DRAFT

HATCHERY AND GENETIC MANAGEMENT PLAN
(HGMP)

Hatchery Program:	Upper Willamette Summer Steelhead
Species or Hatchery Stock:	*Oncorhynchus mykiss*, Skamania summer steelhead (stock 024)
Agency/Operator:	Oregon Department of Fish and Wildlife (ODFW)
Watershed and Region:	Upper Willamette River Basin (UWRB), Northwest Region
Date Submitted:	11/24/04
Date Last Updated:	10/22/04

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Upper Willamette River Summer Steelhead

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

Oncorhynchus mykiss, Skamania summer steelhead (stock 024). This program releases hatchery summer steelhead smolts in at least 10 fish Evolutionarily Significant Units (ESUs), including 2 steelhead ESUs listed as threatened under the Federal ESA (Table 1.2). The steelhead (*Oncorhynchus mykiss*) ESUs listed under the Federal ESA are the Lower Columbia River Steelhead ESU listed as threatened on March 19, 1998 (Federal Register Notice 1998) and the Upper Willamette River Steelhead ESU listed as threatened on March 25, 1999 (Federal Register Notice 1999a). The majority of the smolts are released in rivers in one chinook (*Oncorhynchus tshawytscha*) ESU which was listed as threatened under the Federal ESA on March 24, 1999 (Federal Register Notice 1999).

Table 1.2. Federal ESA listing status for ESUs where this program releases smolts.

ESU	Federal ESA Status
Oregon Chub	Endangered
Lower Columbia River Steelhead ESU	Threatened
Upper Willamette River Steelhead ESU	Threatened
Upper Willamette River Chinook Salmon ESU	Threatened
Lower Columbia River Chinook Salmon ESU	Threatened
Lower Columbia River Chum Salmon ESU	Threatened
Columbia River Bull Trout	Threatened
Southwest Washington/Lower Columbia River Coho Salmon ESU	Candidate
Southwest Washington/Columbia River Coastal Cutthroat Trout ESU	Not Warranted
Upper Willamette River Coastal Cutthroat Trout ESU	Not Warranted

1.3) Responsible organization and individuals.

Oregon Department of Fish and Wildlife (lead contact):

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Oregon Department of Fish and Wildlife (hatchery contacts):

Oak Springs:	Lyle Curtis - Hatchery Manager - (541) 395-2546
Bonneville:	Randy Winters - Assistant Hatchery Manager - (541) 374-8393
Clackamas:	Bryan Zimmerman - Hatchery Manager - (503) 630-7210
Sandy:	Ken Bourne - Hatchery Manager - (503) 668-4222
Dexter Pond:	Tim W. Wright - Facility Manager - (541) 937-2714
Roaring River:	Tim Schamber - Hatchery Manager - (503) 394-2496
Willamette:	Gary Yaeger - Hatchery Manager - (541) 782-2933
Leaburg:	Tim C. Wright - Hatchery Manager - (541) 896-3294
Marion Forks:	Greg Grenbemer - Assistant Hatchery Manager - (503) 854-3522
South Santiam:	Bill Nyara- Hatchery Manager - (541) 367-3437

Other organizations involved and intent:
The production of summer steelhead (024) is funded in part (or whole) by the following agencies.

- USACE funding: South Santiam Hatchery (70%), Leaburg Hatchery (100%), Marion Forks Hatchery (83.75%), Bonneville Hatchery (55%), Willamette Hatchery (83.75%)
- ODFW funding: South Santiam Hatchery (30%) from State General Fund, Roaring River Hatchery (25%) from other state funds, Marion Forks Hatchery (16.25%), Willamette Hatchery (16.25%)
- NMFS funding: Clackamas Hatchery (29.6%), Sandy Hatchery (100%), Bonneville Hatchery (45%)
- USFWS funding: Roaring River Hatchery (75%), Oak Springs Hatchery (75%)
- PGE funding: Clackamas Hatchery (22%)
- BPA funding: Oak Springs Hatchery (25%)

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

Facility	Funding Source	Staffing Level	Facility Annual Operating Cost	Annual Steelhead Program Operating Costs
South Santiam	70% USACE 30% ODFW	4. 7	$587,564	$102,162
Oak Springs	75% Sports Fish Restoration 25% BPA	6.16	$458,750	$55,968
Bonneville	55% USACE 45% NMFS	17	$1,810,573	$199,163
Willamette	83.75% USACE 16.25% ODFW	12	$1,002,177	$110,239
Roaring River	75% Sports Fish Restoration 25% ODFW	4.75	$334,626	$69,267
Leaburg	100% USACE	7.25	$1,017,680	$122,121
Marion Forks	83.75% USACE 16.25% ODFW	4.75	$543,633	$0 [1/]

[1/] Acclimation at Marion Forks/Minto Pond requires 2-3 weeks and does not require a significant portion of the facility's operational funding.

Annual steelhead program operating costs were estimated by calculating the percentage of steelhead production poundage as compared to the overall facility production.

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

Table 1.5. Locations of summer steelhead spawning and rearing facilities.

Broodstock source	Skamania Summer Steelhead returning to Foster Dam trap
Broodstock collection location	South Santiam, 38.5 RM, Willamette
Adult holding location	South Santiam, 38.5 RM, Willamette
Spawning location	South Santiam, 38.5 RM, Willamette
Incubation location	South Santiam FH, South Santiam, 38.5 RM, Willamette; Oak Springs, Deschutes, 47 RM, Deschutes; Bonneville, Tanner Creek, 0.5 RM, Lower Columbia
Rearing location	South Santiam FH, RM 38.5 South Santiam River, Willamette Basin; Oak Springs FH, RM 47 Deschutes River, Deschutes Basin; Bonneville FH, RM 0.5 Tanner Creek, Lower Columbia basin; Willamette FH, RM 42 MF Willamette River, Willamette Basin; Roaring River FH, RM 1.2 Crabtree Creek trib, Willamette Basin; Leaburg FH, RM 39 McKenzie River, Willamette Basin; Dexter FH, RM 17 MF Willamette River, Willamette basin

1.6) Type of program.

Isolated harvest. The Upper Willamette summer steelhead program is managed to provide fish for sport fisheries, and to replace lost fisheries caused by habitat and passage loss/degradation in the Willamette River Basin and other lower Columbia basins.

1.7) Purpose (Goal) of program.

The goal of this *mitigation* program is to: provide fish for sports fisheries and replace fisheries lost due to habitat and production loss in the Willamette River Basin and other lower Columbia basins. Specific adult summer steelhead harvest goals are established in ODFW subbasin management plans and are listed in Table 1.7

Table 1.7. Average annual harvest goals for summer steelhead adults established in ODFW subbasin management plans.

Subbasin	Average Annual Harvest	OAR 635-500-
Mainstem Willamette above Will. Falls	500	-1170
Mainstem Santiam River	700	-1500
North Santiam River	4,500	-1500
South Santiam River	5,600	-1500
McKenzie River	1,200	-0269
Middle Fork Willamette River	2,250	-1300
Total Above Willamette Falls	14,750	
Clackamas River	7,000	-0830

1.8) Justification for the program.

ODFW first introduced summer steelhead into the upper Willamette basin in the latter 1960s. Summers initially were brought into the South Santiam River as mitigation for lost winter steelhead production in areas inundated by the Foster and Green Peter pools. This hatchery program was expanded to include annual smolt releases into the North Santiam, McKenzie, Middle Fork Willamette, and Molalla rivers as well, with the Molalla summer steelhead program being discontinued in 1997.

Winter steelhead were not used for mitigation in the South Santiam system for several reasons: 1) because winter steelhead spawn so late in the spring, a good smolt could not be produced in one year, meaning that twice as much pond space would be required to rear them; 2) since trap-and-transport and bypass facilities were incorporated into the dams, it was believed that production above the reservoirs would occur as it had in the past; 3) fisheries managers wanted to develop expanded steelhead angling opportunities.

Native winter steelhead had not provided the angling opportunity desired by sportsmen and fisheries managers, since they spawned and were essentially gone from the system by late May. High water through the late winter and spring often impacted, and sometimes substantially reduced, sport angling efforts for winter fish. By the time dependable weather rolled around, the winter fish were gone. The creation of a healthy summer run was intended to expand the duration of the steelhead angling season through the summer and fall and, in fact, that has happened. This hatchery program has created very popular recreational fisheries that have greatly extended the duration of the steelhead angling season. However, since the summer steelhead being used are not native to the upper Willamette, any interaction with listed salmonid populations may be significant. Various management actions have been implemented (in each subbasin) to minimize the potential for adverse effects on these populations,

specifically, winter steelhead, the species perceived to be most "at risk" from the current program, and spring chinook. The popularity of the summer steelhead fisheries, combined with the belief that current management measures (including ongoing research, monitoring and evaluation) have significantly reduced risk to listed salmonid populations, constitutes the primary justification for maintaining the program.

Natural production of summer steelhead associated with the hatchery program may adversely affect listed winter steelhead populations. Chilcote (1998) conducted an analysis of the effects of naturally produced summer steelhead on native Clackamas River winter steelhead. The analysis showed a 27% decrease in winter steelhead productivity associated with the occurrence of naturally spawning summer steelhead. Additionally, Chilcote (2003), while examining data from 12 steelhead populations throughout Oregon, concluded that steelhead spawning populations with a high frequency of wild fish tended to be more productive (as measured by recruits/spawner) than those populations with a lower frequency of wild fish. These results have implications to the entire Upper Willamette River Basin due to the co-occurrence of listed winter steelhead and non-native hatchery summer steelhead.

North and South Santiam

The summer steelhead section of the *Santiam and Calapooia Subbasin Fish Management Plan* (ODFW 1998) includes six "policies" (Oregon Administrative Rules) specific to the management of summer steelhead in the subbasin. These are listed below:

1. Summer steelhead shall be managed for production and harvest of hatchery fish. The Department shall monitor the run for possible natural production.

2. Summer steelhead smolts shall be released into streams that have suitable adult holding habitat throughout the summer and where adults will provide optimum recreational opportunity.

3. Summer steelhead in the South Santiam River shall be confined to releases at South Santiam hatchery to protect native winter steelhead production in the upper and lower South Santiam.

4. Summer steelhead in the North Santiam shall be released at or near Minto hatchery to protect native winter steelhead production in the North Santiam subbasin. No summer steelhead shall be released into Little North Fork Santiam River.

5. Only smolt-sized fish shall be released to minimize competition with native salmonids.

6. Brood stock shall be collected May through October to maintain broad run-timing while reducing overlap with the run timing of the native winter steelhead stock.

Policies 3 through 6 are explicitly intended to minimize potential adverse effects of the summer steelhead program on listed winter steelhead. [*It should be noted that Policy 3 also helps to minimize impacts to listed spring chinook that occur above Foster Dam; Policy 5 helps to minimize impacts to both listed winter steelhead and spring chinook.*]

In addition to Policies 3 through 6 above, the following actions are currently being implemented that facilitate removal of "surplus" hatchery fish before they have an opportunity to spawn naturally. (Note: those actions implemented in direct response to the ESA-listing of winter steelhead are *italicized*):

- *All smolts are released "on-station" to maximize adult homing and subsequent capture and removal.*

- The daily bag limit for summer steelhead has been increased to maximize harvest.
- *Recycling is discontinued in the fall and returning fish removed from the system in order to minimize the straying of hatchery fish to natural production areas.*

Ongoing monitoring associated with the current Biological Opinion for Hatchery Programs in the Upper Willamette ESUs includes surveys designed specifically to document natural spawning of summer steelhead in the Santiam basin. In addition, observations of unmarked adult summer steelhead made at capture facilities in the Santiam basin (e.g., North Santiam at Stayton Island, South Santiam at Foster Dam) provides valuable information on the extent of natural summer steelhead production in the basin.

McKenzie and MF Willamette

The McKenzie River and MF Willamette River summer steelhead programs are managed to provide maximum harvest opportunities while minimizing potential adverse effects on native salmonid populations. The program relies on disparate life history characteristics of the non-native summer steelhead stock to maintain some spatial and temporal separation from native steelhead and rainbow trout. (Note: summer steelhead are not native to the Willamette basin above Willamette Falls.) To maximize harvest, adults returning to the respective hatchery are hauled downstream and "recycled" through the fishery until approximately mid-October. An active fishery on summer steelhead continues in most subbasins until approximately December (Jeff Ziller, ODFW, personnel communication 8-28-03). To minimize straying of returning adults and to minimize freshwater competition with non-hatchery fish, all summer steelhead are stocked into each subbasin as full term smolts, and most are released at the hatchery. One exception to this practice is the release of 42,000 Roaring River Hatchery smolts into the Mainstem Willamette at Eugene. The purpose of this program is to create a fishery where none historically existed, and the use of out-of-system-reared smolts has been shown to be most effective in producing the highest catch rate. Other exceptions include releases approximately 14 miles downstream from Leaburg Hatchery on the McKenzie River and releases approximately 8 miles downstream from Dexter Rearing Facility on the Middle Fork Willamette. The off station releases into the McKenzie and the Middle Fork Willamette are made to spread out angling pressure. To encourage rapid out migration, all summer steelhead smolts are raised to a size of approximately 4.5 fish/lb prior to release. All hatchery steelhead are fin-marked (adipose clipped) for identification and to allow a selective fishery on hatchery fish.

1.9 & 1.10) List of program "Performance Standards" and "Performance Indicators" designated by "benefits" and "risks".

Note: Designation of benefit or risk may not reflect a universal opinion by ODFW staff. Benefit or risk is interpreted from the standpoint of effect of the hatchery program on a listed species.

Category 1: Legal Mandates

Standard 1.1: Program contributes to basin-wide mitigation requirements.

Indicator: Number and/or pounds of hatchery smolts released into the Upper Willamette River Basin (UWRB) annually. **Risk**

Category 2: Harvest

Standard 2.1: Fish are produced and released to meet harvest objectives (average annual catch of 14,750 above Willamette Falls) established in ODFW management plans, while minimizing potential for adverse impacts to listed salmonid populations.

Indicator: Annual number of fish produced by this program which are harvested in the

Upper Willamette Basin. **Benefit**

Indicator: Annual number of listed salmonid species caught (including fish retained and fish released/discarded) in fisheries targeting this population. **Risk**

Indicator: Recreational angler days generated annually by the summer steelhead fishery. **Benefit**

Standard 2.2: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable selective harvest of hatchery origin fish in respective fisheries.

Indicator: Pre-release marking rate. **Benefit**

Indicator: Pre-release tag retention rate (PIT tags, CWT's etc.). **Benefit**

Standard 2.3: Excess adult hatchery returns are "recycled" through the fishery to increase harvest rate.

Indicator: Number of hatchery fish recycled. **Benefit**

Indicator: Number of recycled hatchery fish harvested in the sport fishery. **Benefit**

Indicator: Number of recycled hatchery fish straying into non-target tributaries. **Risk**

Category 3: Conservation of ESA-listed salmonid populations

Standard 3.1: Juveniles are released at a time and size to expedite their out-migration and minimize impacts on native species.

Indicator: Date and size of hatchery summer steelhead juveniles at release. **Risk**

Standard 3.2: Juvenile release strategies minimize direct impacts (e.g., predation, competition, behavioral) on wild winter steelhead and spring chinook juveniles.

Indicator: Type of release (i.e., volitional, forced, or direct). **Risk**

Indicator: Extent of hatchery smolt residualism. **Risk**

Indicator: Inter- and intra-specific competition and predation interactions. **Risk**

Indicator: Out-migration timing of hatchery smolts relative to similar life stages of juvenile winter steelhead and spring chinook. **Risk**

Standard 3.3: Release groups are sufficiently marked to allow evaluation of program effect on local natural population(s).

Indicator: Pre-release marking rates and type and quality of mark. **Benefit**

Standard 3.4: Juvenile release strategies are designed to maximize homing ability to intended return location and minimize extent of adult straying (and associated potential for impacts to natural production) in the basin.

Indicator: Location of juvenile releases. **Risk**

Indicator: Length and timing of acclimation period. **Risk**

Indicator: Release type (volitional, forced, or direct). **Risk**

Indicator: Proportion of adult returns to program's intended return location(s). **Risk**

Standard 3.5: The hatchery summer steelhead program has minimal adverse effects on ESA-listed winter steelhead and spring chinook populations in the UWRB.

Indicator: Number of adult hatchery summer steelhead returning to respective subbasins. **Risk**

Indicator: Number of hatchery fish harvested by anglers in the respective subbasins. **Benefit**

Indicator: Number of hatchery adults removed from the systems (via broodstock collection, harvest, and/or seasonal removal to prevent straying). **Benefit**

Indicator: Estimated total proportion of adult hatchery population on natural spawning grounds. **Risk**

Indicator: Number of natural adult summer steelhead and/or redds observed during spawning surveys. **Risk**

Indicator: Number of naturally produced (i.e. unmarked, subjected to scale analysis to verify origin) adult summer steelhead returning to the respective subbasin. **Benefit**

Indicator: Population status of winter steelhead and spring chinook relative to estimated natural production levels (and potential impacts) of summer steelhead in the respective subbasin. **Risk**

Indicator: Extent of interbreeding between hatchery fish and naturally produced fish. **Risk**

Standard 3.6: Basin-wide and local annual release numbers do not exceed estimated basin-wide and local habitat capacity; including spawning, freshwater rearing, migration corridor, and estuarine and near-shore rearing locations.

Indicator: Carrying capacity criteria for basin-wide and local habitat. **Benefit**

Indicator: Annual release numbers from each program in basin, including size and life stage at release, and length of acclimation. **Benefit**

Indicator: Annual estimates of naturally produced juveniles present. **Benefit**

Indicator: Location of releases and natural rearing areas. **Risk**

Indicator: Run timing of hatchery releases, compared to natural populations. **Risk**

Indicator: Residualism rates of artificially produced juveniles in natural habitat. **Risk**

Category 4: Operation of artificial production facilities

Standard 4.1: All involved hatcheries will be operated in compliance with the Integrated Hatchery Operations Team (IHOT) fish health guidelines and the ODFW Fish Health Management Policy and Fish Hatchery Management Policy.

Indicator: Number of broodstock sampled and pathogens observed. **Risk**

Indicator: Rearing survival rates (i.e. egg to fry, and fry to smolt). Results of fish health examinations. **Risk**

Indicator: Number of juveniles sampled and pathogens observed immediately prior to release. **Risk**

Standard 4.2: Water discharged from all involved hatcheries (or other facilities) will comply with proscribed National Pollutant Discharge Elimination System (NPDS) permit as required by the Oregon Department of Environmental Quality (DEQ).

Indicator: Water samples collected and results reported. **Risk**

Indicator: Results within accepted criteria. **Risk**

Standard 4.3: Water withdrawal (i.e. intake) for all involved hatcheries (and other related facilities) will be constructed and operated in such a way as to minimize impacts on other species present in the system.

Indicator: Intake screens comply with the NOAA Fisheries juvenile fish screening criteria. **Risk**

Standard 4.4: Wild spring chinook, winter steelhead, and other native fishes that enter any hatchery trap or holding facility will be handled and released in a manner that minimizes stress, injury, mortality and delay in migration.

Indicator: Numbers of unmarked adult winter steelhead and spring chinook released alive above trap. **Risk**

Indicator: Numbers of unmarked juvenile *O. mykiss* and spring chinook handled at trap and released downstream. **Risk**

Indicator: Mortalities of unmarked spring chinook and winter steelhead at each hatchery facility during operation of the adult trap. **Risk**

Indicator: Dates the trap is operated and frequency of handling unmarked winter steelhead and spring chinook. **Risk**

Standard 4.5: All hatchery summer steelhead carcasses used for stream enrichment will comply with a Memorandum of Agreement (MOA) between DEQ and ODFW.

Indicator: Number and locations of summer steelhead chinook carcasses distributed. **Benefit**

Indicator: Number of carcasses sampled and pathogens observed. **Risk**

Category 5- Socio-economic benefits

Standard 5.1: Each basin-specific summer steelhead program will be managed such that estimated harvest benefits of the program will equal or exceed hatchery production costs based on the benefit-cost model in ODFW (1999) or an updated version of that model.

Indicator: Estimated annual budget expenditures. **Benefit**

Indicator: Estimated economic benefit from angler days generated by the program.

Benefit

1.11) Expected size of program.

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

A return of 2,000 adults to Foster Dam is necessary to insure that broodstock needs are met. Only 1,000 adults are required for broodstock, but the overage allows for mortality and better variety for selection of timing segments.

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

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	North Santiam River/Minto Pond (April Release)	161,500
	South Santiam River (April Release)	144,000
	Willamette River @ Eugene (April Release)	42,000
	Middle Fork Willamette (April Release)	115,000
	McKenzie River (April Release)	108,000

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

Adult production
Estimates of adult summer steelhead production from the South Santiam hatchery Skamania Stock StS programs in the Upper Willamette River Basin (UWRB), for the last 10 years, are presented in Table 1.12. The estimated number of adult hatchery summer steelhead produced was derived from a variety of data sources.

The "Freshwater Sport" column is based on punch card estimates of catch in the UWRB. Summer steelhead are not native to the UWRB, therefore all summer steelhead caught in this basin are assumed to be from this program. The "Hatchery Return" column depicts the actual count of program-specific adult hatchery summer steelhead returns at Powerdale Dam on the Hood River, at Marmot Dam and Sandy Hatchery in the Sandy Basin, and at Clackamas, Marion Forks/Minto, South Santiam, McKenzie, Leaburg, and Willamette/Dexter Hatcheries in the Willamette Basin. Estimates are not available for the number of hatchery summer steelhead that strayed to natural spawning areas in any of the basins.

In order to relate adults produced to smolt release numbers it is necessary to estimate the age composition of the catch and hatchery returns. The hatcheries report a small number of "jack" summer steelhead returns, which were assumed to be 1-salt fish. Age determinations from scale samples were used to estimate the number of 2-salt and 3-salt fish among the reported punch card catch and "adult" hatchery

returns. The average age composition from the last 10 years was used to estimate brood year. The historic average age composition was 86.9% 2-salt and 13.1% 3-salt (Buchanan 1977, Buchanan et. al 1979, Wade and Buchanan 1983, Kirk Schroeder personnel communication 2002). A smolt to adult survival rate was estimated as the sum of the catch and hatchery escapement, divided by the number of smolts released.

Table 1.12. Estimated total adult hatchery summer steelhead produced per brood year, from smolts released in the Willamette Basin. Derived from ODFW hatchery and punch card data.

Brood Year	Smolt Release	2-Salt Return Year	Estimated Adult Hatchery STS (2-salt + 3-salt)			
			Freshwater Sport	Hatchery Return	Spawning grounds	Smolt to Adult Surv
1989	614,068	1991-92	8,398	2,697	n.a.	1.81%
1990	625,569	1992-93	16,907	3,863	n.a.	3.32%
1991	722,811	1993-94	15,429	3,875	n.a.	2.67%
1992	550,562	1994-95	9,652	3,937	n.a.	2.47%
1993	526,170	1995-96	8,680	4,809	n.a.	2.56%
1994	489,372	1996-97	5,679	3,040	n.a.	1.78%
1995	544,945	1997-98	11,326	5,091	n.a.	3.01%
1996	754,768	1998-99	9,625	5,253	n.a.	1.97%
1997	687,372	1999-00	10,599	7,241	n.a.	2.60%
1998	752,897	2000-01	12,850	10,833	n.a.	3.15%
Avg.	626,853		10,915	5,064		2.53%

Adult fish harvested

Summer steelhead (stock 24) are taken in sport fisheries throughout the Upper Willamette subbasins. Current ODFW summer steelhead (stock 024) fish management plans provide an average annual sport catch of: 1,200 adult summer steelhead in the McKenzie River subbasin; provide for an annual sport catch of 2,250 summer steelhead in the Middle Fork Willamette subbasin; increase recreational catch of summer steelhead above Willamette Falls to an average of 500 fish; increase potential average annual sport catch to 700 summer steelhead in the mainstem Santiam, 4,500 in the North Santiam, and 5,600 in the South Santiam.

