HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Grande Ronde Basin Summer Steelhead Hatchery Program - Lower Snake River Compensation Plan (LSRCP)**
Species or Hatchery Stock:	***Oncorhynchus mykiss*, summer steelhead (Wallowa Stock, stock # 056)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Grande Ronde / Snake River / Columbia Basin**
Date Submitted:	Phase-1, December 2002
Date Last Updated:	**September 2002**

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, summer steelhead, Wallowa River Stock (# 056), not listed

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 – Comanagers
3. Nez Perce Tribe – Comanagers

mitigation program funded through the US Fish and Wildlife Service and designed to mitigate for fish losses at the Lower Snake River dams. The LSRCP steelhead program in Oregon includes an integrated Imnaha basin program as well. Staff are shared between the two programs at an approximately 70% Grande Ronde basin and 30% Imnaha basin level. Combined program staff includes: (.25) Hatchery Coordinator, (2) Hatchery Managers, one at Wallowa Hatchery and one at Irrigon Hatchery, (7 ½) technician positions, (1) trades maintenance coordinator position and (1) office manager position. Annual operation and maintenance costs for the Grande Ronde portion of the FY 2002 program include: an estimated $212,000 for Wallowa Hatchery and $546,000 for Irrigon Hatchery

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

Adult Collection and Holding: Adult summer steelhead are collected in the Wallowa Basin (HUC-17060105) at Wallowa Hatchery and at the Big Canyon facility and held at Wallowa Hatchery. Wallowa Hatchery is located along Spring Creek (RK 1), a tributary to the Wallowa River at RK 66.8, and one mile west of Enterprise, Oregon. Big Canyon facility is operated as a satellite to Wallowa Hatchery. It is located on Deer Creek (RK 0.1) at the confluence of Deer Creek and the Wallowa River (RK 17.7), just east of Minam, Oregon.

Spawning: Fish collected at Big Canyon Hatchery and Wallowa Hatchery are spawned at Wallowa Hatchery.

Early Incubation: Incubation of eggs from green egg to eyed egg stage occurs at Wallowa Hatchery.

Final incubation and Rearing: Final incubation (eyed egg to hatching) and rearing to smolt size occurs at Irrigon Hatchery. Irrigon Hatchery is located along the south bank of the Columbia River, above John Day Dam, near Irrigon, Oregon.

- Currently, a small group (400) of eyed eggs is appropriated to a STEP program. These fish are reared from eyed-egg to fry in local classroom incubators, and are released into Marr Pond (200) and Wallowa Wildlife Pond (200) near Enterprise and Wallowa, Oregon, respectively.

Acclimation to release: Smolts are transferred from Irrigon Hatchery in February and April and acclimated at Wallowa Acclimation Pond (Wallowa Hatchery) and held for varying lengths of time, before being released into the Wallowa River. Other smolts are transferred from Irrigon Hatchery to Big Canyon Acclimation Pond in March and April, and acclimated for one month before being released into Deer Creek (a tributary to the Wallowa River).

1.6) Type of program.

Mitigation and Isolated Harvest

1.7) Purpose (Goal) of program.

The goal of the current program is to mitigate for summer steelhead harvest opportunity lost as a result of the construction of four Lower Snake River dams while minimizing impacts to listed populations. The LSRCP adult return goal is 9,184 adults for harvest and escapement to the area above Ice Harbor Dam.

The hatchery production program will continue to produce and release Wallowa stock steelhead smolts as mitigation for under LSRCP. Program adult returns will provide a high level of harvest opportunity in the Columbia, Snake and Grande Ronde rivers sport and tribal fisheries while overall impacts to listed fish are reduced both within and outside the basin. Program features designed to limit and/or further reduce impacts to listed populations include:

- Current program smolt production is reduced by 35% from the original LSRCP goal of 1.35 million smolts at 5/lb to 870,000 smolts at 5/lb (174,000 lbs.). This program reduction responded to suggestions in the NMFS Hatchery BIOP. We plan to continue a reduced level of production (in pounds of fish) into the future in order to diminish potential program impacts by reducing potential strays, surplus adult escapement and the number of residual smolts.

- Results from Whitesel et. al. (1993) and Jonasson et. al. (1994 and 1995) suggested that Wallowa stock steelhead smolt reared to 4 fpp produced fewer residuals and returned at a better rate than smolts at 5 fpp. Based on these findings, ODFW has proposed to lower production numbers to 700,000 smolts and increase fish size to 4 fpp (175,00 lbs.). This shift is expected to further reduce residualism and maintain adult return levels comparable to the current reduced production (870,00) at 5 fpp release size.

- Release of all production fish will occur at the smolt stage thereby reducing potential interaction with rearing naturally produced fish

- All smolt releases will occur at acclimation/adult trapping facilities allowing broodstock collection and removal of adult escapement surplus to broodstock needs, and potentially reduce in basin stray rates.

- Volitional release of all smolts allows; a less stressful release and removal of fish with a high likelihood of producing residuals

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
   1.3. Estimated number of Grande Ronde basin wild steelhead harvested in tribal fisheries by run year
2. Program contributes to mitigation requirements
   2.1. LSRCP compensation area harvest estimate 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

3.1. *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*
3.4. *Annual escapement trend of wild steelhead as determined by key area spawning ground survey*

4. Release groups are marked to enable determination of impacts and benefits in fisheries
   4.1. *Number of recovered marked fish reported in each by fishery produces accurate estimates of 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*
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. Release numbers do not exceed habitat capacity for spawning, rearing, migration corridor, and estuarine and near-shore rearing.
   9.1. *Annual smolt release numbers in basin*
   9.2. *Location and timing of releases*
   9.3. *Proportion of residual hatchery smolts in key natural rearing areas*
   9.4. *Outmigration behavior of hatchery smolts*
   9.5. *Proportion of hatchery fish spawning in key natural spawning areas*
   9.6. *Density of natural spawners in key spawning areas*
10. Patterns of genetic variation within and among natural populations do not diverge as a result of artificial production
    10.1. *Genetic profiles of naturally produced juveniles from indicator areas compared in time series, samples at five year intervals*
11. Hatchery produced adults do not exceed appropriate proportions of natural spawners
    11.1. *Proportion of hatchery fish in key steelhead natural spawning areas*
12. Juveniles are released after sufficient acclimation to maximize homing ability to intended locations
    12.1. *Length of acclimation period*
    12.2. *Proportion of adult returns to intended location*
    12.3. *Proportion of hatchery fish in key steelhead natural spawning areas*
13. Number of adult hatchery returns surplus to broodstock needs declines to an average of 75% of that seen the last five years
    13.1. *Number of hatchery adults collected surplus to broodstock needs*
14. Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation

toward achieving the experimental objective and evaluate the beneficial and adverse affects on natural populations

15.1. Monitoring and evaluation framework including detailed timeline

15.2. Annual and final reports

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

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

17. Effluent from artificial production facilities will not detrimentally affect populations,

17.1. Discharge water quality compared to applicable water quality standards and guidelines

18. 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

18.1. Water withdrawals compared to applicable passage criteria

18.2. Water withdrawal compared to NMFS juvenile screening criteria

18.3. Proportion of diversion of total stream flow between hatchery facility intake and out-fall

18.4. Length of stream impacted by water withdrawal

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

19.1. Certification of juvenile fish health immediately prior to release

19.2. Juvenile rearing density

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

20.1. Number and location of carcasses distributed for nutrient enrichment

20.2. Disease examination of all carcasses to be used for nutrient enrichment

20.3. Statement of compliance with applicable regulations and guidelines

21. Broodstock collection does not significantly alter spatial and temporal distribution of naturally populations

21.1. Number of wild adult fish aggregating or spawning immediately below the adult weir

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

22.1. Adult trapping mortality rate for wild fish

23. Predation by artificially produced fish on natural produced fish does not significantly reduce numbers of natural fish

23.1. Size at, and time of release of juvenile fish, compared to size and timing of natural fish present

23.2. Rate of observation of listed fish in stomachs of sampled hatchery steelhead

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

24.1. Total cost of program operation

24.2. Average cost of similar operations

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

restore and create viable naturally spawning populations using supplementation and reintroduction strategies; (3) Provide fish to satisfy legally mandated harvest in a manner which minimizes the risk of adverse effects to listed wild populations; (4)....".

