

HATCHERY AND GENETIC MANAGEMENT PLAN
(HGMP)

Hatchery Program:

Clackamas River (Wild) Winter Steelhead Program

Species or Hatchery Stock:

Clackamas River winter steelhead (stock 122W)

Agency/Operator:

Oregon Department of Fish and Wildlife

Watershed and Region:

Clackamas River Basin

Date Submitted:

August 29, 2006

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SECTION 1. General Program Description

1.1) Name of hatchery Program:

Clackamas River (Wild) Winter Steelhead Program (stock 122)

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

Clackamas winter steelhead (stock 122), *Oncorhynchus mykiss*, Threatened Status (Lower Columbia River Steelhead ESU). These fish are also a sensitive species under Oregon's Sensitive Species Rule (OAR 635-100-0040).

1.3) Responsible organization and individuals

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Other agencies, co-operators, or organizations involved:

NOAA Fisheries (NOAA), through the Mitchell Act, funds production and operation expenditures at Clackamas Hatchery. Portland General Electric Company (PGE) and the City of Portland (COP) fund production and operation expenditures at Clackamas Hatchery as mitigation for hydroelectric development in the Sandy, and Clackamas Rivers. Smolt production at Irrigon Hatchery is funded within the Bonneville Hatchery Mitchell Act budget. Smolt production at Oak Springs Hatchery is funded within the Oak Springs Hatchery base budget (ODFW).

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

Funding Sources: Oregon Department of Fish and Wildlife (ODFW) = 29.6%
 NOAA Fisheries = 29.6%
 Portland General Electric = 22.0 %
 City of Portland = 18.8%
 Staff Level: 4.5 Full Time Employees (FTE)
 Annual Budget: \$722,359 (Total budget for 2005)

Comment [JB1]: Todd – I deleted reference to the Eagle Creek program to avoid confusion since it is another StW stock and is covered by a separate HGMP. If you disagree, reject this edit but include text to clarify that EC releases involve a different stock and are covered under another HGMP.

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 winter steelhead program summary.

Adult Collection	Adult Holding & Spawning	Egg Incubation	Rearing	Acclimation	Release
Clackamas Hatch.	Clackamas Hatch.	Clackamas Hatch.	Irrigon Hatch. Oak Springs H. Bonneville H.	Clackamas H. CassidyPond Foster Creek	Clackamas H. Cassidy Pond Bradshaw P.

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.

Winter steelhead program functions include:
 Adult collection
 Spawning
 Incubation

Early rearing
Acclimation
Release

2) **Irrigon Hatchery** is located on the Columbia River, mile 279, Columbia River basin, Oregon Township 5 north, Range 26 East.

Winter steelhead program functions include:

Incubation
Rearing from eyed egg to smolt

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.

Winter steelhead program functions include:

Juvenile rearing

4) **Oak Springs Hatchery** is located on the Deschutes River mile 50.75, Deschutes River Basin, Oregon Township 4 south, Range 13 east, Section 10.

Rearing from 200/lb. to smolt

5) **North Fork Dam** - Owned and operated by Portland General Electric Company; an adult sorting and brood collection facility; operations supervised by ODFW.

1.6) Type of program

Integrated program

1.7) Purpose of program

The Clackamas River late winter steelhead program was developed from locally adapted broodstock, using naturally produced fish, beginning in 1991. Naturally produced fish are regularly incorporated into the broodstock. Due to water quality and quantity limitations at the hatchery, a portion of the program involves out-of-basin incubation and rearing at other hatchery facilities. 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 watershed. Spawning interactions between returning hatchery fish and the naturally produced population are minimized by sorting fish at the PGE facility at North Fork Dam and managing the basin above this site as a wild fish sanctuary. Wild fish are passed upstream of the dam into upper Clackamas River spawning grounds. Hatchery produced fish are either recycled through the lower river fishery, or taken to Clackamas Hatchery for disposition

The primary objectives of the Clackamas Hatchery, as outlined in the 2004 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

As mentioned in section 1.6, the Clackamas winter steelhead program is in place for both harvest augmentation and mitigation. The intent is to provide a sport fishery with fish that are similar to the wild fish in the Clackamas, and provide a fishery that meets a public need. The Clackamas River is a well-regarded and fished river, due to its high quality and proximity to the Portland metropolitan area. It receives a great deal of angler pressure, as indicated by the harvest card catch estimates that are shown in Table 1. The estimated average number of angler trips from 1980 through 1996 is 16,375 per year (ODFW 1996). Additional details are described in Section 3.3.1.

Table 1. Estimated sport catch of winter steelhead by run-year in the Clackamas River.

Year	Catch
92-93	509
93-94	290
94-95	945
95-96	382
96-97	691
97-98	737
98-99	974
99-00	1,182
00-01	2,420
01-02	4,193

The major concern about holding a sport fishery is its impact upon the listed fish. Section 2.1 of the Fisheries Management and Evaluation Plan, Lower Columbia ESU Steelhead (ODFW 2001) provides the reasoning for holding this sport fishery where hooking mortality can occur:

“Current fishing regulations in the Lower Columbia River ESU require that *all* unmarked adult steelhead be released back to the wild unharmed. There is no retention of unmarked, listed steelhead in the ESU. Only adult steelhead with an adipose fin clip may be retained in recreational fisheries.

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

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

Fishing rates identified in this plan do not appreciably reduce the likelihood of survival and recovery of wild Lower Columbia River ESU winter steelhead. This statement is based on an assessment by Chilcote (2001) of the impacts of human-caused fish mortality (e.g., fisheries) on the status and recovery of Oregon steelhead. This assessment, involving Population Viability Analysis (PVA), is described in section 1.4.1 of the Fisheries Management and Evaluation Plan, Lower Columbia ESU Steelhead (ODFW 2001). In general, these PVA results indicated that for all Lower Columbia steelhead populations examined a maximum fishery mortality rate limit of 20% is sufficient to minimize the biological risk of the fisheries involved.”

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 (NFCP), the ODFW Hatchery Management Plan, and the Clackamas River Basin Fish Management Plan.

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 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.

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. 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): Maintain the upper Clackamas Basin (above North Fork Dam) as a wild fish sanctuary.

Indicator (10)(a): The number of hatchery steelhead spawning above North Fork Dam shall remain below 10%.

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 or placed in Faraday Reservoir to provide for additional angling opportunity.

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)

The proposed annual broodstock collection level is 120 adults. Green egg total are estimated to be 198,000 from these adults, if 50% are females. This program will yield an estimated 165,000 smolts for release into the Clackamas. The fish will be collected proportionally to the size and frequency of the returning run. Currently, no more than 30% of the hatchery broodstock comes from wild fish collected at North Fork Dam. The remaining 70% comes from returning F1 broodstock collected at the Clackamas Hatchery.

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

<u>Life stage</u>	<u>Release Location</u>	<u>Annual Release Level</u>
Yearling	Clackamas Hatchery	115,000
	Cassidy Pond	25,000
	Foster Creek	25,000

1.12) Current program performance

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

The estimated number of adult hatchery winter 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 winter steelhead returns to both the Clackamas Hatchery and North Fork Dam. The “Harvest Rate” column is based on an assumed average annual harvest rate of winter steelhead in the Clackamas River (personal communication with Todd Alsbury, ODFW). The total number of returning adults (“Total Adults” column) was estimated as the sum of returns to the Clackamas Hatchery and North Fork Dam, expanded by the assumed harvest rate [e.g. total adults = (returns to Clackamas hatchery + returns to NF Dam) / (1- harvest rate)].

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 winter 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 winter steelhead, brood years 1996-2003.

Brood Year	Smolts Released	Adult Returns			Freshwater Harvest Rate	Total Adults	Brood-Specific Adults	Smolt-to-Adult Survival
		Return Year	NF Dam	Clack. Hat.				
2003	159,410	2006	429	410	0.25	1,119	N/A	N/A
2002	128,260	2005	851	493	0.25	1,792	1,705	0.0133
2001	176,106	2004	1,831	2,654	0.25	5,980	5,436	0.0309
2000	137,921	2003	1,152	791	0.25	2,591	3,031	0.0220
1999	116,096	2002	1,972	3,048	0.25	6,693	6,160	0.0531
1998	175,343	2001	851	1,728	0.25	3,439	3,862	0.0220
1997	150,588	2000	191	907	0.25	1,464	1,721	0.0114
1996	162,322	1999	737	50	0.25	1,049	1,103	0.0068

Clackamas Hatchery data obtained from Clackamas Hatchery records. North Fork Dam data obtained from Doug Cramer, PGE. The 1999 return year was the first year that all returning hatchery and wild fish could be distinguished.

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

Clackamas winter steelhead (stock 122) broodstock collection started in 1991, and is a localized Clackamas stock. Winter steelhead (stock 122) (smolts) were first released in 1992. Since then, the program has expanded to replace stock 013 (Big Creek) and stock 020 (Eagle Creek). Year 2000 was the first year at the proposed production level (for winter steelhead stock 122) described in section 1.11. The last releases of out of basin Big Creek (013) stock occurred in the spring of 2001.

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:

- Lower Clackamas River below North Fork Dam: smolt release, harvest and adult return.
- Willamette River below Willamette Falls: harvest.
- Columbia River below the confluence with the Willamette River: harvest.

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

The Clackamas River late winter steelhead program is an integrated program that was developed from locally adapted broodstock, using naturally produced fish, beginning in 1991. Naturally produced fish are regularly incorporated into the broodstock. Due to water quality and quantity limitations at the hatchery, a portion of the program involves out-of-basin incubation and rearing at other hatchery facilities. 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 watershed. Spawning interactions between returning hatchery fish and the naturally produced population are minimized by sorting fish at the PGE facility at North Fork Dam and managing the basin above this site as a wild fish sanctuary. Wild fish are passed upstream of the dam into upper Clackamas River spawning grounds. Hatchery produced fish are either recycled through the lower river fishery, or taken to Clackamas Hatchery for disposition.

1.16.1) Brief Overview of Key Issues

Issue 1: Limitations in water supply/water quality at Clackamas Hatchery preclude meeting production goals for winter steelhead entirely at this facility. High water temperatures in the summer create pathogen problems, and cold water temperatures during the winter prevent production of one-year smolts. Current conditions require that winter steelhead production be transferred to other facilities out of the basin to meet incubation and rearing needs.

Issue 2: Water intake screens at Clackamas Hatchery do not meet current NOAA Fisheries criteria.

1.16.2) Potential Alternatives to the Current Program

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

Issue 1; Alternative 1: *Investigate the potential and feasibility for developing alternate water supplies such as wells, or constructing a gravity-feed pipeline from River Mill Reservoir to provide high quality water (particularly during summer months).*

Pros & Cons: If feasible, the development of an alternate or supplemental water supply system could eliminate the limitations currently created by water quality issues at the facility. This could reduce or eliminate the need to transfer production to other facilities. If a well system is developed, pathology problems associated with high summer water temperatures would be eliminated. This system could also potentially be used to address cold water temperatures in the winter. This action could potentially reduce costs and risks associated with pathology treatment but would have increased pumping costs. If a gravity-feed system is deemed feasible and is constructed, operational costs would be significantly reduced due to savings in pumping costs, but pathology and winter rearing problems may continue. Development of a new water supply would require a substantial financial investment for both construction and long-term operation and maintenance. Funding for this investment has not been identified.

Issue 1; Alternative 2: *Investigate whether structural changes could be implemented at the facility to result in reduced pathology problems during summer/fall rearing, and higher water temperatures for winter rearing. Changes could include installation of UV or ozone water treatment systems for pathology issues, and water heaters for rearing during winter months.*

Pros & Cons: If feasible, structural changes that reduce pathology problems in rearing facilities could eliminate the production limitations currently created by summer water quality issues. Structural changes to increase winter water temperatures in rearing facilities could eliminate the limitations created by low winter water temperatures. In combination, these improvements could reduce or eliminate the need to transfer production to other facilities. The actions could potentially reduce costs and risks associated with pathology problems and fish transport costs would be reduced. Structural changes would require a financial investment for construction, and long-term operation and maintenance. The cost of this alternative is currently unknown, but is expected to be substantial. Funding for this investment has not been identified. This alternative may be more expensive than constructing wells (Alternative 1).

Issue 2; Alternative 1: *Install new screens at the water intake consistent with current NOAA screening criteria.*

Pros & Cons: The action reduces potential mortality of listed and unlisted species, but requires a substantial financial investment. Funding for this investment has not been identified. The project may require additional reconstruction of the water intake due to other existing problems. It is unknown whether an adequate water supply would be maintained with new screens due to existing flow related problems at the current intake site.

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 a feasibility study to determine if alternate water supplies are available to eliminate current water quality/quantity problems, and assess the cost of developing alternate water sources. The cost of the study is currently undetermined. The cost of constructing an alternate water supply system would be determined by the study. {Issue #1}

Reform/Investment 2: Conduct a feasibility study to determine if structural changes to the facility (particularly rearing ponds) could reduce or eliminate the water temperature problems that currently effect operations. If feasible alternatives are identified, assess the cost of implementing the changes. The cost of the study is currently undetermined. The cost of structural changes to the facility would be determined by the study. {Issue #1}

Reform/Investment 3: Evaluate structural and flow conditions at the existing water intake and determine the cost and feasibility of installing a new screening system that meets current NOAA screening criteria. Install new screens at the water intake. The cost of the evaluation is currently undetermined. The cost of installing criteria screens will be determined by the evaluation but is estimated to be approximately _____. {Issue #2}

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

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).

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

Comment [JB2]: Check the newer HGMP's. The format appears to have changed significantly (?).

(a) Identify the ESA-listed population(s) that will be directly 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.

Steelhead are rainbow trout that migrate to and from the ocean. Lower Columbia River steelhead include summer and winter runs. Summer steelhead return from the ocean between May and November and generally spawn between January and June. Winter steelhead return to freshwater between November and April and generally spawn sometime during the months of March to June. Some adult steelhead return to the ocean after spawning and may survive a second freshwater migration to spawn twice during the life cycle. Juvenile steelhead typically rear one to 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.

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(b) Identify the ESA-listed population(s) that will be indirectly 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 subbasin 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 (personal communication with Todd Alsbury, ODFW).
- 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.

(a) Describe status of the listed natural population(s) relative to “critical” and “viable” population thresholds.

The Willamette/Lower Columbia Technical Review Team (WLC-TRT) has not determined critical and viable population thresholds for the Oregon lower Columbia fall/spring Chinook, chum, steelhead, or coho populations in the vicinity of the Clackamas Hatchery winter steelhead program. However, the WLC-TRT has established “default value” minimum population viability criteria of 1,400 for Chinook and 1,100 for chum for use as a general value for lower Columbia Chinook and chum populations. A default minimum viable population criterion has not been identified by the WLC-TRT for coho, although the Lower Columbia Fish Recovery Board (LCFRB) has assumed a value of 600 for Washington lower Columbia coho populations, which is the same criterion identified by the WLC-TRT for lower Columbia steelhead.

The WLC-TRT and ODFW have both assessed the current viability status of salmon and steelhead populations in the lower Columbia and Willamette ESUs. Both assessments used the same persistence probability criteria to estimate extinction risk for each population. To estimate the extinction risk, four key attributes were evaluated: 1) abundance and productivity, 2) diversity, 3) spatial structure, and 4) habitat. The populations were ranked from 0-4, with category 0 representing a 0-40% chance of persistence in the next 100 years and category 4 representing a 99% chance of persistence in the next 100 years. A population was considered viable with a category 3 score, or higher. The status assessment includes fall Chinook, winter steelhead, chum, and coho populations in the Clackamas River (Figure 1).

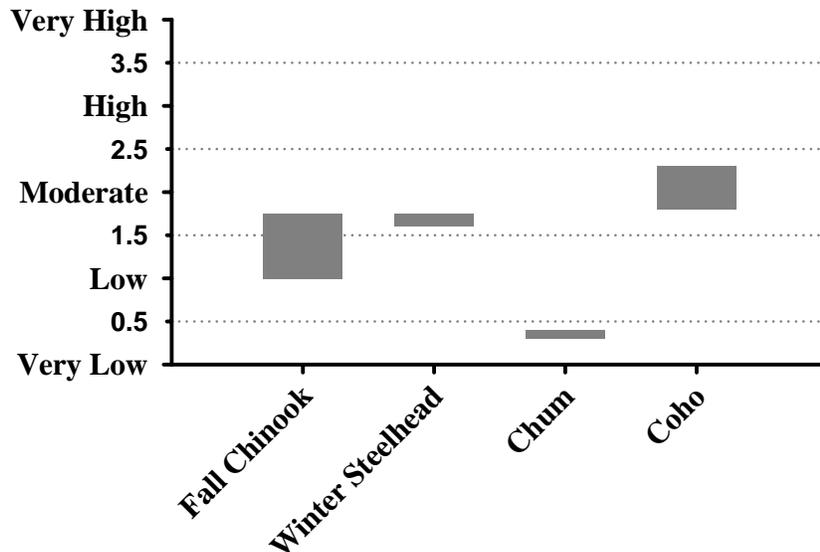


Figure 1. Current viability status of fall Chinook, winter steelhead, chum, and coho salmon populations in the Clackamas River. Figure adapted from McElhany et al. (2004).

