HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Upper Willamette Hatchery Rainbow Trout Program
Species or Hatchery Stock:	Rainbow Trout
Agency/Operator:	Oregon Department of Fish and Wildlife, U.S. Army Corps of Engineers
Watershed and Region:	Willamette - West Region, ODFW
Date Submitted:	October 24, 2018
Date Last Updated:	February 24, 2021 (Modified Release Table 10.1-1)-approved)

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SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Upper Willamette Hatchery Rainbow Trout Program

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

Rainbow Trout (*Oncorhynchus mykiss).* Hatchery rainbow trout in the upper Willamette subbasin are not listed under provisions of the Federal ESA. {Note that this program operates within the range of two Federal ESA threatened listed ESUs, upper Willamette winter steelhead and upper Willamette spring chinook. These program fish are also stocked into waters containing listed bull trout.}

1.3) Responsible organization and individuals.

Lead Contact
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Agency: U.S. Army Corps of Engineers
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On-Site Lead Contact
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Name (and title): Jeff Boechler, Watershed District Manager
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South Willamette Watershed District
Name (and title): Brian Wolfer, Watershed District Manager
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On-Site Hatchery Operations Info.:

Name (and title): Robert "Jake" Rice (Roaring River Hatchery)
Agency or Tribe: Oregon Department of Fish and Wildlife
Address: 42279 Fish Hatchery Drive, Scio, Oregon 97374
Telephone: 503-394-2496
Fax: 503-394-3155
Email: RoaringRiver.Hatchery@state.or.us

Name (and title): Erik Withalm (Leaburg Hatchery)
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Email: Leaburg.Hatchery@state.or.us

Name (and title): Dan Peck (Willamette Hatchery)
Agency or Tribe: Oregon Department of Fish and Wildlife
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Email: Willamette.Hatchery@state.or.us

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

Congress authorized the construction, operation, and maintenance of hatcheries in cooperation with state and federal fisheries agencies to provide mitigation, in part, for habitat lost or made inaccessible by the construction of the Willamette Valley Project (WVP) dams. The U.S. Army Corps of Engineers' (USACE) authority for the Willamette hatcheries derives principally from the 1938 "An Act Authorizing the Construction of Certain Public Works on Rivers and Harbors for Flood Control, and for Other Purposes," (Pub. L. No. 75-761) and the Flood Control Act of 1950, "An Act Authorizing the Construction, Repair, and Preservation of Certain Public Works on Rivers and Harbors for Navigation, Flood Control, and for Other Purposes" (Pub. L. No. 81-516) and the house documents referred to therein.

In addition to the ODFW fish hatcheries listed above, rainbow trout are purchased from private hatcheries for stocking in the upper Willamette basin. These facilities include:

Private Hatchery Name: Blue Den Ranch
Contact Person: Clint Bentz
Site Address: 38734 Lulay Road, OR 97374

Telephone: 503-394-2488

Private Hatchery Name: Desert Springs Trout Farm
Contact Person: Bernie Burkholder
Site Address: 48320 Desert Springs Rd, Summer Lake, OR 97640
Telephone: 228-596-0507
Fax: 541-943-3193
Email: berniebburkholder@gmail.com

Of these private facilities, only Desert Springs Trout Farm is currently contracted for stocking legal-sized rainbow trout as part of the USACE mitigation requirements in the upper Willamette River basin.

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

Leaburg Hatchery
Funding Source: General Funds (100%) ODFW
Staffing Level: 5 FTE
Annual Operation Costs: FY 19 (est) $750,000
Species Budget: ODFW has submitted a budget request to produce 100,000 pounds of trophy sized Rainbow Trout starting in 2019.

Willamette Hatchery.
Funding Source: U.S. Army Corps of Engineers (90%) License Funds (10%)
Staffing Level: 9 FTE
Annual Operation Costs**:**
Species Budget: 0% of U.S. Army Corps of Engineers (USACE) funding is used for trout production at this facility. USACE funding is allocated for spring Chinook and summer steelhead at Willamette Hatchery. Willamette hatchery annually produces legal sized rainbow trout, many of which are released outside of the Upper Willamette.

Roaring River Hatchery
Funding Source: Sport Fish Restoration (75%) Other Funds (wildlife 25%)
Staffing Level: 5.2 FTE
Annual Operation Costs: FY18 $599,333
Species Budget: About 70% of the total budget is allocated to rainbow trout production; and each year the hatchery produces about 7.723 million green eggs and continues subsequent rearing and transferring to other facilities.

1.5) Location(s) of hatchery and associated facilities.
ODFW Production
Roaring River Hatchery
Broodstock for the upper Willamette hatchery rainbow trout program are held and spawned at Roaring River Hatchery. Early incubation of the eggs and the rearing of some juvenile fish occur at Roaring River. Eyed eggs are shipped from Roaring River Hatchery to various hatcheries. Some rainbow trout are reared to legal size and

liberated from Roaring River Hatchery.

Roaring River Hatchery is located along the Roaring River which is a tributary to Crabtree Creek on the South Santiam River in the Willamette subbasin. The hatchery is about 18 miles (29 kilometers) northeast of Albany, Oregon. The ODFW waterbody code for Roaring River is 0201220020; the Hatchery intake is at River Mile (rm) 1.4; Latitude 44° 37' 30" North, Longitude 122° 43' 09" West.

Willamette Hatchery
Some eyed eggs collected at Roaring River Hatchery are shipped to Willamette Hatchery for early rearing and growout.

Willamette Hatchery is located along Salmon Creek approximately 3 miles (5 kilometers) upstream from its confluence with the Middle Fork of the Willamette River near rm 42 (river kilometer (rkm) 67). Approximate hatchery coordinates are Latitude 43° 44' 36" North, Longitude 122° 26' 33" West (UTM 0544848E and 4843289N). The ODFW waterbody code for Salmon Creek is 0200410000 and the ODFW waterbody code for the Middle Fork Willamette River is 0200300000.

Leaburg Hatchery
Leaburg Hatchery receives eyed eggs and rears legal and trophy sized rainbow trout. Leaburg is located at rm 39 (rkm 62) on the McKenzie River, Willamette River Subbasin, Oregon. The approximate hatchery coordinates are 44° 08' 103" North and 122° 36' 29" West (UTM 0531346E and 4886841N). The ODFW waterbody code for the McKenzie River is 0201500000.

U.S. Army Corps of Engineers Production
Desert Springs Trout Farm receives eggs from Troutlodge Inc., incubates and rears rainbow trout to various sizes for stocking throughout the Willamette Valley as specified in the 2017 contract. The hatchery is located near Summer Lake, OR, outside of the Willamette Valley Basin. The hatchery operates on artesian wells and spring water. The approximate hatchery coordinates are 42° 59' 20.5836" North and 120° 43' 56.8596" W.

1.6) Type of program.

The hatchery rainbow trout program is an "Isolated Harvest" program, where the fish are produced for harvest and are not intended to spawn in the wild or be genetically integrated with any specific natural population. The broodstock is composed entirely of hatchery fish, reared to maturity. No wild trout are included in the broodstock. To ensure hybridization does not occur with wild trout populations, trout released from hatcheries are triploided, or reproductively sterile.

1.7) Purpose (Goal) of program.

The USACE's portion of this program is designed to provide mitigation, in part, for habitat lost or made inaccessible by the construction of 13 flood control projects in the

Upper Willamette River subbasin and help meet harvest objectives for trout in the Upper Willamette River subbasin. The USACE operates the flood control projects in the upper Willamette subbasin. The flood control projects are Big Cliff, Detroit, Green Peter and Foster in the Santiam River subbasin, Fern Ridge in the Long Tom River subbasin, Blue River and Cougar in the McKenzie River subbasin, and Fall Creek, Lookout Point, Dexter, Dorena, Cottage Grove and Hills Creek in the upper Willamette River subbasin. The USACE funds up to 277,000 pounds of trout each year. Historically, rainbow trout have comprised the majority of this amount (see also Section 3.2). A stock of cutthroat that originated from the Long Tom River was discontinued because of poor performance. Cutthroat trout are no longer produced as part of this mitigation agreement.

1.8) Justification for the program.

The upper Willamette hatchery rainbow trout program will not enhance or benefit the survival of listed natural populations of fish. The program is designed to mitigate, in part, for habitat lost or made inaccessible by the construction of 13 flood control projects in the Upper Willamette River subbasin and help meet harvest objectives for trout in the Upper Willamette River subbasin. The trout from this program are stocked in the Willamette Valley, and provide fishing opportunities to many of Oregon's major population centers.

Stocked rainbow trout might have adverse ecological effects on ESA listed chinook and bull trout and adverse ecological and genetic effect on ESA listed steelhead. Ecological impacts are being controlled though limiting spatial overlap between hatchery trout and listed chinook and steelhead juveniles. Historically hatchery trout were stocked in standing and flowing waters throughout the Willamette Valley. Currently, stocking is limited to standing waters and flowing waters outside of the Willamette winter steelhead ESU.

The hatchery rainbow trout program has been eliminated in several areas in an effort to avoid potential adverse impacts to listed spring chinook, winter steelhead and bull trout. For example, in the mid-Willamette area, rainbow trout legal programs have been eliminated from the Molalla River, Abiqua and Silver Creeks, North Santiam River below Big Cliff Dam, Little North Santiam River, Thomas and Crabtree creeks (lower South Santiam), South Santiam River above Foster Reservoir, Calapooia River, Mill Creek (Willamette R. in Salem), Mill and Agency Creeks (South Yamhill River), Rickreall Creek, Luckiamute and Little Luckiamute Rivers. All of these programs were terminated specifically to protect natural winter steelhead populations and were re-allocated to standing water bodies throughout the Willamette Basin. In addition, stocking programs have been eliminated in the South Fork McKenzie River above Cougar Dam to protect native bull trout. Hatchery rainbow trout stocking into Sharps Creek in the Coast Fork Willamette River basin was eliminated to help protect native cutthroat trout. Genetic impacts to wild steelhead are limited through release of triploid, thus sterile, trout Sterile trout are unable to contribute genetic material to the native run.

1.9 &1.10) Program Performance Standards and Indicators

1.10.1) "Performance Indicators" addressing *Benefits*.

1. **Standard**: Meet production levels for mitigation and fisheries.
    a. **Indicator**: Number of pounds of fish released by program is applicable to given mitigation requirements.

2. **Standard**: Program addresses ESA responsibilities.
    a. **Indicator**: ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.

3. **Standard**: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural – and hatchery-origin fish in fisheries.
    a. **Indicator**: Marking rate by mark type for each release group.
    b. **Indicator**: Sampling rate by mark type for each fishery.
    c. **Indicator**: Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery.

4. **Standard**: Non-monetary societal benefits for which the program is designed are achieved.
    a. **Indicator**: Recreational fishery angler days, length of seasons, and number of licenses purchased.

1.10.2) "Performance Indicators" addressing *Risks*.

1. **Standard**: Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.
    a. **Indicator**: Annual number of fish produced by this program caught in a representative sample of fisheries, including estimates of fish released and associated incidental mortalities, by fishery (necessitates new program).
    b. **Indicator**: Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries developed from these hatchery fish releases.
    c. **Indicator**: Recreational angler days, by fishery.
    d. **Indicator**: Annual escapements of natural populations that are affected by fisheries targeting program fish.
    e. **Indicator**: Catch per unit effort, by fishery.

2. **Standard**: Life history characteristics and genetic variation within and among natural populations do not change as a result of this artificial production program.
    a. **Indicator**: Hatchery produced rainbow trout do not spawn with wild rainbow

and winter steelhead populations.
   b. **Indicator**: Triploidy in hatchery-produced rainbow trout is greater than 99%.

3. **Standard**: Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, INAD, MDFWP and ODFW's Fish Health Management Policy.
   a. **Indicator**: Annual reports indicating level of compliance with applicable standards and criteria.
   b. **Indicator**: Periodic audits indicating level of compliance with applicable standards and criteria.

4. **Standard**: Impacts to natural populations due to effluent from artificial production facility will be controlled through compliance with applicable federal and state permits, standards and guidelines.
   a. **Indicator**: Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, including those relating to temperature, nutrient loading, chemicals, etc.

5. **Standard**: Impacts to natural populations from water withdrawals and instream water diversion structures for artificial production facility operation will be controlled through compliance with applicable federal and state permits, standards and guidelines.
   a. **Indicator**: Water withdrawals compared to applicable passage criteria.
   b. **Indicator**: Water withdrawals compared to NOAA Fisheries, USFWS, and state juvenile screening criteria
   c. **Indicator**: Number of adult fish passing water intake point.
   d. **Indicator**: Proportion of total stream flow diverted for artificial production facility.

6. **Standard**: Impacts to natural populations from pathogens in hatchery water effluent will be controlled through compliance with applicable federal and state permits, standards and guidelines.
   a. **Indicator**: Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.
   b. **Indicator**: Juvenile densities during artificial rearing

7. **Standard**: Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.
   a. **Indicator**: Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition and consumption. .

8. **Standard**: Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population
   a. **Indicator**: Total cost of program operation.

b. **Indicator**: Sum of catch adjusted and monetary value of recreational effort placed appropriately to calculate all fishery-related financial benefits.

1.11) Expected size of program.

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

No naturally produced fish**,** listed or otherwise, are collected for broodstock. ODFW's current broodstock consists of 2,000 three year olds. A description of the broodstock rearing occurs in Section 6.

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

The current proposed annual releases from this program are436,825 pounds of trout, the majority of which are 3 fish/lb. In addition, fingerling and trophy sized trout are also released. Proposed annual releases by location are listed in Table 1.11.2-1.

Table 1.11.2-1. Proposed maximum annual legal rainbow trout release level into Upper Willamette River basin, in pounds, for all programs.

Waterbody	Total pounds of trout
Alton Baker Canal	15,000
Bethany Pond	1,500
Billy Lake	20
Blue River Above Reservoir	3,000
Blue River Reservoir	8,000
Breitenbush River	6,700
Buck Lake	10
Canby Pond	800
Carmen Reservoir	8,000
Clear Lake	15,000
Commonwealth Lake	1,200
Cottage Grove Reservoir	30,000
Crabtree Lake	20
Crabtree Pond	5
Cronemiller Lake	200
Detroit Reservoir	59,000
Dexter Reservoir	10,000
Dorena Reservoir	30,000
Dorman Pond	2,000
EE Wilson Pond	7,300
Fall Creek above Reservoir	5,000
Fall Creek Reservoir	5,000
Foster Reservoir	16,000
Freeway Lake, East	1,800
Green Peter Reservoir	9,000
Henry Hagg Lake	27,000
Hills Creek Reservoir	30,000
Huddleston Pond	4,000
Junction City Pond	11,500
Lake Eleanor (Indian Prarie) Lake	20
Leaburg Lake	10,000
McKenzie R above Leaburg Dam	25,000
McKenzie R below Leaburg Dam	15,000
Progress Lake	1,300

Quartzville Creek	7,900
Roaring River Park	400
Row River Nature Park	5,000
Salmon Creek	7,000
Santiam R, N Fk, Above res	12,000
Sheridan Pond	3,500
Silver Cr Reservoir	6,500
Smith Reservoir	5,000
St Louis Pond	2,800
Sunnyside Pond	1,550
Timber Linn Pond	1,500
Trail Bridge Reservoir	5,000
Walling Pond	3,700
Walter Wirth Lake	10,600
Waverly Lake	2,500
Willamette R, Cst Fk	2,500
Yamhill River	1,000
Total	**436,825**

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

The hatchery rainbow trout program in the upper Willamette subbasin is designed to provide legal and trophy size rainbow trout, eight inches or greater in length, for recreational fishing. Smolt-to-adult survival rates, adult spawners, and escapement numbers are not a measurable part of the program. Total number of fish released and subsequently caught has not been determined, in part due to the variability in angler success rates at different waterbodies.

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

The State of Oregon began releasing legal-sized hatchery rainbow trout into the Upper Willamette River tributaries in the late 1940s.

1.14) Expected duration of program.

The duration of the program is indefinite and will probably last as long as the USACE is required to mitigate for habitat lost or made inaccessible by the construction of the WVP dams.

1.15) Watersheds targeted by program.

The target watershed is the Willamette River basin upstream from Willamette Falls

(ODFW waterbody code 0200100000). Latitude and longitude of proposed current release watersheds are listed in Table 10.2-1.

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

The USACE's portion of this program is designed to mitigate, in part, for habitat lost or made inaccessible by the construction of 13 flood control projects in the Upper Willamette River sub-basin and help meet harvest objectives for trout in the Upper Willamette River sub-basin.

1.16.1) Brief Overview of Key Issues.

Issue 1: The hatchery program may amplify Infectious Hematopoietic Necrosis (IHN) virus in natural environments.