25.1. *Recreational fishery angler days*

26. Fish health problems associated with hatchery production do not adversely impact wild fish productivity

    26.1. Health condition and history of fish released

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.*").

1.10.2) "Performance Indicators" addressing risks.

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

1.11) Expected size of program.

1.11.1) Proposed annual broodstock collection level.

Average annual broodstock needs include 230 females and 240 males.

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

Life Stage	Release Location	Annual Release Level
Unfed Fry	Marr Pond	200
Unfed Fry	Wallowa Wildlife Pond	200
Fingerling	Various standing water bodies	0
Yearling	Spring Creek, 1st acclimation (smolts @ 5 fpp)	348,000
Yearling	Spring Creek, 2nd acclimation (smolts @ 5 fpp)	217,500
Yearling	Deer Creek, 1st acclimation (smolts @ 5 fpp)	174,000
Yearling	Deer Creek, 2nd acclimation (smolts @ 5 fpp)	130,500

Note: There are no planned releases of fingerling steelhead in various standing water bodies; however, if production exceeds 870,000 smolts, fingerling fish are out planted in Kinney Lake or Phillips Reservoir.

Table 1. Smolt to adult return (SAR) and smolt to adult survival (SASR) rates for coded wire tagged groups of Wallowa stock hatchery smolts released at Wallowa and Big Canyon facilities, for selected brood years (Flesher, ODFW, pers. com.).

Brood Year	SAR (%)		SASR (%)	
	Wallowa	Big Canyon	Wallowa	Big Canyon
1988	0.08	0.07	0.21	Na
1989	0.27	0.19	1.18	Na
1990	0.26	0.19	1.13	1.18
1991	0.01	0.02	0.08	0.10
1992	0.07	0.09	0.31	0.41
1993	0.18	0.38	0.75	0.86
1994	0.22	0.35	0.30	0.41
1995	0.20	0.24	Na	Na
1996	0.15	0.08	Na	Na
1997	0.16	0.16	Na	Na

Adult production and escapement levels are described in Table 9 in Section 3.3.1.

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

Adults were first collected for program broodstock in 1976. Resulting smolt releases first occurred in 1977.

1.14) Expected duration of program.

Ongoing fisheries mitigation

1.15) Watersheds targeted by program.

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

1.16) Indicate 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 hatchery program was determined to be unnecessary to accomplish program objectives and to represent an increased risk for the basins wild steelhead relative to the proposed program modification. Such basin specific broodstocks become necessary only to reduce genetic concerns related to intentional supplementation and/or hatchery straying. Based on Chilcote (in prep.), steelhead populations within the basin are viable and sustainable without supplementation. Although straying has been identified as an issue related to direct stream release of smolts, recent discontinuation of direct stream releases will minimize potential for straying within the basin. Development of an endemic stock would likely impact natural productivity through,
  - 1) Take of listed wild fish for broodstock;

basin.

- Development of an early returning broodstock to the Grande Ronde from the Wallowa stock has been considered. Modified hatchery steelhead adult return timing will emphasize fall entry into the Grande Ronde thereby reducing potential for straying into Columbia River tributaries and emphasizing harvest within the LSRCP compensation area. We can accomplish this shift by developing a new Grande Ronde basin hatchery broodstock comprised of early returning hatchery origin broodstock collected from the lower Grande Ronde River during the fall.

- 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 adult straying outside the basin.

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

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

- An abbreviated HGMP was forwarded to NMFS in 2000 without response
- The program has operated under a NMFS program specific Biological Opinions since 1993. The most recent Biological Opinion was released in 1999 and a new one is expected in early 2001.
- NPDES 0300J
- DEQ MOA Water Quality Limited stream list. (carcass disposal)
- Lower Snake River Compensation Plan (2002 AOP)
- US v. Oregon
- NMFS 4 (d) – Section 7 consultation with USFWS permit #818
- Oregon Scientific Taking Permit OR2002-043
- Oregon Scientific Taking Permit OR2002-077

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.
Unknown.

program.
The hatchery production program may incidentally affect listed Snake River summer steelhead populations. In addition, listed Snake River spring chinook populations, Snake River fall chinook, Columbia Basin bull trout may be affected to a lesser degree. The magnitude of that affect will, however, be reduced from past levels through program modifications outlined in this document.

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

A conservative description of potential steelhead population structure within the Grande Ronde basin is outlined below.

1. Lower Grande Ronde River
   - Wenaha River
   - Lower Grande Ronde River tributaries in Oregon
2. Joseph Creek and tributaries
3. Wallowa River
   - Wallowa River tributaries from North
   - Wallowa River tributaries from South (except Minam)
   - Prairie Creek
   - Minam and tributaries
4. Upper Grande Ronde River
   - Lookingglass
   - Middle Grande Ronde (Grande Ronde tributaries between Wallowa and the upper end of the Grande Ronde Valley except Lookingglass, Catherine and Willow creeks)
   - Willow Creek
   - Catherine Creek
   - Upper Mainstem and tributaries above the Grande Ronde Valley up to and

This identified steelhead population structure in Grande Ronde basin streams represents a conservative approach to population delineation 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. For the purposes of this plan populations are grouped into management units as indicated to accommodate inference from existing data analysis. Individuals from all above listed populations may be intercepted and handled in recreational fisheries or during broodstock collection. Only Wallowa River populations have a high likelihood of interception at adult trapping facilities.

Spring chinook – Historically, spring chinook spawned in headwater areas throughout the Grande Ronde basin. Reduced spawner numbers combined with human manipulation of spawning areas have resulted in population fragmentation. Population in the Minam, Lostine, Wenaha and upper Grande Ronde rivers and Catherine Creek represent relative strongholds within the basin.

Adult spring chinook enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde. Spawning occurs from early August through September and generally peaks in late August. Emergence begins in January and extends through June. Fry expand their distribution after emergence in the spring. The extent and direction of fry movement depends on environmental conditions. A fall pre-smolt movement appears to involve a substantial portion of the population in some streams. Juveniles rear for one year and smolt the spring of the year following emergence. Smolt migration from the basins begins in January and extends through early July.

Fall chinook – Fall chinook in the lower reaches of the Grande Ronde Rivers are considered segments of the Snake River population and exhibit similar life histories. Adult Snake River fall chinook 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, with fry emergence during March and April. Outmigration occurs within 3-4 months following emergence with peak migration past Lower Granite Dam in late June.

Bull trout – Both fluvial and resident life history forms of bull trout inhabit the Grande Ronde River and a number of tributaries. Little is known of their population structure. Habitat conditions and influence of introduced brook trout vary widely across the basin and affect bull trout productivity in some areas. As a result, the basins bull trout population(s) vary from areas of relative strength in wilderness streams where brook trout are not currently a problem to areas where habitat condition and/or interaction mainstem tributaries and the Snake River. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge in during the spring. Juvenile rearing is restricted to headwater areas by increasing water temperatures downstream.

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

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

<u>Summer steelhead</u> - Population viability analysis is not available for all steelhead Management Units within the Grande Ronde basin. However, analysis of spawning survey data from a number of Grande Ronde basin streams suggests steelhead populations within the basin are viable and resilient (Chilcote, 2001, in prep.). Furthermore, that analysis determined that productivity of these populations was such that they would remain viable and productive under modestly increased mortality or harvest. We utilized results of analysis completed to infer population status in adjacent management units (Table 2).

General tends in observed steelhead spawner abundance within the basin can be represented as reaching a low in the late 1970s, gradually increasing to a peak in the mid-1980s, and declining to another low in the late 1990s before recovering slightly. Average abundance over the last 6 years for all basin steelhead populations examined exceeded the viable threshold identified (Table 3).

Table 2. List of the natural fish populations, "Viable Salmonid Population" thresholds, and associated hatchery stocks within the Grande Ronde basin (Chilcote, 2001).