Section 1.3.1 and 1.3.2 of the Fisheries Management and Evaluation Plan for the Lower Columbia Winter Steelhead (2001) provided this description:

1.3.1 Description of the current status of each population (or management unit) relative to its “Viable Salmonid Population thresholds” described above:

In “Conservation Assessment of Steelhead Populations in Oregon”, 2001, Chilcote estimates the "viable and critical" thresholds for both the Clackamas and Sandy Rivers, listed in Table 2. He describes both of these populations as "Type 3" populations, in "steady decline with no peak in abundance or evidence of cyclic character...". He continues, "This pattern appears most commonly for steelhead populations in the Upper Willamette and Lower Columbia ESUs." However, his Population Viability Analysis (PVA) results state, "The PVA model results did not place any of the populations in the Snake basin or Lower Columbia ESU in an at-risk category." This result markedly differs from his status review of 1998 wherein he found both systems to be at high-risk. He states, "However, in all three cases, changes in the associated hatchery program have been instituted since 1998. It is believed that in the future these changes will prevent hatchery fish from spawning in the natural production areas utilized by wild fish belonging to these populations." This assertion is now the case on both rivers: no hatchery fish are allowed to pass above Marmot Dam on the Sandy River and the North Fork Dam on the Clackamas River.

Table 2. List of the natural fish populations, "Viable Salmonid Population" thresholds, and associated hatchery stocks included in the FMEP.

Natural Populations (or Management Units)	Critical Thresholds	Viable Thresholds	Associated Hatchery Stocks	Hatchery Stock Essential for Recovery
Sandy River Basin	Abundance: 76 adults/yr	Abundance: 336 adults/yr	Sandy: Stock 011W	No
Clackamas Basin	Abundance: 71 adults/yr	Abundance: 279 adults/yr	Clackamas: Stock 0122W Eagle Creek: Stock 030	No

Data gathered from the dams on the Clackamas and Sandy Rivers (Tables 3 and 4) are used inferentially as a representation for the entire ESU occurring within the North Willamette Fish District. Chilcote's assessment (2001) states that these populations are not at risk. He uses a six-year average to describe abundance in both systems as 94% above the viable threshold for the

Sandy River, and 42% above the viable threshold for the Clackamas River. The assumption is that these estimates are valid for the rest of the waters in the ESU described in this FMEP.

Chilcote (2001) examined the trend in annual pre-harvest abundance of wild fish for 31 steelhead populations in Oregon and reported the findings as follows: "... for most populations it was possible to look at the pattern of wild fish abundance for the last 20 to 30 years. Nearly all populations had a rapid decline in abundance during the early to mid-1990's and a low point in abundance during the late 1990s. However, beyond this shared characteristic, there appeared to be 3 semi-distinct temporal patterns of steelhead abundance. By far the most common pattern (Type 1) is characterized by a period of low abundance, followed by a period of greater abundance, and then most recently a second, but more severe low period. The Type 2 pattern is similar to the Type 1, however, in the case of the Type 2, the first period of low abundance is deeper than the second low abundance period. A third pattern (Type 3) was also recognized. It is characterized by a steady decline with no peak in abundance or evidence of cyclic character. This pattern appears most commonly for steelhead populations in the Upper Willamette and Lower Columbia ESUs. This decline appears to have been a feature that started prior to 1990."

Table 3. Total numbers of adult salmon and steelhead counted at North Fork Dam (Clackamas River), 1990 - 2004 (PGE 2004).

Year	North Fork Fish Counts					
	Spring Chinook		Coho		Steelhead	
	Adult	Jack	Adult	Jack	Winter	Summer
1990	3,388	56	725	162	837	4,323
1991	4,584	75	3,123	314	2,107	2,225
1992	3,514	39	3,476	210	1,174	6,001
1993	3,059	31	159	31	1,247	2,181
1994	2,161	13	2,863	54	1,146	1,493
1995	1,639	20	2,037	69	325	1,012
1996	888	15	86	1	531	293
1997	1,264	3	1,435	37	504	1,075
1998	1,395	40	369	15	189	1,484
1999	860	28	241	61	770	788
2000	2,128	65	2,832	149	2,571	440
2001	3,667	80	5,346	184	3,377	1,260
2002	5,742	141	1,006	138	2,386	4,172
2003	9,480	503	2,117	194	3,941	1,445
2004	13,030	128	1,776	96	1,785	2,658

Comment [JB3]: Why are we including salmon escapement data since this is a steelhead HGMP? Also, it appears as though we need to clarify that this table reports fish collected at the facility, not fish passed to upstream areas. The table also needs a clarification that the numbers include both hatchery and wild fish (?) and that hatchery/wild could not be distinguished for returns prior to 1999 (?). Bottom line...this table needs some work to avoid confusing the public.

Comment [JB4]: Does this table even belong in this location, or should it be presented later in sections describing recent escapement trends?

Jacks not included in adult count.

1990 winter steelhead counts are 1990-91 counts, 1991 counts are 1991-92 counts, and so forth.

Table 4. Total numbers of adult salmon and steelhead counted at Marmot Dam (Sandy River), 1990 - 2004 (PGE 2004).

Marmot Fish Counts	
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Comment [JB5]: Why are we including Marmot Dam data?

Year	Spring Chinook		Coho		Steelhead	
	Adult	Jack	Adult	Jack	Winter	Summer
1990	1,557	57	376	80	1,995	4,293
1991	1,888	16	1,491	1	2,916	2,127
1992	4,451	20	790	55	1,636	3,662
1993	3,429	6	193	27	1,567	2,053
1994	2,309	10	601	47	1,680	2,097
1995	1,503	0	697	19	537	1,351
1996	2,561	11	179	1	1,426	1,164
1997	3,301	3	116	0	883	1,954
1998	2,612	1	261	0	928	849
1999	2,056	65	162	19	784	681
2000	2,000	9	680	12	974	173
2001	3,495	10	1,176	18	1,529	728
2002	4,301	5	289	1	692	544
2003	3,880	66	1,178	26	877	278
2004	5,285	11	1,047	7	631	403

Jacks not included in adult count.

1990 winter steelhead counts are 1990-91 counts, 1991 counts are 1991-92 counts, and so forth.

- (b) 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.

Productivity was analyzed by Chilcote in the Fisheries and Evaluation Management Plan for the Lower Columbia Winter Steelhead (2001):

Productivity – Productivity, as used in this report, is the number of adult offspring (recruits) produced per spawner. It is determined by counting all of the fish that spawn in a monitoring area (both hatchery and wild fish) and dividing this number into the number of pre-harvest offspring produced by these spawners. Steelhead have a complex life history with multiple ages of return and the capacity to spawn more than once. Therefore, estimating recruits is a process of apportioning each year’s return into the correct parental brood year and then obtaining a brood year total by adding up its apportioned amount across multiple return years.

Productivity, in its various expressions, is probably the most important factor to consider in assessing the conservation status of a species. It is related to the innate ability of a population to rebuild its self and therefore relates directly to forecasting the persistence of the population. In addition, the incorporation of underlying trends or cycles in productivity is often critical in understanding the true biological health of a population. Further, by regressing observed recruits per spawner and total spawner abundance it is possible to estimate the capacity of a given habitat to produce adult steelhead. In other words, it is possible to estimate the number of spawners needed to seed the available habitat to maximum production (maximum seeding).

Comment [JB6]: Any newer assessments? This section should probably be “re-reviewed” by Mark Chilcote to incorporate recent work by the TRT, etc.

For most naturally reproducing populations, productivity (recruits per spawner) decreases as the spawner abundance increase. This is because as juveniles fill up the available habitat, the proportion that is able to survive becomes less and less. Therefore, to estimate the productivity of a population in a consistent manner, it is necessary to standardize the recruit per spawner data with respect to spawner abundance. In this report, this standardization process was accomplished by estimating the a parameter of the Ricker recruitment equation,

$$\text{Recruits} = \text{Spawners} (2,718(a + B(\text{Spawners}))) \quad \text{Equation 1}$$

In this recruitment relationship both the a and B parameters were estimated using the linear regression method, where the general equation, $y = a + B(x)$, was transformed to:

$$\text{Ln}(\text{Recruits}/\text{Spawner}) = a + B(\text{Spawners}) \quad \text{Equation 2}$$

Therefore, for a data set of paired observations of spawner abundance and $\text{Ln}(\text{recruits}/\text{spawner})$, the a parameter is the y-intercept and the B parameter the regression line slope, which is almost always negative.

Because these values remain the same for a population, regardless of its spawner abundance, they serve as a standardized way to compare different populations and as a way to compare the same population at different intervals of time. The a parameter serves as a means to compare population productivity. In addition, the inverse of the B parameter, $1 / B$, can be shown to be the spawner abundance which generates the maximum number of recruits. Therefore, the B parameter can be used to estimate how many recruits a population can produce, while the a parameter estimates how efficient the population is in producing them. For the purposes of this report, $1 / B$, the number of spawners necessary to achieve maximum production of recruits, will be referred to as “maximum seeding”.

Estimates for a and B were generated for 27 of the 31 data sets examined. The four data sets omitted were from relatively new monitoring sites and as such did not yet have a sufficient number of data points to estimate their recruitment parameters. Most data sets examined extended back to 1974. Rather than fitting a single recruitment curve to all of the data from each site, a series of multiple curves, and associated estimates of a and B were determined for each data set. This was done to examine the temporal variation in productivity.

These multiple curves were built upon a moving 7-year sequence of spawner/recruit data. For example, for a population having spawner/recruit data beginning in 1974, the first recruitment curve was estimated for the spawners of 1974 to 1980 and their subsequent recruits. The next recruitment curve was based upon the production of 1975 to 1981 spawners. The third curve, for 1976 to 1982 spawners and so forth until the end of the data set. Depending on the length of the data set, 10 to 25 recruitment

curves and associated values for the Ricker equation parameters a and B were generated for each population.

Data of the “ a ” values for the Clackamas River are presented in Table 5. Values that are positive, hypothetically result in a greater return than the run that produced them.

Table 5. Summary of productivity estimates (Ricker a –values), associated regression statistics (R^2), and proportion of hatchery fish (P_h) for Clackamas River steelhead by 7-year moving sequences of spawner and recruit data, 1974-1995 brood years. (Chilcote, 2001)

Sequence Years	Clackamas		
	a	R^2	P_h
1974-80	1.559	0.84	0.21
1975-81	1.465	0.81	0.26
1976-82	1.461	0.82	0.28
1977-83	1.262	0.85	0.27
1978-84	1.306	0.89	0.26
1979-85	1.181	0.83	0.22
1980-86	1.114	0.75	0.19
1981-87	0.891	0.46	0.18
1982-88	1.411	0.52	0.16
1983-89	1.257	0.47	0.16
1984-90	0.969	0.37	0.20
1985-91	0.221	0.35	0.24
1986-92	1.049	0.41	0.26
1987-93	0.587	0.27	0.26
1988-94	0.078	0.16	0.25
1989-95	0.636	0.36	0.26

(c) Provide most recent 12-year estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds. Chilcote (2001), compiled figures on the Clackamas returns of hatchery and wild winter steelhead. Appendix E displays this information as well as Average Distribution of ages in return year, viable thresholds, and further brief discussions of the fish counts.

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.

(a) Adult collection, sorting and holding at Clackamas Hatchery

Unmarked adult steelhead are collected and sorted in a trap at Clackamas Hatchery. The hatchery trap is operated and checked a minimum of once per week; it is run and checked more often during peak migrations. Hence, at most, steelhead may be held up to seven days in the Hatchery trap. To date, there has been no observed mortality on wild steelhead at the trap. (Personal Communications, Bryan Zimmerman).

Mortality associated with the adult collection and passage at Clackamas Hatchery has varied over the past nine years (0.00% to 17.5% mortality); however, since 1997, percent mortality has remained below 10.0% (Table 6).

Table 6. Number (and proportion) of adult winter steelhead mortalities at Clackamas Hatchery (as a result of handling, sorting, and/or transport). Note, 1991 – 1998 depict adults captured at North Fork Dam and transported to Clackamas Hatchery. 1999-2006 depicts adult captured at North Fork Dam and at Clackamas Hatchery (Personal Communication, Bryan Zimmerman)

Calendar Year	# Fish Collected	# Mortality	% Mortality of natural fish only
1991	43	4	9.3
1992	40	7	17.5
1993	35	3	8.6
1994	33	2	6.1
1995	46	3	6.5
1996	42	5	11.9
1997	48	0	0
1998	32	1	3.1
1999	52	2	3.9
2000	61	1	1.6
2001	34	2	5.9
2002	37	3	8.1
2003	37	0	0.00
2004	36	2	5.6
2005	34	2	5.9
2006	36	0	0

*25 fish were spawned for Eagle Creek National Fish Hatchery

b) Broodstock collected at North Fork Reservoir

All winter steelhead that are migrating up the Clackamas at North Fork Dam are captured in the trap at the upstream end of the fishway. PGE owns the facility and operates it under the supervision of ODFW. Each fish is individually handled in a soft mesh net. Wild steelhead that are destined to be used in the broodstock are transported to Clackamas Hatchery. The fish are transferred promptly, but this activity has the potential to: 1) induce stress; 2) delay migration; and/or 3) encourage fallback to the reservoir. However, mortality associated with broodstock collection is minimal (personal communications, Tim Shibahara, PGE). To confirm this, PGE has radio tagged adult winter steelhead below North Fork Dam, and tracked their movement through the hydro facility, and up through the upper Clackamas River Basin. This study began in 1994, and in the 1999 “Fisheries Partnership in Action” (PGE 1999) stated: “The studies have not shown definitively if the ladder at River Mill Dam and the facilities at North Fork complex hinder fish passage.”

Comment [JB7]: Todd – I wonder if John Zauner has any new information relative to this topic from the hydro negotiations. Also, we may need to have Doug Cramer look at this again given the amount of time that has passed since the plan was written.

SECTION 3. Relationship of Program to Other Management Objectives

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (e.g. Hood Canal Summer Chum Conservation Initiative) or other regionally accepted

Comment [JB8]: EDITING STOPPED AT THIS POINT - - JB

policies (e.g. the NPPC Annual Production Review Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

This program is consistent with ODFW's NFCP and the Clackamas River Subbasin Plan. The North Willamette Fish District follows the Clackamas River Subbasin Plan that was adopted by the Oregon Fish and Wildlife Commission in January 1992. The program has evolved (quite dramatically) since its acceptance in 1992; the mixed fishery augmentation program has transitioned to a locally adapted brood program; out-of-basin hatchery infusion was eliminated. In addition, smolts are acclimated for a 3-week period prior to release. Due to the design of the rearing ponds at Clackamas Hatchery, 120,000 smolts are forced released at the end of the 3 week acclimation period. The remaining 45,000 are voluntarily released from Cassidy acclimation pond. However, the smolt production goal has not changed. The current plan has a target release of 165,000 smolts. These release goals are consistent with those identified in the 1992 basin management plan and represent current fish management objectives for both hatchery and wild winter steelhead production.

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

- Legal Considerations Binding the Clackamas River Subbasin Plan - See Appendix A
- Oregon Native Fish Conservation Policy
- Memoranda of Understanding for North Fork Fish Trap Operations (PGE/ODFW 2005)
- Biological Opinion on Artificial Propagation in the Columbia River Basin. 1999. Incidental Take of Listed Salmon and Steelhead from Federal and Non-Federal Hatchery Programs that Collect, Rear and Release Unlisted Fish Species. Portland, Or.

The Clackamas River Subbasin Fish Management Plan (as adopted in 1992) directs use of out-of-basin stock that had developed an earlier return to the Clackamas River basin: December through March. However, endemic stock enters the Clackamas from January through June. This plan has not been revised, but due to its dynamic state, it will be modified to reflect the change to the use of only local stock winter steelhead. As the Clackamas River winter steelhead program transitions to a localized stock, anglers will be directed to change their fishing strategies to a later winter fishery to target and capture the new endemic hatchery brood.