IHN virus has caused large losses of rainbow trout at the Leaburg Hatchery in the past. ODFW has revised rearing strategies that includes incubation of eggs and rearing of fry at other hatcheries to minimize hatchery losses (see Section 1.5). IHN losses have not occurred at Leaburg Hatchery since 2005. The impacts of IHN virus on listed salmon and steelhead are unknown.

Issue 2: The presence of legal- sized rainbow trout promotes recreational fisheries which may incidentally "take" listed fish.

The goal of the hatchery rainbow trout program is to provide resident trout for recreational harvest opportunities. Cramer et al. (1997) found that angler effort is greatly increased by stocking of catchable trout. Some hatchery rainbow trout releases are made into waters which support listed winter steelhead and spring chinook. The concern is that anglers targeting resident trout provided by this program will incidentally harvest listed fish. Specific concerns have been raised regarding the potential harvest of listed species in Foster reservoir. An ODFW creel survey was implemented in 2002 and 2003 to quantify potential impacts of the Foster Reservoir trout fishery on listed winter steelhead. Based on these data, impacts of the rainbow trout fishery in Foster on the winter steelhead population is roughly between 0.2 and 5% (Firman and Buckman, 2003, Firman et al., 2005), and harvest was restricted to rainbow trout marked with an adipose fin-clip in waters within the ESU for both upper Willamette spring Chinook and winter steelhead.

Issue 3: Legal-sized hatchery rainbow trout may prey on listed fish in the McKenzie Subbasin.

It is possible that legal hatchery rainbow trout could prey on emergent steelhead and chinook fry. Rainbow trout are primarily insectivores (Horner 1978; Partridge 1985, 1986; Viola and Schuck 1991), but piscivory increases markedly after rainbow trout reach 250 mm (9.8 inches). Hatchery rainbow trout released in the Willamette subbasin are mostly eight inches and larger. Parkinson et al. (1989) suggest that predators prey on food items less than or equal to one-third of their length. These factors suggest that piscivory of legal rainbow trout on listed fish may occur because legal rainbow trout released from hatcheries typically are greater than eight inches long, and chinook and steelhead fry are less than 2.5 inches long early in the fry stage. Further, the planting time of rainbow trout in the McKenzie River in April, May and June overlaps with the presence of chinook fry.

Legal sized hatchery fish, when released, are greater than eight inches in length and large enough to prey on listed fry. Many of the hatchery rainbow trout are caught in the same year they are released, but some may live for another year. Firman et al. (2004) have documented low levels of predation by hatchery trout upon juvenile spring Chinook in the McKenzie River below Leaburg Dam.

<u>Issue 4: Hatchery trout compete with wild trout and juveniles of listed species for rearing space and food.</u>

Hatchery rainbow trout are larger at time of stocking than most resident wild trout and juveniles of listed chinook and steelhead. Their larger size is an advantage in competing for the most favorable rearing and feeding areas in the stream. Naturally produced residents may be pushed to the more marginal habitats and that can negatively impact growth and survival rates.

<u>Issue 5: Intake screens at Leaburg, Roaring River and Willamette hatcheries do not meet NOAA Fisheries criteria.</u>

The intake screens at Leaburg, Roaring River and Willamette hatcheries fail to meet NOAA Fisheries criteria. Non-compliance of screens may lead to entrainment of fish. No listed fish species currently reside above the screen intakes at Roaring River or Willamette Hatcheries, although listed spring chinook and bull trout reside above intakes for Leaburg. Upgrades to the facilities are anticipated, pending funding, with Roaring River planned for 2020-2021.

1.16.2) Potential alternatives to the current program.

Note: The following draft alternatives were identified during public workshops more than 10 years ago and are not necessarily being endorsed by the managing agency or the authors of this document.

Alternative 1: Discontinue the release of all legal sized hatchery rainbow trout into waters with listed species.

PROS:

<u>Pathogen Concerns</u>

Discontinuing the release of hatchery rainbow trout into waters with listed species of fish would eliminate the potential amplification of IHNV in the natural environment. The impacts of IHN virus on listed salmon and steelhead are unknown.

<u>Predation Concerns</u>

Discontinuing releases of hatchery rainbow trout into waters with listed fish would reduce the potential for predation of hatchery rainbow trout on listed fish. Hatchery rainbow trout collected in the Leaburg Dam downstream migrant trap have been observed consuming chinook fry while in the trap. However, evidence suggests that the proportion of hatchery rainbow trout consuming listed fish is low. In the McKenzie River between 2003 and 2005, 3,905 hatchery rainbow trout stomachs were sampled for content and 0.7% contained salmonids (Schroeder et al 2006). See Section 2.2.3 for more information.

Competition Concerns

Elimination of the hatchery rainbow trout program would take away the risk of hatchery rainbow trout competing with native fish for food, habitat and potential spawning partners.

Harvest Concerns

Elimination of the releases of hatchery rainbow trout into waters with listed species would significantly reduce the availability of resident rainbow trout for harvest in the Willamette Basin. This, presumably, would reduce angler effort and subsequent incidental contact with juvenile listed fish. Mortality of juvenile steelhead from incidental catch in trout fisheries may have been significant within the Willamette winter steelhead ESU. In 1998, ODFW dramatically reduced the Willamette Basin hatchery trout program in the ESU, dropping juvenile steelhead mortality by as much as 44% (Witty and Cramer 2001). The impact of the Foster Reservoir rainbow trout fishery on naturally produced winter steelhead is roughly between 0.5% and 5.0% (Firman and Buckman, 2003). In the McKenzie River, a 1983 creel survey showed that trout anglers caught 6% of hatchery reared summer steelhead and 0.4% of hatchery reared spring chinook released into the river (Hutchinson and Hooton 1990).

CONS:

Elimination of hatchery rainbow trout releases into waters with listed fish would inevitably result in lost harvest opportunities and fewer angler hours in those waters. This would compromise the goal of the hatchery program and mitigation requirements, while also introducing loss of social and economic benefits. In 1983, angler effort during trout season on the McKenzie River generated an estimated 164,000 angler hours, and 84% of anglers surveyed were targeting resident rainbow trout exclusively (Hutchinson and Hooton 1990).

Alternative 2: Discontinue the releases of hatchery rainbow trout at times when listed fish could be harvested, i.e. Dexter Reservoir in fall months and Foster Reservoir in spring months. See Table 1.11.2-1.). In addition, all hatchery rainbow trout will be marked with an adipose fin-clip. Current regulations require the release of all non-fin-clipped fish in most ESU-listed waters.

PROS:

More information would be required prior to accepting this as a viable alternative.

CONS:

Discontinuing the fall release would likely reduce angler effort in Dexter Reservoir in the fall when spring chinook parr are largest and probably most susceptible to incidental catch. However, studies have not been conducted to determine the magnitude or even presence of a spring chinook parr incidental catch mortality in the Dexter Reservoir resident trout fishery. Eliminating the fishery may be pre-mature given a lack of evidence suggesting a significant by-catch problem, and may unnecessarily reduce angler harvest potential in Dexter Reservoir.

Historically, eighty-eight percent of steelhead smolts harvested by anglers in Foster Reservoir were caught in February, March and April with the greatest catch of steelhead smolts in April. Hatchery rainbow trout are stocked primarily in April and May, with some also being stocked in September. Angling pressure and catch of hatchery rainbow trout is high in the months of April, May and June, with greatest catch occurring in May. The ratio of unmarked smolts to marked trout was greatest in February when approximately eight times as many unmarked steelhead as marked trout were caught, but this is prior to the stocking of trout for the season. In every other month, anglers caught greater numbers of hatchery fish than steelhead smolts. The reduction in the catch of steelhead smolts is likely a function of time of year as most of the smolts have migrated by the end of April.

A change in the stocking strategy, i.e., stocking either later or earlier in the season, likely would not be very effective. Although wild steelhead show up mainly in the spring and again in fall, there is much overlap with current stocking schedules and catch of holdovers (Firman and Buckman, 2003). Spring is the popular time period to be fishing for trout in this lake. Stocking earlier (March) might entice anglers to fish more during that month, but it would not do anything to ease pressure on juvenile steelhead. In June or later, surface temperature warms, fish go deeper, other water sports dominate the lake, and overall interest in angling declines until fall. Stocking during this time period probably would not provide a very good return on stocked fish.

Alternative 3. Delay time of stocking in the McKenzie River to reduce hatchery rainbow trout predation upon spring chinook fry. In addition, all hatchery rainbow trout will be marked with an adipose fin-clip. Current regulations require the release of all non-fin-clipped fish in most ESU-listed waters.

PROS:

By delaying stocking until late June in the lower McKenzie River, spring chinook fry would have an opportunity to obtain a size to make them less likely to be preyed upon by the hatchery rainbow trout. As part of the work for the evaluation of the hatchery impacts on the spring chinook population, it was shown that the predation rate by hatchery rainbow trout upon spring chinook fry in the lower McKenzie River decreased as the fry grew and in fact no chinook fry were observed in stomach contents after late June in 2003 (Firman et al., 2004) and August in 2004 (Julie Firman, ODFW, pers. comm.).

CONS:

There could be economic, social and ecological ramifications to delaying stocking the lower McKenzie River. May is typically a very popular and effective time to fish for and harvest the stocked hatchery rainbow trout. By delaying stocking until June in this section of river, more pressure may be placed on the catch and release fishery of wild trout. There may also be an associated decline in economic revenues associated with the lack of a harvest hatchery rainbow trout fishery at this time of year.

Alternative 4: Use water purification techniques to minimize IHNV at Leaburg Hatchery.

Several techniques have been applied at hatcheries throughout the Pacific Northwest to minimize large losses caused by IHNV. Some of these techniques have included chlorination-dechlorination, UV sterilization, and ozonation. Dworshak National Fish Hatchery in Idaho had significant losses from IHNV in the early 1980's. After altering incubation and rearing practices failed to prevent significant losses, Dworshak NFH began experiments treating water with ozone. The treatment was successful, but the method was never fully applied in the hatchery because of its high costs. Similar results of preventing IHNV with ozonation have been experienced at Merwin Fish Hatchery on the Lewis River, WA. Merwin Fish Hatchery has the capabilities of treating 3,000gpm via ozonation, but the system required a substantial investment.

PROS:

Use of water sterilization techniques such as ozonation have proven to be effective at minimizing losses from diseases including IHNV at other hatcheries. Not only would losses be reduced, but released fish would not be infected with the virus, and thus would not contribute the virus in the natural environment.

CONS:

The costs of incorporating such techniques into a program can be significant. One estimate of incorporating such a system at Leaburg Hatchery priced the installation of a system at $20 million dollars with an additional $1 million per year for operating costs. Managers have decided to rear some fish at Roaring River and Willamette hatcheries rather than spend the money for water sterilization equipment at this time. Dworshak National Fish Hatchery ultimately decided to change water source rather than go to a full ozonation purification system because of the cost entailed. However, the costs of continually purchasing fish from other hatchery programs can be expensive as well. In addition, purifying the water source could allow the program to move the entire culture process to Leaburg Hatchery. Moving the whole process to Leaburg Hatchery would reduce costs associated with incorporating Roaring River Hatchery and Willamette Hatchery into the fish rearing process. Roaring River Hatchery would continue to rear broodstock for the hatchery rainbow trout program. Leaburg has also addressed some rearing practices, including rearing pond density, that will reduce the likelihood of future outbreaks.

An additional concern with purification systems is that while they are largely effective, they are not always entirely effective. Each method has limitations as far as the volume of water that can be purified for given levels of investment. One hundred percent purification can be highly expensive when large volumes of water are used.

Alternative 5: Minimize IHNV in the water source.

Implement recycling/removal program for all adult summer steelhead returning to Leaburg Dam and Leaburg Hatchery. Returning hatchery summer steelhead passed above Leaburg Dam have been implicated as major contributors to IHNV contamination in the McKenzie River above Leaburg Dam (See Section 1.16 in the steelhead HGMP for the Willamette subbasin for more detail).

PROS:

Removing summer steelhead would reduce the number of IHNV carriers reaching the upper watershed and water source of Leaburg Hatchery. Presumably, this would reduce the likelihood of IHNV outbreaks at the hatchery, and the possibility that fish produced at Leaburg Hatchery are IHNV carriers.

CONS:

A possible negative effect of the action is that to remove all hatchery steelhead would require one of two alternatives: 1) increased contact and take of listed spring chinook at Leaburg Dam or, 2) investments to update sorting facilities so that contact or take of spring chinook could be avoided while sorting hatchery summer steelhead. Unmarked winter steelhead still pose a major threat of spreading and contributing the risk of outbreak of IHNV.

1.16.3) Potential Reforms and Investments

Note: The following draft potential reforms/investments were identified during public workshops and are not necessarily being endorsed by the managing agency or the authors of this document.

Potential Reform or Investment 1:

Description and Implications/Importance:

Initiate creel survey programs in all waters where hatchery rainbow trout interact with listed species of fish (see Table 1.11.2-1) to address the impact of incidental harvest and predation on listed species of fish, as well as to determine the current harvest rate of stocked fish in representative waters. Data provided by the survey would increase understanding of adverse impacts to listed species and the value of the hatchery rainbow trout fishery. These data could be used in future decisions regarding whether to continue releases into waters with listed fish.

Costs: Annual cost for creel surveying: $$$

Multi-year cost for creel surveying: $$$$

Potential Reform or Investment 2:

Description and Implications/Importance:

Upgrade facilities or methods to reduce the likelihood of IHNV amplification in natural environments and outbreaks of virus at Leaburg Hatchery. Options would include ozonation, UV sterilization, or chlorination-dechlorination.

Costs: Initial cost to upgrade hatchery facilities could be $$$$; annual operation costs could be $$$. Depending on the method applied costs of this option will vary widely.

Potential Reform or Investment 3:

Description and Implications/Importance:

Fish screen at Leaburg, Willamette and Roaring River hatcheries do not meet NOAA Fisheries criteria for screening. The fish screens at these hatcheries should be in compliance with NOAA Fisheries guidelines.

Costs: Estimated costs of upgrading the screens at Leaburg Hatchery is $$$$ ($900,000-$1,000,000) and at Willamette Hatchery is $$$ ($450,000-$500,000). The cost for Roaring River Hatchery is estimated at $$$$ ($500,000-$750,000)

Potential Reform or Investment 4:

Description and Implications/Importance:

Update sorting facility at Leaburg Dam on McKenzie River to increase removal of summer steelhead while minimizing handling of listed spring chinook. Complete removal of steelhead would reduce IHNV prevalence in the water supply. The sorting facility would need to limit handling of listed spring chinook while sorting for hatchery summer steelhead.

Cost: $$$

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 NOAA FISHERIES ESA-LISTED SALMONID POPULATIONS (USFWS ESA-Listed Salmonid Species and Non-Salmonid Species are addressed in Addendum A)

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

Endangered Species Act Incidental Take Coverages

- In 2018, this hatchery trout program is currently undergoing ESA section 7 consultation. When approved, the new Biological Opinion from NMFS will provide updated ESA coverage for this program on listed spring Chinook salmon and winter steelhead in the Upper Willamette Basin.
- Currently in effect – the incidental take statement in the 2008 Biological Opinion on the Willamette Project issued by NMFS in July, 2008.
- Previous ESA coverage – the incidental take statement in the 2000 Biological Opinion issued by NMFS in July, 2000 (impacts from the collection, rearing, and release of salmonids associated with artificial propagation programs in the Upper Willamette spring Chinook and winter steelhead evolutionarily significant units).

Permits/Leases for Hatchery Operations
U.S. Army Corps of Engineers
Lease to ODFW for use of the Leaburg Hatchery
U.S. Forest Service
Conditional use permit for the operation of the Willamette Hatchery

Water Right Use Permits for Hatchery Operations
Oregon Department of Water Resources
Leaburg Hatchery – Permit numbers S 21289 and S 20954
Willamette Hatchery – Permit numbers G 12109, S 7188, S 8600, S 19208
Roaring River Hatchery – Permit numbers S 6851, S 51219, S 7901

Discharge Permits for Hatchery Operations
Oregon Department Environmental Quality
Permit for Leaburg Hatchery (No. 101914),
300 J Effluent Permit for Willamette Hatchery,
300 J Effluent Permit for Roaring River Hatchery

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

An incidental take of listed juvenile spring chinook and winter steelhead from the upper Willamette River ESU may occur as a result of the hatchery rearing operations (e.g., water diversion, screening, chemical use) and release of legal-sized hatchery rainbow trout into the environment (e.g., pathogens, competition/predation, harvest, and genetic impacts). Determining precise levels of "take" for listed juvenile spring chinook salmon and winter steelhead attributable to the culture and release of legal-sized hatchery rainbow trout is difficult to quantify for a variety of reasons, including the dimensions and variability of river systems, scientific uncertainty, and the operational complexities of hatcheries and interactions of fish.