<u>Management Units</u> (see above for description of population structure within Management Units)	<u>Critical Thresholds</u> (Abundance in spawners/mile)	<u>Viable Thresholds</u> (Abundance in spawners/mile)	<u>Associated hatchery stock</u>(s)
Lower Grande Ronde [2]	Abundance: 0.18	Abundance: 0.67 Productivity: replacement rate =1	
Joseph Creek	Abundance: 0.18	Abundance: 0.67 Productivity: replacement rate =1	
Wallowa River [3]	Abundance: 0.35	Abundance: 0.78 Productivity: replacement rate =1	Wallowa stock summer steelhead (#56)
Upper Grande Ronde (Middle Grande Ronde)	Abundance: 0.35	Abundance: 0.78 Productivity: replacement rate =1	
Upper Grande Ronde (Upper Grande Ronde)	Abundance: 0.11	Abundance: 0.45 Productivity: replacement rate =1	

[1] Inference from adjacent Joseph Creek management unit

Table 3. Previous 6-year average steelhead spawner density (spawners per mile) for FMEP area population units examined (Chilcote, 2001)

Population	Sub-population	Observed Abundance	Viable Threshold	Critical Threshold
Joseph		4.6	0.7	0.2
Upper Grande Ronde	Mid – Grande Ronde	2.2	0.8	0.4
Upper Grande Ronde	Upper Grande Ronde	3.3	0.5	0.1

Spring chinook, fall chinook and bull trout
Population viability analysis has not been completed for Grande Ronde basin spring chinook and bull trout or Snake River fall chinook.

- 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.

Table 4. Recruit/spawner ratios for several Grande Ronde Basin wild steelhead populations based on spawning surveys, 1988-1993 (Chilcote, ODFW, pers com.)

Year	Stream		
	Upper Grande Ronde[1]	Joseph Cr[2]	Phillips Cr
1988	0.34	0.52	0.78
1989	0.86	0.30	0.97
1990	0.91	0.28	0.77
1991	1.20	2.19	0.47
1992	1.44	1.85	0.29
1993	0.81	0.82	1.23

[1] Includes data from McCoy and Meadow creeks
[2] Includes data from Butte, Crow, Elk, Peavine and Swamp creeks

Analysis for spring and fall chinook is not available and insufficient data is available for bull trout.

- 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

(Garcia, 1999).

Summer steelhead

Table 5. Steelhead spawning survey data (spawners per mile) for some streams within the Grande Ronde Basin, 1988-2002. Blank cells indicate no survey (Data from Grande Ronde Watershed District files).

POP. UNIT	Prairie Cr.	S Wallowa	N Wallowa	Joseph Creek									M.Grande Ronde	U. Grande			S.Grande Ronde
Miles*	2	5	5	2.5	1	12	6	10	1	6	1	5	2.5	7	2	6	4
STREAM	Prairie Cr.	Wallowa R.	Whiskey Cr.	Butte Cr.	S. FK.Chesnimnus	Crow Cr.	Devils Run Cr.	Elk Cr.	McCarty Gu.	Peavine Cr.	Summit Cr.	Swamp Cr.	Phillips Cr	Meadow Cr.	McCoy Cr.	Five Points Cr.	Fly Cr.
Year																	
1988	23.0	2.7	22.3	0.5	24.3	8.7	23.4	12.2	0.0	22.7	67.5	8.4	2.7	7.9	3.4	2.5	13.8
1989	8.8	3.0	17.2	0.9	16.2	9.5	24.5	15.1	6.8	10.6	29.7	11.1	2.2	1.5	2.0	1.4	1.7
1990	14.9	3.2	11.8	2.2	5.4	10.4	5.6	10.7	1.4	11.9	12.2	14.0	2.7	2.9	2.0	2.5	1.0
1991	2.7	0.8	4.1	0.0	0.0	2.5	0.9	4.5	0.0	1.4	2.7	0.0					
1992	11.5	2.4	11.0	0.5	0.0	2.8	4.1	4.3	0.0	5.9	6.8	1.4	8.6	4.6	1.4	2.5	7.9
1993	9.5	0.0	3.7	0.5	2.7	5.1	15.3	12.2	0.0	5.6	9.5	14.9	2.2	1.7	4.7	1.4	1.4
1994	16.2	1.6	7.8	0.0	2.7	2.6	9.5	6.2	0.0	5.2	9.5	0.5	1.6	2.5	0.0	4.5	1.4
1995	5.4	1.4		0.0	5.4	0.5		1.8	0.0		1.4	2.2	2.7	1.7	2.0	2.7	1.7
1996	16.9	3.5	3.4	1.6	5.4	1.2	4.3	2.7	0.0	4.1	4.1	1.9	2.2	1.7	3.4	4.5	1.4
1997	17.6		4.6	4.9	6.8	2.5	4.1	3.9	0.0	2.7	4.1	1.9	1.1	3.7	6.8	5.2	2.3
1998	20.9		8.4	2.2		2.6		9.0	5.4	13.3		4.9	4.3	5.2	7.4	3.4	2.3
1999	31.1		5.7	5.4	8.1	4.1	10.8	4.7	0.0	3.6	8.1	8.1	2.2	1.4	0.7	3.6	
2000	37.1		6.8	2.2	13.5	2.5	5.9	5.9	1.4	6.1	17.6	9.2	1.1	0.8	0.0	4.1	2.7

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

Spring chinook

Table 6. Number of spring chinook salmon redds observed in the Grande Ronde River and tributaries, 1988-2000 (Kinery, ODFW, pers com).

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Redds observed	969	227	296	198	558	688	149	80	306	298	253	180	502	

Fall Chinook

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 1988-1998. Empty cells indicate no searches conducted (Garcia, 1999).

River	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Snake (aerial)[1]	64	58	37	41	47	60	53	41	71	49	135
Snake (camera)[2]				5	0	67	14	30	42	9	50
Grande Ronde	1	0	1	0	5	49	15	18	20	55	24

[1]The target search was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.
The target search areas were discrete sites composed mainly of 1-6 in. bottom substrates. Number of sites varied each year.

Bull trout - Spawning survey data collection for bull trout has only recently been initiated within the Grande Ronde basin. No consistent time series data set is available.

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

Proportion of hatchery steelhead adults in natural spawning areas has been estimated one quarter of available spawners in some Grande Ronde basin streams in the past (Chilcote, in prep.). It is believed this high incidence of hatchery fish in those few natural spawning areas is related to adults returning from smolts released directly into adjacent stream reaches without acclimation and/or adult collection facilities. In response to concerns regarding this high level of wild/hatchery interaction, all smolts released in the Grande Ronde basin are now acclimated and released at facilities within the Wallowa basin. Incidence of hatchery fish in natural spawning areas is expected to decline dramatically in response to this elimination of direct stream smolt releases beginning with 2000 releases. Observation in spawning areas will be utilized to confirm the outcome of this shift in release location as well as monitor hatchery/wild ratios in natural spawning habitat elsewhere in the basin.

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

- 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 – Fall program broodstock collection activities have a high likelihood of resulting in incidental take of adult and juvenile listed Grande Ronde summer steelhead. Fall collection will occur in an area where wild listed and target potential for hook wounds and descaling of listed steelhead. Catch data from the lower Grande Ronde steelhead fishery between 1994 and 1997 indicates an average of 65%, 41% and 45% of fish caught in September, October and November, respectively, were wild (Flesher, et.al.,1994, 1995, 1996, 1997, 1999). Collection will not occur during September in order to avoid handling the high proportion of wild fish present during that time period and to avoid handling fish in warmer water conditions. Warm water temperatures reduces ability of fish captured in seining and angling operations to recover from associated handling stress. Early fall temperatures in the Grande Ronde River may at times exceed temperature levels known to cause increased stress related mortality in steelhead. In order to reduce mortality of both listed wild steelhead and Wallowa stock hatchery steelhead, broodstock collection will occur after September and only when temperatures are below 18º C. All wild summer steelhead captured in broodstock collection activities will be released immediately, with a minimum of handling at the location of capture.

Based on the above estimates of the proportion of wild fish likely to be encountered, we would expect to handle 0.75 wild fish for each hatchery fish collected. Collection of the targeted 100 hatchery adults for broodstock will result in handling an estimated 75 wild fish. Hook and line sampling is the most likely method of collection and likely the most stressful for the fish. Hooton (1988) suggests, based on steelhead mortality studies conducted in British Columbia, that we might expect a handling mortality rate of 5% for wild steelhead handled and released during broodstock collection. A 5% mortality rate could result in mortality of an estimated 4 adult wild steelhead annually during broodstock collection. Hooking and releasing wild fish is not expected to impact reproductive success (Pettit, 1977).

