United States Department of the Interior
FISH AND WILDLIFE SERVICE
Lower Snake River Comp Plan Office
1387 S Vinnell Way, Suite 343
Boise, Idaho 83709

TAKE PRIDE IN AMERICA

May 26, 2011

Mr. Rob Jones
NOAA Fisheries Service
Salmon Recovery Division
1201 NE Lloyd Blvd., Suite 1100
Portland, Oregon 97232

Dear Mr. Jones:

Attached is the final Hatchery and Genetic Management Plan (HGMP) for the U.S. Fish and Wildlife Service's, Lower Snake River Compensation Plan (LSRCP), ODFW – Wallowa stock Grande Ronde River steelhead program, as required for compliance under the Endangered Species Act (ESA). The LSRCP Office is submitting this HGMP and requesting initiation of Section 7 consultation under the ESA for the program.

The ODFW, Wallowa stock steelhead HGMP was completed by ODFW, reviewed by co-managers, and submitted to the LSRCP Office for submittal under Section 7. The proposed production is consistent with the 2008-2017 *US v OR* Management Agreement. The LSRCP Office has concluded that while the ODFW, Wallowa stock steelhead program may affect listed salmonid species, the effects will not threaten the survival and recovery of any listed salmonid species.

If you have any questions regarding the ODFW Wallowa stock steelhead HGMP please contact Joe Krakker or me at the LSRCP Office.

Sincerely,

Scott Marshall
LSRCP Program Manager

Enclosures (1)

cc: Rich Johnson (FWS, Portland, OR)
Bruce Eddy (ODFW)
Scott Patterson (ODFW)
Rich Carmichael (ODFW)
Colleen Fagan (ODFW)

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May 2, 2011

Mr. Scott Marshall
Program Manager
Lower Snake River Compensation Plan
U.S. Fish and Wildlife Service
1387 S. Vinnell Way, Suite 343
Boise, Idaho 83709

Dear Mr. Marshall:

Attached is the Hatchery and Genetic Management Plan (HGMP) for the Lower Snake River Compensation Plan (LSRCP) Wallowa stock steelhead program operated by Oregon Department of Fish and Wildlife (department). This HGMP was completed in consultation with program co-managers and is consistent with provisions of U.S. v. Oregon and associated co-manager agreements. The department requests that LSRCP initiate Section 7 consultation under the federal Endangered Species Act for this program.

Should you have questions regarding this HGMP please contact Ms. Colleen Fagan at 541-962-1835 or myself at 541-962-1825.

Sincerely,

Bruce Eddy
Grande Ronde District Manager
Oregon Department of Fish and Wildlife

Enclosure

c: Joe Krakker – LSRCP
Mark Chilcote – NMFS
Scott Patterson – ODFW
Rich Carmichael – ODFW
Colleen Fagan – ODFW
Becky Johnson – NPT
Gary James – CTUIR

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**GrandeRondeBasin Summer Steelhead Hatchery Program - Lower Snake River Compensation Plan (LSRCP)**
Species or Hatchery Stock:	***Oncorhynchusmykiss,*** **summer steelhead (Wallowa Stock, stock # 056)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Grande Ronde / Snake River / ColumbiaBasin**
Date Submitted:	**December 2002**
Date Last Updated:	**May 2011**

SECTION 1.   GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Lower Snake River Compensation Plan (LSRCP) Grande Ronde Basin Summer Steelhead Hatchery Program

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

*Oncorhynchus mykiss,*Snake River summer steelhead, Wallowa River Stock (# 056), not an ESA-listed population.

1.3) Responsible organization and individuals.

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

1. U. S. Fish and Wildlife Service – Lower Snake River Compensation Plan - Program funding/oversight
2. Confederated Tribes of the Umatilla Indian Reservation – Co-operators
3. Nez Perce Tribe – Co-operators

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

The program operates under the federally-mandated Lower Snake River Compensation Plan (LSRCP) mitigation program funded through the U.S. Fish and Wildlife Service. The program is designed to mitigate for fish losses caused by hydropower operations of the four Lower Snake River dams. The LSRCP steelhead program in Oregonalso includes an integrated Imnaha basin program. Staff are shared between the two programs (approximately 70% Grande Ronde basin and 30% Imnaha basin). Combined program staff includes: (0.25) Hatchery Coordinator, (2) Hatchery managers, one at Irrigon Hatchery and one at Wallowa Hatchery, (2) assistant hatchery managers, (6 ½) fish and wildlifetechnicians, (1) trades maintenance coordinator and (1) office manager.Operation and maintenance costs for the Grande Ronde portion are estimatedat $900,000, not including monitoring and evaluation activities.

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

Adult Collection and Holding: Adult summer steelhead are collected in the WallowaBasin (HUC-17060105) at Wallowa Hatchery and at the BigCanyon facility (BigCanyon). Adults collected at BigCanyon are transferred and held at Wallowa Hatchery. Wallowa Hatchery is located along Spring Creek (rkm 1), a tributary to the WallowaRiver at rkm67, one mile west of Enterprise, Oregon.

Big Canyon operates as a satellite to Wallowa Hatchery, and is located on Deer Creek (rkm 0) at itsconfluence with the Wallowa River (rkm 18), just east of Minam, Oregon (Figure 1).

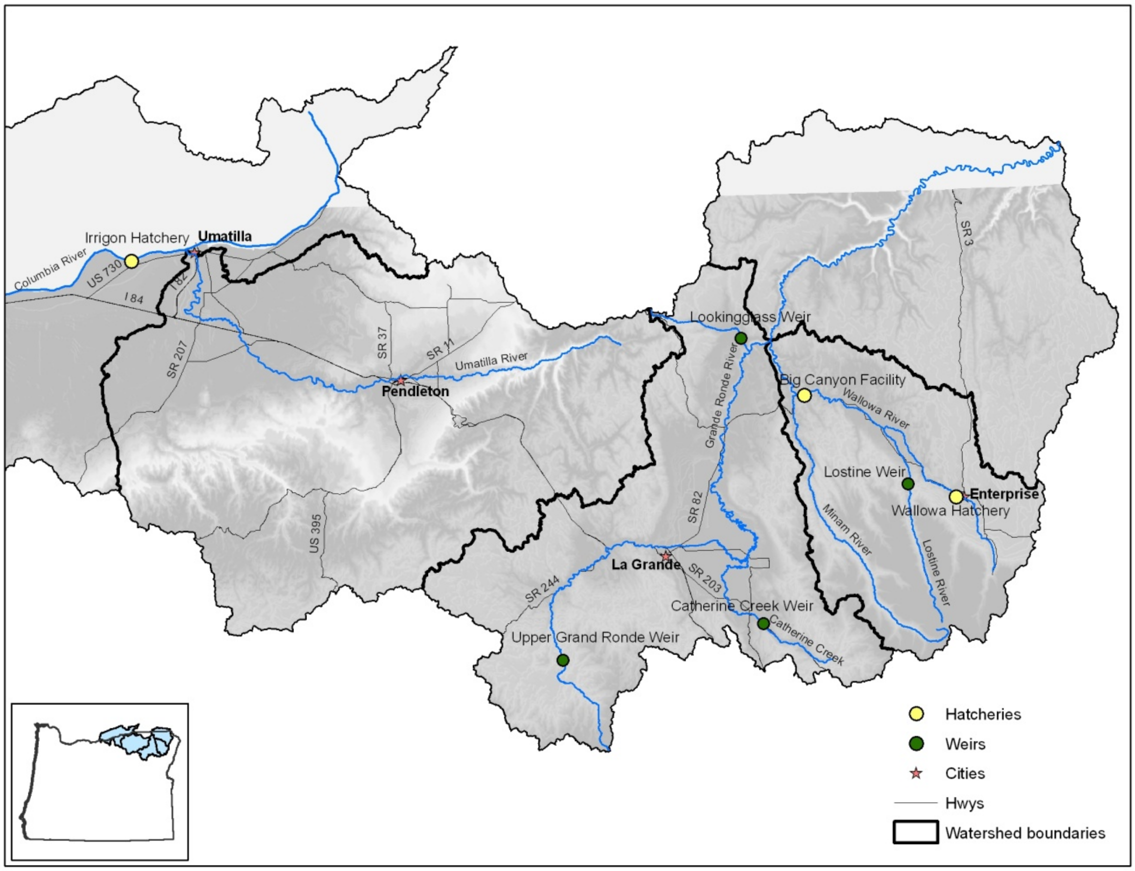


Figure 1. Locations of spawning, rearing, and release facilities for the Wallowa steelhead hatchery program. Map also shows locations of weir sites within the Grande Ronde basin.

<u>Spawning:</u> Fish are collected and spawned atWallowa Hatchery. Fish collected at Big Canyon can be used for spawning at Wallowa Hatchery if needed (Figure 1).

*<u>Early Incubation:</u>*Incubation from green egg to eyed egg stage occurs at Wallowa Hatchery (Figure 1).

<u>Final incubation and Rearing:</u> Final incubation (eyed egg stage to hatch) and rearing to smolt size occurs at Irrigon Hatchery. Irrigon Hatchery is located along the south bank of the Columbia River, upstream of John Day Dam, near Irrigon, Oregon (Figure 1).

<u>Salmon and Trout Enhancement Program (STEP)</u>: Currently, a small group of

eyed eggs (1,200) are appropriated to a STEP program. These fish are reared from eyed egg stage to fry in local classroom incubators, and released into Marr Pond (800) and Wallowa Wildlife Pond (400) near Enterprise and Wallowa, Oregon, respectively.

Acclimation to release: Smolts are transferred from Irrigon Hatchery in February and April, acclimated at Wallowa Acclimation Pond (Wallowa Hatchery), and held for 3 to 7 weeks before release into the WallowaRiver. Other smolts are transferred from Irrigon Hatchery to Big Canyon Acclimation Pond in February and April, and acclimated for approximately 3 to 7 weeks before release into Deer Creek near the confluence with the Wallowa River (Figure 1).

1.6) Type of program.

Isolated program used for harvest mitigation.

1.7) Purpose (Goal) of program.

This hatchery program is part of the Lower Snake River Compensation Plan (LSRCP). The purpose of the LSRCP is to replace adult salmon, steelhead and rainbow trout lost by construction and operation of four hydroelectric dams on the Lower Snake River in Washington.   Specifically, the stated purpose of the plan is:

"…[to]….. provide the number of salmon and steelhead trout needed in the Snake River system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean" (NMFS & FWS 1972 pg 14)

Mitigation goals for the LSRCP were established in a three step process. First the escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt).   Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement.   Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area.

For steelhead, the escapement above Lower Granite Dam prior to construction of these dams was estimated at 114,800.   Based on a 15% mortality rate for smolts transiting each of the four dams (48% total mortality), the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 55,100.   This number established the LSRCP escapement mitigation goal. Based on a catch to escapement ratio of 2:1, the anticipated benefit to fisheries below Lower Granite Dam was expected to be 110,200 fish.

Component	Number
Escapement Above Lower Granite Dam	55,100
Commercial Harvest	37,000
Recreational Harvest Below Lower Granite Dam	73,200
Total	165,300

One component of the steelhead mitigation computations was accounting for the estimated loss of 130,000 recreational angler days of effort caused by transforming the free flowing Snake River into a series of reservoirs. The U.S. Army Corps of Engineers (COE) recommended purchasing land to provide access for sportsman to compensate for this loss. When computing expected benefits for this loss, the COE assumed this access would be provided, that the 130,000 anger days would be restored and that that one fish would be caught for each five hours of effort. As such, the COE expected that 26,000 of the 110,200 steelhead would be caught in the Snake River below Lower Granite Dam.

Location of the hatchery facilities was a key decision and the COE recommended: " These [steelhead hatcheries] should be constructed upstream of the Lower Snake River Project to provide for the sport fisheries of eastern Oregon, Washington and Idaho as well as the downriver fisheries". While recognizing that some steelhead crossing Lower Granite Dam would be caught, and some used for hatchery broodstock, no other specific priorities or goals were established regarding how the remaining fish might be used.

Since 1976 when the LSRCP was authorized, many of the parameters and assumptions used to size the hatchery program and estimate the magnitude and flow of benefits have changed:

- The survival rate required to deliver a 2:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults being produced in most years.

- The listing of Snake River fall Chinook and Snake River Steelhead under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the mainstem Columbia River. This has resulted in a much higher percentage of the annual run returning to the project area than was expected.

- The *U.S. v. Oregon* court stipulated Fishery Management Plan has established specific hatchery production agreements between the states, tribes and federal government and this has diversified the hatchery program by adding new off station releases to meet short term conservation objectives.

The Wallowa steelhead hatchery program was designed to escape 9,184 steelhead back to the project area after a harvest of 18,368. While recognizing the overarching purpose and goals established for the LSRCP, and realities' regarding changes since the program was authorized, the following objectives for the beneficial uses of steelhead returns have been established for the period through 2017:

1. To contribute to the recreational, commercial and tribal fisheries in the mainstem Columbia River consistent with agreed abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
2. To trap 450 broodstock to perpetuate this program.
3. Re-establishing sport and tribal fisheries.
4. Minimizing program impacts on naturally-producing steelhead populations in the Grande Ronde basin, and resident stocks of game fish.
5. To maximize the beneficial uses of any fish that return to the project area, that are not used for broodstock or harvest including: food bank and tribal distributions, and nutrient enhancement.

1.75) Recovery Plan Goals

<u>Background</u>

The program goal to provide adult steelhead to meet fishery mitigation goals will be guided, in part, by the recovery plan currently under development for the Snake River ESU. The primary units of the recovery plan are Major Population Groups (MPGs). The summer steelhead that exist in the Grande Ronde basin represent one of these MPGs. For the ESU to achieve recovery, all MPGs must be viable. A determination of whether or not a MPG is viable is dependent on the status of the constituent populations. In the case of the Grande Ronde MPG the draft recovery plan targets all of the populations for either low risk or very low risk status. Currently, hatchery steelhead are released into the Wallowa basin but not elsewhere in the Grande Ronde MPG, with the exception of the smolts released from WDFW's Cottonwood Pond program in the lower Grande Ronde basin. The incidence of hatchery fish straying into natural populations is believed to be low and maintaining this condition is described in the recovery plan as being the conservation goal for the Wallowa hatchery program.

1.8) Justification for the program.

The Lower Snake River Compensation Plan is a congressionally mandated program pursuant to PL 99-662.

This program produces Wallowa stock steelhead smolts for harvest mitigation under LSRCP. Adult returns will provide harvest opportunity in the Columbia, Snake and GrandeRondeRiver sport and tribal fisheries while reducing impacts to ESA-listed fish. Co-operators manage this program adaptively, and since the inception have developed actions to limit and/or reduce impacts to listed populations. These features include:

- Reducing the production of residual smolts by targeting a larger size at release. Results from Whitesel et al. (1993) and Jonasson et al. (1994 and 1995) suggested that Wallowa stock steelhead smolts reared to 4fpp produced fewer residuals and returned at a better rate than smolts at 5fpp. Based on these findings and in response to suggestions in the NMFS Hatchery BiOp, smolt production starting with BY2006 was reduced by 40% from the original LSRCP goal of 1.35 million smolts at 5/lb to 800,000 smolts at 4/lb (200,000 lbs.). This action expects to maintain comparable adult returns while reducing the amount of residual smolts produced.

- Reducing in-basin stray rates and interactions with ESA-listed fish with appropriate acclimation and release strategies. Prior to release, smolts will be acclimated to Spring Creek (Wallowa Acclimation Ponds) or Deer Creek (Big Canyon Acclimation Ponds) water with the goal of reducing in-basin straying. Release of all production fish will occur at the smolt stage to reduce potential interaction with naturally-produced and ESA-listed fish rearing in the vicinity of release sites. All smolts will have a short volitional release period to limit stress and provide opportunity to remove fish likely to residualize.

- Eliminating direct stream releases. Releasing smolts at acclimation/adult trapping facilities will allow broodstock collection and removal of adult escapement surplus to broodstock needs while reducing in-basin straying.

1.9) List of program “Performance Standards” and associated “Performance Indicators”

1. Grande Ronde basin steelhead production contributes to fulfilling tribal trust responsibility mandates and treaty rights.

1.1. Estimated number of program steelhead harvested in tribal fisheries by run year.
1.2. Proportion of program harvest by tribal fisheries by run year.

2. Program contributes to mitigation requirements.

2.1. LSRCP compensation area harvest and total return estimates by run year.
2.2. Estimated recreational angler days in the Grande Ronde basin by run year.
2.3. Estimated total hatchery adult harvest and escapement.

3. Fish are produced in a manner enabling effective harvest while avoiding over-harvest of non-target fish.

3.1. Run year harvest estimate by fishery.
3.2. Estimated run year catch of listed species in associated fisheries.
3.3. Run year recreational angler days in the Grande Ronde basin fishery.

4. Release groups are marked to enable determination of impacts and benefits in fisheries.

4.1. Number of marked and unmarked fish reported in each fishery produces accurate estimates of catch and harvest.

5. Efficiency of hatchery program in producing smolts.

5.1. Survival by life stage for hatchery progeny.

6. Hatchery program achieves sustainability.

6.1. Number of broodstock collected.
6.2. Number of smolts released.
6.3. Adult returns to compensation area.
6.4. Angler days and harvest in annual fisheries.

7. Broodstock collection does not reduce potential juvenile production in natural rearing areas.

7.1. Number of wild spawners passing to natural spawning areas.
7.2. Number of wild fish handled during broodstock collection.
7.3. Observed mortality of wild adults at trapping locations.

8. Releases are marked to allow evaluation of effects on local natural populations.

   8.1. Visible mark ratio in hatchery release groups.

9. Hatchery produced adults do not exceed 5% of the spawning adults in the natural populations of the Grande Ronde MPG including Lower Grande Ronde, Joseph, Wallowa, and Upper Grande.

   9.1. Monitor proportion of hatchery fish in key natural spawning areas (Lookingglass Creek, CatherineCreek, and Upper Grande Ronde).
   9.2. Marked proportion of adults observed during annual spawning surveys.

10. Juveniles are released after sufficient acclimation to maximize homing ability to intended locations.

   10.1. Length of acclimation period.
   10.2. Proportion of adult returns to intended location.
   10.3. Proportion of hatchery fish in key steelhead natural spawning areas.

11. Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.

   11.1. Scientifically based experimental design, with measurable objectives and hypotheses.

12. Monitoring and evaluation occurs on an appropriate schedule and scale to assess progress toward achieving the experimental objective and evaluate the beneficial and adverse effects on natural populations.

   12.1. Monitoring and evaluation framework including detailed timeline.
   12.2. Annual and final reports.

13. Facility operation complies with applicable fish health and facility operation standards and protocols.

   13.1. Annual reports indicating level of compliance with applicable standards and criteria.

14. Effluent from artificial production facilities will not detrimentally affect populations.

   14.1. Discharge water quality compared to applicable water quality *standards and guidelines.*

15. Water withdrawals and diversion structures used in operation of artificial production facilities will not prevent access to natural spawning areas, affect spawning behavior of listed natural populations, or impact juvenile rearing.