Escapement goals

Skamania summer steelhead stock 24 are managed to minimize natural spawning escapement in each target watershed. Summer steelhead are not native to the Willamette basin. Escapement goals are based upon projected harvest and broodstock production needs. Harvest goals are identified in the preceding paragraph. Fish for brood stock are collected only at Foster Dam, as all spawning of summer steelhead is done at South Santiam Hatchery. Desired escapement for annual brood needs is 2,000 fish.

Fish Management Plan	Projected Escapement Goal
South Santiam Subbasin	11,200 (including 2,000 to Foster Dam)
North Santiam Subbasin	9,000
McKenzie Subbasin	2,400

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

Summer steelhead (Skamania stock 024) was first introduced into the North Santiam River in 1966, the McKenzie River in 1968, and the South Santiam River in 1969 (ODFW 1990). This same stock was later

introduced into the McKenzie, Sandy, Middle Fork Willamette, and Molalla, in 1972, 1975, 1981, and 1984 respectively (ODFW 1990).

1.14) Expected duration of program.

The program is expected to continue indefinitely.

1.15) Watersheds targeted by program.

In the Upper Willamette River Basin, summer steelhead (stock 024) are currently released into reaches of the McKenzie River, the Middle Fork Willamette River, the North Fork Santiam River, South Fork Santiam River, and the Mainstem Willamette River near Eugene. Releases by Federal ESA Listing unit are reported in Table 1.15.

Table 1.15. Hatchery summer steelhead stock 024 smolt release locations, numbers and associated Federal ESA listed Evolutionarily Significant Unit (ESU).

Release Location	Release Number	ESU *			
		UW Sthd	UW Chin	CR BT	Chub
N. Santiam River	161,500	X	X	X?	X
S. Santiam River	144,000	X	X	X?	X
Will. R. @ Eugene	42,000		X	X?	X
M Fk Willamette R.	115,000		X	X	X
McKenzie River	108,000		X	X	X

* = UW Sthd - Upper Willamette River Steelhead ESU; UW Chin - Upper Willamette River Chinook Salmon ESU; CR BT = Columbia River Bull Trout; Chub = Oregon Chub

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

NORTH SANTIAM SUBBASIN

This program mitigates for fishery losses associated with the construction of Detroit and Big Cliff dams on the North Santiam River. The annual allocation of 161,500 smolts has provided adequate returns to the fishery. In recent years, above average run sizes have resulted in large numbers of "surplus" fish being present in the subbasin. Various management issues and actions (described previously in Section 1.8) have been implemented to minimize the potential adverse effects of the program on listed winter steelhead, the species perceived to be most "at risk" from the program.

1.16.1 Brief Overview of Key Issues (*North Santiam*)

Issue 1: Natural production of summer steelhead may result in a decrease in productivity of the native winter steelhead population in the North Santiam subbasin.

The impacts of spawning hatchery fish on the viability of the subject wild population are unknown. However, results from analysis of the effects of hatchery summer steelhead on native winter steelhead productivity in the Clackamas basin provide cause for concern (Chilcote 1998). In recent years, management of the North Santiam subbasin's summer steelhead program has been modified to reduce the level of hatchery-associated risk to the winter steelhead population.

Issue 2: Hatchery summer steelhead smolts may prey upon juvenile Willamette spring chinook, Oregon

chub and/or Willamette winter steelhead.

Analysis of stomach samples taken from steelhead smolts caught by angling from the McKenzie River in 2001 and 2003 has not confirmed predation of juvenile spring chinook by juvenile steelhead. However, predation by hatchery rainbow trout on juvenile spring chinook has been documented in the McKenzie River. It is therefore likely that some predation by steelhead does occur in streams where they co-habit, including the North Santiam River.

Issue 3: Residualism of hatchery summer steelhead smolts may contribute to reduced survival of juvenile winter steelhead in the North Santiam subbasin.

Intra-specific competition constitutes the primary mechanism of potential impact. Competition for rearing space and available food supply will result from hatchery summer steelhead smolts that take up residence in the stream, instead of migrating to the ocean. They may have an advantage because of their size, compared to the smaller naturally produced steelhead juveniles in the river, and displace the wild fish to the habitats requiring more effort to survive and grow. Predation on juvenile winter steelhead (age 0) may also be a factor.

Issue 4: Summer steelhead adult returns tend to be positive for infectious hematopoietic necrosis virus (IHNV). Transmission of IHNV to other fish species in the basin can negatively affect production of both wild and hatchery stocks.

The impacts of IHNV on listed salmon and steelhead are currently unknown. Existing measures designed to minimize natural spawning by summer steelhead should also minimize the subject risk.

Issue 5: Existing facilities associated with the operation of Marion Forks Hatchery require improvement.

Issues 5a, b, and c (below) pertain to facility improvements that enhance/facilitate hatchery operation and personnel safety. Resolution of these issues would facilitate the processing of wild winter steelhead encountered during hatchery operations.

5a: Fish processing facilities at the Minto Trap need to be structurally modified to: 1) achieve compliance with NOAA Fisheries handling guidelines and 2) better accommodate the transfer of summer steelhead to liberation trucks.

The need for such improvements increased dramatically once ODFW started "recycling" large numbers of hatchery adults to increase harvest.

5b: A new liberation truck is needed to accommodate the recycling of adult summer steelhead.

The need for such improvements increased dramatically once ODFW started recycling large numbers of hatchery adults to maximize harvest. Additional personnel (estimate 1 seasonal EBA for 6 months per annum) are needed to operate the truck.

5c: The existing adult holding pond (Minto Pond) needs to be modified so that at higher flows the trap can be operated to collect adults or the pond used for acclimating smolts.

As river flows increase above 2,500 cfs, operation of the trap becomes increasingly inefficient. Above 3,500 cfs the trap is virtually inoperable. It is not uncommon, during a wet fall, for flows to exceed that level as the reservoir is being evacuated. The longer into the fall that the trap is functional, the greater number of steelhead can be trapped and removed.

The trap also needs to function as an acclimation facility for smolts just prior to release. Flow levels below Big Cliff Dam are unpredictable during the time period when summer steelhead smolts need to be acclimated, i.e., March through mid-April. When the river level gets too high, water backs into the pond area, reducing flow through the holding pond, and making it unsuitable to accommodate a large number of fish. It also is more difficult to get the fish to move out at release if there is little current.

Issue 6: Summer steelhead, an introduced species in the upper Willamette basin, are utilized in hatchery programs that mitigate for the loss of native winter steelhead production associated with the construction of Big Cliff and Detroit dams/reservoirs; re-establishment of native winter steelhead production above the subject dams comprises an essential aspect of stock recovery in the basin.

Mitigation for lost winter steelhead production above Big Cliff and Detroit dams was (and continues to be) provided in the form of Marion Forks Hatchery and associated production of summer steelhead. Re-establishment of native winter steelhead production above Detroit dam constitutes a high priority management objective in the basin (ODFW 1992). The absence of out-migrant passage facilities at Detroit and Big Cliff dams is believed to preclude attainment of this objective at this time.

Issue 7. Monitoring capability at Stayton Island (Bennett dams) needs to be improved to: 1) reduce trapping-associated impacts on listed fish and 2) improve the precision of run size estimates presently generated from partial counts at these locations.

1.16.2 Alternatives to the Current Program (*North Santiam*)

Alternative Action 1

Description: **Implement "first time" removal of adult summer steelhead at existing capture facilities.**

Removal of summers when they first arrive at Minto would greatly decrease the number of fish still in the river at spawning time. It is assumed that not all steelhead in the North Santiam will actually return to Minto, but because smolts are acclimated and released at that site, most of them can be expected to return there. The portion of the run that could be prevented from spawning in the wild is substantial.

Summer steelhead begin arriving at the Minto trap in June. Peak angling effort is from May through July. During the peak of the run and angling season, fish are in prime condition. Presently, hatchery summer steelhead returning to Minto trap are recycled through the summer and early fall periods to maximize harvest. First time removal at Minto would reduce angling opportunity and prevent high quality fish from being taken by the angling community. It would also provide ODFW with a greater challenge in disposing of the fish removed.

Information on the contribution of recycled fish to sport fishery in the North Santiam, while limited, suggests that harvest rates may be at least comparable to those observed in the South Santiam fishery. Initial analyses of 2003 creel data from the South Santiam River indicates that of 4607 summer steelhead recycled, 1825 (39.6%) showed up in the fishery. Coincidentally, recycled fish comprised an estimated 39.2% of the total summer steelhead catch in the South Santiam. These results clearly illustrate the significance/importance of recycled fish to the fishery. ODFW plans to initiate a comprehensive assessment of the North Santiam recycling program in 2005 (comparable to the aforementioned South Santiam assessment).

Spawning surveys conducted in select North Santiam basin tributaries in 2003-04 indicate that summer steelhead stray rates could be relatively high. These surveys were specifically intended to document the

extent of summer steelhead spawning activity in the subject streams. Determination of spawner origin (i.e. summer vs. winter) was based on the time of year the activity was observed. It has been acknowledged that significant overlap in spawn timing between summer and winter run steelhead may occur and that additional investigations, specifically those involving fish genetics, are critical to any comprehensive assessment of potential impacts. Genetic investigations would provide critical information specific to the level of natural summer steelhead production (hybridization included) taking place. In the juvenile competition (and hybridization) context, the degree of impact (and genetic influence) would be definitively ascertained via genetic analyses of tissue samples collected from naturally produced juveniles sampled in streams where spawning by suspected summer steelhead has been observed. Depending on the outcome of these initial (juvenile) assessments, subsequent investigations could be conducted to determine the origin of: 1) early spawning, naturally produced adults (currently classified, perhaps erroneously, as summer steelhead) and/or 2) eggs/alevins excavated from redds made by early spawning adults.

Removal of summer steelhead at Stayton Island via traps at the Bennett dams would eliminate all natural production of summer steelhead (and the associated potential impacts to winter steelhead) above this point. Removal would also eliminate a very popular and well-established consumptive fishery for hatchery summer steelhead above Stayton Island. The socio-political ramifications of such an action would be profound.

Access to Upper Bennett Dam, a primary passage route taken by adult summer steelhead, is through privately owned land. Development of the site for the subject purpose would require acquisition of an access agreement with the property owners. Additional infrastructure would be required at the trap to accommodate the program.

Recommendations: 1) Continue the status quo as it relates to the operation of the subject facilities and processing of adult hatchery summer steelhead; consider removing summer steelhead adults returning to Minto trap earlier in the fall (when angling effort typically drops off) to reduce stray potential 2) Continue documenting the occurrence of naturally and hatchery produced adult summer steelhead at the Bennett dams and, to the extent possible, on the spawning grounds (including the presence of recycled hatchery adults) 3) Conduct genetic analyses on juvenile *O. mykiss* sampled at selected locations throughout the basin to determine the extent of natural summer steelhead production and/or hybridization with winter steelhead 4) Conduct a comprehensive assessment of the North Santiam recycling program in 2005.

Alternative Action 2

Description: **Reduce the number of smolts released up to and including program elimination**.

A reduction in the number of hatchery fish released would reduce the potential for negative impacts to the winter steelhead population by: 1) reducing post-release interactions between hatchery smolts and juvenile wild winter steelhead and 2) reducing the potential for natural production to occur since fewer adults would be returning to the basin.

Established mitigation agreements and associated legal obligations would need to be adjusted accordingly under this scenario. The socio-political ramifications under this scenario could be substantial depending on the severity of the program reduction.

Recommendations: Maintain current program.

Alternative Action 3

Description: **Remove "non-migrants" from hatchery release groups to reduce residualism.**

Currently, all hatchery smolts are acclimated at the Minto facility prior to being released. While volitional release methods are initially employed, non-migrants are eventually subjected to manual release. Removal of hatchery fish not actively smolting could reduce the level of residualism and its associated impact on native winter steelhead juveniles.

Recommendation: Investigate methods of cost-effectively removing non-migrants from hatchery release groups.

1.16.3 Potential Reforms and Investments (*North Santiam*)

Potential Reforms and Investment 1

Description and Implications/Importance
Fish processing facilities at the Minto Trap need to be structurally modified to: 1) achieve compliance with NOAA Fisheries handling guidelines, and 2) better accommodate the transfer of hatchery summer steelhead to liberation trucks for recycling.

Cost Estimate
$$-$$$

Potential Reforms and Investment 2

Description and Implications/Importance
Purchase a new fish liberation truck to accommodate the recycling of hatchery adults.

Cost Estimate
$$

Potential Reforms and Investment 3

Description and Implications/Importance
Employ the personnel necessary to operate the fish liberation truck described in R&I #2 above (e.g. EBA-1 for 6 months each year).

Cost Estimate
$

Potential Reforms and Investment 4

Description and Implications/Importance
Reconstruction/modification of the holding pond to allow trap operation and accommodate smolt acclimation at higher river levels.

Cost Estimate
$$-$$$

Potential Reforms and Investment 5

Description and Implications/Importance
Improve monitoring capability at Stayton Island (Bennett dams). Monitoring at these locations provides valuable information on summer steelhead run size and composition. Partial counts are expanded to estimate total run size to the basin. Status quo monitoring consists of physically detaining and handling fish, on average, 4 out of 7 days a week during the migration period. Managers presently desire to transition the operation to one that is less traumatic for listed fish. The City of Salem is planning to replace the fishway and trap at Upper Bennett in 2004 and Lower Bennett in 2005. The current design incorporates some accommodation for the possible future installation of Vaki "River Watcher" and/or conventional viewing chamber. However, costs to implement either approach, particularly the latter, are presently beyond the City's capability and will thus not be implemented in the near future barring the unanticipated acquisition of available funding. This investment is viewed as a high priority need by managers as its implementation would have an immediate beneficial effect on listed winter steelhead and spring chinook by reducing take levels associated with the monitoring status quo at the site. The precision of the passage estimates generated via the monitoring would also be much more precise since monitoring would occur 24 hours a day, 7 days a week.

Cost Estimate
$$-$$$$

Applicable references or Studies
Bennett Dam trapping records are available upon request.
City of Salem's fishway and trap designs may be available upon request.

Potential Reforms and Investment 6

Description and Implications/Importance
Provide viable downstream passage opportunities for listed winter steelhead out-migrants at Detroit and Big Cliff dams via implementation of: 1) appropriate technical investigations; and 2) structural and/or operational modifications designed to provide passage. $$-$$$$$$

For reference:

$	<$50,000
$$	$50,000-<$100,000
$$$	$100,000-<$500,000
$$$$	$500,000-<$1,000,000
$$$$$	$1,000,000-$5,000,000
$$$$$$	>$5,000,000

SOUTH SANTIAM SUBBASIN

This program mitigates for fishery losses associated with the construction of Foster and Green Peter dams on the South Santiam River. The annual allocation of 144,000 smolts has provided adequate returns to the fishery. In recent years, above average run sizes have resulted in large numbers of "surplus" fish being present in the subbasin. Various management issues and actions (described previously in Section 1.8) have been implemented to minimize the potential adverse effects of the program on listed winter steelhead, the species perceived to be most "at risk" from the program.

1.16.1 Brief Overview of Key Issues (*South Santiam*)

Issue 1: Natural production of summer steelhead may result in a decrease in productivity of the native winter steelhead population in the South Santiam subbasin.

The impacts of spawning hatchery fish on the viability of the subject wild population are unknown. However, results from analysis of the effects of hatchery summer steelhead on native winter steelhead productivity in the Clackamas basin provide cause for concern (Chilcote 1998). In recent years, management of the South Santiam subbasin's summer steelhead program has been modified to reduce the level of hatchery-associated risk to the winter steelhead population.

Issue 2: Hatchery summer steelhead smolts may prey upon juvenile Willamette spring chinook, Oregon chub and/or Willamette winter steelhead.

Analysis of stomach samples taken from steelhead smolts caught by angling in the McKenzie River during 2001 and 2003 has not confirmed predation of juvenile spring chinook by juvenile steelhead. However, predation by hatchery rainbow trout on juvenile spring chinook has been documented in the McKenzie River. It is therefore likely that some predation by steelhead does occur in streams where they co-habit, including the South Santiam River.

Issue 3: Residualism of hatchery summer steelhead smolts may contribute to reduced survival of juvenile winter steelhead in the South Santiam subbasin.

Intra-specific competition constitutes the primary mechanism of potential impact. Competition for rearing space and available food supply will result from hatchery summer steelhead smolts that take up residence in the stream, instead of migrating to the ocean. They may have an advantage because of their size, compared to the smaller naturally produced juveniles in the river, and displace the wild fish to the habitats requiring more effort to survive and grow. Predation on juvenile winter steelhead (age 0) may also be a factor.

Issue 4: Summer steelhead adult returns tend to be positive for infectious hematopoietic necrosis virus (IHNV). Transmission of IHNV to other fish species in the basin can negatively affect production of both wild and hatchery stocks.

The impacts of IHNV on listed salmon and steelhead are currently unknown. Existing measures designed to minimize natural spawning by summer steelhead should also minimize the subject risk.

Issue 5: Existing facilities associated with the operation of South Santiam Hatchery require improvement

Issues 5a-d (below) constitute infrastructure critical to implementation of the subject hatchery program in a manner that affords sufficient protection to listed winter steelhead and spring chinook populations. Issues 5e-g primarily pertain to facility improvements that enhance/facilitate hatchery operation, personnel safety and/or comfort.

5a: Fish processing facilities at the Foster Trap need to be structurally modified to: 1) better accommodate the transfer of adult summer steelhead to liberation trucks and 2) minimize handling of listed winter steelhead and spring chinook associated with current and future operations (i.e. compliance with NOAA Fisheries fish handling guidelines).

The need for such improvements increased significantly once ODFW started recycling summer steelhead.

5b: The hatchery's water supply lacks state-of-the-art treatment capability and is vulnerable to contamination by various water-borne pathogens

Treatment capability would eliminate concerns associated with the release of potential IHNV carriers, wild winter steelhead included, above Green Peter reservoir.

5c: The hatchery intake screen in Foster Reservoir is not in compliance with NOAA Fisheries screening criteria.

5d: A settling pond is needed to meet ODEQ and USEPA discharge requirements.

5e: The hatchery's incubation area is confined and needs to be enlarged to facilitate the efficient maintenance of eggs and alevins.

5f: The adult spawning facility should be improved to facilitate sorting/loading and egg taking operations.

Personnel safety issues result from sloped pond sides and the crude, labor-intensive nature of the facilities.

5g: One of the hatchery residences, an old mobile home, needs to be replaced.

Issue 6: Summer steelhead, an introduced species in the upper Willamette basin, are utilized in hatchery programs that mitigate for the loss of native winter steelhead production associated with the construction of Foster and Green Peter dams/reservoirs; re-establishment of native winter steelhead production above Green Peter dam comprises an essential aspect of stock recovery in the basin.

Mitigation for lost winter steelhead production in the South Santiam above Foster Reservoir and, more significantly, above Green Peter Dam was (and continues to be) provided in the form of South Santiam Hatchery and associated production of summer steelhead. Re-establishment of native winter steelhead production above Green Peter dam constitutes a high priority management objective in the basin. The absence of suitable out-migrant passage facilities at Green Peter reservoir and dam are believed to preclude attainment of this objective at this time.

6a: Natural production of listed winter steelhead in the upper Middle Santiam River is precluded by a lack of functional fish passage facilities at Green Peter Dam.

The results of past investigations indicated that juvenile survival in the reservoir-proper is severely constrained by a combination of delay and/or residualism associated with the reservoir's large size, convoluted shoreline, and slow velocities, and predation by northern pikeminnow and largemouth bass.

6b: Recommendations included in the "South Santiam Fishery Restoration Draft Reconnaissance Study (USACE 1995)" have not been implemented.

The Reconnaissance Study recommends implementation of a "test program" designed to evaluate the viability of floating juvenile surface collectors as a means of achieving adequate downstream passage through Green Peter Reservoir. It acknowledges that "the technology of the floating surface collector is not proven with steelhead and only marginally proven with chinook". The Study also recommends modifying the existing juvenile bypass system to provide temperature control in the existing adult fishway in order to resolve existing adult passage deficiencies.

1.16.2 Potential Alternatives to the Current Program (*South Santiam*)

Alternative Action 1

Description: **Implement "first time" removal of adult summer steelhead at existing and potential capture facilities.**

Presently, hatchery summer steelhead returning to Foster trap are recycled through the summer and early fall periods to maximize harvest. Recycling is discontinued in the fall and returning fish removed from the system in order to minimize the straying of hatchery fish to natural production areas. The 'first time" removal of hatchery fish returning to Foster trap (i.e. no recycling) would likely reduce the number of natural summer steelhead that spawn in the basin below Foster dam. Limited available information indicates that the level of natural summer steelhead production in the system is minimal; however, the extent of this production and its impacts on the health of the native winter steelhead population has yet to be determined.

Initial analyses of 2003 creel data from the South Santiam River indicates that of 4607 summer steelhead recycled, 1825 (39.6%) showed up in the fishery. Coincidentally, recycled fish comprised an estimated 39.2% of the total summer steelhead catch in the South Santiam. These results clearly illustrate the significance/importance of recycled fish to the fishery.

Spawning surveys conducted in select South Santiam basin tributaries in 2003-04 indicate that summer steelhead stray rates are relatively low (<10%). These surveys were specifically intended to document the extent of summer steelhead spawning activity in the subject streams. Determination of spawner origin (i.e. summer vs. winter) was based on the time of year the activity was observed. It has been acknowledged that significant overlap in spawn timing between summer and winter run steelhead may occur and that additional investigations, specifically those involving fish genetics, are critical to any comprehensive assessment of potential impacts. Genetic investigations would provide critical information specific to the level of natural summer steelhead production (hybridization included) taking place. In the juvenile competition (and hybridization) context, the degree of impact (and genetic influence) would be definitively ascertained via genetic analyses of tissue samples collected from naturally produced juveniles sampled in streams where spawning by suspected summer steelhead has been observed. Depending on the outcome of these initial (juvenile) assessments, subsequent investigations could be conducted to determine the origin of: 1) early spawning, naturally produced adults (currently classified, perhaps erroneously, as summer steelhead) and/or 2) eggs/alevins excavated from redds made by early spawning adults.

The removal of hatchery fish at Lebanon dam would eliminate a very popular and well established consumptive fishery for hatchery summer steelhead which occurs between Lebanon and Foster dams. The socio-political ramifications of such an action would be profound. The cessation of recycling at Foster dam would result in a decrease in harvest of hatchery summer steelhead and likely generate angler concern.

Development of the Lebanon dam site for the subject purpose would require design, installation, and maintenance of a new trapping facility. Currently, there are no traps at this location.