In addition to adult listed steelhead, listed juvenile steelhead, bull trout and fall chinook co-occur in the proposed broodstock collection area, occasionally these fish will be handled during broodstock collection. Creel surveys conducted in from the lower Grande Ronde steelhead fishery during October and November 1993 through 2000 tracked incidental catch of rainbow and bull trout. Anglers checked during that period caught an average of 65.4 hatchery steelhead, 42.1 rainbow/steelhead and 53.7 bull trout. That data suggests that in the process of collecting 100 hatchery broodstock via hook and line 64 rainbow trout/juvenile steelhead (we have no way to differentiate between rainbow and steelhead in this data set) and 82 bull trout would be handled annually. In addition, one or two fall chinook were reported caught and released each year (Flesher, ODFW, pers. com.). If we apply a liberal 10% estimate of mortality for fish caught, handled and released, we would estimate loss of 7 rainbow/steelhead and 8 bull trout and no fall chinook annually during broodstock collection.

Adult listed wild steelhead are handled at the Big Canyon trap in conjunction with broodstock collection. Wild fish are removed from the trap and immediately released above the weir. Since 1988, 415 wild adults have been handled at the Big Canyon

Monitoring and Evaluation

Spawning Surveys – Foot surveys conducted to determine natural spawning density proportion of hatchery fish in key natural spawning areas are likely to result in observation of natural listed summer steelhead adults and juveniles. These surveys are conducted in various reaches of spawning habitat from March through May. Experienced surveyors walk along the stream, crossing when necessary, avoiding and counting redds and observing fish. Although every effort is made to observe adults and determine their origin without disturbance, spawners are occasionally forced to seek cover. These encounters are brief and spawning fish generally resume their activity within a short period of time.

Juvenile surveys/collections – Electrofishing, snorkeling and hook and line sampling will be used to monitor density, size and food habits of residual hatchery steelhead and to collect genetic samples from naturally produced steelhead. These activities which generally occur from May through October will result in take of juvenile listed steelhead and occasionally spring chinook and bull trout. Electrofishing efforts will conform to NMFS electrofishing guidelines to minimize disturbance and injury to listed fish. Snorkeling is a low impact sampling method that may be used to identify relative proportion of residual hatchery steelhead in key stream reaches. Disturbance of rearing juveniles associated with snorkeling is generally limited to forcing individuals to seek cover and is a short duration effect. Hook and line sampling may also be utilized to collect residual hatchery steelhead in larger streams. These efforts will be limited in number and to time periods when water temperatures minimize any incidental mortality of listed fish.

Adult trapping – Monitoring of the proportion of hatchery adults in natural spawning areas may include use of adult trapping facilities on key natural spawning streams. This activity will involve take of listed summer steelhead. Every effort will be made to design and construct these facilities to avoid harm to listed fish. Traps will be monitored daily when in operation. Upstream migrating wild adult steelhead will be removed from the trap net, anesthetized with MS222, enumerated, checked for marks, marked with opercal punches if necessary for evaluation and released after recovery from anesthetic within 24 hours of capture. Hatchery adults encountered at trapping facilities will be enumerated, removed and not allowed to proceed upstream to spawning areas. Downstream migrating adult steelhead will be removed from the trap, anesthetized, examined for marks and released downstream after recovery, also within 24 hours of capture. Other species encountered will be handled only to determine species and released without being anesthetized. This activity will occur between March 1 and June 15.

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

Since 1988 no wild fish have died during holding and handling at Wallowa Hatchery.

- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).
See Table 8.

Table 8. Estimated take levels of listed salmonids by hatchery activities.

Listed species affected: Summer Steelhead	**ESU/Population:** Snake River			
Activity: Grande Ronde steelhead hatchery program				
Location of hatchery activity: Grande Ronde Basin	**Dates of activity:** Annual			
Hatchery program operator: ODFW				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	2000	2500	250	5
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	250	10
Capture, handle, tag/mark/tissue sample, and 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 listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

- 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. The most likely circumstance that could lead to higher than expected mortality related to these activities is increased water temperature. We will limit during any operation the activity will be suspended until conditions for fish handling 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 modification outlined in this HGMP are consistent with the NPPC Annual Production Review – Report and Recommendations and address issues of concern outlined in the NMFS Hatchery Biological Opinion.

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

- <u>Lower Snake River Compensation Plan</u> **–** the program is not consistent smolt production level as outlined in original LSRCP. However, the proposed program will continue to support a substantial tribal and sport harvest level and is likely to increase the proportion of harvest benefits occurring in the program mitigation area above Ice Harbor Dam.

- Because of proposed smolt reductions the hatchery program outlined within this HGMP is not consistent with the now out-dated Appendix B hatchery smolt production agreements of the *US vs Oregon* negotiations. It is, however, consistent with that documents intent to provide fish for harvest in tribal and sport fisheries into the future.

3.3) Relationship to harvest objectives.

Proposed program modifications, including shifts in broodstock return timing, reductions in smolt numbers and increased smolt size are all designed to maintain harvest opportunity at the highest possible level while reducing impacts to listed species, especially Deschutes River and Snake River summer steelhead. However, reductions in program smolt releases will likely result in fewer fish harvested if harvest rates remain at the level of those recently observed. The Grande Ronde steelhead hatchery program has been successful in reestablishing a fishery within the Grande Ronde basin with catch rates, and harvest and effort levels similar to historic, pre-dam levels (Flesher, et. al., 1994). The program has been less successful in returning the goal of 9,184 to the compensation area as a whole (Table 9). Proposed program modifications will likely shift harvest from Deschutes and Columbia rivers to the Snake and Grande Ronde rivers compensation area. As a result, impact to program compensation area harvest is expected to be small.

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. 1999; Messmer et. al. 1991, 1991 and 1993 and Flesher, ODFW, pers. comm.). Columbia River tribal net and sport and Deschutes River fisheries have accounted for an average of 47.4 % of Wallowa stock harvest and escapement in recent years (Table 9). Snake and Grande Ronde sport harvest has averaged 29% of the total harvest plus escapement for years summarized since 1987. While escapement to hatchery facilities and strays have made up an average of 23.3% of the reconstructed runs.

Table 9. 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 1996-97.

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
Mean Harvest/ Escapement	**18**	**2,780**	**815**	**657**	**2,602**	**2,092**	**8,964**
Ave. % of run	**0.2**	**31.0**	**9.1**	**7.3**	**29.0**	**23.3**	**100**

[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**)

3.4) Relationship to habitat protection and recovery strategies.

Human development and land management impacts consistent with those identified across the Columbia basin affects steelhead production in the Grande Ronde basin. Loss of channel within the watershed. 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. While activities on public lands must meet listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service. These protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an upward trend in steelhead habitat in many Grande Ronde basin streams. Most of these restoration projects funded through the Grande Ronde Model Watershed and Oregon Watershed Enhancement Board programs produce both short and long term improvements in habitat. Taken together these habitat protection and improvement measures are and will continue to improve habitat for and productivity of the basin's wild 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.

Predation - Predation requires opportunity, physical ability and predilection on the part of the predator. Opportunity only occurs when distribution of predator and prey species overlaps. This overlap must occur not only in broad sense but at a microhabitat level as well. Physical ability and predilection imply, in general, a steelhead at least 250mm in length with an individual prey item less than one third its length (Horner 1978; Hillman and Mullan 1989; Beauchamp 1990; Canamela 1992). Although, Jonasson et. al. (1995) found no significant relationship between residual size and salmonid prey size in pen experiments.

The following discussion reviews these factors as they relate to the interaction between actively migrating and residualized hatchery steelhead smolts and emergent fry, fingerling and smolts of listed species. Relative size of proposed hatchery steelhead smolts (225 mm @ 4 fpp) and spring chinook smolts (90 mm) and wild steelhead migrants, yearlings (80-120 mm) and two year old smolts (150 mm +) should preclude any substantial predator/prey interaction between migrating fish based on some studies cited above.