In the absence of quantitative estimates of incidental take, a monitoring program has been established to monitor compliance of reasonable and prudent measures identified in the BiOp. The monitoring program is designed to determine "take" associated with the releasing of legal-sized hatchery rainbow trout in the upper Willamette subbasin. Task 3.1 of the BiOp Task Order provides for the monitoring of the effects of hatchery rainbow trout stocking in the McKenzie subbasin on listed spring chinook. Monitoring consists of (1) sampling stomach contents of hatchery rainbow trout observed as well as creel surveys for adult chinook and steelhead, and (2) assessing the impacts of the Foster Reservoir recreational trout fishery, created and sustained by the stocking of hatchery rainbow trout, on listed steelhead and spring chinook.

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

Include information describing: adult age class structure, sex ratio, size range, migration timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release locations and weir sites

Life History Characteristics of Spring Chinook in the Upper Willamette Subbasin

Currently, there are three known naturally-spawning populations of spring chinook in the Upper Willamette ESU. These populations spawn in the Clackamas, North Santiam, and McKenzie subbasins.

Spring chinook from the Willamette River have the earliest return timing of chinook stocks in the Columbia Basin with freshwater entry beginning in February. Historically, adult chinook passed over Willamette Falls during the winter and spring high flow periods. Chinook salmon began appearing in the lower Willamette River in February, but the majority of the run ascended Willamette Falls in April and May, with a peak in mid-May. The early run timing of Willamette River spring-run chinook salmon relative to other lower Columbia River spring-run populations is viewed as an adaptation to flow conditions at the Willamette Falls. Harvest managers use the timing of spring chinook passing Willamette Falls as a tool to selectively harvest spring chinook in the Columbia River downstream of the Willamette River. Of interest, spring chinook returning to the Upper Willamette River subbasin historically strayed into the Clackamas River at times when conditions at Willamette Falls prevented upstream passage.

Historically, juvenile spring-run chinook salmon began their downstream emigration at a variety of ages and sizes. There appeared to be a continuous emigration through the summer and autumn, with none of the previous year's juveniles being present in the tributaries by March of the following year.

Ocean distribution of the Willamette spring chinook is consistent with an ocean-type life history with the majority of chinook being caught off the coasts of British Columbia and Alaska. Adults return to the Willamette River primarily at ages 3 through 5. Spring chinook hold in deep pools for at least several months before spawning. Historically, spawning occurred between mid-July and late October. However, the current spawn timing of hatchery and natural-origin chinook is September and early October. Egg incubation occurs September through January. Emergence of fry occurs primarily during January through March and fry continue to move downstream through mid-June. Parr/presmolt migration occurs from approximately October through December. Smolt migration takes place primarily from late January through March (Howell et. al, 1988).

Adult migration and spawning and juvenile emergence and migration timing has changed with construction of dams. Releases of cold water from reservoirs have delayed entry of adults and may delay adult migration. Fry and parr/smolt migration is earlier now than prior to the construction of dams.

Life History Characteristics of listed Winter Steelhead in the Upper Willamette Subbasin

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.

- Identify the NOAA Fisheries ESA-listed population(s) that will be <u>directly</u> affected by the program. *(Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).*

The ESA-listed fish in the target area that may be directly affected by the program are spring chinook salmon (*Oncorhynchus tshawytscha*) and winter steelhead (*Oncorhynchus mykiss*). No listed fish are integrated into the rainbow trout hatchery program.

- Identify the NOAA Fisheries ESA-listed population(s) that may be <u>incidentally</u> affected by the program.
(Includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas).

The ESA-listed fish in the target area are spring chinook salmon (*Oncorhynchus tshawytscha*) and winter steelhead (*Oncorhynchus mykiss*).

There is potential for competition and genetic interactions with the hatchery stock to indirectly affect the ESA-listed populations. In addition, disease transmission from the hatchery to native fish may occur.

2.2.2) <u>Status of NOAA Fisheries ESA-listed salmonid population(s) affected by the program.</u>

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

Spring Chinook
The critical population threshold is an abundance level for a self-sustainable salmonid population: (1) below which dispensatory processes are likely to reduce it below replacement, (2) where short-term effects of inbreeding depression or loss of rare alleles cannot be avoided, and (3) where productivity variation occurs due to demographic conditions, and causes a substantial source of extinction risk. Independent populations have been recommended but not adopted for the Willamette subbasin.

The viable population threshold is an abundance level above which an independent salmonid population has: (1) negligible risk of extinction due to threats from demographic variation (random or directional), (2) local environmental variation, and (3) genetic diversity changes (random or directional) over a 100-year time frame.

NOAA Fisheries has determined that spring chinook and winter steelhead in the Willamette subbasin have decreased to a population level that could be critical to their continued survival. According to Mattson (1948), the sizes of the Willamette River runs prior to 1946 were never ascertained; estimates from salmon hatchery egg takes in the basin suggested runs approximately five times as large as those of the late 1940's. In 1947 the run size was about 55,000 chinook (Mattson, 1948). From 1946-50, the mean count of chinook at Willamette Falls was 31,000 fish which was primarily naturally-produced fish. In 1994, ODFW estimated 1,300 naturally-produced spawners for the ESU. Since 1994, there has been a gradual increase in naturally-produced spring chinook, but it is believed that many of these fish are of hatchery origin (ODFW unpublished data, Clackamas).

Presently, the only significant natural production of spring-run chinook above Willamette Falls occurs in the McKenzie River subbasin. The McKenzie River may now account for 50% or more of the production potential in the Willamette River subbasin (Willis et. al, 1960). Cougar Dam on the South Fork McKenzie River blocks access to approximately 25 miles of the most productive spring chinook habitat in the subbasin (Howell et al., 1988). There maybe a self-sustaining population of spring-run chinook in the North Santiam River subbasin, but the thermal profile of water released from Detroit Dam significantly reduces the survival of any progeny from naturally-spawning fish (personal communication, W. Hunt, ODFW, Salem). More than 70% of the production capacity of the North Santiam system was blocked when Detroit Dam was built without passage facilities (Mattson, 1948).

Winter Steelhead

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

Attempts have been made to maintain winter steelhead spawning in the upper South Santiam above Foster dam. Returns to Foster Dam tended to be low until 2001, when return numbers allowed for the potential to exceed the basin plan goal of increasing escapement of winter steelhead above Foster Dam to 650 fish (Wevers et. al, 1992). ODFW abandoned passing unmarked winter steelhead above Green Peter Dam in the mid-to-late eighties due to low production and return numbers. Currently there is no natural production in the Middle Santiam above Green Peter Dam. Winter steelhead continue to spawn and rear in the Calapooia and its upper most tributaries, although run size has declined from historical levels (Wevers et. al, 1992). In spite of this reduced spawning distribution, the Santiam subbasin still provides the majority of winter steelhead production in the Willamette sub-basin (Wevers et. al, 1992).

The ODFW has a policy (OAR 635-500-1490) to manage the main-stem Santiam River, North Santiam, South Santiam and Calapooia subbasins for only natural production of winter steelhead. No hatchery winter steelhead program exists in these areas. Hatchery rainbow trout have been released in areas designated for natural production of winter steelhead in the Santiam, but currently only in Foster Reservoir. There are anecdotal reports of anglers catching what they consider to be hatchery rainbow trout which have come down through Foster Dam.

- 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.

These data are not available.

- 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. *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

Refer to Tables 2.2.2-2 through 2.2.2-15.

- 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.

Refer to Tables 2.2.2-6, 2.2.2-7, 2.2.2-10, 2.2.2-11, 2.2.2-14, and 2.2.2-15.

North Santiam StW:

Table 2.2.2-2. StW spawning grounds counts, N. Santiam River, 1990-2003. (ODFW unpublished data).

Run Year	Redds/Mile
1990	21.0
1991	25.5
1992	18.4
1993	20.4
1994	19.4
1995	13.0
1996	21.0
1997	15.6
1998	21.0
1999	21.0
2000	21.0

2001	25.0
2002	23.9
2003	26.8

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, 1998-2003. (ODFW unpublished data).

Run Year	Count
1998	546
1999	460
2000	705
2001	2004
2002	914
2003	1261

South Santiam StW:

Table 2.2.2-4. StW spawning grounds counts, S. Santiam River, 1990-2003. (ODFW unpublished data).

Run Year	Redds/Mile
1990	20.0
1991	20.7
1992	18.1
1993	9.8
1994	17.2
1995	15.0
1996	14.0
1997	6.1
1998	6.5
1999	17.3
2000	15.5
2001	23.6
2002	12.1
2003	13.5

Surveys in Table 2.2.2-3 are conducted once per season to obtain peak counts in each section.

Table 2.2.2-5. 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

McKenzie River ChS

Table 2.2.2-6. ChS counts at Leaburg Dam on the McKenzie River, 1994-2002 (ODFW 2001b).

	Wild		Hatchery		
Run Year	Number	Percent	Number	Percent	Total
1994	825	54	701	46	1,526
1995	933	58	689	42	1,622
1996	1,105	76	340	24	1,445
1997	991	84	185	16	1,176
1998	1,415	76	459	24	1,874
1999	1,383	72	526	28	1,909
2000	1,985	75	672	25	2,657
2001	3,380	76	1,048	24	4,428
2002	4,104	67	1,983	33	6,087 2/

2/ An additional 690 adipose fin-clipped hatchery fish were removed from Leaburg Dam ladder.

Table 2.2.2-7. ChS passed above Leaburg Dam, McKenzie River 1991-2002. (ODFW unpublished data)

Run Year	Unmarked ChS passed above	Marked ChS passed above	% marked ChS above Leaburg
1991	4232	55	1%
1992	3617	62	2%
1993	3432	122	3%
1994	1397	110	7%
1995	1467	110	7%
1996	1321	111	8%
1997	1069	41	4%
1998	1790	58	3%
1999	1807	55	3%
2000	2198	335	13%
2001	3433	869	20%
2002	4223	1864	31%

Table 2.2.2-8. Estimated return of ChS to the McKenzie River, 1990-2002 (ODFW 2001b).

Run Year	Leaburg Dam Count	McKenzie Hatchery Return	Sport Catch Above Leaburg	Sport Catch Below Leaburg	Sport Catch Total	Est. Natural Spawn Below Leaburg Dam 1/ Redds	Est. Natural Spawn Below Leaburg Dam 1/ No. Fish	Total Return
1990	7,226	3,206	315	1,387	1,702	160	720	12,854
1991	4,359	4,483	64	1,922	1,986	161	725	11,553
1992	3,816	3,407	81	1,195	1,276	106	477	8,976
1993	3,629	2,051	80	1,761	1,841	142	639	8,160
1994	1,526	701	13	486	499	59	266	2,992
1995	1,622	1,135	24	84	108 2/	66	297	3,162
1996	1,445	1,573	58	244	302 2/	71	320	3,640
1997	1,176	1,524	0	0	0 3/	90	405	3,105
1998	1,874	1,690	0	0	0 3/	95	428	3,992
1999	1,909	2,279	0	0	0 3/	82	369	4,557
2000	2,657	3,553	0	0	0 3/	132	594	6,804
2001	4,428	3,920	0	750	750 2/	100	450	9,548
2002	6,087 5/	6,832	0	1,500	1,500 2/	214	963	16,072

1/ Estimated Natural Spawn below Leaburg Dam = No. of Redds below Leaburg Dam X 4.5 Fish/Redd.
2/ Adipose fin-clipped hatchery fish only allowed to be retained.
3/ Closed season.
4/ Preliminary
5/ An additional 690 adipose fin-clipped hatchery fish were removed from Leaburg Dam ladder and hauled and released primarily above Cougar Dam into the South Fork McKenzie River.

Table 2.2.2-9. Summary of chinook salmon spawning surveys in the McKenzie River above Leaburg Dam, 1996-2002. (Firman et al. 2002)

Survey Area		Number		Redds/mi					
Section	**Length (mi)**	**Carcasses**	**Redds**	**1996**	**1997**	**1998**	**2000**	**2001**	**2002**
McKenzie River[a]:									
Ollalie–McKenzie Trail	10.3	71	168	7	11.4	--	5.6	17.7	16.3
McKenzie Trail–Hamlin	9.9	44	51	2.1	--	--	1.6	4.9	5.2
Hamlin–South Fork McKenzie	0.3	13	11	--	--	--	--	--	36.7
South Fork–Forest Glen	2.4	40	40	0.8	--	--	2.1	0.8	16.7
Forest Glen–Rosboro Bridge	5.7	72	85	6.1	--	--	5.8	13.2	14.9
Rosboro Bridge–Ben and Kay	6.5	79	105	4.9	--	--	3.2	6.3	16.2
Ben and Kay–Leaburg Lake	5.9	3	17	--	--	--	--	3.2	2.9
South Fork McKenzie:									
Cougar Dam–Road 19 bridge	2.3	142	84	--	--	--	--	--	36.5
Road 19 bridge–mouth	2.1	35	24	2.9	--	--	7.6	8.1	11.4
Horse Creek:									
Separation Creek–mouth	10.7	112	129	--	--	--	--	7.4	12.1
Lost Creek:				--	--	--	--	--	--
Hwy 126–mouth	0.5	6	16	--	--	--	--	--	32
McKenzie River:									
Leaburg Dam–Leaburg Landing	6	172	115	10.3	19.8	15.3	--	12.3	19.2

[a] *We counted 55 carcasses and 77 redds in the Carmen-Smith spawning channel (500 ft long)*

Table 2.2.2-10. Composition of naturally spawning spring chinook salmon based on carcasses recovered in the McKenzie River, 2002 (Firman et al. 2002).

Section	No fin clip[a]	Fin clipped	% clipped
McKenzie spawning channel	50	5	9%
Spawning channel–Forest Glen	147 [b]	21	13%
Forest Glen–Leaburg Lake	98	56	36%
S Fork McKenzie	108 [c]	69	39%
Horse Creek	101 [c]	11	10%
Lost Creek	5	1	17%
Total Above Leaburg	509	163	24%
Total Below Leaburg	56 [d]	116	67%

[a]*Otoliths have not yet been read to determine the proportion of wild and hatchery fish.*
[b]*Otoliths were not collected from 2 fish.*
[c]*Otoliths were not collected from 3 fish.*
[d]*Otoliths were not collected from 1 fish.*

Middle Fork Willamette ChS

Table 2.2.2-11. Summary of chinook salmon spawning surveys in the Middle Fork Willamette, 2002. (Firman et al. 2002)

River	Section	Length (mi)	Redds	Carcasses No fin clip[a]	Carcasses Fin clipped
Middle Fork Willamette	Dexter–Jasper	9	64	58	197
	Jasper–Coast Fork	8	0	1	4
	Fall Creek (above reservoir)	13.3	171[b]	49[c]	31

[a] *Otoliths have not yet been read to determine the proportion of naturally produced and hatchery fish.*
[b] *Includes an estimated 50 redds in a 5.3 mi reach that was subsampled.*
[c] *Otoliths not collected from 1 fish.*

North Santiam River ChS

Table 2.2.2-12. Redd counts of spring chinook salmon in the N. Santiam River, 1996-99.

	Redd Counts			
Area	**1996**	**1997**	**1998**	**1999**
Mainstem North Santiam: Stayton to Minto	137	134	155	215[a]
Little North Fork Santiam	0	10	39	11
Total	137	144	194	226

a. *Counts adjusted for sections not surveyed, which accounted for 18% of the redds based on data in 1996-98.*

Table 2.2.2-13. Summary of spawning surveys for spring chinook in the N. Santiam River, 2002, and comparison to redd densities in 1996-2001.

	Number			Redds/mi						
Survey Reach	**Length (mi)**	**Carcasses**	**Redds**	**2002**	**2001**	**2000**	**1999**	**1998**	**1997**	**1996**
Minto – Fishermen's Bend	10.0	213	162	16.2	17.9	23.0[a]	15.6	11.8	8.5	7.8
Fishermen's Bend - Mehama	6.5	54	61	9.4	5.7	5.8	3.1	4.3	2.5	3.5
Mehama – Stayton Is	7.0	35	43	6.1	10.0	[b]	--	0.6	0.9	1.0
Stayton Is - Stayton	3.3	47	10	3.0	6.7	[b]	--	10.0	3.6	2.0
Stayton – Greens Br	13.7	25	6	0.4	0.1	--	0.0	0.4	1.1	0.1
Greens Br - Mouth	3.0	0	14	4.7	--	--	--	4.7	9.7	--
L N Santiam[c]	17.0	16	30	1.8	1.1[a]	1.3[a]	1.0	2.3	0.5	0.0

a. *Corrected number.*
b. *Data was recorded for Mehama-Stayton; density for this section was 0.9 redds/mi.*
c. *Four hundred surplus hatchery adult spring Chinook were released into the Little North Fork Santiam on August 20 and 30, September 5 and 6, 2002.*

Starting in 2001, all of the returning hatchery 5-year-old and younger chinook were fin marked. Estimates for passage of returning naturally produced adults at the Bennett dams were 415 in 2001, 1,306 in 2002, and 1,286 in 2003, based on visual observation of fin clips. Subsequent otolith analysis revealed that in 2001, only 39% of the unclipped fish passing the Bennett dams were actually of natural origin (162 fish). In 2002, about 51% (666) of the unclipped fish proved to be of natural origin (ODFW, unpublished data).