The Clackamas River is a complex subbasin with demands (societal, ecological, and biological) that often conflict. In an effort to address these multiple issues, the Clackamas River Fisheries Working Group (CRFWG) was formally established in 1992:

"The working group is comprised of representatives from various federal, state, and local management agencies and Portland General Electric. The motivation for establishing the working group came from the recognized need for better cooperative management and coordination between various agencies and entities charged with managing the subbasin's fisheries resources. In addition, the need for a more holistic view and emphasis on fisheries management within the subbasin became apparent as opposed to a

piecemeal, singular approach by individual management agencies or parties. Many of the issues involving the maintenance and recovery of salmonids in the Clackamas River transcend jurisdictional boundaries and dictate a multi-partnership approach if successful outcomes are to be realized. Finally, it was recognized that through partnership efforts, limited funds and resources could be coordinated and directed towards collectively identified high priority needs." (Fisheries Partnerships in Action, 1996).

The CRFWG holds annual meetings, develops annual work plans, and produces annual summary reports ("Partnerships in Action") that identify yearly accomplishments.

3.2) Relationship to harvest objectives.

As stated in section 1.7, the purpose of this program is to provide a lower Clackamas River sport fishery. Fishery goals were established 1992 and are described in the Clackamas River Fish Management Plan as follows: *"Increase the potential average annual harvest of winter steelhead in the subbasin to 8,000 fish (2,000 in Eagle Creek and 6,000 in the mainstem of the Clackamas River, above and below River Mill Dam)"* (Clackamas River Subbasin Plan (Objective 2), 1992). To satisfy this sport fishery pressure (8,000 fish per year), Eagle Creek National Fish Hatchery (150,000) and Clackamas River Hatchery (165,000) release an aggregate of 315,000 smolts per year.

Refer to the Clackamas Basin Fishery Management Evaluation Plan for additional fishery-Related plans and detail (ODFW 2001).

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

As stated in the Clackamas River Subbasin Plan (ODFW 1992, Objective 2, Assumption 2), *"The Clackamas River is near Portland, Oregon's largest population center. Steelhead angling is popular on the river. And anglers have expressed a desire that the number of fish available for harvest be increased above current level."*

The river has had good boat and bank river access; from 1980 through 1996, the estimated average number of angler trips equaled 16,375 per year (ODFW 1996). Punch card data for 1992 to 2004 (Table 1) show a high level of angler harvest and interest. A statistical creel survey, conducted below North Fork Dam during the 1993-1994 run season, estimated that 10,376 anglers spent 33,986 hours, and caught 524 winter and 120-summer steelhead (Massey 1995). Data suggest that angler effort per captured fish averaged 52.8 hours. If this is assumed, and is extrapolated through 1980-1996, then the average number of angler hours (based upon the average number of anglers) was 53,635. These data suggest that anglers spend a significant amount of time fishing the Clackamas in pursuit of winter steelhead; hence, the Clackamas River provides tremendous recreational benefits to fishermen.

A follow-up creel survey was conducted during the 1994-1995 and 1995-1996 run years. Results from these surveys showed that the percent of unmarked fish caught in the sport fishery (per year) averaged 40.0% and 49.3% respectively (ODFW, 1995&1996). Note,

all wild (non-clipped) winter steelhead caught during this fishery were released, as per ODFW harvest regulations; subsequently, hooking mortality is described in detail in Section 1.8.

3.3) Relationship to habitat protection and recovery strategies.

Policies defined in the "Clackamas River Subbasin Plan" describe the position of the Department on habitat protection and recovery strategies and priorities:

Policy 1. The Oregon Department of Fish and Wildlife shall actively pursue and promote habitat protection and improvement necessary to achieve the objectives for management of the Subbasin's fish resources.

Policy 2. ODFW shall coordinate with and advise agencies that manage the land and water Resources of the Willamette basin.

Policy 3. Habitat protection shall be emphasized over habitat rehabilitation and enhancement.

Policy 4. Potential losses of fish production from habitat alteration shall be prevented or reduced to the extent possible.

Refer to **Appendix B** for details regarding these policies as they apply to state, federal and local agencies, to dams and hydropower projects, and to diversion and water withdrawals from the hatchery.

3.4) Ecological interactions.

Competition / Niche-Displacement

Exploitative competition (niche displacement) occurs when one species uses a resource more efficiently than another, and makes it unavailable to the other species (Moyle 1993). If displaced, juveniles may experience premature emigration, increased vulnerability to predators (as a result of being in more exposed areas), and competition for food and space with other instream species. Likewise, native adults may unsuccessfully compete for spawning grounds; hence, their reproductive success may be compromised.

Although theory would substantiate that these interactions could occur, there is little evidence to suggest that such competitive interactions exist (in terms of habitat utilization, and maximized habitat carrying capacity). Oregon Department of Fish and Wildlife believes that there is a chance that this might occur in the reach of the river below North Fork Reservoir.

Risk avoidance measures to minimize incidental impacts to wild juveniles resulting from the release of hatchery winter steelhead.

Smolt Size at Release

To minimize the impacts of niche-displacement (or density-dependent effects) ODFW releases large (180-250mm) steelhead as recommended by NOAA Fisheries (1999 Biological Opinion). The release of large-sized fish is believed to promote swift emigration and prevent residualization; and subsequently minimize potential temporal and spatial overlap for food and space.

However, it should be noted that length is a non-specific smolt character that does not indicate whether a fish has begun physiological smoltification (Beckman 1999). A study of spring chinook (on the Deschutes River) showed that smoltification and eventual adult survival was more closely linked to smolt attributes such as accelerated spring growth rate, elevated gill NA⁺, K⁺-ATPase, and elevated plasma insulin growth factor-I (IGF-1) (Beckman 1999). Previous studies conducted by Ewing and Birks (1982), and Zaugg and Mahnken (1991) showed similar results.

Type of Smolt Release

Winter steelhead are acclimated for 3 weeks prior to release. The ~~115,000~~ that are acclimated at Clackamas are forced out of the pond within four hours, due to the configuration of the pond. The pond is 100' x 300', and in order to allow volitional release, the outlet would have to be modified so that the juveniles would have to migrate through an orifice. The reason for this is that adult winter steelhead are migrating upstream at this time, and would enter the pond, if the outlet were simply opened. The ~~50,000~~ smolts that are transferred from ~~Bonneville Hatchery~~, go to Cassidy (25k) and Foster Creek (25k) acclimation ponds. At the end of the 3 week acclimation period, the fish are allowed to volitionally migrate out of the ponds.

Deleted: 20

Deleted: 45,000

Deleted: Oak Springs Hatchery

Number of Fish Released

The aggregate number of late run winter steelhead released from this program and the Eagle Creek National Fish Hatchery is 315,000. Fish releases (per subbasin) will be coordinated such that hatchery releases do not overlap, or do not “swamp” existing natural populations. This number of fish released is considered by the USFWS (1999) as, “moderate in magnitude --- relative to other Columbia River production programs. This level of release is not expected to cause serious density dependent effects in the Clackamas or lower Columbia rivers.”

Location of Release

Clackamas Hatchery receives ~~50,000~~ smolts from Irrigon Hatchery and ~~65,000~~ smolt from Oak Springs Hatchery for acclimation. Cassidy Pond is a privately owned pond that is operated with trained volunteers through the STEP Program. It receives ~~25,000~~ fish from ~~Bonneville~~ Hatchery for acclimation. ~~Foster Creek Pond is a privately owned facility that receives 25,000 smolts from Bonneville Hatchery for acclimation~~

Deleted: 120,000

Deleted: (**Will change to Bonneville hatchery prior to 2008 due to production adjustments at Irrigon Hatchery)

Deleted: 45

Deleted: Oak Springs

Risk avoidance measures to minimize incidental impacts to spawning adults resulting from the return of hatchery winter steelhead.

Adult Removal

The District has developed a strategy that follows the Department's Native Fish Conservation Policy, and minimizes adverse genetic effects with listed steelhead. The Department believes that 80% of the spawning of winter steelhead in the Clackamas basin occurs above North Fork Dam. Removing all hatchery fish at that point is now policy, thereby giving the wild fish the majority of basin as spawning and rearing area, without any influence from hatchery fish. Adult hatchery fish and adult wild fish do spawn in the lower basin, but since the majority of the activity occurs above this reach, and only wild/wild spawning occurs here (80% of the spawning in the basin), that wild fish genetics will be adequately protected.

Disease Transmission

Interactions between hatchery reared and naturally produced populations may be a source of pathogen and disease transmission. Although there is little evidence showing that diseases are transmitted from hatchery fish to wild fish (Steward and Bjornn 1990). Hatchery-reared fish are managed to minimize such effects (IHOT 1995).

Risk avoidance measures used to minimize incidental impacts to listed species, as a result of hatchery fish presence include:

- The ODFW conducts fish disease examinations to ensure minimal disease transmission and to prevent the introduction and/or spread of any fish diseases. Fish health-monitoring efforts include fish health examinations and virus sampling, abnormal fish loss investigations, virus sampling, and pre-transfer and pre-liberation inspections. All activities are done in accordance with guidelines developed under the Pacific Northwest Fish Health Protection Committee.

Predation

Direct Mortality – Hatchery steelhead released into nursery habitats may residualize within the subbasin, and may directly prey on naturally produced salmon and steelhead fry. Due to their location, size and time of emergence, newly emerged chinook salmon fry or fingerling are likely to be the most vulnerable to predation by hatchery released fish (NMFS 1999). Salmonids are believed to prey on fish less than or equal to 1/3 their body length (USFWS 1994). Since steelhead are released at sizes nearly equal in size to wild fish, consumption of wild fish (by hatchery reared steelhead) is unlikely. Direct predation by hatchery fish on naturally produced fish in migration corridors is believed to be low (NMFS 1999).

Indirect Mortality - Large groups of hatchery fish may attract alternate predators in rearing habitats and migration corridors, such as pinnepeds, birds, and other fish species. Predator attraction theories (and implied indirect mortality) have not been demonstrated to-date.

Risk avoidance measures to minimize predation on listed species, resulting from the release of hatchery winter steelhead

- Within the Clackamas River Basin, late-run wild winter steelhead migrate at 140-220 mm forklength (mean forklength = 170). To minimize direct mortality (or consumption) on listed species, NOAA Fisheries has directed ODFW to release large winter steelhead smolts at 171-237 mm forklength (mean forklength = 209). Hatchery releases are skewed from the natural population's size structure by approximately 20%. Large steelhead smolts are released to promote swift outmigration and minimize residualization, and subsequent predation on listed salmonid fry and fingerling.
- The benefit of having swift emigration versus managing releases to match natural population structures and assemblages in an impact that the Department will investigate as time and resources become available.

Risk avoidance measures to minimize residualization by hatchery steelhead

- ODFW releases large steelhead (171-237 mm total length, mean forklength = 209), as recommended by the NOAA Fisheries 1999 Biological Opinion, to promote swift out-migration and minimize residualization.
- As stated in Section 1.9 (performance standard 5), the Department will enumerate the number of steelhead smolts remaining in Cassidy Pond and Clackamas Hatchery (after the 2-3 week acclimation period) to quantify the proportion of hatchery releases that do not voluntarily emigrate.

Habitat Quantity

The Eagle Creek National Fish Hatchery HGMP for Winter Steelhead (1999) provides insight into the effects of hatchery releases on the migration corridor, estuary, and ocean, through a discussion of competition:

“Migration corridor/ocean- The hatchery production ceiling called for in the Proposed Recovery Plan for Snake River Salmon of approximately 197.4 million fish (1994 release levels) has been incorporated by NMFS into their recent hatchery biological opinions to address potential mainstem corridor and ocean effects as well as other potential ecological effects from hatchery fish. Although hatchery releases occur throughout the year, approximately 80 percent occur from April to June (NMFS 1999c) and Columbia River out-migrations occur primarily from April through August. Eagle Creek NFH production is typically released in April and May under a volitional release strategy. Volitionally released fish, with a propensity to migrate, should reduce potential migration corridor effects as the fish migrate quickly out of the system. The total number of hatchery fish released in the Columbia River basin has declined by about 26 percent since 1994 (NMFS 1999c) reducing potential ecological interactions throughout the basin.

Competition in the estuary – Juvenile salmon and steelhead, of both natural and hatchery origin, rear for varying lengths of time in the Columbia River estuary and pre-estuary before moving out to sea. The intensity and magnitude of competition in the area depends on location and duration of estuarine residence for the various species of fish. Research

suggests, for some species, a negative correlation between size of fish and residence time in the estuary (Simenstad et al. 1982).

While competition may occur between natural and hatchery juvenile salmonids in – or immediately above – the Columbia River estuary, few studies have been conducted to evaluate the extent of this potential problem (Dawley et al. 1986). The general conclusion is that competition may occur between natural and hatchery salmonid juveniles in the Columbia River estuary, particularly in years when ocean productivity is low. Competition may affect survival and growth of juveniles and thus affect subsequent abundance of returning adults. However, these are postulated effects that have not been quantified or well documented.

Competition in the ocean – Ocean rearing conditions are dynamic. Consequently, fish culture programs might cause density-dependent effects during years of low ocean productivity, especially in nearshore areas affected by upwelling (Chapman and Witty 1993). To date, research has not demonstrated that hatchery and naturally produced salmonids compete directly in the ocean, or that the survival and return rates of naturally produced and hatchery origin fish are inversely related to the number of hatchery origin smolts entering the ocean (Enhancement Planning Team 1986). If competition occurs, it most likely occurs in nearshore areas when (a) upwelling is suppressed due to warm ocean temperatures and/or (b) when the abundance or concentration of smolts entering the ocean is relatively high. However, we are only beginning to understand the food-chain effects of cyclic, warm ocean conditions in the eastern north Pacific Ocean and associated impacts on salmon survival and productivity (Beamish 1995; Mantua et al. 1997). Consequently, the potential for competition effects in the ocean cannot be discounted (Emlen et al. 1990).”

The discussion postulates that the smolts released from the Clackamas hatchery programs are large enough that they migrate swiftly through the river systems and enter the ocean with little effect on the wild fish during their travel. This suggests that since the fish migrate with speed through the Clackamas, Willamette and Columbia rivers that their presence has little effect on the quantity of habitat since it is a highway to get to the ocean, and not for rearing. There is a concern with the hatchery fish migrating downstream as a school. The “7. Predation” portion of Eagle Creek’s HGMP (2000) suggests that if this happens there may be a benefit to listed fish by having a “swamping” effect toward predators providing them prey that are more readily accessible than wild stocks thereby providing a beneficial effect to listed species. It is truly uncertain precisely what effects that hatchery releases from the Clackamas system have on the available habitat, and listed fish. This uncertainty will only be resolved with further study.

Habitat Quality

Habitat quality may be affected by the operation of each hatchery. Hatchery effluent likely has the most significant impact on habitat quality (chemical, physical and biological water quality conditions). Although biological criteria has not been monitored to date. Physical and chemical water quality attributes of hatchery effluent have been monitored for numerous years. Of those water quality constituents defined in the federal

CWA and regulated by the Oregon DEQ the ODFW monitors (and complies) with all reporting conditions identified for NPDES compliance.

Behavior

Altered spawning behavior (in time and space)

Since the hatchery fish will be from local stock origin, the timing of spawning is expected to be the same. However, with the unmarked fish being the only animals that are allowed to pass upstream, a separation in space will occur. Those steelhead that are allowed to go above North Fork will have the majority (80%) of the basin to spawn in with no influence from hatchery fish. Since this program began in 1991, a regularly scheduled genetic sampling program should be developed in order to see if progeny from the wild stock winter steelhead that spawn below the North Fork Dam can be identified. If they can be identified, a determination could be made stating the portion of the winter steelhead run that is passed above North Fork Dam that was influenced by hatchery fish. Program changes could be made on the basis of this information.

Smolt emigration

"The Risk avoidance measures----", described under Competition/Niche-Displacement in this section describes all of the measures that are being taken to insure that juvenile outmigration behavior does not change.

Hatchery smolts that remain in the system may rear to adulthood and spawn in nature. If they successfully spawn, their progeny are outwardly indistinguishable from "wild" winter steelhead progeny. Hence, they will be considered wild origin, albeit one generation removed. Regularly scheduled genetic sampling could provide information that answers this question.

Genetic introgression

Hatchery adults spawning in the wild

Hatchery winter steelhead likely spawn in mainstem and tributary reaches below River Mill Dam and North Fork Dam. Although primary spawning and rearing habitats are believed to be above North Fork Dam (80%), viable habitat exists down river, and hatchery steelhead may breed with other hatchery fish or with residing wild fish, resulting in genetic introgression. Since progeny from this spawning are not outwardly identifiable as such, regularly scheduled genetic sampling would be the method of choice to identify these individuals. Potential risks from these crosses include **loss of genetic variation within and between populations, genetic drift, and domestication** (resulting from hatchery selection).

Intentional Selection (in the Hatchery)

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

Although some level of selection is unavoidable, other selective pressures are encouraged to optimize smolt to adult returns, ocean survival, adult homing, etc. Although some of these practices may polarize (or further diverge) the wild population from the hatchery population, all are conscious management decisions, intended to optimize sport fishery opportunities, which is the primary purpose of the program. The following is a brief description of each intentional selective pressure:

Length, grading, feeding, size, at release

Fish culture techniques, such as adjusting feed rates and length grading, are used to separate fish groups at the hatchery. Smaller fish are put on an adjusted feed rate, to promote rapid growth in the absence of competition with larger, perhaps more aggressive, steelhead.