Timing of steelhead smolt releases and distribution of fry limit potential interaction between steelhead smolts and emergent chinook, steelhead and bull trout fry. Steelhead release sites are downstream of documented spring chinook spawning areas. Steelhead smolts are released in April and early May, approximately mid-way through the spring chinook emergence period. The opportunity for these fry to move into steelhead migration corridors is limited. Fry distributed downstream from spawning areas and potentially available to steelhead smolts would already be seeking preferred habitat areas. Bjorn and Reiser (1991) reviewed literature on habitat preferences of juvenile salmonids and concluded that newly emerged fry prefer shallow areas of low velocity (<10 cm/s) and larger fish occupy deeper and faster areas. Partitioning of habitat by chinook fry and steelhead smolts minimizes direct interaction between the two species.

limit interaction and opportunity for predation. Naturally produced steelhead fry generally emerge during June, after a high proportion of released hatchery steelhead smolts has migrated from the system. Yearling natural steelhead in areas accessible by migrating smolts achieve lengths of 80 to120 mm by the time of smolt releases making them less vulnerable to predation due to their size and ability to avoid predators. Bull trout fry tend to maintain themselves in headwater spawning areas and thus avoid interaction with smolts.

A varying percentage of hatchery steelhead releases do not migrate. ODFW considers hatchery steelhead remaining after June 15 to be residuals. These fish, by remaining in the Grande Ronde have an increased opportunity to interact with juveniles listed fish. Although most residual rates 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).

Studies of the effect of size at release and acclimation on rates of hatchery steelhead residualism have been conducted in Idaho, Washington, and Oregon. Results are in some cases contradictory. Larger smolts may residualize at a higher rate than smaller smolts (Partridge 1985, 1986) although some minimum size is necessary for outmigration (Crisp and Bjorn 1978). In northeast Oregon, ODFW found that residual steelhead remaining two to five months after release were significantly smaller at release than the mean length of the release group as a whole (Jonasson et. al. 1993, 1994 and 1995). This study forms the basis for our proposed shift from hatchery releases of 5/lb. to 4/lb. smolts. Results of residualism studies suggest that direct stream releases residualize at a higher rate than acclimated fish (Schuck 1993; Jonnason et. al. 1995).

Steelhead residuals normally 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 within about 8km of the 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. 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 (Whitesel et al. 1993).

The number of residual steelhead appears to decline steadily throughout the summer in most Snake River basin release areas. This may be due to harvest, other mortality, and outmigration. Partridge (1986) noted that where harvest was heavy virtually no steelhead were present for harvest after ten weeks in the upper Salmon River. In the East Fork Salmon River, where harvest pressure was light, he found residuals in the harvest sixteen weeks after the late May 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 Big Canyon 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

The LSRCP program funded studies in Oregon, Washington, and Idaho to evaluate food habits of steelhead smolts and residuals. Whitesel et al. (1993) sampled 676 steelhead stomachs (65 smolts and 611 residuals) during spring of 1992 through spring of 1993. Stomachs were taken from smolts collected at the screw trap operated by Nez Perce tribe at mile 4 of the Imnaha River. None of the smolt stomachs sampled contained fish. Residuals were sampled by angling and electrofishing in the Imnaha and Grande Ronde basins. No chinook were observed in any of the stomachs of residuals although 54 (8.0%) contained fish (mainly sculpins) and 8 (1.2%) contained salmonids (rainbow or whitefish). Subsequent sampling in 1993 resulted in examination of 358 residual hatchery steelhead stomachs. Fish or fish parts were found in only three stomachs including one 63mm steelhead and sculpins (Jonasson et. al. 1994). Residual steelhead do not appear to prey on juvenile chinook in northeast Oregon and have low rates of predation on other salmonid.

Competition - Hatchery steelhead smolts have the potential to compete with chinook, natural steelhead and bull trout juveniles for food, space, and habitat. Canamela (1992) concluded that effects of behavioral and competitive interactions would be difficult to evaluate or quantify. If significant interaction does occur, it is restricted to a short duration as smolts move downstream or to the immediate vicinity of release sites due to the limited dispersal of residual steelhead. The size difference between residual steelhead and chinook fry will probably result in selection of different habitat areas (Bjorn and Reiser 1991) and further reduce the likelihood of interactions between species. Direct competition between hatchery smolts or residuals and natural smolts and rearing juveniles is likely due to the substantial overlap in macro and microhabitat. A study of interaction between resident rainbow and hatchery steelhead residuals concluded that in a situation where the two were held together in pens growth of the smaller resident rainbow showed decreased growth when compared to controls (McMichael, et. al. 1997). This suggests similar influence on smaller juvenile steelhead. In a natural situation juvenile fish can move to alternate habitats to avoid the negative interaction. Although the ultimate result of this type of interaction in the natural environment is unknown, shifts to what may be less suitable habitat may also result in impacts to growth.

Bull trout associated with areas influenced by residual hatchery steelhead are generally fluvial adults and are more likely to out compete and prey on hatchery steelhead due to a significant size advantage.

Disease - Hatchery operations potentially amplify and concentrate fish pathogens that could affect wild chinook, listed adult and juvenile steelhead and bull trout growth and survival. Because the hatchery produced summer steelhead for the Grande Ronde mitigation program are reared at Irrigon Hatchery, outside these watersheds of concern, disease impacts by these stocks on chinook in these basins are almost nonexistent. Irrigon is supplied with well water; thus occurrences of diseases and the presence of pathogens and parasites are infrequent. When infestations or infections have occurred, they have been effectively treated due to the almost losses. Documentation of disease status in these stocks is accomplished through monthly and preliberation fish health examinations. No transfers of steelhead juveniles with known clinical infections or infestations have been made to the Grande Ronde basin from Irrigon.

When steelhead from Irrigon are acclimated at sites on the Wallowa River for over 30 days, a preliberation fish health examination is also conducted. Over the past six years, when these preliberation examinations were done, there has been no indication that acclimated fish acquired any infectious agents or parasites. Cold water temperatures at this time of year are not conducive to such processes. However, several adults that returned from these releases have tested positive for *Myxobolus cerebralis*, the causative agent of whirling disease, suggesting an infection during acclimation.

Returning adult summer steelhead held for artificial spawning at Wallowa and Big Canyon potentially create a concentrated source for the pathogens and parasites they carry. The increase in risk posed to natural chinook, steelhead and bull trout by these fish is considered minimal for several reasons. First, it is unlikely that the hatchery steelhead adults that return to the production facilities harbor any agents that naturally spawning steelhead do not also carry. Second, cold water temperatures during the winter and early spring holding season for steelhead adults are, again, not conducive to infectious processes. This reduces the potential for transmission between adults in holding ponds and from those fish to fish in the natural habitat. Documentation of the disease status of the adult steelhead stocks is accomplished through annual fish health examinations of both spawning adults and pre-spawning mortality. Results of these examinations over the past five years indicate a low prevalence and incidence of serious fish pathogens and parasites in these stocks.

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 combined Grande Ronde and Little Sheep Creek steelhead programs occur at Wallowa and Irrigon Hatchery. The facilities were designed for a combined program production of 1.68 million smolts at 5 fpp. (1.35 million smolts for the Grande Ronde program). Initial incubation (green to eyed egg) occurs at Wallowa Hatchery on spring 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 on occurs at Irrigon Hatchery using 5 cfs of temperature controlled well water. Rearing at Irrigon is accomplished in 32 raceways and 68 circular starter tanks with an approximate total water supply of 46.6 cfs 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 and Deer Creek for Wallowa Hatchery and Big Canyon facilities, respectively (Christianson 1994). Water use for those facilities is 12 cfs quality at both acclimation facilities. Discharge water quality likely exceeds NPDE permit standards at times due to the poor quality of inflow water. Associated with warmer water conditions during the later acclimation period, dissolved oxygen has reached critical levels in the lower of two acclimation ponds at Wallowa Hatchery. Adjustment in numbers between acclimation groups and ponds resulted in lower rearing densities in the lower ponds and has alleviated this problem. Reduced program smolt production will allow additional flexibility in this effort.

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 these locations meets NMFS screening criteria and minimizes risk to wild steelhead, chinook and bull trout encountering the intake. Water withdrawals for acclimation utilize substantial portions of natural flow from both Spring Creek and Big Canyon. However, adequate instream flow is maintained to provide rearing habitat within the bypass reach at both sites. Stocking densities in the acclimation ponds are adjusted to maintain quality of outflow water.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).
See 2.2.3

Adults are collected at Wallowa Hatchery and Big Canyon facilities. Both 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 Wallowa River and Deer Creek is diverted through the trap and ladder at Wallowa and Big Canyon, respectively. The trap at Wallowa Hatchery is 25'x8.6'x4.33' and at Big Canyon 30'x10'x4.5'.

