^3). Flow through the pond is ~4,500 gpm. Forced release of smolts takes place after acclimating for up to 3 weeks directly into the Clackamas River at the Clackamas Hatchery.

Foster Acclimation Pond – The remainder (~25,000) of the target release for the Clackamas River is acclimated on water from Foster Creek, a tributary to the lower Clackamas River at RM 11. Fish are held in an above ground rearing tank measuring 60' x 12' x 4.5' (32,400 ft^3). Flow through the pond is ~450 gpm. Forced release of smolts takes place after acclimating for up to 3 weeks directly into the creek and subsequently the Clackamas River

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

Clackamas Hatchery - There has been no significant Summer Steelhead mortality at the Clackamas Hatchery.

South Santiam Hatchery – There has been no significant fish mortality 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.

Foster Acclimation Pond – Pump/intake failure led to the loss of ~7,000 Summer Steelhead smolts at the pond in 2007 when a severe winter storm knocked out power. The back-up oxygen system was out of oxygen due to a leak in the lines which led to new procedures being put in place to prevent the same thin g from happening again. We now have a long list of daily checks that are performed at acclimation ponds to ensure all components are performing properly.

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.

Clackamas Hatchery – Clackamas 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, disease control, and disease prevention standards consistent with IHOT and the fish health management policy protocols are applied at the Clackamas 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. The 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.

Foster Acclimation Pond - Clackamas Hatchery staff is on-call 24 hrs/day to address emergency (or unexpected) events. The water system is equipped with an alarm and supplemental oxygen that is triggered by a float alarm if anything happens that effects intake water supply. The phone alarm calls a list of ODFW staff that will respond and determine what needs to be done to get the pond running again.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source

The Skamania stock Summer Steelhead 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. The stock is now referred to as the South Santiam stock. Only known hatchery reared fish are used for this broodstock collection program. 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.

Skamania stock Summer Steelhead were developed from Washougal and Klickitat River Summer Steelhead in the late 1950s at the Skamania Hatchery, Washington (Crawford 1979). 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 was 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 been spawned exclusively at the South Santiam Hatchery, 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 average number of broodstock collected annually at the Foster Dam trap from 1994-2004 was 455 males and 550 females. These broodstock are used to produce eggs for all Summer Steelhead (stock-24) programs of the ODFW. See Section 7.4 for details regarding annual broodstock collection.

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

Listed natural fish are not used as broodstock for 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 Steelhead are not considered indigenous to the Clackamas Basin, and actual genetic differences between these 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 Clackamas 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 the distinct areas of ancestral origin (Washougal and Klickitat rivers versus Willamette basin).

6.2.5) Reasons for choosing.

The Skamania Stock 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 subbasin 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 their applied mark. All adult hatchery Summer Steelhead are sorted out a North Fork Dam, and only wild fish are passed upstream to natural spawning areas.

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.

7.2) Collection or sampling design.

All marked adults volitionally entering the trap at Foster Dam are collected. 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 indigenous to any subbasin on the Oregon side of the lower Columbia River or the upper Willamette River above Willamette Falls. Currently all hatchery produced 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 1.8 M (2003-2004 ODFW Hatchery Production Schedules) from returning hatchery fish. From 1994-2002 the average number of broodstock collected annually was 455 males and 550 females, resulting in an average egg take of 1,849,000.

7.4.2) Broodstock collection levels for the last twelve years (2004-2015), 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, 2004-2015.

Brood Year	Adults Collected at Foster Dam	Adults Spawned			Egg Take
		# Males Spawned	# Females Spawned	Spawning Ratio (M:F)	
2004	6,120	500	500	1:1.0	1,699,700
2005	7,820	285	429	1:1.5	1,523,285
2006	6,937	356	450	1:1.3	1,486,450
2007	10,345	362	494	1:1.4	1,745,100
2008	6,394	464	464	1:1.0	1,644,800
2009	5,420	384	537	1:1.4	2,170,700
2010	7,621	420	444	1:1.0	1,567,900
2011	10,690	399	399	1:1.0	1,698,708
2012	7,530	426	426	1:1.0	1,463,500
2013	11,112	453	453	1:1.0	1,711,728
2014	6,042	354	394	1:1.1	1,361,524
2015	722	131	350	1:2.7	1,524,900

Source: HMS, ODFW

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

All hatchery fish that enter the trap are collected and are either selected for the broodstock, are disposed of, or recycled to the lower river for additional sport opportunities. Fish that are to be disposed of are done so in accordance with ODFW policies and procedures, which include freezing, rendering, and/or burying. Fish in suitable condition can be sold to a competitive bidder, or go to the Oregon Food Bank or local food banks.