To minimize the impacts of niche-displacement (or density-dependent effects) ODFW releases large (180-250mm) steelhead as recommended by NOAA Fisheries (1999 Biological Opinion). Specifically, since 1999, over 90% of the Clackamas River winter steelhead have been released between 171mm and 238mm (average fork length)(these fish are larger than the wild fish passing over North Fork Dam). The release of smolts at this size range is believed to promote swift emigration and prevent in-river residualization; and subsequently minimize potential temporal and spatial overlap for food and space (with co-existing juvenile winter steelhead).

Age at smolt release

Hatchery winter steelhead are released as one year age smolts, and presumably emigrate to the ocean to begin their ocean phase life history. Conversely, in nature, steelhead rear for 1-3 years in freshwater prior to migrating to the ocean. Since we presume that hatchery winter steelhead emigrate within the same year that they are released, we also presume that they will return after spending 2-3 years in the ocean. Hence their age composition may be more homogenized and younger (3-4 year olds), than wild winter steelhead.

Broodstock Selection

Risk avoidance measures to minimize adverse genetic interactions between hatchery winter steelhead and wild winter steelhead.

- Out-of-basin brood sources (Big Creek stock 013) were eliminated, and a new broodstock was founded from wild winter steelhead returning to the upper Clackamas River basin (above North Fork Dam). The effects of using out-of-basin stocks and/or long-term domesticated stocks has been documented: for example, juvenile and adult run timing, foraging patterns, spawning behavior, and natal homing may be altered. We hope to avoid these types of deleterious impacts by using an endemic brood source. In addition, it is believed that using a more localized brood source will reduce straying to adjacent basins, while maximizing adult homing to the lower Clackamas basin. In addition, use of a localized brood source (and constant infusion of wild adults) will minimize genetic differences between the hatchery and wild population.

- To minimize potential negative effects of interbreeding, hatchery winter steelhead will be monitored to comprise less than 30% of a natural spawning population within the Clackamas River basin (basin-wide aggregate stray rate). Because the upper Clackamas River Basin has been designated as a wild fish sanctuary (ODFW believes that 80% of the winter steelhead spawning occurs in this reach), hatchery adults are not released above North Fork Dam. Nearly all hatchery-reared fish are externally marked (with subsets of CWT groups); hence, the combination of external fin clips and internal tags allow hatchery-reared salmonids to be readily identified and sorted from naturally produced fish.
- A maximum of 25% of the wild population may be retained and incorporated into the hatchery brood.
- Winter steelhead are collected (and sorted) throughout the run, in a manner that is proportional with the arrival of adults, at North Fork Dam. When adults are ripe, they are spawned at a one-to-one, male-to-female, spawning ratio to maximize genetic diversity.

Wild winter steelhead are infused into the hatchery population in order to maintain wild-type genome characteristics within the hatchery population.

Risk avoidance measures to ensure that hatchery programs do not “mine” the natural population:

- If the wild population falls below 300 adults (the critical population size), then ODFW will consult with NOAA Fisheries to re-evaluate within season program goals and to determine the best use of fish on-hand.
- Wild winter steelhead will be live-spawned, if possible, and returned to the Clackamas River.

Broodstock Collection – Adult trapping and handling

Operating North Fork Dam and Clackamas Hatchery traps may harass (or indirectly impact) wild steelhead adults. These impacts can be summarized by 1) those inflicted as a result of dam existence and operation and 2) those inflicted by adult handling (associated with broodstock collection).

- 1) Dams block upstream migrations (functioning as a barrier to natural anadromy) force adults to enter adult migrant fish ladders (or traps) which block upstream migrations, thus delaying (or altering) natural migrations timing. As a result, adults may reject the collection trap, fallback, and spawn downstream in non-native (or less suitable) spawning grounds.
- 2) Handling by hatchery personnel may induce stress, which may inadvertently affect natural spawning behaviors.

The combined result of these actions may displace adult spawning (temporal and spatial distributions). The magnitude of impact and its associated effects (direct and indirect) to native fishes has not yet been statistically measured. However, PGE has radio tagged

adult winter steelhead and tracked their movements. This study began in 1994, and the 1999 “Fisheries Partnerships in Action” (PGE 1999) stated: “The studies have not shown definitively if the ladder at River Mill Dam and facilities at North Fork complex hinder fish passage.”

Risk avoidance measures to minimize harassment (or incidental impact) to listed steelhead as a result of adult capture and handling:

- ODFW and PGE staff uses special care when handling adult fish, to ensure that fish are released unharmed.
- In 2000, PGE completed the study to evaluate adult fish passage efficiency at North Fork Dam. This was a coordinated project between co-managers of the Clackamas River Basin and results are reported in the Clackamas River Fisheries Working Group – 2000 Accomplishes Report. This report states that the study “did not indicate that fish experience delay between River Mill Dam and the Faraday Diversion Dam” or that the “hydroelectric complex creates areas of “holding” for adult winter steelhead”.

Table 7. A summary of ecological interactions through fish propagation activities associated with this program, and their potential impacts.

Potential Impact	Resulting Effect to Listed Species	Type of “Take” [Direct/Indirect]
Competition / Niche-Displacement	<ul style="list-style-type: none"> • Altered emigration timing and performance by juveniles • Competition for food and space on juvenile nursery areas. • Displaced adult spawning • Altered behavior 	<ul style="list-style-type: none"> ➔ Indirect ➔ Indirect ➔ Indirect ➔ Indirect
Disease Transmission	<ul style="list-style-type: none"> • Compromised fitness 	➔ Indirect
Predation	<ul style="list-style-type: none"> • Consumption • Predator attraction (negative and positive) 	<ul style="list-style-type: none"> ➔ Direct ➔ Indirect
Habitat Quantity	<ul style="list-style-type: none"> • Reduced habitat carrying capacity resulting from smolt releases and/or adult spawners 	➔ Indirect
Habitat Quality	<ul style="list-style-type: none"> • Reduced habitat quality resulting from hatchery effluent. 	➔ Indirect
Behavior	<ul style="list-style-type: none"> • Altered spawning behavior (in time and space) • Smolt emigration 	<ul style="list-style-type: none"> ➔ Indirect ➔ Indirect
Genetic Introgression	<ul style="list-style-type: none"> • Loss of genetic diversity within and between populations • Domestication 	<ul style="list-style-type: none"> ➔ Indirect ➔ Indirect

Broodstock Selection	<ul style="list-style-type: none"> • Reduced genetic pool (census size) of the natural population • Reduced genetic diversity in natural population if broodstock collection drives the natural population to fall below the effective population size. 	→ Direct
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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:

- ◆ Winter steelhead are incubated and reared in 52F well water or with Clackamas River water that is treated with ozone and ultraviolet light (UV). Either water source may be chilled during early incubation to even-up stages of egg development. After all groups of eggs are at equal developmental stages, fish are reared in (natural temperature) river water.
- ◆ River water intake is 100% screened with 3/16” mesh. Fish screens were inspected (October 18, 2000) and deemed non-compliant to NOAA Fisheries fish screening criteria (post 1995). Fish screens are expected to be upgraded in the near future as time and budgets allow.
- ◆ River water withdrawal is covered under Oregon water permit number S49433 and S42105. Well water is withdrawn under permit number G8257.
- ◆ Discharge water is currently covered under a general NPDES 300J permit.

- ◆ Natural limitations of Clackamas River water include: 1) temperatures may be too cold to rear a one-year smolt when starting with such a late spawning winter steelhead; 2) exposing eggs, fry, and fingerlings to untreated river water may be a disease transmission concern. To avoid these problems, eyed-eggs are shipped to Irrigon Hatchery, and fingerlings (@ 200/lb.) are transferred to Oak Springs Hatchery and reared to smolt. All smolts released within the Clackamas River basin are returned to the Clackamas Basin and acclimated before release.

Cassidy Acclimation Pond:

- ◆ Smolts acclimated in Cassidy Acclimation Pond are reared and released with untreated (natural temperature) river water.
- ◆ Effluent from Cassidy Acclimation Pond is exempt from DEQ permits; its production is less than 20,000 pounds of fish per year.

Irrigon Hatchery:

- ◆ All eggs and fingerlings are reared on well water. Water may be chilled to even-up egg groups.
- ◆ River water withdrawal is covered under permit numbers G10142 and G11229.
- ◆ Source water is pumped from an on-site well; fish screens are not necessary.
- ◆ Discharge water is currently covered under a NPDES 300J General permit.
- ◆ There are no recognized natural limitations to fish culture at Irrigon Hatchery.

Oak Springs Hatchery:

- ◆ All winter steelhead are reared on 100% spring-fed water at a constant 54F.
- ◆ There are no applied methods to offset influent or effluent water quality.
- ◆ Discharge water is currently covered under a general NPDES 300J permit.

Table 8. Summary of water temperatures, and water usage at fish culture facilities.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Clack ¹⁾												
gpm	750	750	750	750	750					750	750	750
degrees	39	40	43	45	50					50	44	40
Cass ²⁾												
gpm			650	650								
degrees			44	44								
Irrig ³⁾												
gpm	1200	1200	1500	1500			1200	1200	1200	1200	1200	1200
degrees	54	53	53	52			53	55	57	56	56	55
Oak S.												
gpm	500	500	500	500	500	500	500	500	500	500	500	500

degrees	53	53	53	53	53	53	53	53	53	53	53	53
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- 1) Fish not on station June – September.
- 2) Fish not on station May – February.
- 3) Fish not on station May – June.

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 river intake system is 100% screened with 3/16th-inch wire mesh, rotating screens. The intake was inspected on 10-18-00 and was considered non-compliant to pre-1995 NOAA Fisheries fish screening criteria. Funding will be sought from mitigation partners to upgrade screens to current NOAA Fisheries standards. Effluent is discharged through the pollution abatement pond during pond cleaning, to settle-out solid wastes prior to discharging into the Clackamas River.

Cassidy Acclimation Pond: The river intake is 100% screened with 3/16th-inch wire mesh.

Irrigon Hatchery: All water is drawn from a well; therefore screens are not necessary. Discharge water is currently covered under a NPDES 300J permit.

Oak Springs Hatchery: All water is drawn from a spring; therefore screens are not necessary. Discharge water is currently covered under a NPDES 300J permit.

SECTION 5. Facilities

5.1) Broodstock collection facilities (or methods)

Both marked and unmarked adults may be collected at Clackamas Hatchery and/or at North Fork Dam. Our intent is to collect broodstock throughout the run period (at both collection facilities), to maintain natural run timing in the hatchery population.

The Clackamas Hatchery trap is operated year round. Adults are trapped (finger weir) in a 9' X 30' pond at the head of a 120' fish ladder. After anesthetizing and selecting brood fish, winter steelhead are transported to and held in an 8' x 80' raceway until spawning.

North Fork Dam is a 100% barrier dam; hence migrating adults are captured in the North Fork Dam trap before they can pass upstream of North Fork Dam. The trap is operated continuously during natural run timing of adult migrations. Adults are collected, sorted and transported (to Clackamas Hatchery) throughout the entire run period.

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

Adult Transportation

- a) Winter steelhead are transported from the hatchery trap to the raceway (holding pond) in a 200 gallon aluminum slip tank. Liberation equipment is equipped with aerators (oxygen supplementation) and all tanks (greater than 1000 gallons) are monitored for

dissolved oxygen, temperature, and % total gas saturation to ensure optimal environmental conditions during transport.

- b) Excess fin-clipped winter steelhead are recycled back into the fishery and transported from the hatchery trap to downstream release sites in either a 200-gallon aluminum portable tank, a 400-gallon aluminum trailer, or 1000-gallon fiberglass liberation truck.
- c) Unmarked winter steelhead are transported from the hatchery trap to sites below North Fork Dam in the Clackamas River in either a 200 gallon aluminum portable tank, or a 400 gallon aluminum trailer.
- d) Winter steelhead are transported from North Fork Dam (Faraday fish ladder) in a 300-gallon fiberglass trailer (with oxygen and aerators). Hatchery adults are either taken to Clackamas Hatchery (for brood), returned to the river below the dam to enhance the lower river sport fishery, or released into Faraday Lake, to enhance the trout fishery.

Egg Transportation

Eyed eggs are transported from Clackamas Hatchery to Irrigon in burlap and deep trough baskets or in aluminum and Styrofoam egg containers.

Fingerling Transportation

Fingerling (@ 200/lb.) are transported from Clackamas Hatchery to Oak Springs Hatchery in a 500-gallon aluminum portable tank, or in a 1,000-gallon fiberglass liberation truck.

Smolt Transportation

Smolts are transported from Irrigon and Oak Springs Hatcheries to Clackamas Hatchery and Cassidy Acclimation Pond in 1,000, 2,000, or 3,000-gallon liberation trucks.

5.3) Broodstock spawning and holding facilities

All winter steelhead broodstock are held at Clackamas Hatchery in an 8' x 80' concrete raceway with an average depth of 30". The raceway has been converted into a holding pond by the addition of aluminum frames with 1" vinyl coated wire mesh screens used as dividers. All steelhead are spawned there under a portable canvas canopy.

5.4) Incubation facilities

Clackamas Hatchery - Eggs are incubated in vertical, Heath-style, incubator trays. All water is pumped to a head tank, then distributed through the incubation trays and starting troughs via gravity flow.

Irrigon Hatchery - Eggs are incubated in vertical Heath-style incubator trays. Well water is distributed through the trays via gravity flow from an aeration tower.

5.5) Rearing facilities

Clackamas Hatchery - From swim-up (alevin) to fingerling (~45,000 @ 200/lb.), fish are reared in two, 16' Canadian-style troughs: 28' x 3" with 30 gpm of well or treated river water.

Irrigon Hatchery - Fish are initially reared in 6' circular ponds, then are transferred to 20' x 100' raceway ponds and reared to smolt size.

Oak Springs - Fingerling are started in one 30' concrete circular pond, and then split into two 46' x 38' concrete raceways/ponds.

5.6) Acclimation/release facilities

Cassidy Acclimation Pond - Cassidy acclimation pond receives a maximum of 45,000 smolts. It is a privately owned, dirt-bottomed, intermittent, spring-fed pond immediately adjacent to the Clackamas River at river mile 13 (approximately 9 miles downstream from Clackamas Hatchery). During low spring flows, 600 gallons of (untreated) Clackamas River water is pumped into the pond to maintain adequate water supply. The pond is approximately 75' x 200' with an average depth of 36".

Clackamas Hatchery - Winter steelhead are acclimated in a 100' x 300' asphalt rearing pond (for two to three weeks). At the end of the acclimation, smolts are force-released into Dog Creek, a tributary to the Clackamas River (river mile 23). All water (5,000 gpm) is pumped untreated from the Clackamas River.

5.7) Describe operational difficulties or disasters that led to significant fish mortality.
Clackamas Hatchery - In 2000, Clackamas Hatchery lost nearly 30% (15,999 of 54,492) of its winter steelhead production: the UV treatment failed, resulting in disease losses.

Oak Springs Hatchery - There have not been any significant fish losses because of operational difficulties at Oak Springs Hatchery.

Irrigon Hatchery - There have not been any significant fish losses because of operational difficulties at Irrigon Hatchery.

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

Clackamas Hatchery:

- ◆ The hatchery is investigating future use of a water filtration along with UV treatment to maintain proper fish health standards.
- ◆ 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.
- ◆ Both water sources are hooked-up to back-up generators.
- ◆ River water is treated with ozone and UV light during incubation and early rearing to minimize disease transmission to hatchery reared fish.
- ◆ Monthly fish health monitoring is conducted by a fish health specialist to detect disease early and provide prevention and control measures.
- ◆ Fish and eggs are transferred to Irrigon Hatchery and Oak Springs Hatchery during the summer months to avoid exposure to pathogens and viruses present in the Clackamas River.
- ◆ The adult holding pond is covered with black cloth to provide shade, and to minimize disturbance to broodfish.

Irrigon Hatchery:

- ◆ Hatchery staff is on-call 24 hrs/day to address emergency (or unexpected) events.
- ◆ Alarms and back-up generators are hooked-into the water source, and incubation units.
- ◆ Monthly fish health monitoring is conducted by a fish health specialist to detect disease early and provide prevention and control measures.

Oak Springs:

- ◆ Hatchery staff is accessible 24 hrs/day to address emergency (or unexpected) events: either on duty or on standby.
- ◆ Raceway ponds are alarmed to notify hatchery personnel if an equipment failure occurs.
- ◆ Monthly fish health monitoring is conducted by a fish health specialist to detect disease early and provide prevention and control measures.