Adult collections commence as soon as river conditions allow, typically in mid-February, and continue through May. Peak collection occurs in late March and early April.

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

A number of different transportation equipment is used transfer or release fish.
- Adults are transported tanker trucks ranging in size from 200 to 1400 gallon capacity.
- Eggs are transported in 10 gallon coolers
- Fingerlings and smolts are transported in tanker trucks ranging in size form 2400 to 5000 gallon capacity.

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

Adults are held at maximum densities of 2.5 ft^3/fish and 2 gpm per fish.

5.4) Incubation facilities.

Incubation facilities for the combined Imnaha and Grande Ronde steelhead program include:

- Wallowa Hatchery incubation facilities consist of 228 vertical incubation trays. Eggs are incubation to eyed stage when they are transferred to Irrigon Hatchery. Eggs are cooled with ice and transferred in coolers via truck.
- Irrigon Hatchery incubation facilities consist of 288 vertical trays. Eggs are incubated from the eyed to emerging fry.

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
- (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.

- Water quality related disease events occur occasionally during smolt acclimation at Wallowa Hatchery. 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.
- Smolt losses due to low DO conditions in the lower of two acclimation ponds at Wallowa Hatchery has occurred in some years. Holding densities have been modified to address this issue.
- Freezing and low water temperatures on Deer Creek (Big Canyon) have resulted in fish loss.

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,

6.1) Source.
Snake River

6.2) Supporting information.

6.2.1) History.
The Wallowa stock originated from collections of adults during the spring at Ice Harbor (1976) and Little Goose (1977, 1978) dams as will as embryos from Pahsimeroi Fish Hatchery (ID) (1979) (Table 10). Since 1979 Wallowa stock adults returning to Wallowa Hatchery, Big Canyon, and Cottonwood traps have been utilized as broodstock. We have attempted to maintain hatchery return timing characteristics through incorporation of adults from across the run.

Table 10. Broodstock history for females spawned to initiate the Wallowa summer steelhead stock (# 56).

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

6.2.2) Annual size.
Annual broodstock needs for the proposed reduced program include on average: 230 females and 240 males to meet 870,000 fish production level.

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

Natural fish were last incorporated into the broodstock in 1979. Since then hatchery broodstock has consisted entirely of hatchery origin fish returning to Wallowa Hatchery, Big Canyon or Washington's Cottonwood Creek facility. Future broodstock can consist of hatchery produced fish collected from the Lower Grande Ronde River during the early fall and at existing trapping facilities.

6.2.4) Genetic or ecological differences.

Genetic information describing natural Grande Ronde basin steelhead and the Wallowa hatchery stock is limited. However, analysis by Waples (NMFS, pers. com.) detected consistent genetic differences between samples collected from Chesnimnus Creek (Joseph Creek tributary) and Wallowa hatchery stock steelhead samples. While samples allowed to move above the weir in Deer Creek and spawn naturally. Given these findings, it is likely that further sampling and analysis within the basin would underscore the differentiation between hatchery and wild fish within the basin. Further sampling is also likely to identify other areas where hatchery spawners resulting from intentional adult releases or past direct stream release of smolts have influenced the genetic make-up of natural populations.

As a result of initial hatchery broodstock collection from the later part of the run (during the spring at lower Snake River Dams), hatchery adults tend to return to the Grande Ronde River later than natural adults. This tendency to spend more time in the Columbia River and Snake River likely contributes to the current Wallowa stock's propensity to stray into 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. Proposed modified broodstock collection and expected return timing modification should reduce an identified problem with adult straying into other Columbia River tributaries while maintaining program harvest opportunity.

6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.
Only hatchery origin adults will be collected for broodstock. Collection of earlier returning hatchery adults from the Lower Grande Ronde River as hatchery broodstock has a high likelihood of reducing the 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).
Adults

7.2) Collection or sampling design.

All adult hatchery origin Wallowa stock steelhead are collected from Wallowa Hatchery and Big Canyon weir/trap facilities. Collection begins in mid February and continues 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. Approximately 40 females and 40 males are spawned each week.

Adults returning above broodstock needs are considered surplus and out planted in closed water bodies or carcasses distributed to the local food bank.

All hatchery fish released receive an adipose fin clip and are easily differentiated from wild fish. In addition, a ventral fin is clipped to identify fish implanted with a coded wire tag (CWT).

7.4) Proposed number to be collected:

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

Broodstock consists of 230 females and 240 males on average. The difference in collection number is due to the synchronicity of in ripeness and pre-spawn mortality by sex.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1989-00), or for most recent years available:

Table 11. Adults spawned and eggs and juveniles produced in the Grande Ronde summer steelhead hatchery program, 1988-2000 and juveniles produced

Brood Year	Adults Females	Adults Males	Adults Jacks	Eggs	Juveniles[1] (smolts)
1989	457	300	0	2,225,350	1,227,537
1990	569	361	0	2,455,822	1,178,710
1991	789	473	0	2,763,054	1,188,519
1992	594	402	0	2,531,788	1,404,530
1993	514	350	0	2,166,754	1,350,418
1994	680	239	0	3,300,340	1,124,111
1995	396	375	0	1,602,367	1,323,668
1996	592	605	0	2,781,565	1,308,405
1997	544	530	0	2,786,600	1,378,301
1998	579	584	0	2,883,300	1,252,976
1999	491	470	0	2,482,385	1,250,459
2000	418	405	0	2,046,530	891,978
2001	229	232	0	1,155,992	848,947

[1] Additional production released at earlier life stages (Table 18).

Data source: hatchery records – Greg Davis, 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 broodstock will be killed and donated to local food bank, deposited in landfills, or utilized in a yet to be developed stream nutrient enhancement program.

7.6) Fish transportation and holding methods.

Hatchery adults collected in the Lower Grande Ronde River will be held in tubes after capture, transported, in water, and loaded by hand into transport vehicles within 6 hours of capture. Fish will be held for a varying length of time up to 4 hours in the transport tank prior to movement to Wallowa. Adults collected at Big Canyon are held in the concrete trap for up to one week, netted and transferred by hand to transport vehicles. Transport time from the Lower Grande Ronde and Big Canyon to Wallowa Hatchery is 1.5 and 0.5 hours, respectively.

Adult holding occurs at Wallowa Hatchery in facilities described in section 5.3 for up to 8 months prior to spawning.

7.7) Describe fish health maintenance and sanitation procedures applied.

There are no disease treatments given to adult steelhead.

Table 12. Five year 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
Aeromonas salmonicida	Yes	No	No	No
Aeromonas/Pseudomonas	Yes	Yes	Yes	Yes
Flavobacterium psychrophilum	Yes	Yes	Yes	Yes
Fl. columnare	No	No	No	No
Renibacterium. salmoninarum	Yes	No	No	No
Yersinia ruckeri	Yes	No	No	No
Carnobacterium sp.	Yes	No	No	No
Ichthyobodo	No	No	No	No
Gyrodactylus	No	No	No	No
Ichthyophthirius multifilis	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	No	No	No
Internal Fungi	No	Yes	No	No
Myxobolus cerebralis	Yes	No	No2	No2
Ceratomyxa shasta	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.

Table 13. The co-managers in this program explain Wallowa steelhead fish health monitoring plan in the Lower Snake Program Operation Plan document developed annually. These monitoring plans are consistent with monitoring plans developed by the Integrated Hatchery Operations Team for the Columbia Basin anadromous salmonid hatcheries (see Policies and Procedures for the Columbia Basin anadromous Salmonid Hatcheries, Annual Report 1994. Bonneville Power Administration).

- 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 when possible.
- Findings and results of fish health monitoring will be recorded on a standard fish health reporting form and maintained in a fish health database.
- Fish culture practices will be 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 from this stock were used for nutrient enrichment there would be enhanced fish health monitoring requirements. Carcasses would need to be labeled and frozen for identification until laboratory results are complete and only carcasses cleared for out-planting could be used. All fish should be sampled for *Myxobolus cerebralis* (whirling disease). No fish determined to be positive for *M. cerebralis* spores would be used for this purpose. Other monitoring plans would be consistent with guidelines for the use of adult salmon and steelhead carcasses for nutrient enrichment (ODFW memorandum November 7, 2000). For example, if IHNV is found during a given spawning season and the prevalence exceeds 30% then carcasses could no longer be used for this purpose for that spawning season.

