WDFW Wallowa Stock Summer Steelhead
Grande Ronde River Release
@ Cottonwood Acclimation Pond

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Grande Ronde River Summer Steelhead – Wallowa Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery**
Species or Hatchery Stock:	**Summer Steelhead - Wallowa Stock** *Oncorhynchus mykiss*
Agency/Operator:	**Washington Department of Fish and Wildlife**
Watershed and Region:	**Grande Ronde River / Snake River Basin, Washington State**
Date Submitted:	**July 31, 2002**
Date Last Updated:	**July 20, 2005**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Hatchery: Lyons Ferry Complex (LFC).
Program: Grande Ronde River Summer Steelhead – Wallowa Stock Program

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

Summer Steelhead *(O. Mykiss)*, Grande Ronde River, Wallowa Stock (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 (LSRCP) – Provides Program funding/oversight, provides coordination responsibility between all LSRCP cooperators.
2. Nez Perce Tribe (NPT) – Co-manager within the Grande Ronde Basin.
3. Confederated Tribes of the Umatilla Indian Reservation – Co-manager within the Grande Ronde Basin.
4. Oregon Department of Fish and Wildlife (ODFW) – Co-manager within the Grande Ronde Basin.

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

The Lower Snake River Compensation Plan (LSRCP – US Fish and Wildlife Service) presently funds production of these compensation program fish (Wallowa stock summer steelhead). The program was established as compensation for lost fish resources and fisheries resulting from construction and operation of hydroelectric projects in the Snake River. The LSRCP in Washington also has programs for spring and fall chinook salmon, resident trout, and other summer steelhead (Lyons Ferry Stock (LFH) Origin, Tucannon Endemic Stock, Touchet Endemic Stock).

Currently, LSRCP mitigation goals in the Washington portion of the Grande Ronde River is managed to provide 1,500 returning adult hatchery steelhead annually. Both Operational and Evaluation costs are covered by LSRCP.

The LFC staff includes the Hatchery Complex Manager, and 11 permanent fish hatchery specialists, 1 plant mechanic, and seasonal workers. Not all hatchery staff are needed for the Wallowa Stock program on an annual basis, as other programs require staff time. Annual operation and maintenance costs for the program is estimated at $135,000. A staff of 8-10 permanent and seasonal biologists and technicians conduct evaluations for each species produced at LFC. The Wallowa Stock program represents about 6.5% of the annual evaluation budget ($42,000).

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

Incubation, rearing, and marking - Lyons Ferry Hatchery – along the lower Snake River in Franklin County, Washington (RM 58)

Juvenile Acclimation and Release - Cottonwood Cr. Acclimation Pond – RM 29 on the Grande Ronde River (WRIA 35-2684), on the upstream side of the mouth of Cottonwood Creek, tributary to the Grande Ronde River, Asotin County, Washington.

Adult Collection, Holding, Spawning - Cottonwood Cr. Adult Trap – RM 0.25 on Cottonwood Creek, Asotin County, Washington.

1.6) Type of program.

Mitigation / Isolated Harvest

1.7) Purpose (Goal) of program (based on priority).

1. **Mitigation / Isolated Harvest:** Continue to provide mitigation goals as specified under the LSRCP program (USACE 1975) while meeting conservation and recovery criteria established for the Grande Ronde River and Snake River summer steelhead ESU. Provide harvest opportunities established under *US v Oregon* for tribal and recreational fisheries.

1.8) Justification for the program.

Congress authorized the Lower Snake River Project on March 2, 1945 by Public Law 14, 79th Congress, First Session. The project was authorized under the Rivers and Harbors Act of 1945. It consists of Ice Harbor Dam (IHR), completed in 1962; Lower Monumental Dam, 1969; Little Goose Dam, 1970 and Lower Granite Dam, 1975. The project affected over 140 miles of the Snake River and tributaries from Pasco, Washington to upstream of Lewiston, Idaho. The authorized purposes of the project were primarily navigation and hydroelectric power production. The original authorizing legislation for the project made no mention of fish and wildlife measures needed to avoid or otherwise compensate for the losses or damage to these important resources.

The Fish and Wildlife Coordination Act (FWCAR) of 1958 (48 Stat. 401, 16 U.S.C. 661 et seq. as amended) requires an analysis of fish and wildlife impacts associated with federal water projects as well as compensation measures to avoid and/or mitigate for loss of or damage to wildlife resources (refer to Section 662 (b) of the Act). The U. S. Fish and Wildlife Service (USFWS) and NMFS provided the U.S. Army Corps of Engineers with a FWCAR on the Lower Snake River Project in 1972. Using the FWCAR, the U.S. Army Corps of Engineers (COE) wrote a report to Congress in 1975 (USACE 1975) detailing losses of fish and wildlife attributable to the Project. Congress authorized the LSRCP as part of the Water Resources Development Act of 1976 (Public Law 94-587).

The LSRCP is funded by the USFWS through the LSRCP Office with power production revenues provided by the Bonneville Power Administration. The WDFW administers and implements Washington's portion of the program. Specific mitigation goals include "in-place" and "in-kind" replacement of adult salmon and steelhead. The LSRCP program for steelhead and trout in Washington was begun in 1982 and for salmon in 1984. The LSRCP program in Washington has been guided by the following objectives: 1) Establish broodstock(s) capable of meeting egg needs, 2) Maintain and enhance natural populations of native salmonids, 3) Return adults to the LSRCP area which meet designated goals, and 4) Improve or re-establish sport and tribal fisheries.

. *Indicate how the hatchery program will be operated to provide fish for harvest while minimizing adverse effects on listed fish (integrated or isolated harvest programs).*

The Wallowa Stock Summer Steelhead Program provides adult steelhead for recreational and tribal harvest within the LSRCP compensation area (Snake River and tributaries above Ice Harbor Dam), and in the Columbia River. The program utilizes a non-endemic steelhead hatchery stock originally collected from Lower Snake River dams. Currently, hatchery origin adults trapped at Cottonwood Creek Adult Trap are used for the broodstock and natural origin adults (though likely produced from Wallowa Stock Hatchery parents spawning in Cottonwood Creek) are allowed to spawn naturally in Cottonwood Creek each year. In addition, during extreme low water years (times when there is little water in Cottonwood Creek), eggs may also be collected at the Oregon Department of Fish and Wildlife Wallowa Hatchery (same stock). A large portion of returning hatchery origin adults are released into Cottonwood Creek to "isolate" excess hatchery adults that have escaped the fishery to Cottonwood Creek to lessen any negative impacts on natural steelhead populations in the Grande Ronde River.

All hatchery smolts released for the program are acclimated on site (Cottonwood AP) for an extended period of time to provide adequate imprinting for returning adults so they will have less chance of straying into other rivers. Further, the program emphasis has been to release smolts at 4.5 fish/pound to 1) reduce residualism, 2) produce fish that are ready to migrate quickly from the area, 3) reduce interactions with natural salmon and steelhead in the Grande Ronde River, 4) increase smolt-to-adult survival of the hatchery reared smolts to increase hatchery cost-efficiency, and 5) meet adult return mitigation goals.

Within the last four years, smolt production numbers have been reduced to lessen the potential impacts to listed populations nearby. From these reductions, we expect adult returns in future years to decrease in total numbers. Meanwhile, harvest limits in the lower Snake and Grande Ronde rivers have been increased (3 fish/angler/day) in an attempt to remove more harvestable fish from the system (See WDFW Snake River FMEP)

1.9) List of program "Performance Standards".

(From NMFS *Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest*, January 17, 2001)

3.1 Legal Mandates
3.2 Harvest
3.3 Conservation of Wild/Naturally Spawning Populations
3.4 Life History Characteristics
3.5 Genetic Characteristics
3.6 Research Activities
3.7 Operation of Artificial Production Facilities
3.8 Socio-economic Effectiveness

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

1.10.1) "Performance Indicators" addressing benefits.

3.1 LEGAL MANDATES

3.1.2 Standard: Program contributes to mitigation requirements.

Indicator 3.1.2a: Number of fish released by program, returning, or caught, as applicable to given mitigation requirements.

3.1.3 Standard: Program addresses ESA responsibilities.

Indicator 3.1.3a: ESA consultation(s) under Section 7 have been completed, Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.

3.2 HARVEST

3.2.1 Standard: Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.

Indicator 3.2.1a: Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.
Indicator 3.2.1b: Annual numbers of each non-target species caught (including fish retained and fish released/discarded) in fisheries targeting this population.
Indicator 3.2.1c: Recreational angler days, by fishery.
Indicator 3.2.1d: Catch per unit effort, by fishery.

3.2.2 Standard: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.

Indicator 3.2.2a: Marking rate by mark type for each release group.
Indicator 3.2.2b: Sampling rate by mark type for each fishery.
Indicator 3.2.2c: Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery.

3.3 CONSERVATION OF WILD/NATURALLY SPAWNING POPULATIONS

3.3.2 Standard: Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.

Indicator 3.3.2a: Marking rates and type of mark.
Indicator 3.3.2b: Number of marks and estimated total proportion of this population in juvenile dispersal and in adults on natural spawning grounds.

3.4 LIFE HISTORY CHARACTERISTICS

3.4.1 Standard: Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of the population from which broodstock is taken.

Indicator 3.4.1a: Temporal distribution of broodstock collection, and of naturally produced population at point of collection.
Indicator 3.4.1b: Age composition of broodstock collected, and of naturally produced population at point of collection.

3.4.4 Standard: Annual release numbers do not exceed estimated basin-wide and local habitat capacity, including spawning, freshwater rearing, migration corridor, and estuarine and near-shore rearing.

Indicator 3.4.4a: Annual release numbers from all programs in basin and subbasin, including size and life-stage at release, and length of acclimation, by program.
Indicator 3.4.4b: Location of releases and natural rearing areas.
Indicator 3.4.4c: Timing of hatchery releases, compared to natural populations.
Indicator 3.4.4d: Migration behavior of releases from this program.

3.5 GENETIC CHARACTERISTICS

3.5.3 Standard: Artificially produced origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.

Indicator 3.5.3a: The ratio of observed and/or estimated total numbers of artificially produced fish on natural spawning grounds, to total number of naturally produced fish, for each significant spawning area.
Indicator 3.5.3b: Observed and estimated total numbers of naturally produced and artificially produced adults passing a counting station close to natural spawning areas.

3.5.4 Standard: Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.

Indicator 3.5.4a: Location of juvenile releases.
Indicator 3.5.4b: Length of acclimation period.
Indicator 3.5.4c: Release type, whether forced, volitional, or direct stream release.
Indicator 3.5.4d: Proportion of adult returns to program's intended return location, compared to returns to unintended dams, fisheries, and artificial or natural production areas.

3.5.5 Standard: Juveniles are released at fully smolted stage.

Indicator 3.5.5a: Level of smoltification at release, compared to a regional smoltification index (when developed). Release type, whether forced, volitional, or direct stream release.

3.7 OPERATION OF ARTIFICIAL PRODUCTION FACILITIES

3.7.1 Standard: Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.

Indicator 3.7.1a: Annual reports indicating level of compliance with applicable standards and criteria.
Indicator 3.7.1b: Periodic audits indicating level of compliance with applicable standards and criteria.

3.7.2 Standard: Effluent from artificial production facility will not detrimentally affect natural populations.

Indicator 3.7.2a: Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.

3.7.3 Standard: Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.

Indicator 3.7.3a: Water withdrawals compared to applicable passage criteria.
Indicator 3.7.3b: Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria.
Indicator 3.7.3c: Number of adult fish aggregating and/or spawning immediately below water intake point.
Indicator 3.7.3d: Number of adult fish passing water intake point.
Indicator 3.7.3e: Proportion of diversion of total stream flow between intake and outfall.

3.7.5 Standard: Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.

Indicator 3.7.5a: Number and location(s) of carcasses or other products distributed for nutrient enrichment.
Indicator 3.7.5b: Statement of compliance with applicable regulations and guidelines.

3.7.8 Standard: Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.

Indicator 3.7.8a: Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.

3.9 SOCIO-ECONOMIC EFFECTIVENESS

3.8.1 Standard: Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.

Indicator 3.8.1a: Total cost of program operation.

Indicator 3.8.1b: Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.

3.8.2 Standard: Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.

Indicator 3.8.2a: Total cost of program operation.

Indicator 3.8.2b: Average total cost of activities with similar objectives.

3.8.3 Standard: Non-monetary societal benefits for which the program is designed are achieved.

Indicator 3.8.3a: Number of adult fish available for tribal ceremonial use.

Indicator 3.8.3b: Recreational fishery angler days, length of seasons, and number of licenses purchased.

WDFW will use the above indicators to determine whether the program has provided expected benefits. The ability to estimate such indicators will be determined by implementation plans, budgets, and assessment priorities.

1.10.2) "Performance Indicators" addressing risks.

3.2 HARVEST

3.2.1 Standard: Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.

Indicator 3.2.1a: Annual escapements of natural populations that are affected by fisheries targeting program fish.

3.3 CONSERVATION OF WILD/NATURALLY SPAWNING POPULATIONS

3.3.1 Standard: Artificial propagation program contributes to an increasing number of spawners returning to natural spawning areas.

Indicator 3.3.1a: Annual number of spawners on spawning grounds, by age.

Indicator 3.3.1b: Spawner-recruit ratios.

Indicator 3.3.1c: Annual number of redds in selected natural production index areas.

3.4 LIFE HISTORY CHARACTERISTICS

3.4.2 Standard: Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.

Indicator 3.4.2a: Number of spawners of natural origin removed for broodstock.

Indicator 3.4.2b: Number and origin of spawners migrating to natural spawning areas.

3.4.3 Standard: Life history characteristics of the natural population do not change as a result of this artificial production program.

Indicator 3.4.3a: Specific life history characteristics to be measured in the artificially produced population include:

- Juvenile migration timing
- Juvenile size at outmigration
- Adult return timing

- Adult return age and sex composition
- Adult size at return
- Spawn timing, distribution
- Juvenile rearing densities
- Juvenile growth rate, condition factors, and survivals at several growth stages prior to final release
- Adult physical characteristics (length)
- Fecundity and egg size

3.5 GENETIC CHARACTERISTICS

3.5.1 Standard: Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.

Indicator 3.5.1a: Genetic profiles of naturally produced adults, as developed at program's outset (e.g. through DNA or allozyme procedures) and compared to genetic profiles developed each generation.

3.5.2 Standard: Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.

Indicator 3.5.2a: Total number of natural spawners reaching the collection facility.
Indicator 3.5.2b: Total number of spawners estimated to pass the collection facility to spawning areas, compared to minimum effective population size (when established) required for those natural populations.
Indicator 3.5.2c: Timing of collection compared to overall run timing.

3.5.6 Standard: The number of adults returning to the hatchery that exceeds broodstock needs is declining.

Indicator 3.5.6a: Number of adults available for broodstock (moving geometric mean, based on number of ages at return for this species).

3.6 RESEARCH ACTIVITIES

3.6.1 Standard: The artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.

Indicator 3.6.1a: Scientifically based experimental design, with measurable objectives and hypotheses.

3.6.2 Standard: The artificial propagation program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving the experimental objective and evaluate beneficial and adverse effects on natural populations.

Indicator 3.6.2a: Monitoring and evaluation framework including detailed time line.
Indicator 3.6.2b: Annual and final reports.

3.7 OPERATION OF ARTIFICIAL PRODUCTION FACILITIES

3.7.4 Standard: Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.

Indicator 3.7.4a: Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.
Indicator 3.7.4b: Juvenile densities during artificial rearing.

3.7.6 Standard: Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.

Indicator 3.7.6a: Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.

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

Indicator 3.7.7a: Mortality rates in trap.

Indicator 3.7.7a: Prespawning mortality rates of trapped fish in hatchery or after release.

WDFW will use the above indicators to determine whether the program has, or is, causing unacceptable risks to the listed natural populations within the Snake River Basin. The ability of the evaluation staff to estimate hatchery and natural proportions in the Grande Ronde River and other basins will be determined by implementation plans, budgets, and assessment priorities.

1.11) Expected size of program.