Table 2.2.2-14. Composition of naturally spawning spring chinook salmon based on carcasses recovered in the N. Santiam River above Stayton Island, 2002 (from Schroeder et al. 2002).

River Reach	No fin clip[a]	Fin clipped
Minto – Fishermen's Bend	54	159
Fishermen's Bend – Mehama	9	45
Mehama – Stayton Island	10	25
Little North Fork Santiam	12[b]	4
Total	85	233

[a.] *Otoliths have not yet been read to determine proportion of wild and hatchery fish.*
[b.] *Otoliths were not collected from one fish.*

South Santiam River ChS

Table 2.2.2-15. Summary of chinook spawning surveys in the South Santiam, 2002. (Firman et al. 2002)

River	Section	Length (mi)	Redds	Carcasses	
				No fin clip[a]	Fin clipped
South Santiam	Foster–Pleasant Valley	4.5	875	238	1256
	Pleasant Valley–Waterloo	10.5	19	29	126
	Lebanon–mouth	20	67	4	21
	Thomas Creek	7.6	18	2[d]	23[d]
	Crabtree Creek	5.2	2	0	0
	Wiley Creek	3	1	d	d

[a] *Otoliths have not yet been read to determine the proportion of wild and hatchery fish.*
[b] *Includes an estimated 50 redds in a 5.3 mi reach that was sub-sampled.*
[c] *Otoliths not collected from 1 fish.*
[d] *Carcasses too decomposed to determine presence or absence of fin clips were found in Calapooia River (181), Wiley Creek (30), and Thomas Creek (42), and were likely surplus hatchery fish outplanted from South Santiam Hatchery.*

Currently, data about these hatchery-wild spring chinook interactions is limited in the South Santiam basin because returning South Santiam Hatchery spring chinook have only been 100% marked since 2002. In 2002, it is estimated that the percentage of naturally produced fish spawning below Foster Dam was 12% (Firman et. al, 2004).

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of NOAA Fisheries listed fish in the target area, and provide estimated annual levels of take (see *"Attachment 1" for definition of "take")***.**

"Take" associated with the operation of Roaring River, Willamette, and Leaburg hatcheries is unknown. "Take" associated with the release of hatchery rainbow trout is also unknown, but a monitoring and evaluation program has been initiated to assess "Take" associated with the release of hatchery rainbow trout in the McKenzie River and in Foster Reservoir. ODFW has a permit under 4(d) of the ESA to sample listed spring chinook in the McKenzie River. The permit number is OR2003-813. The estimated number of listed spring chinook caught, handled and released is 500. The estimated non-intentional mortality associated with the monitoring and evaluation program is 25.

- 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.

Take can 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.

McKenzie River

Schroeder et al (2006), captured hatchery rainbow trout and steelhead by various methods and sampled stomach contents of to determine the extent of predation of hatchery reared rainbow trout on ESA listed Chinook fry. Salmonids were found in approximately 1.0% of the hatchery rainbow trout stomachs collected from the lower McKenzie River and Leaburg Canal intake and salmonids were found in approximately 0.2% of the hatchery rainbow trout collected in Leaburg Lake or the upper McKenzie River (Table 2.2.3-1.). Most of the salmonids were thought to be Chinook salmon.

Table 2.2.3-1. Number of hatchery rainbow trout (Rb) sampled and number of stomach content samples that contained salmonids (Salm).

	Lower River		Leaburg Canal intake		Leaburg Lake		Upper River	
Year	Rb	Salm	Rb	Salm	Rb	Salm	Rb	Salm
2003	324	1	16	0	41	0	0	0
2004	358	6	557	8	433	1	55	0
2005	0	0	945	8	0	0	1,176	2
Total	682	7	1,518	16	474	1	1,231	2
Percent	17%	27%	39%	62%	12%	4%	32%	7%

The extent of predation on Chinook fry by hatchery steelhead or rainbow trout was not estimated because of data uncertainties about digestion rates, consumption rates, sampling timing, species composition of predated fish and hatchery fish population abundance (Schroeder et al 2006).

Foster Reservoir

The program at Foster Reservoir is designed to evaluate the number of winter steelhead and spring chinook caught in the rainbow trout fishery. Creel surveys were conducted during 2002 and 2003 at Foster Reservoir. An estimated 908 naturally produced steelhead smolts were caught and retained in the Foster Reservoir fishery in 2002 (Firman and Buckman, 2003) and an additional 382 smolts were retained in 2003 (Firman et. al, 2005). Another 168 natural steelhead smolts were caught and released in 2002 and 87 smolts were caught and released in 2003. If 20% of the released fish died, 942 steelhead smolts were "taken" in the 2002 Foster Reservoir trout fishery and 400 steelhead smolts were "taken" in 2003. The steelhead smolt harvest composed 3% of the catch and the harvest in Foster Reservoir in 2002 and 2% of the catch and harvest in 2003. Tables 2.2.3-2 and 2.2.3-3 provide estimated catch and harvest of unmarked, naturally produced steelhead smolts and marked hatchery rainbow trout in Foster Reservoir in 2002 and 2003.

Table 2.2.3-2. Estimated angler effort, catch, and harvest of unmarked naturally produced steelhead smolts (Unmk), and marked hatchery rainbow trout in Foster Reservoir, 2002 (Firman and Buckman, 2003).

Month	Unmk, kept	Marked, kept	Unmk, released	Marked, released
February	107	15	15	0
March	293	581	36	97
April	404	4,053	94	875
May	47	15,804	9	3,436
June	26	5,889	10	910
July	0	1,373	0	40
August	0	402	0	89
September	8	604	0	71
October	24	1,074	6	153
2002	908	29,796	168	5,670

Table 2.2.3-3. Estimated angler effort, catch and harvest of unmarked, naturally produced steelhead smolts (Unmk), and marked hatchery rainbow trout in Foster Reservoir, 2003 (Firman et. al, 2005).

Month	Unmk, kept	Marked, kept	Unmk, released	Marked, released
November	44	642	10	258
December	52	721	13	87
January	79	252	3	8
February	58	196	12	0
March	41	218	0	35
April	33	1,128	13	389
May	0	3,964	3	1,412
June	13	4,921	23	886
July	0	2,107	0	204
August	20	1,302	0	265
September	16	1,481	0	156

October	26	2,170	10	175
2003	382	19,102	87	3,875

ODFW estimated the take of listed steelhead in the Foster Reservoir trout fishery to be between 0.5 and 5% of the total population of listed steelhead in 2002 and between 0.5 and 2.2% of the total population of listed steelhead in 2003(Firman and Buckman, 2003, Firman et. al, 2005).

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

No information is available on past takes associated with the hatchery program.

- 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).

The hatchery rainbow trout program does not have a direct take on listed spring chinook or winter steelhead. The hatchery BiOp research program has an approved take of up to 500 juvenile or smolt spring chinook (capture/handle/release) and up 25 unintentional mortalities of juvenile or smolt spring chinook when seining or angling for hatchery rainbow trout to collect stomach samples.

- 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.

If it appears that take may exceed permit limits, operations causing take will cease until NOAA Fisheries is contacted and an acceptable plan is formulated to work within the limitations of the permit or make allowances as necessary.

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.

ESU-wide Hatchery Plans

1. Artificial Production Review. Report and recommendations of the Northwest Power Planning Council. Council document 99-15. (NWPPC 1999).

In July 1997, Congress directed the Northwest Power Planning Council (Council), with the assistance of the Independent Scientific Advisory Board (a panel of 11 scientists who advise both the Council and the National Marine Fisheries Service on scientific issues related to fish and wildlife), to conduct a thorough review of all federally funded artificial production programs in the Columbia River Basin. Congress directed the Council to recommend a coordinated policy for future operation of artificial production programs and to provide recommendations for how to obtain such a policy.

The Council recommended ten policies to guide use of artificial production:

1. The purpose and use of artificial production must be considered in the context of the environment in which it is used.

   Limited stockings of hatchery rainbow trout take place into waters containing listed salmon or steelhead in the upper Willamette basin (see Table 1.11.2.-1 and Alternative 1 in Section 1.16.2). All stocked rainbow trout in the upper Willamette are adipose fin-clipped to allow a selective fishery and triploided.

2. Artificial production remains experimental. Adaptive management practices that evaluate benefits and address scientific uncertainties are critical.

   Section 11 of this document outlines various adaptive management strategies for the upper Willamette hatchery rainbow trout program.

3. Artificial production programs must recognize the regional and global environmental factors that constrain fish survival.

   The upper Willamette hatchery rainbow trout program is designed to mitigate, in part, the habitat lost or made inaccessible by the construction of 13 flood control projects in the Upper Willamette River subbasin and help meet harvest objectives for trout in the Upper Willamette River subbasin. There is currently no feedback mechanism in place for responding to environmental factors constraining fish survival.

4. Species diversity must be maintained to sustain populations in the face of environmental variation.

Alternative 8 in Section 1.16.2 addresses this issue somewhat in that the proposal of using native, locally adapted stocks would help maintain species diversity (see below).

5. Naturally spawning populations should be the model for artificially reared populations.
   The use of reproductively sterile triploid trout reduces the risk of genetic impacts to the native populations.

6. Fish managers must specify the purpose of each artificial production program in the basin.
   Sections 1.7 and 1.8 of each HGMP address both the purpose and justification of each hatchery program.

7. Decisions about artificial production must be based on fish and wildlife goals, objectives and strategies at the subbasin and basin levels.
   In addition to policies guiding native fish conservation, hatchery and fish health management, ODFW has sub-basin and basin plans which aid in the use and management of hatchery-produced fish within the upper Willamette basin (current section).

8. Because artificial production poses risks, risk management strategies must be implemented.
   Section 1.16 provides a brief overview of some of the key issues identified as part of the upper Willamette hatchery rainbow trout program. In addition, Section 11.2 addresses some risk aversion measures that have either been applied or may be applied to minimize deleterious effects of this hatchery program on listed fish.

9. Production for harvest is a legitimate management objective of artificial production. But to minimize adverse impacts on naturally spawning populations, harvest rates and practices must be dictated by the need to sustain naturally spawning populations.
   Stocking locations (avoiding stocking in waters inhabited by listed fish in many instances), differentially marking hatchery fish (adipose fin-clip) as well as stocking reproductively sterile fish all contribute to minimizing impacts to naturally spawning populations.

10. Federal and other legal mandates and obligations for fish protection, mitigation, and enhancement must be fully addressed.
   Section 3.2 addresses agreements, understandings and court orders under which the upper Willamette hatchery rainbow trout program exists.

2. 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 has been prepared by NOAA Fisheries (NOAA Fisheries 2000).

This Biological Opinion (BiOp) was prepared to satisfy Section 7 of the Endangered Species Act, and it covers all the hatchery programs in the Willamette Valley. The BiOp concludes that the proposed hatchery programs will not likely jeopardize the continued existence of the wild salmonid populations if "Reasonable and Prudent Alternatives" (RPA) outlined in the document are implemented. The RPA measures are to:

a.) immediately reduce the numbers of hatchery fish spawning naturally;
b.) modify the numbers and release locations of hatchery fish to reduce adverse effects;
c.) develop locally adapted hatchery stocks;
d.) facilitate the identification of naturally- and hatchery-produced fish.

The USACE funded a project to determine compliance under the Biological Opinion (Task Order: NWP-OP-FH-02-01). Tasks 3.1 and 4.3 of the Task Order are designed to assess impacts of hatchery rainbow trout stocking on spring chinook in the McKenzie River (Task 3.1) and harvest of hatchery rainbow trout on listed fish in Foster Reservoir (Task 4.3).

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

The 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 steelhead that are adipose fin-clipped are allowed to be retained throughout the Willamette River Basin. All unmarked, wild steelhead will be required to be released unharmed in all fisheries (with the exception of steelhead in the Santiam Basin in July and August which are assumed to be mismarked summer steelhead).

Results of a creel of the fishery on Foster Reservoir showed the angling-associated impacts to juvenile winter steelhead to be low (harvest of wild winter steelhead in Foster Reservoir estimated at 2-3% of the population). To minimize this angling impact risk, a fin-clip only trout fishery was instituted in the reservoir in 2005.

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

The Native Fish Conservation Policy (OAR 635-007-0502 through -0506) and the Fish Hatchery Management Policy outlined below (OAR 635-007-0543 though -0548) further refine the objectives of conservation of native fish stocks and limiting the impacts of hatchery produced fish on those native stocks. The Native Fish Conservation Policy (NFCP) defines ODFW's principle obligation for fish management as the conservation of naturally produced native fish in the geographic areas to which they are indigenous. The policy is based on the concept that locally adapted populations provide the best foundation for maintaining and restoring sustainable naturally produced fish. The NFCP requires a conservation plan for each native stock (yet to be developed for the native rainbow stock). These conservation plans will contain an assessment of the status of each native stock, 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.

HGMPs help provide a basis for hatchery influence on native stocks. For example, Section 1.10 identifies benefits and risks of the upper Willamette hatchery rainbow trout program to listed salmon and steelhead in the upper Willamette ESU. Section 11 then expands on the monitoring and evaluation needed for those benefits and risks identified in Section 1.10. Section 11 includes reference to how angling regulations may provide protection to unmarked fish, as is the case for the McKenzie River and Foster Reservoir. The potential for use of a native broodstock is discussed as an alternative in Section 1.16.2.

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

The Fish Hatchery Management Policy (FHMP) compliments the Native Fish Conservation Policy (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 HPMP may be an HGMP or an aspect of a conservation plan developed under the NFCP. The FHMP also provides general fish culture and facility guidelines and measures to maintain the genetic resources of native fish populations spawned or reared in captivity.

6. 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 Fish Health Management 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. This is accomplished 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.

Other than angler creels as part of work done to meet the information needs of the BiOp listed as plan #2 above, the rainbow trout fishery is not routinely monitored for its impact to native fish, including naturally produced spring chinook and winter steelhead. In an effort to facilitate the identification of naturally- and hatchery-produced fish and thereby further reduce angler harvest impactsall hatchery rainbow trout releases are adipose fin-clipped. In addition, hatchery rainbow trout stocking has been reduced or eliminated from many areas used by winter steelhead and spring chinook to reduce adverse effects.

Routine testing of fish health and effluent water quality occur as part of standard hatchery operations. See further information in Sections 4, 9, 10 and 11.

3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates *Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.*

1. USACE Willamette Valley Hatchery Trout Contract.

In September of 2017, the USACE awarded a contract for the production and stocking of hatchery trout in the Upper Willamette Basin to Desert Springs Trout Farm. Previously, this work was completed by ODFW under other contracts and cooperative agreements. The contract has options to extend work through the 2021 stocking season. The contract is designed with several quantity options that allow for up to 277,000 pounds or 739,403 rainbow trout to be stocked each year. In some years, if the USACE does not have adequate funding, less trout may be stocked by Desert Springs. The contract specifies that all trout released must be triploid or otherwise rendered sterile, and be adipose fin clipped. Desert Springs must obtain all necessary permits from ODFW and adhere to Oregon's Fish Health Policy. The USACE works with ODFW and Desert Springs to develop and adjust stocking schedules.

2. As part of its Administrative Rules, the Oregon Department of Fish and Wildlife has several subbasin fish management operating principles and objectives. These operating principles and objectives include the management of both wild and hatchery-produced fish. These Rules include:

Oregon Administrative Rules (OAR 635-500-1370). 1998. Molalla and Pudding Subbasins Fish Management Operating Principles and Objectives. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-1480). 1998. Santiam River and Calapooia River Fish Management Plan. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-0830). 1992. Clackamas River Fish Management Plan. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-1150). 1992. Mainstem Willamette River Fish Management Plan. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-1280). 1992. Middle Fork Willamette River Fish Management Plan. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-0266). 1988. McKenzie Subbasin Fish Management Policies and Objectives. Oregon Department of Fish and Wildlife. Portland, OR.