Spawned carcasses and carcasses of surplus adults killed can be donated to local food bank, hauled to local landfills or frozen and included as part of a yet to be established stream nutrient enrichment program.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.
All unmarked naturally produced steelhead adults encountered at the traps will be opercal punched and released above the weir. Tissue from opercal punches is preserved for use in 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 randomly by broodstock from ripe fish sorted on spawning day.

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.
Target equal sex ratio 1 male to 1 female. Crosses are individual mating. In 2002, 2 males were used per females due to low motility observed in males; however, the results indicated that there was no survival advantage to the eyed egg stage. 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:

An estimated collection of 1,100,000 green eggs is required to produce 870,000 smolts (79%). Recent survival from green egg to smolt has averaged better than 85%. Most recent five year average green egg to eyed egg survival is 89% (Table 14) (Davis ODFW, pers.com., Flesher, ODFW, pers. com. and Messmer et. al. 1991, 1991 and 1993). This survival rate will result in 980,000 eyed eggs shipped from Wallowa Hatchery to Irrigon Hatchery for final incubation and rearing. Our estimate of 89% survival from eyed-egg to smolt yields 872,200 smolts.

Table 14. Survival rate for Wallowa stock steelhead incubated to eyed stage at Wallowa Hatchery and incubated to swim-up and reared at Irrigon Hatchery, 1988-2002.

Brood Year	**Survival Rate**	
	Green to eyed	**Eyed to smolt**
1988	0.75	0.60
1989	0.69	0.58
1990	0.81	0.61
1991	0.91	0.75
1992	0.85	0.59
1993	0.74	0.92
1994	0.81	1.00
1995	0.86	0.98
1996	0.89	1.00
1997	0.92	N/A
1998	0.90	N/A
1999	0.90	N/A
2000	0.89	N/A
2001	0.87	0.89
2002	0.91	

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

The program uses an 89% green egg to eyed egg survival (11% loss) and 89% eyed egg to smolt survival (11% loss) to estimate egg take needs. Under estimation of fecundity, shifts in age structure and improved survival may result in egg takes that exceed program needs. We attempt of identify program surplus and kill and/or dispose of the eggs or fish at the earliest possible date. Care is taken in this process to select groups for removal from across the run. Grading has occurred during rearing in order to avoid bimodal growth in rearing ponds. Rearing groups are graded and ponded by size after grading. In some years, approximately 10,000 to 20,000 of the smallest fish graded out from the population and eliminated from the program. These fish are either killed or utilized for stocking in standing waterbodies.

9.1.3) Loading densities applied during incubation.

Table 15. Incubator flow, eggs/tray, egg size and effluent dissolved oxygen for steelhead eggs incubated at Wallowa Hatchery, 1988-2002 (Davis, pers. comm.)

Year	GPM per tray	Eggs per tray	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	7.94 - 7.20	7.2 - 8.6
1991	3.5	11,500-16,000	8.40 - 6.81	7.2 - 8.6
1992	4.0	11,500-16,000	10.23 - 7 .20	7.2 - 8.6
1993	4.0	11,500-16,000	10.23 - 7.62	7.2 - 8.6
1994	4.0	11,500-16,000	8.32 - 6.46	7.2 - 8.6
1995	4.0	11,500-16,000	10.44 - 7.55	7.2 - 8.6
1996	3.5	11,500-16,000	10.08 - 8.82	7.2 - 8.6
1997	4.0	11,500-16,000	11.63 - 9.4	7.2 - 8.6
1998	4.0	11,500-16,000	11.63 - 9.35	7.2 - 8.6
1999	4.0	11,500-16,000	12.93 - 9.68	7.2 - 8.6
2000	4.0	11,500-16,000	13.0 - 9.3	7.2 - 8.6
2001	4.0	11,500-16,000	12.3 - 9.7	7.2 - 8.6
2002	4.0	11,500-16,200	10.8 - 9.6	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 16).

Table 16. 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

Wallowa and Irrigon Hatcheries – Water temperature is continuously monitored via recording thermograph or set via chillers. Dissolved oxygen is monitored, but has never presented a problem for egg survival.

9.1.5) Ponding.

Fry are ponded at about 950 TU @ 2800fpp
This occurs mid to late June and is forced ponding

9.1.6) Fish health maintenance and monitoring.

Disease treatments for Wallowa steelhead eggs are given at Wallowa and Irrigon

treated with formalin at target dose of 1667 ppm (1:600) for 15 minutes. Treatments three times per week have shown to prevent excessive fungus problems. Eyed eggs are transferred to Irrigon Hatchery and upon arrival are disinfected in 75 ppm iodophor for 10 minutes. Formalin treatments @ 1667 ppm are continued three times per week until hatch, which is usually no more than two weeks after arrival to Irrigon Hatchery.
See section 7.7

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.
N/A

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 12.

9.2.2) Density and loading criteria (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:

42,500 @ 5 fpp = 8500 lbs/pond
1500gpm/pond = 5.66 lbs/gpm
7000 ft.^{3}/pond = 1.21 lbs/ ft.^{3}

During peak loading LOX is used 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 to 62°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.

Month	Fish /Pound
June	1982
July	415
Aug	118
Sept	65
Oct	28
Nov	15
Dec	10
Jan	6
Feb[1]	5
Mar[1]	5
Apr	5

[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.
Growth is fairly constant. In October fish are programmed for size at release and fed no less than 70% AGR.

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 Bio Diet Starter then switched to Silver Cup Salmon from 800 fpp to smolt.
– Feed rate:
  Start - 5.0% B.W./day
  End - 0.9% B.W./day
– The feed is distributed to the raceways with Garon feeders.
– Food conversions are 1.1

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
See section 7.7

Juvenile fish are treated for bacterial infections if necessary with oxytetracycline under an Investigational New Animal Drug Permit (INAD).

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 will allow lower density rearing within existing facilities.

likelihood for adverse genetic and ecological effects to listed fish under propagation.
N/A

<u>SECTION 10. RELEASE</u>

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

10.1) Proposed fish release levels

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Unfed Fry	400	2800	Early June	Marr and Wallowa Wildlife ponds, Wallowa Watershed
Fingerling	20,000	30	September	Local standing waters (surplus to smolt production goals)
Yearling	20,000	5	April and May	Local standing waters
Yearling	1,300,000	5	April and May	Acclimation facilities in the Wallowa Watershed

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

Stream, river, or watercourse: Wallowa River (HUC-17060105) tributary, Spring Creek
Release point: RK 1
Major watershed: Grande Ronde River
Basin or Region: Columbia

Stream, river, or watercourse: Wallowa River (HUC-17060105) tributary, Deer Creek
Release point: RK 0.1
Major watershed: Grande Ronde River
Basin or Region: Columbia

Table 17. Release numbers for some fry and smolts produced by the Wallowa stock steelhead hatchery program, 1988-2000 (Davis, ODFW, pers. comm.).

Release year	Fry	Avg size	Yearling[1]	Avg size (fpp)
1988	38,928	N/A	1,178,605	4.92
1989			1,227,537	4.80
1990			1,178,710	4.80
1991			1,188,519	4.82
1992			1,404,530	4.85
1993			1,350,418	4.98
1994			1,124,111	4.24
1995			1,323,668	4.87
1996			1,308,405	4.72
1997			1,378,301	5.02
1998			1,252,976	4.79
1999			1,250,459	4.71
2000			891,978	3.98

[1] Acclimated smolt releases

[2] Direct stream smolt releases

Table 18. Recent release numbers, location and size for Wallowa stock steelhead releases other than smolts (Flesher, ODFW, pers. com.).