7.6) Fish transportation and holding methods.

Captured adults are anesthetized using carbon dioxide gas introduced into the sorting tank at Foster Dam. 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.

Details regarding fish health monitoring, maintenance, and sanitation are described in Section 9.1.6.

7.7)1. 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 free of IHNV are utilized in various nutrient enrichment programs.

7.8) 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 consist of hatchery fish returning to the Foster trap on the South Santiam. 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 summer hatchery-produced 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.

Ripe males are selected for spawning, but 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, 2004-2015.

Brood Year	Spawning Ratio (M:F)
2004	1:1.0
2005	1:1.5
2006	1:1.3
2007	1:1.4
2008	1:1.0
2009	1:1.4
2010	1:1.0
2011	1:1.0
2012	1:1.0
2013	1:1.0
2014	1:1.1
2015	1:2.7

Source: HMS, ODFW

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; no listed fish are used in this program. 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.

ODFW will investigate the opportunity of incubating Summer Steelhead eggs at Clackamas Hatchery or other specific release points in order to further increase homing and return patterns that will increase angler harvest while minimizing risk to wild fish in the Clackamas.

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

South Santiam Hatchery:

Table 9.1.1a. Number of annual egg take (for all stock-24 Summer Steelhead programs of ODFW) and survival of eggs (to eyed stage) at the South Santiam Hatchery, 2004-2015.

Brood Year	Egg Take	Green to eyed egg Survival
2004	1,699,700	74.1%
2005	1,523,285	87.2%
2006	1,486,450	93.3%
2007	1,745,100	73.2%
2008	1,644,800	83.1%
2009	2,170,700	76.9%
2010	1,567,900	88.4%
2011	1,698,708	93.9%
2012	1,463,500	93.9%
2013	1,711,728	72.5%
2014	1,361,524	83.0%
2015	1,524,900	89.9%

Source: South Santiam Hatchery records, HMS.

Bonneville Hatchery:

Table 9.1.1b. Annual survival rates (eyed-egg to fry) of Summer Steelhead eggs at Bonneville Hatchery, 2004-2015.

Brood Year	Eyed-egg to fry Survival
2004	98.2%
2005	97.0%
2006	93.4%
2007	97.5%
2008	99.0%
2009	91.9%
2010	99.4%
2011	97.8%
2012	98.6%
2013	97.7%
2014	96.4%
2015	96.8%

Source: Bonneville Hatchery records, HMS.

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 additional eggs 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.

Integrated Hatchery Operations Team species-specific incubation recommendations are followed for water quality, flows, temperature and incubator loading densities.

South Santiam Hatchery: Incubation facilities at this hatchery utilize 30 incubator stacks with 15 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 from 49-51ºF. D.O. levels are not monitored during incubation. Incubation densities are kept low enough that D.O. is not of concern. The use of well water ensures that siltation is not an issue.

9.1.5) Ponding.

In February, approximately 260,000 eyed-eggs are transferred from South Santiam Hatchery to Bonneville Hatchery for further incubation and ponding. All rearing of Summer Steelhead for this program occurs at Bonneville Hatchery; and 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 fish per pound (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.

South Santiam Hatchery - No listed fish are reared at this hatchery, and the fish for this program are not listed. However, during spawning, eggs destined for Oak Springs Hatchery that test positive for IHNV are culled to minimize the likelihood that the program spreads IHNV to this spring-fed hatchery. IHNV positive eggs are often used

for shipment to Bonneville Hatchery (with ODFW pathology approval) since Bonneville's water source is already infected with IHNV. Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site and to the receiving stream. 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 (1988-1999) or for years dependable data are available.