Recommendations: 1) Continue the status quo as it relates to the operation of the subject facilities and processing of adult hatchery summer steelhead; consider removing summer steelhead adults returning to Foster trap earlier in the fall (when angling effort typically drops off) to reduce stray potential 2) Continue documenting the occurrence of naturally and hatchery produced adult summer steelhead at Foster trap and, to the extent possible, on the spawning grounds (including the presence of recycled hatchery adults)

3) Conduct genetic analyses on juvenile *O. mykiss* sampled at selected locations throughout the basin to determine the extent of natural summer steelhead production and/or hybridization with winter steelhead 4) Continue the comprehensive assessment of the South Santiam recycling program in 2005.

Alternative Action 2

Description: **Reduce the number of smolts released, up to and including program elimination**.

A reduction in the number of hatchery fish released would reduce the potential for negative impacts to the winter steelhead population by: 1) reducing post-release interactions between hatchery smolts and juvenile winter steelhead; and 2) reducing the potential for natural production to occur since fewer adults would be returning to the basin.

Established mitigation agreements and associated legal obligations would need to be adjusted accordingly under this scenario. The socio-political ramifications under this scenario could be substantial depending on the severity of the program reduction.

Recommendations: Maintain current program.

Alternative Action 3

Description: **Remove "non-migrants" from hatchery release groups to reduce residualism.**

Currently, hatchery smolts are acclimated at the Foster facility prior to being released. While volitional release methods are initially employed, non-migrants are eventually subjected to manual release. Removal of hatchery fish not actively smolting could reduce the level of residualism and its associated impact on native winter steelhead juveniles.

Recommendations: 1) Investigate methods of cost-effectively removing non-migrants from hatchery release groups. 2) Consider modifying current angling regulations to allow the retention of marked trout.

1.16.3 Potential Reforms and Investments

Potential Reforms and Investment 1

Description and Implications/Importance
Structurally modify fish processing facilities at Foster Trap to achieve compliance with NOAA Fisheries handling guidelines.

Cost Estimate
$$-$$$$

Applicable references or Studies
An interagency (USACE, ODFW, NMFS) assessment of existing facilities was initiated in 2000 and 3 conceptual design alternatives developed.

Potential Reforms and Investment 2

Description and Implications/Importance
Installation of state-of-the-art water treatment capability at South Santiam Hatchery to reduce disease-associated risk to wild fish utilized in the hatchery program.

Cost Estimate
$$$

Potential Reforms and Investment 3

Description and Implications/Importance
Modifying the hatchery intake screen in Foster Reservoir to comply with NOAA Fisheries screening criteria to reduce entrainment or impingement of listed species.

Cost Estimate
Estimated cost after consult by SJO Consulting Engineers in 2002: $293,000.

Potential Reforms and Investment 4

Description and Implications/Importance
Installation of a settling pond at South Santiam Hatchery to insure compliance with ODEQ and USEPA discharge requirements.

Cost Estimate
$$$

Potential Reforms and Investment 5

Description and Implications/Importance
Expansion of the incubation area at South Santiam Hatchery for the purpose of facilitating the efficient management of eggs/alevins originating from hatchery and wild fish.

Cost Estimate
$$$

Potential Reforms and Investment 6

Description and Implications/Importance
Renovation of the adult spawning facility to facilitate sorting/loading and egg taking operations.

Cost Estimate
$$$

Potential Reforms and Investment 7

Description and Implications/Importance
Replacement of a mobile home at South Santiam Hatchery for the purpose of providing hatchery personnel with adequate living accommodations.

Cost Estimate
$$

Potential Reforms and Investment 8

Description and Implications/Importance
Implement: 1) appropriate technical investigations that compliment findings from the *"South Santiam*

Fishery Restoration Draft Reconnaissance Study (USACE 1995)" and 2) installation of infrastructure deemed necessary to provide adequate fish passage as determined via the outcome of the aforementioned investigations.

Potential Reforms and Investment 9

Description and Implications/Importance
Installation of a fish monitoring system at Lebanon Dam.

This R&I is desirable from a fish management perspective, as it would provide valuable information on run size of both hatchery and naturally produced components of the summer steelhead run. The City of Albany is planning to replace the existing fishways in 2005-06. The project design includes provisions for the possible future installation of a Vaki "River Watcher" in both the left and right bank fishways. Costs to fully implement the desired monitoring system are substantial and will likely need to be borne by an entity other than the City. This investment is viewed as a high priority need by managers as its implementation would provide immediate benefits in the form of critical population-specific data necessary for effective management and stock conservation.

Cost Estimate
$$-$$$$

Applicable references or Studies
City of Albany's fishway designs are in the early stages of development.

For reference:

$	<$50,000
$$	$50,000-<$100,000
$$$	$100,000-<$500,000
$$$$	$500,000-<$1,000,000
$$$$$	$1,000,000-$5,000,000
$$$$$$	>$5,000,000

MF WILLAMETTE SUBBASIN

This program mitigates for fishery losses associated with the construction of flood control dams in the upper Willamette Basin including Fall Creek, Hills Creek, Lookout Point and Dexter dams on the Middle Fork Willamette River. The annual allocation of 115,000 smolts has produced a popular fishery on the Willamette and Middle Fork Willamette rivers downstream from Dexter Dam. Because anglers generally harvest less than 1/3rd of the return and no fish are removed for broodstock collection, approximately 2/3^{rds} of the adults remain in the subbasin. Management issues and actions (described below) have been implemented in an attempt to minimize the potential adverse effects of the program on listed species.

The Summer Steelhead section of the *Middle Fork Willamette Subbasin Fish Management Plan* (ODFW, 1992) includes five "policies" (Oregon Administrative Rules) specific to the management of summer steelhead in the subbasin. These are listed below.

1. Summer steelhead shall be managed for production and harvest of hatchery fish. ODFW shall monitor the run for possible natural production.
2. Summer steelhead will not be passed above Fall Creek or Dexter Dams.
3. Only smolt-sized fish will be released to minimize competition with native salmonids.
4. Provide diversity of angling opportunity with an annual sport catch of 2,250 summer

steelhead in the subbasin.

5. Minimize impact of summer steelhead on the production of native trout.

Actions implemented to reduce the impact of summer steelhead on listed species include:

- Approximately 73% of the smolts are released from the rearing ponds to increase adult homing and potential capture and removal.
- To increase harvest, hatchery fish returning to Dexter Dam are captured and trucked downstream to recycle them through the sport fishery.
- The daily bag limit for summer steelhead has been increased to help increase harvest.

Ongoing monitoring associated with the current Biological Opinion for Hatchery Programs in the Upper Willamette ESUs includes surveys designed specifically to document natural spawning of summer steelhead in the Upper Willamette Basin. At this time, we are unable to determine the level of natural summer steelhead production in the basin.

1.16.1 Brief Overview of Key Issues (*MF Willamette*)

Issue 1: Hatchery summer steelhead smolts may compete with or prey upon juvenile Willamette Spring Chinook, Oregon chub and/or Willamette winter steelhead.

Analysis of stomach samples taken from steelhead smolts caught by angling in the McKenzie River during 2001 and 2003 has not confirmed predation of juvenile spring chinook by juvenile steelhead. However, this predation by steelhead probably does occur. Also, inter-specific competition between summer steelhead and native listed species constitutes a potential impact; however, the effect on listed fish species is probably not measurable.

Issue 2: Natural production of summer steelhead may result in a decrease in productivity or genetic viability of the native rainbow trout population in the Middle Fork Willamette Subbasin.

The impacts of hatchery summer steelhead on the native rainbow trout population are unknown. However, spot checks of spawning tributaries have confirmed that steelhead and native rainbow trout spawn in common tributaries at the same time of year.

Issue 3: Summer steelhead adult returns tend to be positive for infectious hematopoietic necrosis virus (IHNV). Transmission of IHNV to other fish species in the basin can negatively affect production of both wild and hatchery stocks.

IHNV has caused large losses of rainbow trout at the Leaburg Hatchery. ODFW staff has worked to minimize the chance of IHNV infection by: 1) rearing fingerling trout at other ODFW hatchery facilities until they are large enough to fight a potential infection, 2) trapping and removing a limited number of adult summer steelhead, and 3) minimizing cross contamination between rearing ponds. The impacts of IHNV on listed salmon and steelhead are currently unknown.

Issue 4: Returning summer steelhead can not be efficiently recycled through the fisheries or removed from the Willamette or Middle Fork Willamette rivers below Dexter Dam.

Currently, summer steelhead are not being removed from the Willamette or Middle Fork Willamette rivers. Numbers of steelhead ascending the ladder peak at the same time as numbers of spring chinook. To efficiently separate and remove steelhead when chinook numbers are high would require additional design and structural work for the fish sorting facility at Dexter Dam and a liberation truck dedicated to recycling summer steelhead. In addition, the fish ladder is not operated during the portion of the year that summer steelhead removal is most desired (late September through April). Additional personnel

(estimate 1 seasonal Fish and Wildlife Technician for at least 6 months per annum) would be needed to operate the trapping facility all year.

Other than harvest, we do not know the fate of summer steelhead returning to the Willamette River from releases between river mile 178 and 186. There is potential for increasing homing and eventually removing adult steelhead by rearing juveniles at acclimation facilities.

1.16.2 Potential Alternatives to the Current Program (*MF Willamette*)

Alternative Action 1

Description: Implement recycling and late season removal program for all adult summer steelhead returning to Dexter Dam.

Recycling summer steelhead can increase utilization of these fish by anglers and reduce the number of adults in the population. Removing summer steelhead captured at Dexter Dam after the majority of the fishery has been completed would reduce natural production of summer steelhead straying into tributaries downstream from the dam.

Removing summer steelhead after the majority of the fishery has concluded would reduce the potential for carrying IHNV to wild and hatchery fish in the Willamette and Middle Fork Willamette rivers.

Removing summer steelhead in the fall of the year would reduce the catch in the consumptive fishery that takes place in the Willamette and Middle Fork Willamette rivers throughout much of the year. Although data from recent years are not available, information collected from 1997 indicates approximately 10 percent of the fish are caught after October 1.

Recommendations: 1) Continue the status quo and assist with the design and implementation of more efficient facilities for processing of adult hatchery summer steelhead at Dexter Dam. 2) After capture facilities are built, recycle summer steelhead until early fall, then remove summer steelhead as they are captured at Dexter Dam. 3) Continue documenting the occurrence of naturally produced adult summer steelhead below Dexter Dam.

Alternative Action 2

Description: Implement removal of adult summer steelhead as they are captured at Dexter Dam.

Removing summer steelhead the first time they are captured at Dexter Dam would reduce natural production from summer steelhead straying into tributaries downstream from the dam. This action would reduce the potential for carrying IHNV to wild and hatchery fish in the Willamette and Middle Fork Willamette rivers downstream from Dexter Dam. This action would also reduce the catch of the popular consumptive fishery for hatchery summer steelhead in the Willamette and Middle Fork Willamette rivers below Dexter Dam.

Recommendations: 1) Continue the status quo and assist with the design and implementation of more efficient facilities for processing of adult hatchery summer steelhead at Dexter Dam. 2) After capture facilities are built, re-evaluate the feasibility of removing summer steelhead as they are captured. 3) Continue documenting the occurrence of naturally produced adult summer steelhead in tributaries below Dexter Dam.

Alternative Action 3

Description: Reduce the number of smolts released up to and including program elimination.

Reducing or eliminating the number of hatchery summer steelhead released would reduce the potential for negative impacts to other fish species by: 1) reducing post-release interactions between hatchery smolts and juvenile wild fish; 2) reducing the potential for natural production to occur because fewer adults would be returning to the basin; and 3) reducing the potential for IHNV transmission to other wild and hatchery fish.

The current program of 115,000 smolts released at Dexter Dam and 42,000 smolts released into the Willamette River between river mile 178 and 186, provides enough summer steelhead adults to generate an adequate catch rate for anglers during most years. Reduced smolt releases may not produce enough adults to generate a viable fishery during a larger percentage of return years.

Established mitigation agreements and associated legal obligations would need to be adjusted under this scenario. The socio-political ramifications of reducing or eliminating this popular fishery could be substantial.

Recommendations: Maintain current program with potential modifications as noted in other Alternative Actions.

Alternative Action 4

Description: To reduce residualism of summer steelhead released at Dexter Dam, remove juvenile steelhead that are unlikely to immediately migrate from the upper Willamette Basin.

Currently, all summer steelhead smolts released into the Middle Fork Willamette River are reared at Dexter Ponds immediately prior to liberation. While volitional release methods are employed for the first few days, steelhead that have not migrated are eventually subjected to manual release. Removal of hatchery fish not actively smolting or migrating could reduce the level of residualism and its associated impact on native species including winter steelhead juveniles.

Approximately 42,000 smolts are released into the Willamette River between river mile 178 and 186. Volitional release of these fish is currently not possible without some investment into acclimation facilities.

Recommendations: Investigate methods of removing non-migratory steelhead from hatchery release groups that are cost effective.

1.16.3 Potential Reforms and Investments (*MF Willamette*)

Potential Reforms and Investment 1

Description and Implications/Importance
Provide Dexter Dam fish ladder and trapping facilities that will sort fish without de-watering. Currently, fish are de-watered and manually separated into various dispositions (recycling, broodstock collection and transportation over the dams. The physical nature of the handling can lead to increased disease incidence especially in adult spring chinook. This investment would have a beneficial effect on listed spring chinook by reducing take at the site.

Cost Estimate
Unknown

Applicable references or Studies

Potential Reforms and Investment 2

Description and Implications/Importance
Design and build fish processing facilities at Dexter Dam to better accommodate the recycling and removal of adult summer steelhead. If Potential Reforms and Investment 1 is not built, there continues to be a necessity to easily separate summer steelhead adults from the other fish captured. The steelhead can then be recycled or removed form the river.

Cost Estimate
Unknown

Applicable references or Studies

Potential Reforms and Investment 3

Description and Implications/Importance
Purchase a new 1,200-gallon fish liberation truck to accommodate the recycling of steelhead hatchery adults.

Cost Estimate
$150,000

Applicable references or Studies

Potential Reforms and Investment 4

Description and Implications/Importance
Employ personnel necessary to operate the fish recycling and removal equipment all year (at least one FTE of Fish and Wildlife Technician). This would allow the trap to be operated continuously providing data on total run size and enabling fish removal.

Cost Estimate
$75,000 including some funds for supplies and services.

Applicable references or Studies

Potential Reforms and Investments 5

Description and Implications/Importance
Additional acclimation facilities are needed in the MF Willamette. Volitional release of fish into the MF Willamette River between river mile 178 and 186 is not possible due to the lack of acclimation facilities. Volitional (vs. direct) release is desired to enable removal of non-migrating smolts that may residualize and negatively interact with other native species.

Cost Estimate
$$$

Applicable references or Studies

For reference:

$	<$50,000
$$	$50,000-<$100,000
$$$	$100,000-<$500,000
$$$$	$500,000-<$1,000,000
$$$$$	$1,000,000-$5,000,000
$$$$$$	>$5,000,000

MCKENZIE RIVER SUBBASIN

This program mitigates for fishery losses associated with the construction of flood control dams in the upper Willamette Basin including Cougar and Blue River dams on the McKenzie River. The annual allocation of 108,000 smolts has produced a popular fishery on the McKenzie River downstream from Leaburg Dam. Because anglers generally harvest less than 1/3rd of the return and no fish are removed for broodstock collection, approximately 2/3^{rds} of the adults remain in the subbasin. Management issues and actions (described below) have been implemented in an attempt to minimize the potential adverse effects of the program on listed species.

The Summer Steelhead section of the *McKenzie Subbasin Fish Management Plan* (ODFW, 1988) includes four "policies" (Oregon Administrative Rules) specific to the management of summer steelhead in the subbasin. These are listed below:

1. Summer steelhead will be managed for production and harvest of hatchery fish.
2. Provide an average annual sport catch of adult summer steelhead produced from a maximum release of 120,000 smolts.
3. Reduce the potential impact of summer steelhead on the production of native trout and spring chinook.
4. Develop a brood stock from adults returning to the McKenzie River to produce smolts for the McKenzie and Middle Fork Willamette subbasins. [*This objective has not been implemented because of viral disease problems at Leaburg Hatchery*].

Actions implemented to reduce the impact of summer steelhead on listed species include:

- Approximately 75% of the smolts are released "on-station" to increase adult homing and subsequent capture and removal.
- Hatchery fish returning to Leaburg Hatchery and Leaburg Dam are recycled through the sport fishery to maximize harvest.
- The daily bag limit for summer steelhead has been increased to maximize harvest.
- Recycling is discontinued in the fall and returning fish removed from the system in order to minimize the straying of hatchery fish to natural production areas [*This action has been conducted in past years, however, it is currently not implementable until capture facilities are modified at Leaburg Hatchery*].

Ongoing monitoring associated with the current Biological Opinion for Hatchery Programs in the Upper Willamette ESUs includes surveys designed specifically to document natural spawning of summer steelhead in the McKenzie Basin. In addition, observations of unmarked adult summer steelhead made at the fish ladder at Leaburg Dam provide an index to the level of natural summer steelhead production in the basin.

1.16.1 Brief Overview of Key Issues (*McKenzie*)

Issue 1: Hatchery summer steelhead smolts may compete with or prey upon juvenile Willamette Spring Chinook.

Analysis of stomach samples taken from steelhead smolts caught by angling in 2001 and 2003 has not confirmed predation of juvenile spring chinook by juvenile steelhead. However, predation by hatchery rainbow trout on juvenile spring chinook has been documented in the McKenzie River. It is therefore likely that some predation by steelhead does occur. Inter-specific competition between summer steelhead and native species constitutes a potential impact; however, the effect on listed fish species is probably not measurable.

Issue 2: Natural production of summer steelhead may result in a decrease in productivity or genetic viability of the native rainbow trout population in the McKenzie Subbasin.

The impacts of hatchery summer steelhead on the native rainbow trout population are unknown. However, spot checks of spawning tributaries have confirmed that steelhead and native rainbow trout spawn in common tributaries at the same time of year.

Issue 3: Summer steelhead adult returns tend to be positive for infectious hematopoietic necrosis virus (IHNV). Transmission of IHNV to other fish species in the basin can negatively affect production of both wild and hatchery stocks.

IHNV has caused large losses of rainbow trout at the Leaburg Hatchery. ODFW staff has worked to minimize the chance of IHNV infection by rearing fingerling trout at other ODFW hatchery facilities until they are large enough to fight a potential infection, limiting trapping of adult summer steelhead, and minimizing cross contamination between ponds. Although fish losses can be reduced, fish released from Leaburg Hatchery could carry IHNV causing amplification of the virus in natural environments. The impacts of IHNV on listed salmon and steelhead are currently unknown.

Issue 4: Returning summer steelhead can not be efficiently removed from the fish ladders at Leaburg Dam.

Currently, summer steelhead are removed only from the left bank ladder at Leaburg Dam and only during periods of the year when low numbers of spring chinook salmon are present. Numbers of steelhead ascending the ladder peak at the same time as numbers of spring chinook. To separate and remove steelhead without handling the chinook will require additional design and structural work for both the left and right- bank ladders at the dam. The Eugene Water and Electric Board owns and operates the dam and associated ladders.

Issue 5: Hatchery reared summer steelhead returning to Leaburg Hatchery can not be efficiently collected for either recycling through the fishery or removal from the river.

Fish processing facilities at Leaburg Hatchery need to be designed and built to better accommodate the capture and subsequent transfer of summer steelhead to liberation trucks. The need for such improvements increased dramatically once ODFW started “recycling” large numbers of hatchery adults to maximize harvest. Additional personnel (estimate 1 seasonal EBA for 6 months per annum) may be needed to operate the trapping facility.

1.16.2 Potential Alternatives to the Current Program (*McKenzie*)

Alternative Action 1

Description: Implement recycling and late season removal program for all adult summer steelhead returning to Leaburg Dam and Leaburg Hatchery.

Recycling summer steelhead can increase utilization of these fish by anglers and reduce the number of adults in the population. Removing summer steelhead captured at Leaburg Hatchery and Leaburg Dam after the majority of the fishery has been completed would eliminate all natural production of summer steelhead upstream from river mile 39 and reduce steelhead straying into tributaries downstream from the dam. Data from the videotapes at the Leaburg Dam fish ladder indicate that the level of natural summer steelhead production in the system has been about 10 percent of the run.

Removing summer steelhead after the majority of the fishery has concluded would reduce the potential for carrying IHNV to wild and hatchery fish in the McKenzie River upstream from Leaburg Dam. In addition, there would be a reduced risk of developing IHNV outbreaks at Leaburg and McKenzie hatcheries.

Removing summer steelhead in the fall of the year would reduce the catch in the consumptive fishery that takes place in the McKenzie River below Leaburg Dam from April through December.

Recommendations: 1) Continue the status quo and assist with the design and implementation of more efficient facilities for processing of adult hatchery summer steelhead at Leaburg Dam and Leaburg Hatchery. 2) After capture facilities are built, recycle summer steelhead until early fall, then remove summer steelhead as they are captured at Leaburg Dam and Hatchery. 3) Continue documenting the occurrence of naturally produced adult summer steelhead above Leaburg Dam.

Alternative Action 2

Description: Implement “first time” removal of adult summer steelhead at Leaburg Dam and Leaburg Hatchery.

Removing summer steelhead the first time they are captured at Leaburg Hatchery and Leaburg Dam would eliminate all natural production of summer steelhead upstream from river mile 39 and reduce steelhead straying into tributaries downstream from the dam. Data from the videotapes at Leaburg Dam fish ladder indicate that the level of natural summer steelhead production in the system has been about 10 percent of the run.

Removing summer steelhead the first time they are captured would reduce the potential for carrying IHNV to wild and hatchery fish in the McKenzie River upstream from Leaburg Dam. In addition, there would be a reduced risk of developing IHNV outbreaks at Leaburg and McKenzie hatcheries.

Removing summer steelhead the first time they are captured would reduce the catch of the popular consumptive fishery for hatchery summer steelhead in the McKenzie River below Leaburg Dam.

Recommendations: 1) Continue the status quo and assist with the design and implementation of more efficient facilities for processing of adult hatchery summer steelhead at Leaburg Dam and Leaburg Hatchery. 2) After capture facilities are built, re-evaluate the feasibility of removing summer steelhead as they are captured. 3) Continue documenting the occurrence of naturally produced adult summer steelhead above Leaburg Dam.

Alternative Action 3

Description: Reduce the number of smolts released up to and including program elimination.

Decreasing or eliminating the number of hatchery summer steelhead released would diminish the potential for negative impacts to other fish species by reducing: 1) post-release interactions between hatchery smolts and juvenile wild fish; 2) the potential for natural production to occur because fewer adults would be returning to the basin; and 3) the potential for IHNV transmission to other wild and hatchery fish.

The current program of 108,000 smolts provides enough summer steelhead adults to generate an adequate catch rate for anglers during most years. Reduced smolt releases may not produce enough adults to generate a viable fishery during a larger percentage of return years.

Established mitigation agreements and associated legal obligations would need to be adjusted under this scenario. The socio-political ramifications of reducing or eliminating this popular fishery could be substantial.

Recommendations: Maintain current program with potential modifications as noted in other Alternative Actions.

Alternative Action 4

Description: To reduce residualism of summer steelhead released from Leaburg Hatchery, remove juvenile steelhead that are unlikely to migrate from the upper Willamette Basin.