    15.1. Water withdrawals compared to applicable passage criteria.
    15.2. Water withdrawal compared to NMFS juvenile screening criteria.
    15.3. Proportion of diversion of total stream flow between hatchery facility intake and out-fall.

16. Releases do not introduce new pathogens into local populations, and do not increase the levels of existing pathogens.

    16.1. Certification of juvenile fish health immediately prior to release.

17. Any distribution of carcasses or other products for nutrient enhancement meets appropriate disease control regulations and guidelines.

    17.1. Number and location of carcasses distributed for nutrient enrichment.
    17.2. Disease examination of all carcasses to be used for nutrient enrichment.
    17.3. Statement of compliance with applicable regulations and guidelines.

18. Weir/trap operations do not result in significant stress, injury or mortality in natural populations.

    18.1. Adult trapping mortality rate for wild fish.

19. Juvenile production costs are comparable to or less than other regional programs designed with similar objectives.

    19.1. Total cost of program operation.
    19.2. Average cost of similar operations.

20. Non-monetary societal benefits for which the program is designed are achieved.

    20.1. Recreational fishery angler days.

21. Fish health problems associated with hatchery production does not adversely impact wild fish productivity.

    21.1. Health condition and history of fish released.

In addition, Appendix Table 1 represents the union of performance standards described by the Northwest Power and Conservation Council, regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Beasley et. al. 2008). The adoption of this regionally-applied means of assessment will facilitate coordinated analysis of findings from basin-wide M&E efforts and will provide the scientifically-based foundation to address the management questions and critical uncertainties associated with supplementation and ESA listed stock status/recovery.

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

1.10.1) "Performance Indicators" addressing benefits.

(e.g. "*Evaluate smolt-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.*").

- Number of adults returning to compensation area
- Number of hatchery fish harvested in sport and tribal fisheries
- Number of angler days of recreation in fishery

In addition to yearly evaluations, every five years the Wallowaprogram will undergo a comprehensive review to evaluate its effectiveness. This review will include adaptive management recommendations that address program benefits.

1.10.2) "Performance Indicators" addressing risks.

(e.g. *"Evaluate predation effects on listed fish resulting from hatchery fish releases."*).

- A population level determination of the proportion of the naturally spawning fish that are hatchery strays.
- Proportion of hatchery smolts that residualize and their density relative to the density to older aged steelhead juveniles.

In addition to yearly evaluations, every five years the Wallowa program will undergo a comprehensive review to evaluate its effectiveness. This review will include adaptive management recommendations that address programrisks.

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level.

Average annual broodstock needs include 225 females and 225 males.

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

Table 1. Proposed annual fish liberation levels by life stage for the Grande Ronde steelhead program.

Life Stage	Release Location	Annual Release Level
Unfed Fry	Marr Pond	800
Unfed Fry	Wallowa Wildlife Pond	400
Fingerling	Various standing water bodies	0
Yearling	Spring Creek, 1st acclimation (smolts @ 4fpp)	360,000
Yearling	Spring Creek, 2nd acclimation (smolts @ 4fpp)	120,000
Yearling	Deer Creek, 1st acclimation (smolts @ 4fpp)	160,000
Yearling	Deer Creek, 2nd acclimation (smolts @ 4fpp)	160,000
Adult	Marr Pond	100
Adult	Wallowa Wildlife Pond	70
Adult	Roulet Pond	50
Adult	Ladd Pond	40

Note: There are no planned releases of fingerling steelhead in various standing water bodies; however, if production exceeds 800,000 smolts, fingerling fish can be out planted in Kinney Lake or other locations stocked in ODFW trout program.

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

Table 2. Smolt to adult return (SAR) and smolt to adult survival (SAS) rates for coded wire tagged groups of Wallowa stock hatchery smolts released at Wallowa and Big Canyon facilities, for selected brood years. NA indicates not available (updated 12/09, Clarke, ODFW, pers. com. LSRCP annual report).

Brood Year	SAR (%)		SAS (%)	
	Wallowa	Big Canyon	Wallowa	Big Canyon
1985	0.32	NA	1.03	NA
1986	0.26	NA	1.03	NA
1987	0.14	NA	0.58	NA
1988	0.06	NA	0.21	NA
1989	0.15	NA	1.18	NA
1990	0.21	0.19	1.13	1.18
1991	0.02	0.02	0.08	0.10
1992	0.06	0.09	0.31	0.38
1993	0.20	0.28	0.81	0.98
1994	0.16	0.27	0.51	0.78
1995	0.19	0.22	0.72	0.98
1996	0.12	0.11	0.34	0.26
1997	0.16	0.14	0.37	0.72
1998	0.19	0.24	0.72	0.81
1999	0.44	0.68	1.62	1.95
2000	0.19	0.15	0.68	0.35
2001	0.45	0.41	1.45	1.60
2002	0.33	0.41	1.45	1.60
2003	0.49	0.21	NA	NA
2004	0.38	0.24	NA	NA
2005	0.45	0.20	NA	NA

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

Adults were first collected for program broodstock in 1976. The first smolts were released in 1977.

1.14) Expected duration of program.

Under LSRCP, the duration of this program is linked to operations of the four Lower Snake Riverhydropower dams.

1.15) Watersheds targeted by program.

Grande Ronde Watershed and more specifically the Wallowa sub-basin (HUC-17060105).

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

- Development of an endemic broodstock to replace the existing Wallowa hatchery stock was considered. However, development of such a program was determined unnecessary to accomplish program objectives. Endemic broodstocks become necessary only to reduce genetic concerns related to intentional supplementation and/or hatchery straying. Natural populations within the basin have been designated at "low" (JosephCreek population) or "moderate" risk of long-term extinction without supplementation (NMFS 2008). Recent discontinuation of direct stream releases will minimize potential for straying within the basin (Clarke et al. 2010). Development of an endemic stock would likely impact natural productivity through:

    1) Take of listed wild fish for broodstock;
    2) Increased interactions between wild and hatchery spawners in nature that may have more adverse impacts than the present program where the hatchery fish produced are rarely spawn in the wild.

- Development of an early-returning broodstock (early brood) began in 2004. Wallowa stock steelhead adults were captured from the GrandeRondeRiver in fall (October), with the expectation that progeny from these fish would return earlier to the Grande Ronde, reduce potential for straying into Columbia River tributaries, and emphasize harvest within the LSRCP compensation area. Return data from three brood years of PIT-tagged adults suggest that, on average, early brood progeny return earlier than standard production fish (Appendix Figure 1). However, preliminary stray rate data, available only for the first two fall production broods, suggest that early brood progeny do not stray less than standard Wallowa stock progeny (Appendix Table 2). However, preliminary data indicates that fall broodstock progeny may be harvested in the LSRCP compensation area at higher rates than standard Wallowa stock progeny.

- Switching hatchery stocks to the Clearwater B-run stock to reduce straying in Columbia River tributaries has been considered, but a decision was made to instead pursue the early brood strategy (discussed in previous bullet).

- Elimination of the hatchery program has been considered. However, this alternative fails to provide desired hatchery fish harvest opportunity.

- Maintenance of the existing Wallowa stock without modification of adult return timing and at a modestly reduced production level has been considered. However, even at a reduced production level the program would likely continue to produce unacceptable impacts to listed species as a result of adults straying outside the basin.

In 2009,independent scientific review groups, Hatchery Scientific Review Group (HSRG) and Hatchery Review Team (HRT) assessed the Wallowa Hatchery program extensively. Their findings are summarized as follows:

The HSRG had no specific recommendations to improve this hatchery program. The report is available at: *http://www.hatcheryreform.us/hrp/report/appendixe*. The HSRG recommends that managers continue to monitor steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. They also recommended managers continue to explore ways to reduce straying to out-of-basin areas such as the Deschutes and John Day rivers. The HSRG encourages managers to explore opportunities to increase the harvest contribution, such, as increasing daily bag limits.

The HRT concluded that programmatic risks outlined were either minor or their probability of occurrence was small, and, thus, did not warrant a proposed change to the current program(see: *http://www.fws.gov/Pacific/fisheries/Hatcheryreview/reports.html)*. In brief, the recommendations outlined below address HRT concerns that should be considered by managers (USFWS 2009).

Table 3. Recommendations for the Wallowa hatchery steelhead program provided by the USFWS Hatchery Review Team (HRT). Approximate costs and comments regarding recommendation implementation are listed.

WA	Brief Description	Priority	Additional Costs	Comments
WA1	Restate Goals	Low	$0	HGMP
WA2	Unmarked adults released below Wallowa hatchery	Low	$0	Under discussion AOP
WA3	Evaluate different brood sources	High	$0	Ongoing (fall brood)
WA4	Evaluate in-basin strays	High	$0	Ongoing
WA5	Discontinue recycling adults	Low	$0	Public supports recycling, cap of 150 fish
WA6	Reduce early rearing density	Low	Up to $1M	Very expensive for little benefit
WA7	Evaluate early density to predict disease out breaks	Medium	$25,000	Coldwater is suspected to be vertically transmitted
WA8	Single acclimation and direct stream release	Disagree	$0	Applied research results do not support this recommendation

WA9	Irrigon 3rd variable speed pump	Low	$35,000	Unnecessary for current program
WA10	Install alarm and new in-line chiller	Low	$50,000	Expensive for couple weeks of brood year over lap
WA11	Replace vertical egg trays	Low	$25,000	Ongoing, annual O&M
WA12	Modify bird netting	Low	$100,000	Ongoing, annual O&M
WA13	Cover Irrigon Raceways	Low	$1M	Very expense for little benefit
WA14	Review Irrigon NPDES permit	High	$0	complete
WA15	Modify alarms	High	$25,000	Ongoing, annual O&M
WA16	Transfer water rights	Disagree	$0	WH is primarily state owned
WA17	Review Wallowa NPDES permit	High	$0	complete
WA18	Replace Spring Creek intake	High	$50,000	Under discussion
WA19	Big Canyon de-icing well	Medium	$100,000	Current system is manageable
WA20	Monitor residualism	High	$0	Ongoing
WA21	Review tagging composition	Low	$0	Ongoing
WA22	Update I&E material	Medium	$70,000	Ongoing for WH complete in 2010
WA23	Add harvest information in I&E	Low	$10,000	Need to be added to I&E package

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

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

- The program has operated under a NMFS program draft Biological Opinion since 1993. The most recent Biological Opinion was released in 2004. NPDES 0300J.
- DEQ MOA Water Quality Limited stream list. (carcass disposal).
- Lower Snake River Compensation Plan (Annual Operating Plans (AOPs).
- NMFS 4 (d) – Section 7 permit #818 (currently expired, in consultation with USFWS staff).
- Oregon Scientific Taking Permit OR2009-043.
- Oregon Scientific Taking Permit OR2009-077.
- Oregon recreational fisheries associated with this program are described in a Fisheries Management and Evaluation Plan (FMEP) submitted to NOAA fisheries in 2009.

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

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

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

None.

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

The Wallowa Hatchery program may incidentally affect ESA-listed Snake River summer steelhead populations. In addition, ESA-listed Snake River spring Chinook salmon, Snake River fall Chinook salmon, and ColumbiaBasin bull trout are present in the Grande Ronde basin. Interactions between the hatchery program and these populations will be reduced from past levels through program modifications outlined in sections 1.8 and 1.16.

<u>Snake River summer steelhead</u> - Grande Ronde basin summer steelhead are typical of A-run steelhead from the mid-Columbia and Snake basins. Approximately 60% of adults return to the Grande Ronde basin after one year of ocean rearing (one-salt). The remainder consists of two-salt adults with an occasional three-salt fish. Females generally dominate adult returns with an average 60/40 sex ratio. Size of returning adults range from 45 to 91 cm and 1.4 to 6.8 kg. Adults generally enter the Columbia River May through August, and subsequently enter the GrandeRondeRiverSeptember through April. Adults utilize accessible spawning habitat throughout the Grande Ronde basin including Deer Creek above the facility weir. Wild fish are seldom observed in the Wallowa Hatchery trap. Spawning typically begins in March in lower elevation streams and spring-fed tributaries and continues until early June in higher elevation snowmelt driven systems. Juveniles utilize a wide range of habitats throughout the basin including areas adjacent to smolt release locations. Most naturally-produced smolts out-migrate after rearing for two years. A much lower percentage emigrate seaward after one or three years. Smolt out-migration from the Grande Ronde basin extends from late winter until late spring, and peak movement is typically associated with increased flow events between mid-April and mid-May (P. Keniry, ODFW, pers.com.)

The Grande Ronde MPG is comprised of four populations, three of which contains two more distinctive production units as follows:

1. Lower Grande Ronde Population
    - WenahaRiver
    - Lower Grande Ronde River tributaries in Oregon

2. Joseph Creek Population

3. Wallowa Population
    - Wallowa River tributaries from north
    - Wallowa River tributaries from south (except Minam)
    - Prairie Creek

- Minam and tributaries

4. Upper Grande Ronde Population
   - Lookingglass
   - Middle Grande Ronde (Grande Ronde tributaries between Wallowa and the upper end of the GrandeRondeValley except Lookingglass, Catherine and Willow creeks)
   - Willow Creek
   - CatherineCreek
   - Upper mainstem and tributaries above the Grande Ronde Valley up to and including Meadow Creek
   - South Upper Mainstem (basin above Meadow Creek)

This identified steelhead population structure in Grande Ronde basin, which is consistent with the ICTRT designations,may be a conservative approach to population structure due to a lack of data and our desire to minimize risk of population impacts resulting from management decisions. The identified structure is based upon basin size and differences in hydrology, elevation, geology, temperature regime, aspect and spawning time. Individuals from all above listed populations may be intercepted and handled in recreational fisheries or during broodstock collection. Only returning members of the Wallowa River populations have a high likelihood of interception at adult trapping facilities.

Snake River Spring Chinook – Historically, spring Chinook spawned in headwater areas throughout the Grande Ronde basin. Human manipulation of migratory corridors and spawning areas have resulted in population fragmentation and reduced spawner numbers. Currently, populations in the Minam, Lostine, Wenaha, Wallowa and upper Grande Ronde rivers and CatherineCreek represent relative strongholds within the basin.

Adult spring Chinook enter the Columbia River in March through May, and move into staging areas from April through July. The majority of naturally-produced fish in the Grande Ronde basin return as Age-4 adults. Spawning occurs from early-August through September and generally peaks in late-August. Fry emerge from January to June, and expand their distribution depending on environmental conditions. A fall pre-smolt movement into higher-order reaches appears to involve a substantial portion of the population in some streams. Juveniles exhibit a stream-type life history and smolt one year following emergence. Smolt migration from the basins begins in January and extends through early July.

Snake River Fall Chinook – Fall Chinook that spawn and rear in the lower reaches of the GrandeRondeRiver are considered a segment of the Snake River population and exhibit a similar ocean-type life history. Adults enter the Columbia River in July and migrate into the Snake River from mid-August through October. Spawning occurs from late-October through early-December. Fry emerge March and April, and begin migratingseaward within 3-4 months. Migration past Lower Granite Dam typically peaks in late June, although recent studies have documented juvenile fall Chinook that overwinter in Lower Granite reservoir and resume migration the following spring (Connor et al. 2005)

ColumbiaBasinBull trout – Both fluvial and resident life history forms of bull trout inhabit the Grande Ronde basin. Little is known of their population structure, although habitat conditions and influence of introduced brook trout contribute to varyingproductivity and relative strength among local populations.

Fluvial adults migrate into headwater areas during spring and early summer after overwintering in mainstem tributaries and the Snake River. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge in during the spring, and the extent of juvenile rearing is restricted to headwater areas with favorable temperature regimes.

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

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

Summer steelhead - The Grande Ronde River Major Population Group (MPG) currently does not meet MPG-level viability criteria set by the Interior Columbia Basin Technical Recovery Team (ICTRT). The ICTRT recommend a minimum of two Grande Ronde basin populations be at 'viable' status for the MPG to be viable, and at least one of them must be rated as 'highly viable'. However, the draft recovery plan describes an implementation process that is intended to bring all four populations in this MPG to a 'viable' or better status level.Currently the Joseph Creek population is rated 'highly viable', while the upper Grande Ronde and Wallowa river populations received a 'maintained' rating (ICTRT2010a). To achieve a 'viable rating', the Upper Grande Ronde and Wallowa river populations must improve in abundance/productivity criteria.

Observed steelhead spawner abundance within the basin reached a low in the late- 1970s, gradually increased to peak in the mid-1980s, and declined to another low in the late-1990s (Figure 2). Spawner abundance has recovered in the current decade.According to the ICTRT analysis, average abundance over the last 6 years for the Joseph Creek population has exceeded the viable threshold identified in Table 4, whereas the upper Grande Ronde population has not

(Appendix Tables 3-5).

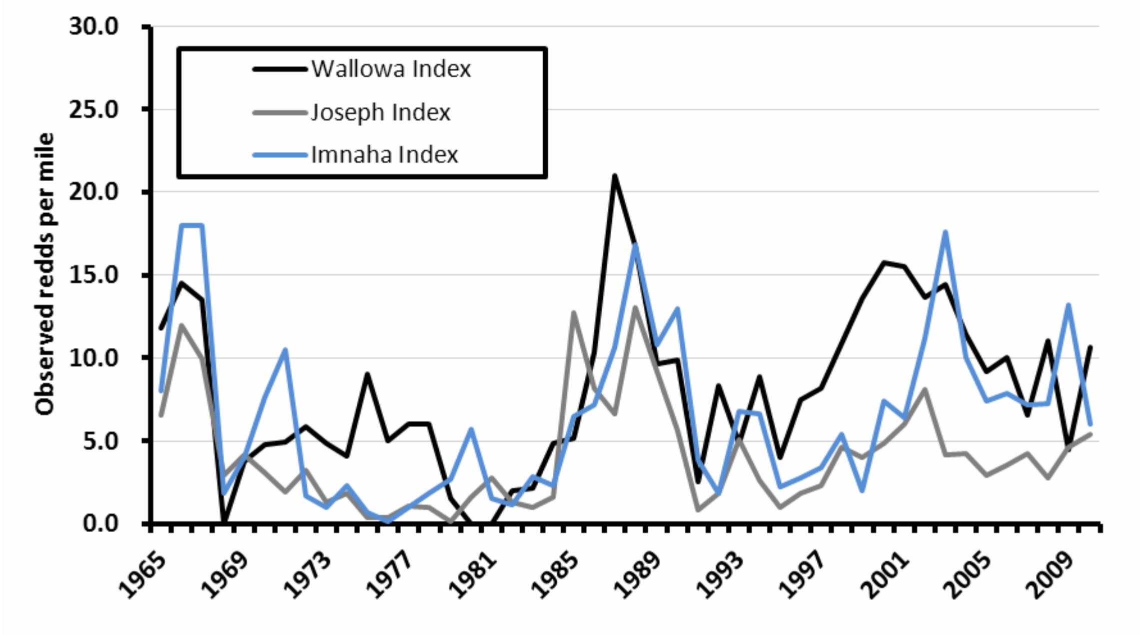


Figure 2. Average steelhead redd densities for index reaches of the Wallowa River, Joseph Creek, and Imnaha River populations 1965-2010. Wallowa River index reaches are Whiskey and Prairie Creeks. Joseph Creek index reaches include the following: Butte, South Fork Chesnimnus, Crow, Devil's Run, Elk, McCarty, Peavine, Summit, Swamp Creeks and TNT Gulch. The index reach for the Imnaha population is Camp Creek.