Bonneville Hatchery:

Table 9.2.1. Fry to transfer survival rates of Summer Steelhead (stock -24) reared at Bonneville Hatchery, brood years 2004-2015.

Brood Year	Fry to Transfer Survival
2004	85.6%
2005	84.3%
2006	92.8%
2007	83.3%
2008	98.3%
2009	94.5%
2010	96.2%
2011	89.0%
2012	86.7%
2013	94.9%
2014	94.0%
2015	88.9%

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 of relatively consistent temperature (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 9.2.4. Average monthly growth data (fish/lb) for Summer Steelhead reared at Bonneville Hatchery.

Month	Size (fish/lb)
March	1700
April	750
May	340
June	130
July	70
August	40
September	26
October	17
November	12
December	9
January	7
February	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. See 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)
BioVita Starter #0, #1, #2	4-6 times/day	2000-150
BioClark's Fry 1.2, 1.5	3-4 times/day	150-35
BioClark's Fry 2.0, 2.5, 3.0	2 times/day	35-6

Average food conversion ratio is 0.81.

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 the Clackamas Hatchery based on size (number of fish per pound), age, 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.

Clackamas Hatchery: This program uses conventional hatchery rearing techniques, and does not use any of the new "natural" type hatchery rearing strategies. In March, the Clackamas Hatchery receives ~125,000 smolts from Bonneville hatchery, which will be acclimated in ambient Clackamas River water for up to 3 weeks and released from the Clackamas Hatchery. These basin-specific environmental cues, along with pre-migration imprinting are believed to encourage adult homing to release areas. Fish are forced out of the pond at the end of the acclimation period.

Foster Acclimation Pond: In March, the Foster Acclimation Pond receives two groups of 25,000 smolts that are each acclimated for up to 3 weeks prior to release into Foster Creek. Acclimation at this location allows for spreading out the return of adults which is intended to improve the fishery and return to the angler creel.

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.

Listed fish are not under propagation in the Clackamas Hatchery Summer Steelhead program. However, to minimize any possible impacts on listed fish, ODFW releases full-term smolts that exhibit swift emigration, low residualism, and strong homing, thus minimizing potential temporal and spatial overlap that may result in 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 (stock-24) from Clackamas Hatchery.

Age Class	Number Released	Fish/lb.	Release Date	Release Location
Yearling	125,000[a/]	5.0	March	Clackamas River (Clackamas Hatchery)
	50,000[a/]	5.0	March	Foster Creek (Foster Acclimation Pd)

[a/] The maximum number released should not exceed 192,500 smolts (+/-10% target release number per IHOT standard).

10.2) Specific location(s) of proposed releases.

River Name: Clackamas River; Regional Mark Location Code = 5F33307 H7 21
Release Point: Clackamas Hatchery, RM 22.6, Clackamas River)
Major Watershed: Clackamas River
Basin or Region: Lower Willamette River

River Name: Foster Creek
Release Point: Foster Acclimation Pond (RM 0.25), at latitude 45.3838 and longitude -122.4476.
Major Watershed: Clackamas River
Basin or Region: Lower Willamette River

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

Table 10.3(a). Annual release numbers and average size of Summer Steelhead (stock-24) released from Clackamas Hatchery into the Clackamas River during 2004-2015

Brood Year	Number of Smolts Released	Average Size at Release (fish/lb)
2004	178,234	6.3
2005	176,137	6
2006	174,051	5.4
2007	152,932	5.3
2008	182,688	6.7
2009	149,928	5.9
2010	174,907	4.8
2011	135,619	5
2012	144,242	5
2013	141,790	4.7
2014	144,414	4
2015	109,837	4.8

Source: Clackamas Hatchery records, HMS.

Table 10.3(b). Annual release numbers and average size of Summer Steelhead (stock-24) released from Foster Acclimation Pond into the Clackamas River during 2004-2015

Brood Year	Number of Smolts Released	Average Size at Release (fish/lb)
2004	0	
2005	0	
2006	0	
2007	19,938	5.3
2008	29,223	6.7
2009	25,168	5.9
2010	26,238	4.8
2011	25,107	5
2012	24,861	5
2013	50,029	4.7
2014	49,806	4
2015	49,908	

Source: Clackamas Hatchery records, HMS.