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

Age composition and fecundity of adults varies from year to year. To meet current smolt production levels (160,000), we estimate 45-50 females (disease free) are needed. This target number has been calculated from the following survival information from data collected over the years. Average eggs/female is about 5,200 eggs. Survival data collected from the last three years (since we started transporting eggs from Cottonwood with ovarian fluid) indicates 90% survival from green egg to fry, and 75% survival from fry to smolt. Total eggtake therefore needs to equal ~237,000. Additional females (more than recommended above for egg collection) may also be collected because of the incidence of IHNV positive females, or females with bad eggs. Only marked fish (those with adipose or ventral fin clips) will be retained for broodstock. All other unmarked fish will be released to spawn naturally.

As a backup, eggs may also be collected from the Oregon Department of Fish and Wildlife (ODFW), Wallowa Hatchery. Summer steelhead used at ODFW's Wallowa Hatchery are from the same parenting stock as Cottonwood. Eggs from Wallowa Hatchery were provided to WDFW in the early 1980's to develop the WDFW Wallowa Stock program.

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

The current production level is 160,000 yearling smolts. Original production goal was 250,000 smolts, but was reduced to 200,000 in 2001 due to ESA concerns and a jeopardy ruling by NMFS (Table 1), and further reduced in 2004 based on CWT studies that showed smolt-to-adult return rates were well above mitigation goals.

Table 1. Release of hatchery steelhead from the LFH into the Washington portion of the Grande Ronde River, 1982-2005 release years.

Release Year	Stock	Release Location	River Mile	Release Goal	Number of smolts
1982	Wallowa	Direct Stream	25	250,000	35,155
1983		- - - - -	- - - - -		- - - - -
1984		- - - - -	- - - - -		- - - - -
1985	Wallowa	Direct Stream, Cottonwood AP	25, 29	250,000	149,408
1986		Direct Stream, Cottonwood AP	25, 29		124,200
1987	Wallowa	Cottonwood AP	29	250,000	200,845
1988	Wallowa	Direct Stream, Cottonwood AP	25, 29	250,000	220,676
1989	Wallowa	Cottonwood AP	29	250,000	222,050
1990	Wallowa	Cottonwood AP	29	250,000	239,000
1991	Wallowa	Cottonwood AP	29	250,000	252,799
1992	Wallowa	Cottonwood AP	29	250,000	213,622
1993	Wallowa	Cottonwood AP	29	250,000	291,711
1994	Wallowa	Cottonwood AP	29	250,000	273,000
1995	Wallowa	Cottonwood AP	29	250,000	206,182
1996	Wallowa	Cottonwood AP	29	250,000	249,530
1997	Wallowa	Cottonwood AP	29	250,000	250,262
1998	Wallowa	Cottonwood AP	29	250,000	252,211
1999	Wallowa	Cottonwood AP	29	250,000	268,803
2000	Wallowa	Cottonwood AP	29	250,000	274,146
2001	Wallowa	Cottonwood AP	29	200,000	215,584
2002	Wallowa	Cottonwood AP	29	200,000	182,722
2003	Wallowa	Cottonwood AP	29	200,000	236,627
2004	Wallowa	Cottonwood AP	29	160,000	137,915
2005	Wallowa	Cottonwood AP	29	160,000	150,442

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

Returns of summer steelhead released into the Washington portion of the Grande Ronde River have been estimated through coded-wire tag recoveries from fisheries and adult traps, freeze-brand recoveries at Lower Granite Dam, or from inference from other released groups in the Snake River Basin (Table 2 and Table 3). Data have been consolidated from WDFW's LSRCP Annual Reports for the Steelhead/Trout program at LFC. Under the original LSCRP goals, production returns of 0.5% back to the LSRCP area (above Ice Harbor Dam) would satisfy WDFW mitigation goal responsibilities in the Grande Ronde.

As evident from the results of CWT's and freeze brands, survivals of the Cottonwood release groups have been higher than the compensation goal of 0.5%. These data were critical in our response to and eventual action to reduce the number of fish released from the program.

Table 2. Smolt-to-adult survival rates from Wallowa stock steelhead released into the Washington portion of the Grande Ronde River from Cottonwood Cr. Acclimation Pond, or direct stream releases for 1984-1986 BY, 1996-2000 BY.

	Freeze Brand Recoveries at Lower Granite Dam	Coded-Wire Tag Recoveries	Coded-Wire Tag Recoveries
Brood Year	SAR to LSRCP area (%)	SAR to LSRCP area (%)	SAR to Columbia R. (%)
1984	1,409 (1.80)	272 (0.35)	940 (1.20)
1985	790 (1.31)	378 (0.63)	1035 (1.73)
1986	1,119 (1.41)	432 (0.54)	1218 (1.52)
1996	149 (0.41)	88 (0.23)	98 (0.26)
1997	419 (0.88)	304 (0.63)	358 (0.74)
1998	1,706 (3.60)	1,090 (1.22)	1,347 (1.51)
1999	2,808 (7.04)	1,785 (4.48)	2,072 (5.19)
2000	823 (1.93)	597 (1.40)	625 (1.47)
Mean	2.30%	1.19%	1.70%

Table 3. Estimated adult returns to the Washington Portion of the Grande Ronde River from fisheries, freeze brand recoveries at Lower Granite, and extrapolations from other coded-wire tag groups within the Snake River Basin. (Annual adult return goal is 1,500)

Run Year	Total Returns to Snake From Grande Ronde Releases
1990	1,873
1991	1,777
1992	3,882
1993	2,188
1994	2,945
1995	4,087
1996	3,012
1997	2,243
1998	1,207
1999	1,687
2000	4,344
2001	10,598
2002	5,296
2003	1,877
14-Year Average	3,358

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

Releases of summer steelhead into the Washington portion of the Grande Ronde River from LFC first occurred in 1982, and have been released from Cottonwood AP on an annual basis since 1987.

1.14) Expected duration of program.

Indefinitely continue compensation under the LSCRP as long as the four lower Snake River dams are in place.

1.15) Watersheds targeted by program.

As a compensation/mitigation program, the primary function is to provide harvestable fish to the Washington portion of the Grande Ronde River. These fish will provide sport and tribal harvest opportunities within the Columbia and Snake River Basins as well.

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

1.16.1) Brief Overview of Key Issues

The LSRCP summer steelhead compensation program in the Washington portion of the Grande Ronde River has been active since 1982. A non-endemic hatchery-origin summer steelhead stock (Wallowa stock) has been used to achieve, and often greatly exceed, the hatchery mitigation goals established under the LSRCP (1,500 adult steelhead to the river). However, naturally produced steelhead have not been self-sustaining as originally assumed under the mitigation plan. Therefore, additional mitigation may be appropriate to compensate for this unanticipated loss of steelhead.

Returning hatchery adults are trapped for broodstock in Cottonwood Creek adjacent to Cottonwood Acclimation Pond. Their long-term use in the hatchery is believed to have caused some domestication of the Wallowa stock. The Wallowa stock releases from Oregon facilities have been determined to stray heavily into the Deschutes River, Oregon. This rate of straying is of concern, and has been determined by NOAA Fisheries to jeopardize listed steelhead populations in the Deschutes River, and potentially the tributary populations in the Grande Ronde River. WDFW has conducted limited adult trapping in very small tributaries near Cottonwood Creek and documented high percentages (i.e. 40-70%) of hatchery fish entering them. Also, large returns to Cottonwood Creek have been documented even following an intensive fishery in the Grande Ronde to remove them.

1.16.2) Potential Alternatives to the Current Program

Alternative 1: Develop a new broodstock and eventually eliminate the Wallowa Stock summer steelhead from the Grande Ronde River. Should a new endemic stock be developed by WDFW or ODFW, the primary purpose would be continued compensation/mitigation under the LSRCP for sport fisheries, while lessening the potential negative effects to the natural populations through use of an endemic stock. Unfortunately, the potential to develop a new endemic stock from Grande Ronde River tributaries in Washington is not good because, 1) many are very small streams with limited production of natural steelhead, 2) some are larger streams, but isolated and in

remote locations that would be logistically difficult to manage for endemic broodstock development, and 3) areas that are accessible for broodstock development likely have been influenced by stray Wallowa Stock hatchery fish in the past, and are therefore not a true endemic stock. This has been supported by a recent genetic study completed by Paul Moran (NOAA Fisheries) that demonstrates that tributaries in the Washington portion of the Grande Ronde River are very similar to Wallowa stock steelhead. For the reasons stated above, this alternative is not being pursued.

Alternative 2: Partner with ODFW in the development of a Lower Grande Ronde endemic steelhead stock for hatchery production. Because of the lack of a significant, accessible, non-hatchery altered endemic stock(s) within Washington, we could partner with Oregon Department of Fish and Wildlife (ODFW) to develop an endemic stock for use in the lower Grande Ronde River. The majority of the Grande Ronde River lies within Oregon; hence ODFW has more options to develop an endemic stock for use in the lower Grande Ronde River. However, steelhead stock structure within the Grande Ronde River in Oregon is only now being resolved. While the rivers/streams are potentially more numerous and better suited for broodstock collection in the Oregon portion of the Grande Ronde River, issues surrounding remoteness of locations and logistics of trapping during spring-time flows remain. Further, managers would have to decide on the appropriateness of using an upper Grande Ronde River stock in the lower Grande Ronde River should such an alternative be approved. This alternative is being considered, but will have to be resolved between the States and Tribal Agencies within the Grande Ronde River.

Currently, ODFW is evaluating an alternative to their Wallowa stock program. They plan on collecting early Wallowa stock arrivals in the lower Grande Ronde River. Their reasoning is that these early arrivals may show fewer tendencies to stray into the Deschutes River (which has been the main concern for the Wallowa stock program). If they are correct, then perhaps the development of these early arrivals into a new, improved Wallowa stock will provide an alternative to the WDFW program. While this alternative does not address Wallowa stock straying into areas of the Grande Ronde River, it may eliminate them as a major concern in the Deschutes River. The ODFW collected early returning Wallowa stock fish from the lower Grande Ronde in the fall of 2003 to begin this evaluation. WDFW will assist ODFW as necessary to gather return information from these groups.

Alternative 3: Eliminate the releases of Wallowa stock summer steelhead from the Cottonwood Acclimation Pond to protect the listed populations of concern. This action would decrease the potential impacts to natural populations from further introgression with the Wallowa stock. Washington is presently evaluating tag data to determine the extent of straying of fish released from Cottonwood pond. Early indications from the data seem to show less tendency for Cottonwood pond acclimated fish to stray into the Deschutes River of Oregon. These fish may not jeopardize Deschutes River steelhead because of their fidelity to the Grande Ronde, obviating the need for this extreme alternative. Moreover, this alternative is not acceptable as Washington is legally due compensation under the LSRCP. Currently the compensation provides a popular sport fishery in the Grande Ronde River and elsewhere.

Alternative 4: Reduce the current Wallowa stock releases to a point where negative impacts to listed natural fish will be minimized. This alternative does not fully meet the intent of NOAA Fisheries Biological Opinion. However, the NOAA Fisheries ruled that non-native stocks that stray into other basins at less than a 5% stray rate do not jeopardize native stocks. If the Wallowa stock (WDFW origin) made up less than 5% of spawning steelhead in other river basins, then the releases could continue to provide for harvest mitigation. Current production has been reduced to 160,000 from 250,000 in recent years. Further, WDFW re-initiated annual tagging (CWT) in with the 1996 brood year Wallowa stock to determine stray rates and provide program changes based on those results as they become available (see **Alternative 3**).

Alternative 5: Increase mitigation to compensate for unanticipated losses of naturally produced steelhead. This option is under discussion, but it may be partly accomplished under ESA recovery implementation.

1.16.3) Potential Reforms and Investments

Reform/Investment 1: The extent of straying of Wallowa stock steelhead within the Grande Ronde River basin is still relatively unknown. Additional adult trapping facilities should be implemented in Grande Ronde tributaries where healthy populations of natural origin summer steelhead still exist. Determining the extent of straying Wallowa stock fish throughout the basin would provide for better management and decisions regarding hatchery usage in the basin. Five to ten locations should be picked throughout the basin and monitored for stray hatchery fish. $$$ to $$$$.

Reform/Investment 2: Implement development of an endemic broodstock with ODFW. This implies that agreement has been reached on how to develop endemic broodstock for the hatchery program. It probably would require additional traps in the lower Grande Ronde basin. The estimated cost is $$ to $$$.

For reference

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

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

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

For the Lyons Ferry LSRCP program, WDFW currently has applications pending for the replacement of Section 10 Permits #1126 (research activities on the Tucannon and Asotin Creek), and #1129 (hatchery supplementation for Tucannon River spring chinook); USFWS Consultation with NMFS for LSRCP actions and the NMFS Biological Opinion; and a statewide Section 6 Consultation with USFWS (Bull Trout). In addition, HGMPs have been developed for the Tucannon and Touchet River Endemic Broodstock programs. Concurrent with this HGMP to satisfy Section 7 consultations, WDFW has completed HGMPs to cover all stock/programs produced at LFC (Snake River Fall Chinook (Snake River Stock), Tucannon Summer Steelhead (LFH Stock), Walla Walla Basin Summer Steelhead (LFH Stock), and Snake River Summer Steelhead (LFH Stock).

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.

Washington Department of Fish and Wildlife has documented natural steelhead populations (Snake River ESU) in small tributaries of the Grande Ronde River in Washington State. However, questions of parental origin have yet to be resolved because of likely straying of the Wallowa Stock fish into some of these very small tributaries that are in close proximity to Cottonwood Creek.

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

Snake River and/or Grande Ronde Basin natural-origin steelhead are part of the listed Snake River ESU. Natural-origin adult steelhead are not collected for broodstock, and therefore not directly affected by this compensation program. ESA listed Columbia Basin bull trout, and Snake River spring/summer chinook, and fall chinook are also present in the lower Grande Ronde Basin. Bull trout, spring/summer and fall chinook have not, nor are they expected to be encountered at the Cottonwood Adult trapping site when steelhead are present. None of these salmonid species is anticipated to be directly affected by the compensation program as described.

However, natural origin steelhead returning to Cottonwood Creek (even though their parentage may be of Wallowa Stock) will be delayed by the adult trap in Cottonwood Creek. Delays at the adult trap are expected to be minimal as the trap is checked, and fish are removed and passed daily.

- Identify the ESA-listed population(s) that may be incidentally affected by the 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 and Columbia Basin bull trout may be affected to a lesser degree.

Summer steelhead – Grande Ronde basin summer steelhead (hatchery stock) are typical of A-run steelhead from the mid-Columbia and Snake basins. Most adults (60%) return to the basin after one year of ocean rearing. The remainder is primarily two ocean age adults, with a rare three ocean age fish returning. The percent of salt-water residence is different than documented for Lyons Ferry stock steelhead. This has been explained by stock origin, as the Wallowa stock were derived from a composite of A-run and B-run fish passing the lower Snake River dams. Hence, there appears to be some of the older age B-run characteristics present in the Wallow stock. Females generally predominate with an average 60/40 sex ratio. Returning adults range in size from 54 to 85 cm in length and weigh 1.4 to 6.8 kg. Adults generally enter the Columbia River from May through August, subsequently entering the lower Grande Ronde River from September through April. Adults in the lower Grande Ronde Basin (Washington State) utilize tributaries to the mainstem Grande Ronde River. Some mainstem spawning may occur but is not well documented.

Spawning begins in March in the tributaries and continues until May. 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 emigrate after one or three years. Smolt out-migration through the lower Grande Ronde Basin extends from late winter until late spring, thereby overlapping with hatchery steelhead smolts releases as described for this program. Peak smolt movement is associated with increased flow events between mid-April and mid-May (Ann Setter – ODFW, pers comm.).

Hatchery-origin steelhead from this program may stray into local or other tributaries where natural origin steelhead may spawn. Spawning with hatchery origin fish may reduce the reproductive success of natural spawners. In addition, hatchery-origin steelhead from this program are the target of a major sport fishery in the Snake and Grande Ronde Rivers. Incidental hooking of natural-origin summer steelhead will occur, with some losses expected due to hooking mortality and handling.

Juvenile hatchery steelhead released as smolts may compete for food and space with naturally reared summer steelhead as some degree of extended rearing by hatchery steelhead following release is expected. However, this is generally minimized because of release size, condition of fish at release (smolts), and release method (volitional release). Further, while unlikely, hatchery-origin steelhead from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Strict protocols will be followed to ensure healthy fish upon release.