Brood Year	Facility	Release Date	Location	Number Released	Lbs. Released	# / Lbs.
1990	Irrigon H	11/20/90	Snake River	140,787	2,617	53.80
	Irrigon H	03/27/91	Columbia River	8,400	1,400	6.00
1991	Irrigon H	11/14/91	Snake River	422,748	86,133	4.91
1994	Wallowa H	05/26/94	Marr Pond	80	Fry	
1995	Wallowa H	07/03/96	Wallowa Lake	2,933	946	3.10
1996	Wallowa H	06/10/97	Kinney Lake	5,029	932	5.40
	Wallowa H	05/03/96	Marr Pond	97	Fry	
	Wallowa H	05/10/96	Wallowa Wildlife Pond	92	Fry	
1997	Big Canyon	5/28/98	Roulet Pond	2,188	500	4.38
	Wallowa H	05/13/97	Marr Pond	77	Fry	
	Wallowa H	05/15/97	Wallowa Wildlife Pond	93	Fry	
1998	Big Canyon	06/09/99	Kinney Lake	2,571	415	6.20
	Wallowa H	05/15/97	Roulet Pond	178	Fry	

increases in flow which occurs 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. Smolts are transferred to acclimation facilities three to six weeks prior to target release date. After being held for several weeks they are allowed to move volitionally into the receiving stream. Smolts remaining after the one week volitional period are sub-sampled to determine sex ratio. If males comprise 70% or more of fish remaining, the group is transferred to a standing waterbody and not released as smolts. Otherwise the group is forced out of the acclimation pond and released.

Table 19. Forced release times for Wallowa stock hatchery steelhead smolts acclimated and released at Wallowa Hatchery and Big Canyon, 1996-2000.

Year	Forced release date first acclimation period		Forced release date second acclimation period	
	Wallowa	Big Canyon	Wallowa	Big Canyon
1996	April 8-9	April 8-9	May 13	May 5
1997	April 1-2	April 8-9	May 15-16	May 20-21
1998	March 24-25	March 31 to April 1	May 1-2	May 12-13
1999	March 31 to April 6	March 7-8	May 12-13	May 19-20
2000	April 5-6	April 12-13	May 3-4	May 10-11
2001	April 4-6	April 11-13	May 2-17	May 9-24
2002	April 3-5	April 10-12	May 1-16	May 8-23

10.5) Fish transportation procedures, if applicable.
Smolts are transported via tanker trucks ranging in size from 2,000 to 5,000 gallon capacity from Irrigon Hatchery to acclimation facilities. Transportation criteria is described in the Oregon State Liberation Manual. Maximum loading is 1 pound per gallon.

10.6) Acclimation procedures
Smolts are transported to acclimation facilities from 3 to 6 weeks prior to intended release date. After being held for a minimum of two weeks smolts are allowed to migrate from acclimation facilities on their own volition. Smolts are fed daily until the initiation of this volitional release period. At the end of the release period, fish remaining in the acclimation ponds are sampled to determine sex ratio. In the past males dominate some groups remaining in the facilities. Whitesel et. al.(1993) and Jonasson et. al. (1994) and (1995) found that the majority of residual smolts originated from male fish in the release groups. As a result, when the proportion of males is 70% or greater of fish remaining after the release period those fish are released into standing waters to supplement trout fisheries and not released with other smolts. This action further reduces the number and density of residual hatchery fish. If the remaining fish are comprised of less than 70% males they are forced from the acclimation facility.

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

numbers adequate to provide an acceptable level of precision in estimating adult harvest and survival are marked with coded wire tags and ventral fin clip. In addition, groups are marked with passive integrated transponder 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 surplus to program needs are culled prior to reaching smolt stage. See Section 10.6.

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.

No release would occur in the case of system failure at Irrigon Hatchery during rearing. At acclimation facility 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.

A number of measures are in place to reduce impacts of smolt releases on listed fish.

- We have evaluated factors influencing residualism, monitored their density and distribution, and studied food habits of residual hatchery smolts. The hatchery program has been modified as a result of these findings (Whitesel et. al. 1993; Jonasson et. al. 1994 and 1995).
- A reduction in steelhead release numbers in the Grande Ronde system by nearly 65% from historic levels will act to further reduce impacts of the hatchery program on listed fish.
- All fish releases are at smolt stage. Smolts released from the program tend to move quickly from the system, which reduces the amount of time, hatchery fish interact with wild steelhead, spring chinook and bull trout juveniles.
- Releases occur during the period of increasing flows. This strategy provides the best opportunity for rapid movement out of the Grande Ronde River.
- We release hatchery steelhead smolts at 4 to 5 fpp. 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).
- 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.
- Volitional smolt release allows sampling of fish remaining in the acclimation ponds at the end of the release period. In the past males dominate some groups remaining in the facilities. Whitesel et. al. (1993) and Jonasson et. al. (1994) and (1995) found that the majority of residual smolts originated from male fish in the release groups. As a result, when the proportion of males is 70% or greater of fish remaining after the release period those fish are

– All hatchery fish released are marked with adipose clips.

– We have taken actions to encourage harvest of marked residual steelhead by trout anglers. We eliminated catchable trout stocking in the Wallowa River system and applied adipose clipped only trout harvest regulations on 67 miles of the Grande Ronde and Wallowa rivers to focus harvest on residual hatchery steelhead. These actions should encourage harvest of residual steelhead and reduce their abundance over the trout angling season.

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, 1.3, 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, 1.3, 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 via observation and/or trapping
(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 via observation and /or trapping
(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 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)*

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 interaction, including ratios of hatchery and wild fish in natural spawning areas and genetic monitoring will require commitment of additional resources.

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

– Wild adults intercepted at monitoring sites will be enumerated, marked and released above the collection facility within 24 hours of being captured.

SECTION 12. RESEARCH

12.1) Objective or purpose.
The ongoing LSRCP program research is designed to:

– Document hatchery rearing and 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 listed fish.
– Document the level of effectiveness of program modification in achieving desired reduction in Columbia River tributary straying.

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
- Jim Ruzycki
- Michael W. Flesher

Same as described in Section 2.

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

1. Monitoring hatchery/wild ratios in natural spawning streams - Adult steelhead will be captured and enumerated at the existing Big Canyon facility and temporary facilities placed in representative natural spawning streams across the Grande Ronde basin. See section 2.2.3.

2. Sampling to determine impacts of residual hatchery steelhead – Electrofishing, snorkeling and hook and line sampling will be used to determine distribution and relative abundance of wild *O. mykiss* and hatchery steelhead residuals in representative streams across the Grande Ronde basin. Wild juveniles will be anesthetized measured for length and released after recovery. Hatchery steelhead residuals will be taken for stomach content analysis. All sampling will occur when water temperatures do not pose additional risk to fish sampled.

3. Genetic monitoring – Wild juvenile *O. mykiss* will be sampled from various natural production areas in the course of genetic monitoring. Samples will be collected using electrofishing gear. Juvenile *O. mykiss* sampled will be captured and anesthetized with MS222 and measured for length. The adipose fin will be removed for genetic analysis and the fish allowed to recover before release.

4. Spawning surveys – In addition to adult trapping, density and hatchery/wild ration of wild spawners in natural spawning areas will be monitored via observation. See section 2.2.3.

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.

Handling of listed fish will be restricted to the site of capture. Fish will be held in containers with well-aerated water of suitable temperature. If handling involves more than determining species and enumeration, fish will be anesthetized before the procedure and allowed to recover before release. Transport well be by hand in water filled containers with a holding period of up to 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, capture handling and marking (Table 8). Injury due to capture, marking and tissue sampling is inevitable. Hooking wounds, electrofishing injury and other physical damage is generally temporary in nature. Some fish, however, succumb to the effects of such injury. 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 and are displayed in Table 8.

8).
See Table 8

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, produces increased sample bias and smaller expected sample size than 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 to labor intensive to consider feasible.

Observation via snorkeling will be used in place of electrofishing for residual sampling in streams suitable for effective use of that technique 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 number of encounters and as a result the level of mortality is expected to be on the order of 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.

- 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 or immediate mortality.
- Every effort will be made to insure that adult trapping facilities do not delay movement of listed fish, including daily trap checks.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_______________________________ Date:______________

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

15.3) 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, etc.
Predation -
Monitoring and evaluations - surveys (trap, seine, electrofish, snorkel, spawning, carcass, boat, etc.).
Habitat - modifications, impacts, quality, blockage, de-watering, etc.

15.4 Actions taken to mitigate for potential effects.

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

15.5 References