Currently, all summer steelhead smolts released into the McKenzie River are reared at Leaburg Hatchery immediately prior to liberation. Approximately 25% are released at locations between river mile 19 and 32. While volitional release methods are employed for the remaining fish that are released directly from Leaburg Hatchery, steelhead that have not migrated in the first few days are eventually subjected to manual release. Removal of hatchery fish not actively smolting or out-migrating could reduce the level of residualism and its associated impact on native winter steelhead juveniles.

Recommendations: Investigate cost effective methods of removing non-migratory steelhead from hatchery release groups.

1.16.3 Potential Reforms and Investments (*McKenzie*)

Potential Reforms and Investment 1

Description and Implications/Importance
Provide Leaburg Dam fish ladders with sorting and trapping facilities that will not impede, or require handling of, wild spring chinook. Currently, summer steelhead removal consists of physically detaining and handling fish in the left bank fish ladder, during the portion of the year that is outside the major spring chinook migration period. The right bank ladder does not have a fish trap, making 100 percent removal improbable. This investment is viewed as a high priority by managers as implementation would have an immediate beneficial effect on listed spring chinook by reducing take at the site.

Cost Estimate
Unknown

Applicable references or Studies
Leaburg Dam Fish Passage Data (ODFW Springfield)

Potential Reforms and Investment 2

Description and Implications/Importance
Design and build fish processing facilities at Leaburg Hatchery to better accommodate the recycling and removal of adult summer steelhead.

Cost Estimate
Unknown

Applicable references or Studies

Potential Reforms and Investment 3

Description and Implications/Importance
Employ personnel necessary to operate the fish recycling and removal equipment (at least one FTE).

Cost Estimate
$50,000

Applicable references or Studies

Potential Reforms and Investment 4

Description and Implications/Importance
Installation of a water disinfecting facility on the intake and outfall at Leaburg Hatchery to reduce the potential for acquiring and distributing diseases in the hatchery program.

Cost Estimate
In development

Potential Reforms and Investment 5

Description and Implications/Importance
Expansion of well water system to provide a disease-free water supply for egg incubation and rearing of fish up to disease-resistant size (100 fish/lb).

The current well provides adequate water for domestic use and minimal egg incubation and will either need to be expanded or supplemented by a different well source in order to serve effectively as a clean water supply. Investigation will be required to assess the feasibility of the expansion or supplementation of the existing well. Given enough flow from a developed well, this water could also serve as a back-up water supply to the hatchery.

Cost Estimate
In development

For reference:

$	<$50,000
$$	$50,000-<$100,000
$$$	$100,000-<$500,000
$$$$	$500,000-<$1,000,000
$$$$$	$1,000,000-$5,000,000
$$$$$$	>$5,000,000

SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.

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

The NMFS (2000) Biological Opinion on the impacts of artificial propagation programs provides temporary coverage for the McKenzie, North Santiam, South Santiam, and Middle Fork Willamette River hatchery summer steelhead programs. Once adopted, this HGMP will serve as the authorizing document under the ESA for the Upper Willamette River Basin hatchery summer steelhead program (subprograms: McKenzie, North Santiam, South Santiam, and Middle Fork Willamette River hatchery summer steelhead).

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

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

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

Upper Willamette River Steelhead

The Upper Willamette River steelhead ESU (listed as threatened under the ESA on March 25, 1999), includes native winter-run populations from Willamette Falls to and including the Calapooia River. Significant natural populations of steelhead occur in the North Santiam, the South Santiam, the Molalla, and the Calapooia rivers. Additionally, smaller, but still significant natural populations occur in several West Valley tributaries (Tualatin, Yamhill, Luckiamute, Rickreall).

Steelhead from the Upper Willamette River are genetically distinct from steelhead from the lower river. Reproductive isolation from lower river populations may have been facilitated by Willamette Falls, which is known to be a migration barrier to some anadromous salmonids. The native steelhead of this basin are late-migrating winter steelhead, entering fresh water primarily in March and April (Howell et al. 1985), whereas most other populations of west coast winter steelhead enter fresh water beginning in November or December. Native steelhead primarily used tributaries on the east side of the basin, with cutthroat trout predominating in streams draining the west side of the basin. Historically, spawning by Upper Willamette River steelhead was concentrated in the North and Middle Santiam River Basins (Fulton, 1970). These areas are now largely blocked to fish passage by dams, and steelhead spawning is now distributed throughout more of the Upper Willamette River Basin than in the past (Fulton, 1970). Due to introductions of non-native steelhead stocks and transplantation of native stocks within the basin, it is difficult to formulate a clear picture of the present distribution of native Upper Willamette River steelhead, and their relationship to non-anadromous and possibly residualized *O. mykiss* within the basin. Various factors have combined to give credence to the theory that, for some unidentified reason, the upper reaches of the Willamette River Basin are not suitable to support steelhead populations, although resident trout and chinook salmon have been successful there. NMFS concluded that this ESU was comprised of the native late-run winter steelhead and that the historic distribution of the ESU did not extend upstream of the Calapooia River. While west side tributaries are included in the ESU, the listed ESU consists only of naturally spawned, winter-run steelhead. Where distinguishable, naturally spawned summer-run steelhead are not included in the listed ESU.

Steelhead in the Upper Willamette River exhibit varied life history traits. Steelhead may exhibit anadromy or freshwater residency. Few detailed studies have been conducted regarding the relationship between resident and anadromous *O. mykiss* and, as a result, the relationship between these two life forms is poorly understood. Steelhead typically migrate to the ocean after spending 2 years in fresh water. They then rear in the ocean for 2 or 3 years prior to returning to their natal stream to spawn as 4-or 5-

year-olds. Unlike Pacific salmon, steelhead are iteroparous (capable of spawning more than once before they die). However, it is rare for steelhead to spawn more than twice before dying; most that do so are females. Steelhead adults typically spawn between December and June. Depending on water temperature, steelhead eggs may incubate from 1.5 to 4 months before hatching as alevins. Following yolk sac absorption, alevins emerge from the gravel as fry and begin actively feeding. Juveniles rear in fresh water from 1 to 4 years, then migrate to the ocean as smolts.

Upper Willamette River Chinook Salmon
The Upper Willamette River chinook ESU (listed as threatened under the ESA on March 24, 1999), 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. Wild spring chinook are commingled with releases at hatcheries located on the Clackamas, N. Fork Santiam, S. Fork Santiam, McKenzie, and Middle Fork Willamette rivers. The NMFS designated these five hatchery stocks as part of the ESU but not essential for recovery, and not listed.

(b) Identify the ESA-listed population(s) that may be incidentally affected by the program.

Lower Columbia River Steelhead
The Lower Columbia River steelhead ESU was listed as threatened under the ESA on March 19, 1998. This ESU occupies 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.

Lower Columbia River Chinook Salmon
The Lower Columbia River chinook salmon ESU was listed as threatened under the ESA on March 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. Within this ESU, there are historic runs of three different chinook salmon populations: spring-run, tule, and late-fall ‘‘bright’’ chinook salmon.

Lower Columbia River Chum Salmon
Listed as a threatened species on March 25, 1999. The ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon.

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 Recovery Unit encompasses the Willamette River Basin, a major tributary to the Columbia River. The Upper Willamette River Recovery Unit includes local populations in the mainstem McKenzie River, South Fork McKenzie River, upper Middle Fork Willamette River, and Salt Creek/Salmon Creek/North Fork Middle Fork Willamette River complex.

Oregon Chub
The reduction of suitable habitat and the restricted distribution of the Oregon chub resulted in a determination of "endangered" status under the federal endangered species act in 1993. Oregon chub are endemic to the Willamette Valley of western Oregon. Historically, Oregon chub were found throughout the Willamette Basin from Oregon City to Oakridge. The historical records note collections from the Clackamas River, Molalla River, Mill Creek, Luckiamute River, North Santiam River, South Santiam River, Calapooia River, Long Tom River, Muddy Creek, McKenzie River, Coast Fork Willamette River,

Middle Fork Willamette River drainages, and the mainstem Willamette River. Current distribution is limited to populations in the Santiam River, Muddy Creek(s), Camus Creek, and the Middle Fork Willamette River drainages.

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

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

Five major basins historically produced upper Willamette winter steelhead including the Molalla, North Santiam, South Santiam, Calapooia, and various West Valley tributaries (i.e. Luckiamute, Rickreall, Yamhill, Tualatin). Dams in the Santiam basin eliminated wild winter steelhead production in significant portions of this system.

The Upper Willamette populations analyzed by Chilcote (2001) exceeded critical thresholds for abundance and productivity during recent years (Table 2.2.2-1). Chilcote examined the trend in annual pre-harvest abundance of wild fish for 31 steelhead populations in Oregon. In some cases, such as the West (Willamette) Valley population, the data were inadequate for meaningful evaluation. However, for the remaining Upper Willamette populations it was possible to look at the pattern of wild fish abundance for the last 20 to 30 years.

For each monitoring location, annual estimates of adult spawner abundance or density (fish per mile) were determined from direct adult enumeration at counting facilities (Foster Dam) or redd counts (all other locations). Conversion of redds per mile to spawners per mile, discrimination between hatchery and wild fish, and estimation of cumulative fishery mortality on wild steelhead was similar to methods described by Chilcote (1998). Estimates of pre-harvest abundance for wild steelhead were obtained by dividing annual estimates of spawner abundance by 1 minus the associated harvest rate.

Statewide, nearly all the 31 Oregon populations, including those from the Upper Willamette ESU, examined by Chilcote (2001) had a rapid decline in abundance during the early to mid 1990s 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. As characterized by Chilcote (2001): "*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 was 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*."

Table 2.2.2-1. List of conservation abundance thresholds and observed 6-year average wild steelhead abundance for 5 populations of steelhead belonging to the Upper Willamette ESU. Abundance expressed as total spawners (data without decimals) or spawners per mile (data with decimals). (Chilcote 2001).

Natural Populations (or Management Units)	Critical Thresholds	Viable Thresholds	Recent 6-Year Average	Associated Hatchery Stock(s)	Hatchery Stocks Necessary for Recovery (Y/N)
Molalla	2.6	9.9	14	None	NA
North Santiam	13.0	16.6	21.9	None	NA
Lower South Santiam	2.1	8.1	8.4	None	NA
Upper South Santiam	33	108	312	None	NA
Calapooia	0.8	2.2	8.3	None	NA

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

Such productivity data do not currently exist for the listed species in the Upper Willamette River Basin.

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

Santiam StW:

Table 2.2.2-2. Winter Steelhead spawning grounds counts in the South Santiam River and the North Santiam River, 1990-2003. (ODFW unpublished data).

Run Year	N. Santiam R Redds/Mile	S. Santiam R Redds/Mile
1990	21.0	20.0
1991	25.5	20.7
1992	18.4	18.1
1993	20.4	9.8
1994	19.4	17.2
1995	13.0	15.0
1996	21.0	14.0
1997	15.6	6.1
1998	21.0	6.5
1999	21.0	17.3
2000	21.0	15.5
2001	25.0	23.6
2002	23.9	12.1
2003	26.8	13.5

Surveys are conducted once per season to obtain peak counts in each section.

Table 2.2.2-3. Trap catch totals of unmarked adult StW, Stayton Island, North Santiam River, 1998-2002. (ODFW unpublished data).

Run Year	Count
1998	546
1999	460
2000	705
2001	2,004
2002	914
2003	1,261

Table 2.2.2-4. Number of unmarked fish (StW) passing above Foster Dam (ODFW unpublished data).

Year	Begin Date	End Date	Count
1990	2/1/1990	6/30/1990	272
1991	2/1/1991	6/30/1991	139
1992	2/1/1992	6/30/1992	361
1993	2/1/1993	6/30/1993	256
1994	2/1/1994	6/30/1994	234
1995	2/1/1995	6/30/1995	297
1996	2/1/1996	6/30/1996	131
1997	2/1/1997	6/30/1997	336
1998	2/1/1998	6/30/1998	359
1999	2/1/1999	6/30/1999	328
2000	2/1/2000	6/30/2000	326
2001	2/1/2001	6/30/2001	783
2002	2/1/2002	6/30/2002	1002
2003	2/1/2003	6/30/2003	850

(d) Provide the most recent 12-year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Summer steelhead are not native to the Upper Willamette River Basin, however, winter steelhead are native as far up the Willamette as the Calapooia River (RM 120). Currently, Skamania summer steelhead (stock 24) are not released into the natural spawning areas of the basin except in the North and South Santiam rivers downstream of the U.S. Army Corps of Engineers dams.

Stray stock 24 do not appear to be successful natural spawners. Naturally produced (unmarked) summer steelhead are believed to account for less than 10% of the total runs in the North and South Santiam River subbasins; and less than 5% of the total runs in the Molalla and Middle Fork Willamette subbasins (ODFW 1988, 1992, 1992a, 1992b, 1998), indicating poor reproductive success.

Natural production of Skamania summer steelhead in the Willamette Basin is not desirable because; 1) they are not indigenous to the Willamette Basin, and 2) they may negatively impact species native to the basin. As a result, summer steelhead are not released above Fall Creek and Dexter dams on the Middle Fork Willamette; thus any natural production that has occurred has been below these two barriers. The extent of natural production in these lower Middle Fork Willamette regions is not currently known, but is considered non-existent (ODFW 1992b).

The proportion of hatchery summer steelhead that spawn naturally in the North and South Santiam rivers is believed to be very low, but studies are currently underway to evaluate the accuracy of that assumption. Since summer steelhead are not passed above Foster Dam, on the South Santiam River, or Minto Dam, on the North Santiam River, any natural spawning by hatchery steelhead would occur below those dams.

Table 2.2.2-5. Proportion of hatchery steelhead on natural spawning grounds in the North Santiam River. (Chilcote 2001).

Spawn Year	Wild spawners	Hatchery spawners	% Hatchery
1989	48.6	8.4	15%
1990	44.1	7.7	15%
1991	33.3	5.8	15%
1992	25.3	4.4	15%
1993	22.4	4.4	16%
1994	27.2	4.1	13%
1995	6.7	0.8	11%
1996	11.8	1.5	11%
1997	23.2	2.3	9%
1998	24.2	10.1	29%
1999	31	11.2	27%
2000	27.9	3.9	12%

Table 2.2.2-6. Proportion of hatchery steelhead on natural spawning grounds in the (lower) South Santiam River (Chilcote 2001).

Spawn Year	Wild spawners	Hatchery spawners	% Hatchery
1989	17.1	4.8	22%
1990	30	1.1	4%
1991	33.7	0	0%
1992	29.5	0	0%
1993	16	0	0%
1994	25.6	0	0%
1995	8.5	0	0%
1996	3.9	0	0%
1997	9.9	0	0%
1998	10.6	0	0%
1999	4.1	0	0%
2000	10.6	0	0%

Table 2.2.2-7. Proportion of hatchery steelhead on natural spawning grounds in the (upper) South Santiam River (Chilcote 2001).

Spawn Year	Wild spawners	Hatchery spawners	% Hatchery
1989	222	62	22%
1990	272	10	4%
1991	139	0	0%
1992	361	0	0%
1993	256	0	0%
1994	234	0	0%
1995	297	0	0%
1996	131	0	0%
1997	336	0	0%
1998	359	0	0%
1999	328	0	0%
2000	326	0	0%

Table 2.2.2-8. Abundance estimates for summer steelhead (StS)* redds, 2003. (Firman, et al. 2004).

Monitoring Area	Estimate	C.I.	C.I. %
Mid Willamette Monitoring Area	1,480	836	56.5
Upper Willamette Monitoring Area	2,048	1,464	71.5
Upper Willamette ESU	3,529	1,686	47.8

Table 2.2.2-9. Comparison of summer steelhead (StS)* and winter steelhead (StW) redd counts, 2003. (Firman, et al. 2004).

Subbasin	Stream	StS Redds	StW Redds	% Hatchery
N Santiam River	Rock Cr.	19	49	27.9
N Santiam River	Mad Cr.	26	27	49.1
N Santiam River	Elkhorn Cr.	6	18	25.0
N Santiam River	Sinker Cr.	14	13	51.8
N Santiam River	**Total**	**65**	**107**	**37.8**
S Santiam River	Wiley Cr, upper	2	19	9.5
S Santiam River	Wiley Cr, lower	1	16	5.9
S Santiam River	Crabtree Cr.	0	6	0.0
S Santiam River	Thomas Cr.	2	13	13.3
S Santiam River	**Total**	**5**	**54**	**8.5**
Mid Willamette	**Total**	**70**	**161**	**30.3**

*Redds counted prior to March 10 were identified as StS redds. It is acknowledged, however, that pre-March 10 counts may include redds from early spawning winter steelhead. Future genetic analyses of spawning adults and/or naturally produced juveniles form the subject streams is planned to determine/confirm stock origin.

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

Listed winter steelhead are collected at the Bennett traps and Minto trap on the North Santiam. At the Bennett traps, fish are dip-netted and carried above the ladder for release. At Minto, fish are anaesthetized and passed above the barrier back into the river. Over the last several years of trapping, observable mortality has been very low or non-existent at all locations.

Wild winter steelhead adults are trapped at Foster Dam for transport and release upstream for spawning. The fish are anaesthetized, loaded onto trucks, and hauled above the reservoir for release. This collection period runs from November through June each year. Collection of winter steelhead is completed each year prior to the start of hatchery summer steelhead and spring chinook collections. Foster Dam does not have a ladder that allows upstream passage without transport. Thus, there is no other way for fish to pass above the Foster Dam site than to come into the trap and be lifted or hauled above. Operation of this trapping facility has a high potential to take listed winter steelhead through delay, capture, handling, transportation and upstream release, during trapping operations. Trapping and handling devices may lead to injury to listed fish through confinement, delayed migration and spawning, or delayed mortality as a result of injury.

Broodstock collection of hatchery origin summer steelhead and spring chinook have a high potential to

take listed spring chinook, through migration delay, capture, handling, transportation and upstream release, during trapping operations at South Santiam Hatchery. Trapping and handling devices may lead to injury to listed fish through confinement, delayed migration and spawning, or delayed mortality as a result of injury.

In addition, take can also be associated with hatchery operations (e.g., non-compliant screens and entrainment of fry) or exposure to diseases amplified within the hatchery population, such as infection of wild stocks with IHNV.

ODFW is conducting a monitoring and evaluation program to determine the effects of the hatchery summer steelhead smolt stocking program on listed spring chinook in the McKenzie River. The program consists of sampling stomach contents of hatchery summer steelhead smolts during creel surveys to determine if they are preying on listed salmon. Preliminary results of the monitoring program are available. Based on a gut residence time of 3-5 hours, and assuming that steelhead smolts were available to prey on juvenile chinook for 30 days after release, and assuming no removal of steelhead smolts, it is estimated that between 34,257 and 57,095 juvenile chinook were consumed by the 113,000 steelhead smolts released to the McKenzie in 2004. 1,187 Chinook redds were counted on the McKenzie in 2003. Assuming a fecundity of 4,350 eggs per female (based on fecundity observed in chinook at McKenzie Hatchery) and egg-fry mortality of 15%, we estimate that there were 4,388,933 fry available for the steelhead smolts to prey upon. Thus we estimate that between 0.8% and 1.3% of the chinook fry available were eaten by steelhead smolts.

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

Table 2.2.3-1. Numbers of wild winter steelhead collected, mortality and number released at South Santiam Hatchery since 1993.

Brood Year	Fish Collected	Fish Released	Mortalities	% Mortality
1993	256	256	0	0
1994	234	234	0	0
1995	294	294	0	0
1996	131	131	0	0
1997	334	332	2	0.60%
1998	355	355	0	0
1999	328	328	0	0
2000	331	331	0	0
2001	783	782	1	0.13%
2002	1008	1008	0	0
2003	888	885	3	0.34%

Until 2002 when almost all of the returning hatchery spring chinook were marked, wild spring chinook were not readily distinguishable from hatchery fish in the Willamette Basin hatcheries. There is little specific information on the level of take associated with the adult trapping and holding before that time.

Table 2.2.3-2. Numbers of wild winter steelhead collected, mortality and number released at Marion Forks Hatchery since 2002.

Brood Year	Fish Collected	Fish Released	Mortalities	% Mortality
2002	442	442	0	0
2003	174	174	0	0

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

See Appendix Table 1.

(d) Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

Winter steelhead returning to Foster represent escapement from production occurring above the dam, and we will pass all unmarked winters entering the trap, regardless of how many return. If it appears that the run will exceed the total number we expected it to be, we will request from NOAA Fisheries authorization to handle the greater number.

At the Bennett traps, if mortality becomes an issue, we will suspend trapping efforts until the winter steelhead run has passed. If we are simply exceeding the anticipated number because the return is so great, we will request authorization from NOAA Fisheries to exceed our take limits.

At Minto we will close the trap, if necessary, to prevent exceeding authorized take.

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

Biological Opinion On the Impacts From the Collection, Rearing, and Release of Salmonids Associated with Artificial Propagation Programs in the Upper Willamette Spring Chinook and Winter Steelhead Evolutionary Significant Units (NMFS 2000).

This Biological Opinion (BO) was written pursuant to Section 7 of the Endangered Species Act, and covers all hatchery programs in the Willamette Valley. The BO concludes that in order to avoid jeopardy, the proposed hatchery programs must implement Reasonable and Prudent Alternatives (RPAs) outlined in the document. In addition, the BO identifies discretionary actions to minimize or avoid adverse effects on listed species (Conservation Recommendations) and measures to minimize and reduce anticipated levels of anticipated take (Reasonable and Prudent Measures, RPMs).

Reasonable and Prudent Alternatives are:
1.) Reduce the numbers of hatchery fish spawning naturally by removing marked adults and modifying the numbers and release locations of hatchery smolts;
2.) Facilitate the identification of naturally- and hatchery-produced fish.

Conservation Recommendations are:
1.) Develop HGMPs for hatchery programs;
2.) Develop subbasin specific distinguishable marks on hatchery populations;
3.) Minimize out-of-basin hatchery rearing;
4.) Consider relocating mitigation production to Lower Columbia River "select areas";
5.) Determine whether production goals and release strategies are appropriate for current fisheries pressures;
6.) Determine impacts to naturally spawning populations;
7.) Recycle known hatchery origin salmon and steelhead to promote harvest.

Reasonable Prudent Measures are:
1.) Keep NOAA Fisheries informed of proposed hatchery releases and incidental take.
2.) Manage programs to minimize potential interbreeding of hatchery reared fish and listed salmon and steelhead;
3.) Quantify the effects of hatchery broodstock collection on listed spring chinook and winter steelhead;
4.) Minimize potential negative impacts to listed salmon and steelhead from hatchery operations;
5.) Monitor and evaluate each hatchery program.

Fishery Management and Evaluation Plan-Upper Willamette River Winter Steelhead in Sport Fisheries of the Upper Willamette Basin (ODFW 2001).

This Fisheries Management and Evaluation Plan (FMEP) specifies the future management of recreational fisheries potentially affecting listed Upper Willamette River winter steelhead trout, and plans for evaluation of the effectiveness of the fishery regulations in protecting natural spawning populations. The FMEP states that fisheries will be managed to promote the conservation and recovery of all listed winter steelhead populations in the Upper Willamette River Basin by continuing ongoing selective fisheries for hatchery fish. Only winter and summer steelhead that are adipose fin-clipped may legally be retained throughout the Willamette River Basin. All unmarked, wild fish will be required to be released unharmed

in all fisheries. When compared to previous years (1983-1993), this selective fishing regime is expected to continue the 70% reduction in average fishery mortality that occurred prior to 1994 when wild steelhead were legal to harvest. A comprehensive monitoring and evaluation plan will assess the catch of wild fish, the abundance of hatchery and wild fish throughout the entire basin, and angler compliance. This information will be used annually to assess whether impacts to listed fish are as expected. Review of the FMEP will occur in 2006 and at five-year intervals thereafter to evaluate whether the objectives of the FMEP are being accomplished.