Spring chinook –Spring chinook adults utilize the lower Grande Ronde River primarily as a migration corridor to reach to the headwater streams in the upper Grande Ronde Basin (i.e. Minam, Lostine, Wallowa). Occasional spawning has been documented in the smaller tributaries, but these have been considered strays from other areas (Glen Mendel, pers comm. 2002). Juvenile utilization in the lower Grande Ronde River is minimal due to high summer water temperatures. Juveniles in the Grande Ronde Basin rear for one year, become smolts, and emigrate the following spring. Smolt migration from the basin begins in late January and extends through early July, thereby overlapping with the hatchery steelhead production from this program (Ann Setter (ODFW) pers. comm. 2002).

Juvenile hatchery steelhead released as smolts may compete for food and space with naturally reared spring chinook following release. However, this is generally minimized because of release size, condition of fish at release (smolts), and release method (volitional release). Predation of chinook smolts is unlikely due to size constraints (See Section 3.5).

Fall chinook – Fall chinook in the lower reaches of the Grande Ronde River are considered part of the Snake River population. The WDFW and Nez Perce Tribe (NPT) have documented the number of fall chinook redds in the Grande Ronde since 1986 (Glen Mendel (WDFW) and Bill Arnsberg, (NPT) pers. comm. 2002). Redd counts have ranged from 0-197 since 1986 in the area between the mouth and Troy, Oregon. The most recent ten-year average is 40 (SD=57.4). Approximately 75% of redds observed in 2001 (197 total), were located between the Grande Ronde River mouth and Cottonwood Creek (Groves 2002). Adult Snake River fall chinook enter the Columbia River in July and migrate into the Snake River from mid-August through November. Spawning occurs from late October through early December, with fry emergence during April. Outmigration occurs within several months following emergence with peak migration past Lower Granite Dam in late June. Competition for food and space is possible, though likely minimal due to different microhabitat preference between steelhead smolts and juvenile fall chinook. However, predation on juvenile fall chinook from hatchery steelhead is a possibility (See Section 3.5).

Bull trout – Both ad-fluvial and resident life history forms of bull trout inhabit a number of tributaries in the Grande Ronde River. The lower mainstem in Washington State is likely utilized as a migration or over-wintering corridor. Fluvial adults migrate into headwater areas during summer and early fall. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge during the spring. Juvenile rearing is restricted to headwater areas by increasing water temperatures downstream, and therefore will not be located in areas of hatchery steelhead juveniles from this program.

However, juvenile hatchery steelhead released as smolts may compete for food and space with the fluvial and resident forms of bull trout as some degree of extended rearing by hatchery steelhead following release is expected. Time spent together may be limited because of release size, condition of fish at release (smolts), release method (volitional release), and release location (far below most bull trout juvenile rearing areas). Predation

of hatchery steelhead on bull trout in the migration corridor is likely limited due to size (See Section 3.5). Bull trout associated with areas influenced by migrating or residual hatchery steelhead are generally fluvial adults and are more likely to out-compete or prey on hatchery steelhead due to a significant size advantage. As with the other species, hatchery-origin steelhead from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Strict protocols will be followed to ensure healthy fish upon release.

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

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

Summer steelhead – Natural origin summer steelhead in the Grande Ronde Basin are listed as "threatened" under the ESA as part of the Snake River ESU. Status of local stocks in small tributaries within the Washington portion of the Grande Ronde is classified as either depressed (due to their relatively small size), or unknown. Remoteness and inaccessible areas have limited WDFW's ability to assess stock status.

An assessment of steelhead populations was completed by ODFW in 2001 (Chilcote, 2001). The lower Grande Ronde Population of summer steelhead averaged 2.2 spawners/mile, well above the "Viable Population" threshold (0.8 spawners/stream mile), and the "Critical Threshold" (0.3 redds/mile). Based on the ODFW assessment, the natural steelhead populations within the Grande Ronde appear healthy. The most recent reduction in smolt release numbers of Wallowa stock steelhead from Cottonwood will provide further protection to natural populations.

Spring/summer chinook – Natural origin spring/summer chinook in the Grande Ronde Basin are listed as "threatened" under the ESA as part of the Snake River spring/summer chinook ESU. Local populations of spring/summer chinook in the Washington portion of the Grande Ronde exist in a few isolated tributaries (N.F. Wenaha, Butte Creek). Remoteness and inaccessible areas in both of these tributaries have limited the ability of WDFW to assess population status. The mainstem Grande Ronde River in Washington does not likely contain a spring chinook population due to limited rearing capabilities for juveniles because of high summer water temperatures in the lower basin.

Fall chinook – Natural origin fall chinook in the Grande Ronde River are listed as "threatened" under the ESA as part of the Snake River ESU. The spawning population in the lower Grande Ronde is considered part of the larger composite population for the entire Snake River Basin. Spawners consist of natural and hatchery origin fish (LFH – which rears the Snake River fall chinook stock). Lyons Ferry fall chinook hatchery releases occur throughout the Snake River Basin; from LFH and at acclimation facilities operated by the Nez Perce Tribe.

Bull trout – Natural origin fluvial and resident bull trout in the Grande Ronde River are listed as "threatened" under the ESA as part of the Columbia Basin Bull Trout Distinct Population Segment (DPS). In the Washington portion of the Grande Ronde, sub-

populations of bull trout exist in the Wenaha River, and potentially Menatchee Creek. Status of the bull trout population in the Wenaha River is considered at low risk for extinction (Buchanan et al. 1997), while status of the Menatchee Creek population is unknown because of limited data to document its existence.

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

Not available.

- Provide the most recent 12 year annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Broodstock trapping at Cottonwood Creek provides some indication of the abundance of natural spawners returning to Cottonwood Creek. Additional adult trapping on Rattlesnake Creek (2000) and Menatchee Creek (2001) is also provided (Table 4).

Table 4. Number of natural and hatchery origin spawners documented in small tributaries to the Grande Ronde River. Numbers provided are trapped fish.

	Cottonwood Creek		Rattlesnake Creek		Menatchee Creek	
Year	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery
1992		397				
1993		362				
1994		308				
1995		450				
1996	< 10 fish	430				
1997	Annually –	233				
1998	all years	720	12	43		
1999		276				
2000		288			13	4
2001		749				
2002		1,712				
2003		480				
2004		844				
2005		1,010				

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

Table 4 provides trapping data back to Cottonwood Creek Adult Trap. An unknown number of adult fish are able to pass the trap during years when spring stream flows get high. We assume the proportion of trapped fish (hatchery and wild origin) represents similar proportions on the spawning grounds.

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.

Broodstock Trapping: Listed summer steelhead adults (Snake River ESU) will be incidentally trapped from March through May at the Cottonwood Creek adult trap, which constitutes an indirect take of listed fish (Take Table 1). All natural origin adults captured are passed upstream to spawn naturally. Based on trapping records, and limited juvenile production from Cottonwood Creek, it is anticipated that less than 10 natural origin adults will be captured and handled in any given year. Because of the high number of Wallowa stock fish allowed to pass and spawn in Cottonwood Creek each year, we assume that nearly all natural fish returning are likely to be offspring of hatchery parents.

Spawning, Rearing and Releases: Rearing/release of summer steelhead from Cottonwood AP has a potential for indirect take of listed summer steelhead that may be present in the mainstem of the Grande Ronde River. The release of Wallowa Stock summer steelhead may incidentally affect (take) other listed salmonids (bull trout, spring/summer chinook, fall chinook) in the Grande Ronde or Snake River by displacement or competition. In addition, smolts that might residualize will also compete for food and space, though we believe this is kept at a minimum because released fish are generally fully smolted to maximize emigration, and are released below primary steelhead rearing areas. An estimate of the annual take level to each of these species is not possible.

- 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.

Operation of the adult trap during early spring to collect hatchery broodstock will indirectly take listed Snake River ESU summer steelhead. Current trap operations may prevent or delay upstream migration of a small number of summer steelhead that approach the trap. However, the current trap is estimated to be only 75-85% efficient depending on stream flows, and fish entering the trap are processed daily, allowing natural origin fish to be passed generally within 24 hours of trapping.

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

See Table 4 Above. No injuries or mortalities to listed fish have been recorded.

-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 "Take" Table 1 at back of document.

- 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.

At the Cottonwood Creek Adult Trap, natural origin fish are passed above the trap to spawn naturally. Fish are sorted on a daily basis by trap operators, or during the hatchery broodstock spawning operations. Furthermore, because the trap is estimated to be only 75-85% efficient, some steelhead (both origins) can pass when spring flows are high. Further, natural-origin (unmarked) fish that do return are likely from parents of hatchery spawners that were passed above the adult trap in the past. ESA status listing of these fish should be questioned. Exceeding expected take levels is therefore not likely.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery 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.

LFC and the resulting production of steelhead is part of legally required compensation provided to Washington under the LSRCP Program. According to the Artificial Production Review (APR-1999), the Council stated "Management objectives such as for harvest opportunities, or for in-kind, in-place mitigation, or for protection of specific natural populations are all equally important." As such, managers will have to identify their legal mandates, and do their best to provide fish for harvest, while protecting naturally spawning populations. WDFW believes they have taken such actions with the proposed program outlined in this HGMP to be consistent with the Policy Recommendations in the APR.

In the 2 April, 1999 Biological Opinion, NMFS cited "great concern" regarding the large number of Wallowa Hatchery steelhead reported spawning in other rivers (specifically in the Deschutes River, Oregon). NMFS based their ruling on preliminary data analysis that suggested Wallowa Stock steelhead were straying above the 5% rate. Further analyses completed by ODFW in 2004 for Wallow hatchery steelhead have confirmed that early analysis (Rich Carmichael, pers. comm.). Another analysis by WDFW of Wallowa stock fish released from Cottonwood AP also show some fish straying into the Deschutes River. Regardless, according to the BiOP (1999), NMFS proposed elimination of the Wallowa Stock by 2008, concurrent with development of a new stock from local populations. However, a recent analysis by Chilcote (2002) suggests that hatchery fish, whether from a local or non-native broodstock, can still reduce the reproductive success of natural populations if they are allowed to intermix on the spawning grounds.

Therefore, actions proposed under this HGMP are not consistent with the Reasonable and Prudent Actions suggested by NMFS. Unfortunately, WDFW did not re-initiate releases of coded-wire tagged fish in the Grande Ronde until the 1997 release year. However, between 1985 and 1989, WDFW released tagged fish from Cottonwood AP. Adult return data from those releases showed that only a few of them strayed into the upper Deschutes River (Attachment 1).

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

This HGMP is consistent with the following cooperative and legal management agreements. Where changes to agreements are likely to occur over the life of this HGMP, WDFW is committed to amending this plan to be consistent with the prevailing legal mandates.

- *Lower Snake River Compensation Plan* – LSRCP goals as authorized by Congress direct actions to mitigate for losses that resulted from construction and operation of the four Lower Snake River hydropower projects. The program is consistent with smolt production but lower than levels as outlined in original LSRCP. The proposed program will continue to support a substantial tribal and sport harvest.
- *US vs Oregon* - The hatchery program outlined within this HGMP is consistent with the now out-dated Appendix B hatchery smolt production agreements of the *US vs Oregon* negotiations and the intent to provide fish for harvest in tribal and sport fisheries into the future. Current negotiation to develop a CRFMP (see below) will identify the production level from Cottonwood AP.
- *Columbia River Fish Management Plan* – The program would continue to provide substantial harvest in Zone 6 tribal net fisheries as well as in-basin tribal harvest opportunity.
- *Fisheries Management and Evaluation Plan (FMEP).* – FMEPs for Snake River fisheries are currently being drafted by WDFW which will describe in detail the current fisheries management within the Snake River Basin (including the Grande Ronde). Fishery management objectives within the FMEP and this HGMP are consistent.
- *WDFW Wild Salmonid Policy.* Washington Department of Fish and Wildlife is directed by State and Departmental management guidelines to conserve and protect native fish and wildlife populations. No other comprehensive management agreements are in effect.

3.3) Relationship to harvest objectives.

As a Mitigation / Isolated Harvest Program, the use of the Wallowa Stock in the lower Grande Ronde River is intended to fulfill mitigation goals as outlined under the LSRCP.

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.

Multiple fisheries benefit from the summer steelhead compensation program in the Grande Ronde River. Summer steelhead from Grande Ronde releases have been documented in Columbia River net and sport fisheries at a very high rate. They have also been harvested successfully in the Snake and Grande Ronde rivers. Unfortunately, WDFW did not release CWTs in the Grande Ronde for many years. Hence, data to show long-term harvest rates in the Grande Ronde River in the 1990's is not available except for the last few years, some of which are still incomplete.

Over the years, WDFW and ODFW have cooperated in a joint creel survey effort in the Grande Ronde River. Annually since 1987, ODFW has provided estimates of steelhead harvest (Flesher 1994-2003) to WDFW for the lower Grande Ronde River from Bogan's Oasis (RM 41.9) to the Oregon Border (RM 61.9). Since ODFW also releases Wallowa Stock fish in the upper Grande Ronde Basin, the

fishery captures both States' releases. During run years 1988–2002, hatchery origin sport catch in the Washington portion of the Grande Ronde River ranged from 697-6,268 fish (Table 5) for the September through mid-April fishery. Natural origin fish captured and released in the fishery has ranged between 211 and 1,508 fish on an annual basis.

All of these fisheries are consistent with LSRCP goals, and with *U.S. v. Oregon* management plans and principles for tribal and sport fisheries. All sport fisheries within the region are selective for hatchery-reared fish and require release of natural-origin summer steelhead (See WDFW and ODFW Snake River FMEP). Sport fishing regulations in the Grande Ronde River have been set to reduce the incidental mortality natural fish in the catch by requiring barbless hooks. The use of barbless hooks promotes a safer, less stressful release of natural origin fish in the fishery. These actions work in concert with focused fishing effort on hatchery-origin fish to minimize spawning escapement of Wallowa Stock summer steelhead into the Grande Ronde Basin.

Table 5. Estimated angler effort, with estimated natural and hatchery catch for steelhead anglers on a portion of the Grande Ronde River in Washington 1988-2002 run years.

Run Year	Effort Hours	Hatchery Catch	Natural Catch
1988	7,440	697	393
1989	9,468	1,910	267
1990	8,446	1,241	269
1991	21,278	3,109	412
1992	15,097	1,028	264
1993	17,812	1,910	426
1994	12,021	1,335	220
1995	13,685	2,040	211
1996	14,770	2,300	267
1997	19,984	2,325	422
1998	16,667	2,050	350
1999	22,036	1,958	500
2000	27,764	4,621	921
2001	29,173	6,268	1,508
2002	28,366	3,872	1,023

3.4) Relationship to habitat protection and recovery strategies.

Human development and land management impacts consistent with those identified across the Columbia and Snake River basins affects natural steelhead production in the Grande Ronde. Loss of channel diversity, sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawn, water temperature and fragmentation of habitat all affect productivity of natural steelhead populations within the watershed. However, portions of the Grande Ronde Basin (i.e. Wenaha River within Washington) are within the Wenaha-Tucannon Wilderness Areas and are protected from negative human impacts in many ways.

Only one comprehensive review of the ecological health of the Grande Ronde River in Washington in relation to salmonid population status and recovery has been completed (Kuttle, M. 2002). Limiting factors such as water temperature, channel stability, sediment, and instream habitat (in tributaries to the mainstem) are known to exist in the basin, but the extent of these problems are still relatively un-quantified due to data limitations. In addition, the Grande Ronde Subbasin Summary (2001), completed for Northwest Power and Conservation Council (NPCC) planning efforts, identified parameters of concern within the basin but was not specific on the extent of the problems. State programs in place provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or federally funded actions must additionally meet Endangered Species Act listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Protection Act (NEPA) review.

Most watershed restoration/improvement projects are funded through the Grande Ronde Model Watershed Program, (funded by BPA's Fish and Wildlife Program - 1992), and Asotin County Conservation District. Efforts include fencing to ensure riparian vegetative recovery, improved fish passage at road crossings and diversions, and reduced sediment production from roads and cropland, and screening of irrigation diversions. Taken together, habitat protection and improvement measures have, and will continue to improve habitat for and productivity of the basin's natural summer steelhead populations.

3.5) Ecological interactions.

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.