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

Table 10.4(a). Release dates of Summer Steelhead (stock-24) from Clackamas Hatchery into the Clackamas River, 2004-2016.

Brood Year	Release Date	Number Released
2003	4/15/04	159,410
2004	4/4/05	178,234
2005	4/12/06	176,137
2006	4/18/07	174,051
2007	3/26/08	152,932
2008	4/24/09	182,688
2009	4/20/10	149,928
2010	4/12/11	174,907
2011	4/13/12	135,619
2012	4/16/13	144,242
2013	4/18/14	141,790
2014	4/9/15	144.414
2015	5/13/16	109,837

Source: Clackamas Hatchery records, HMS.

Table 10.4(b). Release dates of Summer Steelhead (stock-24) from Foster Acclimation Pond into the Clackamas River, 2004-2015.

Brood Year	Release Date	Number Released
2003	NA	0
2004	NA	0
2005	NA	0
2006	NA	0
2007	4/2/08	19,938
2008	4/15/09	29,223
2009	4/19/10	25,168
2010	4/4/11	26,238
2011	4/5/12	25,107
2012	4/4/13	24,861
2013	3/14/14	25,050
	4/4/14	24,979
2014	2/22/15	24,963
	4/6/15	24,843
2015	3/8/16	25,108
	4/4/16	24,890

Source: Clackamas Hatchery records, HMS.

The fish undergo an acclimation period of up to three weeks. Actual acclimation timing is dependent upon fish condition (visual cues) and in-river conditions that provide rapid outmigration from the Clackamas. The acclimation scenario is intended to maximize homing back to the point of release, increase survival, and reduce residualism in smolts.

10.5) Fish Transportation.

Fish are transported to the Clackamas Hatchery and Foster Acclimation Pond (from Bonneville Hatchery) for final acclimation and release (See Section 5.2 for details regarding transportation). Once at the Clackamas Hatchery, Summer Steelhead are not transported prior to release. All hatchery Steelhead are acclimated on site and released into the Clackamas River from the Clackamas Hatchery.

In the future, we may investigate alternate release strategies that can improve angler harvest while minimizing risk to wild fish in the Clackamas.

10.6) Acclimation procedures.

All fish are transported to the Clackamas Hatchery or Foster Acclimation Pond for final acclimation and release. The fish undergo an acclimation period of up to three weeks. Actual acclimation timing is dependent upon fish condition (visual cues) and in-river conditions that provide rapid outmigration from the Clackamas. The acclimation scenario is intended to maximize homing back to the point of release, increase survival, and reduce residualism in smolts.

Smolts are forced released out of the rearing ponds in order to prevent adult Winter Steelhead from accessing the rearing ponds through pipelines. We are investigating means of preventing this from happening so we can allow volitional release over a 48-hour period similar to procedures used at Sandy Fish Hatchery.

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

All (100%) of Clackamas Hatchery Summer Steelhead smolts are fin marked (adipose fin-clip) 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 Clackamas 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 subbasin 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.

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 Clackamas Hatchery Summer Steelhead smolts would be directly released into the Clackamas River.

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 Clackamas Hatchery Summer Steelhead smolts are reared to a sufficient size that smoltification occurs within nearly the entire population, thus promoting rapid emigration from the Clackamas River.
- All smolts are acclimated on Clackamas River or Foster Creek water to promote adult homing to the Clackamas River and the Clackamas Hatchery and Foster Creek release sites.
- All smolts are released downstream of the wild fish sanctuary area (above North Fork Dam).
- Alternate release sites in the basin below Clackamas Hatchery are being investigated in order to minimize potential introgression or competition between wild Winter and hatchery Summer Steelhead.
- All (100%) smolts are fin marked to differentiate between natural and hatchery fish. Clackamas Hatchery Summer Steelhead are fin marked with an adipose fin clip (AD).
- Mark quality checks (to identify the percentage of unmarked fish) are performed on 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 Clackamas Hatchery Summer 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 Clackamas Hatchery Summer 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 staff will conduct a literature review of issues related to wild/hatchery fish interactions in order to gain insight into potential competition that may be occurring in the lower Clackamas River. Despite funding and staffing limitations, ODFW staff will attempt to assess potential negative interactions between hatchery and wild fish through review of related research in other Pacific Northwest streams.