ODFW Fish Health Management Policy (OAR 635-007-0960 through 1000)

The purpose of the Fish Health Management Policy is to describe measures that minimize the impact of fish diseases on the state's fish resources. This policy applies to all Department hatchery operations and programs including Salmon and Trout Enhancement Program (STEP), fish propagation projects, Cooperative Salmon Hatchery Programs, and to all other persons importing, transporting, releasing or rearing non-aquaria species in this state, including, but not limited to persons operating private fish rearing facilities and research facilities.

The policy states that the Department (ODFW) shall restrict the introduction, amplification, or dissemination of disease agents in hatchery produced fish (hatchery produced stock or naturally produced native stock) 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 of the state. In so doing, the Department shall inspect and detect disease agents from fish in public and private fish hatchery facilities and from natural environments; and contain and treat disease agents to minimize impacts on fish populations.

ODFW Native Fish Conservation Policy (OAR 635-007-0502 through 0506)

The Native Fish Conservation Policy (NFCP) defines ODFW's principle obligation for fish management as the conservation of naturally produced native fish in the geographic areas to which they are indigenous. The policy is based on the concept that locally adapted populations provide the best foundation for maintaining and restoring sustainable naturally produced fish. The NFCP requires a conservation plan for each species management unit (similar to an ESU). These conservation plans will contain an assessment of the status of each native population, a description of the desired biological status relative to measurable biological attributes, and a description of short and long term management strategies to address the primary limiting factors. They will also include short and long term monitoring and research needs and a description of measurable "trigger" criteria that would indicate a change in status or a need to modify or expand recovery efforts.

ODFW Fish Hatchery Management Policy (OAR 635-007-0543 through 0548)

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

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

Corps Mitigation Agreement (USACE 1990). Several hatcheries are funded by the COE for mitigation of impacts from hydroelectric dams in the Upper Willamette River Basin.

3.3) Relationship to harvest objectives.

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

Skamania summer steelhead 24 stocked into the Hood, Sandy and Upper Willamette subbasins are managed strictly to provide select area fisheries.

Current ODFW summer steelhead (stock 024) fish management plans set goals of: an average annual sport catch of 1,200 adult summer steelhead in the McKenzie River subbasin; an annual sport catch of 2,250 summer steelhead in the Middle Fork Willamette subbasin; increase recreational catch of summers steelhead above Willamette Falls to an average of 500 fish; increase potential average annual sport catch to 700 summer steelhead in the mainstem Santiam, 4,500 in the North Santiam, and 5,600 in the South Santiam.

Sport summer steelhead fisheries occur in both the lower and upper Willamette Basins. Summer steelhead are not native to the Upper Willamette Basin, but were introduced into the basin in the late 1960s to provide a sport fishery and to mitigate for lost winter steelhead production. The summer steelhead fishery begins in March and extends through December, but the greatest degree of effort and most of the catch occurs from June through August. The Columbia River from the mouth to the I-5 Bridge does not open to angling for hatchery steelhead until May 16, after the winter steelhead run has passed upstream. Catch and release only (zero bag limit) for trout, and seasonal closures are in effect to protect juvenile steelhead.

Partial creels were conducted on the South Santiam and the McKenzie Rivers in 2002. The creel in the South Santiam began on July 5, 2002 and ended October 31, 2002. The survey on the McKenzie River was conducted from July 5, 2002 to September 1, 2002. In 2003, angler surveys were conducted from April through October in the North Santiam, South Santiam and McKenzie, and from April through July in the Middle Fork Willamette, however results from these creels are not yet available.

Six hundred eighty three (683) marked spring chinook were harvested from the South Santiam during the period of the survey, with another 573 harvested in the McKenzie (Table 3.3.1). An additional 705 marked and 128 unmarked chinook were caught and released on the South Santiam, while 420 marked and 626 unmarked chinook were released on the McKenzie.

In the South Santiam, 1,447 marked steelhead were harvested during the period of the survey, and another 1,221 were harvested in the McKenzie. An additional 329 marked and 106 unmarked steelhead were caught and released on the South Santiam. Four hundred ninety-four (494) marked and 189 unmarked steelhead were caught and released on the McKenzie.

Table 3.3.1. Total estimated catch*, 2003. (Firman et. al 2004).

	McKenzie Spring Chinook	S Santiam Spring Chinook	McKenzie Steelhead	S Santiam Steelhead
No mark, released	626	128	189	106
Marked, kept	573	683	1,221	1,447
Marked, released	420	705	494	329
Released, mark unknown	24	186	0	0

*Estimates are based on partial creels

3.4) Relationship to habitat protection and recovery strategies.

The summer steelhead program in the Upper Willamette River Basin does not specifically include habitat protection and/or recovery strategies. However, ODFW and the USACE work with land and resource management agencies, landowners, and other environmental interest groups (such as watershed councils) to ensure the maximum available protection to fish habitat is applied. Habitat protection and improvement supports management strategies, resulting in benefits to both hatchery and wild chinook and steelhead populations.

3.5) Ecological interactions.

Releases of hatchery summer steelhead could increase competition for food and space with naturally rearing salmonids, including wild spring chinook and winter steelhead. Therefore, all program hatchery releases are coordinated in time and space to minimize this risk. Theoretically, the hatchery smolts will be inclined to move rapidly downstream to estuarine waters, thus minimizing intra- and inter-specific competition with naturally rearing chinook and steelhead. However, this is not always the case. Fish that are not ready to migrate upon release will tend to stay in the river for a longer period of time (residualize), and are sometimes hooked by anglers several months post release. Hatchery smolts that do not migrate have a size advantage over naturally produced chinook and steelhead, and thus may out-compete naturally produced juvenile salmonids for food and/or space.

Returning adult hatchery summer steelhead could amplify the rate of IHNV infection among naturally produced salmonids. In subbasins such as the McKenzie River, returning adult hatchery steelhead tend to be infected with IHNV. Furthermore, because not all hatchery fish are removed from each subbasin upon return, the likelihood exists for the transmission of IHNV to other natural fish species in the subbasin, which may negatively affect production of both wild and hatchery stocks. The exact impacts of IHNV on listed salmon and steelhead are currently unknown.

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.

South Santiam Hatchery:

South Santiam Hatchery's main water source for incubation, rearing and adult holding is Foster Reservoir. The water source meets IHOT guidelines (IHOT 1995). There are two water intake pipes, one located at elevation 630' and the other at elevation 576' in the dam structure. The low pool level commonly maintained from November through May is near elevation 596'. Mixing of these two water intakes is possible and is commonly done from late May through October. Water temperatures from the upper intake can reach 70 degrees during summer. Water temperatures from the lower intake rarely exceed 50 degrees. ODFW does not currently hold a water right for withdrawal from Foster Reservoir. These intakes do not currently meet NMFS screening criteria.

A secondary, small water source is a well that is commonly used for summer steelhead egg incubation from December through April. This withdrawal has a permit.

The main water source (Foster Reservoir) is excellent rearing water for most of the year. During fall and winter months, however, upstream freshets commonly result in high turbidity. A very fine, suspended clay makes hatching of fry and early rearing of fingerlings very difficult. Consequently, all egg incubation past the "eyed" stage and early rearing of fingerlings is accomplished at other hatcheries. Rearing water quantity is limited to approximately 19 cfs due to pipeline size and head. All reservoir rearing and incubation water passes through an aeration/screening tower that reduces the head from the reservoir intakes.

Spring chinook adults have been passed above Foster Dam for the last several years and winter steelhead since the dams were first constructed. There is a variety of disease agents present in the water supply of the hatchery and there is potential to infect the hatchery production at any time. To minimize the likelihood of that happening, hatchery practices have been adjusted so that early life stage rearing is accomplished at other facilities. Should the need arise to rear fish from egg to smolt at South Santiam Hatchery, it will be necessary to provide a dependable, pathogen-free water supply.

Marion Forks Hatchery:

Marion Forks Hatchery uses two different surface water supplies: Marion Creek and Horn Creek. The water rights for both streams are gravity feed to the hatchery, and their water quality meets IHOT guidelines (IHOT 1995). Marion Creek is used primarily from April to November due to the extreme fluctuations that may occur during the winter months. Its temperature ranges from 32 to 60° F. Horn Creek is used during the winter months because stream level is more predictable and temperatures are warmer, ranging from 36 to 50° F. Also, at highest months of production, Horn Creek alone cannot adequately supply the entire hatchery.

The hatchery runs on an individual DEQ permit due to the "3-basin rule". All conditions of the permit are administered within the ODFW and regulated by the DEQ. The water intakes at Marion Forks are not in compliance with NMFS screening criteria. The hatchery does meet the terms of its NPDES permit.

Table 4.1. Summary of water temperature (°F) and water usage at Marion Forks Hatchery (monthly averages).

	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GPM	5550	3750	450	1400	3200	4100	9200	9200	9350	9350	5550	5550
TEMP	36	37	38	40	46	50	55	56	52	44	40	38

Leaburg Hatchery:

Water rights for Leaburg Hatchery total 44,900 gpm from the McKenzie River. All raceways are supplied with single-pass water.

Water quality remains high throughout the year with problems only during flood events. Leaburg Hatchery is currently under the Three Basin NPDES permit with no effluent violations. Compliance with NMFS screening criteria needs to be addressed when funds are available. The water source meets IHOT guidelines (IHOT 1995).

Roaring River Hatchery:

Roaring River Hatchery possesses a Water Rights Use Permit for Hatchery Operations through the Oregon Department of Water Resources. The water source is the Roaring River, and the hatchery is allocated 25 cfs. The water source meets all IHOT guidelines (IHOT 1995). Some of the water is pumped through a filter system to insure a clean supply for incubation and early rearing. Water is reused from the upper ponds to the lower ponds. The hatchery operates under a 300J effluent permit and meets the terms of the permit. Intake screens do not conform to NMFS screening criteria.

Willamette Hatchery:

Willamette Hatchery has Water Right Use Permits for Hatchery Operations through the Oregon Department of Water Resources. The water source meets or exceeds all IHOT water quality guidelines (IHOT 1995). Willamette Hatchery operates under permits S7188, S8600, and S19208 which combine for rights to 82cfs of flow from Salmon Creek, and permit G12109 which supplies 1.14cfs of well water. The hatchery operates within the limits set by its NPDES permit.

Dexter Hatchery:

The water source for the hatchery is the outflow of Dexter Reservoir on the Middle Fork Willamette River. Dexter Dam is run by the USACE. Water is screened at the dam and then provided to the hatchery via gravity. The water source meets IHOT guidelines (IHOT 1995). The hatchery effluent meets all the terms of its NPDES permit.

Oak Springs hatchery:

Water source for the hatchery is Oak Springs, which meets IHOT guidelines (IHOT 1995) for water quality. Water rights provide 28.5 cfs coming from 32 different points of the spring. The hatchery possesses a NPDES permit and meets all of its terms. Intake screens do not meet NMFS screening criteria, but no fish are present in the water source.

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

South Santiam Hatchery:

South Santiam Hatchery is not in compliance with NOAA Fisheries juvenile fish screening criteria. A plan has been developed to bring intake screens into compliance with NOAA standards, but to date, no funding has been available.

Marion Forks Hatchery:

Marion Forks Hatchery is not in compliance with NOAA Fisheries juvenile fish screening criteria. A study by Tetra-Tech, completed in March of 2002, showed a cost of $153,000 for the Horn Creek intake screen, and $225,000 for the Marion Creek intake.

Leaburg Hatchery:
Leaburg Hatchery's main intake is on Leaburg Lake. The Leaburg fish screens are scheduled to come into full compliance with NOAA Fisheries fish screening criteria by the end of 2004 or 2005.

Willamette Hatchery:
At Willamette Hatchery, no listed species are present in the water source, Salmon Creek. The facility operates within the limitations established by the NPDES permit. The hatchery has both vertical and horizontal intake screens. The horizontal screens are in compliance with NOAA Fisheries fish screening criteria, but the vertical screens are not. Plans are underway to upgrade the intake screens so as to meet NOAA criteria.

Dexter Hatchery:
The hatchery water source is screened at Dexter Reservoir. Those screens are maintained by the USACE. It is unknown as to whether those screens met NOAA Fisheries fish screening criteria (Personal communication with Tim Wright, manager of Dexter Pond). Effluent from the hatchery is in compliance with its NPDES permit.

Roaring River Hatchery:

At Roaring River hatchery, listed winter steelhead are present in the water source, the Roaring River. Withdrawls are small enough that passage of migrating salmonids in the bypass reach is not prevented. While the hatchery meets the terms of its NPDES permit, the intake screens of the facility do not meet NOAA Fisheries fish screening criteria. There are plans to bring the screens into compliance pending funding.

Oak Springs Hatchery:
The water source of Oak Springs Hatchery is Oak Springs. No fish are present in the water source. The hatchery meets the terms of its NPDES permit.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

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

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

South Santiam Hatchery:
Two 1,000-gallon diesel fish transportation trucks are located at the hatchery. One is old and was acquired from a state funded hatchery when they replaced it with a new unit. It needs to be replaced. The other unit was acquired new and is in good condition. A 300-gallon portable tank that is carried in a pickup is also used at the hatchery. Adults are loaded into these trucks at Foster Trap via 10-inch pipelines or a mechanical hoist/loading bell. Manual loading of surplus adults from the adult holding pond occurs occasionally. On occasion, smolts and fingerlings are loaded via a Neilsen fish pump into transportation trucks.

Marion Forks Hatchery:
Marion Forks has a flatbed truck with a 1,000-gallon tank equipped with two aerator pumps. Also used are region trucks, which utilize a 1,600-gallon tank equipped with a recirculation and oxygen pumps. Both adults and juveniles are transported with these trucks.

Leaburg Hatchery:
At Leaburg Hatchery, fish transportation equipment consists of two 1,200-gallon tankers with supplemental oxygen and recirculation capabilities. One of the tankers incorporates a refrigeration unit to cool ambient water temperatures during hauling. In addition, the hatchery utilizes a 500-gallon portable unit for hauling small local loads or for on station movements. The hatchery uses two fish pumps to load fish onto the tankers.

Willamette Hatchery:
Willamette Hatchery uses a 2,200-gallon fish liberation truck with a Nielson pump for loading, offloading, and transporting fish for this program. The truck is equipped with supplemental oxygen and recirculation capabilities, but does not have ambient water cooling capabilities.

Dexter Hatchery:
The hatchery does not use fish transportation equipment. Other hatcheries transport fish to Dexter Pond where they are released volitionally.

Roaring River Hatchery:
At Roaring River hatchery, one on site pickup with a 200-gallon portable slip tank is used for on-site movements. Vehicles provided by the ODFW regional office are used to move fish from Oak Springs

Hatchery to Roaring River Hatchery.

Oak Springs Hatchery:
Eyed eggs are shipped to Oak Springs Hatchery via the South Santiam Hatchery truck and egg crates. Fish are transferred from the hatchery using Northwest Region liberation trucks.

5.3) Broodstock holding and spawning facilities.

South Santiam Hatchery:
An oval concrete broodstock holding pond, measuring 148' x 47', is used for adult holding at the South Santiam Hatchery. The pond holds approximately 199,000 gallons when full. The pond is used to hold 1,400 adult spring chinook and 1,300 adult summer steelhead. Approximately 5,000 gpm flows through this pond during heavy loading. A center divider allows separation of species and a cross divider allows separation of males and females. Adults are trucked from Foster Trap. Spawning facilities are crude and small. A flat working area of approximately 8' x 10' is exposed when the pond volume is lowered. All live fish must be handled manually and spawned carcasses must be manually moved from the spawning area up to ground level. The sloping sides of the pond complicate the use of mechanical means for removing fish.

Integrated Hatchery Operations Team (IHOT 1995) adult holding guidelines are followed for holding, loading density, water quality, alarm systems and predator control measures to provide necessary security for broodstock.

5.4) Incubation facilities.

South Santiam Hatchery:
The incubation room in the South Santiam Hatchery is approximately 18' x 24' and contains 30, 16-tray vertical incubators (4,000-9,000 eggs/unit) and two six-foot fiberglass picking troughs. A 120-gallon hot water tank is available for heating incubation water but is extremely expensive to operate. All incubators and both troughs are plumbed with reservoir and well water. Flow through the incubators is approximately 4 gpm. A chemical treatment system is also plumbed to each incubator. Water from the incubation room discharges directly into the South Santiam River. All incubators are equipped with low water alarms. Spring chinook and summer steelhead eggs are incubated from egg take through shipment at the "eyed" stage. Eyed eggs are shipped to Oak Springs Hatchery for continued incubation and rearing.

Oak Springs Hatchery:
The incubation room at Oak Springs is approximately 35'x75' and contains 22, 8 tray vertical incubators, 8, 16 tray vertical incubators, 4, 20 tray vertical incubators (up to 10,000 eggs/unit), 16, 3x16 Canadian troughs, and 4, 18 foot picking troughs. A chiller unit is available for cooling incubation water and 4 of the Canadian troughs. Depending on usage, chilled water can be maintained from 36-41 degrees, with ambient water @ 53 degrees. Water is supplied from springs and both chilled and ambient water is plumbed to the incubators and 4 of the troughs. A chemical treatment system is plumbed to each of the incubators. Water from the incubator room is discharged into an abatement pond and ultimately goes into the Deschutes River. All head boxes are equipped with low water alarms.

5.5) Rearing facilities.

Of all eggs collected at the South Santiam Hatchery, approximately 80% are transferred to Oak Springs Hatchery, and the remaining 20% are transferred to Bonneville Hatchery for early rearing.

Oak Springs Hatchery rears ~700,000 summer steelhead for 5-6 months, before transferring them to other

hatcheries. Oak Springs Hatchery is located along the Deschutes River, 9 miles from Maupin, Oregon (IHOT 1996). Sub-yearlings from Oak Springs Hatchery are then transferred to Roaring River, South Santiam, Leaburg, and Willamette Hatcheries. Of those sub-yearling juveniles transferred to Roaring River Hatchery, 79,000 are reared through pre-smolt development and then transferred to Minto Pond to acclimate for 3-4 weeks before release. An additional 42,000 are reared to smolts and releases in the Mainstem Willamette river at Eugene. Roaring River Hatchery is located along Roaring River (a tributary to Crabtree Creek in the South Santiam River Basin), 18 miles northeast of Albany, Oregon (IHOT 1996). Sub-yearlings transferred to Willamette Hatchery rear for an additional 10 months (at Willamette and Dexter) before 115,000 are released into Middle Fork Willamette River, and 42,000 are transferred to Minto Pond to acclimate for 3-4 weeks before release. Willamette Hatchery is located one mile east of Oakridge, Oregon, adjacent to Salmon Creek three miles above its confluence with the Middle Fork of the Willamette River, near river mile 42 (Lewis 1996). The Dexter facility is located at the base of Dexter Dam, adjacent to the Middle Fork of the Willamette River, near river mile 17 (Lewis 1996). The summer steelhead transferred to Leaburg Hatchery are reared for an additional nine months before release in the McKenzie River. Leaburg Hatchery is located at River Mile 39 along the McKenzie River, 23 miles east of Springfield, Oregon (IHOT 1996). The sub-yearling juveniles transferred to South Santiam Hatchery are reared about 10 months until they are released in the South Santiam River. South Santiam hatchery is located 2 miles east of the town of Sweet Home, at the base of Foster dam, adjacent to the South Santiam River at river mile 37 (Lewis 1996).

South Santiam Hatchery:
Rearing facilities consist of 10, 17'x 76'x 4' Burrows raceways and 4, 21'x 76'x 4' Burrows raceways. A middle walkway provides access for feeding and other tasks. Water is supplied at both ends of each raceway via 4-inch valves. All water is discharged directly to the South Santiam River. Rearing stages range from fingerlings through smolt.

Roaring River Hatchery:
Rearing facilities for this program consist of 4 concrete raceways. Raceways measure 89.5' by 19.5' by 3.75' for a total volume of 6,545 cu. ft. Flow through the raceways is 350-650 gpm with a maximum flow index of 1.1.

Marion Forks Hatchery:
Rearing facilities consist of 12 Canadian style troughs -21' long ½ round, 8 raceways 20'x80'x3', and 48 circular ponds 24' diameter x 2.5'depth.

Leaburg Hatchery:
Rearing facilities at Leaburg Hatchery include 13 Canadian troughs of 89 cubic feet each, 39 concrete raceways with a volume of 7,000 cubic feet each, one half pond with a volume of 3,500 cubic feet, and six circular 20 ft diameter ponds.

Willamette Hatchery:
Hatchery uses four rearing ponds each measuring 80' x 20' x 3.5' for this program.

Dexter Hatchery:
The hatchery uses 4 raceways and one asphalt pond. The asphalt pond measures 210' x 70' x 6.5'. Each of the raceways measure 161' x 18' x 5'.

Oak Springs Hatchery:
Oak Springs Hatchery primarily uses two rearing ponds for fish of this program. Each of these ponds measures 40' x 50' x 4'. Occasionally, the fish may be held in Canadian troughs for a short period before being moved to the main rearing ponds.

5.6) Acclimation/release facilities.

South Santiam Hatchery:
All smolts reared and acclimated at South Santiam Hatchery are released volitionally from the rearing ponds directly into the South Santiam River via a 24-inch pipe.

Marion Forks Hatchery:
Currently, depending on year and water flow, all steelhead are trucked from the Marion Forks Hatchery (rearing location) to Minto pond and acclimated; if flows are to high river water backs up into the pond and the fish can move out on their own.

Leaburg Hatchery:
There are no acclimation sites other than hatchery raceways that drain into a fingerling release pipeline. This pipeline then flows into the McKenzie River via the fish ladder.

Willamette Hatchery:
No fish of this program are acclimated or released at this hatchery. Fish are taken to Dexter Pond for final acclimation and release.

Dexter Hatchery:
Fish exit volitionally from the rearing/acclimation ponds. See section 5.5 for description of the rearing ponds.

Oak Springs Hatchery:
No fish of this program are acclimated or released at this hatchery.

Roaring River Hatchery:
Fish are acclimated at Minto Pond on the North Santiam River. The remaining production is direct released into the Middle Fork Willamette at Eugene.

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

South Santiam, Marion Forks and Leaburg Hatcheries:
There has been no significant fish mortality at either the South Santiam Fish Hatchery or the Marion Forks Hatchery. At Leaburg Hatchery on the McKenzie River, flood events can cause operational difficulties due to debris damage to intake facilities and by causing heavy silt loads in the water supply. However flood events do not normally result in significant fish mortality.

Willamette Hatchery:
The hatchery has not incurred significant losses from operational difficulties or disasters.

Dexter Hatchery:
The hatchery has not had significant operational difficulties or disasters.

Roaring River Hatchery:
The hatchery has not incurred significant losses from operational difficulties or disasters.

Oak Springs Hatchery:
The hatchery has not had any major operational difficulties recently. In the past, cold water has been a problem, but hatchery practices have alleviated those problems. Problems have also occurred because of

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

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.