Table 4. List of the natural steelhead populations, "Viable Population" thresholds, and associated hatchery stocks within the Grande Ronde basin considered for the viability anaylsis conducted by the Interior Columbia Technical Recovery Team (ICTRT2010a).

Management Units	Critical Thresholds (Abundance[a], R/S[b])	Current Values (Abundance[a],R/S[b])	Associated hatchery stock
Lower Grande Ronde	Abundance: 1,000 R/S = 1.15	Abundance: unknown R/S = 2.29-2.62	Wallowa stock summer steelhead (#56) – Cottonwood Facility
JosephCreek	Abundance: 500 R/S = 1.27	Abundance: 2,132 R/S = 2.58	
WallowaRiver	Abundance: 1,000 R/S = 1.15	Abundance: 172[c] R/S = 1.73	Wallowa stock summer steelhead (#56)
Upper Grande Ronde	Abundance: 1,500 R/S = 2.29	Abundance: 1,226 R/S =1.22	

[a] 10-year geometric mean abundance of natural origin spawners.
[b] Recruits per spawner.
[c] Abundance estimate from three index areas.

Snake River Spring Chinook

The Grande Ronde River Chinook salmon MPG does not currently meet the ICTRT criteria for MPG viability. There are five extant populations of spring Chinook salmon in the Grande Ronde River MPG, of which all have a "High Risk" population viability rating (ICTRT 2010b). The Lookingglass Creek population is considered functionally extirpated from low abundance over many generations and extensive genetic influence of non-native hatchery-origin spawners produced at Lookingglass Hatchery.

General trends in observed Chinook spawner abundance within the basin fluctuated in the 1980s and 1990s, and have remained generally higher in the first half of the current decade (Appendix Tables6-10).Currently none of the spring Chinook populations in the Grande Ronde basin meet the population viability threshold (ICTRT 2010b).

Snake River Fall Chinook

The ICTRT (ICTRTc2010) concluded that the Snake River drainage historically supported three populations of fall Chinook salmon. At present, only the Lower mainstem (and tributaries below Hells Canyon) population is extant, which occupies approximately 15% of the historical range of the Snake River Fall Chinook ESU.

Snake River Sockeye

The Snake River sockeye salmon ESU was listed as "endangered" in November 1991 (56 FR 58619). The only extant sockeye salmon population in the SnakeRiver basin at the time of listing was that in RedfishLake in the StanleyBasin (upper Salmon River drainage) of Idaho. Other lakes in the Snake River basin that historically supported sockeye salmon populations, but now considered extinct, include: Wallowa Lake in the Grande Ronde River drainage, Oregon; Payette Lake in the Payette River drainage, Idaho; and Warm Lake in the South Fork Salmon River drainage, Idaho (Waples et al. 1991).

ColumbiaBasin Bull Trout

Overall population trends within the Grande Ronde Core area are estimated to be stable. Redd count data from the Lostine River / Bear Creek, Lookingglass and North Fork Catherine Creek populations averaged 104 redds from 1999 to 2008, and ranged from 69 redds in 2002 to 126 redds in 2006 (Sausen 2009, P. Sankovich, USFWS, pers. comm. 2008, T. Bailey, ODFW, pers. comm.). The Wenaha population is considered separate from the aforementioned Grande Ronde Core area populations, and bull trout surveys are not conducted in Oregon reaches. However, Washington surveyors found 153, 82, and 86 redds in the North Fork Wenaha in 2005, 2006, and 2007, respectively. In addition, the Washington section of the Butte Creek drainage had 31 and 32 bull trout redds in 2005 and 2006, respectively (Mendel et al. 2008).

- 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.

Grande Ronde steelhead populations are not currently monitored with the required intensity to provide productivity metrics for the naturally-spawning listed population. However, attempts were made by the ICTRT to estimate steelhead productivity data (Recruits per Spawner) as part of viability analyses. These data are shown in Appendix Tables 3-5. In addition, the BPA research project "Investigations into the Early Life Historyof Naturally Produced spring Chinook salmon and summer steelhead in the Grande Ronde River Subbasin" (project 1992-026-04) has documented survival rates of juvenile steelhead leaving spawning tributaries using PIT tags. Although survival estimates do not account for residualism, this data is summarized in Favrot et al. (2010).

- 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.

Data collected via annual foot surveys of key steelhead spawning streams in the Grande Ronde basin is presented in Table 5. Data on observations of spring Chinook redds during annual spawning surveys of most spawning habitat utilized within the Grande Ronde basin is presented in Table 6. Data on fall Chinook redds observed during aerial and camera surveys in the Snake and lower Grande Ronde rivers is presented in Table 7(Garcia 2008).

Bull trout spawning surveyswithin the Grande Ronde basin are sporadic and confined to a few index streams. Time series data collected from surveys employing consistent methodology are not available. When available, redd surveys from Lookingglass and Bear/Goat creeks, and from the Little Minam and LostineRivers suggest stable spawner abundance.

Bull trout redd abundance in Lookingglass Creek has been relatively stable from 1994 through 2008; five years of data (1996-2000) in Little Minam Creek also suggests stable spawner abundance; nine years of data in the Lostine River and eight years of data at Goat Creek suggest the same (Table 8).

Table 5. Steelhead spawning survey data (observed redds per mile) for some production units within the Grande Ronde Basin, 1988-2008. Blank cells indicate no survey (Data from Grande Ronde Watershed District files).

Production Unit	Prairie Cr.	S Wallowa	N Wallowa	Joseph Creek									M.Grande Ronde	U. Grande Ronde		S. Grande Ronde	
Miles*	**2**	**5**	**5**	**2.5**	**1**	**12**	**6**	**10**	**1**	**6**	**1**	**5**	**2.5**	**7**	**2**	**6**	**4**
Stream / Year	**Prairie Cr.**	**Wallowa R.**	**Whiskey Cr.**	**Butte Cr.**	**S. FK.Chesnimn**	**Crow Cr.**	**Devils Run Cr.**	**Elk Cr.**	**McCarty Gu.**	**Peavine Cr.**	**Summit Cr.**	**Swamp Cr.**	**Phillips Cr**	**Meadow Cr.**	**McCoy Cr.**	**Five Points**	**Fly Cr.**
1988	17.0	2.0	16.5	0.4	18.0	6.4	17.3	9.0	0.0	16.8	50.0	6.2	2.0	5.9	2.5	1.9	10.2
1989	6.5	2.2	12.7	0.7	12.0	7.0	18.1	11.2	5.0	7.9	22.0	8.2	1.6	1.1	1.5	1.0	1.3
1990	11.0	2.4	8.7	1.6	4.0	7.7	4.1	7.9	1.0	8.8	9.0	10.4	2.0	2.1	1.5	1.9	0.7
1991	2.0	0.6	3.0	0.0	0.0	1.9	0.7	3.3	0.0	1.0	2.0	0.0					
1992	8.5	1.8	8.1	0.4	0.0	2.1	3.0	3.2	0.0	4.4	5.0	1.0	6.4	3.4	1.0	1.9	5.9
1993	7.0	0.0	2.7	0.4	2.0	3.8	11.3	9.0	0.0	4.1	7.0	11.0	1.6	1.3	3.5	1.0	1.0
1994	12.0	1.2	5.8	0.0	2.0	1.9	7.0	4.6	0.0	3.9	7.0	0.4	1.2	1.9	0.0	3.3	1.0
1995	4.0	1.0		0.0	4.0	0.4		1.3	0.0		1.0	1.6	2.0	1.3	1.5	2.0	1.3
1996	12.5	2.6	2.5	1.2	4.0	0.9	3.2	2.0	0.0	3.0	3.0	1.4	1.6	1.3	2.5	3.3	1.0
1997	13.0		3.4	3.6	5.0	1.9	3.0	2.9	0.0	2.0	3.0	1.4	0.8	2.7	5.0	3.9	1.7
1998	15.5		6.2	1.6		1.9		6.7	4.0	9.9		3.6	3.2	3.9	5.5	2.5	1.7
1999	23.0		4.2	4.0	6.0	3.0	8.0	3.5	0.0	2.7	6.0	6.0	1.6	1.0	0.5	2.7	
2000	27.5		5.0	1.6	10.0	1.9	4.4	4.4	1.0	4.5	13.0	6.8	0.8	0.6	0.0	3.0	2.0
2001	25.5		5.6	4.0	11.0	1.1	8.1	3.7	2.0	6.0	8.0	14.0		1.9	1.0	3.5	
2002	19.0		8.4	5.6	8.0	2.1	14.7	7.1	0.0	8.0	16.0	16.4		0.6	2.5	3.5	
2003	23.0		5.8	1.6	5.0	2.4	6.7	7.4	0.0	3.9	1.0	13.6		1.5	2.0	2.8	
2004	16.0		6.8	0.0	6.0	1.2	7.9	4.2	1.0	9.7	5.0	7.2		0.6	0.0	1.2	
2005	16.5		1.8	0.8	4.0	0.2	9.5	2.1	0.0	3.7	9.0	0.0		0.6	0.5	3.3	
2006	15.0		5.0	3.6	5.0	1.0	6.5	2.7	0.0	4.0	2.0	10.8		1.1	1.5	1.3	
2007	9.5		3.6	2.8	5.0	0.6	9.5	4.1	0.0	3.5	10.0	7.2		1.4	0.0	2.7	
2008	11.0			0.8								4.8		0.0	1.0	0.0	

* Miles surveyed varied over time in some survey units, value given represents most years.

Table 6. Number of spring Chinook salmon redds observed in the Grande Ronde River and tributaries, 1995-2009 (Feldhaus, ODFW, pers com).

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Redds observed	80	306	298	253	180	502	868	895	768	1005	669	558	442	969	919

Table 7. Number of fall Chinook salmon redds counted in the Snake River upstream of Lower Granite Dam and in the Lower Grande Ronde River 1995-2007 (Garcia 2008).

River	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Snake (aerial)[1]	41	71	49	135	273	255	535	878	1118	1218	1042	696	714
Snake (camera)[2]	24	33	9	50	100	91	174	235	394	491	400	329	403
Grande Ronde	18	20	55	24	13	8	197	111	93	162	129	41	80

[1]The target search was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.

[2]The target search areas were discrete sites composed mainly of 1-6 in. bottom substrates. Number of sites varied each year.

Table 8. Number of bull trout redds observed in tributaries to the Grande Ronde River. Lostine and Bear/Goat Creek data is reported in Sausen (2009), Little Minam River data is reported inHemmingsen et al. (2001), and Lookingglass Creek (LKCR) data is from Dave Crabtree (USFS, pers. com.).

Stream	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
LKCR	29	39	62	57	53	54	56	40	43	31	69	38	58
L. Minam	54	377	381	300	270	432							
Lostine				39	38	43	22	71	26	32	45	47	53
Bear/Goat				6	5	12	7	17	11	16	9	11	20

- Provide the most recent 12 year (e.g. 1997-2008) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

In the 1980's, a relatively high proportion of hatchery fish were found commingling with wild fish on spawning areas in the upper Grande Ronde River. This was associated with adults returning from smolts released directly into adjacent stream reaches without acclimation and/or adult collection facilities. In response to the potential for wild/hatchery adult interaction, smolts were acclimated and released only at Big Canyon (Deer Creek) and Wallowa Hatchery facilities within the Wallowa basin starting in 2000. Since 2000, the incidence of hatchery fish in spawning areas of the upper Grande Ronde River has declined dramatically in three primary spawning areas in the Upper Grande Ronde (McLean et al. 2009; Table 9).

Table 9. Numbers of natural-origin adult steelhead and hatchery-origin strays trapped at Grande Ronde River tributary weirs, 2001-2004

Weir Site	Run Year 2001-02	2002-03	2003-04	Total (Hatchery Strays)
Lookingglass Creek	258	165	134	557 (4)
Upper Grande Ronde	36	56	63	155 (1)
CatherineCreek	256	226	181	663 (3)
Total (Hatchery Strays)	**550 (5)**	**447 (1)**	**378 (2)**	**1,375 (8)[a]**

[a]According to current comanager agreements, stray hatchery steelhead are captured and killed, and do not spawn naturally.

Typically, few adults are observed during steelhead spawning surveys relative to the number of redds observed. However, we observed up to 7 and 34 adults, respectively, during annual spawning surveys conducted on Wallowa River and Joseph Creek tributaries from 1998 through 2009 (Tables10 and 11). No adipose-clipped adults observed were observed in Wallowa River index from 1998 to 2009, with the exception of 2006 when 4 marked fish were observed (Table 11). The average percentage of hatchery fish for those years when at least one fish was observed during the surveys was 6.3%. No adipose-clipped adults were observed in the Joseph Creek system (Table 12).

Table 10. Observations of adult steelhead in during annual spawning surveys in Wallowa River index streams (7.0 miles), 1998-2009 (District data).

Year	Redds Observed	Fish Observed			% Marked Fish Observed
		Marked (Ad)	Unmarked	Unknown	
1998	62	0	0	0	0.0
1999	67	0	0	2	0.0
2000	75	0	2	1	0.0
2001	79	0	0	0	0.0
2002	80	0	4	0	0.0
2003	75	0	1	0	0.0
2004	66	0	1	0	0.0
2005	42	0	1	3	0.0
2006	55	4	2	1	57.1
2007	37	0	1	0	0.0
2008[1]	22	0	0	1	0.0
2009	21	0	0	0	0.0
Totals	**681**	**4**	**12**	**8**	**Avg. = 6.3[2]**

Table 11. Observations of adult steelhead in during annual spawning surveys in Joseph Creek index streams (43.0), 1998-2009 (District data).

Year	Redds Observed	Fish Observed			% Marked Fish Observed
		Marked (Ad)	Unmarked	Unknown	
1998	166	0	4	0	0.0
1999	173	0	1	2	0.0
2000	165	0	7	1	0.0
2001	203	0	4	0	0.0
2002	314	0	14	3	0.0
2003	213	0	0	1	0.0
2004	191	0	19	1	0.0
2005	117	0	19	15	0.0
2006	145	0	2	0	0.0
2007	166	0	3	0	0.0
2008[1]	12	0	0	0	0.0
2009	159	0	2	2	0.0
Totals	**2021**	**0**	**75**	**25**	**Avg. = 0.0**[2]

1 Incomplete sample of index streams due to high flows and lack of access (deep snow)
2 Average of years when at least one fish was observed

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

- 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.

Broodstock collection

ESA-listed wild steelhead adults are handled at the BigCanyon trap in conjunction with broodstock collection. Wild fish are removed from the trap and immediately released above the weir. Since 1988, of the 1439 wild adults handled at the BigCanyon facility, 24 have died during trapping and handling (1.67%).

Monitoring and Evaluation

Spawning Surveys – Foot surveys are conducted in key spawning areas March-May to determine spawning density of wild adults, and the proportion of hatchery fish. ESA-listed summer steelhead adults and juveniles are observed during these surveys. Surveyors take precautionary efforts to avoid disturbing redds and adult fish, however some adults take cover upon observation. These encounters are brief and general observations indicate adults readily resume normal activity.

Juvenile surveys/collections – Take of ESA-listed juvenile steelhead, juvenile Chinook salmon, and bull trout may result from efforts that monitor density, size and food habits of residual hatchery steelhead and that collect genetic samples from naturally-produced steelhead. Sampling activities generally occur May-October, and utilize electrofishing, snorkeling, and hook and line methods. Electrofishing efforts conform to NMFS guidelines to minimize disturbance and injury to listed fish. Snorkeling may result in disturbance of rearing juveniles, but encounters are low-impact as individuals briefly seek cover from surveyors. Hook and line sampling may also be utilized to collect residual hatchery steelhead in larger streams. All sampling efforts are limited to time periods when water temperatures minimize any incidental mortality of listed fish, and are covered by Section 4(d) take authorization from NOAA fisheries.

Adult trapping – Adult weirs that target spring Chinook broodstock collections between March 1 and June 15 catch adult steelhead as by-catch in the Lostine and upper Grande Ronde rivers, Catherine, and Lookingglass creeks. Although efforts are made to design and construct facilities that avoid harm to ESA-listed fish, some ESA take occurs during trapping activities. Upstream-migrating wild adult steelhead are removed daily from the trap net, anesthetized with MS222, enumerated, checked for marks, marked with opercle punches if necessary for evaluation. Fish are recovered and released within 24 hours of capture. Upstream-migrating hatchery adults are enumerated, removed, and not allowed to proceed upstream to spawning areas. All downstream-migrating adult steelhead will be removed from the trap, anesthetized, examined for marks, and released downstream within 24 hours of recovery. Other species encountered are handled only to identify species, and are released without being anesthetized.

Intake Maintenance – High water episodes can deposit large amounts of debris at the Big Canyon Facility intake structure. Gravel deposition can re-channel the stream away from the intake, which could cause significant problems during low flows. Although these events are infrequent, removal of material is required for operation of the facility. All efforts will be made to minimize impacts to ESA-listed fish, although some loss may result from efforts to remove debris. Material will be removed during the in water work period July 15 to August 30. Department of State Lands and the Corp of Engineers may issue an emergency permit to remove large amount of material if it poses an immediate threat to fish survival.

- **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 wild fish have died while held at Wallowa Hatchery since 1988. During the same time period, 24 of 1439 (1.67 %) wild steelhead trapped and held at the BigCanyon facility died.

- 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).

Table 12. Estimated take levels of ESA-listed salmonids by activities related to the Wallowa steelhead hatchery program.

Listed species affected: Summer Steelhead **ESU/Population:** Snake River **Activity:** Wallowa steelhead hatchery program **Location of hatchery activity:** GrandeRondeBasin **Dates of activity:** Annual **Hatchery program operator:** ODFW				
Type of Take	**Annual Take of ESA-Listed Fish By Life Stage** *(**Number of Fish**)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass[a]	2000	2500	250	5
Collect for transport[b]	0	0	0	0
Capture, handle, release[c]	0	0	250	10
Capture, handle, mark, release[d]	0	500	300	20
Removal (e.g. broodstock)[e]	0	0	0	0
Intentional lethal take[f]	0	0	0	0
Unintentional lethal take[g]	0	100	15	0
Other Take (specify)[h]	0	0	0	0

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

- 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.