As hatchery steelhead smolts migrate downstream, avian (i.e. kingfishers, mergansers, gulls) and mammal predators will likely prey on hatchery steelhead smolts. While not always desired from a production standpoint, these hatchery fish provide an additional food source to natural predators that might otherwise consume listed fish.

Predation by hatchery fish on natural-origin smolts is less likely to occur than predation on fry (NMFS 1995). Salmonid predators are generally thought to prey on fish 1/3 or less their length (Horner 1978; Hillman and Mullan 1989; Beauchamp 1990; Canamela 1992; CBFWA 1996). Jonasson et al. (1995) found no significant relationship between residual hatchery steelhead size and salmonid prey size in pen experiments. Further, Witty et al. (1995) concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor. Martin et al (1993) also concluded the summer steelhead residuals in the Tucannon River were not affecting listed Chinook salmon populations based on stomach analysis.

Relative size differential of proposed hatchery steelhead smolts (210 mm @ 4.5 fpp) compared to spring chinook smolts (90-110 mm) and wild steelhead smolts (130-200 mm) should preclude any substantial predator/prey interaction among migrating fish. However, fall chinook (35-95 mm) could be consumed by hatchery steelhead.

With the exception of fall chinook, timing of hatchery steelhead smolt releases from Cottonwood AP (April) and the distribution of listed species fry limit potential interaction. Hatchery steelhead smolts are released in late March to early May, approximately mid-way through the spring chinook emergence period. However, the hatchery release site for this program is downstream of documented spring chinook spawning areas and opportunity for spring chinook fry to move into the steelhead migration corridor is limited (Ann Setter – ODFW, pers comm 2002).

Based on where fall Chinook spawn however, they will completely overlap with the hatchery steelhead migration corridor. Fall Chinook fry will likely be seeking habitat areas near stream margins. Bjornn 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. Naturally produced steelhead fry likely emerge during May-June, long after the majority of released hatchery steelhead smolts from this program have migrated from the system. Bull trout fry tend to rear in headwater spawning areas and thus avoid interaction with steelhead smolts.

A varying percentage of hatchery steelhead releases do not migrate from the system. WDFW considers hatchery steelhead remaining after June 15 to be residuals. These fish, by remaining in the lower Grande Ronde River have an increased opportunity to interact with juvenile 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 Bjornn 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 Bjornn 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. 1994 and 1995). Results of residualism studies suggest that direct stream releases residualize at a higher rate than acclimated fish (Schuck 1993; Jonasson 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 8 km of the upper Salmon River release site. Schuck (1993) reported steelhead residuals were found about 20 km below and 10 km

above release sites in the Tucannon River, Washington. Steelhead residual densities were highest within 8 km 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. 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 rapidly over time.

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 river mile four 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 residual hatchery steelhead stomachs, 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 *O. mykiss* and sculpins (Jonasson et. al. 1994). Martin et al. (1993) found similar levels of predation in residual steelhead on the Tucannon River. **Residual steelhead do not appear to prey on juvenile chinook and have low rates of predation on other salmonids.**

Competition - Hatchery steelhead smolts have the potential to compete with chinook, natural steelhead and bull trout juveniles for food, space, and habitat. The Species Interaction Work Group (SIWG, 1984) reported that potential impacts from competition between hatchery and natural fish are assumed to be greatest in the spawning and nursery areas and at release locations where fish densities are highest (NMFS 1995). These impacts likely diminish as hatchery smolts disperse, but resource competition may continue to occur at some unknown, but lower, level as smolts move downstream through the migration corridor. Canamela (1992) concluded that the effects of behavioral and competitive interactions would be difficult to evaluate or quantify.

The size difference between residual steelhead and chinook fry will probably result in selection of different habitat areas (Bjornn 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, 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.

Steward and Bjornn (1990), however, concluded that hatchery fish kept in the hatchery for extended periods before release as smolts may have different food and habitat preferences than natural fish, and that hatchery fish will unlikely be able to out-compete natural fish. Further, hatchery-produced smolts emigrate seaward soon after liberation, minimizing the potential for competition with natural fish. Competition between hatchery-origin salmonids with wild salmonids, including steelhead, in the mainstem corridor was judged not to be a significant factor (Witty et al. 1995). All production fish described in this program are released as smolts to minimize the likelihood for interaction, and adverse ecological effects to listed natural Chinook salmon juveniles, bull trout, and steelhead.

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 because of a significant size advantage.

Disease - Hatchery operations potentially amplify and concentrate fish pathogens that could affect listed chinook, steelhead, and bull trout growth and survival. Because the hatchery produced summer steelhead for the compensation program are reared outside the watershed most of their life, disease impacts by this stock on Grande Ronde Basin salmonids are reduced. LFH is supplied with constant temperature well water; as a result, disease occurrence and the presence of pathogens and parasites are infrequent. When infestations or infections have occurred, they have been effectively treated. Further evidence for the relative disease-free status of this stock at Lyons Ferry is the low mortality that occurs during rearing following typical early life stage 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 River basin from LFH. Further, IHNV testing on all spawned females during spawning and infected eggs/fry are destroyed as necessary after results are obtained.

Returning adult steelhead held for spawning at the Cottonwood Creek adult trap potentially create a concentrated source of pathogens and parasites. 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 the combination of cool water temperatures and high flows during spring holding season for steelhead adults are not conducive to infectious processes. This reduces the potential for transmission between adults in holding ponds and from 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 years indicate a low prevalence and incidence

of serious fish pathogens and parasites in these stocks. For the Wallowa Stock program described here, the viral pathogen IHNV has been most prevalent. Procedures described for this viral disease later (See Section 8 and Section 9) limit the possibilities of outbreaks in the hatchery.

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.

Presently, LFH is the main rearing site for Wallowa stock summer steelhead. Gametes are collected at Cottonwood Creek Adult Trap, and transported to LFH. Eggs are fertilized, hatched and juveniles reared to the pre-smolt stage (early February of the following year). In early February, pre-smolts are transported to Cottonwood AP for extended acclimation and volitional release. Lyons Ferry has eight deep wells that produce nearly constant 52^0 F, fish pathogen-free water. The hatchery is permitted to pump up to 53,000 gpm (118.1 cfs). High concentrations of dissolved Manganese (variable among the eight wells), and particulate Manganese Oxide, is strongly suspected of limiting the density at which chinook can be reared in raceways at LFH, but no such limitations are known to affect steelhead. While the water also has higher concentrations of other minerals (common in deep wells), no negative impacts on eggs or fish from these are known. Discharge from LFH complies with all NPDES standards and enters the Snake River.

For smolts acclimated at the Cottonwood AP, water is removed from Cottonwood Creek under a permit for non-consumptive fish propagation purposes. Cottonwood Creek is a small watershed (almost seasonal) flowing from the Blue Mountains of southeast Washington. Cottonwood AP receives a maximum of 2,694 gallon/minute directly from Cottonwood Creek. Water temperatures while fish are acclimating range between 35-60^0 F.

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.

Water intake screens at Cottonwood AP meet current NMFS screening guidelines, and effluent discharge is monitored, reported, and currently complies with NPDES standards. The chance of a potential "Take" of listed species from water withdrawal, screening or effluent discharge at Cottonwood increases depending on stream flows in Cottonwood Creek. Since the pond has been in operation, there have been a couple of times when all water from the creek was diverted for the acclimation pond, thereby stranding any naturally produced smolts from leaving Cottonwood Creek, and preventing or delaying any natural origin adults from the stream. Water withdrawal at LFH is through wells, and effluent is discharged to the Snake River, in compliance with NPDES standards. The chance of a potential "Take" of listed species from water withdrawal, screening or effluent discharge at LFH is very low.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock will be collected at the Cottonwood Creek Adult Trap, located in a small tributary to the Grande Ronde River. The trap will be checked daily or more than once a day if many fish are expected to be captured. During years of low water and most or all the stream is being diverted for the acclimation pond, WDFW may also get broodstock (eggs) from ODFW to fulfill production goals. (A photo of the Cottonwood Creek trap can be seen in Attachment 1) Returning adults have the option of bypassing the trap on the left during high spring flows (pictured), or in lower stream flows will enter the trapping area (seen on the right with spilling water). Fish are netted out by hand one at a time. Depending on origin of the fish or broodstock needs, fish will be passed (all natural fish are passed immediately) or held for spawning or CWT recovery.

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

Captured adults are not transported.

5.3) Broodstock holding and spawning facilities.

Captured fish are netted from the trap area and placed immediately upstream in a 10' x 11' holding area. A portion of the Cottonwood Creek water is diverted into the holding area to maintain proper flow/oxygen levels for broodstock. Jump boards have been placed around the perimeter of the holding area to prevent captured broodstock from jumping in or out. All natural fish trapped are immediately passed upstream upon being identified at capture.

During weekly spawning activities all fish are sorted from the holding area. Ripe hatchery origin fish needed for the day are killed and spawned. Other hatchery origin fish are either 1) retained for future spawning, 2) killed to collected Coded-Wire tags, or 3) passed upstream to spawn naturally in Cottonwood Creek. Collected gametes are held separately (plastic bags with O_2 for milt, plastic bags for eggs) in coolers and packed with ice for transportation back to the LFH. Fertilization, disinfection, and water hardening is then completed at LFH.

5.4) Incubation facilities.

The incubation room at LFH is designed to accept and incubate eggs from individual females through the eyed stage. Isolated incubation vessels allows isolation of eggs from individual females on separate water supplies while lab testing for virus from ovarian fluid tests taken at spawning are conducted. If the presence of virus such as IHNV is detected, eggs from infected individual females can be removed from the incubation facility without infecting eggs from other females. After eyeing is complete and virus sample results are received, eggs are consolidated into hatching baskets and transferred to hatching troughs. As the eggs hatch, fry fall through the hatching baskets, and settle to

the bottom of the rearing troughs where they absorb their egg sacks, and eventually start feeding. Substrate has not been recommended at this time in the hatching troughs due to questions about cleaning and disease control.

5.5) Rearing facilities.

Four intermediate indoor rearing tanks and 47 outside raceways are available for rearing. Water supply is from wells as previously described. Feeding is by hand. After fish reach fingerling size, they are adipose fin clipped and transferred into one of three 2.1 acre rearing lakes at LFH. Each lake is supplied with up to 4,500 gpm of well water. Fish rearing densities at this point are very low. Fish are fed commercial salmon or steelhead diet blown from a feeder truck.

a. Acclimation/release facilities.

Cottonwood AP has a volume of 357,192 ft^3, and is supplied with a maximum of 2,694 gpm (~six cfs (ft^3/sec) river water that comes directly from Cottonwood Creek. Acclimation on Cottonwood Creek water occurs from February through mid-May. The screens that block the pond outlet are generally removed around the last week of March. This allows the fish to volitionally migrate from the pond until as late as the middle of May, after which all fish are forced from the pond into the Grande Ronde River.

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

No significant mortality of Wallowa stock steelhead has generally occurred. Catastrophic losses occurred in the LFH summer steelhead stock due to IHNV in the past (BY1989 100% loss), but did not happen with the Wallowa stock. Following the loss in 1989, strict spawning protocols and procedures were implemented to prevent a similar event (disinfection of eggs during water hardening). These protocols and procedures have and will continue to be strictly followed with the Wallowa stock program. Losses to the program have generally been from cold-water disease at Lyons Ferry (common – almost every year to some degree), bird predation in the 2.1 acre rearing lake at LFH (this has now been fixed with bird netting over the entire lake), and bacterial gill disease (rare incidence, but know to cause significant mortality).

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

Strict operational procedures as laid out by Integrated Hatchery Operation Team (IHOT 1993) are followed at LFH and Cottonwood AP. Where possible, remedial actions identified in a 1996 IHOT compliance audit are implemented. Staff is available to respond to critical operational problems at all times. Lyons Ferry has water flow and lower water alarm systems to monitor water supplies to its incubation, raring and adult holding facilities. Because pumps supply LFH, it has several emergency power generation systems to operate its pumps during electrical power outages. Fish health

monitoring occurs monthly, or more often, as required in cases of disease epizootics. Fish health practices follow PNWFHPC (1989) protocol. Personnel are present at Cottonwood AP 24 hours/day to respond to water flow or fish health problems.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Hatchery-origin steelhead (Wallowa Stock) captured in the Cottonwood Creek adult trap will be used for the hatchery broodstock, or eggs provided from ODFW of Wallowa Stock origin.

6.2) Supporting information.

6.2.1) History.

The Wallowa Stock (currently used by both WDFW and ODFW) steelhead was originally derived in the early 1980's from trapping steelhead at Ice Harbor and Little Goose dams. The stock is therefore likely made up of both "A" and "B" run steelhead from the Snake River basin, and could include fish from Clearwater, Salmon and Grande Ronde basins. A permanent adult trapping site was installed in Cottonwood Creek to trap hatchery broodstock beginning in 1992. Prior to that and for a few years following, WDFW received eggs from ODFW in order to reach program goals.

6.2.2) Annual size.

The proposed use of 45-50 females captured in the Cottonwood Creek Adult Trap will provide program needs. Up to 5-10 additional females may also be spawned for extra eggs in case IHNV is detected in the broodstock. If more eggs are available then needed, an appropriate percent of eggs from all IHNV negative females will be used to provide the greatest genetic variation in the program. Eggs in excess of program needs will be used as fry plants into area lakes.

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

The Wallowa Stock origin was likely derived from many genetically distinct populations of summer steelhead in the Snake River Basin, some of which may have been of both hatchery and natural origin. Collection of fish from the Cottonwood Creek Adult Trap has consisted entirely of hatchery-origin spawners (adipose clipped fish). Unmarked fish (i.e. presumably natural origin) have not been included to date. WDFW has always believed these unmarked fish are likely first generation offspring from hatchery spawners in Cottonwood Creek. Unmarked fish will continue to be released to spawn naturally in the stream.

6.2.4) Genetic or ecological differences.

Hatchery broodstock may likely be genetically similar to many other Snake River summer steelhead populations given their founding source. Genetic characterization of the Wallowa stock is currently being analyzed by NMFS as part of a Grande Ronde Basin genetic characterization study. Genetic samples (fin clips or punches) will periodically be collected from hatchery origin (Wallowa Stock) summer steelhead in the future for population structure and genetic variation.

6.2.5) Reasons for choosing.

The Wallowa Stock steelhead has been propagated over many generations by WDFW and ODFW (Wallowa Hatchery). The stock performance indicates that it is highly successful at producing harvestable fish for the program.

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.

Continued use of the Wallowa Stock (at lower production levels than original LSRCP goals) will diminish the potential negative effects to the natural population's genetic structure. Broodstock (i.e. eggs) for the Wallowa Stock program will be collected over the entire run timing to the best of our abilities. Spawning will occur on three to four separate dates to cover the run and spawn timing. Collection of Wallowa stock adult at Cottonwood and passing hatchery origin adults upstream is Cottonwood Creek will minimize the geographic effect these fish might otherwise have on natural spawning fish in the other Grand Ronde tributaries. Further reductions in the total number of smolts could in the future following more coded-wire tag returns.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Adult steelhead enter Cottonwood Creek in March through late April. As fish approach the trap, they jump into the trap box, or if spring flows are high, they can bypass the trapping area and proceed upstream. All trapped fish are netted out and passed directly upstream to a 10' x 11' holding area. During the spawning process, all fish will be sorted and decisions will be made as to their fate (killed for spawning, killed for study information, passed upstream).

7.3) Identity.

Currently, 100% of the Wallowa stock steelhead are marked with an adipose fin clip for harvest management. In addition, a portion (~40,000) are coded-wire tagged and the left ventral fin is removed. All of these marks allow for external identification upon adult return for fishery and broodstock purposes. Further, this will allow for a more complete evaluation of the success and/or failure of the program in the future and assess stray rates into other river basins.

7.4) Proposed number to be collected:

7.4.1) Program adult broodstock goal:

Short Term: Minimum of 135 Adults (45 females, 90 males) .
Long Term: Unknown; could be reduced depending on survival and the ability of the program to maintain the mitigation goal as set forth under the LSRCP program.

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

Table 6. Collected, spawned, and eggs collected from summer steelhead (Wallowa Stock) at Cottonwood Creek Adult Trap from 1992-2005.