Fish Health Monitoring:
Fish health and disease prevention of hatchery steelhead is managed at all hatcheries involved in this program in accordance with the U.S. Fish and Wildlife Service's Fish Health Policy, the "Policy and Procedures for Columbia Basin Anadromous Salmonid Hatcheries" (IHOT 1995), and protocols of the Oregon Department of Fish and Wildlife.

South Santiam Hatchery:
The South Santiam hatchery does not hold any listed steelhead, but is staffed 24 hours a day and is equipped with alarm systems that notify personnel of water supply system failures. Rearing ponds and incubation stacks are equipped with water height alarms. Fish health monitoring and disease prevention standards consistent with IHOT protocols are applied, and the ODFW Fish Hatchery Management Plan is followed.

Marion Forks Hatchery:
The Marion Forks hatchery does not hold any listed steelhead, but is staffed 24 hours a day and is equipped with water alarms. At Minto Pond any unmarked fish are "processed" quickly (released or hauled upstream). The water for the pond is gravity fed and the intake is low maintenance at this time of year. Fish Health Monitoring and Disease Prevention standards consistent with IHOT protocols are applied at both facilities.

Leaburg Hatchery:
The Leaburg hatchery does not hold any listed steelhead. The hatchery is staffed full-time. The water system is equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish Health Monitoring and Disease Prevention standards consistent with IHOT protocols are applied at this facility.

Willamette Hatchery:
The hatchery does not hold any listed species. The hatchery is staffed full time. The water system is equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish Health Monitoring and Disease Prevention standards consistent with IHOT protocols are applied in this facility.

Dexter Hatchery:
No listed fish are raised at the hatchery.

Oak Springs Hatchery:

The hatchery does not hold any listed species. The water supply system is equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish Health Monitoring and Disease Prevention standards consistent with IHOT protocols are applied in this facility.

Roaring River Hatchery:

The hatchery does not hold any listed species. The water supply system is equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure. Fish Health Monitoring and Disease Prevention standards consistent with IHOT protocols are applied in this facility.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.

6.1) Source.

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

6.2) Supporting information.

6.2.1) History

The Skamania Hatchery summer steelhead stock was derived from wild fish taken from the Washougal and Klickitat rivers. For decades the Skamania Hatchery summer steelhead broodstock had been obtained directly from adults returning to the Skamania Hatchery. The Skamania stock is the source of nearly all hatchery summer steelhead smolts released into the Lower Columbia River and the Upper Willamette River basins.

The first fish for broodstock were captured at Skamania Hatchery in 1956. The first returns of fish reared at the hatchery were in 1959. Lavier (1973) described the Washougal River as originally being a summer steelhead stream. Cowlitz and Skamania Hatchery stocks were introduced into the system in the late 1950s and are assumed to have interbred with the wild stock (Salmon and Steelhead Production Plan Washougal River Subbasin, 1990).

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

6.2.2) Annual size.

Listed fish are not used as broodstock for stock 24.

To satisfy a *cumulative* smolt production goal of ~900 K, the current green-egg take goal is approximately 1.8 million (2003-2004 ODFW Hatchery Production Schedules) from returning hatchery origin fish. Adult collection goals vary depending upon annual broodstock needs.

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

Returns of unmarked summer steelhead adults to the Foster trap have typically been less than one percent of the total. Any unmarked summer adults may be incorporated into the broodstock, but there is no goal we are attempting to attain.

6.2.4) Genetic or ecological differences.

Summer steelhead are not native to any of the basins into which they are released.

6.2.5) Reasons for choosing.

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

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

Summer steelhead are not indigenous to any subbasin in the UWRB. Therefore the non-indigenous stock 24 was selected for use throughout the basin. All hatchery program fish are marked by removal of the adipose fin prior to release. This mark distinguishes returning adults as either a naturally produced fish or a hatchery produced fish. Efforts are made to restrict hatchery fish, both temporally and spatially, from interacting with naturally produced .

SECTION 7. BROODSTOCK COLLECTION

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

Adults of all age classes returning to the South Santiam are collected for broodstock.

7.2) Collection or sampling design.

Over the past ten years, only adults returning to Foster Dam (South Santiam Hatchery) have been used for broodstock collection. Adults are collected throughout the spring, summer and fall (April-October) and are spawned the following winter/spring (January-March).

7.3) Identity.

(a) Methods for identifying target populations (if more than one population may be present). Summer steelhead return to the Willamette system later than the native winter run does. All hatchery summer steelhead smolts are adipose fin-clipped. Therefore, summers can be distinguished from wild winter steelhead by both their run timing and their applied mark.

7.4) Proposed number to be collected:

Adult collection goals vary depending upon annual broodstock needs. To satisfy a cumulative smolt production goal of ~900 K, the current green-egg take goal is approximately 1.8 million (2003-2004 ODFW Hatchery Production Schedules) from returning hatchery fish. Over the past 9 years (1994- 2002) the average number of broodstock collected annually was 455 males and 550 females, resulting in an average egg take of 1,849,000 (see Table 7.4.2).

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

The ratio between males and females used during broodstock collection has not been consistant over the past decade. Prior to 1994, the number of male adults spawned was not recorded; hence, exact spawning ratios can not be calculated. Since then, spawning ratios have varied from year to year. In 1994, the hatchery spawned at a 3:4 male-to-female ratio; in 1995 and 1996 they spawned at 1:1 male-to-female ratio; in 1997 they spawned at a 1:2 male-to female ratio; in 1998 they spawned at 2:3 male-to–female ratio; and in 1999 they attempted to spawn at a 1:1 male-to-female ratio (see Table 7.4.2).

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:

Table 7.4.2. Broodstock collection levels at the South Santiam Hatchery.

Brood Year	Adults Collected at Foster Dam	Adults Collected & Spawned		Spawning Ratio (M:F)	Egg Take (in 1,000's)	Egg Transfers (in 1,000's)	Fry Ponded	Live-Out
		Males	Females					
1990	1,316	**1/**	251		1059	994	0	*
1991	6,220	**1/**	416		1502	1248	0	*
1992	2,277	**1/**	427		1632	1470	0	*
1993	3,411	**1/**	541		1982	1626	0	*
1994	3,593	355	457	01:01.3	1763	1307	0	*
1995	3,121	392	402	01:01.0	1607	1161	0	*
1996	2,806	470	473	01:01.0	1691	1470	0	*
1997	2,101	175	328	01:01.9	1206	1056	0	*
1998	3,676	532	872	01:01.6	3058	1563	0	*
1999	4,217	574	687	01:01.2	1191	1702	0	*
2000	4,107	592	608	01:01.0	2257	1355	0	*
2001	4,933	597	597	01:01.0	2208	1214	0	*
2002	6,621	412	523	01:01.3	1971	1050	0	*

1*/ Prior to 1994 the number of males spawned was not recorded.*

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

Surplus fish are disposed of in accordance with ODFW's Fish Hatchery Management Policy (OAR 635-007-0542 to 0548). Section 14(c) of the Policy specifies disposal options of surplus broodstock in priority order for harvest hatchery programs such as Upper Willamette summer steelhead.

Surplus hatchery fish collected at Minto and Foster Dams (Santiam basin) are re-cycled through downstream recreational fisheries through the summer. Recycling is discontinued in the fall and returning fish removed from the system in order to minimize the straying of fish to natural production areas. At this time, surplus hatchery adults of high quality are given to local charities and food banks. Spawned fish carcasses determined to be low in IHNV are utilized in ongoing nutrient enrichment programs in the South Santiam basin.

7.6) Fish transportation and holding methods.

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

7.7) Describe fish health maintenance and sanitation procedures applied.

All adults held for broodstock are inoculated for Furunculosis with oxytetracyclene and for Bacterial Kidney Disease (BKD) with erythromycin at the trap prior to loading into the trucks. During the holding of these fish (three times a week) formalin or hydrogen peroxide treatments are administered (since 2001) as a flow through treatment for 1-2 hours. This is to control fungus on the fish. A second inoculation of erythromycin and oxytetracyclene occurs about one month prior to spawning. Mortalities are removed from the pond on a daily basis.

7.8) Disposition of carcasses.

Both spawned fish and excess fish are disposed of in accordance with ODFW's Fish Hatchery Management Policy (OAR 635-007-0542 through 0548), which includes freezing, rendering, or burying. Surplus hatchery adults of high quality are given to local charities and food banks after recycling is

discontinued for the season. Spawned fish carcasses determined to be low in IHNV are utilized in ongoing nutrient enrichment programs in the South Santiam basin.

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

All hatchery program fish are marked by removal of the adipose fin prior to release. This mark distinguishes returning adults as either a naturally produced fish or a hatchery produced fish. No summer steelhead are passed above Foster Dam. Adults not held at the hatchery for brood are recycled downstream and back into the fishery. Beginning October 1, all summer steelhead entering the trap are removed from the river to minimize numbers that may spawn naturally.

SECTION 8. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

8.1) Selection method.

Adults used for broodstock purposes are collected throughout the run and spawned from late December through mid-February. Some release programs have requested particular segments of the run to provide specific fisheries and basin needs.

8.2) Males.

Male-to-female spawning ratios have not been consistently applied over the past decade. Prior to 1994, the number of male adults spawned was not recorded; hence, exact spawning ratios can not be calculated. Since then, spawning ratios have varied from year to year. In 1994, the hatchery spawned at a 3:4 male-to-female ratio; in 1995 and 1996 they spawned at 1:1 male-to-female ratio; in 1997 they spawned at a 1:2 male-to female ratio; in 1998 they spawned at 2:3 male-to –female ratio; and in 1999 they attempted to spawn at a 1:1 male-to-female ratio. Refer to Section 7.4.2 for specific spawning ratios from 1994 to present.

8.3) Fertilization.

South Santiam Hatchery

The hatchery applies a 1:1 fertilization scheme. Sanitation procedures include disinfection of personnel between handling of females, footbaths, and a 15-minute iodophore treatment for eggs prior to incubation. Eggs are kept to 1 or 2 females per incubator tray, and eggs destroyed if found to be IHNV positive.

8.4) Cryopreserved gametes.

Cryopreserved gametes are not used for Skamania summer steelhead (stock 024) programs.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

No listed fish are collected for subsequent mating.

SECTION 9. INCUBATION AND REARING -

Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.

9.1) Incubation:

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

South Santiam Hatchery

Table 9.1.1-1. Egg survival to eyed stage at South Santiam Hatchery.

Year	Egg Take	Green-Eyed Survival (%)
1992	1,632,000	93
1993	1,982,000	93
1994	1,763,000	90
1995	1,607,000	91
1996	1,691,000	92
1997	1,206,000	89
1998	3,058,000	89
1999	1,191,000	87
2000	2,257,000	89
2001	2,208,000	84
2002	1,971,000	87

Oak Springs Hatchery

Table 9.1.1-2. Eyed egg to ponding survival at Oak Springs Hatchery.

Brood Year	Eyed egg – Ponding Survival	Ponding to Fingerling/ Shipment
1992	97.6%	nya
1993	87.0%	nya
1994	99.8%	96.9%
1995	84.5%	96.0%
1996	95.1%	82.3%
1997	86.1%	83.6%
1998	94.2%	95.9%
1999	81.6%	92.3%
2000	93.2%	94.8%
2001	95.6%	90.8%
2002	95.9%	92.6%
2003	98.5%	95.1%

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

Current egg take goals allow for up to 1,000,000 surplus eggs if IHNV are not encountered. Surplus eyed eggs, if not needed by any other program, are destroyed by freezing and burying in a landfill.

If the hatchery reduces the number of eggs retained, a representative sample of each male/female cross is culled. Exceptions may occur if there is a high degree of disease or epidemics associated with certain parents; if this occurs, offspring of diseased parents may be culled, in order to maximize long-term survival of the brood.

Oak Springs Hatchery:
Eggs received in excess of production goals are raised through the fry stage. Those remaining at the fry stage in excess of production are destroyed. In the future, the hatchery plans to adjust egg request to minimize excess production.

9.1.3) Loading densities applied during incubation.

Integrated Hatchery Operations Team (IHOT 1995) species-specific incubation recommendations are followed for water quality, flows, temperature and incubator capacities.

South Santiam Hatchery:
The hatchery maintains flow in incubators at 4-5 gpm. Each tray holds 3,000-8,000 eggs. Incubation facilities for this program involve 30 stacks with 14 trays/stack. Average egg size is 152 eggs/oz.

Oak Springs Hatchery:
The hatchery uses 100 trays for eggs of this program. Each tray holds 10,000 eggs with an average egg size of 152 eggs/oz. Flow through the incubators is 5gpm.

9.1.4) Incubation conditions.

Integrated Hatchery Operations Team (IHOT 1995) species-specific incubation recommendations are followed for water quality, flows, temperature and incubator capacities.

Eggs are monitored during incubation when needed to determine fertilization efficiency and embryonic development. Eggs are incubated under conditions that result in equal survival of all segments of the population to ponding. Families are NOT incubated individually. Families within spawning groups are mixed randomly at ponding so that unintentional rearing differences affect families equally. Incubation conditions are manipulated as to synchronize ponding of fry.

Incubation from eye-up to hatch also occurs at Oak Springs Hatchery (Deschutes River).

South Santiam Hatchery:
At South Santiam Hatchery, initial incubation (through eyed-egg) occurs on a mix of well water and home stream water for a portion of the fish, while other eggs are reared through eye-up solely on well water. Families are initially incubated individually to allow culling for disease. Families are combined after eye-up and culling for shipment to other hatcheries for incubation from eyed egg to hatch.

Temperatures are monitored by thermographs or digital thermometers at each stack. Temperature is regulated via mixing of water from two water sources. Typical temperature range throughout incubation is 42-56ºF, with an average of 48ºF. Dissolved oxygen is not monitored during incubation, but the hatchery has not experienced problems during incubation associated with super-saturation or low D.O. The hatchery also does not have problems with siltation in the incubators.

Oak Springs Hatchery:
Temperatures in the incubators are checked daily with a hand-held thermometer. Temperatures during incubation are held at either 37°F or 53°F. When eggs arrive in multiple shipments, or at multiple developmental stages, eggs that are further progressed are held on water chilled to 37°F until the less-developed eggs catch up. Once all eggs are at similar development, they are held in ambient water at 53°F. Ambient water is spring source and is a constant 53°F. Dissolved oxygen levels are not monitored during incubation, and silt levels are not an issue because the water source is a spring. Flow through the incubators is 5gpm. A flow alarm is situated at the headbox to alert staff to water loss.

9.1.5) Ponding.

South Santiam Hatchery:
All eggs incubated at South Santiam Hatchery are transferred to either Oak Springs Hatchery or Bonneville Hatchery prior to ponding. No ponding or rearing of summer steelhead of this program occurs at South Santiam Hatchery.

Oak Springs Hatchery:
Ponding of fish of this program is forced, and is based primarily on visual inspection of the fish, though cumulated temperature units is used as a general guideline. Fish are generally at 2,800 fish per pound (fpp) at ponding in late March. Button up is estimated to be nearly 100% at ponding.

9.1.6) Fish health maintenance and monitoring.

Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site.

Eggs are monitored when needed to determine fertilization efficiency and embryonic development. Following eye-up stage, eggs are inventoried, and dead or undeveloped eggs removed and disposed of as described in the disease control guidelines.

Dead or culled eggs are discarded in a manner that prevents transmission to receiving watershed.

Oak Springs Hatchery:
Fungus control for fish of this program is not an issue. Fish are received at a late enough developmental stage that fungus has never been an issue. For eggs held on chilled water for an extended period, the water is cold enough that fungus is not a problem. Once received, eggs are not interacted with until ponding. Eggs are not closely monitored, and mortalities are not inspected for until near time for 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.

South Santiam Hatchery:
No listed fish are reared at this hatchery, and the fish of this program are not listed. However, during spawning, eggs testing positive for IHNV are culled to minimize the likelihood that the program produces IHNV positive fish. Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed.

Oak Springs Hatchery:
No listed fish are reared at this hatchery. Eggs are incubated on spring water, and the water source meets all IHOT guidelines. Disinfection procedures are implemented during incubation that prevent pathogen transmission between stocks of fish on site. Dead or culled eggs are discarded in a manner that prevents transmission to the receiving watershed.

9.2) Rearing:

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

data are available.

South Santiam Hatchery

Table 9.2.1-1. Fingerling to smolt survival at South Santiam Hatchery.

Year	Fingerling to Release Survival
1992	99%
1993	99%
1994	98%
1995	99%
1996	99%
1997	94%
1998	98%
1999	86%
2000	98%
2001	96%
2002	NA

Marion Forks Hatchery

Marion Forks hatchery receives a limited number of fish at 4.5 fpp from Roaring River and Willamette hatcheries. These fish are acclimated at Marion Forks Hatchery (Minto collection facility) for approximately 3 weeks, at which time they are volitionally released. No data are kept regarding mortality rates during this acclimation period, but mortality is considered to be negligible.

Roaring River Hatchery

Table 9.2.1-2. Fingerling to smolt survival at Roaring River Hatchery.

Year	Fingerling to Release Survival
1992-93	99.0%
1993-94	98.1%
1994-95	98.3%
1995-96	99.9%
1996-97	98.9%
1997-98	99.0%
1998-99	97.6%
1999-00	97.9%
2000-01	98.9%
2001-02	98.5%
2002-03	98.4%

Leaburg Hatchery

Table 9.2.1-3. Fry to smolt survival at Leaburg Hatchery.

Year	Fry to Fingerling Survival	Fingerling to Smolt Survival
1990	98%	99%
1991	47%	98%
1992	94%	99%
1993	NA	98%
1994	NA	98%
1995	22%	99%
1996	NA	97%
1997	NA	93%

1998	NA	97%
1999	NA	98%
2000	NA	99%
2001	NA	96%
2002	NA	88%

Leaburg Hatchery currently obtains fingerlings from Oak Springs Hatchery at 150 fpp in mid-June.

Dexter Hatchery

Table 9.2.1-4. Fingerling to smolt survival at Dexter Hatchery.

Year	Parr to Release Survival
1995	99.9%
1996	98.5%
1997	99.6%
1998	98.2%
1999	99.5%
2000	99.6%
2001	99.2%
2002	99.8%

Willamette Hatchery

Table 9.2.1-5. Fingerling to smolt survival at Willamette Hatchery.

Year	Fingerling to Release Survival
1998	98.0%
1999	98.8%
2000	99.6%
2001	98.4%
2002	99.0%

Willamette Hatchery was first involved in this program in 1998.

Oak Springs Hatchery

Table 9.2.1-6. Fry to transfer survival at Oak Springs Hatchery.

Year	Fry to Transfer Survival
1998	85.2%
1999	95.8%
2000	92.5%
2001	95.1%
2002	90.8%
2003	95.6%

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

South Santiam Hatchery:

Juvenile rearing density and loading guidelines used at the facility are based on: standardized agency guidelines, life-stage specific survival studies conducted at other facilities, staff experience (e.g., trial and error) and other criteria. Fish are reared at a maximum density of 1.1 lbs./cu. ft., and a loading criterion of 7.0 lbs./gpm. These are the density and loading criteria near the time of release.

IHOT standards are followed for water quality, alarm systems, loading and density.

Marion Forks Hatchery:
Fish are acclimated at Minto Pond at a density of 0.5 lbs/ cu. ft. and a loading criterion of 11.9 lbs./gpm.

Roaring River Hatchery:
Juvenile density and loading guidelines at the facility are based on standardized agency guidelines, life-stage specific survival studies conducted at other facilities, and staff experience. IHOT standards for density and loading criteria are followed. Roaring River hatchery maintains densities and loading criteria lower than IHOT standards because water and space are available. Rearing density (actual levels and goals) is 0.72 lbs./cu. ft. Loading criteria levels and goals are 9.0 lbs./gpm, and the flow index is 1.45.

Leaburg Hatchery:
IHOT standards are followed for: water quality, predator control to provide the necessary security for the cultured stock, loading and density. Program loading and density guidelines are lower than agency guidelines. Rearing densities are 0.9 lbs/cu. ft., and the loading criteria is 5.1 lbs/gpm. These values are equivalent to the hatchery goals.

Dexter Hatchery:
Rearing density is 1.36 lbs/ cu. ft., and the loading criteria over the last 8 years has ranged from 5.74-7.55 lbs./gpm while averaging 6.94 lbs./gpm. The loading criteria goal is to be below 8.0 lbs/gpm.

Willamette Hatchery:
The rearing density is 2.0 lbs./cu. ft, and the loading criteria is 6 lbs./gpm. These values are the same as the goals.

Oak Springs Hatchery:
The rearing density is 0.33 lbs/cu. ft., and the loading criterion is 10 lbs./gpm. These values are the same as the goals.

9.2.3) Fish rearing conditions

South Santiam Hatchery:
Solids, unused feed and feces are removed periodically to ensure proper cleanliness of rearing containers. Raceways are swept weekly (spring, summer, fall) or biweekly (winter) depending upon loading and amount of feed distributed. IHOT standards are followed for water quality, alarm systems, loading and density. Temperatures in the rearing ponds range from 40-58°F throughout rearing from June to release in April. Dissolved oxygen is not monitored regularly because problems associated with D.O.'S. are not experienced. Water flows through the raceways average 600 gpm and mortality is picked daily.

Marion Forks Hatchery:
Fish of this program are held in adult rearing ponds at Minto Pond. Fish are visually monitored for presence of disease periodically. The fish are held at Minto for 2-3 weeks for acclimation. During this period the ponds are not cleaned, water flows average 3700-4000 gpm, water temperatures are 40-42°F and D.O. levels are 9-10 ppm.

Roaring River Hatchery:
Ponds are cleaned weekly to remove settleable solids. Temperature is monitored with a handheld digital thermometer three times a day. Temperatures range from 40-55°F during rearing. Dissolved oxygen levels vary from 9.5 ppm to summer low flow values of 6.5 ppm. The hatchery doesn't experience problems with D.O. being too high or low. Mortality is picked daily. Flow in the rearing ponds is 600-800 gpm

Leaburg Hatchery:
The fish are monitored for behavioral tendencies on a daily basis when mortality is removed and during feeding. Ponds are brushed weekly to remove settleable solids and to ensure proper cleanliness of rearing containers. Temperature is monitored via digital temperature data logger on the McKenzie and typically ranges between 35-60°F. Dissolved oxygen is at or near saturation incoming, and is usually at 8 ppm or greater leaving the ponds. Leaburg hatchery doesn't experience difficulties with gas super-saturation in the source water. Flow rates in the incubation ponds are 1,200 gpm. Each pond has its own equipment for cleaning.

Dexter Hatchery:
The rearing ponds are not manually cleaned, but are cleaned via flow through the ponds. Flow rate in the ponds is 8 CFS. Temperatures in the ponds are monitored via a thermograph in the headbox of the raceways. Dissolved oxygen is not measured regularly because it is typically not a problem. When problems occur, D.O. measurements are taken with a portable D.O. meter. Supplying each pond with its own brooms, brushes, etc minimizes spread of disease. Personnel are required to sanitize themselves and equipment between ponds when working in multiple ponds. Fish are not transferred between ponds during their stay to minimize interaction between groups of fish. Mortalities are picked daily

Willamette Hatchery:
Ponds are maintained by being cleaned once per week. A thermograph in the hatch house monitors the temperature of the water going to all the rearing ponds. Flow rates in the ponds is 600-700 gpm. Each pond has its own pickers and other equipment, and personnel sanitize their boots/raingear when moving between ponds. Mortalities are picked daily. D.O. is not routinely monitored, and has not been a cause of concern in the past.