Unintentional lethal take associated with broodstock collection and sampling will be monitored. High water temperatures could cause increased probabilities of mortality related to activities listed above. Water temperatures will be monitoredand sampling will be limited to low-risk periods. Should mortality exceed occasional and accidental levels, activities will be suspended until conditions improve.

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.

Proposed program modifications outlined in this HGMP (*see* sections 1.8 and 1.16) are consistent with the NPPC Annual Production Review – Report and Recommendations, and address issues of concern outlined in the 1995 Integrated Hatchery Operations Team (IHOT) Policy and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).

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

- Lower Snake River Compensation Plan– The program is not consistent with smolt production levels as outlined in original LSRCP (*see* sections 1.8 and 1.16). Current production levels are not inconsistent with the *U.S. vs. Oregon* agreement; however, the agreement does not specify Wallowa Stock production levels. Program modificationsseek to achieve adult escapement goals,they supportsubstantial tribal and sport harvest, and they are likely to increase harvest benefits occurring in the mitigation area above Lower Granite Dam.

- *Annual Operation Plan (AOP 2009/10 LSRCP)*–The program is consistent with co-manager agreements outlined in the Annual Operation Plan.

3.3) Relationship to harvest objectives.

The Grande Ronde steelhead hatchery program has reestablished a fishery within the Grande Ronde basin with effort, catch rates, and harvest levels similar to historic, pre-dam levels (Flesher et al. 1994, 1995, 1996, 1997, 1999, 2000, 2001, 2004a, 2004b, 2005, 2007, 2008a, 2008b, 2009). The program goal of returning 9,184 adults to the compensation area was met in 1997-98 and every year since 2001-02 (Table 13). Reducing smolt numbers and increasing smolt size (as described in section 1.8) are actions designed to maintain optimal harvest opportunity while reducing impacts to ESA-listed fish populations, especially summer steelhead in the mid-Columbia and Snake Rivers. However, reducing smolt releases may result in lower harvest. The early brood program modification seeks to shift harvest from Deschutes and Columbia rivers to the Snake and Grande Ronde rivers compensation area. Preliminary data from the program suggests early brood progeny are providing higher harvest levels than production fish within the compensation area.

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.

Wallowa stock hatchery fish are intercepted in fisheries from the ocean to headwater tributaries of the Grande Ronde system (Carmichael et. al. 2005; Flesher, ODFW, pers. comm.). Averaged from 1987 to 2006, Columbia River tribal and sport fisheries (including the DeschutesRiver) account for 30.8% of Wallowa stock harvest. Sport harvest in the Snake and Grande Ronde rivers averaged 28.4%. Escapement to hatchery facilities and strays make up an average of 40.6% of the reconstructed runs (Table 13).

Table 13. Run reconstruction for Wallowa stock hatchery steelhead indicating contribution to various fisheries and escapement based on coded-wire tag recovery expansions for run years 1987-88 through 2005-06.

Run Year	Ocean	Columbia Net	Columbia Sport	Deschutes[1]	Snake Sport[2]	Escapement[3]	Run Year Total
1987-88	0	2,240	133	165	595	2,061	5,194
1988-89	2	4,376	930	133	1,175	2,203	8,819
1989-90	15	2,890	804	846	4,157	2,000	10,712
1990-91	27	2,684	356	761	126	1,274	5,228
1991-92	67	4,559	1,238	2,264	4,383	2,554	15,065
1992-93	58	4,878	1,256	875	3,641	2,189	12,897
1993-94	0	2,795	1,132	417	2,951	1,346	8,641
1994-95	14	900	654	264	1,519	856	4,207
1995-96	0	1,365	1,264	380	2,403	2,476	7,888
1996-97	0	1,113	385	466	5,073	3,949	10,986
1997-98	12	1,255	988	196	2,849	8,035	13,373
1998-99	0	274	220	32	2,265	3,279	6,243
1999-00	14	900	654	264	759	1,616	4,207
2000-01	4	281	767	164	2,368	5,649	9,233
2001-02	0	706	872	410	3,434	11,875	17,297

2002-03	19	283	268	207	2,894	6,920	10,591
2003-04	0	278	500	25	4,111	7,825	12,739
2004-05	2	177	312	45	3,874	8,452	12,862
2005-06	0	432	1,297	6	5,138	10,231	17,104
Mean	**12**	**1,705**	**738**	**417**	**2,655**	**3,687**	**9,346**
Mean % of run	**0.2**	**18.3**	**8.0**	**4.5**	**28.4**	**40.6**	**100.0[4]**

[1]Includes sport and Tribal C and S harvest

[2]Includes Snake River and Tributaries (**Program Compensation Area**)

[3]Includes recoveries at hatchery weirs and strays within and outside the Snake basin (**most recoveries within Compensation Area**)

[4] Assumes inter-dam mortality (not including harvest) is 0%

3.4) Relationship to habitat protection and recovery strategies.

Steelhead production in the Grande Ronde basin is affected by land management impacts consistent with those across the Columbia basin; namely loss of channel diversity, sedimentation, reduced stream flows, and habitat constriction due to increased water temperature and fragmentation. Ongoing private and publicly funded habitat restoration efforts have resulted in an upward trend in steelhead habitat in many Grande Ronde basin streams. State programs in place through the Department of Environmental Quality, Department of Forestry and Division of State Lands provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands must meet criteria developed through consultation with US Fish and Wildlife Service and NOAA Fisheries. Most of these restoration projects are funded through the Grande Ronde Model Watershed and Oregon Watershed Enhancement Board programs, and produce both short and long term improvements in habitat. Together, habitat protection and improvement measures will continue to increase productivity of the basin's summer steelhead populations.

3.5) Ecological interactions.

The narrative below is adapted from Biological Assessments completed by ODFW for the Grande Ronde summer steelhead hatchery program and submitted to NMFS in 1993 and 1994. NMFS developed Biological Opinions for guidance in operating the Grande Ronde steelhead hatchery program based on these documents. We believe the information provided in the assessment is still germane to current program operations.

Residualism - ODFW considers hatchery steelhead remaining after June 15 to be residuals. Residuals, by remaining in the Grande Ronde, have an increased opportunity to interact with ESA-listed juveniles. Although rates of residualism vary from a few percent (Viola and Schuck 1991) to 10% (Partridge 1985, 1986),some estimates have been higher than 25% (Viola and Schuck 1991; Crisp and Bjorn 1978).

Rates of residualism in hatchery steelhead may be associated with size at release and release strategies. In northeast Oregon, residual steelhead that remained two to five months post-release were significantly smaller at release than the mean length of the whole release group (Jonasson et al. 1994 and 1995). This study was the impetus for increasing size at release for the Grande Ronde steelhead program to 4/lb from 5/lb, as described in section 1.8. Conversely, Partridge (1985 and 1986) found that larger smolts may residualize at a higher rate than smaller smolts, although some minimum size is necessary for outmigration (Crisp and Bjorn 1978). Direct stream releases have shown to contribute to higher rates of residualism than acclimated releases (Schuck 1993; Jonnason et al. 1995).

Residual steelhead generally remain near their release point (Whitesel et al. 1993; Jonasson et al. 1994 and 1995; Canamela 1992). Partridge (1986) noted that most residual steelhead were located within 8 km of an upper Salmon River release site. Schuck (1993) reported steelhead residuals were found about 20km below and 10km above release sites in the Tucannon River, Washington. Whitesel (1993) found steelhead residual densities were highest within 8km of release sites and decreased quickly above and below these sites in the Grande Ronde and Imnaha rivers in Oregon.

After smolt releases in spring, the amount of residual steelhead near release areas declines steadily throughout the summer, and may be an effect of harvest, other mortality, and outmigration. Partridge (1986) noted that, where angler harvest was heavy, virtually no residual steelhead were caught after ten weeks in the upper Salmon River. Where harvest pressure was light, residuals were found in the harvest sixteen weeks after the release date. Viola and Schuck (1991) noted that residual populations in the Tucannon River of Washington declined at a rate of about 50% per month from June to October (declining from 4.3 to 0.8% of the total released). Whitesel et al. (1993) found residual steelhead up to twelve months after release, however, densities declined precipitously over time. For example, residuals from the 1992 BigCanyon release were present near the release site at densities (#/100 square meters) of approximately 55 in summer, 18 in fall, 7 in winter, and less than one in spring of 1993. Oregon angling regulations focus harvest on hatchery residuals for the 67 miles of the Wallowa and Grande Ronde rivers by requiring harvest of adipose-clipped trout only.

Predation- Predation requires opportunity, physical ability and predilection on the part of the predator. Opportunity only occurs when distribution of predator and prey species overlap in a broad sense, and at the microhabitat level. In general, physical ability and predilection imply that a steelhead at least 250mm in length will key on individual prey items less than one third its length (Horner 1978; Hillman and Mullan 1989; Beauchamp 1990; Canamela 1992). However, Jonasson et al. (1995) found no significant relationship between residual steelhead size and salmonid prey size in pen experiments. Relative average size of hatchery steelhead smolts (225 mm @ 4 fpp), spring Chinook smolts (90 mm), wild steelhead yearlings (80-120 mm), and age-2 smolts (>150 mm) should preclude any substantial predator/prey interaction based on the studies cited above.

Steelhead smolt releases, in relation to the timing and distribution of naturally-produced fry, also limit potential interaction between smolts and ESA-listed species. Steelhead smolts are released downstream of documented spring Chinook and bull trout spawning areas in April and early-May, approximately halfway through the Chinook fry emergence period. Chinook salmon and bull trout fry are not likely to move downstream into steelhead migration corridors soon after emerging. Naturally-produced steelhead fry generally emerge during June, after a high proportion of released hatchery steelhead smolts have migrated from the system.

Habitat partitioning between Chinook fry and steelhead smolts also minimizes direct interaction. Fry that are potentially available to steelhead smolts (including fall Chinook fry in the lower Grande Ronde, Snake, and Columbia rivers) prefer habitat that does not overlap with that of steelhead smolts. Bjornn and Reiser (1991) concluded that newly emerged fry prefer shallow areas of low velocity (<10 cm/s) and larger fish occupy deeper and faster areas.

Studies indicate that residual steelhead do not appear to prey on juvenile Chinook in northeast Oregon and have low rates of predation on other salmonids. Whitesel et al. (1993) found no fish in the contents of 676 steelhead stomachs (65 smolts and 611 residuals) sampled during 1992-93 from the ImnahaRiver. No Chinook were observed in any of the stomachs of residuals sampled in the Grande Ronde and Imnaha basins, although 54 (8.0%) contained fish (mainly sculpins) and 8 (1.2%) contained salmonids (rainbow or whitefish). Jonasson et al. (1994) found fish parts in 3 of 358 (0.8%) residual hatchery steelhead stomachs, including one 63mm steelhead and sculpins.

Competition - Hatchery steelhead smolts have the potential to compete with naturally-produced steelhead, Chinook salmon, and bull trout juveniles for food, space, and habitat; although effects of behavioral and competitive interactions are difficult to evaluate or quantify (Canamela 1992). Interactions are limited to a short timeframe as smolts move downstream post-release, and are restricted to the immediate vicinity of release sites considering the limited dispersal of residuals.

The potential for competition also extends to migration corridors, the estuary, and ocean, given the cumulative abundance of hatchery fish released into the Snake and Columbia River systems. Annual releases of hatchery steelhead smolts in 1988-2008 totaled 9,000,000 to 12,000,000 into the Snake River and tributaries; 1,000,000 to 2,000,000 into the mid-Columbia River and tributaries; and, 500,000 to 700,000 into the lower Columbia (FishPassageCenter data).

Direct competition between hatchery smolts or residuals and natural smolts and rearing juveniles is likely due to the substantial overlap in macro and microhabitat. McMichael et al. (1997) found reduced growth in resident rainbow trout when reared in net pens with hatchery residuals. However, in natural situations juvenile fish can move to alternate habitats to avoid negative interactions. Size differences between residual steelhead and Chinook fry lead to habitat partitioning (Bjornn and Reiser 1991) and further reduce significant interactions between species. Bull trout associated with areas influenced by residual hatchery steelhead are generally larger fluvial adults and are more likely to out-compete and prey on hatchery steelhead.

Disease - Hatchery operations can potentially amplify and concentrate fish pathogens that could adversely affect ESA-listed species. Irrigon hatchery is supplied with well water; therefore occurrences of disease and presence of pathogens and parasites are infrequent. As a result, Irrigon hatchery is categorized as a Class "A" facility. Disease transfer from Irrigon hatchery to the Grande Ronde basin is almost nonexistent.

Despite infrequent disease occurrence at Irrigon hatchery, parasitic infestations or bacterial infections, namely coldwater disease, have occurred and effectively treated. Early life stage survival is generally high. Disease status is documented by monthly and pre-liberation fish health examinations. Juveniles with known clinical infections or infestations have never been transferred to the Grande Ronde basin.

Pre-liberation fish health examinations are conducted after a 30 day acclimation to the WallowaRiver. There has been no indication to date that acclimated fish acquired infectious agents or parasites. Water temperatures during spring releases are typically cold, and mitigate any potential infection risk. However, several adults have tested positive for *Myxoboluscerebralis*, the causative agent of whirling disease, suggesting an infection during acclimation or out-migration.

Returning adults held for artificial spawning at Wallowa and BigCanyon create a potential "point" source for pathogens and parasites. Disease status of adults is documented through annual fish health examinations, which indicate a low prevalence and incidence of serious fish pathogens and parasites. The risk posed to naturally-produced Chinook salmon, steelhead, and bull trout is considered minimal. Hatchery steelhead adults returning to the production facilities are not likely to harbor agents that naturally-spawning steelhead do not also carry. Cold water temperatures during the winter and early spring holding season are not conducive to infectious processes. This reduces the potential for transmission between adults in holding ponds to fish in the natural habitat.

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.

Early incubation and rearing for the Grande Ronde steelhead program occur at Wallowa and Irrigon Hatchery. Both facilities were designed for a combined Grande Ronde program production of 1.35 million smolts at 5fpp. Initial incubation (green to eyed egg) occurs at Wallowa Hatchery on spring water and well water (250 gpm). Some adjustment of water temperature can be achieved through mixing the two water sources at differing rates.

Incubation from eye-up to smolt occurs at Irrigon Hatchery using 5cfs of temperature-controlled well water. Rearing at Irrigon uses 32 raceways and 68 circular starter tanks with an approximate total water supply of 46.6cfs of well water. Combined program smolt production is limited by ground water available for rearing at Irrigon Hatchery.

Water supplies at Grande Ronde basin acclimation sites are taken from adjacent streams, Spring Creek for Wallowa Hatchery and Deer Creek for BigCanyon. Water use for those facilities is 12and 8cfs, respectively, and within existing water rights. Water quality at acclimation sites is generally good, with occasional freshets that temporarily contribute to increased sediment loads and reduced water quality. During such occasions, discharge water quality likely exceeds NPDE permit standards for a limited time. Dissolved oxygen has reached critical levels in the lower of two acclimation ponds at Wallowa Hatchery, usually associated with warmer water conditions during the later acclimation period. Lower rearing densities in the lower ponds, and reduced smolt production has alleviated this problem.

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.

Potential for entrapment of wild juvenile steelhead exists at both acclimation sites. Intake screening at BigCanyonmeets NMFS fish screening criteriaand minimizes risk to wild steelhead, Chinook salmon, and bull trout encountering the intake. The Spring Creek intake at Wallowa Hatchery has 1/8 inch screen. Water withdrawals for acclimation at both sites utilize substantial portions of natural flow from both Spring and Deer creeks. However, adequate in-stream flow is maintained to provide rearing habitat within the bypass reach at both sites. Stocking densities in the acclimation ponds are adjusted to maintain discharge water quality.

SECTION 5. FACILITIES

5.1) Broodstock collectionfacilities (or methods).

Adults are collected at Wallowa Hatchery and BigCanyon(see section 2.2.3). Both facilities include a fish ladder leading from the base of a concrete and steel grate weir to a finger weir trap at the upper end. Flow from Spring and Deer creeks is diverted through the trap and ladder at Wallowa (25'x8.6'x4.33') and BigCanyon (30'x10'x4.5'), respectively. Adult collections commence as soon as river conditions allow, typically in mid-February, and continue into the first part of June. Peak collection occurs in late March and early April.

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

- Adults are transported in a three compartment truck (270 gallons/compartment).
- Eggs are transported inegg shipping containers.
- Fingerlings and smolts are transported in tanker trucks ranging in size from 2400 to 5000 gallon capacity.

Loading density, dissolved oxygen and temperature criteria will follow those outlined in the Oregon State Liberation Manual, section 7.

5.3) Broodstock holding and spawning facilities.

Broodstock can be held at Wallowa Hatchery in a secure rectangular concrete pond (80'x20'x4.5'). Adults are held at maximum densities of 2.5 ft^3/fish and 2 gpm per fish. Spawning occurs inside the Wallowa Hatchery building adjacent to the adult holding area.

5.4) Incubation facilities.

- Wallowa Hatchery incubation facilities consist of 228 vertical incubation trays. Eggs are incubated to eyed stage when they are transferred to Irrigon Hatchery. Eggs are cooled with ice and transferred in aluminum egg shipping containers via truck.

- Irrigon Hatchery incubation facilities consist of 288 vertical trays. Eggs are incubated from the eyed to emerging fry stage.

5.5) Rearing facilities.

Rearing facilities for the combined Imnaha and Grande Ronde steelhead program at Irrigon Hatchery include:

- (68) 6' circular tanks for initial rearing, and
- (32) 20'x100'x4' raceways after initial rearing to smolt size.

5.6) Acclimation/release facilities.

- Wallowa Acclimation ponds – Two in series, 300'x42'x4', 50,400 ft^3 each
- Big Canyon Acclimation – Two in series, 150'x30'x4', 18,000 ft^3 each

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

- Disease events have occurred during smolt acclimation at Wallowa Hatchery resulting from isolated incidents of poor water quality. Both water quality and fish health are monitored during and following the high flow events during which nutrient and sediment rich water condition seem to trigger the onset of disease. There has been no recent outbreak of disease.

- Mortality resulting from low DO conditions in the lower of two acclimation ponds at Wallowa Hatchery has occurred. Holding densities have been modified to address this issue.

- Freezing and low water temperatures on Deer Creek (BigCanyon) have contributed to post-hauling mortality.

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.

- Monitor facilities operation during high flow events.
- Maintain screens in working order.

- Keep trap and ladder area free of debris.
- Adjust diversions to maintain flow in passage facilities and bypass reaches.
- Adjust acclimation densities to maintain quality of facility outflow.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Mixed stock, Snake River

6.2) Supporting information.