Oregon Administrative Rules (OAR 635-500-0910). 1992. Coast Fork Willamette Subbasin Fish Management Operating Principles and Objectives. Oregon Department of Fish and Wildlife. Portland, OR.

In addition, there are numerous MOUs, MOAs, court orders and management plans directing flood control project, ESA activities, fish management programs, and hatchery operations in the upper Willamette subbasin. All of these plans are in some way connected to flood control projects and the ESA.

Congress authorized the construction, operation, and maintenance of hatcheries in cooperation with state and federal fisheries agencies to provide mitigation, in part, for habitat lost or made inaccessible by the construction of the WVP dams. The USACE's authority for the Willamette flood control project derives principally from the 1938 "An Act Authorizing the Construction of Certain Public Works on Rivers and Harbors for Flood Control, and for Other Purposes," (Pub. L. No. 75-761) and the Flood Control Act of 1950, "An Act Authorizing the Construction, Repair, and Preservation of Certain Public Works on Rivers and Harbors for Navigation, Flood Control, and for Other Purposes" (Pub. L. No. 81-516) and the house documents referred to therein, among others. The upper Willamette flood control project has grown to include several aspects, including fish hatcheries. However, the primary function of the projects continues to be flood control. The USACE must comply with National Environmental Policy Act, the Clean Water Act, the ESA and other federal laws and regulations. Any significant operational change requires congressional authorization.

The Endangered Species Act of 1973 provides for the identification and protection of species that are identified as threatened or endangered with extinction. The Willamette flood control project has the potential to influence a number of species that are listed as either "Threatened" or "Endangered." The Endangered Species Act was amended in 1982 (Section 10) to allow the taking of listed species incidentally to activity by non-Federal entities such as states, counties, local governments, and private landowners.

NOAA Fisheries is required by the ESA or court order to develop an artificial propagation (hatchery) policy, a status review of listed fish, and a recovery plan for listed fish.

Perhaps one of the more notable MOAs with the Willamette flood control project and the ESA is an agreement between the Environmental Protection Agency, the U.S. Fish and Wildlife Service, and NOAA Fisheries designed to enhance coordination between the agencies so that they can carry out responsibilities under the Clean Water Act and ESA (Federal Register, February 22, 2001, Vol. 66, No. 36). The MOA seeks to enhance the efficiency and effectiveness of consultation by providing guidance to personnel and resolving issues quickly. The MOA also seeks to enhance coordination establishing a joint research plan that will prioritize research on the effects of water pollution on endangered and threatened species.

Section 7 of the ESA requires federal agencies to consult with NOAA Fisheries and the U.S Fish and Wildlife Service if they determine that any action they fund, authorize, or carry out may affect a listed species or its designated critical habitat. The Bureau of Reclamation (BOR) markets irrigation water stored by the Willamette flood control project. A series of correspondences constitute the agreement between the BOR and the USACE for the sale of water from USACE flood control projects in the Willamette subbasins. Contracting activities must comply with the Oregon Water Resources Department, Oregon Department of Fish and Wildlife, National Environmental Protection Agency, and ESA requirements.

The Oregon Department of Water Resources issues permits for the use of water, the Oregon Department of Environmental Quality (DEQ) issues permits for the discharge of hatchery effluent, and the Oregon Department of Fish and Wildlife operates the hatcheries. Hatcheries operate under 300-J permits through DEQ, as well as individual permits for specific waterbodies, including the McKenzie River. Water samples and information are collected during heaviest production months on a quarterly basis and submitted to DEQ. ODFW hatcheries are in compliance with all DEQ permit criteria. In addition, the ODFW has prepared fish and basin management plans, artificial propagation policies, and policies to manage pathogens.

Unless otherwise noted, this HGMP is consistent with plans and commitments provided in management plans, laws, regulations, MOAs, MOUs, and court orders.

3.3) Relationship to harvest objectives.

Explain whether artificial production and harvest management have been integrated to provide as many benefits and as few biological risks as possible to the listed species. Reference any harvest plan that describes measures applied to integrate the program with harvest management.

The ODFW submitted Fisheries Management and Evaluation Plans (FMEP) for upper Willamette spring chinook and winter steelhead to NOAA Fisheries. The FMEPs were submitted under limit number 4 of the 4 (d) Rule of the Endangered Species Act (ESA).

NOAA Fisheries evaluated the FMEPs and determined that they adequately addressed all of the criteria specified in limit number 4 of the Rule. Thus, take prohibitions under Section 9 of the ESA and applicable 4(d) Rule do not apply to fish harvest activities provided such fisheries are managed in accordance with the FMEP.

Regulations for trout fisheries have become progressively more restrictive in response to conservation concerns for native spring chinook and winter steelhead. For example, an angling regulation approved in 2005 allows harvest of kokanee and adipose-fin clipped trout from Foster Reservoir. This will reduce angling-associated impacts to juvenile winter steelhead using the reservoir.

With the exception of Foster Reservoir on the South Santiam River, all releases of catchable trout in the upper Willamette steelhead ESU have been terminated, in part to eliminate incidental catch of juvenile steelhead in these fisheries.

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.

Refer to Table 1.11.2-1 for waterbodies stocked with legal- and fingerling-sized hatchery rainbow trout in the upper Willamette River basin. Harvest levels and rates are not available in most cases.

Angler creels are checked to estimate harvest of salmon and steelhead in the upper Willamette subbasin. Some trout harvest information is obtained, but the information is not specific to the hatchery rainbow trout program.

A statistical creel check was conducted at Foster Reservoir in 2002 and 2003 to assess total harvest of hatchery rainbow trout and determine impacts of the stocking of hatchery rainbow trout on listed spring chinook and winter steelhead. Creel results are discussed in Section 2.2.3. During the two years, an estimated total of 48,898 adipose fin-clipped hatchery rainbow trout were harvested and 9,545 hatchery rainbow trout were caught and released during over 138,000 angler hours (Firman and Buckman, 2003; Firman et. al, 2005).

3.4) Relationship to habitat protection and recovery strategies.

Aquatic habitat conditions in the Willamette subbasin have been altered substantially by European settlement. The Willamette River was once a meandering, braided stream with many side channels and sloughs. Flooding was an annual event during the wet winter months.

Conversion of the riparian areas to agricultural use has altered riparian vegetation and accelerated bank and channel erosion and sedimentation of the river substrate. Logging in the upper reaches of the tributaries has influenced water quality and increased input of fine sediment. The 13 Willamette flood control projects have had an effect on listed species, as described earlier. Oregon's three largest population centers, Portland, Salem, and Eugene-Springfield are located along the mainstem Willamette River and these cities account for more than two-thirds of the state's total populations. The increasing urbanization of the Willamette subbasin will eliminate or adversely affect habitat for fish.

There are numerous ongoing habitat protection and recovery actions in the upper Willamette subbasin. The expected natural production benefits of the many habitat restoration programs over the short- and long-term are, at this point, unknown. The large scale and scope of Willamette restoration activities and natural conditions that cause fish populations to fluctuate makes it difficult to distinguish benefits from each action.

ODFW is working toward habitat restoration for all native species in the Willamette basin. The upper Willamette hatchery rainbow trout program does not interfere with or reduce those efforts.

3.5) Ecological interactions [Please review Addendum A before completing this section. If it is necessary to complete Addendum A, then limit this section to NOAA Fisheries jurisdictional species. Otherwise complete this section as is.]

Witty and Cramer (2001) describe the potential impacts of hatchery rainbow trout on naturally produced spring chinook salmon and winter steelhead in the upper Willamette River subbasin. These potential ecological interactions include competition, predation, and spread of pathogens. These impacts can be inter-related making them difficult to assess. Each impact is dependent on whether the hatchery rainbow trout will overlap in time and space with ESA listed salmonids, however rainbow trout are no longer stocked below the dams in the Santiam Basin reducing potential conflicts in ESU waters. The potential for stocked hatchery rainbow trout to compete with spring chinook and winter steelhead is dependent on several factors including size differences between hatchery and natural fish, availability of preferred rearing space, and duration and timing of hatchery fish presence. These factors differ between stocking locations and dates for hatchery rainbow trout so the details of each situation would have to be considered in order to determine the potential for adverse interactions.

Competition and Predation

Competition and predation are closely associated. There is likely some competition between the native salmon and trout and hatchery rainbow trout. The potential for competition is greatest in cases where the total number of natural and hatchery fish in an area exceeds the area's carrying capacity. The result of releasing hatchery rainbow trout could be slowing of growth, early emigration, or death of listed fish. Information is not being collected to determine the impact of competition associated with releasing hatchery rainbow trout in the Willamette subbasin.

Many uncertainties limit the accuracy of assessing predation impacts. It may be possible that some hatchery rainbow trout never learn to recognize and consume natural food, and thus predation by hatchery rainbow trout on listed fish could be incidental. As noted earlier, there is concern about predation by hatchery rainbow trout on chinook fry in the

McKenzie River, and a study was initiated to monitor the effects of hatchery rainbow trout stocking in the McKenzie Subbasin on listed spring chinook. Approximately 140,000 legal-sized hatchery rainbow trout are released annually into the McKenzie River. These fish range from 180 to 250 mm in length and are released beginning in April and continuing through mid-September. Natural chinook begin to emerge from the gravel in December and rear in the Willamette for up to 18 months. The planting time of hatchery rainbow trout overlaps with the presence of chinook fry and early parr.

Pathogens

The spread of pathogens and parasites from hatchery rainbow trout to listed salmon and steelhead has potential to cause problems in the Willamette subbasin. Impacts of pathogens and parasites introduced by hatchery fish into natural environments can vary from significant to insignificant.

Crowding natural and hatchery fish may increase risks of increasing populations and virulence of endemic pathogens and parasites. Associated diseases include bacterial kidney disease (BKD), red mouth, *Ceratomyxa*, *Saprolegnia*, and Infectious Hematopoietic Necrosis Virus (IHNV) disease.

Bacterial Kidney Disease
Bacterial kidney disease is reported in rainbow trout and at least 12 other species of salmonids. Bacterial kidney disease is a great threat to hatchery operations, but it is only occasionally found in wild rainbow trout. Bacterial kidney disease in wild fish may represent a greater risk to hatchery fish than vice versa.

Red Mouth
Red mouth is common to hatchery rainbow trout, but its significance in wild populations of salmonids is not known.

Ceratomyxa
Ceratomyxosis is a disease of salmonid fishes caused by a spore that infects the intestinal tissue and causes high mortalities in susceptible strains of salmonids including rainbow trout and steelhead. *Ceratomyxa shasta* occurs in the Willamette upstream to Corvallis. It is unclear if a perceived increase in the range of *C. shasta* in the Pacific Northwest is real or due to better detection techniques. Most salmonid species are susceptible to the disease, but some strains seem to have the ability to resist infection; a genetically transferred immune mechanism.

Saprolegnia
Saprolegnia-infection is a common fungal disease in hatchery fish and likely could be spread to wild fish including native rainbow trout, listed winter steelhead and spring chinook. The disease is caused by an infection of the skin. The disease may be serious to sexually mature fish in connection with spawning, but may also be of importance in fish not sexually mature if the primary lesions are severe enough.

Infectious Hematopoietic Necrosis Virus

All species of salmon and trout can become infected with Infectious Hematopoietic Necrosis Virus (IHNV), and high mortality is typically experienced if fish become infected. In general, the smaller the fish, the more sensitive it is to the virus with most mortality occurring in fry and fingerlings. The virus is spread through infected urine, feces and mucus. The most common form of infection is from horizontal transmission from fish to fish through the water.

IHNV can occur simultaneously with other diseases, and is exacerbated by crowding, stress, and low dissolved oxygen (D.O.) levels. It tends to occur in susceptible fish within two to three weeks following exposure and typically results in fish mortality. The disease can occur in either fresh or marine waters. IHNV has no seasonal pattern of occurrence but some strains are temperature sensitive. Survivors appear to be resistant to further infection and the disease generally does not recur in the same population.

There are no treatments for IHNV. Once a stock of fish is infected, reducing or even eliminating feed while providing as much aeration as possible may reduce the severity of the outbreak. Additional stress such as handling the fish to move them or reduce the loading density usually makes the problem worse.

IHNV can be very difficult if not impossible to eliminate particularly if there are fish in the water supply. In the case of the McKenzie River, summer steelhead are the primary vector of the pathogen. When infected steelhead are allowed unimpeded passage above Leaburg Dam, the Leaburg Hatchery water supply is compromised. Control of IHNV is usually accomplished by controlling the time when the fish are exposed to the virus and keeping loading densities and stress as low as possible during the disease outbreak.

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.

Each of the three hatcheries that are used to produce hatchery rainbow trout - Roaring River, Willamette, and Leaburg - have water right use permits for hatchery operations through the Oregon Department of Water Resources. At each hatchery, the water source meets or exceeds all IHOT water quality guidelines. Leaburg Hatchery operates under permits S21289 and S20954 which combine for rights to 100cfs of flow from the McKenzie River.

Roaring River Hatchery operates under permits S6851, S51219, and S7901 which provide rights to 25 cfs from Roaring River. Some water is pumped through a filter system to insure a clean supply for incubation and early rearing. Water is reused from the upper to the lower ponds.

Willamette Hatchery operates under permits S7188, S8600, and S19208 which combine for rights to 82 cfs of flow from Salmon Creek, a tributary to the Middle Fork Willamette River, and permit G12109 which supplies 1.14 cfs of well water.

Trout for the 2017 USACE contract will come from Desert Springs Trout Farm, located outside the Willamette Valley, near Summer Lake, Oregon.

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.

Listed species are present in the water source of Leaburg Hatchery. Flows are maintained to provide passage of adults and juveniles in the by-pass reach where there are water withdrawals. Leaburg Dam serves as the weir to divert water into Leaburg Hatchery, but the diversion does not divert fish into the hatchery. The facility operates within the limitations established in its NPDES permit, and intake screens conform to NOAA Fisheries screening guidelines to minimize the risk of entrainment of juvenile listed fish.

At Roaring River hatchery, listed wild winter steelhead are present in the Roaring River. The water withdrawal intake dam on Roaring River impedes passage of migrating salmonids, including steelhead. While the hatchery meets the terms of its NPDES permit, the intake screens of the facility do not comply with NOAA Fisheries screening criteria. The mesh size of the screens is too large for current NOAA Fisheries criteria. There are plans to bring the screens to code pending funding.

Listed fish are not present in the water sources for Willamette Hatchery. 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 screening criteria, but the vertical screens are not. Plans are currently underway to upgrade the intake screens to meet NOAA Fisheries criteria.

SECTION 5. FACILITIES

Several facilities are used for trout production in the Willamette Valley. ODFW utilizes a captive broodstock program and employs Roaring River, Leaburg and Willamette hatcheries for broodstock spawning, incubation, and rearing. Trout for the 2017 USACE contract are supplied through Desert Springs Trout Farm, located outside the Willamette Valley, near Summer Lake Oregon. These trout are reared from eggs procured through Troutlodge, Inc., which is located in Bonney Lake, Washington. Desert Springs incubates and rears all fish provided for the contract at their facility near Summer Lake.

5.1) Broodstock collection facilities (or methods).

ODFW's broodstock is captive. They are spawned, incubated, and reared at Roaring River Hatchery. Broodstock are not collected from the wild, and thus there are no broodstock collection facilities.

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

Fish transportation equipment at Leaburg Hatchery consists of a 1,200-gallon tanker, equipped with oxygen and re-circulation capabilities. In addition to the 1,200-gallon tanker, there is a 550-gallon portable fish tank at Leaburg Hatchery which is used for hauling small loads and for moving fish at the hatchery. The hatchery utilizes two fish pumps to load fish onto the tankers.

A small, 200-gallon portable slip tank is used for moving fish at the Roaring River Hatchery. Eggs are shipped from Roaring River Hatchery to Leaburg Hatchery and Willamette hatchery via a truck with insulated shipping crates. In addition, Roaring River Hatchery also utilizes a 1,200 gallon liberation truck equipped with aeration and oxygen systems.

Willamette Hatchery uses a 2,200-gallon fish liberation truck for loading, offloading, and transporting fish for this program. The truck is equipped with supplemental oxygen and re-circulation capabilities, but the truck does not have refrigeration capabilities.

Desert Springs utilizes eight different liberation trucks equipped with oxygen to transport rainbow trout from their hatchery in Summer Lake, Oregon to various stocking sites within the Willamette.

5.3) Broodstock holding and spawning facilities.

The broodstock for ODFW's Upper Willamette hatchery rainbow trout program are held at Roaring River Hatchery. The broodstock are held in two ponds each measuring 100' X 20.5' X 3'. Fish are spawned in a concrete spawning building at the lower end of the ponds. Concrete holding pens are connected to an alleyway between the two brood ponds. The building contains spawning tables, anesthetic tanks, and an air spawning system.