SECTION 6. Broodstock origin and identity

6.1) Source

The broodstock for this wild winter steelhead program originated entirely (100%) from adult “wild” winter steelhead captured at North Fork Dam. For 1991 through 1997, the broodstock was composed entirely of wild winter steelhead. Since 1998, the hatchery brood has been comprised of 70% stock 122 hatchery returns and 30% wild adults. Non-finclicked winter steelhead are assumed to be of wild-origin.

6.2) Supporting information

6.2.1) History

The Clackamas River winter steelhead program was originally comprised of Big Creek and Eagle Creek broodstocks, to provide fishery opportunities in (late) November.

Since 1991, the Department has transitioned from using Big Creek and Eagle Creek stock to a locally adapted stock (122W), to comply with ODFW fish management policies (WFMP and NFCP), while continuing to provide sport fishery opportunities. The endemic broodstock program began with the collection of 40 natural fish in 1991. The broodstock for this program has been comprised of either all native fish or no greater than a 70% stock 122 and 30% naturals. Out-of-basin stocks (Big Creek and Eagle Creek) were last released into the Clackamas in the spring of 2001.

6.2.2) Annual size

The annual broodstock goal is 120 adults, which is comprised of both “wild” and hatchery returns. The wild fish component is 5% to 30% of the broodstock population; hence, hatchery reared (externally marked) steelhead comprise 70% to 95% of the brood population. Under existing program plans (and population status) the 30% wild component will not exceed 25% of the natural population (passing North Fork Dam). Under existing smolt production goals, a maximum of 36 natural adults will be taken for brood. However, the number of natural adults retained for brood may vary depending upon annual escapement levels, population status and population trends.

6.2.3) Past and proposed level of natural fish in broodstock

Under the current management regime, no more than 25% of the natural run will be retained for broodstock.

6.2.4) Genetic or ecological differences

Refer to section 3.5 regarding potential genetic and ecological differences and impacts to wild fish.

6.2.5) Reasons for choosing

Winter steelhead returning to the Clackamas River (and migrating past North Fork Dam) were chosen as the founding brood source, because the program goal is to have a locally adapted hatchery brood program, that will provide angler opportunities to the sport fishers, while meeting mitigation agreements with NOAA Fisheries (see section 1.6). As part of the mitigation agreement and federal consultation, NOAA Fisheries directed the

ODFW to move to a locally adapted broodstock program in the Clackamas River basin, while phasing-out the existing hatchery stock (1999 BiOp, Reasonable and Prudent Alternative F1).

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 hatchery fish are now or will be passed above North Fork Dam. This will provide a native fish sanctuary for the subbasin (ODFW believes that 80% of the winter steelhead spawning area is in this reach).
- Broodstock will be collected throughout the entire run. The hatchery brood will be comprised of up to 30% natural fish and 70% Clackamas winter steelhead (stock 122W).
- North Fork Dam trap will be checked daily during the peak of adult migration and five days per week during the beginning and end of the run. Fish will be sorted and transported to Clackamas Hatchery each day that the trap is checked. This schedule is intended to minimize migration delay and stress to wild fish.
- Clackamas River Hatchery trap will be checked weekly. All non-fin clipped adult steelhead will be sorted and released back into the Clackamas River at McIver boat ramp or used for brood.
- Lower Columbia River coho are listed on the state and federal Endangered Species Act list. Although not common, non-finclipped coho sometimes swim into Dog Creek and into the Clackamas Hatchery trap. To prevent and minimize adverse effects to coho (as a result of winter steelhead trapping operations), the trap will be checked routinely. If adult coho are encountered, they will be immediately returned to the Clackamas River.

SECTION 7. Broodstock Collection

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

Only adults will be collected and used for broodstock.

7.2) Collection or sampling design

The goal is to collect adults throughout the run at North Fork Dam and Clackamas Hatchery; in-season adjustments will be made (as necessary) to track varied run size. Protocols identifying adult collection rates within-season will be coordinated between ODFW and PGE staff. North Fork Dam trap is operated year-round and is checked daily during peak runs, and at least five times per week during low segments of the run (personal communications, Tim Shibahara, PGE).

North Fork Dam will be the primary adult collection facility for wild winter steelhead and the secondary adult collection site for hatchery winter steelhead. Conversely, Clackamas Hatchery will be the secondary adult collection site for wild winter steelhead, but will serve as the primary adult collection facility for hatchery winter steelhead.

Wild winter steelhead -

As described in section 6.1, wild winter steelhead will make-up 5% to 30% of the hatchery brood population and hatchery steelhead (stock 122) will comprise 70% to 95% of the brood population. Additionally, the 30% wild component will not exceed 25% of the natural population arriving at North Fork Dam. Hence, under the existing smolt production goal, a maximum of 36 wild adults will be taken for brood to support the hatchery program. If the wild run is less than 144 (25% = 36 fish) fish per season, ODFW will consult with NOAA Fisheries to determine the best use of the captured fish held at Clackamas Hatchery. Alternate options for hatchery intervention are considered: 1) the hatchery program will go into a “conservation mode”, and consider reintroduction, supplementation, etc.; 2) hatchery adults will be spawned to make-up for the “wild” egg-take portion; or 3) egg-take goals will decline.

Hatchery winter steelhead -

The trap at Clackamas Hatchery is operated seven days per week and depending on the volume of the run, is checked 1-5 times per week.

7.3) Identity

- Naturally produced fish are identified based on lack of marks or tags.
- All hatchery winter steelhead are adipose fin clipped (AD). The hatchery stocks currently released into the Clackamas River basin are differentially marked. Clackamas stock 122 is ADLM marked. However, the intent is to eventually only adipose fin clip winter steelhead (122W), and differentially (ADRM) mark summer steelhead. The Cassidy released fish will then receive an ADLM mark.
- Summer steelhead (024) are released into the Clackamas Basin; currently, they are adipose only fin clipped.

7.4) Proposed number to be collected

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

The estimated goal for full program is to have a spawner brood population of 120 adults; this broodstock goal accounts for 95% pre-spawner survival (IHOT 1995). However, actual size of the brood population will be based upon the number of natural adults migrating above North Fork Dam. However, the number of natural adults retained for brood may vary depending upon annual escapement levels, population status and population trends.

The brood population will be spawned at a 1:1 male to female spawning ratio. Since 1998, when unequal numbers of males and females are retained, the 1:1 spawning matrix is maintained. If this occurs, wild fish are returned to the river (above NFk Dam) and hatchery adults are terminated. Refer to Table 3 for details.

7.4.2) Broodstock collection levels for the last twelve years (1988-1999), or for the most recent years available.

Data summarizing broodstock collection since the inception of this program are presented in the following table.

Table 9. Number of winter steelhead collected and spawned for brood from 1991-2004 – Clackamas Hatchery. Note since 1998, adults have been spawned according to a strict 1:1, male to female spawning ratio. Data compiled from ODFW Hatchery Management Information System (HMIS) (Adult Transaction Report).

Year	<i>Female</i>			<i>Male</i>		
	Hatchery	Wild	Total	Hatchery	Wild	Total
1991		16	16		16	16
1992		15	15		14	14
1993		16	16		16	16
1994		13	13		14	14
1995		13	13		11	11
1996		9	9		9	9
1997		15	15		12	12
1998	4	10/8	14	6	8/8	14
1999	13	21/20	34	14	20/20	34
2000	69	22/22	91*	50	33/22	83*
2001	35	15	50	35	16	51
2002	43	8	51	34	18	52
2003	41	9	50	35	15	50
2004	40	11	51	37	15	52
2005	40	12	52	41	11	52
2006	48	8	56	42	14	56

* Included fish spawned for Eagle Creek National Fish Hatchery (27F1's & 25 naturals)

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

Hatchery winter steelhead excess to brood collection needs will be externally marked (opercular mark) and released into the Lower Clackamas River, to support the lower river steelhead fishery. Steelhead will be recycled once, and then will be released into Faraday Lake to enhance a local trout fishery.

The upper Clackamas River Basin (above NFk Dam) is managed as a wild fish sanctuary. Hence hatchery reared steelhead will not be released above the facility. This management intent was introduced and adopted by the Fish and Wildlife Commission in January 1992 (see Appendix C for additional details).

7.6) Fish transportation and holding methods.

Adults captured at North Fork Dam fish trap are hauled to Clackamas Hatchery and held until spawning. Adults are held in 8'x 80' raceway.

7.7) Describe fish health maintenance and sanitation procedures applied.

- Adult winter steelhead are treated with 1:6,000 ppm formalin solution or 1:3500 hydrogen peroxide solution, three times a week, to control and minimize fungus.
- Necropsies are performed on pre-spawner mortalities to determine the cause of death. Fish transport tanks are disinfected between the hauling of different fish lots.
- All equipment is disinfected with Iodophore between uses with different fish.

7.8) Disposition of carcasses.

- All natural winter steelhead used for brood will be live-spawned and returned to the Clackamas River, below River Mill Dam.
- Hatchery winter steelhead (in excess to broodstock collection) may be used for stream enrichment, or given to charities. Note, these fish have not been chemically treated (for disease, fungus, etc.).
- Surplus winter steelhead will not be sold.
- Portions of each return group are analyzed for disease or deformities.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

- Under the existing program, no more than 25% of the natural run will be incorporated into the hatchery wild-type broodstock; and a maximum of 36 adults will be retained for broodstock. This will minimize the potential for “mining” the wild population.
 - Special care is used when handling listed adult winter steelhead to minimize stress and harm.
 - Brood adults will be collected throughout the run to protect run timing integrity. Likewise, adults are selected randomly from the brood population to minimize unintentional selection pressures.
 - Only wild (non-fin clipped) Clackamas River winter steelhead (stock 122W) and their progeny (that were reared in the hatchery) will be used as a brood source.
-

SECTION 8. Mating

8.1) Selection Method

Steelhead are intended to be selected throughout the run, and will be spawned at a one-to-one, male-to-female, spawning ratio. Steelhead will be selected (and paired) at random from the pooled brood population. Refer to section 7.2 for details regarding broodstock collection procedures.

8.2) Males

All males are spawned at a 1:1 ratio with females. Natural adults are live-spawned. However, hatchery males may be killed prior to spawning.

8.3) Fertilization

- ◆ Eggs and sperm are fertilized according to a predetermined 3 X 3 spawning matrix. For example, eggs are taken from three females, each female's egg-take is divided into thirds, and then 3 different males fertilize each egg group. The second and third females' eggs are divided into three groups, and are fertilized by the same three males that fertilized the first female. If the proposed spawning matrix is met, equal sex ratios are maintained throughout fertilization.
- ◆ No consideration is given to the origin of the males or females during spawning time; hence combinations of (hatchery x hatchery), (wild x wild), or (hatchery x wild) crosses will exist. This approach was adopted to avoid intentional selective pressures.

8.4) Cryopreserved gametes

Not applicable to 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.

- ◆ A factorial-mating scheme (as described in section 8.3) is used to reduce the risk of loss of within population genetic diversity, for this small, wild type hatchery program.
 - ◆ Fish are selected and spawned randomly (while maintaining a 1:1 male to female spawning ratio) from the broodstock population.
 - ◆ The occurrence of BKD is rare in steelhead, but if IHN is detected in parents, a pathology sample is taken when the fish reach 200 per pound. If there is no IHN present, continued rearing is authorized. If IHN is detected, ODFW Fish Pathologists would not authorize the fish to be transferred off station.
 - ◆ Green eggs are water-hardened in Iodophore
-

SECTION 9. Incubation and rearing

9.1) Incubation

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

Table 10. Eggs taken for broodstock, eyed eggs inventoried, fry ponded and subsequent survival rates (1992-2004) – Clackamas Hatchery. Data compiled from ODFW HMIS.

Year	Egg Take	Eyed Inventory	% Survival (egg take to eyed-egg)	Fry Ponded	% Survival (eyed-egg to fry)
1992	60,181	53,504	88.9	48,768	91.1
1993	77,796	72,812	93.6	51,352*	70.5
1994	57,919	54,519	94.1	29,913*	54.8
1995	60,275	57,250	94.9	54,536	95.2
1996	42,558	40,612	95.3	37,666	92.7
1997	68,617	66,859	97.4	50,464*	75.4
1998	58,408	56,408	96.6	55,569	98.5
1999	157,007	152,469	97.1	55,023*	97.5
2000	200,693	196,648	98.0	57,958*	90.5
2001	212,940	204,478	96.0	56,479	99.3
2002	191,053	180,752	94.6	45,473	99.4
2003	213,787	184,800	86.4	57,103	97.1
2004	200,416	190,100	94.9	47,600	99.2

*Ponded numbers include fry that were transferred or liberated. In 1999 93,677 eyed eggs were transferred to Irrigon Hatchery. In addition to the 2000 egg take, 120,000 were taken and shipped to Eagle Creek National Fish Hatchery.

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

Measures are taken to only collect the number of eggs necessary to attain annual egg take goals. If additional eggs are taken, it is anticipated that this would not exceed 10% more than the total needed for production (IHOT 1995); steelhead eggs will either be culled (in equal proportion from all family groups). ODFW will consult with NOAA Fisheries if this occurs.

9.1.3) Loading densities applied during incubation.

Clackamas Hatchery:

Egg size = ~ 185-204 eggs per oz.
 Loading per tray = 12,000/tray - from green egg to eye-up;
 = 10,000/tray - from eye-up to ponding.
 Standard incubator flows = 5 gpm/stack

Irrigon Hatchery:

Loading per tray = < 10,000/tray – from eyed egg.

9.1.4) Incubation conditions

Clackamas Hatchery:

- ◆ Water temperatures are recorded daily. Well water averages 52F. River water is ranges from 48-65F. Temperatures may be reduced by 8F to even-up separate lots of eggs, during early incubation.
- ◆ DO is monitored weekly, and generally falls within 9-10 ppm.

Irrigon Hatchery:

- ◆ Water temperatures are recorded daily (average 50-52F).

9.1.5) Ponding

Clackamas Hatchery - Fry are held in heath-style incubator trays until buttoned up, and are ponded at 920 –940 T.U.'s. @ ~ 2,686 fry/lb.

Table 11. Date that fry are ponded and average size at ponding (fish/lb.) from 1992 to 2005 – Clackamas Hatchery. Data compiled from ODFW HMIS.

Date of Ponding	Size at Ponding (fish/lb.)
6/13/92 to 6/22/92	2,709
7/01/93 to 7/08/93	2,445
6/18/94 to 6/27/94	1,994
7/05/95	2,726
7/11/96	2,511
6/23/97	2,293
6/20/98	3,087
7/22/99	2,817
6/26/00	2,634
6/10/01	2,510
6/10/02	1,977
5/06/03	1,969
5/31/04	1,904
5/29/05	1,892
Average size at pond date →	2,391

Irrigon Hatchery: Fry are ponded at about 950 T.U. @ 2,400 fry/lb. Fry were ponded on 8/2/99, 6/22/00, 7/2/01, 6/21/02, 6/27/03, and 6/18/04.

9.1.6) Fish health maintenance and monitoring

Eggs are treated with formalin (to prevent fungus) from green egg through eyed-egg development. Treatments are administered every other day at 1,666 ppm, for 15 minutes. After eye development (~400 T.U.), eggs are “shocked”, picked, and enumerated. Fry mortalities are handpicked at the time of ponding.

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.

- Eggs are incubated on well water or treated river water to prevent exposure to disease.
- Both water supplies and the power supply are alarmed to notify hatchery personnel if a failure occurs. Both water supplies are hooked to a back-up generator, in case of a power failure.
- Hatchery staff is available 24 hr/day.
- If excess eggs and/or fry need to be culled, they will be selected equally across all family groups, or if family groups have been mixed, will be selected at random.

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.

Clackamas Hatchery – Fry are reared to ~ 200 fingerling/lb. (at Clackamas Hatchery) before they are transferred to Oak Springs Hatchery. As defined in IHOT (1995), the goal is to have 95% or greater survival rate from fry to smolt. Although, survival has been greater than 10% from 1997 to 1999, a significant (30%) proportion of steelhead died from cold-water disease in spring 2000; the UV treatment failed, resulting in disease losses.

Table 12. Percent (%) survival based upon the number of fry ponded and the number of fry counted at time of transfer (1995-2004) – Clackamas Hatchery. Data compiled from HMIS.

Year	# Fry Ponded	# Fry Transferred	% Fry Survival
1995	54,536	48,820	90%
1996	37,666	31,680	84%
1997	50,464	47,464	94%
1998	55,569	51,191	92%
1999	55,023	51,401	93%
2000	57,958	52,772	91%
2001	56,479	54,449	96%
2002	45,473	44,792	99%
2003	57,103	35,824	63%
2004	47,600	45,517	96%

Oak Springs Hatchery – Fingerling are reared from 200fish/lb. to smolt size at Oak Springs Hatchery. Ten-year average survival from fingerling to smolt equals 97.6%.