Table 9.2.3. Average monthly water temperature at Willamette Hatchery, June-January.

Month	Average Rearing Temperature
June	52.0
July	56.5
August	56.0
September	52.0
October	46.0
November	42.0
December	41.0
January	40.0
February	40.0
March	41.5
April	43.5

Oak Springs Hatchery:
Temperature is not monitored in the rearing ponds. The water source for the hatchery provides water of a constant 53°F. Dissolved oxygen is not monitored in the ponds holding fish of this program because the holding densities are low enough that low D.O.'S. is never a concern. Water flows in rearing unit's range from 100-700 gpm depending on densities and water availability. Lower flow rates are used when the fish are initially ponded and do not require the higher flows. Ponds are cleaned two times per week initially, but as development progress, once per week. Ponds are visually inspected daily for signs of disease or mortalities. Mortalities are removed and buried.

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.

The program does not use a diet and growth regime that mimics the natural seasonal growth patterns

South Santiam Hatchery

At South Santiam Hatchery, fish growth is determined and monitored by pond sampling bi-monthly from 300 fpp through 50 fpp. Growth is determined and monitored by pond sampling monthly from 50 fpp through release at 8 fpp. Length sampling is done occasionally during rearing and always at smolt release. Individual lengths and weights, and consequently condition factors, are rarely done since size at release goals are consistently met.

Table 9.2.4-1. Average length and weight of steelhead, by month, at South Santiam Hatchery.

Rearing Period	Length (mm)	Weight (fpp)
May	nya	200.0
June	nya	160.0
July	nya	80.0
August	nya	40.0
September	nya	20.0
October	nya	12.0
November	171	9.0
December	nya	7.0
January	nya	6.2
February	nya	5.5
March	nya	4.9
April	210	4.5

Marion Forks Hatchery

Fish of this program are only held at this facility for three weeks. Fish are kept for acclimation purposes in cold water (38-39ºF), and are assumed to have grown minimally.

Roaring River Hatchery

Table 9.2.4-2. Average weight of steelhead, by month, at Roaring River Hatchery.

Rearing Period	Length (mm)	Weight (fpp)
May	nya	
June	nya	106.1
July	nya	45
August	nya	24.5
September	nya	14.1
October	nya	11.3
November	nya	9.5
December	nya	7.9
January	nya	6.9
February	nya	5.7
March	nya	4.8
April	210	4.5

Leaburg Hatchery

Table 9.2.4-3. Average growth, by month, at Leaburg Hatchery.

Rearing Period	Length (mm)	Weight (fpp)
June	60.5	200.0
July	82.6	81.2
August	99.6	43.3
September	127.0	22.8
October	142.2	15.2
November	158.8	11.0
December	174.2	8.4
January	183.9	7.1
February	193.0	6.2
March	201.4	5.4
April	214.4	4.5

Dexter Hatchery

Table 9.2.4-4. Average weight of steelhead, by month, at Dexter Hatchery.

Month	Weight (fpp)
November 1	14.0
December 1	11.8
January 1	8.9
February 1	7.3
March 1	6.0
April 1	4.7
Release (early April)	4.5

Willamette Hatchery

Table 9.2.4-5. Average weight of steelhead, by month, at Willamette Hatchery.

Month	Weight (fpp)
July 1	75.0
August 1	32.0
September 1	17.0
October 1	11.0
November 1	8.0
December 1	6.5
January 1	5.5
February 1	5.0
March 1	4.6
April 1	4.5

Oak Springs Hatchery

Table 9.2.4-6. Average weight of steelhead, by month, at Oak Springs Hatchery.

Rearing Period	Weight (fpp)
April 1	1,132
May 1	400
June 1	200
Mid June: transfer	140-150

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

Dexter Hatchery
These data are not available.

South Santiam Hatchery
These data are not available.

Marion Forks Hatchery
These data are not available.

Roaring River Hatchery
These data are not available.

Willamette Hatchery
These data are not available.

Leaburg Hatchery
Table 9.2.5. Weight gain, by month, at Leaburg Hatchery.

Rearing Period	Growth Rate	Hepatosomatic Index
June	98%	NA
July	98%	NA
August	98%	NA
September	92%	NA
October	85%	NA
November	85%	NA
December	80%	NA
January	75%	NA
February	75%	NA
March	85%	NA
April	NA	NA

Oak Springs Hatchery
These data are not available.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).

South Santiam Hatchery
Feeding rates are followed so that fish size is within ±10% of program goal each year. Operator conducts periodic feed quality analysis. Feed is stored under proper conditions as described by IHOT guidelines. Prior to brood year 2001, moist feeds were used exclusively. A comparison feed trial conducted with the 2001 brood year fingerlings determined that extruded dry feeds could meet fish production goals more cost effectively. 1.5% BWD to 3.5% BWD is fed during the rearing period. Cumulative food conversion averages 1.0 during rearing.

Marion Forks Hatchery
Fish are fed a dry feed on a demand basis. No estimates of feeding rate or food conversion efficiency are available.

Roaring River Hatchery
Fish are initially fed a BioDiet moist feed until they reach 50 fpp. Then they switch to the Silver Cup Salmon Extruded dry feed. Fish are typically fed six times per day, and feeding averages 2% body weight/day. Conversion rate estimates are usually 1.1-1.3.

Leaburg Hatchery
Table 9.2.6-1. Feeding regime and conversion rates at Leaburg Hatchery.

Rearing Period	Food Type	Application Schedule (# Feedings/day)	Feeding Rate Range (%B.W./day)	Lbs. fed per GPM of Inflow	Food Conversion
Jun/Jul	Bio Dry 1000	4	2.4-1.9	0.04	0.8
Aug/Sep	Bio Dry 1000	4	1.9-1.3	0.08	0.9
Oct/Nov	Bio Dry 1000	3	1.3-0.7	0.09	1.0
Dec/Jan	Bio Dry 1000	3	0.7-0.44	0.10	1.1
Feb/Mar	Bio Dry 1000	3	0.44-0.55	0.07	1.0

Dexter Hatchery
Fish are fed Oregon Bio Dry 1000 one to two times per day. Fish are fed less when turbidity is high. Food conversion ranges from 0.8 in November to 0.6 in April.

Willamette Hatchery
These fish are feed a dry feed of which the brand may vary. Feeding schedule is variable depending on the time of year, but varies from 1-4 times per day. The goal is to feed 0.5% B.W./day. Food conversion estimates are approximately 1.0. Estimates of lbs. of feed/gpm of inflow were not available.

Oak Springs Hatchery
Fish are fed Bioproducts VitaDiet, a dry feed. Feeding is 4-6 times per day, and rates vary from 4.5% B.W./day to 1.9% B.W. day. Feeding rates in terms of pounds of food/gpm was 0.007-0.015. Food conversion efficiency estimates average 0.95.

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

South Santiam Hatchery
IHOT guidelines are followed to prevent transmission between lots of fish on site or transmission or amplification in the watershed. Vaccines are used whenever possible to minimize the use of antimicrobial compounds. Juvenile rearing density and loading guidelines used at the facility are based on standardized agency guidelines, life stage-specific survival studies conducted at other facilities and staff experience. Fish are inspected monthly by fish health staff.

Roaring River Hatchery
IHOT fish health guidelines are followed to prevent transmission between lots of fish on site or transmission or amplification to or within the watershed. Ponds are cleaned weekly to remove settleable solids. Ponds are inspected monthly by pathology and monitored daily by on-site staff. Mortalities are removed daily, frozen and discarded. All ponds are equipped with flow alarms.

Leaburg Hatchery
IHOT fish health guidelines are followed to prevent transmission between lots of fish on site or transmission or amplification to or within the watershed. Whenever possible, vaccines are used to minimize the use of antimicrobial compounds. Juvenile and rearing density guidelines at the facility are based on standardized agency guidelines and other criteria. Rearing ponds are cleaned on a weekly basis.

Dexter Hatchery
Fish are inspected daily for mortalities. Fish are inspected monthly by pathology, and if problem occurs, pathology recommendations are followed. Each pond has its own cleaning and maintenance tools.

Willamette Hatchery
Fish are visually inspected daily for signs of disease or mortalities. Mortalities are removed, frozen and discarded. Pathology inspects the fish monthly, and if problems occur, recommendations of pathology are followed.

Oak Springs Hatchery
Fish are visually inspected daily for signs of disease or mortalities. Mortalities are removed and buried. Pathology inspects fish monthly. If there is a disease problem, Pathology recommendations are followed.

Marion Forks Hatchery
Fish are visually inspected for the presence of disease throughout the acclimation period.

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

South Santiam Hatchery
Smolt development is determined primarily through length and weight criteria. Goal for summer steelhead is 4-6 fish-per-pound (fpp) and a length of 180mm.

Marion Forks Hatchery
Fish are received at smolting size. They are acclimated for three weeks and then volitionally released.

Roaring River Hatchery
Smolt development is determined primarily through length and weight criteria. Goal for summer steelhead is 4-6 fish-per-pound (fpp) and a length of 185mm.

Leaburg Hatchery
The migratory state of the release population is determined by volitional release, behavior, condition factor, or physical appearance.

Willamette Hatchery
Fish are transferred to Dexter Pond or Omsville Ponds when they reach 4.5 fpp.

Dexter Hatchery
Fish are determined when they are ready for release based on: 1) Reaching desired size 2) Visual inspection, and 3) Pathology inspection cleared.

Oak Springs Hatchery
Fish are deemed ready to transfer to other hatcheries when they have reached the size goal.

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

South Santiam Hatchery
The program attempts to better mimic the natural rearing environment by actively simulating photoperiod during incubation. Fish are volitionally released in a manner that simulates natural seasonal migration patterns.

Marion Forks Hatchery
Fish are volitionally released in a manner that simulates natural seasonal migration patterns.

Roaring River Hatchery
No natural rearing methods are applied.

Leaburg Hatchery
The program attempts to better mimic the natural rearing environment by reducing rearing density below agency or other guidelines, and by rearing under natural water temperatures. Fish produced are qualitatively similar to natural fish in morphology and physiological status. Volitional releases simulate natural seasonal migration patterns. Fish released are of NOT similar size to natural fish of the same species.

Willamette Hatchery
No attempts are made to mimic the natural environment. Fish are reared on water similar to that in the natural environment.

Dexter Hatchery
The program attempts to better mimic the natural rearing environment by reducing rearing density below agency or other guidelines, and by rearing under natural water temperatures. Fish produced are qualitatively similar to natural fish in morphology and physiological status. Volitional releases simulate natural seasonal migration patterns. Fish released are of NOT similar size to natural fish of the same species.

Oak Springs Hatchery
No natural rearing methods are applied. Fish are reared in a manner to meet size goals efficiently as possible.

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.

Fish propagated in this program are not listed, and listed fish are not present at any of the hatcheries involved in this program. Fish health monitoring meets guidelines as set up in the IHOT 1995 Annual Report. IHN positive eggs are culled from the population and are not reared to reduce risk of the spread of the virus. Effluent and monitoring criteria meet DEQ water quality standards and are within DEQ NPDES water discharge standards.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

10.1) Proposed fish release levels.

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

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

Stream, river, or watercourse:
Release point:
Major watershed:
Basin or Region:

See Section 10.3 for additional information about release locations.

Middle Fork Willamette River Subbasin
From 1990 to present, summer steelhead have been released into the mainstem Middle Fork Willamette, Fall Creek (below Fall Creek Dam) and Dexter Reservoir. The last release into Fall Creek was completed in April 1998. Since 1996, the percent of South Santiam River broodstock production released into the Middle Fork has steadily increased (from 11% to 17% and 19%).

North Santiam River Subbasin
Summer steelhead have been routinely released into the North Santiam River subbasin, near Stayton Pond. Most steelhead are released in the mainstem North Santiam River, however, portions of the 1990-1993 brood were released into the Little North Fork Santiam River; these releases comprised about 10-48% of the North Santiam subbasin releases.

South Santiam River Subbasin
Releases have primarily occurred in the mainstem South Santiam River below Foster Dam. However, in 1995, a group of fingerlings (averaging 73.0 fish/lb.) were released into Green Peter Reservoir, and a group of smolts were released into Roaring River, a tributary to the South Santiam River.

McKenzie River Subbasin
Fish are primarily released into the mainstem McKenzie River (from the mouth to the confluence with the South Fork) in early April. Since 1996, all releases into the McKenzie River have been at the hatchery, to reduce straying. Juveniles were also released into Blue River Lake in winter of 1991 and 1995.

Molalla River
Steelhead liberated into the mainstem Molalla River from 1991 to 1997, made-up about 7.6% of annual production. To help protect threatened winter steelhead, summer steelhead have not been released into the Molalla River since 1997.

Closed Waterbodies
- Henry Hagg Lake is a man-made reservoir which drains into Scoggins Creek, a tributary to the Tualatin River, off Highway 47.

Willamette River Basin
In 1998, a group of subyearlings were released into Dorena Lake, a reservoir on Row River (a tributary to the Middle Fork Willamette River). Steelhead smolts were likewise released into the mainstem Willamette River in 1997, 1998, 2001, 2002, and 2003. This is anticipated to be an ongoing program.

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

Total numbers of Skamania stock summer steelhead released (since 1990 brood year) are reported in the following tables.

Middle Fork Willamette River - Since 1990, Skamania stock summer steelhead have been released into various reaches (and reservoirs) of the Middle Fork Willamette River (Table 10.3-1). Steelhead are typically released in the spring (April/May), and are hauled from the hatchery for direct release.

Table 10.3-1. Summer steelhead releases into the ***Middle Fork Willamette River basin***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Dexter Reservoir	1997	5/12/98	SS	3,772	920	4.1
	1998	5/5/99	SS	3,504	730	4.8
	1999	10/19/99	LB	32,332	1,379	23.4
		4/27/00	SS	2,408	430	5.6
	2000	10/6-13/00	SS	18,894	467	40.5
FallCreek	1991	4/13/92	MC	9,940	2,115	4.7
	1992	4/14/93	DX	10,120	2,300	4.4
	1996	4/7/97	DX	13,793	3,065	4.5
	1997	4/7/98	DX	20,240	4,600	4.4
	1998	4/1/99	WI	22,483	4,340	5.2
	1999	4/6-7/00	DX	30,025	7,015	4.3
Middle Fork Will. River	1990	12/12/90	MC	19,416	1,230	15.8
	1991	4/13/92	MC	65,349	14,006	4.7
			WI	31,486	6,775	4.6
	1996	4/7/97	DX	80,539	17,897	4.5
	1997	4/7/98	DX	96,514	21,935	4.4
	1998	4/2/99	WI	22,747	4,640	4.9
		4/8/99	DX	112,490	24,832	4.5
	1999	4/4/00	WI	45,297	10,565	4.3
		4/7/00	DX	86,092	20,115	4.3
	2000	4/9/01	DX	115,790	24,224	4.8

North Santiam Subbasin – Summer steelhead are acclimated and released from Minto Pond into the North Santiam subbasin in the spring, from early to mid April. Refer to Section 10.6 regarding acclimation protocols.

Table 10.3-2. Summer steelhead releases into the ***North Santiam subbasin***, since 1990 (brood years 1990 to 2001). All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Little N. F. Santiam River	1990	4/17/91	RR	20,039	3,058	6.6
	1991	4/15/92	RR	30,474	6,880	4.4
	1992	4/9/93	RR	90,420	18,929	4.8
	1993	4/14/94	RR	14,544	3,060	4.8
North Santiam River	1990	4/15/91	MC	42,773	8,640	5.0
		4/16/91	SS	50,499	10,159	5.0

		4/17/91	RR	107,164	16,337	6.6
	1991	4/13/92	MC	44,677	8,212	5.4
		4/14/92	SS	50,505	10,288	4.9
		4/15/92	RR	76,494	17,171	4.5
	1992	4/8-4/9/93	RR	19,725	4,093	4.8
		4/12/93	MC	36,195	4,969	7.3
			SS	40,573	8,186	5.0
	1993	4/10-4/11/94	MC	36,070	7,147	5.0
		4/13-4/14/94	RR	85,488	17,957	4.8
		4/12/94	SS	40,030	8,359	4.8
	1994	4/5-4/6/95	RR	118,353	26,671	4.4
		4/5/95	SS	11,132	2,420	4.6
		4/7/95	MP	18,256	3,260	5.6
	1995	4/3-4/4/96	RR	117,834	27,403	4.3
		4/2/96	SS	46,930	10,230	4.6
	1996	4/9-4/10/97	RR	118,606	22,384	5.3
		4/8/97	SS	35,709	8,070	4.4
	1997	4/6/98	MF	92,394	20,532	4.5
	1998	4/6/99	MF	159,280	36,200	4.4
	2000	4/9/01	MP	128,880	28,140	4.6

South Santiam River Subbasin – Summer steelhead have been released into the South Santiam River drainage in the spring, from mid-to-late April. However, summer steelhead excess to smolt production were released into Green Peter Reservoir in the summer of 1995 and in February of the following year.

Table 10.3-3. Summer steelhead releases into the ***South Santiam subbasin***, since 1990 (brood years 1990 to 2000). All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Green Peter Reservoir	1995	8/24/95	RR	93,425	1,280	73.0
Roaring River	1995	2/7/96	RR	15,990	2,710	5.9
South Santiam River	1990	4/15-4/16/91	SS	156,013	30,654	5.1
	1991	4/14-4/16/92	SS	163,589	34,716	4.7
	1992	4/12-4/13/93	SS	140,927	29,601	4.8
	1993	4/12-4/15/94	SS	143,053	32,403	4.4
	1994	4/5-4/7/95	SS	155,111	35,288	4.4
	1995	4/2-4/11/96	SS	143,923	33,125	4.3
	1996	4/9-4/14/97	SS	147,991	33,333	4.4
	1997	4/30/98	SS	181,112	43,672	4.1
	1998	4/21/99	SS	136,471	32,898	4.1
		5/5/99	SS	13,690	2,852	4.8
	1999	4/10-12/00	SS	147,079	35,576	4.1
	2000	4/12/01	SS	145,195	33,610	4.3

McKenzie River Subbasin – Fish are primarily released into the mainstem McKenzie River in early April. However, juveniles were released into Blue River Lake in winter of 1991 and 1995.

Table 10.3-4. Summer steelhead releases into the ***McKenzie River subbasin***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Blue River Lake	1991	12/27/91	GC	8,160	160	51.0
	1995	1/8/96	GC	7,985	649	12.3
Cedar Creek	1997	4/14/98	SA	37,798	6,539	5.8
	1998	4/12/99	SA	35,324	6,122	5.8
	1999	4/14/00	SA	37,286	5,352	5.9
	2000	4/16/01	SA	59,889	11,451	5.2
McKenzie River-1	1991	4/13/92	MC	20,563	4,375	4.7
	1996	4/1/97	LB	113,907	28,830	4.0
	1997	4/7/98	LB	111,656	25,989	4.3
		5/21/98	SS	2,027	498	4.1
	1998	4/6/99	LB	114,843	24,148	4.8
	1999	4/18/00	LB	114,526	26,634	4.3
	2000	4/3/01	LB	67,949	14,039	4.8
		4/10/01	Willamette	48,662	8,390	5.8

Molalla River Subbasin – All summer steelhead were direct release in the spring, and of smolt condition and size (5.4 fish/lb.). To help protect threatened winter steelhead, summer steelhead have not been released into the Molalla subbasin since 1998 (brood year 1997).

Table 10.3-5. Summer steelhead releases into the ***Molalla River subbasin***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Molalla River	1990	4/17/91	RR	30,686	4,708	6.5
		4/19/91	GC	35,058	6,374	5.5
	1991	4/15/92	RR	31,317	7,012	4.5
		4/17/92	GC	35,449	5,660	6.3
	1992	4/8/93	RR	21,413	4,369	4.9
		4/16/93	GC	35,109	4,809	7.3
	1993	4/13-4/14/94	RR	65,201	13,289	4.9
	1994	4/5-4/6/95	RR	52,853	11,198	4.7
	1995	4/3-4/4/96	RR	57,082	13,190	4.3
	1996	4/9-4/10/97	RR	59,703	11,364	5.3

Table 10.3-6. Summer steelhead releases into the ***Coast Fork Willamette River subbasin***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Dorena Reservoir	1998	10/22/98	LB	12,673	289	43.9
	2000	10/13/00	SS	17,371	457	38.0
	2001	10/17/01	SS	8,875	535	16.6
		10/19/01	LB	864	48	18.0
Cottage Grove Reservoir	2000	4/12/01	SS	3,263	725	4.5
	2001	10/17/01	SS	8,875	535	16.6
		10/19/01	LE	864	48	18.0

Table 10.3-7. Summer steelhead releases into the ***Willamette River basin***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Willamette River-2	1996	4/7/97	DX	19,508	4,335	4.5
	1997	4/8/98	RR	31,836	7,580	4.2
	2000	4/3-4/4/01	RR	39,995	8,695	4.6

Closed Water Bodies – Summer steelhead are released into closed waterbodies in the fall, winter and spring. Time of release has varied from year-to-year, depending upon the rearing facility. The fish are surplus to smolt production needs, and are thus released to supplement a sport fishery on resident trout.

Table 10.3-8. Summer steelhead releases into ***closed water bodies***, since 1990. All data obtained from ODFW HMIS database.

Release Location	Brood Year	Release Date	Rearing Facility	# Fish Released	# lbs. Released	Fish/lb.
Henry Hagg Lake	1998	1/5/99	BO	50,200	5,000	10.0
		3/26-3/30/99	BO	52,086	6,245	8.3

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

Refer to above tables for release dates.

Release and transportation protocols will be consistent with good fish culture practices to reduce stress and to maximize survival of the fish. Some of the factors that reduce survival are; elevated water temperatures, poor water quality, low dissolved oxygen levels, physically induced stress due to overcrowding, physical injury, and overall poor health of the fish prior to release (Carmichael, et.al. 2001). Release methods will address potential stressors and maintain them at the lowest levels possible.

10.5) Fish transportation procedures, if applicable.

Most releases of summer steelhead in the Willamette Basin occur after a minimum of 2-3 weeks acclimation at an ODFW facility. The only direct release of summer steelhead is a group of 42,000 smolts into the Middle Fork Willamette in the Eugene area. These smolts are hauled from Roaring River hatchery to the liberation site in ODFW liberation units of various sizes, following IHOT (1995) guidelines. Travel time from loading to release is approximately 1½ hours.

10.6) Acclimation procedures.

Current acclimation procedures are as follows:

- Approximately 79,000 pre-smolts are transferred from Roaring River Hatchery in March, acclimated at Minto Ponds for 2-3 weeks, before being released into the North Fork Santiam River.
- Approximately 40,500 pre-smolts are transferred from South Santiam Hatchery in March, acclimated at Minto Ponds for 2-3 weeks, before being released into the North Fork Santiam River.
- Approximately 42,000 pre-smolts are transferred from Willamette Hatchery in March, acclimated at Minto Ponds for 2-3 weeks, before being released into the North Fork Santiam River.

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

All hatchery summer steelhead reared for smolt production purposes in the Upper Willamette Basin are adipose fin-clipped, hence, naturally produced steelhead are distinguishable from hatchery reared steelhead.