5.4) Incubation facilities.

Incubation of eggs for the Upper Willamette hatchery rainbow trout program may occur at Roaring River, Willamette or Leaburg hatcheries. However, most eggs are incubated to the eyed egg stage at Roaring River Hatchery. After the eggs develop to the eyed stage, a portion of the eggs are sent to both Leaburg Hatchery and Willamette Hatchery. Eggs for the USACE contract are procured from Troutlodge, Inc and incubated at the Desert Springs hatchery in Summer Lake, Oregon.

5.5) Rearing facilities.

Hatchery rainbow trout for the USACE contract are reared at the Desert Springs hatchery in Summer Lake, Oregon.

Rearing facilities at Leaburg Hatchery consist of 39 raceways each 20ft wide x 100ft long x 3.5ft deep. A 40th raceway the same size as the other 39 raceways is divided into three sections. There is also one raceway that measures 20ft wide x 50ft long x 3.5ft deep. In addition to the raceways, there are 6 circular ponds each 20ft in diameter with an average depth of 30 inches. Fifteen "Canadian" troughs are used for "starting" fry. The troughs are 16ft long x 32 inch wide.

Rearing facilities at Roaring River Hatchery consist of seven 20ft long "Canadian" troughs and three 16ft long "Canadian" troughs as well as fourteen 10ft wide x 100ft long x 3.2ft deep concrete raceways and six 19.5ft wide x 89.5ft long x 3.8ft deep concrete raceways. Fry are ponded from incubators to the Canadian troughs, and then transferred to the smaller raceways when the fish are about 1000 fish/lb.

5.6) Acclimation/release facilities

There are no acclimation or release facilities used in the hatchery rainbow trout program in the Willamette subbasin.

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

Leaburg Hatchery: the hatchery had IHNV outbreaks in 2002 through 2004, but none in the past 10 years.

Willamette Hatchery: Willamette Hatchery has not reported high fish losses.

Roaring River Hatchery: Roaring River Hatchery provides broodstock for the hatchery rainbow trout program in the upper Willamette subbasin. Roaring River Hatchery operates with seasonal water conditions that have, in the past, caused mortality of hatchery fish. These conditions include high, turbid water, low flows, and seasonal pathogen infestations. Personnel have learned to avoid fish losses when these conditions occur.

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.

Infected trout are destroyed rather than stocked into waters where native fish may be affected.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

ODFW's Cape Cod broodstock from Roaring River hatchery has been used for many years for the Upper Willamette hatchery rainbow trout program. The stock derived from McCloud River (California) stock in 1882 (http://www.watrailblazers.org/science/crawford/#mainrainbow). Other broodstocks used in the past in the Willamette subbasin have included the McKenzie strain and Roaring River strain (Kinunen and Moring 1976).

Rainbow trout for the current USACE contract with Desert Springs come from eggs purchased from Troutlodge, Inc. These eggs are verified to be triploid and originate from the Donaldson steelhead strain, developed at the University of Washington in the 1940s.

6.2) Supporting information

6.2.1) History.

Historical information about ODFW's hatchery rainbow trout stock is available on the web. Look under "Washington Trail Blazers: Science" (http://www.watrailblazers.org/science/crawford/#mainrainbow). ODFW's Cape Cod hatchery rainbow trout brood stock came from a commercial hatchery in Massachusetts. The strain was transported to the Spokane Hatchery in 1941 or 1942. In 1967, eggs were transported from Washington to Roaring River Hatchery and a broodstock was established in 1971. No significant alterations have been made to the Cape Cod stock at the Roaring River Hatchery. While the Cape Code stock is currently the one used by ODFW, other domesticated rainbow trout stocks may be used in the future.

6.2.2) Annual size.

ODFW's Cape Cod stock is an independent broodstock propagated in the hatchery. Natural fish are not used as part of this program. The current broodstock consists of 2,000 three year olds.

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

No natural fish are used as broodstock. ODFW's upper Willamette hatchery rainbow trout program is a self-sustaining broodstock program. The broodstock at Roaring River was established from eggs of Cape Cod stock from the Spokane Hatchery in 1971.

6.2.4) Genetic or ecological differences.

ODFW's Cape Cod stock differs from natural rainbow trout in the Willamette subbasin in that the Cape Cod stock spawn in the fall (November – December) and natural rainbow trout spawn in the spring (March – May). Also, it has been theorized that the genetic tendency for migration is more suppressed in the Cape Cod stock (Moring 1975) than in natural stocks. The natural rainbow trout in the Willamette display unique morphological and life history traits dissimilar to the Cape Cod stock, but these dissimilar characteristics have not been described (personal communication, J. Ziller, ODFW, Springfield).

6.2.5) Reasons for choosing.

ODFW's broodstock has several desirable life history traits to meet harvest goals. Also, the Cape Cod fish tend to remain in the reach in which they are planted. They are genetically different to native stock, and, most significant, they seem to have a high capture rate by anglers.

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.

ODFW's broodstock are held under captive conditions throughout their lives, spawned at a different season from natural fish, and are not genetically predisposed to selecting seaward migration. These characteristics reduce the likelihood that they would spawn with a listed steelhead.

SECTION 7. BROODSTOCK COLLECTION

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

ODFW's broodstock for this program are held under captive conditions throughout their lives at the Roaring River Hatchery. The broodstock are first spawned when they reach age-3. The broodstock consists of about 2,000 age-3 Some of the fish are held to meet the broodstock needs at Roaring River Hatchery.

7.2) Collection or sampling design.

ODFW's broodstock for this program reared under captive conditions throughout their lives. No collection of additional natural breed broodstock is needed.

7.3) Identity.

ODFW's broodstock for this program is self-sustained and reared under captive conditions throughout their lives. There is no need to distinguish them from natural fish.

7.4) Proposed number to be collected.

ODFW's broodstock for this program is self-sustained and reared under captive conditions throughout their lives. There is no need to collect broodstock.

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

For ODFW: Captive Cape Cod age-3 fish average 40% males and 60% female.

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

ODFW broodstock are held as captive fish throughout their lives, and no broodstock is collected from naturally spawning fish.

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

ODFW's program is a captive broodstock program. No fish are collected for natural broodstock.

7.6) Fish transportation and holding methods.

This is a captive broodstock program. There is no need to transport broodstock. ODFW's broodstock are held in the brood ponds. Flow through these ponds is 700-800 gpm.

7.7) Describe fish health maintenance and sanitation procedures applied.

ODFW's hatchery rainbow trout broodstock are held at Roaring River Hatchery. As per IHOT guidelines, broodstock are kept isolated from general population. All equipment used in the broodstock ponds is sterilized before and after use, fish health is examined as needed, and mortality is closely monitored. Alarms are placed in ponds to warn of low flow situations.

7.8) Disposition of carcasses.

ODFW's broodstock are not sacrificed after spawning. Once fish are no longer needed for broodstock, they are planted as large fish, about 0.5 fish per pound, in local, isolated lakes for harvest opportunities where there isn't a risk of escape or reproduction.

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.

ODFW's utilization of captive broodstock eliminates the need to collect native broodstock, and eliminates the potential for incidental take of listed natural fish via broodstock collection.

SECTION 8. MATING

8.1) Selection method.

ODFW's Cape Cod hatchery rainbow trout that are held for broodstock are mated at Roaring River Hatchery. After the initial sorting in early November, the females are checked for ripeness once a week throughout the spawning season. The spawning season runs from early November to early January. The ripe fish are usually spawned the day after sorting.

8.2) Males.

ODFW currently spawns on a 1:1 basis, but the males may be used more than once during the spawning season. All males are three years old.

8.3) Fertilization.

ODFW's spawning is on a 1:1 basis. The eggs are placed in a pan where they are fertilized. The pan is allowed to sit for a few minutes to allow fertilization to take place, and then the eggs are combined with fertilized eggs from other females to meet the desired incubator tray capacity. Fertilized eggs are water hardened and disinfected in iodophor for 15-30 minutes.

A foot bath is located at incubation and spawning building entrances to prevent infection of eggs with pathogens from boots.

8.4) Cryopreserved gametes.

ODFW does not use cryopreserved gametes.

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.

Released fish are triploids, which significantly reduces the risk of interbreeding with native trout.

SECTION 9. INCUBATION AND REARING

9.1) Incubation.

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

Table 9.1.1-1. Leaburg Hatchery egg take and survival to ponding, 1990-2002.

LEABURG HATCHERY			
Brood Year	**Egg Take**	**Green-Eyed Surv. %**	**Eyed-Ponding Survival**
1990	na	na	na
1991	na	na	na
1992	na	na	na
1993	na	na	na
1994	na	na	na
1995	na	na	na
1996	na	na	97.7
1997	na	na	97.6
1998	na	na	97.4
1999	na	na	97.3
2000	na	na	97.7
2001	na	na	na
2002	na	na	na

Table 9.1.1-2. Roaring River Hatchery egg take and survival to ponding, 1990-2002.

ROARING RIVER HATCHERY			
Brood Year	**Egg Take**	**Green-Eyed Surv. %**	**Eyed-Ponding Survival**
1990	4,754,907	91.7	96.9
1991	7,369,121	90.5	95.7
1992	6,793,614	89.9	97.8
1993	6,621,165	91.6	97.5
1994	7,064,521	96.6	96.9
1995	6,923,541	95.9	94.6
1996	6,588,494	89.7	97.6
1997	6,566,935	90.5	98.7
1998	8,077,385	91.3	98.3
1999	7,282,275	85.0	97.4
2000	7,530,022	87.8	95.9
2001	7,492,365	86.9	96.4
2002	5,826,034	85.7	96.3

Table 9.1.1-3. Willamette Hatchery egg take and survival to ponding, 1990-2002.

WILLAMETTE HATCHERY			
Brood Year	**Egg Take**	**Green-Eyed Surv. %**	**Eyed-Ponding Survival**
1990	na	na	96.5%
1991	na	na	96.5%
1992	na	na	96.5%
1993	na	na	96.5%
1994	na	na	96.5%
1995	na	na	96.5%
1996	na	na	96.5%
1997	na	na	96.5%
1998	na	na	96.5%
1999	na	na	96.5%
2000	na	na	96.5%
2001	na	na	96.5%
2002	na	na	96.5%

Eyed egg to ponding survival applies only to eggs received at Leaburg Hatchery from Roaring River hatchery. This program started with the 1996 brood. Previous to 1996, only fingerlings were started at Leaburg Hatchery. Willamette Hatchery eyed egg to ponding survival applies only to eggs received from Roaring River hatchery. There is not an egg take or pre-eyed egg incubation for this program at Willamette Hatchery. There is very little variation in survival between the eyed egg and ponding stage at Willamette Hatchery because eggs are graded at Roaring River Hatchery and they arrive in healthy condition at Willamette Hatchery.

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

ODFW takes extra eggs to ensure that program goals are met. Surplus eggs, excess to program needs, are destroyed.

9.1.3) Loading densities applied during incubation.

ODFW Hatcheries

IHOT species-specific incubation recommendations are followed for water quality, flows, and temperature and incubator capacities at Leaburg Hatchery. Eggs are incubated under conditions to allow equal survival of all segments of the population prior to ponding. Flow through the vertical incubators is 4gpm. Loading density is 8,000-10,000 eggs per unit. The eggs range in size from 250 to350 eggs/oz.

IHOT species-specific incubation recommendations are followed for water quality, flows, temperature and incubator capacities at Roaring River Hatchery. Flow through the vertical incubation stacks is 5 gpm to each stack. Green eggs average 454/oz and eyed eggs average 325/oz for age-3 females. All future brood stock will continue to be selected from 3-year-old brood each year. Each tray holds about 27,000 eggs from age-3 females to the eyed stage. The number is reduced to 12,000 prior to hatching.

IHOT incubation recommendations are followed for water quality, flows, and temperature and incubator capacities at Willamette Hatchery. Average egg size in incubators is 253 eggs/oz., and about 800 eggs are held in each tray.

9.1.4) Incubation conditions.

ODFW Hatcheries

Temperature, dissolved oxygen, flows and other water quality parameters are monitored at Leaburg Hatchery. A digital temperature logger is used to track daily water temperature. Temperatures during incubation range from 35-50° F. Dissolved oxygen levels are typically not recorded, but D.O. monitors are available when it is perceived that D.O. levels are harmful. Dissolved oxygen is typically between 10-12 ppm, and is almost always at saturation level in both incoming and outgoing water from incubators. Flow rates are monitored as well as water quality. During freshets, silt levels are monitored visually and incubation trays are cleaned when needed.

Temperature, flow, and water quality are monitored at Roaring River Hatchery. Incubation temperatures range from 40-47° F and fluctuate 3-4 degrees during the day. Silt levels are monitored during freshets.

Temperature, flow and water quality are monitored at Willamette Hatchery. Temperatures throughout incubation period average 42° F and range from 38-49° F. Temperatures at the hatchery are monitored via a thermograph that records water temperature on all water coming into the hatchery from Salmon Creek. A separate thermograph is used for well water. Temperatures in incubation units can also be taken with a hand held thermometer. Dissolved oxygen is checked periodically, and D.O. is typically near 10 ppm, with a minimum observation of 7 ppm. Supersaturation and low D.O. are very rarely experienced. Flow through the incubation trays is 5gpm. Silt management hasn't been a problem, but when potentially harmful situations arise, incubators are visually monitored and cleaned. Eggs are visually inspected weekly, and sometimes more often, for fungus.

9.1.5) Ponding.

Ponding of fry at Leaburg Hatchery is typically between April 1st and May 1st. Temperature units and visual inspection are used to determine when ponding should take place. The degree of button up is 90% at ponding. Average ponding size is 2,800 fish/lb, and temperature units are 950-1,000.

Ponding of fry at Roaring River Hatchery is based on cumulated temperature units and visual inspection. Fry are about 90% buttoned at the time of ponding, and they have received approximately 1,015 to 1,030 temperature units at the time. Ponding typically takes place between mid-February and mid-March.

Fry are ponded at Willamette Hatchery when approximately 90 to 95% of the fry have buttoned. The average size of fry is 2,900-3,500 fish/lb. Ponding usually takes place between early and late March, and feeding is delayed 1-3 days immediately following ponding. Lengths at ponding are not measured. The cumulative T.U.'s at ponding are approximately 1,088.

9.1.6) Fish health maintenance and monitoring.

ODFW Hatcheries

Disinfection procedures are implemented during egg incubation to prevent pathogen transmission between stocks of fish on site at Leaburg Hatchery. Eggs are received from

Roaring River Hatchery at the eyed stage. No fungus control treatments are used at this stage. Eyed eggs are visually inspected daily and if needed are cleaned and treated. Dead eggs are removed weekly. Dead or culled eggs are discarded in a manner that prevents disease transmission. Approximately 10% of eggs are culled because of disease, malformation, etc. between the eyed egg and ponded egg stage.

Fungus control includes a 1:600 formalin drip for 15 minutes daily at Roaring River Hatchery. There are no additional disease monitoring and treatment procedures used during incubation other than daily visual inspections. Yolk sac malformation is not monitored, but is very low. When eggs reach eyed stage at 400 T.U.'s, eggs are shocked, run through a mechanical egg picker which removes most of the dead eggs, and then the eggs are hand picked to remove the remaining dead and unfertilized eggs.

Eggs transferred from Roaring River Hatchery to Willamette Hatchery are given a 10-minute iodophor bath. Trays are visually inspected for fungus and disease, and infected eggs are removed, frozen and discarded. Dead or culled eggs are discarded in a manner that prevents disease transmission. Yolk-sac malformation typically ranges between 3-4%.

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.

ODFW's stock of rainbow trout is not a listed stock. Certain practices are applied at each hatchery to reduce the potential for transmission of disease to the watershed, and reduce the similarities between natural resident rainbow trout and the hatchery stock.

Incubation of eggs at Leaburg Hatchery does not take place in home stream water, and the program does not use a water source that results in hatching/emergence timing similar to that of the naturally produced population. IHOT species-specific incubation recommendations are followed for water quality, temperature, flow, and incubator capacities. Disinfection procedures are implemented during incubation to prevent pathogen transmission between stocks of fish on site. Dead or culled eggs are discarded in a manner that prevents disease transmission.

At Roaring River Hatchery, IHOT species specific incubation recommendations are followed for water quality, temperature, flow, and incubator capacities. A formalin drip is used to prevent fungus, and dead or culled eggs are discarded in the appropriate manner.

At Willamette Hatchery IHOT species specific incubation recommendations are followed for water quality, temperature, flow, and incubator capacities. Disinfection procedures are implemented when eggs are received and during incubation to prevent pathogen transmission between stocks on site. Dead or culled eggs are discarded in a manner that prevents disease transmission.