Table 13. Percent survival from fingerling to smolt (1995-2004) – Oak Springs Hatchery. Data compiled from ODFW HMIS.

Year	% Survival (fingerling to smolt)
1995	96.3%
1996	95.8%
1997	96.0%

1998	97.5%
1999	98.2%
2000	98.3%
2001	97.3%
2002	99.9%
2003	97.5%
2004	99.6%

Irrigon Hatchery: Since 1999, fry have been reared to smolt size at Irrigon Hatchery. Fry to smolt survival from 1999 – 2004 averaged 95.5%.

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

Clackamas Hatchery – Fry are reared to 200 fingerling/lb. in Canadian-style troughs. Troughs are 28" x 3" with 30-gpm/trough-flow capacity.

Table 14. Rearing densities (based upon spatial and water volume capacities) – Clackamas Hatchery. Data compiled from HMIS.

Year	lbs. biomass / ft ³	lbs. biomass / gpm
1995	1.33	2.66
1996	1.82	3.65
1997	1.88	3.76
1998	2.30	4.66
1999	1.30	2.60
2000	2.05	4.10
2001	1.77	3.55
2002	1.45	2.90
2003	1.86	3.72
2004	2.15	4.30

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Irrigon Hatchery –

Goal: 5.67 lb./gpm (actual: 4.98 lb./gpm)

Goal: 1.20 lb./ft³ (Actual: 1.07 lb./ft³)

Oak Springs -

Goal: 10.0 lb./gpm

Goal: 2.0 lb./ft³

Table 15. Fingerling loading (1995-2004) – Oak Springs Hatchery. Data compiled from ODFW HMIS.

Year	Lbs. /gpm	Lbs. /ft ³
1995	5.4	0.48
1996	5.6	0.50
1997	6.7	0.59
1998	7.0	0.62

1999	4.8	0.43
2000	7.2	0.63
2001	7.7	0.60
2002	7.4	0.57
2003	4.7	0.36
2004	13.8	0.61

9.2.3) *Fish rearing conditions*

Clackamas Hatchery – Fry are reared to 200 fingerling/lb. at Clackamas Hatchery. Fish are reared on treated river water, with water temperatures ranging from 56F – 65F. During highest fish rearing densities, DO levels are monitored weekly and maintained at 6 ppm or greater. Fry are reared to fingerling in Canadian-style troughs – troughs are cleaned and flushed daily. Fish mortalities are monitored daily.

Irrigon Hatchery – Fry and fingerling are reared on well water, with water temperatures ranging 50’F – 62’F. DO is monitored during peak rearing densities to insure that DO levels remain above 6ppm. Rearing raceways are cleaned once per week.

Oak Springs Hatchery –Fingerling are reared on 100% spring water, maintained at 54F. DO levels are not routinely monitored, and regularly measured, except during suspected oxygen-deficit circumstances; this has not occurred in the past. Ponds are cleaned weekly with a pump/vacuum system. Fish are fed daily and all data is recorded daily. Fish mortality are removed and recorded daily. Standard pond management procedures are applied during rearing, including sanitation, appropriate screening, stop logs to control depth, avian predator control systems as required, and control of influent water.

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.*

Clackamas Hatchery - Fish growth (measured as fish per pound) is monitored weekly. Forklength (mm) is measured and condition factor is calculated at the time of transfer to Oak Springs.

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Table 16. Growth data (fish /lb.) per month (1992-2004) – Clackamas Hatchery. Note, data is collected at the end of each month. Data compiled from ODFW Monthly Pondered Fish Reports.

Brood Year	May (Fish/lb.)	June (Fish/lb.)	July (Fish/lb.)	Aug (Fish/lb.)	LIB¹⁾
1992		1,364	285	164	
1993			551	191	
1994		1,380	345		
1995			725	202	
1996			768	199	
1997		1,827	265		
1998			1,624	270	
1999		2,359	381	340	
2000		772	222		
2001		768	210		
2002		1,100	205		
2003	1,935	578	204		
2004	1,889	523	169		

1) Clackamas Hatchery transfers its fish to Oak Springs Hatchery for continued rearing.

Irrigon Hatchery – Fish growth (measured as fish per pound) is measured and monitored monthly. Forklength (mm) and weight (g) is measured prior to liberation (refer to data below).

Table 17. Growth data (fish /lb.) per month (1999-2004) – Irrigon Hatchery. Note, data is collected at the end of each month. Data compiled from ODFW Monthly Poned Fish Reports.

Brood Year	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	LIB¹⁾
1999	503	177	53	30	17	12	9	7	5	
2000	125	72	34	22	13	10	7	6		
2001	176	70	33	21	13	11	7	6	6	
2002	117	56	35	19	11	9	5	5		
2003	137	76	26	16	12	8	6	5	5	
2004	121	65	30	17	10	8	6	5	5	

1) The smolts are transferred to Clackamas Hatchery for acclimation (2-3 weeks) prior to release.

Oak Springs -- Fish growth (measured in fish per pound) is measured and monitored monthly. Forklength (mm) and weight (g) is measured prior to liberation (Table 15).

Table 18. Growth data (fish /lb.) per month (1991-2004) – Oak Springs Hatchery. Note, data is collected at the end of each month. Data compiled from ODFW Monthly Poned Fish Reports.

Brood Year	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	LIB ²)
1991		NA	220	78	40	33	18	12	7.1	NA	6.6
1992		100	60	47	40	23	15	9	7.6	5.9	5.6
1993		155	102	53	38	26	13	10	6.8	5.8	5.8
1994		200	71	52	41	23	14	9.3	6.0	NA	5.1
1995		200	85	58	37	21	14	11	6.8	NA	7.3
1996		199	104	54	50	35	20	13	8.5	NA	7.8
1997		145	66	49	25	16	11	8	6.6	NA	5.6
1998		125	73	45	31	18	12	7	7	NA	5.6
1999		NA	102	63	35	18	15	13	9	6.6	6.6
2000	144	70	70	31	18	12	10	6.9	6.9	5.8	5.8
2001	153	73	54	28	17	14	12	8	6.9	6	6.0
2002	210	65	45	36	19	15	9	7	5.9	N/A	5.9
2003	174	91	47	30	20	14	11	7	5.4	N/A	5.4
2004	180	104	50	32	23	13	11	8	6.3	5.9	5.9

1) Smolts are transferred to Cassidy Pond for acclimation (2-3 weeks) prior to release.

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

Fish growth rates (biomass) are measured each month for ponded fish. This data is reported and monitored monthly and is archived in ODFW standard Monthly Ponded Fish Reports. See growth data charts in 9.2.4.

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).

Clackamas Hatchery – As start-up fry, steelhead are hand-fed every 30 minutes. Once steelhead begin feeding regularly, they are hand-fed four times per day; additionally, they are supplemented with Neilson trough feeders throughout the day. Food conversions greater than 1.0, range from 0.86 to 0.98. Steelhead are fed between 3% and 5% body weight (BW) depending on their size and ambient water temperature. Food types used to rear winter steelhead from fry to fingerling include:

- Bio Diet Starter #2
- Bio Diet Starter #3
- Bio Moist Grower 1.0mm
- Bio Moist Grower 1.3mm
- Bio Moist Grower 1.5mm

Irrigon Hatchery – Fry are started on a Bio-Diet Starter feed, then are switched to Silver Cup Salmon feed from 800 fish/lb. to smolt. Fish are initially fed at 5% BW, and then are fed at 1.3% BW (as they grow to smolt-size). Fish are fed with Garon feeders. The food conversion rate is 1.27.

Oak Springs Hatchery – Fingerling are fed Bio Moist Grower, Moore-Clark Nutra, and Moore-Clark AB. Feeding rates range from 2.5% BW to 1.7% BW. An average food conversion rate is 1.33.

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

Refer to Appendix F (IHOT 1996) regarding fish health monitoring, disease treatment and sanitation procedures conducted at Clackamas, Irrigon, and Oak Springs Hatchery (during incubation and rearing).

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

Refer to section 9.2.4 for growth factor data.

9.2.9) *Indicate the use of “natural” rearing methods as applied in the program.*

Cassidy Acclimation Pond – Two groups of fish are acclimated at Cassidy Acclimation Pond, one in April and one in May. Smolts are acclimated for 2-3 weeks before release. Acclimated release (versus direct release of large groups of fish) is believed to reduce the impact of density-dependent effects; fish experience on-site environmental cues and conditions such as flow, temperature, light, and weather conditions. In addition, these basin specific environmental cues, along with pre-migration imprinting are believed to encourage adult homing to release areas. Fish are forced out of the pond at the end of the acclimation period. Residualization of these fish is assumed to be low.

Clackamas Hatchery - At Clackamas Hatchery, smolts are held 2-3 weeks for on-site acclimation. At the end of the 3-week acclimation period, smolts are forced-out; existing facility design does not allow for volitional release.

9.2.10) *Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.*

To minimize the impacts of niche-displacement (or density-dependent effects) ODFW releases large (180-250mm) steelhead as recommended by NOAA Fisheries (1999 Biological Opinion). Specifically, since 1999, over 90% of the Clackamas River winter steelhead has been released between 171mm and 238mm (average forklength). The release of smolts at this size range is believed to promote swift emigration and prevent in-river residualization; and subsequently minimize potential temporal and spatial overlap for food and space (with co-existing juvenile winter steelhead).

Fish culture techniques, such as adjusting feed rates and length grading, are used to separate fish groups at the hatchery. Smaller fish are put on an adjusted feed rate, to promote rapid growth in the absence of competition with larger, perhaps more aggressive, steelhead.

SECTION 10. Release

10.1) Proposed fish release levels

Age Class	Number Released*	Fish/lb.	Release Date	Release Location	
Yearling	65,000	6.0	March/April	Clackamas R. (Clackamas H)	Deleted: 120
Yearling	50,000	6.5	April	Clackamas R. (Clackamas H)	Deleted: April/May
Yearling	25,000	6.0	March/April	Cassidy Acclimation Pond	Deleted: atchery
Yearling	25,000	6.0	March/April	Foster Cr Acclimation Pond	Deleted: 45
					Deleted: April/May

* This is the target release (does not include plus or minus 10%).

10.2) Specific location(s) of proposed releases.

River Name: Clackamas River (watershed code = 0300200000)

Release Point:

- (a) Clackamas Hatchery, RM 23
- (b) Cassidy Pond – RM 8.
- (c) Foster Creek – RM7.5

Major Watershed: Clackamas River Basin

Basin or Region: Willamette River / Lower Columbia River Winter Steelhead ESU

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Winter steelhead were direct stream released prior to acclimation procedures instituted in brood year 1999. These pre-1999 (brood year) release groups were released into the Clackamas River at Barton Park, Feldheimer Ramp, and Carver Ramp.

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

Proposed releases are 165,000 yearling smolts at 6.0 fish/lb. Smolts are planned for release (and acclimation) at Clackamas Hatchery and Cassidy Acclimation Pond from 2000 and beyond. Refer to section 10.1 and Table 16 for additional details.

Table 19. Releases of winter steelhead into the Clackamas River from 1992 to 2004. Note release data include direct releases at Carver, Barton and Feldheimer boat ramps from 1992-1999. Data compiled from ODFW HMIS (Fish Liberation Reports).

Release Year	Release Dates		Number Released	Average Fish/lb.	Average Gm/fish
1992	04/20/92	04/23/92	53,913	6.6	68.6
1993	05/04/93	05/05/93	28,948	5.6	80.4
1994	04/11/94	05/20/94	38,410	5.8	77.6
1995	04/03/95	04/07/95	45,732	5.1	77.7
1996	04/02/96	04/04/96	46,593	7.2	62.5
1997	04/09/97	04/11/97	26,370	7.8	57.8
1998	03/30/98	04/01/98	44,961	5.6	80.6
1999	03/31/99	04/30/99	45,940	5.5	82.6
2000	05/05/00		98,810	5.4	84.0
2001*	04/09 & 30/01	05/14/01	116,559	6.6	68.7
2002	04/26/02	05/16/02	127,501	6.5	69.8
2003	04/18/03	05/12/03	99,181	5.9	76.9
2004	04/28/04	05/12/04	102,175	5.4	84.0

* Includes 6,170 wild stock released at McIver boat ramp.

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

Refer to Table 13, for release dates from 1992 to 2004. In 2000, smolts were acclimated and released in May primarily to 1) rear smolts to target release size (as mandated in the 1999 BO) and 2) mimic natural temporal emigration periods that wild winter steelhead experience.

10.5) Fish Transportation.

All Clackamas River winter steelhead are currently released from Clackamas Hatchery and Cassidy acclimation pond. Winter steelhead are transported to these sites prior to the 2-3 week acclimation period.

10.6) Acclimation procedures.

Clackamas Hatchery: Steelhead are acclimated at Clackamas Hatchery in an 80,000ft³ asphalt-rearing pond for three weeks. Steelhead are forced-out of the acclimation pond (and into Dog Creek) at the end of the scheduled acclimation period.

Cassidy Acclimation Pond: Cassidy acclimation pond is a privately owned, dirt-bottomed, seasonally spring-fed pond. During low spring flows, 600 gallons of (untreated) Clackamas River water is pumped into the pond to maintain adequate water supply. The pond is approximately 75' x 200' with an average depth of 36". Approximately 45,000 steelhead are released from Cassidy in two groups, one in April and one in May. Fish are acclimated for 3 weeks then forced out of the pond. Residualization is assumed to be low.

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

11. All winter steelhead smolts released are “fin-marked” to differentiate between natural and hatchery fish and to differentiate between hatchery stocks. Clackamas River winter steelhead stock (122) is fin marked with an adipose fin clip and a left maxillary (ADLM). Note, Big Creek stock (013) released into the Clackamas River were marked with an adipose fin and right maxillary clip (ADRM) and Eagle Creek stock (020) were marked with an adipose fin and right ventral fin clip (ADRV). Release year 2000 was the last year that out-of-basin stock winter steelhead were released into the Clackamas basin. Starting with the 2006 brood release, we will shift to adipose fin clip winter steelhead (122W), and differentially (ADRM) mark summer steelhead. The Cassidy released fish will then receive an ADLM mark.

Comment [TA9]: ???

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

Although the Department does not plan to rear smolts excess to production goals, if surplus exist, the Department will consult with NOAA Fisheries to determine the most appropriate release strategies.

11.7) Fish health certification procedures applied pre-release.

ODFW Fish Pathology staff performs fish health inspections prior to smolt release. Pathological results are reported on the ODFW fish health forms (Appendix D).

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

If an emergency occurs, smolts at Clackamas Hatchery will be directly released into Dog Creek. If an emergency occurs at Oak Springs, or Irrigon Hatcheries, steelhead will be transported to Clackamas Hatchery.

11.9) 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 smolts will be released into mainstem reaches of the Clackamas River and downstream of the wild fish sanctuary area (above North Fork dam).
 - ◆ All fish are acclimated for a three-week period to promote adult homing back to the Clackamas River.
 - ◆ Smolts are predominately (>90%) released at 171mm to 238mm fork length to promote smoltification and swift outmigration. This reduces the retention time during emigration and minimizes potential ecological interactions that may occur between wild and hatchery reared winter steelhead.
 - ◆ Mark quality checks are performed (to identify the percentage of unmarked smolts released) prior to smolt acclimation and release.
-

SECTION 11. Monitoring and evaluation of performance standards and indicators

Section 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; and

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

All projects identified in Section 1.10 are currently funded and staffed.

Life history characteristics of the natural (wild) winter steelhead population that the Department intends to track, via external agency data sources, are listed below.

Smolt characteristics

- Smolt emigration over North Fork Dam - smolt size and age composition at emigration and timing of emigration over North Fork Dam – Data is available via PGE staff.
- Juvenile rearing densities and distributions in the upper Clackamas River basin – [Summer habitat survey data and smolt trapping data available via USDA Forest Service].

Adult characteristics (escapement above North Fork Dam).

- Adult run timing
- Adult size and sex composition at return
- Spawn timing and distribution – Radio Telemetry Study.
- Smolt to adult survival rates, and adult to adult return rates.

Note co-managers (such as PGE and/or the USDA Forest Service) collect data; hence results and analysis will depend upon the commitment of co-managers to continue projects and supply data and information.

Additionally, the Department has identified monitoring and evaluation projects that we would prefer to conduct if funding and staff were available. Projects are listed in priority order.

- Assess incidental impacts to wild winter steelhead during lower Clackamas River sport fishery.
- Enumerate adult escapement of wild winter steelhead in habitats overlapping sport fishery areas.
- Compare genetic composition of naturally produced adults to hatchery adults measured every other generation.
- Compare age composition of broodstock collected vs. natural spawner age structure.
- Quantify stray rates to out-of-basin areas.
- Evaluate annual release numbers from all programs in the basin and subbasin, including size and life-stage at release, and length or acclimation by program and relate to carrying capacity (i.e., smolt production potential) and winter steelhead production areas within the Clackamas River drainage.