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. No specific creel studies currently exist for the Clackamas River, although they do for the Columbia River sport and commercial fisheries (overseen by the Columbia River Program). The North Willamette Fish District also coordinates and

reports on carcass placement in the Clackamas Basin, with the USFS and STEP volunteers performing most of the work.

PGE owns the fish ladder and trap on the North Fork Dam. PGE staff work the trap. This structure allows the upper Clackamas River basin to be managed for wild fish production. ODFW and PGE coordinate on ladder and trap operation.

Finally, other on-going monitoring of fish populations occurs through ODFW's Corvallis Research Lab (Environmental Monitoring and Assessment Program [E-MAP], spawning surveys, habitat surveys, focused research), PGE (focused research, adult & juvenile counts), the USFS (juvenile surveys), and other entities. 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.

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).

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.

The ODFW has, however, identified monitoring and evaluation projects that it would like to conduct if funding and staff were available. Projects are listed in priority order.

- Evaluate opportunities to provide a fishery on naturally produced Summer Steelhead in the basin.
- Evaluate opportunities to provide a retention fishery on residual hatchery juveniles that may be competing for rearing space in the lower river.
- Assess incidental impacts to wild Winter Steelhead during lower Clackamas River sport fisheries.
- Enumerate adult escapement of wild Winter Steelhead in habitats overlapping sport fishery areas.
- Estimate smolt to adult survival rates.
- Determine juvenile rearing densities and distributions in the upper Clackamas River basin.
- Quantify potential stray rates to out-of-basin areas.

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.

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

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

SECTION 12. RESEARCH

No research is being conducted in direct association with the Clackamas 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**.

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:

Citations:

Bisbal, G.A. and W.E. McConnaha. 1998. Consideration of ocean conditions in the management of salmon. Canadian Journal of Fisheries and Aquatic Sciences, 55 (9): 2178-2186.

Buchanan, D.V. 1977. Willamette River steelhead. Annual Report. Oregon Department of Fish and Wildlife, Salem, Oregon.

Buchanan, D.V, R.M. Hooton, M.G. Wade, and J.E. McCrae. 1979. Willamette River steelhead. Annual Report. Oregon Department of Fish and Wildlife, Salem, Oregon.

Cederholm CJ, Kunze MD, Murota T, Sibatani A. 1999. Pacific salmon carcasses: Essential contributions of nutrients and energy for aquatic and terrestrial ecosystems. Fisheries 24: 6-15.

Federal Register Notice. 2004. Endangered and Threatened Species: Proposed Listing Determinations for 27 ESUs of West Coast Salmonids; Proposed Rule. Vol. 69, No 113, pp 33102-33179.

Groot, C. and L. Margolis. 1991. Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, British Columbia.

IHOT (Integrated Hatchery Operations Team). 1996. Operation Plans for Anadromous Fish Production Facilities in the Columbia River Basin (Volume II). Annual Report 1995. Project Number 92-043, Contract Number DE-BJ79-91BP60629. Portland, OR.

Jacobsen R., J. Nott, E. Brown, M. Weeber and M. Lewis. 2015. Assessment of Western Oregon Adult Winter Steelhead and Lamprey – Redd Surveys 2015. Monitoring Program Report Number OPSW-ODFW-2015-09. Oregon Department of Fish and Wildlife, Salem, Oregon.

Lichatowich, J. A. and J.D. McIntyre. 1987. Use of hatcheries in the management of Pacific anadromous salmon. Pages 131-136 in M.J. Dadswell, R.J. Klauda, C.M. Moffitt, R.L. Saunders, R..A. Rulifson, and J.E. Cooper (Eds.), *Common Strategies of Anadromous and Catadromous Fishes*. American Fisheries Society, Symposium I, Boston, MA, March 9-13, 1986.

McCabe, G. T., Jr., W. D. Muir, R. L. Emmett, and J. T. Durkin. 1983. Interrelationships between juvenile salmonids and nonsalmonid fish in the Columbia River Estuary. Fishery Bull. 81:815-826.