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.

Table 9.2-1. Leaburg Hatchery survival rates by lifestage, 1990-2001.

LEABURG HATCHERY		
Brood Year	Fry-Fingerling Surv. %	Fingerling to Catchable Surv. %
1990	94.1	98.0
1991	99.3	96.6
1992	92.8	91.4
1993	93.0	79.4
1994	99.5	82.5
1995	75.5	91.1
1996	88.2	82.5
1997	88.0	95.3
1998	90.1	98.9
1999	98.3	86.5
2000	92.8	76.9
2001	--	--

Table 9.2-2. Willamette Hatchery survival rates by lifestage, 1991-2002.

WILLAMETTE HATCHERY		
Brood Year	Fry-Fingerling Surv. %	Fingerling to Catchable Surv. %
1991	Na	na
1992	Na	na
1993	95.0	na
1994	96.0	na
1995	93.0	na
1996	92.5	na
1997	93.5	na
1998	95.8	na
1999	96.4	na
2000	95.3	na
2001	98.2	na
2002	97.2	na

Table 9.2-3. Roaring River Hatchery survival rates by lifestage, 1990-2002.

ROARING RIVER HATCHERY		
Brood Year	Ponding to 100fish/lb surv. %	100fish/lb to Release surv. %
1990	93.2	na
1991	90.8	na
1992	92.5	na
1993	90.5	na
1994	92.5	na
1995	91.5	na
1996	90.1	na
1997	91.4	na
1998	90.2	na
1999	90.1	na
2000	90.8	na
2001	92.8	na
2002	90.5	na

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

ODFW Hatcheries

Density guidelines are 1.0 lb/ft^3 and loading guidelines are less than 10 lbs/gpm at Leaburg Hatchery. Actual density is about 1.1 lbs/ft^3 and loading is about 6 lbs/gpm.

At Roaring River Hatchery, density and loading criteria are not to exceed 1.3 lbs/ft^3 and 9.0 lbs/gpm. Density is monitored weekly and tracked using flow density calculations. Production rearing is planned to stay under a maximum flow density factor of 1.5. Flow density calculations take into account fish weight, fish length, water flows, and rearing container size.

As for Roaring River, flow density calculations at Willamette Hatchery take into account fish weight and length, water flows and rearing container size. For the 20'x100'x4' deep ponds, density and loading criteria are typically 1.25 lbs/ft^3 and 10 lbs/gpm. For the smaller ponds (80'x20'x2.5' deep), density and loading criteria are typically 1.1 lbs/ft^3 and 4.5 lbs/gpm.

9.2.3) Fish rearing conditions.

ODFW Hatcheries

Settleable solids, unused feed and feces are removed periodically to ensure proper cleanliness of rearing containers at Leaburg Hatchery. IHOT standards are followed for: water quality and predator control measures to provide the necessary security for the cultured stock. The juvenile rearing density and loading guidelines used at the facility are based on standard agency guidelines, staff experience, and other criteria. The flow rate in the 20' x 100" raceways is 1,200 gpm with a maximum flow index of 6.7 lbs./gpm. The maximum flow index in the 20' x 50' raceway is 3.35 lbs./gpm.

Rainbow trout are monitored daily for behavior, and dead fish are removed at that time. Signs of fish stress and water quality are recorded at that time. Water temperature is recorded on the digital logger, and water temperatures typically range between 35 to 60°F. Dissolved oxygen in incoming flow is at or near saturation, and is usually 8 ppm or greater leaving the ponds. Leaburg hatchery does not experience difficulties with gas supersaturation in the source water. The NPDES permits require monitoring inflow and outflow TSS, pH, and temperature. Ponds with fish are cleaned weekly when fish are small and once every two weeks thereafter. Feeding of fish is delayed approximately 7 days after they are ponded to minimize potential for internal fungus. After ponding, fry are inspected by ODFW fish health staff on a monthly basis.

IHOT standards are followed for water quality at Roaring River Hatchery. Dissolved oxygen and temperature are monitored. Temperature typically ranges between 40 to 55°F. Dissolved oxygen levels vary from 9.5 ppm to 6.5 ppm. Flow in the Canadian troughs is 20-30gpm. Flow in the raceways is 200-300 gpm for fingerlings. Ponds are checked daily for mortalities and dead fish are removed. Dead fish are frozen prior to their disposal. Fish health is monitored visually for stress daily during feeding and weekly during pond cleaning. Predator control measures are provided for the Cape Cod broodstock.

IHOT standards are followed for water quality at Willamette Hatchery. Temperatures range from 48 to 54° F. The lowest observed D.O. levels have been near 7.0ppm, but low D.O. levels are not a typical problem. Ponds are cleaned daily to remove mortalities and fish are visually monitored for stress. Each pond has its own equipment to avoid cross contamination of pathogens between ponds. Mortalities are frozen and discarded.

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.

Table 9.2.4-1. Leaburg Hatchery fish growth.

LEABURG HATCHERY	
Rearing Period	**Weight (fpp)**
Ponding	2,800
Week 4	653
Week 8	232
Week 12	93
Week 16	38.4
Week 20	20.7
Week 28	9.3
Week 36	6.5
Week 44	4.7

Week 52	3.7
Week 60	3.5
Week 68	3.1

Table 9.2.4-2. Roaring River Hatchery fish growth.

ROARING RIVER HATCHERY	
Rearing Period	**Weight (fpp)**
End March	3,200
End April	1,050
End May	550
Delivery to Leaburg (May-June)	300

Table 9.2.4-3. Willamette Hatchery fish growth.

WILLAMETTE HATCHERY	
Rearing Period	**Weight (fpp)**
Ponding	2,900-3,500
End February	1,900
End March	1,000
End April	4,00
Delivery to Leaburg (May-June)	300-350

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

See Section 9.2.4 for the available information on growth rates. No information is available about energy reserves.

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*.

Rainbow trout at Leaburg Hatchery are fed a dry feed diet, and the feeding rate varies depending upon water temperature, water quality and general fish health. At time of ponding, fry are fed 8 to 10 times daily on a demand basis until they are transported to larger raceways outside. At this time the fish are fed 4 to 5 times per day based on a feed schedule to achieve specific size criteria for grading. After grading, the fish are fed by machine 8 to 12 times per day to achieve specific size criteria for release from February through September. Feeding rate is dependent of water temperature, life stage of fish and program goals. Fry and small fingerlings are fed about 3% body weight/day, and larger fingerlings and legals are fed 1-1.5% body weight per day. Total average food conversion for this stock for the years 1996 to 2000 is 1.09. Feeding rates are designed to achieve maximum growth rate and achieve size based on program goals.

Rainbow trout at Roaring River Hatchery are fed on BioDiet starter until they reach 300 fish/lb, the approximate weight at which they are shipped to Leaburg Hatchery. Fry in the "Canadian" troughs are fed about once an hour. Fingerlings in the concrete raceways are fed a dry diet using automatic feeders. Daily feeding rate is 2-4% of body weight for fry, and 0.4-2% of body weight for fingerlings per day. Conversion rate estimates are 0.8 to 1.2.

Hatchery rainbow trout are fed a dry feed constantly through the day via Bell feeders at Willamette Hatchery. Feeding level varies between 3-5% body weight per day. Conversion rates are approximately 1.0.

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

ODFW's rainbow trout are inspected by ODFW fish health staff once per month. The fish are visually inspected daily by hatchery staff. Any unusual behavior or rise in mortality is noted and reported. IHOT standards are followed for sanitation including iodophor foot baths, spray bottles for disinfecting equipment at the pond site, and a bath for disinfecting equipment and boots in the hatchery building. Each pond has mortality-picking equipment, and pond cleaning equipment is disinfected between use in each pond. **Chemical treatments are implemented as needed for external parasite control, based on recommendations from ODFW Fish Health Staff, dead fish are removed daily, and pond flows are monitored daily. All rearing ponds and troughs have alarms to indicate low flows.**

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

N/A

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

"Natural" rearing methods are not applied in the program.

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.

N/A. Listed fish are not propagated as part of this program.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Table 10.1-1. Maximum pounds of trout to be released annually into ESA-listed fish waterbodies, effective beginning in 2020. This table includes all waterbodies with USACE-funded hatchery trout. These waterbodies may also be stocked with hatchery trout funded by ODFW. Waterbodies that are ***bolded and italicized*** are not ESA-listed fish waters. For waterbodies without ESA-listed fish present: ODFW determines trout stocking levels and these waterbodies are provided for informational purposes only. *(Note: Table was modified by Corps and ODFW and concurred by NMFS in February 2021*).

Waterbody	Total pounds of trout
Alton Baker Canal	25,000
Bethany Pond	***1,500***
Billy Lake	***20***
Blue River Above Reservoir	***3,000***
Blue River Reservoir	***8,000***
Breitenbush River	6,700
Buck Lake	***10***
Canby Pond	***800***
Carmen Reservoir	***8,000***
Clear Lake	***15,000***
Commonwealth Lake	***1,200***
Cottage Grove Reservoir	***30,000***
Crabtree Lake	***20***
Crabtree Pond	***5***
Cronemiller Lake	***200***
Detroit Reservoir	59,000
Dexter Reservoir	15,000
Dorena Reservoir	***30,000***
Dorman Pond	***2,000***
EE Wilson Pond	***7,300***
Fall Creek above Reservoir	5,000
Fall Creek Reservoir	7,500
Foster Reservoir	16,000
Freeway Lake, East	***1,800***
Green Peter Reservoir	***20,000***
Henry Hagg Lake	***27,000***
Hills Creek Reservoir	30,000

Huddleston Pond	***4,000***
Junction City Pond	***11,500***
Lake Eleanor	***20***
Leaburg Lake	10,000
McKenzie R above Leaburg Dam	25,000
McKenzie R below Leaburg Dam	15,000
Progress Lake	***1,300***
Quartzville Creek	***7,900***
Roaring River Park	***400***
Row River Nature Park	***5,000***
Salmon Creek	7,000
Santiam R, N Fk, Above res	12,000
Sheridan Pond	***3,500***
Silver Cr Reservoir	6,500
Smith Reservoir	***5,000***
St Louis Pond	***2,800***
Sunnyside Pond	***1,550***
Timber Linn Pond	***1,500***
Trail Bridge Reservoir	10,000
Walling Pond	***3,700***
Walter Wirth Lake	***10,600***
Waverly Lake	***2,500***
Willamette R, Cst Fk	5,000
Yamhill River	1,000
Total	**472,825**

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

All current and proposed locations for trout releases are shown in the first column of Table 10.1-1.

ODFW has not stocked trout into the North Santiam River below Big Cliff Dam, the Little North Fork Santiam River, Thomas Creek, Crabtree Creek, or the South Santiam River above Foster Reservoir since 1998. The only winter steelhead-bearing water body stocked with hatchery trout is Foster Reservoir.

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

Table 10.3-1. Numbers and sizes of fish released, 1991-2002.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size (fpp)	Yearling	Avg size
1991	--	--	--	--	85,722	22.6	693,218	3.02
1992	--	--	--	--	82,842	25	719,153	3.00
1993	--	--	--	--	12,750	12.5	740,273	2.98
1994	--	--	--	--	400	100	683,255	3.04
1995	--	--	--	--	112,659	16.3	735,692	3.01
1996	--	--	--	--	30,938	17.8	724,321	2.93
1997	--	--	--	--	111,547	24.9	630,233	2.97
1998	--	--	--	--	119,887	24.5	747,734	2.90
1999	--	--	--	--	215,950	17.8	741,423	2.86
2000	--	--	--	--	191,677	--	718,166	--
2001	--	--	--	--	29,566	--	709,670	--
2002	--	--	--	--	0	--	702,855	--
Average	--	--	--	--	82,828	25.4	712,166	2.96

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

Figures 10.3-1, 10.3-2, 10.3-3, and 10.3-4 depict areas where hatchery rainbow trout are released in the McKenzie and Santiam subbasins. These areas are depicted because there are areas where spring chinook and winter steelhead spawn and rear.

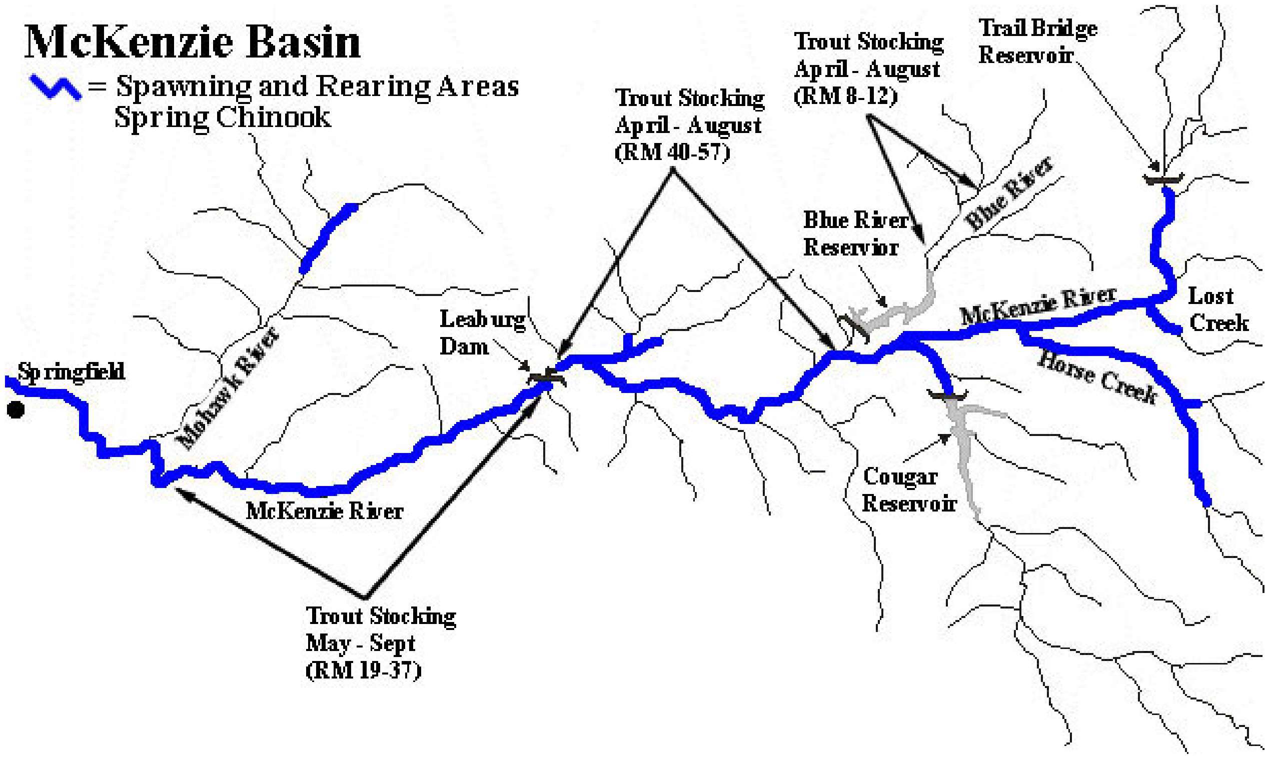

Figure 10.3-1. Reaches of the McKenzie River subbasin where hatchery rainbow trout are released and where spring chinook spawn and rear. There is also spawning above Trail Bridge and Cougar reservoirs.