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.

Legal Mandates

- Using the guidance of the Clackamas River Basin Fish Management Plan, the Fisheries Management and Evaluation Plan, Lower Columbia Winter Steelhead, and the NFCP, the District will ensure that the combined number of hatchery fish released into the Clackamas River basin does not exceed basin-defined carrying capacity.

Harvest

- "Hatchery fish only" angling regulations are in-place for adults. "Catch and release only" regulations are in place for juvenile protection. Catchable rainbow trout are no longer released into the Clackamas. This has resulted in a decrease in angling that used to incidentally take steelhead smolts through thousands of angler hours, it is now near zero. The Oregon State Police, Wildlife Enforcement Division, enforces angling regulations. Fish protection is the Division's highest enforcement-type priority.
- All hatchery winter steelhead released into the Clackamas River basin are externally marked, to easily differentiate them from naturally produced steelhead.

Life history characteristics

- Broodfish will be collected throughout the run, as they arrive at fish collection facilities.
- Intentional selection (size and age) during broodstock collection is avoided.

- The first brood of this program was comprised 100% of wild (natural) winter steelhead, returning to North Fork Dam.
- Timing of smolt releases is coordinated with natural smolt emigration (from upper Clackamas River basin). Data has been confirmed with downstream migrant information collected at North Fork Dam.
- Life history characteristics of the hatchery brood and natural winter steelhead are monitored throughout varying stages of their life cycle: egg-smolt (during fish culture); adult returns (both natural and hatchery); smolt characteristics (both natural and hatchery) and adult characteristics (both natural and hatchery).
- All hatchery fish are acclimated at Clackamas Hatchery and Cassidy Pond prior to release.

Genetic Characteristics

- The first brood of this program was comprised 100% of wild (natural) winter steelhead, returning to North Fork Dam.
- Returning hatchery fish will comprise at least 70% of the entire hatchery brood population, thus up to 30% will be comprised of wild (natural) winter steelhead.
- No hatchery fish will be released above North Fork Dam.

Operation of artificial production facilities

- All ODFW fish culture stations are operated according to State and Federal fish health and facility operation protocols and standards.

SECTION 12. Research

The North Wilamette Fish District will begin monitoring adult winter steelhead abundance and distribution in the lower mainstem, lower mainstem tributaries (Eagle, Clear, Deep) as well as distribution of fish above North Fork Dam. The purpose of assessing distribution of wild winter fish above North Fork Dam is to determine primary spawning reaches and possible restoration actions to benefit production of juvenile recruits. The monitoring effort is currently funded for the 2005-06 and 2006-07 winter steelhead run.

SECTION 13. Attachment and citations:

Refer to Appendices A through F, and References.

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, Title, and Signature of Applicant:

Certified by _____ Date: _____

Appendices

- A Legal considerations binding the Clackamas River Subbasin Plan. Clackamas River Subbasin Fish Management Plan, ODFW 1992, Pages 157 - 160.
- B Details regarding habitat policies. Clackamas River Subbasin Fish Management Plan, ODFW 1992, Pages 21 - 24.
- C Wild fish sanctuary above North Fork Reservoir, Policies, Objectives, and Assumptions. Clackamas River Subbasin Fish Management Plan, ODFW 1992, Pages 51 - 54.
- D Oregon Department of Fish and Wildlife, Fish Exam Form.
- E Wild and hatchery adult returns at North Fork Dam. Chilcote 2001.
- F Five year disease History by Fish Stock at Clackamas Hatchery 1996 - 2000. Rich Holt, ODFW 2001.

APPENDIX A

Legal Considerations Binding Subbasin Plans
Clackamas River Subbasin
Fish Management Plan, ODFW 1992
Pages 157-160

Legal Considerations Binding Subbasin Plans

Federal Laws

Conservation Programs on Public Land Act of 1960: Federal and state agencies cooperatively plan, develop, and maintain programs designed to conserve, rehabilitate, and protect fish, wildlife, and threatened and endangered species.

Endangered Species Act of 1973 – P. L. 93-205, reauthorized 1988: Provides protection for habitat of endangered and threatened species and provides for status review of candidates for listing. Currently, the bull trout (*Salvelinus confluentus*) is listed as a candidate (Category 2) species. More information is needed on its distribution before it can be classified as either rare or endangered. Based on recent research conducted by Oregon State University, the Oregon chub (*Oregonichthys crameri*) may be nominated for consideration for threatened or endangered species status.

Federal Aid in Wildlife Restoration Act of 1937: Provides funding for wildlife programs such as land acquisition, habitat improvement, research and education.

Federal Aid in Sport Fish Restoration Act of 1950, expanded in 1984 (Wallop-Breaux Act) and amended in 1988: Provides funding for sport fish restoration and fish programs such as land acquisition, habitat improvement, research and education.

Federal Land Policy and Management Act of 1976 – P. L. 94-579: Allows Congress to withdraw or designate federal lands for specified purposes.

Federal Water Pollution Control Act, amended by the Clean Water Act of 1977: Establishes as an objective the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. Sections of the act provide authorization for regulations regarding the discharge of pollutants (Section 402) and the disposal of dredged or fill material (Section 404).

Fish and Wildlife Coordination Act of 1934: States that fish and wildlife conservation shall receive equal consideration with water resources development programs.

Flood Control Act of 1936: Legislative mandate authorizing the Corps to study, plan, and construct major flood control works.

Floodplain Management, 1977 – Executive Order 11988: Designed to avoid adverse impacts associated with destruction or modification of floodplains and to mitigate impacts when avoidance cannot be achieved.

Flood Security Act of 1985: Designed to reduce erosion and sedimentation in watersheds.

Forest and Rangeland Renewable Resources Planning Act of 1974: Directs management planning process for units of the National Forest System.

Land and Water Conservation Fund Act of 1965 – P. L. 88-578: Provides federal assistance to states for planning, acquisition and development of land and water recreation resources.

Magnuson Fishery Conservation and Management Act: Establishes forum for recommendations to the Pacific Fishery Management Council for establishing harvest rates and for conservation, restoration, and enhancement of habitat of anadromous salmonids.

Mitchell Act of 1938, amended in 1946: Authorized the establishment of hatcheries and fishways for anadromous fish in the Columbia River watershed of Idaho, Washington, and Oregon and annually provides operation and maintenance funding.

Multiple Use – Sustained Yield Act: Authorizes and directs the administration and development of the renewable surface resources of the national forests.

National Environmental Policy Act of 1969: Requires that any federal agency proposing an action that significantly affects the human environment must prepare an environmental impact statement.

National Forest Management Act of 1976: Provides for multiple use and sustained yield of the products and services of National Forest System land; includes legislation for protection of riparian vegetation.

Northwest Power Act of 1980: Creates an interstate policy making and planning body for electrical power and fish and wildlife in the Columbia River Basin.

Oregon & California Railroad Act: Principle legal mandate for BLM and USFS management of O&C lands.

Rivers and Harbors Act of 1899: Authorizes the U.S. Army Corps of Engineers to issue permits form any types of activities in navigable waters of the Untied States.

Sikes Act: Provides for state and federal cooperative management of fisheries resources.

United States – Canada Reciprocal Fisheries Agreement: Governs the harvest of fish stocks of mutual concern.

Water Bank Act of 1970 – P. L. 91-559: Authorizes the Secretary of Agriculture, after coordination with the Secretary of the Interior, to enter into 10-year contracts with landowners to preserve wetlands and retire adjoining agricultural lands. Annual payments to landowners and sharing in the costs of conservation measures are included.

Water Pollution Control Act of 1972 – P. L. 92-500: Precursor to the Clean Water act. Authorized issuance of permit to discharge fill or dredged material into navigable waters at specified disposal sites.

Water Resources planning Act of 1965 – P. L. 89-80: Established the Water Resources council, which issues the “Principles and Standards and Procedures for Federal Participation in Water and Related Land Resources Planning and Development”. The act also authorized establishment of State-Federal River Basin Commissions.

Water Use Act of 1940: Provides domestic, mining, milling and irrigation uses of waters within national forests.

Watershed Protection and Flood Prevention Act of 1954: Assures cooperation of the federal government with state and local agencies in preventing damage from floodwater, erosion and sediments.

Wild and Scenic Rivers Act of 1968, revised 1988: Designates selected rivers for protection under the National Wild and Scenic Rivers System, which preserves scenic, recreational, and fish and wildlife characteristics.

Wilderness Act of 1964: Preserves selected units of land for their wilderness characteristics.

State Laws

The Oregon Forest Practices Act (Forest Practices Act) (ORS 527.610 to 527.730) was adopted in 1972. Commercial timber operations on state and private land are regulated by the act, which is administered by the Oregon Department of Forestry. The Forest Practices Act contains provisions for protection of aquatic habitat. Forest management activities on U.S. Forest Service and BLM land are designed to comply with Forest Practices Act rules and state water quality standards. The Forest Practices Act does not apply within the urban growth boundary of towns and cities. Cities and towns may or may not have regulations for stream protection.

The Oregon Fill-and-Removal Law (ORS 541.605-541.990) requires a permit for the removal or filling of 50 cubic yards or more of material in rural waterways. The Division of State Lands oversees the program, reviews applications and issues permits, and enforces the law. ODFW has the opportunity to comment on permit requests.

APPENDIX B

Details regarding habitat policies
Clackamas river Subbasin
Fish Management Plan, ODFW 1992
Pages 21-24

Habitat Management

Agencies involved in management of fisheries and fish habitat in the Clackamas Subbasin (and their acronyms are used in this plan) include:

Federal

Bonneville Power Administration (BPA)
Bureau of Land Management (BLM)
Federal Emergency Management Agency (FEMA)
Federal Energy Regulatory Commission (FERC)
National Marine Fisheries Service (NMFS)
National Register of Historic Places
Northwest Power Planning council (NPPC)
U.S. Army Corps of Engineers (USACE)
USDA Forest Service (USFS)
USDA Soil Conservation Services (SCS)
U.S. Fish and Wildlife Service (USFWS)
U.S. Geological Survey (USGS)

State

Department of Environmental Quality (DEQ)
Department of Fish and Wildlife (ODFW)
Department of Forestry (DOF)
Department of Geology and Mineral Industries (DOGAMI)
Department of Land Conservation and Development (DLCD)
Department of Transportation (ODOT)
Division of State Lands (DSL)
Water Resources Department (WRD)

Local

City governments (zoning and planning division)
 Estacada
 Oregon City
Clackamas County Planning and Zoning Division
Clackamas County Soil and Water Conservation District

A memorandum of understanding between USFS and DOF defines how the national forests will be managed in relation to the Oregon Forest Practices Act (Skeesick and Jones 1988). A memorandum of understanding also clarifies the responsibilities of the two agencies.

Activities that may affect threatened or endangered species must be coordinated with USFS. Currently, the Oregon chub (Oregonichthys crameri) and the bull trout (Salvelinus confluentus) are two species potentially inhabiting the Clackamas, listed as "Category 2" species on the federal list.

Fishery managers recognize that habitat degradation and loss is a serious threat to the maintenance of healthy fish populations. Enforcing local, state, and federal laws protecting fish habitat is essential to sustaining a vital habitat base. Consequently, ODFW must be a consistently strong advocate for the protection and proper management of fish habitat.

ODFW coordinates with local, state, and federal agencies regarding their habitat protection and management programs. Often this involves making recommendations to minimize impacts from various land and water users that may conflict with fishery interests. Fish production must compete with other land and water uses such as timber production, irrigation, and hydroelectric power production.

Each of the land and water management agencies has regulatory authority over some aspect of land or water use, or has overall responsibility for specific land or water areas. Each agency has its own policies, procedures, and management directives associated with its area of responsibility. No single agency has total jurisdiction over an entire river basin. For this reason, coordinated involvement and cooperation among fishery, land, and water managers is necessary to achieve comprehensive management of watershed to the benefit of the entire system and its resources.

Fish and wildlife managers coordinate with land and water managers to protect fishery resources and habitat. The role of ODFW concerning habitat protection issues is not through direct management. ODFW has enforcement authority for fish screens and fish passage. ODFW can apply for instream water rights to protect fish habitat and can collect costs of habitat damage from polluters. ODFW reviews the activities of other public agencies and private entities that are land managers and provides recommendations intended to minimize harmful changes to fish habitat. Applications for permits issued by other agencies for land use activities are forwarded to ODFW for review and comment. ODFW is currently developing policies regarding screening, fill and removal, and habitat mitigation.

Memoranda of understanding among ODFW, BLM, USFS, and USACE describe cooperative activities for protecting and improving fish habitat on federal lands. Contractual agreements exist with NOAA Fisheries and USFWS concerning Columbia River and ocean salmon fisheries, marine fish investigations, and hatchery production. Annual contracts with USACE are established to mitigate for fish production lost as result of Corps projects.

ODFW comments on USFS and BLM project proposals as well as the general land management plans. The Mount Hood, Willamette, Siuslaw and Umpqua national forests are finalizing their management plans. BLM has completed its planning process for western Oregon. The plan review process provides a forum for the state to address habitat improvement or protection for fishery resources. USFS and BLM fish habitat improvement projects require close coordination with ODFW.

DEQ establishes minimum water quality standards that comply with the federal Environmental Protection Act and the federal Clean Water Act. State water quality standards are specifically directed at fish bearing waters.

The Oregon Watershed Enhancement Board provides an opportunity for private individuals as well as organizations to become involved in watershed rehabilitation projects. An Oregon Fish and Wildlife commission member is a member of this board.

WRD is currently updating its management programs for the Willamette Basin. Programs affect future water rights, set priorities for water use, and prescribe actions to solve water problems. ODFW, along with other state natural resource agencies, has identified issues that ODFW will cover and contribute to the WRD's planning process.

Habitat Improvement Projects

The Mount Hood National Forest has efforts under way in many areas to rehabilitate reaches that have been impacted by past land management practices. Stream improvement activities include instream placement of large woody debris and boulder berms, and the development of off-channel rearing areas. Habitat rehabilitation project sites are located in the Hot Springs Fork, the Oak Grove Fork, the Big Bottom Area on the mainstem Clackamas, and Fish Creek. The Fish Creek watershed comprises 10% of the Clackamas basin's area above North Fork Dam. About 50 to 60% of the habitat available to anadromous salmonids in Fish Creek is included in the Fish Creek Habitat Enhancement Project being funded by the Bonneville Power Administration (Cain 1986; Everest et al. 1986).

ODFW's Salmon and Trout Enhancement Program (STEP) provides an opportunity for private individuals, industry, and user groups to become involved with projects designed to improve salmon and trout fisheries. Funding of these projects is primarily from donations and volunteers. ODFW provides additional funding when necessary.

In 1987, STEP volunteers constructed a series of four gabion jump pools to allow passage of adult salmonids through an improperly placed and sized culvert on Foster Creek (personal communication, 1988, with W. Bowers, ODFW STEP Biologist, Clackamas, Oregon).

Information Needs

Physical and biological surveys of stream reaches below North Fork Dam (not on Mount Hood National Forest land) are needed to assess the quality and quantity of spawning and rearing habitat as well as the extent of natural spawning for anadromous salmonids and resident trout.

Policies

- Policy 1. The Oregon Department of Fish and Wildlife shall actively pursue and promote habitat protection and improvement necessary to achieve the objectives for management of the subbasin's fish resources.
- Policy 2. ODFW shall coordinate with and advise agencies that manage the land and water resources of the Willamette basin.
- Policy 3. Habitat protection shall be emphasized over habitat rehabilitation and enhancement.
- Policy 4. Potential losses of fish production from habitat alteration shall be prevented or reduced to the extent possible.

Objectives

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

Assumptions and Rationale

1. One of the problems reducing natural production of anadromous fish in the upper subbasin is habitat underseeding and less-than-optimum dispersal of adults.
2. An unknown but substantial number of juvenile salmonids are believed to spill or pass through the turbines at hydroelectric projects in the subbasin.

APPENDIX C

Wild fish sanctuary above North Fork Reservoir
Policies, Objectives, and Assumptions

Clackamas River Subbasin
Fish Management Plan
Page 51-54, ODFW 1992

Policies

- Policy 1. Winter steelhead in the Clackamas Subbasin shall be managed for natural and hatchery production consistent with the Wild Fish Management Policy.
- Policy 2. The lower subbasin below River Mill Dam shall be managed primarily for the production and harvest of Big Creek and Eagle Creek stocks of hatchery fish. Fry releases shall be limited to Rock, Clear, Foster, Deep, and Eagle creeks.
- Policy 3. The subbasin above North Fork Dam shall be managed for natural production of the indigenous stock.