Brood Year	Collected Adults		Spawned Adults		Eggs
	Female	Male	Female	Male	Collected
1992	169	228	113	225	558,437
1993	198	164	96	206	533,995
1994	212	96	118	204	644,886
1995	281	169	99	61	511,283
1996	317	113	124	109	601,979
1997	189	44	92	92	536,723
1998	383	337	173	164	868,973

1999	130	146	126	119	601,699
2000	157	131	105	119	523,011
2001	422	327	94	108	504,182
2002	1084	628	82	87	422,441
2003	322	158	65	65	254,418
2004	495	349	68	105	318,430
2005	453	481	20	20	88177
2005[A]	---	---	40	40	194,498

[A] At the beginning of 2005, low water in Cottonwood Creek would not allow upstream migration of adults to the trap. WDFW reached an agreement with ODFW to collect eggs from Wallowa Hatchery. Stream flows eventually increased many adult steelhead were trapped. Also, Wallowa Hatchery was starting to run short on broodstock, so we collected our final broodstock needs from the Cottonwood Creek.

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

Currently, all unspawned fish trapped at the adult trap are passed upstream to spawn naturally, regardless of origin. This decision was based on the idea that it would be better to have the hatchery fish concentrated in one spawning stream, rather than having them stray more into other local streams where natural fish may still be present.

7.6) Fish transportation and holding methods.

Live adults are not transported from the Cottonwood Creek Adult Trap. The broodstock holding area has previously been described. Portions of the adult trap were updated in 2004 to make certain aspects more fish friendly.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock are held in a holding area of Cottonwood Creek. As such, treatments for fungal infections cannot be applied to the holding broodstock. The number of adults kept at any one time is limited by the capacity of the holding area. WDFW has determined that the maximum number of adults in the holding area is 250 fish. When the 250 fish have been captured, no more adults are retained for broodstock until the holding can be cleared out from the spawning activities or to remove coded-wire tagged study fish.

7.8) Disposition of carcasses.

All fish spawned for the hatchery broodstock are kill-spawned. Males may be live spawned if a shortage for a given year occurs. Live spawned males will be opercle punched to identify them in future spawns. All spawned carcasses have been placed into upper Cottonwood Creek watershed for nutrient enhancement. In addition, some fish not used for spawning are killed outright to obtain coded-wire tag information from study groups. These fish are also used in the nutrient enhancements process.

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.

None. WDFW considers unmarked fish in Cottonwood Creek as part of the Wallowa Stock due to swamping of the stream with past releases of adults to the spawning grounds. WDFW feels it is better to allow as many possible hatchery-origin returns up on the spawning grounds to lessen the potential negative effects if these fish spawned in other adjacent tributaries.

SECTION 8. MATING

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

8.1) Selection method.

All males and females that have been collected for broodstock will be examined weekly during the spawning season to determine ripeness. Fish will be selected at random during the sorting process. The first 15 or 16 ripe hatchery females selected for the day will comprise the egg collection. The same will be true for the first 30-32 ripe hatchery males (if possible). Only some of the ripe fish will be spawned (see above goals) and the remaining (those fish that don't have a coded-wire tag) will be passed upstream to spawn naturally.

Spawned females are individually sampled for IHNV. Samples are sent to WDFW virology lab for culturing. Eggs from individual females with IHNV positive results for the virus will be discarded. In addition, eggs from females that visually appear over-ripe will be immediately discarded and replaced with eggs from new females.

8.2) Matings.

Mating will occur in a 1x2 cross (1 female to 2 males) when possible to ensure the highest likelihood of fertilization, increase genetic diversity, and to increase the effective population size given the relatively small size of the program. If program needs are met, the effective population size will be 147, as derived from the following formula:

$$N_e = 4(N_M)(N_F) / (N_M + N_F) = 4(90)(45) / 135 = 120 \text{ adults}$$

Where: N_M = Number of spawned males
N_F = Number of spawned females

8.3) Fertilization.

In the past, females were spawned directly into colanders and the ovarian fluid was drained off. This was done to prevent possible vertical transmission of IHNV into the egg from the sperm. Gametes were then hauled back to LFH in numbered buckets before fertilization took place. Semen was added to the eggs and water was used to activate the semen to complete the fertilization process. Generally less than one minute was given for fertilization before the eggs were rinsed again with iodine solution, and then water hardened in iodine (100 ppm) for one hour.

Two parts of the fertilization process have recently been questioned by hatchery personnel; 1) should the ovarian fluid be drained, and 2) should more time be allowed for the semen to complete fertilization. It was believed that one or both of these may be contributing to the poor green-egg to shock loss that has been documented for both the Wallowa and LFH stocks. As such, an experiment was conducted in 2003 with the LFH

stock fish to determine if changes in the fertilization/spawning process would increase fertilization success. Results from the LFH experiment were presented (Bumgarner et al 2003) and determined future fertilization procedures for all steelhead stocks at LFC. We continue to evaluate the success of fertilization following this experiment in 2003. Green egg to eyed-egg survival rates have appeared to improve with mortality from green egg to eye-up has decreased from 25% to only 5%. As such, the number of males and females required to meet broodstock (presented in this HGMP) have been altered based on the most recent survival data from the last few years.

After fertilization, eggs are rinsed in a buffered iodine solution (100 ppm) to control viral and bacterial disease, and to remove unwanted organics from the fertilized eggs. They are then water hardened for one hour in the same solution. The volume of iodine solution to eggs should be at least 3:1.

8.4) Cryopreserved gametes.

Currently, no semen from hatchery-origin males has been preserved for use in the program, and is not planned for the future

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.

Broodstock collection protocol will ensure that adults represent a proportional temporal distribution of the run. The 1x2 factorial mating scheme will reduce the risk of loss of within-population genetic diversity for this relatively small steelhead production program.

SECTION 9. INCUBATION AND REARING

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

9.1) Incubation:

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

Lyons Ferry Hatchery staff collects Wallowa stock steelhead eggs annually. Following is the egg survival information at LFH for the ten most recent brood years of Wallowa Stock Steelhead collected from Cottonwood (Table 7). (**Note:** IHNV control measures at LFH require the disposal of eggs from females that test positive for the virus. Discarded eggs are included in percent loss figures for the Wallowa Stock, so figures may not represent true egg survival, but correctly depict survival under existing hatchery management protocol). Current hatchery protocols call for 75% survival from green egg to fry, and 75% survival from fry to smolt stage. Data presented in Table 7 would indicate that these goals have generally been met for the Wallowa Stock.

Table 7. History of egg loss for the Wallowa Stock summer steelhead at WDFW's LFH from 1992-2005 Brood Years.

Brood Year	Eggs Taken	Eggs Retained	% Retained	Fry Produced	% Egg-to-fry survival[1]	Smolts Produced	% Fry-to-Smolt Survival
1992	558,437	198,747	25.6	186,656	93.9	160,017	85.7
1993	533,995	289,198	54.2	271,970	94.0	165,630	60.9
1994	644,886	366,115	56.8	302,397	82.6	144,503	47.8
1995	511,283	335,489	65.6	321,050	95.7	263,449	82.0
1996	601,979	430,394	71.5	447,569	100.0	274,886	64.1
1997	536,723	401,270	74.8	317,590	79.1	252,211	79.4
1998	868,973	479,606 [2]	55.2	475,181	99.1	268,803	56.6
1999	601,699	389,664	64.8	389,664	100.0	274,146	70.4
2000	523,011	322,238	61.6	322,238	100.0	215,584 [3]	66.9
2001	504,182	381,427	75.7	253,743	66.5	182,722	72.0
2002	422,441	319,479	75.6	261,335	81.8	236,627	90.5
2003	301,080	215,097	71.4	206,062	95.8	137,915	66.9
2004	318,430	290,391	91.2	286,536	98.7	150,442 [4]	80.6
2005	282,675	274,586	97.1	269,094	98.0		
Average			64.9		91.3		70.3

1 The imprecision of hatchery methods at times measures survival between life stages as >100% 100% is reported as a maximum in these situations.

2 Destroyed 285,785 viable, disease free, eyed eggs that were in excess of program needs.

3 Release goal was changed from 250K to 200K during rearing. Excess smolts (50,270) were planted as catchable trout into SE Washington area lakes.

4 Approximately 100,000 were planted as fry into area lakes so smolt production goal would not be exceeded.

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

Due to the unknown extent of IHNV possible in the eggtake collections, additional females may be spawned during each eggtake. These excess eggs will be retained until virology results can be obtained to ensure the eggtake goal is met in case of unexpected loss from IHNV or other unexpected circumstances. If more eggs are available then needed, an appropriate percent of eggs from all IHNV negative females will be used to provide the greatest genetic variation in the program. All other eggs in excess of program needs will be destroyed once virology results have been confirmed, or progeny from excess may be stocked into area lakes for put-take fisheries. (Note: present disease control protocol requires the disposal of eggs from IHNV positive female to control outbreaks of the disease within the hatchery).

9.1.3) Loading densities applied during incubation.

Wallowa stock steelhead females from Cottonwood Creek Adult Trap have averaged 5,200 eggs (250/oz) between the 1997 and 2001 spawning years (N= 561 females). Eggs from individual females will be incubated separately. Water flow through each incubator is ~2gpm. After eye-up, eggs of similar size/oz are placed in hatching baskets in shallow troughs with a capacity of 20,000 eggs/fry each.

9.1.4) Incubation conditions.

Incubation, as with rearing, occurs with sediment free, 52 ^{0}F (11 ^{0}C) well water. The incubation building is fitted with back-up pumps to maintain flow through the troughs in emergency situations, and with secondary packed columns to maintain water oxygenation above 10 ppm. Flow monitors will sound an alarm if flow through the incubation troughs is interrupted. IHOT incubation protocols will be followed where practical.

9.1.5) Ponding.

Fish hatch in shallow trough baskets and drop into troughs where they remain for 4-8 weeks after feeding commences. Fish are fed after buttoned up (usually 1-3 days post swimup). Fish are then moved to intermediate inside tanks (usually at about 800 fish/lb). Fish rear in intermediate tanks until July or when fish reach 100/lb, at which time they are transferred to outside raceways. By August (fish are 30-40 fish/lb), all Wallowa Stock production are adipose fin clipped, and placed into one of the three 2.1 acre rearing ponds.

9.1.6) Fish health maintenance and monitoring.

Eggs are examined daily by hatchery personnel. Prophylactic treatment of eggs with formalin (37% @1:600) for the control of fungus is prescribed by a WDFW fish health specialist, and may include treatment with other accepted fungicides as will. Non-viable eggs and sac-fry are removed by bulb-syringe and the loss recorded.

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.

Not Applicable – Fish in this program are not listed.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data by hatchery life stage for the most recent twelve years (1988-99), or for years where dependable data are available.

See Table 7 Above.

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

LFH raceway rearing density index criteria for steelhead will not exceed 0.25 lbs fish/ft^3. Where steelhead are reared in the large rearing ponds at LFH or in the acclimation ponds, densities can be as low as 10% of maximum.

9.2.3) Fish rearing conditions

Raceways are supplied with oxygenated water from the hatchery's central degassing building. Approximately 1,000-gpm (23 minute exchange rate) of water enters each north side raceway through secondary degassing cans. The north side of the hatchery has historically been used to raise steelhead, but south side raceways will likely be included for steelhead rearing in the future due to program changes. South side raceways receive about 650 gpm (33.5 minute exchange rate) each through a manifold. Oxygen levels range between 10-12 ppm entering, to 8-10 ppm leaving the raceway, depending on ambient air temperature and number of fish in the raceway. Similar data are expected in the 2.1 acre rearing ponds (17.5 hour water exchange rate), but dissolved oxygen may be different upon exit due to lower densities, slower exchange rate, and greater amounts of algae in lake compared to raceways. Flow index (FLI) is monitored monthly at all facilities and rarely exceeds 80% of the allowable loading. Raceways are cleaned three times a week by brushing to remove accumulated uneaten feed and fecal material. Feeding is by hand presentation. In the 2.1 acre lake and at Cottonwood AP, feed is dispersed from truck mounted blower feeders.

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. See Table 8.

Table 8. Growth and size of Wallowa Stock Steelhead at LFH for the 1999-2001 Brood Years.

Month/Year	fpp	G/fish	Month/Year	fpp	G/fish	Month/Year	fpp	G/fish
5/99	NA	NA	**5/00**	940.0	0.5	**5/01**	800.0	0.6
6/99	1090.0	0.4	**6/00**	500.0	0.9	**6/01**	409.0	1.1
7/99	285.0	1.6	**7/00**	205.6	2.2	**7/01**	181.4	2.5
8/99	113.0	4.0	**8/00**	109.9	4.1	**8/01**	85.9	5.3
9/99	37.0	12.3	**9/00**	37.8	12.0	**9/01**	43.5	10.4
10/99	26.1	17.4	**10/00**	19.7	23.0	**10/01**	21.0	21.6
11/99	15.8	28.7	**11/00**	12.9	35.2	**11/01**	14.5	31.3
12/99	9.6	47.3	**12/00**	12.2	37.2	**12/01**	11.9	38.1
1/00	7.0	64.8	**1/01**	7.0	64.8	**1/02**	10.5	43.2
2/00	6.3	72.0	**2/01**	6.2	73.2	**2/02**	7.4	61.3
3/00	4.6	98.6	**3/01**	5.5	82.5	**3/02**	5.4	84.0
4/00	5.5	82.5	**4/01**	5.0	90.7	**4/02**	4.5	100.8

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

See above tables or NA.

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 .

Fry/fingerling will be fed an appropriate commercial dry or moist steelhead/salmon diet. Fry feeding starts at ~8 times daily and is reduced as the fish increase in size. Range of feeding varies between 0.5 – 2.8% B.W./day. Feed conversion is expected to fall in a range of 1.1:1 (dry feed)– 1.4:1 (moist feed) pounds fed to pounds produced. Feeding frequency, percent BWD and feed size are adjusted as fish increase in size in accordance with good fish husbandry and program goals.

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

A WDFW fish health specialist monitors fish health as least monthly. More frequent care is provided as needed if disease is noted. Treatment for disease is provided by Hatchery Specialists under the direction of the Fish Health Specialist. Sanitation consists of raceway cleaning three times each week by brushing, and disinfecting equipment between raceways and/or between species on the hatchery site. The size and depth of the 2.1 acre lakes precludes cleaning other than yearly draining when fish are removed. Water quality in the lakes is not effected due to low stocking density.

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

Program goal for the Wallowa Stock program will be to release fish between March 25 and April 30 at 4.5 fish/lb. Pre-liberation samples will note smolt development visually based on degree of silvering, presence/absence of parr marks, fin clarity and banding of the caudal fin. No gill ATPase activity or blood chemistry samples to determine degree of smoltification, or to guide fish release timing is anticipated.

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

“NATURES” rearing concepts will not directly be applied to the Wallowa Stock Program. However, certain aspects of the “NATURES” techniques are used by default at LFH. For instance, the concrete rearing raceways are old enough that the walls and bottoms are of nearly natural coloration (after an algae cover develops) and texture, and promote natural looking fish. Once the fish are removed from the raceways, they are placed in the large semi-natural rearing ponds at LFH, which greatly reduces density, and more natural looking fish (i.e. less erosion on fins) are produced. The large ponds at LFH are constructed with rock banks, and produce natural feed. While the fish must still come to the surface to feed, avian predators at Lyons Ferry add some learned avoidance behavior to the fish in the rearing ponds as well. At Cottonwood AP, acclimation occurs in a semi-natural pond.

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

Professional personnel trained in fish cultural procedures operate LFC facilities. Facilities are state-of-the-art to provide a safe and secure rearing environment through the use of alarm systems, backup generators, and water re-use pumping systems to prevent catastrophic fish losses. The hatchery has water flow and low water alarm systems to monitor water supplies to its incubation, rearing and adult holding facilities. Because LFH is supplied by pumps, it has several emergency power generations systems to operate its pumps during electrical power outages.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels

Refer to Table 2 (Section 1.11.2) that shows proposed WDFW Wallowa Stock smolt releases (goal and maximum) into the Grande Ronde River from Cottonwood AP.

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

Stream, river, or watercourse:	Grande Ronde River (WRIA 35-2684)
Release point:	RM 29 (Cottonwood AP)
Major watershed:	Grande Ronde River
Basin or Region:	Grande Ronde Basin, Snake River Basin

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

The number of Wallowa Stock steelhead released into the Washington portion of the Grande Ronde River has varied since program inception (Table 1). Prior to 1992, WDFW had to rely on ODFW for eggs to meet program needs. Release goals were reduced in 2001 and 2004 due to ESA listing and concerns for natural origin Snake River Summer Steelhead.