McElhany, P., T. Backman, C. Busack, S. Kolmes, J. Myers, D. Rawding, A. Steel, C. Steward, T. Whitesel, and C. Willis. 2004. Status evaluation of salmon and steelhead populations

in the Willamette and lower Columbia River basins. Willamette/Lower Columbia Technical Recovery Team. NOAA Fisheries, Northwest Fisheries Science Center, Seattle, WA.

McNeil, W.J. and D.C. Himsworth (editors). 1980. Salmonid Ecosystems of the North Pacific. Oregon State Univ. Press, Corvallis.

NMFS. 1999. Biological Opinion on Artificial Propagation in the Columbia River Basin. Incidental Take of Listed Salmon and Steelhead from Federal and Non-Federal Hatchery Programs that Collect, Rear and Release Unlisted Fish Species. Portland, OR.

ODFW. 1990. Clackamas River, Willamette River Subbasin Salmon and Steelhead Production Plan. September 1, 1990. Oregon Department of Fish and Wildlife, Salem, OR.

ODFW. 2001. Fisheries Management and Evaluation Plan, for the Lower Columbia ESU Steelhead. Clackamas, Or.

ODFW. 2002. Clackamas River Subbasin Fish Management Plan. Portland, OR.

ODFW. 2010. Lower Columbia River Conservation and Recovery Plan for Oregon Populations of Salmon and Steelhead. Oregon Department of Fish and Wildlife, Salem, OR.

ODFW, 2015. Clackamas Hatchery/Wild Fish Interaction Study. Oregon Department of Fish and Wildlife, North Willamette Watershed District, Clackamas, OR.

Oregon Administrative Rules (OAR 635-007-0502 through -0509). 2002. Native Fish Conservation Policy. Oregon Department of Fish and Wildlife, Salem, OR.

Oregon Administrative Rules (OAR 635-007-0542 through -0548). 2003. Fish Hatchery Management Policy. Oregon Department of Fish and Wildlife, Salem, OR.

Oregon Administrative Rules (OAR 635-007-0960 through -1000). 2003. Fish Health Management Policy. Oregon Department of Fish and Wildlife, Salem, OR.

Roby, D. D., D. P. Craig, K. Collis, and S. L. Adamany. 1998. Avian predation on juvenile salmonids in the lower Columbia River. Unpublished 1997 annual report to the Bonneville Power Administration and US Army Corp of Engineers, Portland, Oregon.

Wade, M.G. and Buchanan, D.V. 1983. Development and assessment of steelhead in the Willamette River basin. Annual Report. Oregon Department of Fish and Wildlife, Salem, Oregon.

WDFW. 1990. Washougal River Subbasin Salmon and Steelhead Production Plan. Olympia, WA.

WDFW & ODFW. 2004. Status Report. Columbia River Fish Runs and Fisheries, 1938-2003. July 2004.

Attachment 1. Estimated listed salmonid take levels by hatchery activity.

Listed species affected: Clackamas River Winter Steelhead; ESU/Population: Lower Columbia ESU; Activity: Hatchery Trap				
Location of activity: Clackamas River mile 22.6; Dates of activity: May – September; 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)			30	
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

Listed species affected: Clackamas River Winter Steelhead; ESU/Population: Lower Columbia ESU; Activity: NF Dam Trap				
Location of activity: Clackamas River mile 22.6; Dates of activity: May – September; 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)			5,000	
Capture, handle, tag/mark/tissue sample, and release d)			500	
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

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

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

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, ODFW

Signature: _____Date: _____

Attachment 2. 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 3. Age class designations by fish size and species for salmonids released from hatchery facilities.

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

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

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

Attachment 4. 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 – Delisting Proposed)
Status: Bald Eagles were listed as endangered in the conterminous United States under the ESA on March 6, 1967 (32 FR 4001). The population in the Pacific Northwest was later downgraded on February 14, 1978 to threatened. Eagles in the remaining states were subsequently downgraded to threatened on July 12, 1995 (60 FR 36000). 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 (Ranununculus aquaticus), yellow water-lily (Nuphar polysepalum), bladderwort (Utricularia vulgaris), and pondweeds (Potamogeton spp.).