Objectives

- Objective 1. Increase spawning escapement of the indigenous stock of winter steelhead above the North Fork Dam to 3,000 fish.

Assumptions and Rationale

1. The Clackamas River indigenous winter steelhead stock is recognized by the public and fishery managers as an important steelhead stock to protect. The smolt production capacity of the upper Clackamas Subbasin is estimated at 130,000 smolts. Based on natural production factors in the Steelhead plan (ODFW 1986), managers can expect from 10 to 30 smolts produced per adult spawner. This means passage between 4,300 and 13,000 indigenous steelhead are needed to fully seed the habitat above North Fork Dam. Over the last 25 years, the number of adult winter steelhead passing the North Fork Dam has declined. Currently, passage averages about 1,400 adult winter steelhead (all stocks).
2. An escapement of 3,000 indigenous winter steelhead represents a reasonable interim goal to reverse the decline in escapement. This escapement is more than twice the current average and is higher than any five-year average measured since 1964. Coupled with actions that will reduce competition with other steelhead stocks, it should maintain the genetic characteristics of the indigenous winter steelhead stock.
3. Most natural spawning of the indigenous stock occurs above North Fork Dam.
4. Habitat quality will be maintained or improved.

Actions

- 1.1 Within the next five years, a creel program and life history inventory should be undertaken to (1) allow management under the WFMP, which requires knowledge of the proportions of hatchery and indigenous stocks in the run, (2) evaluate the hatchery production of Big Creek, Eagle Creek, and wild stocks used in the

hatcheries and net pens, and (3) evaluate the natural production of hatchery summer and winter steelhead for potential effects on indigenous winter steelhead.

- 1.2 Prevent passage of hatchery winter steelhead (Eagle and Big Creek stocks) above the Fork Dam from December 1 through March 31, by transporting only indigenous winter steelhead, coho, and spring chinook above North Fork Dam. Hatchery winter steelhead collected at the trap would be (1) recycled through the fishery, (2) used as brood stock at hatcheries located in the lower Columbia Basin, (3) provided to tribal entities, or (4) provided to local charities.
- 1.3 Encourage and support Portland General Electric's efforts to reduce juvenile mortality at the North Fork Project complex and to improve adult winter steelhead passage at River Mill Dam's fish ladder.
- 1.4 Surplus presmolts from steelhead production will be released into standing waters, except PGE North Fork Project reservoirs to enhance trout fisheries. Eagle Creek National Fish Hatchery should be encouraged to avoid surplus production and unprogrammed releases.
- 1.5 Update the physical and biological survey data on steelhead streams for better management of subbasin fisheries.
- 1.6 Gather life history data on indigenous Clackamas winter steelhead by:
 - a. Determining age-specific patterns of rearing and migration of juvenile steelhead, including smolts.
 - b. Continuing to collect and interpret scale samples from the fishery.
 - c. Determining the timing of river entry, in-river holding patterns, and distribution and timing of spawning.
- 1.7 Conduct surveys to determine the natural production of indigenous winter steelhead below River Mill Dam. Hatchery programs will be modified if the hatchery-to-wild ratios are determined to be out of compliance with the Wild Fish Management Policy. Strategies could include developing acclimation and rearing sites, removal of adults at hatcheries, altering hatchery releases, or other methods to remove hatchery steelhead.
- 1.8 Combine physical-biological survey information and determine limiting factors to reevaluate the production potential of current winter steelhead habitat.
- 1.9 Design habitat projects based on the physical-biological surveys, limiting factor analysis, and production capacity assessment of habitat in the subbasin. Support continued habitat restoration efforts by Mount Hood National Forest in the upper Clackamas. Specific projects that benefit winter steelhead will be identified.

- 1.10 Minimize competition between winter steelhead and other populations of anadromous salmonids and resident trout.
- 1.11 Recommend regulations to protect the indigenous run of winter steelhead.
- 1.12 Monitor and correct major sources of juvenile mortality within the drainage by:
 - a. Estimating the juvenile steelhead mortality in the late summer trout fishery, particularly above North Fork Reservoir
 - b. Estimating juvenile steelhead mortality at Clackamas River dams.
 - c. Reducing juvenile steelhead harvest in the trout fishery by implementing a public education program designed to encourage the release of smolts and pre-smolts caught by trout anglers. This program would target those areas in which the larger proportion of the population of winter steelhead and resident trout is composed of winter steelhead. Areas of primary concern include the mainstem and major tributaries to the Clackamas River.

Objective 2. Increase the potential average annual harvest of winter steelhead in the subbasin to 8,000 fish (2,000 in Eagle Creek and 6,000 in the mainstem of the Clackamas River, above and below River Mill Dam).

Assumptions and Rationale

1. Marking hatchery steelhead will allow ODFW to estimate adult wild steelhead harvest and production, information needed for management under the Wild Fish Management Policy. The Steelhead Plan (ODFW 1986) identifies fin marking as a “high priority of management” in streams to be managed for a combination of wild and hatchery stocks. Actions to determine basic life history parameters will enable management agencies to prioritize efforts to correct factors limiting indigenous steelhead production.
2. The Clackamas River is near Portland, Oregon’s largest population center. Steelhead angling is popular on the river, and anglers have expressed a desire that the number of fish available for harvest be increased above the current level.
3. Combines harvest for the lower Clackamas and Eagle Creek averaged approximately 6,400 adult winter steelhead (hatchery and naturally produce) from 1983 through 1987, while the average release of hatchery fish has been about 319,000 smolts. An average annual harvest of 8,000 fish represents a 20% increase in angler catch.
4. An increase in production for the drainage would be achieved by modifying the hatchery program at Eagle Creek National Fish hatchery, reducing the mortality rate on downstream migrants, and reducing the pre-spawning mortality rate. Evaluating returns of hatchery stocks will improve management of the hatchery program.

Actions

- 2.1 Continue releases of hatchery steelhead smolts using Eagle Creek, Big Creek, and wild stocks. Eagle Creek and Big Creek stock releases will be confined to the Clackamas subbasin below River Mill Dam.
- 2.2 Investigate additional spring water sources at Eagle Creek National Fish Hatchery that would provide warmer water temperatures for rearing fish.
- 2.3 Evaluate STEP hatchbox programs for consistency with STEP guidelines to aid in achieving the objectives for the drainage.
- 2.4 Mark all hatchery steelhead to allow an evaluation of straying rates in this system and to assess the success of this program's contribution to the fishery.
- 2.5 Support and encourage PGE to upgrade enumeration techniques at the North Fork ladder.

APPENDIX D

Oregon Department of Fish and Wildlife Fish Exam Form

OREGON DEPARTMENT OF FISH AND WILDLIFE FISH EXAM FORM

SOURCE:

EXAM DATE: April 13, 2001

COMPLETION DATE:

LOT:

Report Number TA01-085

SPECIES:

SIZE:

PONDS:

REASON FOR EXAM

Inspection

Abnormal Loss

Preliberation

Routine

Other:

SIGNS OF DISEASE:

RESULTS:

RECOMMENDATIONS:

[Empty rectangular box]

Date:

Pathologist:

Healthy

Hatch:

Moribund

LOT:

Report TA01-085

Dead

SPECIES:

MICROSCOPIC EXAM:

CULTURE EXAM:

Media used:

Fish Cultured:

Tissue:

SIGNIFICANT COMMENTS:

EIBS

BKD

ERM

CWD

Copies:

FUR

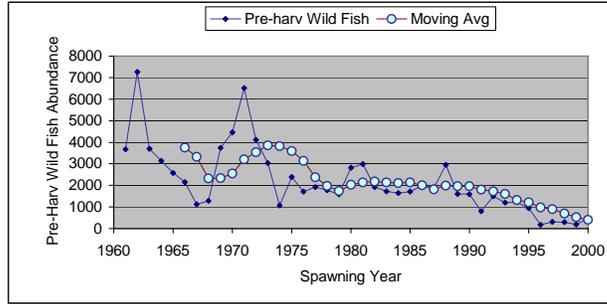
APPENDIX E

Wild and hatchery adult returns at North Fork Reservoir

Conservation Assessment of Steelhead Populations in Oregon.
Pg. 66 Chilcote, M.W. 2001

Basin: Clackamas
Population: Clackamas
Sub-population:
Monitoring sites: NF Dam
Method: Counts estimated from video pictures at ladder until 1997. from 1998 to present fish have been trapped and directly counted. In addition, for identification of hatchery fish; prior to 1996 identification was based upon run timing (hatchery fish earlier than wild).

Critical Threshold	71
Viable Threshold	279
Last 6-yr Average	395



Spawning Year	Average Distribution of Ages in return year						Effective Tot. Spwnrs	Harvest Rate	Pre-Harv Wild Fish	6-yr Moving Avg
	Repeat	Age 2	Age 3	Age 4	Age 5	Age 6				
	0.11	0.00	0.01	0.63	0.23	0.02				
1961							2203	0.40	3672	
1962							4359	0.40	7265	
1963							2223	0.40	3705	
1964							1881	0.40	3135	
1965							1544	0.40	2573	
1966							1287	0.40	2145	3749
1967							676	0.40	1127	3325
1968							767	0.40	1278	2327
1969							2245	0.40	3742	2333
1970							2673	0.40	4455	2553
1971							3908	0.40	6513	3210
1972							2466	0.40	4110	3538
1973							1816	0.40	3027	3854
1974							641	0.40	1068	3819
1975							1431	0.40	2385	3593
1976							1025	0.40	1708	3135
1977							1156	0.40	1927	2371
1978							1067	0.40	1778	1982
1979							950	0.40	1583	1742
1980							1693	0.40	2822	2034
1981							1798	0.40	2997	2136
1982							1153	0.40	1922	2171
1983							1031	0.40	1718	2137
1984							987	0.40	1645	2114
1985							1027	0.40	1712	2136
1986							1194	0.40	1990	1997
1987							1139	0.40	1898	1814
1988							1773	0.40	2955	1986
1989							963	0.40	1605	1968
1990							953	0.40	1588	1958
1991							482	0.40	803	1807
1992							1430	0.04	1490	1723
1993							1155	0.04	1203	1607
1994							1169	0.04	1218	1318
1995							913	0.04	951	1209
1996							161	0.04	168	972
1997							291	0.04	303	889
1998							285	0.04	297	690
1999							177	0.04	184	520
2000							447	0.04	466	395

APPENDIX F

Five year disease history by fish stock at
Clackamas Hatchery
1996 - 2000
by
Rich Holt
ODFW

Five Year Disease History by Fish Stock at Clackamas Hatchery 1996-2000. CHS= Spring Chinook, STW=Winter Steelhead.

Stock/Species

Disease/Organism	CHS 19	STW 20				
IHNV	no	yes				
CAD	no	no				
<i>Fl. psychrophilum</i>	no	yes				
<i>Fl. columnare</i>	yes	yes				
<i>Aeromonas salmonicida</i>	yes	yes				
<i>Aeromonas/Pseudomonas</i>	yes	yes				
<i>Yersinia ruckeri</i>	no	no				
<i>R. salmoninarum</i>	yes	no				
Internal mycosis	no	no				
External mycosis	yes	yes				
<i>Ichthyobodo</i>	no	no				
<i>Gyrodactylus</i>	no	no				
<i>Ichthyophthirius</i>	yes	yes				
Gill Amoeba	no	no				
Trichodinids	yes	yes				
Proliferative Kidney Disease	yes	no				

^a Yes indicates detection of the pathogen but in many cases no disease or fish loss was associated with presence of the pathogen. No indicates the pathogen has not been detected in that stock.

Disease Treatment

Treatments for disease at Clackamas Hatchery include: green eggs are routinely water hardened in diluted buffered iodophor; flush treatments of 1:600 formalin for 15 minutes given three to five times per week for fungi prevention on eggs; treating juvenile fish for external parasites using formalin 1:6000 to 1:40000 depending on species treated and water temperature. *Ichthyophthirius* may be treated with a prolonged formalin drip, 1:25,000 for 8 hours). On rare occasions it is necessary to treat a group of fish for bacterial pathogens and medicated food containing oxytetracycline or Romet is used. The spring chinook adults are given antibiotic injections of erythromycin and oxytetracycline under a veterinary prescription to prevent bacterial infections such as furunculosis and bacterial kidney disease. They are also treated with formalin flush treatments at 1:4,000-1:8,000 for one hour three to five times per week as needed for external fungi infections.

The fish health monitoring plan is identical to that developed by the Integrated Hatchery Operations Team for the Columbia Basin anadromous salmonid hatcheries (see Policies and Procedures for the Columbia Basin Anadromous Salmonid Hatcheries, Annual Report 1994. Bonneville Power Administration).

- All fish health monitoring will be conducted by a qualified fish health specialist.
 - Annually examine brood stock for the presence of viral reportable pathogens. Number of individuals examined, usually 60 fish, will be great enough to assure a 95% chance of detection of a pathogen present in the population at the 5% level. American Fisheries Society “Fish Health Blue Book” procedures will be followed. With wild adult steelhead stocks generally all fish are sampled for viruses at spawning.
 - Annually screen each salmon brood stock for the presence of *R. salmoninarum* (R.s). Methodology and effort will be at the discretion of the fish health specialist.
 - Conduct examinations of juvenile fish at least monthly and more often as necessary. A representative sample of healthy and moribund fish from each lot of fish will be examined. The number of fish examined will be at the discretion of the fish health specialist.
 - Investigate abnormal levels of fish loss when they occur.
 - Determine fish health status prior to release or transfer to another facility. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release.
 - Appropriate actions including drug or chemical treatments will be recommended as necessary. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile will be generated when possible.
 - Findings and results of fish health monitoring will be recorded on a standard fish health reporting form and maintained in a fish health database.
 - Fish culture practices will be reviewed as necessary with facility personnel. Where and when pertinent, nutrition, water flow and chemistry, loading and density indices, handling, disinfecting procedures, and treatments will be discussed.
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References:

- 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.
- Biological Opinion on Artificial Propagation in the Columbia River Basin. 1999. Incidental Take of Listed Salmon and Steelhead from Federal and Non-Federal Hatchery Programs that Collect, Rear and Release Unlisted Fish Species. Portland, Or.
- Fisheries Partnerships in Action. 1996. Clackamas River Subbasin, Oregon - 1996 Accomplishment Report from the Clackamas River Fisheries Working Group. Portland, Or.
- Fisheries Partnership in Action. 1997. Clackamas River Subbasin, Oregon - 1997 Accomplishment Report from the Clackamas River Fisheries Working Group. Portland, Or.
- Fisheries Partnership in Action. 1999. Clackamas River Subbasin, Oregon - 1999 Accomplishment Report from the Clackamas River Fisheries Working Group. Portland, Or.
- Massey, J. and Keeley, J. 1995. Fish Management Review, Columbia Region - Lower Willamette Fish District. Portland, Or.
- ODFW. 1999. 2000 Oregon Sport Fishing Regulations. Portland, Or.
- ODFW. 1992. Clackamas River Subbasin Fish Management Plan. Portland, Or.
- ODFW. 1992. General Fish Management Goals, Natural Production Policy, Wild Fish Management Policy., Wild Fish Management Policy, Wild Fish Gene Resource Conservation Policy Hatchery Fish Gene Resource Management Policy, Transgenic Fish Policy. Portland, Or.
- ODFW. 1995. Winter Steelhead Creel Surveys on the Willamette River in the Oregon City Area, Clackamas River, and Eagle Creek, 1994-1995. Portland, Or.
- ODFW. 1996. Winter Steelhead Creel Surveys on the Willamette River in the Oregon City Area, Clackamas River, and Eagle Creek, 1995-1996. Portland, Or.
- ODFW. 2001. Fisheries Management and Evaluation Plan, for the Lower Columbia ESU Steelhead. Clackamas, Or.
- Hooton, R. 1987. Catch and release as a management strategy for steelhead in British Columbia, In R. Barnhart and T. Roelofs, eds, Proceedings of catch and release fishing, a decade of experience. September 30 - October 1, 1987. Humboldt State University, Arcata, Ca.
- Reingold, M. 1975. Effects of displacing, hooking, and releasing on migrating adult steelhead trout. Transactions of the American Fisheries Society 3:458-460.

NMFS 1998. Analysis of the benefits of management actions taken to reduce hatchery and harvest impacts to natural steelhead in the Oregon Coast and Klamath Mountains Province
esuS. Memorandum from L. Kruzic, through S. Smith, to the Record, dated March 10, 1998, Portland, Or.

Chilcote, M. 2000. Oregon Department of Fish and Wildlife, draft memorandum. : Conservation Assessment of Steelhead Populations in Oregon" draft, November 9, 2000, Portland, Or.

Shibahara, T. Portland General Electric Company, personal communication. 2000.

Section 3.5 Ecological interactions - Cindy will provide these references.