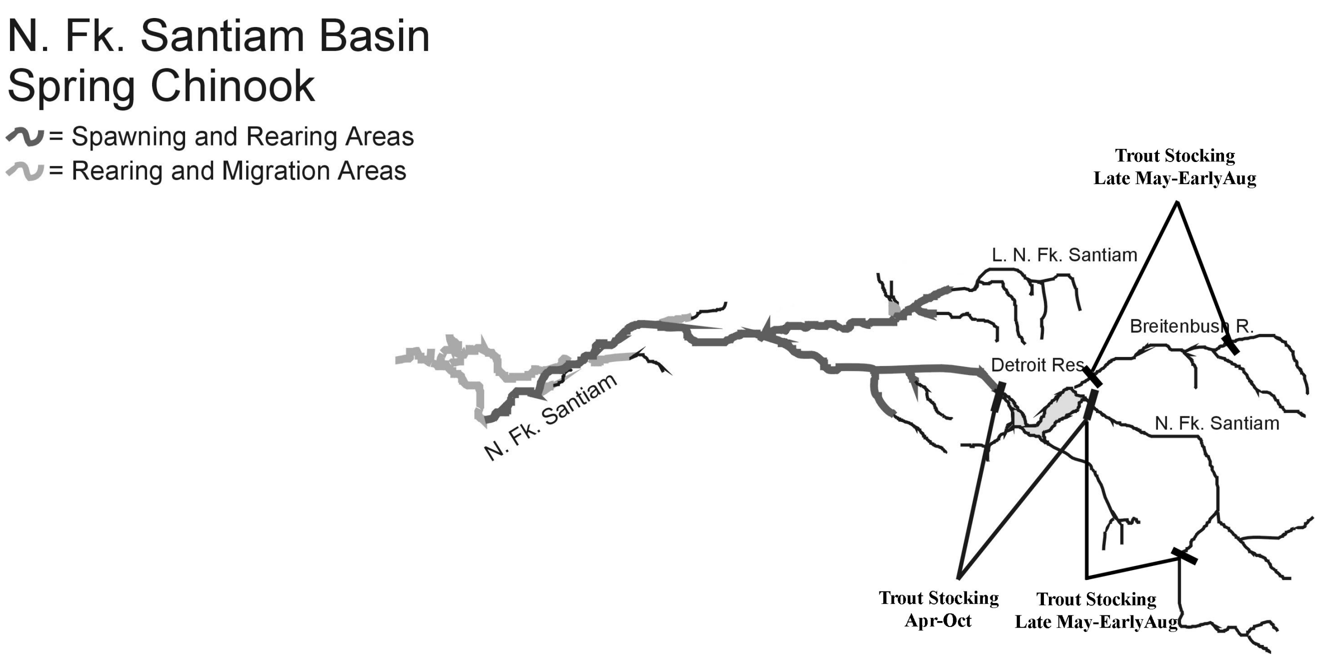

Figure 10.3-2. Reaches of the North Fork Santiam subbasin where hatchery rainbow trout are released and where spring chinook spawn and rear.

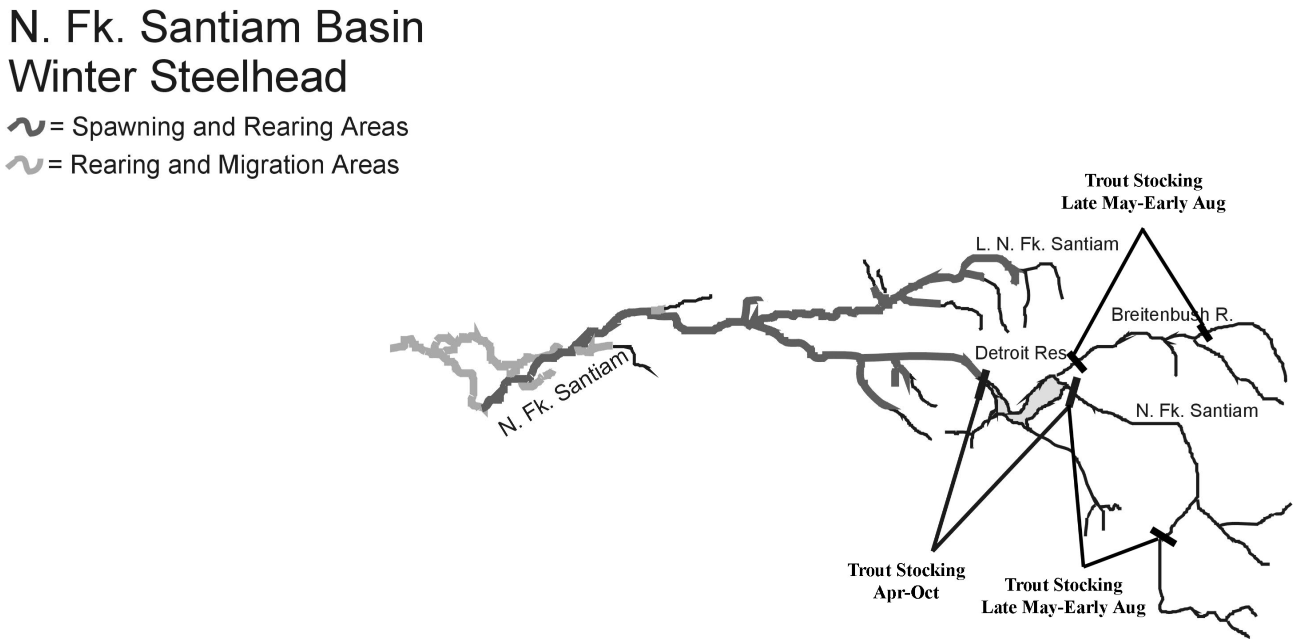

Figure 10.3-3. Reaches of the North Fork Santiam subbasin where hatchery rainbow trout are released and where winter steelhead spawn and rear.

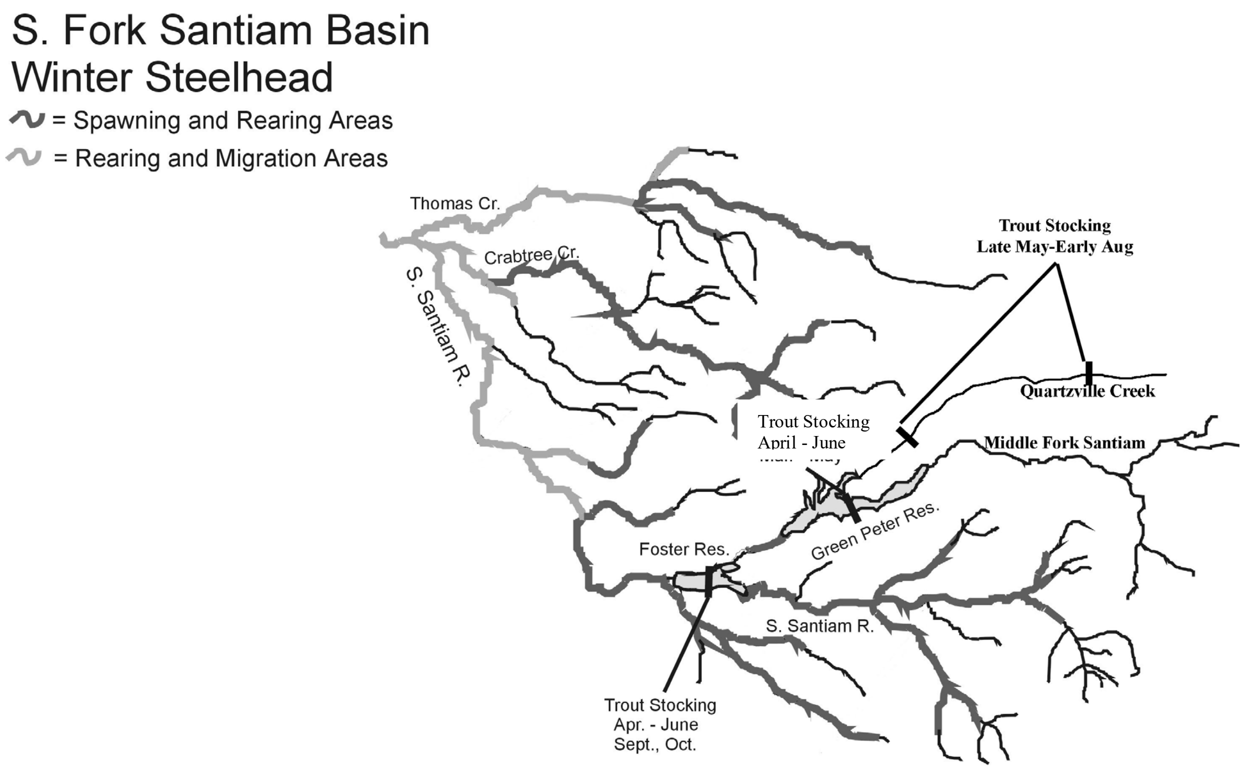

Figure 10.3-4 Reaches of the South Fork Santiam subbasin where hatchery rainbow trout are released and where winter steelhead spawn and rear.

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

The range of annual release dates is between February and October. Releases are timed for maximum public harvest utilization and opportunities. Rainbow trout are hauled by truck. They are either scatter planted or flushed from the truck. Culling is conducted during the rearing phase, but culling is not done at time of release. During rearing, fish are graded by size and grade-outs are euthanized.

10.5) Fish transportation procedures, if applicable.

ODFW loads trout into trucks using fish pumps, and the trucks haul the fish to the release sites. Transit time varies from 0.25 to 6.0 hours depending on the release location. ODFW's truck loading densities are up to 1.5 lbs/gal, and trucks are equipped with supplemental oxygen supplies and pumps that circulate the water.

10.6) Acclimation procedures.

Hatchery rainbow trout are not acclimated prior to their release. However, water in the truck tank must be within 10 degrees F of the water where the fish are released.

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

All hatchery rainbow trout released into waters where anadromous fish are native, are marked with adipose fin clips so that they can be distinguished from the natural population. Fish planted into lakes with no connection to other waterbodies may not be marked.

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

ODFW's production is managed to ensure that program goals for legal-sized fish are met. District Biologists allocate excess fish as they become available.

10.9) Fish health certification procedures applied pre-release.

All fish are examined for the presence of "reportable pathogens" as defined in the PNFHPC disease control guidelines three weeks prior to their release.

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

Emergency releases are dependent on suitability of waters when the emergency occurs. If fish are released, district biologists are consulted as to locations. Emergency releases are placed in waters with listed fish only when they are of program size and if they are fin clipped.

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.

Allocations of hatchery rainbow trout have been discontinued in several waters where listed spring chinook, winter steelhead and bull trout are found. For example, in the mid-Willamette area, rainbow trout legal programs have been eliminated from the Molalla River, Abiqua and Silver Creeks, North Santiam River below Big Cliff Dam, Little North Santiam River, Thomas and Crabtree creeks (lower South Santiam), South Santiam River above Foster Reservoir, Calapooia River, Mill Creek (Willamette R. in Salem), Mill and Agency Creeks (South Yamhill River), Rickreall Creek, Luckiamute and Little Luckiamute Rivers. All of these programs were terminated specifically to protect natural winter steelhead populations. In addition, stocking programs have been eliminated in the South Fork McKenzie River above Cougar Dam to protect native bull trout. Hatchery rainbow trout are marked with an adipose fin clip if they are to be released in areas that contain listed fish. Mass marking allows for selective harvest, as well as improved monitoring and evaluation.

As per IHOT guidelines, fish destined for release undergo a pre-release disease inspection and certification. Hatchery rainbow trout are not released if they are not certified by an ODFW fish health specialist for release into a given waterbody. This does not mean that infected rainbow trout cannot be released. Infected rainbow trout are only released into waters where the pathogen is already known to occur.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

1. **Standard:** Meet production levels for mitigation and fisheries.
   - **a. Indicator:** Number of pounds of fish released by program is applicable to given mitigation requirements.

   Monitoring and Evaluation: Hatchery operations records will document annual production poundage.

2. **Standard:** Program addresses ESA responsibilities.
   - **a. Indicator:** ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.

   Monitoring and Evaluation: ODFW and USACE will respond to requests for further information required to address ESA responsibilities as identified by federal regulatory agencies involved.

3. **Standard**: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural – and hatchery-origin fish in fisheries.
   - **a. Indicator:** Marking rate by mark type for each release group.
   - **b.** Indicator: Sampling rate by mark type for each fishery.
   - **c. Indicator:** Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery, when possible.

   Monitoring and Evaluation: Marking and mark retention rates are monitored as an ongoing and routine part of hatchery marking operations. Catch rates of adipose marked rainbow trout released into Foster Reservoir, Leaburg Lake and the McKenzie River are evaluated with statistical creels when funding is available.

4. **Standard:** Non-monetary societal benefits for which the program is designed are achieved.
   - **a. Indicator:** Recreational fishery angler days, length of seasons, and number of licenses purchased.

   Monitoring and Evaluation: Statistical creel surveys completed as part of the BiOp or for other fish management needs provide location-specific estimates of recreational angler days and will be conducted when funding is available.

"Performance Indicators" addressing risks.

1. **Standard:** Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.
   - **a. Indicator:** Annual number of fish produced by this program caught in a representative sample of fisheries, including estimates of fish released and associated incidental mortalities, by fishery (necessitates new program).
   - **b. Indicator:** Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries developed from these hatchery fish releases.
   - **c. Indicator:** Recreational angler days, by fishery.
   - **d. Indicator:** Annual escapements of natural populations that are affected by fisheries targeting program fish.
   - **e. Indicator:** Catch per unit effort, by fishery.

   Monitoring and Evaluation: Creels will be conducted when funding is available. Escapement of listed chinook and steelhead is monitored through spawning ground surveys, and dam and trap counts of fish passage but are also dependent upon funding.

2. **Standard:** Life history characteristics and genetic variation within and among natural populations do not change as a result of this artificial production program.
   - **a. Indicator:** Hatchery produced rainbow trout do not spawn with wild rainbow and winter steelhead populations.
   - **b. Indicator:** Triploidy in hatchery-produced rainbow trout is greater than 99%.

   Monitoring and Evaluation: Triploid success rate in hatcheries.

3. **Standard:** Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, INAD, MDFWP and ODFW's Fish Health Management Policy.
   - **a. Indicator:** Annual reports indicating level of compliance with applicable standards and criteria.
   - **b. Indicator:** Periodic audits indicating level of compliance with applicable standards and criteria.

   Monitoring and Evaluation: The hatchery facilities are operated in compliance with fish health guidelines, as shown by annual reports and periodic audits. The release of infected fish may not be operated according to the fish health guidelines.

4. **Standard:** Impacts to natural populations due to effluent from artificial production facility will be controlled through compliance with applicable federal and state permits, standards and guidelines.
   - **a. Indicator:** Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES,

IHOT, PNFHPC, including those relating to temperature, nutrient loading, chemicals, etc.

Monitoring and Evaluation: Hatchery effluent is released according to effluent permit requirements from DEQ. Effluent is monitored routinely and results are available.

5. **Standard:** Impacts to natural populations from water withdrawals and instream water diversion structures for artificial production facility operation will be controlled through compliance with applicable federal and state permits, standards and guidelines.
    a. **Indicator:** Water withdrawals compared to applicable passage criteria.
    b. **Indicator:** Water withdrawals compared to NOAA Fisheries, USFWS, and state juvenile screening criteria.
    c. **Indicator:** Number of adult fish passing water intake point.
    d. **Indicator:** Proportion of total stream flow diverted for artificial production facility.

    Monitoring and Evaluation: Minimal monitoring and evaluation of these parameters occurs. No regularly performed spawning ground surveys for winter steelhead take place below Roaring River hatchery. Periodic spring chinook salmon spawning ground surveys take place on Salmon Creek below Willamette Hatchery.

6. **Standard:** Impacts to natural populations from pathogens in hatchery water effluent will be controlled through compliance with applicable federal and state permits, standards and guidelines.
    a. **Indicator:** Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.
    b. **Indicator:** Juvenile densities during artificial rearing.

    Monitoring and Evaluation: It is very difficult to evaluate the transmission of disease in free-flowing wild environments. ODFW makes every attempt to release only healthy fish. Pre-liberation examinations occur in a six-week window prior to release. In addition, disease examination records are maintained for all stocks from egg to release. No tests of virulence (the ability of an organism to cause disease) are carried out. Juvenile rearing densities are monitored by hatchery staff.

7. **Standard:** Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.
    a. **Indicator:** Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition and consumption. Necessitates funding for new program.

    Monitoring and Evaluation: A study to determine levels of hatchery trout predation on spring chinook salmon would need to be funded. Time and size at release of hatchery fish is monitored and recorded as part of standard hatchery operations.

8. **Standard:** Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population
   - **a. Indicator:** Total cost of program operation.
   - **b. Indicator:** Sum of catch adjusted and monetary value of recreational effort placed appropriately to calculate all fishery-related financial benefits.

   Monitoring and Evaluation: An economic study has not been designed for the program, and there are no plans to conduct an economic study. Annual cost of program operation is identified within the Corps contract for hatchery operations.

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

Additional funding, staffing and other support logistics would be unavailable to implement other monitoring and evaluation programs without taking resources away from current programs.

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.

No monitoring of impacts of the hatchery rainbow trout program outside of the Hatchery BiOp takes place. When screw traps were used as part of this BiOp they were checked regularly to reduce holding times of both listed and unlisted fish. Other risk aversion measures associated with monitoring and evaluation activities are discussed in Sections 12.7 & 12.12, and in Firman et al. (2002; 2004).

SECTION 12. RESEARCH

There are no current or planned research studies focusing on rainbow trout.

12.1) Objective or purpose.

12.2) Cooperating and funding agencies.

12.3) Principal investigator or project supervisor and staff.

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

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

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

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

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

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).

12.10) Alternative methods to achieve project objectives.

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

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.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name and Title of Applicant:

Signature:_________________________Date:__________________________

Certified by_____________________________ Date:_______________________________