6.2.1) History.

The Wallowa stock was sourced from collections of adults during spring at Ice Harbor (1976) and Little Goose (1977, 1978) dams, and from embryos at Pahsimeroi Fish Hatchery, Idaho (1979, Table 14). Since 1979, Wallowa stock adults returning to Wallowa Hatchery, BigCanyon, and Cottonwood traps have been utilized as broodstock. Adults are incorporated in the broodstock across the run with the goal of maintaining hatchery return timing characteristics.

Table 14. Broodstock history for females spawned to initiate the Wallowa summer steelhead stock (# 56).

Brood Year	Stock Source	# of Females Spawned
1976	Ice Harbor Dam (spring collection)	35
1977	Little Goose Dam (spring collection)	48
1978	Little Goose Dam (spring collection)	43
1979	Pahsimeroi Hatchery (ID), embryos	40-50

6.2.2) Annual size.

Current annual broodstock needs for the proposed reduced program are 239 females and 239 males to meet 800,000 fish production level. Broodstock needs may vary depending on disease issues and updated information on in-hatchery survival rates.

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

Natural fish were last incorporated into the broodstock in 1979. Since, hatchery broodstock has consisted entirely of hatchery origin fish returning to Wallowa

Hatchery, BigCanyon or Washington's Cottonwood Creek facility. There currently is no intent to incorporate natural fish into the broodstock.

6.2.4) Genetic or ecological differences.

Comprehensive genetic analyses of steelhead populations within the Grande Ronde basin is limited; however, Waples (NMFS, pers. com.) detected consistent genetic differences between wild steelhead collected from Chesnimnus Creek (Joseph Creek tributary) and Wallowa hatchery stock. Conversely, samples from Deer Creek were genetically similar to the Wallowa hatchery stock, which reflects the practice of allowing hatchery adults to move above the weir and spawn naturally since the 1980's.

Further genetic sampling may also identify other areas within the basin where hatchery spawners, resulting from intentional adult outplants or past direct stream release of smolts, have influenced the genetic make-up of natural populations. Moran and Waples (2004) reported genetic similarities between Wallowa Hatchery fish and wild steelhead in lower Grande Ronde tributaries in Washington (Cottonwood, Menatchee, and Rattlesnake creeks), suggesting that hatchery fish were producing offspring in these tributaries.

Hatchery broodstock was sourced from the later part of the run (during the spring at lower Snake River Dams), therefore hatchery adults tend to return to the GrandeRondeRiver later than natural adults. The tendency of Wallowa hatchery adults to spend more time in the Columbia and Snake rivers likely contributes to the stock's propensity to stray into mid-Columbia River tributaries.

6.2.5) Reasons for choosing.

The Wallowa stock is endemic to the Snake basin and is a proven, productive hatchery population that contributes well to tribal and sport harvest. An early-brood program was initiated in 2004-2007 (see section 1.16). Returning adults from this program are currently incorporated into a portion of hatchery production, with the goal of modifying run timing to reduce straying into other Columbia River tributaries while maintaining program harvest opportunity.

6.2) 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.

Only hatchery origin adults will be collected for broodstock. The early brood program is currently being evaluated for reducing the Wallowa stock's tendency to stray into mid-Columbia tributaries.

SECTION 7. BROODSTOCK COLLECTION

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

Hatchery adults are normally collected at Wallowa or BigCanyon facilities in spring. Adults that returned to the Lower Grande Ronde in October (early brood program) were collected in 2004-2007 by hook-and-line.

7.2) Collection or sampling design.

Hatchery-origin Wallowa stock steelhead adults are collected at Wallowa Hatchery and BigCanyon from mid-February through late-May or early-June. Peak collection occurs between mid-March and mid-April. Adults retained for broodstock are spawned during a six-week period starting in late-March. The number of fish spawned each week is proportional to run timing characteristics. Returning adults above broodstock needs are considered surplus and out planted in closed water bodies or carcasses distributed to the local food bank.

7.2) Identity.

All hatchery fish released receive an adipose fin clip and are easily differentiated from wild fish. In addition, a right ventral fin clip is used to identify fish from the early brood program.

7.4) Proposed number to be collected:

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

Broodstock consists of 225 females (45 AD-RV Fall Brood) and 225 males(45 AD-RV Fall Brood) on average.

7.4.2) Brood stock collection levels for the last thirteen years (e.g. 1997-2009).

Table 15. Adults spawned, eggs and smolts produced in the Grande Ronde summer steelhead hatchery program, 1997-2009, (Harrod, ODFW[3]).

Brood Year	Adults			Eggs	Smolts (others[1])
	Females	Males	Jacks		
1997	544	530	0	2,786,600	1,383,997
1998	579	584	0	2,883,300	1,375,679
1999	490	470	0	2,482,381	890,772

Brood Year	Adults			Eggs	Smolts (others[1])
	Females	Males	Jacks		
2000	418	405	0	2,046,530	843,189
2001	229	232	0	1,155,905	832,970
2002	243	389	0	1,331,551	817,483
2003	222	226	0	1,206,310	784,931
2004	231	230	0	1,133,750	712,890
2005	284	282	0	1,510,600[2]	859,648
2006	233	222	0	1,322,980	801,491
2007	217	216	0	1,177,850	803,847
2008	225	225	0	1,185,685	652,424
2009	240	240	0	1,474,620[2]	

[1] Additional production released at other life stages (see Appendix Table 11).
[2] Includes egg production for Lyons Ferry Hatchery, Cottonwood satellite facility (WA).
[3] Data source: hatchery records – Ron Harrod, hatchery manager Wallowa Hatchery, LSRCP Oregon Evaluation Studies – Annual Progress Reports and Oregon Hatchery database.

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

All adult hatchery steelhead returning to the traps will be collected; none will be released to spawn naturally. Up to 300 adult hatchery steelhead will be out-planted to area ponds to enhance recreational opportunity. Approximately 100 fish will be recycled into the WallowaRiver sport fishery. The remainder of adults collected and not utilized for broodstock will be killed and donated to local food bank, or buried on site.

7.6) Fish transportation and holding methods.

Adults are spawned from fish that swim into the trap each week. Currently no steelheadadults are held in the holding pond for spawning.

7.7) Describe fish health maintenance and sanitation procedures applied.

There are no disease treatments given to adult steelhead.

Table 16. Disease history[1] (1996 to present) of Wallowa steelhead spawners at Wallowa Hatchery, progeny reared at Irrigon Hatchery and smolts at acclimation sites.

Life stage and location of examination Disease or Organism	Adults @ Wallowa	Progeny @Irrigon	Smolts@ Wallowa	Smolts@ Big Canyon
IHN Virus	Yes	No	No	No
EIBS Virus	No	No	No	No
Aeromonassalmonicida	Yes	No	No	No
Aeromonas/Pseudomonas	Yes	Yes	Yes	Yes
Flavobacteriumpsychrophilum	Yes	Yes	Yes	Yes
Fl. columnare	No	No	No	No
Renibacterium. salmoninarum	No	No	No	No
Yersinia ruckeri	No	Yes	No	Yes
Carnobacterium sp.	No	No	No	No
Ichthyobodo	No	No	No	No
Gyrodactylus	No	No	No	No
Ichthyophthiriusmultifilis	No	Yes	No	Yes
Epistylis	No	No	No	No
Ambiphyra (Scyphidia)	No	No	No	No
Trichodinids	No	No	No	No
***Salmincola*species (gill copepods)**	Yes	No	No	No
Coagulated Yolk Disease	No	No	No	No
External Fungi.	Yes	Yes	Yes	Yes
Internal Fungi	No	No	No	No
Myxoboluscerebralis	Yes	No	No[2]	No[2]
Ceratomyxashasta	Yes	No	No	No

[1] Yes indicates detection of the pathogen but in most cases no disease or fish loss was associated with presence of the pathogen. No indicates the pathogen has not been detected in that stock.

[2] Smolts from Irrigon are negative for *M. cerebralis* but may get exposed to the infective agent during acclimation at Wallowa and BigCanyon.

A fish health monitoring plan for the Wallowa stock is discussed annually in the Lower Snake Program Operation Plan meetings. The plan is consistent with monitoring guidelines developed by the Integrated Hatchery Operations Team for the ColumbiaBasin anadromous salmonid hatcheries (see Policies and Procedures for the ColumbiaBasin anadromous Salmonid Hatcheries, Annual Report 1994). In brief, fish health monitoring includes:

- A qualified fish health specialist will conduct all fish health monitoring.
- Annually examine a minimum of 60 adults for the presence of viral pathogens. This sample size is great enough to assure a 95% chance of detection of a pathogen present in the population at the 5% level. American

Fisheries Society "Fish Health Blue Book" procedures will be followed.

- Conduct examinations of juvenile fish at least monthly and more often as necessary. A representative sample of healthy and moribund fish from each lot of fish will be examined. The number of fish examined will be at the discretion of the fish health specialist.
- Annually examine up to 20 adult mortalities (if available) for systemic bacteria.
- Investigate abnormal levels of fish loss when they occur.
- Determine fish health status prior to release or transfer to another facility. The exam may occur during the regular monthly monitoring visit, i.e. within 1 month of release.
- Appropriate actions including drug or chemical treatments will be recommended as necessary. If a bacterial pathogen requires treatment with antibiotics a drug sensitivity profile will be generated as needed.
- Findings and results of fish health monitoring will be recorded on a standard fish health reporting form and maintained in a fish health database.
- Fish culture practices will be modified if deemed necessary after reviewing with facility personnel. Pertinent discussion items are as follows: nutrition, water flow and chemistry, loading and density indices, handling, disinfection procedures, and disease treatments.

If carcasses are used for nutrient enrichment, Fish Health monitoring would be consistent with guidelines developed for adult salmon and steelhead carcasses (ODFW memorandum November 7, 2000).

7.7) Disposition of carcasses.

Spawned carcasses and carcasses of surplus adults can be donated to local food banks, hauled to local landfills, or frozen and included as part of nutrient stream enrichment programs.

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

All unmarked naturally-produced steelhead adults encountered at the traps are released above the weir. The trapping may cause a brief migration delay. Tissue samples are collected from the operculum for genetic analysis. Bull trout encountered at the traps will be released upstream with a minimum of handling.

SECTION 8. MATING

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

8.1) Selection method.

Spawners are selected at random(within broodstocks) from ripe fish sorted on spawning day. Early brood adults, indicated by a right ventral fin clip, currently comprise 20% of the adults spawned.

8.2) Males.

In most years, extra males are not used to increase fertilization rates of green eggs; however, in 2002 two males were used to fertilize one female's eggs (sex ratio 2 males: 1 female). Occasional reuse of males occurs when male broodstock numbers are low.

8.3) Fertilization.

An equal sex ratio (1 male to 1 female) is targeted. Crosses are individual mating.In 2002, 2 males were used per females due to low sperm motility observed in males; however, the results indicated that there was no survival advantage to the eyed egg stage. Early brood males and females are paired together for fertilization. Eggs are water hardened in iodophor.

8.4) Cryopreserved gametes.

N/A.

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.

N/A.

SECTION 9. INCUBATION AND REARING -

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

9.1) Incubation

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

An estimated collection of 1,147,500 green eggs is required to produce 800,000 smolts (70% survival), resulting in 1,027,000 eyed eggs shipped from Wallowa Hatchery to Irrigon Hatchery for final incubation and rearing. Our estimate of 77.9% survival from eyed-egg to smolt yields 800,000 smolts (Table 17).

Table 17. Survival rate for Wallowa stock steelhead incubated to eyed stage at Wallowa Hatchery and incubated to swim-up and reared at Irrigon Hatchery, 1988-2009.

	Survival Rate			Survival Rate	
Brood Year	**Green to eyed egg**	**Eyed egg to smolt**	**Brood Year**	**Green to eyed egg**	**Eyed egg to smolt**
1988	0.74	0.81	**1999**	0.90	0.87
1989	0.70	0.83	**2000**	0.89	0.91
1990	0.81	0.61	**2001**	0.87	0.93
1991	0.91	0.75	**2002**	0.91	0.95
1992	0.85	0.59	**2003**	0.89	0.90
1993	0.72	0.92	**2004**	0.88	0.88
1994	0.80	1.00	**2005**	0.92	0.85
1995	0.86	0.98	**2006**	0.88	0.87
1996	0.89	0.88	**2007**	0.92	0.93
1997	0.92	0.92	**2008**	0.91	0.73
1998	0.90	0.94	**2009**	0.83	0.56

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

To estimate egg take needs, the program uses an 89.5% green egg to eyed egg survival rate, and 77.9% eyed egg to smolt survival rate. Underestimation of fecundity, shifts in age structure, and improved survival may result in egg takes that exceed program needs. Program surplus is identified at the earliest possible date. Care is taken to select groups for removal from across the run. Grading by size has occurred during rearing in order to avoid bimodal growth in ponds. Surplus fish are either killed or utilized in put-and-take or put-grow-and-take fisheries in standing waters.

9.1.3) Loading densities applied during incubation.

Eggs are incubated at Wallowa Hatchery at various flows and numbers (Table 18). Currently, eggs from each female are incubated in separate trays. After eggs have eyed, they are picked and shipped to Irrigon Hatchery. Eyed eggs are loaded at 10,000 embryos per tray and water supply set at 5gpm.

Table 18. Incubator flow, eggs/tray, egg size and effluent dissolved oxygen for steelhead eggs incubated at Wallowa Hatchery, 1988-2002 (Hatchery archive data)

Year	GPMper tray	Eggs pertray	Egg Size (eggs/gram)	Effluent D.O. (PPM)
1988	3.0	11,500-16,000		7.2–8.6
1989	3.0	11,500-16,000		7.2–8.6
1990	3.0	11,500-16,000	7.2–7.9	7.2–8.6
1991	3.5	11,500-16,000	6.8–8.4	7.2–8.6
1992	4.0	11,500-16,000	7.2–10.2	7.2–8.6
1993	4.0	11,500-16,000	7.6–10.2	7.2–8.6
1994	4.0	11,500-16,000	6.5–8.3	7.2–8.6
1995	4.0	11,500-16,000	7.6–10.4	7.2–8.6
1996	3.5	11,500-16,000	8.8–10.1	7.2–8.6
1997	4.0	11,500-16,000	9.4–11.6	7.2–8.6
1998	4.0	11,500-16,000	9.4–11.6	7.2–8.6
1999	4.0	11,500-16,000	9.7–12.9	7.2–8.6
2000	4.0	11,500-16,000	9.3–13.0	7.2–8.6
2001	4.0	11,500-16,000	9.7–12.3	7.2–8.6
2002	4.0	11,500-16,200	9.6–10.8	7.2–9.0

9.1.4) Incubation conditions.

Incubation occurs on spring, well and temperature controlled well water. Sediment is not a problem (Table 19).

Table 19. Incubation water parameters at Wallowa and Irrigon hatcheries.

Hatchery	Source	D.O.	Temp. (°F)	Conditions
Wallowa	Well	8.4	56º (avg.)	Clear and silt free
Wallowa	Spring	9.8	42º-53º	Clear and silt free
Irrigon[1]	Well	10.0	42º-55º	Clear and silt free

[1] Well water temperature is mechanically controlled

Wallowaand Irrigon Hatcheries – Water temperature is continuously monitored via recording thermograph or set via chillers. Dissolved oxygen is monitored, but has never limited egg survival.

9.1.5) Ponding.

Fry are ponded into circular tanks at approximately 950 TU, approximately 1 inch in length and 2800fpp.This occurs mid to late-June.

9.1.6) Fish health maintenance and monitoring.

Disease treatments for eggs are given at Wallowa and Irrigon hatcheries during spawning. After ovarian fluid is drained, eggs are fertilized and water hardened in 100ppm iodophor for a minimum of 15 minutes. Green eggs are treated with formalin at 1,667ppm (1:600) for 15 minutes. Treatments three times per week have shown to prevent loss from excessive fungus. Eyed eggs are transferred to Irrigon Hatchery and are disinfected in 100ppm iodophor for 15 minutes upon arrival. Formalin treatments at 1,667ppm maybe continued until hatching, usually less than two weeks after arrival.

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.

There are no impacts to listed fish during incubation. Only hatchery origin fish are used in this program.

9.2) <u>Rearing</u>:

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.

See Table 17.

9.2.2) Density and loadingcriteria(goals and actual levels).

Program goals:

- 5.67 lbs/gpm; Flow Index 0.68 (Piper)
- 1.20 lbs/ft^3; Density Index 0.14 (Piper)

Actual at end of rearing cycle:

- 38,000 @ 4.5 fpp = 8444 lbs/pond
- 1,500 gpm/pond = 5.63 lbs/gpm
- 7,000 ft^3/pond = 1.21 lbs/ft^3

During peak loading and production, liquid oxygen (LOX) is added to the inflowwater to increase the dissolved oxygen in all ponds.

9.2.3) Fish rearing conditions

Fish are reared in well water (seasonal temperature variations 50°F to62°F).Dissolved oxygen levels are monitored during peak production and maintained above 6ppm.Raceways are cleaned weekly and mortalities are picked daily.

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 20. End of month size data (fish/pound) for brood year 2008 Wallowa hatchery stock.

Month	Fish /Pound
June	1155.0
July	343.0
Aug	97.0
Sept	44.0
Oct	23.0
Nov	13.0
Dec	7.3
Jan	5.7
Feb[1]	5.5
Mar[1]	4.4
Apr	4.0

[1] Larger fish are transferred to acclimation ponds beginning in February

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

In October (after marking) fish are programmed for their target size at release. Two sizes are normally programmed: 1) for the early acclimation and 2) the second acclimation. Fish are fed at a minimum of 70% of satiation (AGR), and growth is generally constant.

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*).

Fish are started on BioDiet Starter feed. Fry are switched to Silver Cup Salmon at 800fpp and continue through transfer to release. Feed rates are started at 5.0% and ended at 0.9% body weight/day. Feed is distributed to the raceways viaLinTec feeders, and food conversions are 1:1.

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

Juvenile fish are treated if necessary for bacterial infections with Aquaflor under a Veterinary Feed Directive.

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.

Modification of smolt release goals for the program (see section 1.8) will allow lower-density rearing within existing facilities.

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.

There are no listed fish propagated in this program.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels

Table 21. Proposed fish liberation levels for the Grande Ronde steelhead hatchery program by life stage.

Life stage	Maximum Number	Size (fpp)	Release Date	Location
Unfed Fry	1,200	2800	Early June	Marr and Wallowa Wildlife ponds, Wallowa Watershed
Yearling	800,000	4	April and May	Acclimation facilities in the Wallowa Watershed

Note: There are no planned releases of fingerling steelhead; however, if production exceeds 800,000 smolts, fingerling fish may be used in the state trout stocking program in standing water bodies.