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

All Wallowa Stock production will be volitionally released from Cottonwood AP. Volitional releases will being 25 March, and can continue through 10 May. Yearly adjustments may occur based on water conditions, smolt size, and other environmental conditions. Any proposed releases occurring earlier than stated above will coordinated with the co-managers and NOAA Fisheries.

10.5) Fish transportation procedures, if applicable.

Fish are transported from LFH to Cottonwood AP during February each year. Transportation time is about three hours, but depends on road conditions. Tagged study fish are removed from the raceways at LFH and loaded directly into a 5,000 gallon transportation truck at appropriate density levels based on capacity. Remaining fish that have been rearing in one of the large ponds at LFH are first drawn down into a release structure at LFH by slowly lowering the rearing pond. Fish are then pumped from the release structure directly into the transportation truck. The 5,000 gallon transportation truck is equipped with oxygen and aerators.

10.6) Acclimation procedures.

Fish arrive at Cottonwood AP in February each year. The pond exit is screened so that fish cannot escape. On or after 25 March, the outlet screen is removed, and fish are allowed to volitionally exit the pond for the next 5-7 weeks (10 May). Evaluation staff periodically collects samples to document size, condition factor and the number of precocial fish present in the release population.

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

Since this program is for Mitigation / Isolated Harvest, 100% of the smolts released are marked so they can easily be identified in the fishery. Adipose fins are removed from 100% of the fish prior to release. In addition, marked fish (minimum of 20,000) may also left ventral fin clipped and coded-wire tagged for evaluation purposes. Tagged fish allow for expanded harvest estimates both in the Grande Ronde fishery, and fisheries within the Snake and Columbia rivers, and to document stray rates.

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

All Wallowa Stock fish in excess of program needs (maximum of 176,000 smolts) will either be destroyed or planted as resident rainbow trout in SE Washington area lakes unless approved by the managing agencies.

10.9) Fish health certification procedures applied pre-release.

Fish will be examined by a WDFW fish health specialist and certified for release as required under the PNWFHPC (1989) guidelines.

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

Under conditions requiring release of fish, actions will be taken that are suitable for the incident point.

North Side Rearing Raceways: removing the discharge screen(s), pulling the wooden stoplogs and forcing the fish over the short concrete stoplog support wall will flush fish down to the Snake River with the discharge water.

South Side Rearing Raceways: removing the discharge screen(s) and lowering the adjustable sump pipe into the discharge channel will flush the fish to the Snake River with the discharge water.

2.1 Acre Rearing Lakes: lifting the flush gate and pulling the discharge stoplogs will flush fish from the pond along with the water into the Snake River.

Adult Salmon and Steelhead Ponds: For the Salmon ponds this would be accomplished by removing the discharge screen(s) and pulling the discharge stoplogs to flush fish out of the pond along with the water into the Snake River. For the Steelhead ponds the slide gate valve would be opened and the fish will flush out of the pond into the Snake River.

At Cottonwood AP, draining the acclimation pond and releasing all fish into the Grande Ronde River could easily be accomplished as needed.

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 juvenile fish releases.

For other potential interactions from juvenile releases, see Section 3.5.

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 100% of production releases (adipose fin clip) for harvest. In addition, mark a portion with Coded Wire Tags and Freeze Brands, and determine mark rate.
  - (*Indicators: 3.1.2a, 3.2.1a-d, 3.2.2a, 3.3.2a-b, 3.4.4a-d, 3.5.4d, 3.8)*
- Analyze marked fish recovery data collected by others from Columbia, Snake, and other river fisheries, and Lower Granite Dam, to determine harvest numbers and rate
  - *(Indicators: 3.2.1a, 3.2.2a-d, 3.2.2a-c, 3.3.2a-b, 3.8)*
- Cooperate with ODFW to conduct statistically valid creel studies in the Lower Grande Ronde River to determine harvest of hatchery fish and incidental handling rate for other fish.
  - *(Indicators: 3.1.2a, 3.2.1a-d, 3.2.2a-c, 3.3.2a-b, 3.8)*
- Monitor smolt release size, numbers and timing. Monitor smolt passage past Lower Granite Dam, and collect data from other agencies of smolt passage past smolt traps (ODFW and IDFG)
  - *(Indicators: 3.4.4a-d, 3.5.4a-c, 3.5.5a, 3.4.3a)*
- Monitor adult collection at Cottonwood Adult Trap, record numbers, status and disposition
  - *(Indicators:3.1.2a, 3.3.2a-b, 3.4.1a-b, 3.5.3a-b, 3.5.4d, 3.4.2a-b, 3.4.3a, 3.7.6a, 3.7.7a-b)*
- Monitor in-hatchery survival, growth and performance of Wallowa Stock fish at LFH and Cottonwood AP.
  - *(Indicators: 3.4.3a, 3.7.4a-b)*
- Determine proportion of natural and hatchery origin adults in Cottonwood Creek via observation and/or through inference from adult trapping.
  - *(Indicator: 3.1.2a, 3.3.2a-b, 3.4.1a-b, 3.5.3a-b, 3.5.4d, 3.3.1a-c, 3.4.2a-b)*
- Develop genetic profiles for hatchery and natural origin steelhead populations in the Washington portion of the Grande Ronde River (and tributaries) and conduct regular monitoring
  - *(Indicator: 3.5.1a, 3.5.2a-c, 3.5.6a)*
- Develop and implement evaluation plans and report findings consistent with needs of the program for adaptive management
  - *(Indicators:3.1.3a, 3.8, 3.6.1a, 3.6.2a-b)*
- Monitor discharge water quality and water withdrawals and report annually on compliance with related permits and criteria, i.e., screening and fish passage criteria.
  - *(Indicators:3.7.1a-b, 3.7.2a, 3.7.3a-e)*
- Monitor health of adult and juvenile steelhead associated with hatchery production.
  - *(Indicators:3.7.5a-b, 3.4.36a, 3.7.4a-b)*

Use the above information to determine whether the population has declined, remained stable, or has been recovered to sustainable levels. The ability to estimate hatchery and natural proportions will be determined by implementation plans, budgets, and assessment priorities.

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 (besides Cottonwood Creek) 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.

1. Minimize residualism by producing fully smolted fish that quickly emigrate from the system. Reductions in release numbers may occur in the future if we can determine that the current smolt production level is still exceeding adult mitigation requirements.

2. Adult trapping facilities are monitored daily as necessary to prevent injury and unnecessary delay or any natural origin fish. In addition, all fish not needed are passed upstream into Cottonwood Creek to prevent them from straying unnecessarily into other small nearby tributaries.

3. Monitoring efforts for the Wallowa stock in the Grande Ronde River primarily consists of conducting creel surveys to document harvest and obtain CWT data. It is not anticipated that creel surveys will have any genetic or ecological effects to listed fish in the Grande Ronde River.

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 adult returns to the Grande Ronde River, Lower Granite Dam, or the Snake River Basin.
- Provide management recommendations aimed at improving program effectiveness and efficiency.
- Provide management recommendations aimed at reducing program impacts on listed fish.

12.2) Cooperating and funding agencies.

Lower Snake River Compensation Program
Nez Perce Tribe
Confederated Tribes of the Umatilla Indian Reservation
Oregon Department of Fish and Wildlife

12.3) Principle investigator or project supervisor and staff.

Mark Schuck	Glen Mendel	Joe Bumgarner
Jerry Dedloff	Lance Ross	John Johnston

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

Same as described in Section 2.

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

1) *Monitoring hatchery/wild ratios in natural spawning streams* - Adult steelhead will be captured and enumerated at the existing Cottonwood Creek Adult Trap. See section 2.2.3.

2) *Genetic monitoring* – Wild juvenile *O. mykiss* may be sampled periodically 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. Non-lethal tissue samples will be removed for genetic analysis and the fish will be allowed to recover before release. Wallowa Stock juveniles may also be sampled for comparison to natural fish. In addition, WDFW will periodically collected DNA tissue samples from the existing Wallowa stock adults at the Cottonwood Creek Adult Trap.

3) *Fishery Monitoring* – Creel surveys will be conducted jointly by ODFW and WDFW in the lower Grande Ronde River near the Oregon State border, and WDFW will continue to conduct creel surveys in the portions of the lower Snake River to obtain CWT recoveries to estimate total returns and fishery harvest rates on the Wallowa stock fish.

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

1. March – May
2. September
3. September-April

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

Handling of listed fish will generally be restricted to enumeration, measurement and release at 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 i.e., measurement, marking or tissue sampling, fish will be anesthetized before the procedure and allowed to recover before release.

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

Injury due to capture, marking and tissue sampling is inevitable. Injuries during electrofishing can be lethal. 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.

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

See "Take" Table 2.

12.10) Alternative methods to achieve project objectives.

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 adult or smolt trapping on all tributaries are too labor intensive to consider feasible.

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 <50

fish/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 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.

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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:_____

SECTION 15. PROGRAM EFFECTS ON OTHER (NON-ANADROMOUS SALMONID) ESA-LISTED POPULATIONS. Species List Attached (Anadromous salmonid effects are addressed in Section 2)

Currently, there are 40 separate listings of Federal Status endangered/threatened species within the State of Washington. In the list below (Table 12), are all non-salmonid listed species and their current status ratings. Of the following species listed, only the bald eagle, and the plant species Spalding's Catchfly are confirmed to be found in the area where the Wallowa Stock production program occurs (i.e. Grande Ronde River, Lyons Ferry Hatchery). Species such as the Gray Wolf, the Grizzly Bear, the Canadian Lynx, and the northern spotted owl were once likely found in the Grande Ronde River basin, but their current existence is not verified. The geographic distributions of the other listed species were generally limited to the Cascade Mountain Range, the Selkirk Mountains in NE Washington, the Willamette Valley (Oregon), Puget Sound and Coastal areas.

Table 12. List of current ESA listed species (animal and plant) within the State of Washington.

Status Rating	Species
	ANIMALS
Endangered	Albatross, short-tailed (*Phoebastria (=Diomedea) albatrus*)
Threatened	Bear, grizzly (*Ursus arctos horribilis*)
Threatened	Butterfly, Oregon silverspot (*Speyeria zerene hippolyta*)
Endangered	Caribou, woodland (ID, WA, B.C.) (*Rangifer tarandus caribou*)
Endangered	Deer, Columbian white-tailed (*Odocoileus virginianus leucurus*)
Threatened	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
Threatened	Lynx, Canada (lower 48 States DPS) (*Lynx canadensis*)
Threatened	Murrelet, marbled (CA, OR, WA) (*Brachyramphus marmoratus marmoratus*)
Threatened	Owl, northern spotted (*Strix occidentalis caurina*)
Endangered	Pelican, brown (*Pelecanus occidentalis*)
Threatened	Plover, western snowy (Pacific coastal pop.) (*Charadrius alexandrinus nivosus*)
Threatened	Sea turtle, green (*Chelonia mydas*)
Endangered	Sea turtle, leatherback (*Dermochelys coriacea*)
Threatened	Sea-lion, Steller (eastern pop.) (*Eumetopias jubatus*)
Endangered	Whale, humpback (*Megaptera novaeangliae*)
Endangered	Wolf, gray (*Canis lupus*)
	PLANTS
Endangered	Sandwort, Marsh (*Arenaria paludicola*)
Threatened	Paintbrush, golden (*Castilleja levisecta*)
Endangered	Stickseed, showy (*Hackelia venusta*)
Threatened	Howellia, water (*Howellia aquatilis*)
Endangered	Desert-parsley, Bradshaw's (*Lomatium bradshawii*)
Threatened	Lupine, Kincaid's (*Lupinus sulphureus (=oreganus) ssp. Kincaidii (=var. kincaidii*))
Threatened	Checker-mallow, Nelson's (*Sidalcea nelsoniana*)
Endangered	Checkermallow, Wenatchee Mountains (*Sidalcea oregana var. calva*)
Threatened	Catchfly, Spalding's (*Silene spaldingii*)
Threatened	Ladies'-tresses, Ute (*Spiranthes diluvialis*)

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

Section 10 permits, 4(d) rules, etc. for other programs associated with hatchery program.
Section 7 biological opinions for other programs associated with hatchery program.

See Section 2.1

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

Bald Eagle (Much of following has been compiled from: Watson, J.W., and E.A Rodrick. 2001. Bald Eagle (*Haliaeetus leucocephalus*) – Washington Department of Fish and Wildlife – Birds (Vol #4, Chapter 8) 18pp.)

General species description and habitat requirements (citations).

Bald eagles are one of the worlds larger predatory birds, ranging from 7-14 pounds, with wingspans up to 8 feet. They mate for life and are believed to live 30 years or longer in the wild. Habitat requirements generally consist of a moderate forested area with large trees that are generally located nears rivers, lakes, marshes, or other wetlands. Bald eagles have few natural enemies, and in general need an environment of quiet isolation, a condition that has changed dramatically over the last 100 years.

Major wintering concentrations are often located along rivers with salmon runs. Primary food sources have been marine or freshwater fish, waterfowl and seabirds, with secondary sources including mammals, mollusks and crustations (Retfalvi 1970, Knight et al. 1990, Watson et al. 1991, Watson and Pierce 1998).

Local population status and habitat use (citations).

Bald Eagles breed throughout most of the United States and Canada, with the highest concentrations occurring along the marine shorelines of Alaska and Canada. They winter throughout most of the breeding range, primarily south of souther Alaska and Canada (U.S. Fish and Wildlife Service 1986, Stinson et al. 2000). Within Washington, bald eagles nest primarily west of the Cascade Mountains, with scattered breeding areas along major rivers in the eastern part of the state. The bald eagle is a State Threatened species in Washington, and a Federally listed species. Early declines in populations in the lower 48 states were caused by habitat destruction and degradation, illegal shooting, and contamination of its' food source from the pesticide DDT. It is currently vulnerable to loss of nesting and winter roost habitat and is sensitive to human disturbance, primarily from development and timber harvest along shorelines. Territories are generally defined by 1) nearness of water and availability of food, 2) the availability of suitable nesting, perching, and roosting trees, and 3) the number of breeding eagles the area (Stalmaster 1987).

Site-specific inventories, surveys, etc. (citations).

Site specific inventories (abundance/status) on bald eagles in the Grande Ronde near hatchery production activities is unknown. Sightings have been documented in the area. No nesting or nest trees are known to exist in the area affected by the program.

Spalding's Catchfly

General species description and habitat requirements (citations).

Citation: Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest, Part 2: *Salicaceae to Saxifragaceae*. University of Washington Press, Seattle. 597 pp.

The Spalding's Catchfly is a long-lived, herbaceous perennial, 8-24 inches tall, typically with one stem, but can have several. Each stem bears 4-7 pairs of lance shaped leaves 2 to 3 inches in length. The light green foliage and stem are lightly to more typically densely covered with sticky hairs. The cream-colored flowers are arranged in a spiral at that top of the stem. The outer, green portion of the flower forms a tube, ~1/2 inch long with ten distinct veins running it's length. The flower consists of 5 petals, each with a long narrow "claw" that is largely concealed by the calyx tube and a very short "blade", or flared portion at the summit of the claw. Four (sometimes as many as 6) short petal-like appendages are attached inside and just below each blade.

The species begins to flower in mid- to late July, with some individuals still flowering by early September. Most other forbs within it's habitat have finished flowering when *S. spaldingii* is just hitting its peak. A majority of individuals have developed young fruits by mid- to late August.

S. spaldingii occurs primarily within open grasslands with a minor shrub component and occasionally with in a mosaic of grassland and ponderosa pines. It is most commonly found at elevations of 1900-3050 feet, near lower treeline, with a preference for northerly-facing aspects. The species is primarily restricted to mesic (not extremely wet nor extremely dry) prairie or steppe vegetation that makes up the Palouse Region in SE Washington.

Local population status and habitat use (citations).