Bradshaws Lomatium (*Lomatium bradshawii*, Endangered Species)
Bradshaw's lomatium was federally listed as endangered in 1988 (USFWS 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 (Deschampsia cespitosa) prairies. Bradshaw's lomatium occurs on alluvial (deposited by flowing water) soils. The species occurs on soils in the Wapto, Bashaw and Mcalpin Series (NRCS mapped soil unit STATSGO 81).

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

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

Status: The historical range of this subspecies extends from the Long Beach Peninsula, Pacific County, 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 ant Cascade Head, Bray Point and Clatsop Plains in Oregon, on the Long Beach Peninsula in Washington and in Del Norte County in California.

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

The most important feature of the habitat of the Oregon silverspot is the presence of the early blue violet. This plant is normally the only species on which the Oregon silverspot can successfully feed and develop as larva. This plant is a part of the sal-spray meadow vegetation and is an obligatory component of the butterfly's habitat Other features of optimum habitat include moderate grass cover, and a mixture of herbaceous plants used 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 Clackamas Fish Hatchery.

Adult hatchery fish in the Clackamas Rivercould 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.

References:

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland, and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. N. Amer. Wildl. Nat. Res. Conf. 47:332-342.

Anthony, R.G. and F.B. Isaacs. 1989. Characteristics of bald eagle nest sites in Oregon. J. Wildl. Manag. 53:148-159.

Cederholm, C.J., M.D. Kunze, T. Murota, and A. Sibatani. 1999. Pacific salmon carcasses: Essential contributions of nutrients and energy for aquatic and terrestrial ecosystems. Fisheries 24 (10): 6-15.

Crawford, B.A. 1979. The origin and history of the trout broodstocks of the Washington Department of Game. Washington State Game Department, Fishery Research Report, Olympia.

Isaacs, F.B., R.G. Anthony and D.P. Anderson. 2001. Bald eagle nest locations and history of use in Oregon and the Washington portion of the Columbia River recovery zone, 1972 through 2001. Oregon Cooperative Wildlife Research Unit, Oregon State University, Corvallis, OR, 34pp.

Snow, C. 1981. Southern bald eagle and northern bald eagle, habitat management services for Endangered Species. Bureau of Land Management Report No. 5.

Stalmaster, M.V. 1980. Management strategies for wintering bald eagles in the Pacific Northwest. In Knight, R.L. et al. editors, Proceedings of the Washington Bald Eagle Symposium, June 1980, Seattle, Washington.

Stalmaster, M.V. 1987. The bald eagle. Universe Books, New York, NY. 227pp.

Stalmaster, M.V. and J.R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. J. Wildl. Manage. 42:506-513.

Steenhof, K. 1978. Management of wintering bald eagles. Eastern Energy and Land Use Team, Office of Biological Service, U.S.D.I. Fish and Wildlife Service, FWS/OBS/78/79. 59 pp.

U.S.D.A. Forest Service (USFS). 1977. Bald eagle habitat management guidelines. Pacific Southwest Region, San Francisco, CA. 60 pp.

U.S.D.A. Forest Service (USFS). 1985. Management of wildlife and fish habitats in forests of western Oregon and Washington. Chapter 13 – Bald eagles. R6-F&WL-192-1985. U.S.D.A. Forest Service Pacific Northwest Region, Portland, Oregon. 332pp.

U.S. Fish and Wildlife Service (USFWS). 1992. Recovery Plan for Northern Spotted Owls (draft), 662pp.

U.S. Fish and Wildlife Service (USFWS). 1993. Final Rule: Determination of Threatened status for the plant "Sidalcea nelsoniana" (Nelson's Checker-mallow). February 12, 1993, Federal Register 58:8242.

U.S. Fish and Wildlife Service (USFWS). 1994. Final Rule: The plant, water howellia ("Howellia aquatilis"), determined to be a Threatened Species. July 14, 1994 Federal Register.

Watson, J.W., M.G. Garrett and R.G. Anthony. 1991. Foraging ecology of bald eagles in the Columbia River estuary. J. Wildl. Manage. 55:492-499.