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

Surpluses are reduced to production levels well before time of release. This reduction takes place during grading and marking operations. Under current policy, surplus juveniles are destroyed or marked and released into a closed water system such as a lake, reservoir or pond where they contribute to angling opportunities.

10.9) Fish health certification procedures applied pre-release.

Fish health certification procedures are followed prior to release of hatchery smolts. All fish are examined for the presence of "reportable pathogens" as defined in the Pacific Northwest Fish Health Protection Committee model program (PNFHPC), within 3 weeks prior to release. ODFW fish pathologists conduct monthly fish health checks. The pathologists also conduct a pre-liberation disease check on each release group.

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

Contingency plans are in place to deal with chemical spills or water system failures at hatchery facilities. In the event of a complete water system failure, fish programmed for release into that particular river system would be released into the river after Regional or Manager approval. Any fish not programmed for that particular river system release could be released if they do not conflict with fish management objectives. If there were a conflict with management objectives, they would be allowed to die in the ponds.

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

All summer steelhead reared for smolt production purposes in the Upper Willamette Basin are adipose fin clipped, hence, naturally produced steelhead smolts are distinguishable from hatchery reared steelhead smolts.

Hatchery reared steelhead are released at full smolt size to encourage rapid emigration from the respective subbasin in order to minimize competition between hatchery produced juveniles and naturally produced juveniles.

Fish health certification procedures are followed prior to release of hatchery smolts (see Section 10.9).

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe plans and methods proposed to collect data necessary to respond to each "Performance Indicator" identified for the program.

Category 1: Legal Mandates

Standard 1.1: Program contributes to basin-wide mitigation requirements.
Indicator: Number of hatchery smolts released into the Upper Willamette River Basin (UWRB) annually.
Monitoring and Evaluation: Hatchery operations records will document annual production poundage.

Category 2: Harvest

Standard 2.1: Fish produced for harvest are produced and released in a manner enabling effective harvest while minimizing potential for adverse impacts to listed salmonid populations.

Indicator: Annual number of fish produced by this program which are harvested in the South Santiam River, North Santiam River, McKenzie River, and the Middle Fork Willamette River.
Monitoring and Evaluation: ODFW's catch "punchcard" system provides an annual estimate of catch of anadromous salmon and steelhead for each river. In addition, periodic statistically designed angler "creel" surveys provide refined estimates of catch and angling effort by sub-areas. A statistical creel survey is currently in place (2003) on the North and South Santiam Rivers and it is anticipated that funding will be provided to maintain that monitoring effort into the future.

In the event that data analysis reveals harvest goals are consistently not met, hatchery operations may be modified as follows:

Alternative Management Strategies:
1. Reduce or discontinue the hatchery program.
2. Liberalize angling regulations to increase catch.
3. Modify hatchery operations to increase catch (i.e., recycle excess hatchery adults).

Indicator: Annual number of listed salmonid species caught (including fish retained and fish released /discarded) in fisheries targeting this population.
Monitoring and Evaluation: Periodic statistical angler creel surveys provide an estimate of numbers of wild fish handled and released.

Alternative Management Strategies:
1. Additional regulatory restrictions on angling methods.
2. Limitation of angling effort.

Indicator: Recreational angler days generated annually by the summer steelhead fishery.
Monitoring and Evaluation: Periodic statistically designed angler "creel" surveys provide refined estimates of catch and angling effort by sub-areas.

Standard 2.2: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable selective harvest of hatchery origin fish in respective fisheries.

Indicator: Pre-release marking rate.

Monitoring and Evaluation: Marking and mark retention rates are monitored as an ongoing and routine part of hatchery marking operations.

Indicator: Pre-release mark retention rate.

Monitoring and Evaluation: Marking and mark retention rates are monitored as an ongoing and routine part of hatchery marking operations.

Standard 2.3: Excess adult hatchery returns are "recycled" through the fishery to increase harvest rate.

Indicator: Number of hatchery fish recycled.

Monitoring and Evaluation: Hatchery liberation records.

Indicator: Number of recycled hatchery fish harvested in the sport fishery.

Monitoring and Evaluation: Statistical creel surveys will be conducted to obtain estimates of numbers of recycled fish harvested**.**

Indicator: Number of recycled hatchery fish straying into non-target tributaries.

Monitoring and Evaluation: Number of recycled (tagged) hatchery fish observed during spawning surveys.

Category 3: Conservation of ESA-listed salmonid populations

Standard 3.1: Juveniles are released at a time and size to expedite their outmigration and minimize impacts on native species.

Indicator: Date and size of hatchery summer steelhead juveniles at release.

Monitoring and Evaluation: Hatchery liberations records.

Standard 3.2: Juvenile release strategies minimize direct impacts (e.g. predation, competition, behavioral) on wild winter steelhead and spring chinook juveniles.

Indicator: Type of release (i.e., volitional, forced, or direct).

Monitoring and Evaluation: Hatchery operations records will verify release strategies employed. After volitional release, the percentage of fish not migrating out of the holding pond can be determined.

Indicator: Extent of hatchery smolt residualism.

Monitoring and Evaluation: Proportion of production remaining in ponds after volitional release.

Indicator: Inter- and intra-specific competition and predation interactions.

Monitoring and Evaluation: Downstream migrants will be trapped in each subbasin to provide data on temporal and spatial overlap among hatchery fish and those produced naturally.

Indicator: Out-migration timing of hatchery smolts relative to applicable life stages of juvenile winter steelhead and spring chinook.

Monitoring and Evaluation: Naturally produced downstream migrants will be trapped in each subbasin to provide migration timing data for comparison to hatchery releases. Downstream migrants are also trapped at Willamette Falls to allow comparison of migration timing.

Standard 3.3: Release groups are sufficiently marked to allow evaluation of program effect on local natural population(s).

Indicator: Pre-release marking rates and type of mark.

Monitoring and Evaluation: Pre-release marking and mark retention rates are

monitored as an ongoing and routine part of hatchery marking operations.

Standard 3.4: Juveniles are released on-station to maximize homing ability to intended return location and minimize extent of adult straying (and associated potential for impacts to natural production) in the basin.

Indicator: Location of juvenile releases.
Monitoring and Evaluation: Hatchery liberation records.
Indicator: Length and timing of acclimation period.
Monitoring and Evaluation: Hatchery records.
Indicator: Release type (i.e., volitional, forced, or direct).
Monitoring and Evaluation: Hatchery operations records will verify release strategies employed. After volitional release, the percentage of fish not migrating out of the holding pond can be determined.
Indicator: Proportion of adult returns to program's intended return location(s).
Monitoring and Evaluation: Returns to subbasin traps are monitored and recorded as part of normal hatchery operations.

Standard 3.5: The hatchery summer steelhead program has minimal adverse effects on ESA-listed winter steelhead and spring chinook populations in the UWRB.

Indicator: Number of adult hatchery summer steelhead returning to respective subbasins.
Monitoring and Evaluation: ODFW-generated run size estimates (based on Willamette Falls counts and smolt releases), returns to subbasin traps, statistical creel surveys, and observed natural escapement of hatchery fish.
Indicator: Number of hatchery fish harvested by anglers in the respective subbasins.
Monitoring and Evaluation: Statistical creel surveys and ODFW salmon-steelhead catch records.
Indicator: Number of hatchery adults removed from the systems (via broodstock collection and/or seasonal removal to prevent straying).
Monitoring and Evaluation: Hatchery records at the subbasin collection facilities.
Indicator: Estimated total proportion of adult hatchery population on natural spawning grounds.
Monitoring and Evaluation: Relevant information (e.g. trap, creel, spawning survey data) will be analyzed to develop an estimate of the total proportion of the adult hatchery population that could have spawned naturally.
Indicator: Number of natural adult summer steelhead and/or redds.
Monitoring and Evaluation: Number of natural adult summer steelhead and/or redds observed during spawning surveys.
Indicator: Number of naturally produced (i.e. unmarked, subjected to scale analysis to verify origin) adult summer steelhead returning to the respective subbasin.
Monitoring and Evaluation: Returns to subbasin traps, and unmarked fish observed on spawning grounds.
Indicator: Population status of winter steelhead and spring chinook relative to estimated natural production levels (and potential impacts) of summer steelhead in the respective subbasin.
Monitoring and Evaluation: Hatchery adult return records will be evaluated from the subbasin collection facilities. The number of natural adult summer steelhead, winter steelhead and spring chinook and/or redds will be evaluated from spawning ground surveys. The number of naturally produced downstream migrants will be evaluated from traps in each subbasin to provide annual abundance/status data.

Indicator: Extent of interbreeding between hatchery fish and naturally produced fish.
Monitoring and Evaluation: Genetic analyses of juvenile *O. mykiss* sampled from natural rearing areas throughout the UWRB.

Standard 3.6: Basin-wide and local annual release numbers do not exceed estimated basin-wide and local habitat capacity; including spawning, freshwater rearing, migration corridor, and estuarine and nearshore rearing locations.

Indicator: Carrying capacity criteria for basin-wide and local habitat.
Monitoring and Evaluation: Water quality and habitat assessments/surveys on spawning grounds in each subbasin.
Indicator: Annual release numbers from each program in basin, including size and life stage at release, and length of acclimation.
Monitoring and Evaluation: Hatchery acclimation and release records at the subbasin level.
Indicator: Annual estimates of naturally produced juveniles present.
Monitoring and Evaluation: Naturally produced downstream migrants will be trapped in each subbasin to provide annual abundance/status data.
Indicator: Location of releases and natural rearing areas.
Monitoring and Evaluation: Hatchery release records and habitat/population surveys.
Indicator: Run timing of hatchery releases, compared to natural populations.
Monitoring and Evaluation: Returns to subbasin traps are monitored and recorded as part of normal hatchery operations. Returning adults are also monitored at Willamette Falls to allow further comparison of migration timing.
Indicator: Residualism rates of artificially produced juveniles in natural habitat.
Monitoring and Evaluation: Snorkel and/or electroshock surveys in early summer to determine number of residualized hatchery fish.

Category 4 - Operation of artificial production facilities

Standard 4.1: All involved hatcheries will be operated in compliance with the Integrated Hatchery Operations Team (IHOT) fish health guidelines.

Indicator: Number of broodstock sampled and pathogens observed.
Indicator: Rearing survival rates (i.e. egg to fry, and fry to smolt). Results of fish health examinations.
Indicator: Number of juveniles sampled and pathogens observed immediately prior to release.
Monitoring and evaluation: Above indicators are part of an ongoing monitoring and evaluation program. All groups of fish are observed daily in the hatchery for signs of disease. ODFW's Fish Health team conducts periodic sampling of the fish in the hatchery, especially if hatchery personnel observe any increase in mortality. Whenever diseased fish are detected, the diseased fish are treated according to IHOT protocols. Groups that cannot be certified as disease free prior to release are destroyed or otherwise disposed of according to IHOT protocols. Periodic review of the fish health monitoring results and disease history is necessary to identify trends or areas where operations could be modified to improve fish health.

Standard 4.2: Water discharged from all involved hatcheries (or other facilities) will comply with proscribed 330j general NPDS permit as required by the Oregon Department of Environmental Quality (DEQ).

Indicator: Water samples collected and results reported.
Indicator: Results within accepted criteria.

Monitoring and evaluation: Above indicators are part of an ongoing monitoring and evaluation program. Periodic review of the results of the water quality monitoring is necessary to identify trends or areas where operations can be modified to improve fish health and discharge water quality. If water quality does not meet permit standards, appropriate corrective action must be taken. Samples are collected by the hatchery staff in a manner and frequency described in the permit.

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Standard 4.3: Water withdrawal (i.e., intake) for all involved hatcheries (and other related facilities) will be constructed and operated in such a way as to minimize impacts on other species present in the system.

Indicator: Intake screens comply with the NOAA Fisheries juvenile fish screening criteria.

Monitoring and evaluation: Intake screens at all involved hatcheries (and other related facilities) will be inspected for compliance with the NOAA Fisheries juvenile fish screening criteria. Intake screens will be either in compliance or will be brought into compliance.

Standard 4.4: Wild spring chinook, winter steelhead, and other native fishes that enter any hatchery trap or holding facility will be handled and released in a manner that minimizes stress, injury, mortality and delay in migration.

Indicator: Numbers of unmarked adult winter steelhead and spring chinook released alive above trap.

Indicator: Numbers of unmarked juvenile *O. mykiss* and spring chinook handled at trap and released downstream.

Indicator: Mortalities of unmarked spring chinook and winter steelhead at each hatchery facility during operation of the adult trap.

Indicator: Dates the trap is operated and frequency of handling unmarked winter steelhead and spring chinook.

Monitoring and evaluation: Analysis of detailed hatchery records concerning the handling of any and all non-hatchery fish. Should it be recognized that undue stress, injury, mortality, or delay to migration is occurring, hatchery operations must be changed to minimize harm to wild or native chinook and other species. Such changes might include:

Alternative Management Strategies:

1. Working the trap more frequently.
2. Modification to anesthetizing procedures.
3. Modification to physical infrastructure.
4. Improvements to transport methods.

Standard 4.5: All hatchery summer steelhead carcasses used for stream enrichment will comply with a Memorandum of Agreement (MOU) between DEQ and ODFW.

Indicator: Number and location of summer steelhead chinook carcass distribution.

Monitoring and evaluation: Number of carcasses distributed to each stream reach will be guided by the number of carcasses available, historical run size, and MOA restrictions on pounds per mile of stream.

Indicator: Number of carcasses sampled and pathogens observed.

Monitoring and evaluation: The ODFW Fish Health staff will test an adequate number of carcasses to allow clearance for dispersal of carcasses.

Category 5- Socio-economic benefits

Standard 5.1: Each basin-specific summer steelhead program will be managed such that estimated harvest benefits of the program will equal or exceed hatchery production costs based on the benefit-cost model in ODFW (1999) or an updated version of that model.

Indicator: Estimated annual budget expenditures.
Indicator: Estimated economic benefit from angler days generated by the program.
Monitoring and evaluation: Periodic cost-benefit analysis of the hatchery program. If the benefit/cost analysis indicates the hatchery program is not cost effective, options might include:

Alternative Management Strategies:

1. Reducing or discontinuing the hatchery program.
2. Liberalizing angling regulations to increase catch.
3. Modifying hatchery operations to increase catch (i.e. recycle excess hatchery adults).

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

Many of the monitoring and evaluation activities listed in the previous section are currently part of routine ODFW Fish Culture, Fish Pathology, or Fish Management activities. Periodic review and analysis of the results of the various sampling programs and records of activities will be necessary. For the most part, ODFW staff can perform these reviews. However, it may be desirable to use outside consultants to periodically provide a comprehensive analysis of the hatchery program and monitoring data. ODFW may also need assistance in providing future economic analysis of the costs and benefits of the hatchery program.

Several other areas needing additional funding are also identified, including:
1. Additional funding for periodic creel and spawning ground surveys.
2. Funds to upgrade the intake screens at South Santiam Hatchery.

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.

- All adult traps (in each subbasin) will be monitored daily and worked at least 2-3 times a week during the peak of the run to minimize delay and stress on naturally produced chinook and steelhead adults.

- Water quality at all facilities will be maintained when holding unmarked adults.

- Unmarked adults will be handled only as necessary to load on to trucks for transport upriver or to the hatchery to be held as brood stock.

- All juvenile outmigrant traps (in each subbasin) will be monitored and worked daily during the peak of the run to minimize delay and stress on naturally produced chinook and steelhead smolts.

- All unmarked juveniles will be handled only as necessary to determine identify, abundance and migration timing.

SECTION 12. RESEARCH

12.1) Objective or purpose.

In 2002, the ODFW initiated a comprehensive research program to address the recommendations of the NMFS Biological Opinion on artificial propagation in the basin. The objective of this project is to evaluate the potential effects of hatchery programs on naturally spawning populations of spring chinook and winter steelhead. The project employs several types of activities to achieve this goal, including creels to assess fisheries, monitoring of adult and juvenile migration through the use of traps and video observations, and monitoring natural production and straying through spawning ground surveys.

Studies of predation by hatchery steelhead smolts on native juvenile chinook or steelhead may be initiated in the future. In order to sample steelhead smolts, there would be some incidental catch of listed chinook and steelhead juveniles. If this research goes forward, we anticipate trapping outmigrating smolts at Walterville Canal on the McKenzie River, and possibly at other sites as well. The trapping would take place in the spring during the outmigration of hatchery steelhead smolts. Smolts would be captured using seining, screw traps, or other juvenile fish traps. Trapping and handling could lead to injury or mortality of listed fish. Based on previous experience trapping and handling juvenile fish, we anticipate that mortality will be less than 1% for smolts and less than 5% for fry.

12.2) Cooperating and funding agencies.

U.S. Army Corp of Engineers (Hatchery BiOp funding); Oregon Department of Fish and Wildlife.

12.3) Principle investigator or project supervisor and staff.

Julie Firman, Project Leader, 28655 Highway 34, Corvallis, OR 97333, (541) 757-4263 ext 249, julie.firman@oregonstate.edu

Mike Hogansen, Asst. Proj. Leader, Leaburg Hatchery, 90700 Fish Hatchery Rd., Leaburg, OR 97489, (541) 896-3294 x227, m.hogansen@att.net

Brian Cannon, Asst. Proj. Leader, 28655 Highway 34, Corvallis, OR 97333, (541) 757-4263 ext 247, brian.cannon@oregonstate.edu

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

Refer to Section 2

12.5) Techniques: include capture methods, drugs, samples collected, and tags applied.

Capture (adult trapping facilities at Leaburg Dam and Bennett Dams, rotary screw trap, dam bypass), Observe (in-stream spawning surveys), Anesthetize (MS-222), Release Live Fish. For a detailed description of methods, see Firman et.al. (2004).

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

Adult trapping in the North Santiam is conducted from late February or early March through the end of October.

Adult trapping in the McKenzie is conducted year round with the exception of the peak chinook migration in June and July.

Juvenile trapping at the Leaburg bypass is conducted from January through June.

Summer steelhead spawning surveys run from late December to early March.

The McKenzie Creel runs from April through October.

The Middle Fork Creel runs from April through July.

The lower North Santiam Creel runs from April through July.

The upper North Santiam Creel runs from April through October.

The lower South Santiam Creel runs from April through July.

The upper South Santiam Creel runs from April through October.

Juvenile trapping at Walterville canal would be conducted from April through June if studies on hatchery steelhead smolt predation were initiated.

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

Handling will be minimized and measures taken to reduce stress. Traps are checked daily and the fish processed quickly and released. Densities are kept low in holding tanks. Temperature is monitored to ensure that fish are not stressed while they are held in traps. Adequate flow is maintained to ensure that fish have access to cold, well-oxygenated water. Juvenile fish may be anesthetized to reduce stress. Fish will be allowed to recover completely before release. Trapping and sorting efforts are conducted by trained ODFW biologists. Trapping at Leaburg Dam is discontinued during the peak of the adult chinook run due to the limited size of the trap. Trapping would also be discontinued at any of the traps if we observed unusually high stress or mortality.

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

Juvenile chinook are captured at the Leaburg Dam bypass in the course of trapping the Leaburg bypass for smolts. These fry and smolts are briefly handled before being released.

Adult chinook are trapped in the ladders over the Leaburg and Bennett dams. Wild fish are handled briefly as they are released above the dams.

Some wild winter steelhead are observed during spawning surveys for summer steelhead. Care is taken to avoid disturbing these fish or their redds.

Several measures are taken to minimize the potential for injury or mortality (see Section 12.7). Estimates of take and unintentional lethal take are catalogued in Appendix Table 1.

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

Refer to Appendix Table 1. Take associated with adult and juvenile trapping is documented in Appendix Table 1 of the HGMPs for spring chinook. It has not been included here to avoid overestimating total

take.

12.10) Alternative methods to achieve project objectives.

There are currently no facilities for video monitoring at the Bennett traps in the North Santiam. Installation of video systems would allow us to monitor passage without handling fish. This approach would also allow us to expand our sampling to seven days a week (we currently sample from Monday through Friday). We do not currently remove or recycle hatchery fish at the Bennett Dams. We have the capacity to monitor fish passage by video at the Leaburg ladders, but if we limit our monitoring to video, we will not be able to prevent hatchery chinook and steelhead from entering the spring chinook refuge above Leaburg Dam. Traps that selectively retain steelhead and marked chinook could be installed in the Leaburg ladders. If this avenue is to be pursued, the ODFW, the Army COE and EWEB will need to work together to design, build and install the traps.

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

Rainbow trout, cutthroat trout, and bull trout are caught in the Leaburg ladder adult trap, the Leaburg bypass juvenile trap (McKenzie R), and the Bennett ladders adult traps (North Santiam R). In 2003, we captured 398 unidentifiable juvenile trout, 9 rainbow trout, 41 cutthroat trout and 1 bull trout in the Leaburg bypass trap. Mortality of trout fry in the juvenile trap was 2% in 2003. No mortality was observed for larger trout. Over the last 27 years, catch of trout in the Leaburg adult trap has ranged from 53 in 1994 to 1,599 in 2001, with an average catch of 388. Catch of bull trout has ranged from 1 in 1995 to 28 in 1999, with an average catch of 8 ±6. Between 4 and 24 rainbow trout have been captured in the Bennett traps in the last six years. The average catch is 13 ±6 rainbow trout and 4 ±2 cutthroat trout. Very low mortality is seen in the adult traps (<1%). The same risk aversion measures are taken for these fish as for spring chinook (see Section 12.12).

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

Traps are checked daily and the fish processed quickly. Densities are kept low in holding tanks. Temperature is monitored to ensure that fish are not stressed while they are held in traps. Adequate flow is maintained to ensure that fish have access to cold, well-oxygenated water. Juvenile fish may be anesthetized to reduce stress. Fish will be allowed to recover before release. Trapping and sorting efforts are conducted by trained ODFW biologists. Trapping is discontinued during the peak of the adult chinook run to avoid capturing too many fish in the trap. Trapping would also be discontinued at any of the traps if we observed unusually high stress or mortality. We will minimize handling and take measures to reduce stress. When fish must be captured in a net, cotton nets are used. Fish are kept underwater as much as possible during handling.

SECTION 13. ATTACHMENTS AND CITATIONS

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

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

Appendix Table 1. Estimated listed salmonid take levels of by hatchery activity.

Research programs conducted in association with hatchery programs for Summer Steelhead in the Upper Willamette ESU involve take of listed Spring Chinook Salmon and Winter Steelhead in the North Santiam, South Santiam, McKenzie and Willamette.

Listed species affected: Winter Steelhead ESU/Population: Upper Willamette Activity: Spawning Surveys				
Location of hatchery activity: North Santiam River Dates of activity: December through April Hatchery program operator: ODFW				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			200	
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)			0	
Unintentional lethal take g)			0	
Other Take (specify) h)			0	

Listed species affected: Winter Steelhead ESU/Population: Upper Willamette Activity: Spawning Surveys				
Location of hatchery activity: South Santiam River Dates of activity: December through April Hatchery program operator: ODFW				
	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)			50	
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)			0	
Unintentional lethal take g)			0	
Other Take (specify) h)			0	

Listed species affected: Spring Chinook	**ESU/Population: Upper Willamette**	**Activity: Juvenile Trapping (possible future research)**		
Location of hatchery activity: Walterville Canal - McKenzie	**Dates of activity: April through June**	**Hatchery program operator: ODFW**		
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)	5,000	500		
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)	250	5		
Other Take (specify) h)				

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

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