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

Stream, river, or watercourse: WallowaRiver (HUC-17060105) tributary, Spring Creek
Release point:RK 1
Major watershed: GrandeRondeRiver
Basin or Region: Columbia/Snake

Stream, river, or watercourse: WallowaRiver (HUC-17060105) tributary, Deer Creek
Release point:RK 0.1
Major watershed: GrandeRondeRiver

Basin or Region: Columbia/Snake

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

Release numbers for some fry and smolt stages are listed in Table 22. Release numbers for life stages other than smolts are described in Appendix Table 12.

Table 22. Release numbers for some fry and smolts produced by the Wallowa stock steelhead hatchery program, 1998-2009 (Harrod, ODFW).

Release year	Fry	Avg size (fpp)	Yearling[1]	Avg size (fpp)
1998	200	N/A	1,383,997	4.78
1999	28,879	51	1,375,679	4.73
2000	44,336	68	890,772	3.97
2001			843,189	4.53
2002			832,970	4.27
2003			817,483	4.12
2004			784,931	4.36
2005			712,890	4.34
2006			859,648	4.68
2007			801,491	4.04
2008			803,847	3.70
2009			652,424	

[1] Acclimated smolt releases

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

Release timing is designed to match natural fish out-migration and normal increases in flow. Typically, flow increases from mid-April through mid-May. Specific dates of release are selected within that general time frame to accommodate transportation schedules, sampling schedules and pond maintenance needs(Table 23). Smolts are transferred to acclimation facilities from three to seven weeks prior to target release date. Smolts remaining at BigCanyonafter the second acclimation period are sub-sampled to determine sex ratio. If males comprise 70% or more of fish remaining, up to 2,500 fish are transferred to a standing waterbody and not released as smolts. If males comprise <70% of remaining fish, the group is forced out of the acclimation pond.

Table 23. Forced release times for Wallowa stock hatchery steelhead smolts acclimated and released at Wallowa Hatchery and Big Canyon, 1999-2009.

Year	Forced release date[1] first acclimation period		Forced release date[1] second acclimation period	
	Wallowa	Big Canyon	Wallowa	Big Canyon
1999	March 31	April 7	May 12	May 19[2]
2000	April 5	April 12	May 3	May 10[2]
2001	April 4	April 11	May 2[2]	May 9[2]
2002	April 4	April 11	May 1[2]	May 8[2]
2003	April 11	April 15	May 7[2]	May 8[2]
2004	April 12	April 12	May 5	May 6
2005	April 11	April 14	April 30	May 3
2006	April 9	April 12	April 29	May 2[2]
2007	April 8	April 11	April 28	May 1
2008	April 6	April 9	April 26	April 29[2]
2009	April 13	April 15	April 25	April 28[2]

[1]Reflects the first day of volitional release (1-12 day) and subsequent force out.
[2]Not a forced release, residual fish removed after volitional release.

10.5) Fish transportation procedures, if applicable.

Smolts are transported from Irrigon Hatchery to acclimation facilities via tanker trucks that range in from 2,000 to 5,000 gallon capacity. Transportation criteria are described in the Oregon State Liberation Manual. Loading density is maintained at approximately 1 pound of fish per gallon of water.

10.6) Acclimation procedures

Smolts are transported to acclimation facilities three to seven weeks prior to target release date. Smolts at Wallowa Hatchery and BigCanyon are transferred in two separate release groups.Smolts are fed daily on a maintenance diet before initiating the volitional release period. After the volitional release is started, feeding is greatly reduced or eliminated.

The early release group at Wallowa Hatchery is transferred in mid-February and held five to seven weeks. Fish are allowed to leave for 24 hours at which time they are forced out. The late group at Wallowa Hatchery is transferred in Mid-April and held 3 weeks until mid-May. This group has a 12 day volitional release period after which time all fish are forced out.

The early release group at BigCanyon is transferred late-February and held five to seven weeks. The late release group at BigCanyon is transferred in Mid-April and held 3 weeks until Mid-May. This group has a 12 day volitional release. At the end of the volitional period, fish remaining in the acclimation pond are sampled to determine sex ratio. If males comprise ≥70% of fish remaining, up to

2,500 fish are transferred to a standing water body. If the remaining fish are <70% males, the group is forced out of the acclimation pond.

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

All hatchery steelhead are marked with an adipose fin clip. Representative groups of fish are marked with coded wire tags to estimate adult harvest and survival. Coded-wire-tagged fish receive a ventral fin clip to indicate the presence of a tag, and to differentiate adult progeny of the early brood line (right ventral clip) and standard broodstock (left ventral clip) at spawning. In addition, groups are marked with passive integrated transponder (PIT) tags to determine downstream migration characteristics.

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

Fish that are surplus to program needsmay be culled or utilized in the state's trout programs.

10.9) Fish health certification procedures applied pre-release.

See section 7.7

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

Fish would not be released in response to a system failure at Irrigon Hatchery.Efforts to rescue fish at Irrigon Hatchery could include moving them to the nearby Umatilla Hatchery, or transporting them to acclimation sites. At acclimation facilities, dam boards and screens would be removed and smolts would be forced from the acclimation ponds or allowed access to the stream volitionally.

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.

- Factors influencing residualism, and density, distribution and food habits of residual hatchery smolts have been evaluated. The hatchery program has been modified as a result of these findings (Whitesel et al. 1993; Jonasson et al. 1994 and 1995; see sections 1.8 and 3.4).

- Based on findings above, hatchery steelhead smolts are currently released at 4fpp. Based on information from studies in the Grande

Ronde basin on Wallowa stock steelhead this action should further reduce the number of residual hatchery steelhead while improving smolt to adult survival rate (Whitesel et al. 1993; Jonasson et al. 1994 and 1995; see sections 1.8 and 3.4).

- A reduction in steelhead release numbers in the Grande Ronde system by nearly 41% from original LSRCP levels will further reduce impacts of the hatchery program on ESA-listed fish.

- Volitional smolt releases allow for sampling of remaining fish in the acclimation ponds at the end of the release period. Whitesel et al. (1993) and Jonasson et al. (1994, 1995) found that the majority of residual smolts originated from male fish in the release groups. At BigCanyon, if males comprise ≥70% of fish remaining in a release group, up to 2,500 fish are transferred to a standing water body.

- Harvest of marked residual steelhead by trout anglers is encouraged. To focus harvest on residual hatchery steelhead, catchable trout stocking in the WallowaRiver system was eliminated and adipose-clipped only harvest regulations have been implemented on 67 miles of the Grande Ronde and Wallowa rivers. These actions should encourage harvest of residual steelhead and reduce their abundance during the trout angling season.

- Program volitional smolt releases reduce stress on released fish and likely contribute to their ability to move quickly form the system. In addition, this strategy reduces the rate at which hatchery fish enter the stream and subsequent crowding related impacts adjacent to release sites.

- All fish releases are at smolt stage. Smolts released from the program tend to move quickly from the system, which reduces the potential for hatchery smolts to interact with wild steelhead, spring Chinook and bull trout.

- Releases occur during the period of increasing flows, providing the best opportunity for rapid movement out of the GrandeRondeRiver.

- All hatchery fish released are marked with adipose clips.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

– Mark all smolts for harvest and monitoring and determine mark rate.
(*Indicators: 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.2, 4.1, 6.1, 6.2, 7.1, 10.1, 27.1)*

– Analyze marked fish recovery data collected by others from Columbia, Deschutes, Snake River fisheries to determine harvest numbers and rate.
(Indicators: 1.1, 1.2, 2.1, 2.2, 2.3, 3.1, 3.2, 4.1, 6.1, 6.2, 7.1, 27.1)

– Conduct statistically valid creel studies in the Grande Ronde system to determine harvest of hatchery fish and incidental handling rate for other fish.
(Indicators: 1.2, 2.1, 2.3, 3.1, 3.2, 3.3, 4.1, 6.1, 7.1, 11.5, 27.1)

– Monitor smolt release size, numbers, timing, location and smolt movement.
(Indicators: 7.1, 8.2, 11.1, 11.2, 11.3, 14.1, 25.1)

– Monitor adult collection, numbers, status and disposition.
(Indicators: 1.2, 2.3, 7.1, 8.1, 9.1, 9.2, 9.3, 14.2, 15.1, 24.1)

– Monitor survival, growth and performance of hatchery fish.
(Indicators: 5.1)

– Determine density of residual smolts in key areas and their food habits.
(Indicators: 7.2, 11.3, 25.2)

– Determine proportion of hatchery adults in key natural spawning areas and the Wallowa and Upper Grande Ronde populations as a whole via observation and/or trapping or other methods.
(Indicator: 11.6, 13.1, 14.2, 14.3)

– Develop genetic profiles for hatchery and natural steelhead populations in the basin and conduct regular monitoring.
(Indicator: 12.1)

– Monitor wild fish escapement trend in key natural spawning areas and Wallowa and Upper Grande populations as a whole via observation and /or trapping or other methods.
(Indicators: 3.4, 8.1, 11.6, 23.1)

– Develop and implement evaluation plans and report findings consistent with needs of the program for adaptive management.
(Indicators: 17.1, 17.2)

– Monitor discharge water quality and water withdrawals and report annually on compliance with related permits and criteria, i.e., screening and fish passage criteria.

(Indicators: 19.1, 20.1, 20.2, 20.3, 20.4)

– Monitor health of adult and juvenile steelhead associated with hatchery production.

(Indicators: 21.1, 22.2, 28.1)

It is expected that these monitoring activities will provide the basic information needed to evaluate this program and its impact on the natural population (both positive and negative). However, additional data or analyses may be necessary to ensure the following key pieces of information are available to evaluate this program. The key information pieces are:

1) A time series of wild and hatchery spawner escapement estimates for the entire Wallowa and Upper Grande Ronde populations (similar estimates for Joseph and Lower Grande Ronde populations would also be desirable).
2) Distribution of spawners within the watershed that the population occupies,
3) Proportion of naturally spawning hatchery fish, by year, for the entire Wallowa and Upper Grande populations,
4) Age composition of spawners, preferably by year, but if not a summary from multiple years that is useable;
5) Estimated annual impact of tributary and downstream fisheries (including mainstem Columbia and ocean as appropriate);
6) Green egg to smolt survival for hatchery program
7) Smolt to adult survival for hatchery releases;
8) Hatchery strays recovered from other basins based on CWT or PIT recoveries or other methods;
9) The size of hatchery smolts relative to wild fish;
10) The timing of the hatchery smolt release versus out-migration timing of the wild smolts;
11) An index on how quickly the hatchery smolts migrate after release and how many of them do not migrate at all (residualize).

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

Current monitoring and evaluation funding covers most activities listed above. However, funding to monitor potential hatchery/wild interactions, including ratios of hatchery and wild fish in natural spawning areas and genetic monitoring will require commitment of additional resources.

Residual Hatchery Fish [High Priority]

Monitor the residualization of hatchery-reared steelhead and assess rearing and release methods to reduce residualization. Residualized steelhead will be sampled during river surveys. Residuals will be classified based on the presence of a fin clip or wire tag for hatchery fish. Resident redband trout populations will be similarly noted, but are recognized as part of the Grande Ronde steelhead population. Our work will build upon residual studies conducted by this project in the 1990s, which quantified residual abundance for certain release strategies and investigated the predatory impact of residuals. These studies will focus on whether rearing and release strategies can be used to reduce residual abundance, and whether there are spawning interactions in nature between residual steelhead and endemic populations. Estimated costs are for two seasonal biologists employed for 3 months each: $25,600 annually. This study links with a similar study for the Imnaha Stock steelhead hatchery program. The priority level is high because Wallowa Stock steelhead are not derived from the endemic steelhead population, thus interbreeding could reduce the fitness of the endemic population.

Genetic Stock Structure [Moderate Priority]
Evaluate the genetic substructure of the Grande Ronde steelhead major population group. This work would initially re-analyze samples collected for three years (1999-2001) to help understand genetic stock structure and genetic diversity. The original analysis lacked resolution to address questions of genetic introgression by hatchery stocks, a primary question of interest to managers. Depending on sample re-analysis, collection of new samples may be warranted. Estimated cost for sample re-analysis: $30,000.

Adult Straying [High Priority]
We would need funding to develop alternative strategies to reduce straying of Wallowa stock steelhead, should the fall broodstock experiment fail to accomplish that goal. Additional costs are expected to be for monitoring and evaluation of new release groups. Estimating cost is not possible at this time since a preferred alternative strategy has not yet been identified.

Database Development and Maintenance[High Priority]
We see the need for a “data steward” within the ODFW LSRCP Program to develop and maintain the databases needed for organizing the data collected while monitoring the LSRCP hatchery programs and supplemented natural populations. These databases will allow us to conduct analyses within specific populations, as well as among LSRCP Chinook salmon populations, and will facilitate the effective compilation and transfer of information to the LSRCP databases. They will also have to be coordinated with those from LSRCP, BPA and NOAA Fisheries, the agencies to which we will submit these data, and be available to all co-management agencies.

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

- Wild adults intercepted at monitoring sites will be enumerated, marked and released above the collection facility within 24 hours of being captured.
- NOAA guidelines will be followed in all electrofishing activities.
- Experienced surveyors will be utilized to conduct spawning surveys. .
- Experienced fish culturists and fish pathologists will perform activities associated with fish production within the hatcheries.
- Experienced fish culturists will respond to alarms 24 hours per day 7 days per week.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing LSRCP program research is designed to:

- Document hatchery rearing, release activities, and subsequent adult returns.
- Determine success of the program in meeting mitigation goals and index annual smolt survival and adult returns to Lower Granite Dam.
- Provide management recommendations aimed at improving program effectiveness and efficiency.
- Provide management recommendations aimed at reducing program impacts on ESA-listed fish.
- Document the efficacy of program modification objectives of reducingColumbia River tributary straying by returning adults.

Nez Perce Tribe recently started a new project (#201003200) to evaluate the steelhead population status and distribution of natural and hatchery fish in Joseph Creek. The project goal is to establish steelhead population status information in this key spawning tributary of the Grande Ronde steelhead MPG, to support a scientifically defendable fisheries management process and to provide society with information regarding recovery of the population. The project identified key management questions and those are:

- What is the status of wild steelhead adults in the Joseph Creek (abundance and population growth rate)
- What is the stray rate of hatchery produced fish in the Joseph Creek? (hatchery:natural interactions and distribution)

Total natural and hatchery abundance and distribution of the Joseph Creek system will incorporate all available information obtained through operation of a floating weir, and adult estimation through PIT tag recapture information. Results from these multiple methods will provide natural and hatchery adult abundance, distribution, life history, and genetic information in the entire Joseph Creek drainage.

12.2) Cooperating and funding agencies.

- Lower Snake River Compensation Program
- Nez Perce Tribe
- Confederated Tribes of the Umatilla Indian Reservation

12.3) Principle investigator or project supervisor and staff.

- Richard W. Carmichael
- Lance R. Clarke
- Michael W. Flesher

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

Same as described in Section 2.

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

Research, monitoring, and evaluation methods are described in section 1.9

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

1. March 15 – June 15
2. April 1– September 30
3. July 1 – September 30
4. March 15 – June 15

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

ESA-listed fish will not be handled outside the capture site. Fish will be held in containers with aerated well water at suitable temperatures. If handling involves more than determining species and enumeration, fish will be anesthetized and allowed to recover before release. Transport will use water-filled containers and fish will not be held longer than two hours.

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

Monitoring and evaluation will involve take of all types. Most take will involve observing, capture and handling, and capture, handling and marking (Table 12). Injury due to capture, marking, and tissue sampling is inevitable but generally temporary in nature. Few fish, however, succumb to the effects of such injuries. This mortality, in addition to occasional direct loss due to capture and handling, account for the lethal take estimates that may occur during monitoring and evaluation activities (Table 12).

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 12).

See Table 12.

12.10) Alternative methods to achieve project objectives.

The use of cast nets or other devices to monitor hatchery/wild ratios in spawning areas has been considered. However, this type of sampling represents greater risk to sampled fish, increases sample bias, and reduces expected sample size when compared to the trapping strategy set forth.

The nature of our genetic sampling strategy, to develop a profile and monitor genetic characteristics of *O. mykiss* in a variety of streams across the basin, precludes use of steelhead smolts collected at traps used to monitor smolt movement. Alternate techniques such as trapping are too labor intensive to consider feasible.

Observation via snorkeling will be used in place of electrofishing for residual sampling in suitable streams and where collection of residual hatchery smolts is not required.

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

Due to our inability to differentiate between listed anadromous and non-listed resident forms of *O. Mykiss*, take estimates include both. Occasionally, we expect to encounter spring Chinook juveniles and bull trout during sampling. However, the numbers of encounters are low; therefore the level of mortality is expected to be approximately a few fish per species.

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.

- ESA-listed steelhead, Chinook, and bull trout sampled during the residual steelhead study and genetic monitoring will be collected in compliance with NMFS electrofishing guidelines to minimize the risk of injury.

- Efforts will be made to insure that adult trapping facilities do not delay movement of ESA-listed fish, including daily trap checks.

SECTION 13. ATTACHMENTS AND CITATIONS

Bailey, Timothy. 2008.Oregon Department of Fish and Wildlife. Personal communication. *Timothy.D.Bailey@state.or.us*

Beasley, C.A., B.A. Berejikian, R. W. Carmichael, D.E. Fast, P.F. Galbreath, M.J. Ford, J.A. Hesse, L.L. McDonald, A.R. Murdoch, C.M. Peven, and D.A. Venditti. 2008. Recommendations for broad scale monitoring to evaluate the effects of hatchery supplementation on the fitness of natural salmon and steelhead populations. Final report of the Ad Hoc Supplementation Monitoring and Evaluation Workgroup (AHSWG).

Beauchamp, D.A., 1990. Seasonal and diet food habits of rainbow trout stocked as juveniles in Lake, Washington. Trans. of the American Fish Society 119: 475-485.

Bjorn, T.C. and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 in W.R. Meehan, editor. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, Maryland.

Canamela, D.A. 1992. Potential impacts of releases of hatchery steelhead trout smolts on wild and natural juvenile Chinook and sockeye salmon. Idaho Department of Fish and Game, Boise, Idaho.

Carmichael, R.W., D.L. Eddy, M.W. Flesher, G.C. Grant, J.R. Ruzycki, and G.R. Vonderohe. 2005. Lower Snake River Compensation Plan: Oregon Summer Steelhead Evaluation Studies. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Clarke, Lance. 2009. Oregon Department of Fish and Wildlife. Personal communication.*lclarke@eou.edu*

Clarke, L. R., M. W. Flesher, T. Whitesel, G. Vonderohe, and R. W. Carmichael. 2010.Post-release performance of acclimated and direct-released hatchery summer steelhead into Oregon tributaries of the Snake River. North American Journal of Fisheries Management 30:1098-1109.