Within the State of Washington, S. spaldingii, is found in **Asotin**, Lincoln, Spokane and Whitman counties, with a status listing of 'threatened". A total of 28 populations have been identified (FR# 1018-AF79, Vol 66, No. 196, p. 51598). This plant is threatened by a variety of factors including habitat destruction and fragmentation resulting from agricultural and urban development, grazing and trampling by domestic livestock and native herbivores, herbicide treatment and competition from nonnative plant species (Gamon 1991; Schassberger 1988). It is currently estimated that 98% of the original Palouse prairie habitat has been lost to the mentioned activities (Gamon 1991). Each of

the populations documented are generally very small, and are currently quite fragmented, raising questions about their long-term viability.

Site-specific inventories, surveys, etc. (citations).

Site-specific findings in Asotin County not available.

15.3) Analysis of effects.

Bald Eagle
Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects).

To the best of our knowledge, the program as described in this HGMP will not directly have any negative effects on the listed species. Providing adults and juveniles to the system, even within the short term, will provide a potential prey item, that would likely benefit the listed species. However, the current fishery associated with harvest on the adult steelhead could potentially disturb the behavior (territory, nesting, etc..) of the eagles. The surrounding habitat associated with this hatchery compensation program will not be altered, which would be the only source of negative "take" possible to the listed species.

Identify potential level of take (past and projected future).

Disturbance to listed species from people fishing in the area. A take estimate is not possible for this potential disturbance in the past or in the future. Eagle sightings in the area near the fishery are uncommon.

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.)

Operation of the Adult Trap or Acclimation pond at Cottonwood will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at the Cottonwood Adult trap or Acclimation Pond. Activities at Lyons Ferry all take place on existing hatchery grounds. No new construction activities are planned for the program in either location that could impact the listed species. Effluent from the Acclimation Pond meets state water quality standards and is therefore not a concern.

Fish health - pathogen transmission, therapeutics, chemicals.

Not expected to be a problem. The two species have co-existed for thousands of years, the steelhead being the prey of the eagle. Eagles are likely immune to any potential pathogens that hatchery fish might be carrying. Therapeutics and chemicals when applied (at Lyons Ferry) would follow label directions for proper use, eliminating any potential "take".

Ecological/biological - competition, behavioral, etc.

As stated earlier, behavioral disturbances could occur if fishing pressure and eagle abundance overlap. Generally the highest density of fisherman doesn't exceed 3.4 / river kilometer, and should not greatly disturb the species. Camping is limited within the area where the main fishery occurs, so disturbance from campers will be limited.

Predation -

A positive benefit (adult or juveniles) for the listed species in this case.

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

When/If electrofishing surveys occur to collect genetic samples, little to no negative impact to bald eagles should be expected as surveys will require little time in any particular area, and occur at a time when eagles have migrated from the area. Disturbances could occur if an eagle nest is nearby a collection site.

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

Modifications to the surrounding hatchery areas are not planned at this time, so no loss of potential habitat to the listed species is expected.

Spalding's Catchfly
Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects).

To the best of our knowledge, the program as described in this HGMP will not have direct, indirect, or cumulative effects on the listed species. The surrounding habitat associated with this hatchery compensation program will not be altered, which would be the only source of "take" possible to the listed species. Interactions with the summer steelhead will not occur.

Identify potential level of take (past and projected future).

None (past or 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.)

Operation of the Adult Trap or Acclimation pond at Cottonwood will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at the Cottonwood Adult trap or Acclimation Pond. Activities at Lyons Ferry all take place on existing hatchery grounds. No new construction activities

are planned for the program in either location that could impact the listed species. Effluent from the Acclimation Pond falls below state water quality standards guidelines, and is therefore not a concern.

Fish health - pathogen transmission, therapeutics, chemicals.

Not Applicable – pathogens would not be transmitted between the species, therapeutics and chemicals are not used.

Ecological/biological - competition, behavioral, etc.

Not Applicable - Non-overlapping habitats between the summer steelhead and the flower.

Predation -

Not Applicable - Hatchery summer steelhead do not prey on the flower.

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

When/If electrofishing surveys occur to collect genetic samples, little to no impact should be expected as survey areas will likely be out of the range of the listed species.

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

Modifications to the surrounding hatchery areas are not planned at this time, so no loss of potential habitat to the listed species is expected.

15.4 Actions taken to mitigate for potential effects.

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

No actions are considered necessary at this time. Disturbance to Bald Eagles will be minimal in the area, and land disturbance where Spalding's Catchfly may habitat will not occur over the course of the program.

15.5 References

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Table 1. Estimated listed salmonid take levels by hatchery activity (Broodstock Collection).

Listed species affected: Summer Steelhead ESU/Population: Snake River / Grande Ronde River Activity: Broodstock Collection, spawning, rearing and releases, and Genetic Monitoring of adult population

Location of hatchery activity: Cottonwood Adult Trap, Dates of activity: March-May Hatchery program operator: Don Peterson

Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	50	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	200	0	0
Capture, handle, tag/mark/tissue sample, and released d)	0	0	50	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	5	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through migrational delay at Cottonwood Creek Adult Trap.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Juvenile harassment could occur during a drought year when all water would be diverted into the acclimation pond. Juveniles/smolts delayed could be captured and transported ¼ mile to Grande Ronde River.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release.
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 from adult trapping.
h. Other takes not identified above as a category.

Instructions:

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

Table 2. Estimated listed salmonid take levels of by Research/Monitoring/Evaluation activity.

Listed species affected: Summer Steelhead ESU/Population: Snake River / Grande Ronde River Activity: Electrofishing surveys for Genetic Stock profiles				
Location of hatchery activity: Grande Ronde River (Various Tributaries in the State of Washington) Dates of activity: September Research/ Monitoring / Evaluation program operator: Joe Bumgarner				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	500	100	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	50	5	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish though snorkeling.
b. Take (non-lethal) of juveniles/smolts captured and marked for smolt trap efficiency tests.
c. Take associated with smolt trapping operations, electrofishing, and hook and line methods to estimate residuals, where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to juvenile bio-sampling (length/weight, scales, DNA) of fish collected through electrofishing surveys. Adults would be from trapping on tributaries for broodstock feasibility.
e. Listed fish removed from the wild and collected for use as broodstock
f. Intentional mortality of listed fish during electrofishing.
g. Unintentional mortality to listed fish from electrofishing surveys, or adult trapping.

Instructions:

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

Attachment 1

Straying of Wallowa Stock Summer Steelhead Released from WDFW's Cottonwood Acclimation Pond in the Lower Grande Ronde River into the Deschutes River, Oregon

To

Lower Snake River Compensation Office
United States Fish and Wildlife Service
Boise, Idaho

By

Joseph D. Bumgarner
Mark L. Schuck

Washington Department of Fish and Wildlife
Snake River Lab – Science Division
Dayton, Washington

September 2004

Abstract

Since 1982, the Washington Department of Fish and Wildlife (WDFW) has released Wallowa stock summer steelhead into the lower Grande Ronde River as partial mitigation under the Lower Snake River Compensation Plan. In 1999, NOAA Fisheries ruled that Wallowa stock releases should cease by 2008, and a new stock should be developed for release into the Grande Ronde River. Their ruling was based on analysis that showed Snake River Basin steelhead stock (but mainly Wallowa stock) steelhead strayed heavily into the Deschutes River, Oregon. In 2002, the Oregon Department of Fish and Wildlife (ODFW) was contracted by the USFWS Lower Snake Compensation Plan Office to conduct a full analysis on the Snake River Basin steelhead stock straying into the Deschutes River, with the main focus on the Wallowa stock. Unfortunately, because of analysis protocols set by ODFW, the Wallowa stock steelhead released from WDFW in the lower Grande Ronde River at Cottonwood Acclimation Pond (AP) were not included.

Preliminary data analysis from the WDFW Wallowa stock program did not show high stray rates into the Deschutes River. Therefore, WDFW wanted to provide an additional analysis of stray rates from the Wallowa stock released from Cottonwood AP. Wallowa stock steelhead released from Cottonwood AP represents on average 0.11% of the total hatchery origin steelhead strays in the Deschutes River, and 0.23% of the natural-origin Deschutes River steelhead. Of the total recoveries within and outside the Deschutes River of Cottonwood AP steelhead, the average stray rate into the Deschutes is <1.0% when the mouth and Mack's Canyon fishery recoveries are removed from the analysis.

Based on these results, WDFW does not believe that the Wallowa stock steelhead released from Cottonwood AP represents a significant threat to the native steelhead in the Deschutes River. Nor do we believe that the Wallowa stock should be eliminated from the Grande Ronde Basin. As an Endangered Species Act conservation measure, and for the concerns expressed in the Deschutes River, the WDFW Wallowa stock smolt releases have been reduced by 35% since 1999. These reductions will further reduce any negative impacts that the WDFW Wallowa stock releases may have on Deschutes River native steelhead. Continued monitoring and evaluation of the stray rates will continue for further program adjustments as necessary.

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Introduction

Hatchery summer steelhead production under the Lower Snake River Compensation Plan (LSRCP) for the State of Washington began in 1982 with construction of Lyons Ferry Complex (LFC). The program was established as mitigation for lost fish resources and fisheries resulting from construction and operation of the four lower hydroelectric projects in the Snake River (USACE 1975). In addition to the hatchery, remote acclimation ponds (AP) were built along the Grande Ronde River (Cottonwood AP), Tucannon River (Curl Lake AP) and Touchet River (Dayton AP) to acclimate juvenile summer steelhead before release (Figure 1). Currently, LSRCP mitigation goals in the Washington portion of the Grande Ronde River is managed to return 1,500 adult hatchery steelhead (Wallowa stock) annually to the Snake River.

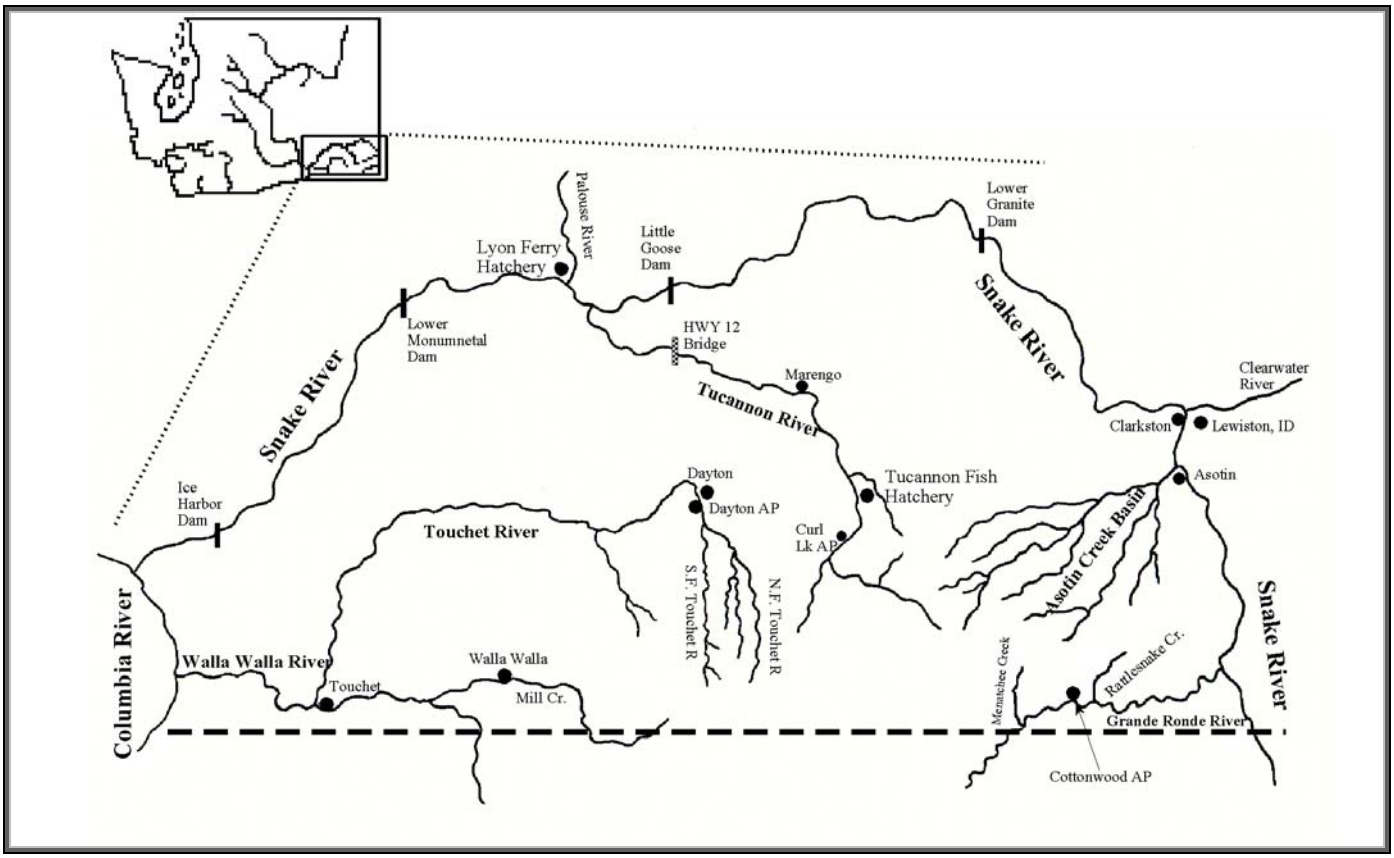

Figure 1. Map showing major rivers and streams in Southeast Washington, and Lyons Ferry Complex facilities.

The Wallowa stock summer steelhead released from Cottonwood AP provide fish for recreational harvest within the LSRCP compensation area (Grande Ronde River, Snake River and tributaries above Ice Harbor Dam). The release also provides adults that contribute to commercial, Tribal and recreational fisheries in the Columbia River. Returns from the released Cottonwood AP fish to the project area have nearly always exceeded the mitigation goal (Figure 2).

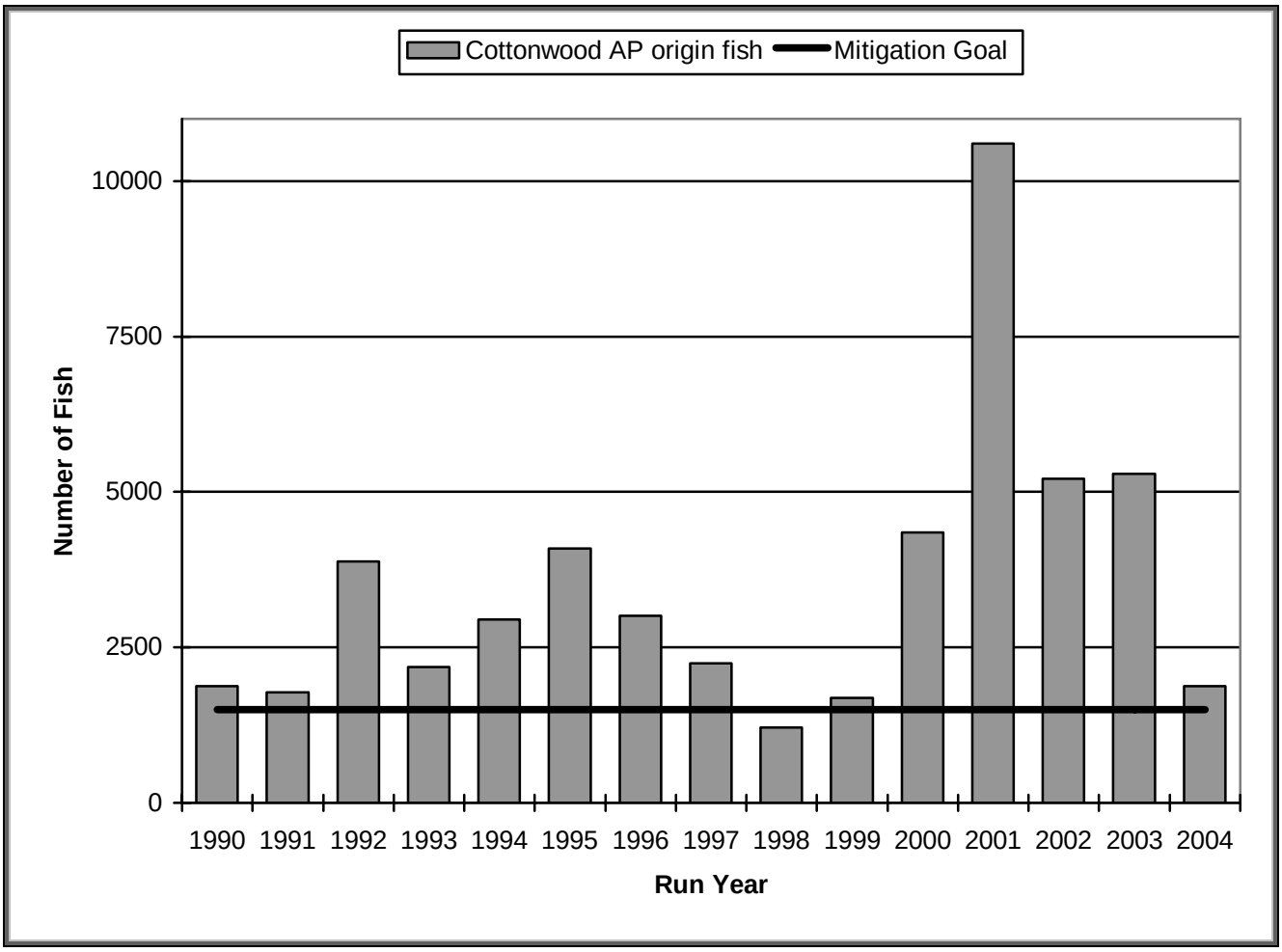

Figure 2. Estimated adult returns of Cottonwood AP released fish to the Snake River Basin based on fisheries, freeze brand recoveries, and extrapolations from other coded-wire tag groups within the Snake River Basin.