Connor, W.P., J.G. Sneva, K.F. Tiffan, R.K. Steinhorst, and D. Ross. 2005. Two alternative juvenile life history types for fall Chinook salmon in the SnakeRiver basin. Trans. of the American Fisheries Society 134: 291-304.

Crabtree, David. 2008. U.S.Forest Service. Personal communication. *dmcrabtree@fs.fed.us*

Crisp, E.Y. and T.C. Bjorn. 1978. Parr-smolt transformation and seaward migration of wild and hatchery steelhead trout in Idaho. Idaho Coop. Fish Res. Unit; Forest, Wildlife and Range Experiment Station. Final report from Project F-49-12. 117 pp.

Everhart, W. H. and W. D. Youngs. 1992. Principles of fishery science. Cornell University Press, Ithaca, New York.

Favrot, S.D., K.W. Bratcher, J.W. Steele, B.M. Alfonse, I.P. Wilson, M.C. Anderson, R.M. Schmit, B.C. Jonasson, and R.W. Carmichael. 2010. Investigations into the early life history of naturally-produced spring Chinook salmon and summer steelhead in the Grande Ronde Subbasin. 2009 Annual Report to Bonneville Power Adminstration. Contract Number 00046139. Portland, Oregon.

Feldhaus, Joseph. 2009. Oregon Department of Fish and Wildlife. Personal communication. *joseph.feldhaus@eou.edu*

Flesher, Michael W. 2001. Oregon Department of Fish and Wildlife. Personal communication. *mflesher@eou.edu*

Flesher, M.W., M.A. Buckman, R.W. Carmichael, R.T. Messmer, and T.A. Whitesel. 1994. Summer steelhead creel surveys on the Grande Ronde, Wallowa and ImnahaRivers for the 1993-94 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1995. Summer steelhead creel surveys on the Grande Ronde, Wallowa and ImnahaRivers for the 1994-95 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1996. Summer steelhead creel surveys on the Grande Ronde, Wallowa and ImnahaRivers for the 1995-96 run year.

Oregon Department of Fishand Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1997. Summer steelhead creel surveys on the Grande Ronde, Wallowa and ImnahaRivers for the 1996-97 run year. Oregon Department of Fishand Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and T.A. Whitesel. 1999. Summer steelhead creel surveys on the Grande Ronde, Wallowa and ImnahaRivers for the 1997-98 run year. Oregon Department of Fishand Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, T.A. Whitesel, and J.R. Ruzycki. 2000. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and ImnahaRivers for the 1998-99 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and J.R. Ruzycki. 2001. Summer steelhead creel surveys on the Grande Ronde, Wallowa, and ImnahaRivers for the 1999-2000 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Portland.

Flesher, M.W., R.W. Carmichael, and J.R. Ruzycki. 2004a. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and ImnahaRivers for the 2000-01 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, La Grande.

Flesher, M.W., R.W. Carmichael, and J.R. Ruzycki. 2004b. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and ImnahaRivers for the 2001-02 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, La Grande.

Flesher, M.W., R.W. Carmichael, and G.C. Grant. 2005. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha rivers for the 2002-03 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Salem.

Flesher, M.W., R.W. Carmichael, and G.C. Grant. 2007. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha rivers for the 2003-04 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Salem.

Flesher, M.W., RW. Carmichael, G.C. Grant, and L.R. Clarke. 2008a. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha rivers for the 2004-05 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Salem.

Flesher, M.W., G.C. Grant., RW. Carmichael, and L.R. Clarke. 2008b. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha rivers for the 2005-06 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Salem.

Flesher, M.W., G.C. Grant., RW. Carmichael, and L.R. Clarke. 2009. Lower Snake River Compensation Plan: Summer steelhead creel surveys on the Grande Ronde, Wallowa, and Imnaha rivers for the 2006-07 run year. Oregon Department of Fish and Wildlife, Fish Research Project, Annual Progress Report, Salem.

Garcia, A.P., S. Bradbury, B.D. Arnsburg, and P.A. Groves. 2008. Fall Chinook salmon spawning ground surveys in the SnakeRiver basin upriver of Lower Granite Dam, 2007. 2007 Annual Report to Bonneville Power Administration, Contract 1998-010-03, Portland, Oregon.

Harrod, Ron. 2009. Oregon Department of Fish and Wildlife. Personal communication. *Ron.L.Harrod@state.or.us*

Hemmingsen, A. R., S. L. Gunckel, P. M. Sankovich, and P. J. Howell. 2001. Bull trout life history, genetics, habitat needs, and limiting factors in central and northeast Oregon. Annual Report to Bonneville Power Administration, Contract 94B134342, Portland, Oregon.

Hillman, T.W. and J.W. Mullan, 1989. Effect of hatchery releases on the abundance and behavior of wild juvenile salmonids. Chapter 8 in D. W. Chapman Consultants, Inc. Summer and Winter Ecology of Juvenile Chinook Salmon and Steelhead Trout in the WenatcheeRiver, Washington. Final Report to Chelan Public Utility District, Washington. 301 pp.

Horner, N.J., 1978. Survival, densities and behavior of salmonid fry in stream in relation to fish predation. M.S. Thesis, University of Idaho, Moscow, Idaho. 115 pp.

Interior Columbia River Technical Recovery Team (ICTRT) 2010a. Current Status Review: Interior Columbia Basin Salmon ESU’s and Steelhead DPSs. Part 4: Status Summary – Snake River Steelhead DPS. NOAA Northwest Fisheries Science Center, Seattle, WA.

Interior Columbia River Technical Recovery Team (ICTRT) 2010b. Current Status Review: Interior Columbia Basin Salmon ESU's and Steelhead DPSs. Part 3: Status Summary – Snake River Spring/Summer Chinook Salmon ESU. NOAA Northwest Fisheries Science Center, Seattle, WA.

Interior Columbia River Technical Recovery Team (ICTRT) 2010c. Current Status Review: Interior Columbia Basin Salmon ESU's and Steelhead DPSs. Part 5: Status Summary – Snake River fall Chinook Salmon ESU. NOAA Northwest Fisheries Science Center, Seattle, WA.

IHOT. 1995. Integrated Hatchery Operations Team: Policies and Procedures for ColumbiaBasin Anadromous Salmonid Hatcheries, 1994 Annual Report. Annual Report to the Bonneville Power Administration, Portland, Oregon.

Jonasson B.C., R.C. Carmichael and T.A Whitesel. 1994. Lower Snake River Compensation Plan -- Residual steelhead characteristics and potential interactions with spring Chinook salmon in northeast Oregon. Oregon Department of Fish and Wildlife, Fish Research Project, 1994 Annual Progress Report, Portland, Oregon.

Jonasson B.C., R.C. Carmichael and T.A Whitesel. 1995. Lower Snake River Compensation Plan -- Residual steelhead characteristics and potential interactions with spring chinook salmon in northeast Oregon. Oregon Department of Fish and Wildlife, Fish Research Project, 1995 Annual Progress Report, Portland, Oregon.

Keniry, Patrick. 2001. Oregon Department of Fish and Wildlife. Personal communication. *pkeniry@eou.edu*

McClean, M.L., R. Seeger, and L. Hewitt. 2009. Grande Ronde Satellite facilities O&M. Annual Progress Report to the Bonneville Power Administration, Contract 1998-007-03, Portland, Oregon.

McMichael, G.A., C.S. Sharpe and T.N. Pearsons. 1997. Effects of residual hatchery-reared steelhead on growth of wild rainbow trout and spring chinook salmon. Trans. Am. Fish Soc.126: 230-239.

Mendel, G., J. Trump, M. Gembala, and C. Fulton. 2008. Baseline Assessment of Salmonids in Tributaries of the Snake and GrandeRondeRivers in Southeast Washington. 2006-2007 Final Report. Prepared for Asotin County Conservation District, United States Fish and Wildlife Service, Washington Department of Fish and Wildlife, Fish Program - Fish Management Division, 529 West Main Street, Dayton, WA99328

Moran, P. and R.S. Waples. 2004. Monitor and evaluate the genetic characteristics of supplemented salmon and steelhead. 1999-2003 Progress Report to Bonneville Power

Administration, Project No. 198909600, BPA Report DOE/BP-00015834-1. Portland, Oregon. 42 Pages.

NMFS. 2008. Supplemental Comprehensive Analysis of the Federal Columbia River Power System and Mainstem Effects of the Upper Snake and other Tributary Actions – Section 8 Effects Analysis for Salmonids. NMFS, Portland, Oregon.

Oregon Dept. of Fish and Wildlife, 1994. Biological assessment of the hatchery steelhead program in the Grande Ronde and Imnaha subbasins.

Partridge, F. E., 1986. Effects of steelhead smolt size on residualism and adult return rates. USFWS Lower Snake River Compensation Plan. Contract No. 14-16-001-83605 (1984 segment), Idaho Department of Fish & Game, Boise, Idaho. 59 pp.

Partridge, F.E., 1985. Effects of steelhead smolt size on residualism and adult return rates. USFWS Lower Snake River Compensation Plan. Contract No. 14-16-001-83605 (1983 segment), Idaho Department of Fish & Game, Boise, Idaho. 26 pp.

Sankovich, Paul. 2008. U.S. Fish and Wildlife Service. Personal communication. *Paul_Sankovich@fws.gov*

Sausen, G. 2009. 2008 Bull Trout Redd Monitoring in the Wallowa Mountains. U.S. Fish and Wildlife Service, La Grande Field Office, La Grande, Oregon. 42 pp.

Schuck, M.L., 1993. Biological assessment of Washington Department of Wildlife's Lower Snake River Compensation Plan Program. Washington Department of Wildlife, Olympia, Washington.

U.S. Fish and Wildlife Service (USFWS). 2009.*OregonLowerSnake RiverCompensationPlanState Operated Hatcheries: Assessments and Recommendations. DRAFT Report, December 2009*. Hatchery Review Team, Pacific Region. U.S. Fish and Wildlife Service, Portland, Oregon. Available at: http://www.fws.gov/Pacific/fisheries/Hatcheryreview/reports.html.

Viola, A.E. and M.L. Schuck, 1991. Estimates of residualism of hatchery reared summer steelhead and catchable size rainbow trout (Oncorhynchus mykiss) in the TucannonRiver and NF Asotin Creek in SE Washington, 1991. Unpublished report, Washington Department of Wildlife, Olympia, Washington. 16 pp.

Waples, R. S., O. W. Johnson, and R. P. Jones Jr. 1991. Status Review of Snake River Sockeye Salmon. NOAA Technical Memorandum NMFS-F/NWC 195, Seattle.

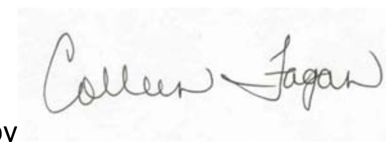
Waples, Robin S., 1999. National Marine Fisheries Service. Personal Communication

Whitesel, T.A., B.C. Jonasson, and R.C. Carmichael. 1993. Lower Snake River Compensation Plan -- Residual steelhead characteristics and potential interactions with spring chinook salmon in northeast Oregon. Oregon Department of Fish and Wildlife, Fish Research Project, 1993 Annual Progress Report, Portland, Oregon.

SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by , ODFW NE Region Hatchery Coordinator
Date: April 29, 2011

SECTION 15. PROGRAM EFFECTS ON OTHER (NON-ANADROMOUS SALMONID) ESA-LISTED POPULATIONS.

Species List Attached (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for all non-anadromous salmonid programs associated with the hatchery program.

Unknown.

15.2) Description of non-anadromous salmonid species and habitat that may be affected by hatchery program.

Unknown.

15.2) Analysis of effects.

Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects).
Identify potential level of take (past and projected future).

Hatchery operations - water withdrawals, effluent, trapping, releases, routine operations and maintenance activities, non-routine operations and maintenance activities (e.g. intake excavation, construction, emergency operations, etc.)

Fish health - pathogen transmission, therapeutics, chemicals.

Ecological/biological - competition, behavioral, predation, etc.

Monitoring and evaluations - surveys (trap, seine, electrofish, snorkel, spawning, carcass, boat, etc.).

Habitat - modifications, impacts, quality, blockage, de-watering, etc.

15.3) Actions taken to mitigate for potential effects.

Identify actions taken to mitigate for potential effects to listed species and their habitat.

15.5) References for Section 15:

None.

APPENDICES

Appendix Table 1. - Standardized Performance Indicators and their associated Definitions and Performance Standards for status, trends, and hatchery effectiveness monitoring.

Performance Indicator		Definition	Performance Standards
Survival – Productivity	Smolt-to-Adult Return rate (SAR) and Smolt-to-Adult Survival rate (SAS)	Smolt-to-Adult Return (SAR), is the number of adult from a given brood year returning to the LSRCP area above Lower Granite Dam divided by the number of smolts that were released 1-5 years prior. Smolt-to-Adult Survival (SAS) is similarly calculated to Bonneville Dam. Adult data is calculated two ways, using coded-wire-tag mark and recovery, and with PIT-tag detections at mainstem dam sites. SAR accounts for all harvest below the LSRCP area. The adult PIT tag detection probabilities at mainstem dams are assumed to be near 100 percent. The number (± 95 confidence intervals) of PIT tagged juveniles arriving at Lower Granite dam is estimated using SURPH 2.2 or PIT Pro 4.8 programs. The variance around the SAR estimate using PIT tags is then calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam: $Var\left(\frac{X}{Y}\right)=\left(\frac{EX}{EY}\right)^2\cdot\left(\frac{Var(Y)}{(EY)^2}\right)$	1.1, 1.2, 2.1, 2.2, 3.1, 3.3, 4.1
Survival – Productivity	Juvenile Survival to Lower Granite Dam	Smolt survival calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Total number of smolts surviving to Lower Granite Dam is then found by multiplying the survival rate to Lower Granite Dam by the number of smolts released.	5.1, 10.1, 11.1
	Juvenile Survival to all Mainstem Dams	Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s) - estimatedusing PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tagged fish are released from the hatchery.	5.1, 10.1, 11.1
	Post-release Survival	Post-release survival of hatchery-origin fish is calculated as described above in the performance measure "Survival to first mainstem dam and subsequent Mainstem Dams". No additional points of detection (i.e. screwtraps) are used to calculate survival estimates.	5.1, 10.1, 11.1
	Comparative Survival Study	Using PIT tag technology as described above, smolt survival to Bonneville Dam will be compared for fish that outmigrate through the hydrosystem versus those that are collected at Lower Granite Dam and transported to Bonneville Dam.	5.1, 11.1
Life History	Stray Rate (percentage)	Estimate of the number and percent of hatchery-origin fish returning to a river basin other than that into which they were released. Calculated from total known-origin CWT recoveries. Data is expanded for un-tagged fish released.	9.1, 10.2, 10.3, 11.1
	Disease Frequency	A certified fish health lab routinely samples fish at hatchery and acclimation facilities for disease testing.	16.1
	Age–at–Return	Age distribution of hatchery spawners. Assessed via scale method or mark recoveries.	6.1, 6.3, 11.1
	Size-at-Return	Size distribution of spawners using fork length (mm). Raw database measure only. Data obtained at weirs or during carcass surveys.	6.1, 6.3
	Size-at-Emigration	Fork length (mm) and weight (g) are representatively collected from hatchery juveniles sampled prior to release.	10.1
	Condition of Juveniles at Emigration	Condition factor is calculated from pre-release length and weight measurements using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).	10.1
	Percent Females (adults)	The percentage of females returning to hatchery facilities.	2.3, 6.1

	Adult Run-timing	Arrival timing of adults at hatchery facilities calculated Using PIT tag detections at facilities. Reported as the range, 10%, median, 90% percentiles.	11.1
	Spawn-timing	Numbers, gender, and date of spawning recorded by hatchery personnel.	6.1, 7.2
	Mainstem Arrival Timing	Unique detections of juvenile PIT-tagged fish at LGD are used to estimate migration timing for each hatchery-origin release group. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by life stage divided by tributary abundance estimate by life stage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.	5.1, 10.1, 11.1
	Water Temperature	Temperature loggers are deployed in reference streams.	14.1
In-Hatchery Measures	Hatchery Production Abundance	The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities.Method dependent upon marking program (census obtained when 100% are marked).	6.2
	In-hatchery Life Stage Survival	In-hatchery survival is calculated during early life history stages of hatchery-origin juveniles. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CW tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts. Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to hatch, hatch to ponded fry, fry to parr, parr to smolt and overall green egg to release) derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities.	5.1
	Size-at-Release	Mean fork length measured in millimeters (mm) and mean weight measured in grams (g) of a hatchery release groups. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff.	5.1
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight (g) and l is the length (mm) (Everhart and Youngs 1992).	5.1
	Juvenile gender ratio after volitional release	Used to reduce the number of residual smolts released into streams (Viola and Schuck 1991) following volitional release. A representative sample of 100 fish remaining after volitional release are killed and sexed. If > 70% are male then the remainder are not released into the stream.	8.1
	Monitor residualized steelhead in stream	Electrofishing, snorkeling and hook and line sampling will be used to determine distribution and relative abundance of hatchery steelhead residuals in representative streams across the Grande Ronde basin.	8.1
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female - calculated by weight or enumerated by egg counter.	11.1
	Spawn Timing	Spawn date of broodstock by age, sex and-origin.	11.1
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality.	6.1
	Hatchery Broodstock Prespawn Mortality	Percent of adults that die while retained in the hatchery, but before spawning.	6.1
	Hatchery broodstock genetics	Fin clips of all hatchery broodstock are collected for genetic analysis. This is a Snake River Basin wide project to genotype each hatchery steelhead stock.	11.1
	Female Spawner ELISA Values	Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum*	13.1, 16.1, 21.1

	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock	13.1, 16.1, 21.1
	Length of Broodstock Spawner	Mean fork length (mm) by age of male and female broodstock. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for ageing.	6.1
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery - estimated from a sample of fish as either "present" or "absent." ("Marks" refer to adipose or ventral fin clips)	4.1
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery. Estimated from a sample of fish passed through a CWT detector or PIT tag detector. (All types of tags)	4.1
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).	6.1, 10.1
	Chemical Water Quality	Hatchery operational measurements include dissolved oxygen (DO) measured with a hand-held DO meter, pH, and on a quarterly basis measurements of un-suspended and suspended solids in the hatchery effluent.	13.1, 14.1
	Water Temperature	Hatchery operational measure: temperature (°Celsius) – measured continuously at the hatchery with thermographs and daily at acclimation facilities with hand-held devices.	13.1, 14.1

Appendix Table 2. Estimated coded-wire tag (CWT) recoveries (including expansions) for Production and Fall Brood Wallowa stock steelhead. Brood year 2005 recoveries are only for age-3 fish. All other locations includes tag recoveries at the hatchery. Coded-wire tag recoveries are incomplete for both brood years.

	CWT Recovery	# of Recoveries		% of Release	
Brood Year	Locations	Production	Fall Brood	Production	Fall Brood
2004	Grande Ronde/ Wallowa River	38	63	0.04	0.06
	Deschutes Strays	85	206	0.09	0.20
	All Other Locations	602	756	0.61	0.73
	Total CWT Recoveries =	*725*	*1025*		
2005	Grande Ronde/ Wallowa River	40	72	0.04	0.07
	Deschutes Strays	33	34	0.03	0.03
	All Other Locations	536	407	0.53	0.39
	Total CWT Recoveries =	*609*	*513*		

Appendix Table 3. Upper Grande Ronde River summer steelhead population abundance and productivity data from ICTRT 2010a.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	542	1.00	542	4937	9.11
1982	858	1.00	858	2913	3.4
1983	1672	1.00	1672	2639	1.58
1984	633	1.00	633	1787	2.82
1985	6461	1.00	6461	925	0.14
1986	3253	1.00	3253	814	0.25
1987	2530	1.00	2530	1053	0.42
1988	2801	1.00	2801	1429	0.51
1989	949	0.68	647	1092	1.15
1990	1536	0.82	1253	1232	0.8
1991	542	0.54	295	1169	2.16
1992	2395	0.8	1916	1512	0.63
1993	1175	0.75	878	2038	1.73
1994	1627	0.82	1336	1519	0.93
1995	1310	0.85	1115	889	0.68
1996	1717	0.71	1217	1190	0.69
1997	2440	0.75	1832	1285	0.53
1998	2756	0.83	2277	2026	0.74
1999	1265	0.64	805	725	0.57
2000	1084	0.71	767	1042	0.96
2001	1898	0.86	1629		
2002	1581	0.9	1424		
2003	1581	1.00	1574		
2004	678	0.99	673		
2005	1310	0.99	1292		
2006	949	0.99	941		

Appendix Table 4. Joseph Creek summer steelhead population abundance and productivity data from ICTRT 2010a.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	1414	1.00	1414	5945	4.2
1982	867	1.00	867	4918	5.67
1983	718	1.00	718	5301	7.38
1984	934	1.00	934	5834	6.24
1985	6476	1.00	6475	4369	0.67
1986	5376	1.00	5375	2103	0.39
1987	4374	1.00	4374	918	0.21
1988	6354	1.00	6354	2131	0.34
1989	5292	1.00	5292	2551	0.48
1990	3394	1.00	3393	1234	0.36
1991	659	1.00	658	816	1.24
1992	1172	1.00	1171	1179	1.01
1993	3228	1.00	3228	2149	0.67
1994	1820	1.00	1820	2678	1.47
1995	574	1.00	573	2084	3.63
1996	1084	1.00	1084	2304	2.13
1997	1251	1.00	1251	3248	2.6
1998	3171	1.00	3170	3193	1.01
1999	2133	1.00	2133	2390	1.12
2000	2020	1.00	2020	2142	1.06
2001	2596	1.00	2596		
2002	4008	1.00	4007		
2003	2283	1.00	2283		
2004	2526	1.00	2525		
2005	1749	1.00	1748		

Appendix Table 5. Wallowa River summer steelhead population (Prairie Cr., Wallowa R., and Whiskey Cr. index areas) abundance and productivity data from ICTRT 2010a.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	105	1.00	105	149	1.42
1982	138	1.00	138	225	1.63
1983	75	1.00	75	79	1.05
1984	92	1.00	92	174	1.89
1985	153	1.00	153	42	0.28
1986	193	1.00	193	56	0.29
1987	252	1.00	252	34	0.14
1988	231	1.00	231	35	0.15
1989	157	0.96	151	41	0.26
1990	144	0.97	139	67	0.47
1991	39	0.91	36	54	1.39
1992	130	0.95	124	103	0.79
1993	37	0.96	35	124	3.35
1994	111	1.00	111	205	1.85
1995	46	1.00	46	156	3.39
1996	100	1.00	100	151	1.51
1997	123	1.00	123	156	1.27
1998	176	1.00	176	152	0.86
1999	191	1.00	191	138	0.73
2000	214	1.00	214	109	0.51
2001	226	1.00	226		
2002	228	1.00	228		
2003	214	1.00	214		
2004	189	1.00	189		
2005	126	1.00			

Appendix Table 6. Wenaha River spring Chinook abundance and productivity data from ICTRT 2010b.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	188	1.00	188	480	2.55
1982	254	1.00	254	418	1.64
1983	220	1.00	220	181	0.82
1984	115	1.00	115	41	0.36
1985	331	1.00	331	50	0.15
1986	639	1.00	639	85	0.13
1987	537	0.09	48	46	0.08
1988	597	0.28	167	183	0.31
1989	61	0.75	46	53	0.86
1990	298	0.22	67	11	0.04
1991	170	0.33	67	57	0.34
1992	606	0.09	52	470	0.78
1993	330	0.54	180	296	0.90
1994	143	0.20	29	153	1.07
1995	68	0.67	48	52	0.77
1996	409	0.98	401	594	1.45
1997	275	0.97	265	725	2.64
1998	250	0.98	246	864	3.46
1999	80	0.85	68	284	3.56
2000	462	0.97	450	633	1.37
2001	881	0.85	750		
2002	674	0.96	651		
2003	539	1.00	539		
2004	634	0.98	624		
2005	448	0.94	422		

Appendix Table 7. Lostine River spring Chinook abundance and productivity data from ICTRT 2010b.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	72	1.00	72	607	8.44
1982	489	1.00	489	352	0.72
1983	375	1.00	375	682	1.82
1984	492	1.00	492	161	0.33
1985	649	1.00	649	60	0.09
1986	393	0.77	317	121	0.31
1987	635	0.68	435	34	0.05
1988	965	0.55	532	235	0.24
1989	277	0.24	64	93	0.33
1990	95	0.60	57	6	0.06
1991	148	0.65	106	41	0.28
1992	194	0.25	49	87	0.45
1993	496	0.49	246	363	0.73
1994	67	0.75	50	57	0.86
1995	37	1.00	37	165	4.43
1996	96	0.88	85	272	2.84
1997	170	1.00	170	550	3.23
1998	246	1.00	246	834	3.39
1999	158	0.96	158	478	3.02
2000	241	0.75	241	380	1.58
2001	663	0.74	518		
2002	1,065	0.48	517		
2003	1,245	0.59	812		
2004	1,408	0.28	406		
2005	798	0.28	217		

Appendix Table 8. Minam River spring Chinook abundance and productivity data from ICTRT 2010b.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	130	1.00	130	998	7.70
1982	212	1.00	212	271	1.28
1983	216	1.00	216	718	3.32
1984	233	1.00	233	269	1.16
1985	1,163	1.00	1,163	289	0.25
1986	649	0.50	322	291	0.45
1987	892	0.50	450	129	0.14
1988	842	0.63	525	178	0.21
1989	308	1.00	308	100	0.33
1990	525	0.44	231	12	0.02
1991	352	0.62	238	62	0.18
1992	389	0.10	37	300	0.77
1993	411	0.56	232	327	0.79
1994	54	0.56	30	102	1.90
1995	62	1.00	62	85	1.37
1996	299	0.95	285	571	1.91
1997	184	0.96	177	565	3.07
1998	209	1.00	209	813	3.88
1999	149	0.95	142	313	2.11
2000	448	0.99	443	405	0.90
2001	608	0.87	526		
2002	650	0.98	638		
2003	550	0.94	526		
2004	468	0.99	462		
2005	346	1.00	346		

Appendix Table 9. Catherine Creek spring Chinook abundance and productivity data from ICTRT 2010b.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	261	1.00	261	430	1.64
1982	709	1.00	709	235	0.33
1983	733	1.00	733	229	0.31
1984	378	1.00	378	130	0.34
1985	369	1.00	369	56	0.15
1986	371	0.80	344	4	0.01
1987	668	0.22	166	11	0.02
1988	673	0.24	178	139	0.21
1989	184	0.38	80	18	0.10
1990	144	0.00	0	6	0.04
1991	48	0.13	8	38	0.79
1992	160	0.25	45	51	0.32
1993	256	0.40	110	173	0.68
1994	27	0.50	15	21	0.77
1995	33	1.00	33	56	1.67
1996	34	1.00	34	87	2.57
1997	96	1.00	96	447	4.68
1998	91	1.00	91	380	4.18
1999	43	1.00	43	85	1.98
2000	53	1.00	53	94	1.79
2001	353	0.79	279		
2002	400	0.51	265		
2003	369	0.45	259		
2004	206	0.34	95		
2005	138	0.35	62		

Appendix Table 10. Upper Grande Ronde River spring Chinook abundance and productivity data from ICTRT 2010b.

Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	208	1.00	208	316	1.52
1982	149	1.00	149	119	0.80
1983	190	1.00	190	144	0.76
1984	150	1.00	150	18	0.12
1985	332	1.00	332	13	0.04
1986	205	0.857	180	52	0.26
1987	692	0.176	125	20	0.03
1988	539	0.077	41	144	0.27
1989	3				
1990	105	0.500	53	2	0.02
1991	39	0.600	26	21	0.54
1992	390	0.206	81	81	0.21
1993	327	0.229	76	113	0.35
1994	13	0.331	4	17	1.39
1995	20	1.00	20	4	0.18
1996	68	1.00	68	33	0.48
1997	68	0.90	61	69	1.02
1998	83	1.00	83	180	2.16
1999	4				
2000	30	1.00	30	31	1.05
2001	64	1.00	64		
2002	54	0.952	51		
2003	126	0.80	140		
2004	535	0.049	26		
2005	341	0.043	15		

Appendix Table 11. Snake River lower mainstem fall Chinook abundance and productivity data from ICTRT 2010b.

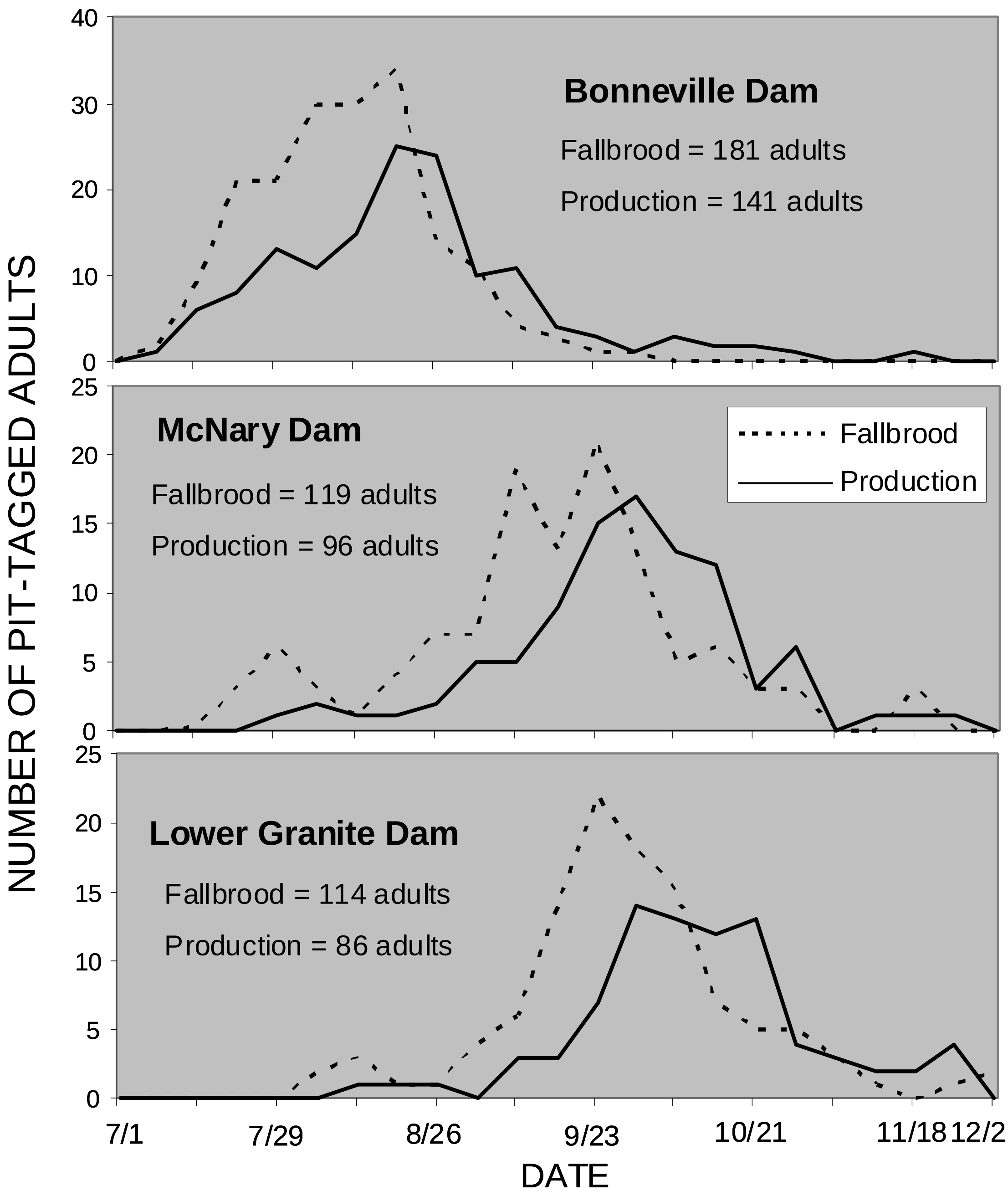
Brood year	Spawners	% Wild	Natural Run	Natural Returns	R/S
1981	340	1	340	335	0.99
1982	720	1	720	147	0.2
1983	540	0.793	428	808	1.5
1984	640	0.506	324	208	0.33
1985	691	0.634	438	235	0.34
1986	784	0.573	449	243	0.31
1987	951	0.266	253	239	0.25
1988	627	0.587	368	487	0.78
1989	706	0.418	295	846	1.2
1990	335	0.233	78	268	0.8
1991	590	0.539	318	269	0.46
1992	668	0.822	549	770	1.15
1993	952	0.779	742	646	0.68
1994	606	0.67	406	334	0.55
1995	637	0.549	350	961	1.51
1996	919	0.695	639	1671	1.82
1997	1007	0.791	797	3245	3.22
1998	962	0.318	306	3327	3.46
1999	1862	0.486	905	3422	1.84
2000	2664	0.431	1148		
2001	10507	0.484	5085		
2002	10115	0.207	2094		
2003	11700	0.333	3896		
2004	15582	0.305	4753		

Appendix Table 12. Recent release numbers, location and size for Wallowa stock steelhead releases other than smolts (Harrod, ODFW).

Brood Year	Facility	Release Date	Location	Number Released	Lbs. Released	# / Lbs.
1997	Big Canyon	5/28/98	Roulet Pond	2,188	500	4.38
	Wallowa	5/21/98	Kinney Lake	2,250	550	4.09
	USFS	5/13/97	Marr Pond	77	Fry	
	STEP	5/15/97	Grande Ronde	93	Fry	
	STEP	5/15/97	Roulet Pond	178	Fry	
1998	Big Canyon	6/9/99	Kinney Lake	2,573	415	6.2
	STEP	6/1/98	Wallowa Wildlife Pond	200	Fry	
1999	Irrigon	11/03/99	Phillips Reservoir	28,606	560.9	51
	Big Canyon	6/1/2000	Kinney Lake	2,069	490	4.22
	USFS	5/26/99	Wallowa Wildlife Pond	43	Fry	
	USFS	6/3/99	Marr Pond	155	Fry	
	STEP	6/1/99	RD Mac Pond	75	Fry	
2000	Big Canyon	5/24/01	Kinney Lake	1,634	334	4.89
	Irrigon	10/16/00	Phillips Reservoir	44,070	650	67.8
	Wallowa	5/24/01	Kinney Lake	4,959	1,097	4.52
	USFS	5/11/00	Marr Pond	169	Fry	
	STEP	5/18/00	Wallowa Wildlife Pond	97	Fry	
2001	Big Canyon	5/23/02	Kinney Lake	1,441	325	4.43
	Wallowa	5/23/02	Kinney Lake	10,450	1,650	6.33
	USFS	5/25/01	Marr Pond	467	Fry	
	STEP	5/25/01	Wallowa Wildlife Pond	149	Fry	
2002	Big Canyon	6/4/03	Morgan Lake	2,014	438	4.6
	Wallowa	6/4/03	Kinney Lake	8,880	2,220	4.0
	USFS	5/10/02	Marr Pond	364	Fry	
		5/15/02	Marr Pond	358	Fry	
		5/15/02	Marr Pond	359	Fry	
	STEP	5/22/02	Wallowa Wildlife Pond	357	Fry	
2003	USFS	6/14/03	Marr Pond	800	Fry	
	STEP	6/2/03	Wallowa Wildlife Pond	400	Fry	
2004	USFS	5/14/04	Marr Pond	1250	Fry	
2005	Big Canyon	5/16/06	Kinney Lake	3,670	500	7.34
	Big Canyon	5/16/06	Wallowa Wildlife Pond	1,028	140	7.34
	Irrigon	10/19/05	Kinney Lake	7,535	137	55.0
		4/24/06	Willow Creek Res	2,010	670	3.0
		4/26/06	Phillips Res	3,501	1,167	3.0
		5/1/05	S. Fork Burnt River	1,002	334	3.0
		5/1/06	Hardy Murray Res	3,003	667	3.0
	USFS	5/10/05	Marr Pond	1,800	Fry	
2006	Irrigon	April/May 2007	Northeast Region trout allocation Waterbodies	29,973	12,756	~2.4
	USFS	5/23/06	Wallowa Wildlife Pond	400	Fry	
		5/23/06	Marr Pond	800	Fry	
2007	Big Canyon	5/12/08	Victor Pond	509	110	4.63
	Big Canyon	5/12/08	Wallowa Wildlife Pond	1,852	400	4.63
	STEP	6/1/07	Grande Ronde R-1	200	Fry	
	USFS	6/1/07	Wallowa Wildlife Pond	400	Fry	
	USFS	6/1/07	Marr Pond	400	Fry	
	Irrigon	10/10/07	Thief Valley Res	22,200	300	74.0
	Irrigon	June 2008	Northeast Region trout allocation waterbodies	47,548	9,826	~2.7

Appendix Table 12. Continued.

Brood Year	Facility	Release Date	Location	Number Released	Lbs. Released	# / Lbs.
2008	Big Canyon	5/12/09	Victor Pond	819	300	2.73
			Wallowa Wildlife Pond	1,638	600	2.73
	USFS	4/21/08	Marr Pond	600	Fry	
		5/7/08	Wallowa Wildlife Pond	600	Fry	



Appendix Figure 1. Cumulative (return years 2006-2008) number of PIT-tagged early (fall) brood and standard production adult steelhead crossing Bonneville, McNary, and Lower Granite dams during the July through November migration period.