In their 2 April 1999 Biological Opinion, the National Oceanographic and Atmospheric Administration (NOAA) Fisheries Section expressed "great concern" regarding the large number of Snake River Basin hatchery-origin steelhead reported spawning in other rivers, specifically in the Deschutes River, Oregon. NOAA Fisheries based their ruling on Coded-Wire Tag (CWT) data that showed hatchery-origin steelhead were straying into the Deschutes River above Sherars Falls greater than a 5% rate (Figures 3 and 4). They concluded that such high numbers of strays jeopardized the long-term health and status of Deschutes River summer steelhead. The average percent stray hatchery steelhead into the Deschutes River above Sherars Falls from 1985-2001 has been 51.8%. Initial CWT data analysis identified the majority of these strays as Wallowa stock origin. Additional analysis were begun to determine the extent of the straying, and actions have been proposed by the management agencies to reduce straying.

This report describes the degree of straying into the Deschutes River from Washington Department of Fish and Wildlife's (WDFW) Wallowa stock steelhead program released from Cottonwood AP in the lower Grande Ronde River.

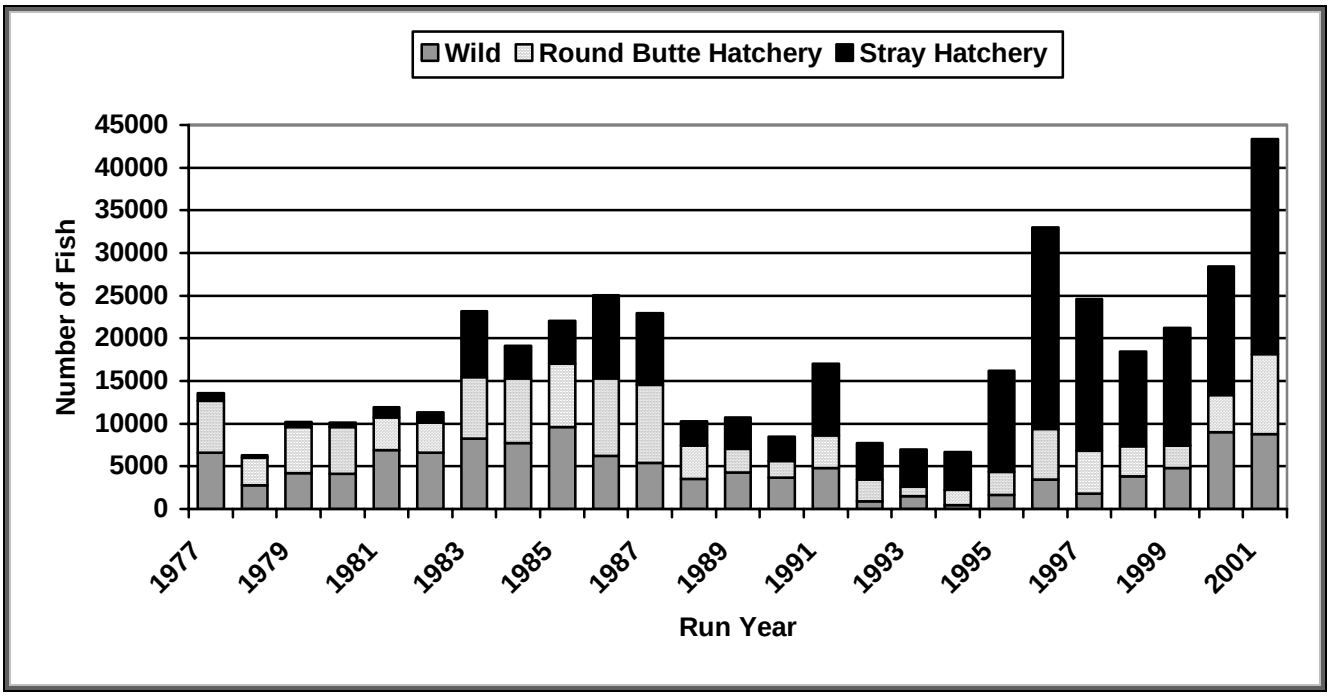

Figure 3. Estimated number of natural and hatchery (Round Butte or stray origin) summer steelhead that migrated past Sherars Falls on the Deschutes River, Oregon (1977–2001 run years). Data provided by Rod French, ODFW district fish biologist for the Deschutes River.

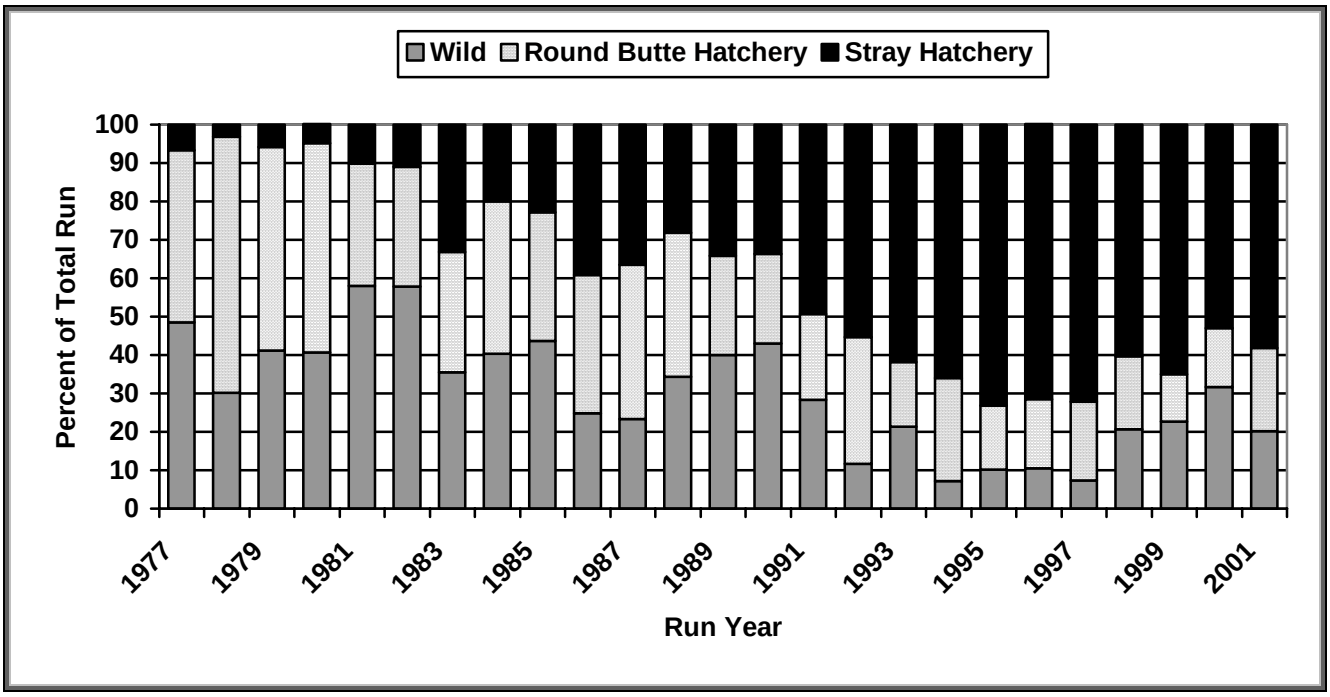

Figure 4. Estimated Percent of natural and hatchery (Round Butte or stray origin) summer steelhead that migrated past Sherars Falls on the Deschutes River, Oregon (1977–2001 run years). Data provided by Rod French, ODFW district fish biologist for the Deschutes River.

WDFW – Wallowa Stock Program Facilities

Production of the Wallowa stock steelhead program takes place at two facilities of the LFC. Egg incubation, juvenile rearing to the smolt stage and marking (production and evaluation) takes place at Lyons Ferry Hatchery. Lyons Ferry Hatchery is located along the Snake River (RM 58) between Lower Monumental and Little Goose Dams (Figure 1). Eggs are incubated separately through the eyed stage until Infectious Hematopoietic Necrosis Virus (IHNV) disease screening is completed. Early juvenile rearing takes place in shallow troughs or raceways, and then all production is adipose fin clipped and moved to a large 2.1 acre rearing lake. In mid-winter, a portion of the production is placed back in raceways for evaluation marking (CWT, left-ventral fin clip, and freeze brand).

Following marking, all fish are moved to Cottonwood AP (Figure 1) in February for extended rearing/acclimation prior to volitional releases in late March to early May. Cottonwood AP is located at RM 29 in the lower Grande Ronde River. Water is supplied to the AP from Cottonwood Creek. Approximately 250 m above the mouth of Cottonwood Creek, WDFW constructed an adult trap (Figure 5) to capture returning Wallowa stock steelhead for hatchery broodstock and evaluation purposes. The Cottonwood Creek adult trap has been in operation since 1992. Prior to then, Wallowa stock eggs were provided to WDFW from Oregon Department of Fish and Wildlife (ODFW). Spawning takes place at the trap site, with the gametes transported back to Lyons Ferry Hatchery.

Figure 5. Cottonwood Creek adult trapping facility.

Wallowa Stock Origin

The Wallowa stock steelhead program was initially developed by capturing returning adult steelhead at the lower Snake River Dams in the 1970's and early 1980's. These adults were transported to ODFW's Wallowa Hatchery on the Grande Ronde River. They were held until mature, spawned, and the resulting progeny were reared to smolts and released into the Wallowa River as part of ODFW's LSRCP Mitigation. Because these fish were trapped at the Lower Snake River dams, they are not a true Wallowa River stock, but a Snake River composite stock, likely consisting of both A- and B-run fish. Beginning in 1983, some of the Wallowa stock steelhead from Oregon's Wallowa Hatchery were transported to LFC for rearing, with WDFW returning the final smolt release to the upper and lower Grande Ronde River. The ODFW provided WDFW with Wallowa stock for releases into the lower Grande Ronde River at Cottonwood AP from 1985-1992. In 1992, the adult steelhead trap was constructed on Cottonwood Creek to capture returning Wallowa stock hatchery fish (presumably released from Cottonwood AP) for broodstock for the WDFW program.

Wallowa Stock Hatchery Production

Releases of summer steelhead into the Grande Ronde Basin from the WDFW LFC program began in 1982, and have been released from Cottonwood AP since 1985 (Table 1). All smolts released from the program since 1985 were acclimated. The program emphasis has been to release smolts at 4-5 fish/pound to 1) reduce residualism, 2) produce fish that migrate quickly from the area to reduce interactions with natural fish, 3) increase smolt-to-adult survival and hatchery cost-efficiency, and 4) meet adult return mitigation goals.

Table 1. Releases of hatchery steelhead from the LFC into the Washington portion of the Grande Ronde River, 1982-2003 release years.

Release Year	Stock	Release Location	River Mile	Number of smolts
1982	Wallowa	Direct Stream	25	35,155
1983	- - - - -	- - - - -	- - - - -	- - - - -
1984	- - - - -	- - - - -	- - - - -	- - - - -
1985	Wallowa	Direct Stream, Cottonwood AP	25, 29	149,408
1986	Wallowa	Direct Stream, Cottonwood AP	25, 29	124,200
1987	Wallowa	Cottonwood AP	29	200,845
1988	Wallowa	Direct Stream, Cottonwood AP	25, 29	220,676
1989	Wallowa	Cottonwood AP	29	222,050
1990	Wallowa	Cottonwood AP	29	239,000
1991	Wallowa	Cottonwood AP	29	252,799
1992	Wallowa	Cottonwood AP	29	213,622
1993	Wallowa	Cottonwood AP	29	291,711
1994	Wallowa	Cottonwood AP	29	273,000
1995	Wallowa	Cottonwood AP	29	206,182
1996	Wallowa	Cottonwood AP	29	249,530
1997	Wallowa	Cottonwood AP	29	250,262
1998	Wallowa	Cottonwood AP	29	252,211
1999	Wallowa	Cottonwood AP	29	268,803
2000	Wallowa	Cottonwood AP	29	274,146
2001	Wallowa	Cottonwood AP	29	215,584
2002	Wallowa	Cottonwood AP	29	182,722
2003	Wallowa	Cottonwood AP	29	236,627
2004	Wallowa	Cottonwood AP	29	137,915

In addition to the WDFW production, ODFW releases Wallowa stock summer steelhead from Wallowa Hatchery and Big Canyon Acclimation Facility on the Wallowa River (tributary in the Grande Ronde). Prior to the NOAA Fisheries ruling (1999), the WDFW Wallowa stock production goal was 250,000 smolts annually, and the ODFW production goal was 1.2 million smolts annually.

Response to NOAA Fisheries Ruling

In the Biological Opinion (1999), NOAA Fisheries proposed elimination of the Wallowa Stock by 2008, concurrent with development of new stocks from local populations. Immediately following the NOAA ruling, both WDFW and ODFW began investigations into developing new stocks, and an option for continued use with the Wallowa stock. Further, with funding from the LSRCP, both agencies spent three years collecting genetic samples to develop a stock profile within the Grande Ronde Basin. In the interim, both WDFW and ODFW made substantial production cuts in the Wallowa stock releases into the Grande Ronde River, as a conservative measure and for ESA concerns while questions regarding the Wallowa stock could be answered. Programmed smolt releases of Wallowa stock into the Grande Ronde from WDFW in 2004 and 2005 were 160,000.

Following the NOAA Fisheries ruling, WDFW, ODFW, and the LSRCP questioned the findings and proposed that a more detailed analysis be conducted to fully describe Snake River Basin steelhead stocks straying into the Deschutes River. Since ODFW releases the majority of Wallowa stock steelhead (as that was the main focus of the NOAA ruling), they took the lead on this analysis. A detailed straying analysis conducted by ODFW in 2003 for Wallowa and other Snake River Basin steelhead stocks confirmed the early analysis (Rich Carmichael, ODFW pers. comm.) that the Wallowa stock steelhead made up the majority of stray steelhead in the Deschutes River. Because of analysis protocols adopted by ODFW, the Wallowa stock steelhead released from the WDFW Cottonwood AP were not included. The ODFW analysis required CWT releases and a terminal trap location. Washington only had CWT releases during a three-year period from 1985-1987, and more recently from 1997 to the present date from Cottonwood AP. Moreover, the adult trap at Cottonwood Creek was not constructed until 1992, and the trap is still currently inadequate to capture 100% of the returning adults. Regardless, preliminary analysis by WDFW during the Hatchery and Genetics Management Plan (HGMP) development process for Wallowa stock steelhead released from Cottonwood AP did not show a high stray rate into the Deschutes River. As such, the WDFW was concerned that the ODFW report would link the WDFW Wallowa stock program by stock name association. Therefore, we undertook a stray rate analysis for the steelhead released from Cottonwood AP.

Determination of a Stray

A separate component of the stray analysis also includes where and when fish were recovered in the Deschutes River. The Deschutes River is a large basin with extensive fisheries occurring throughout. Run year estimates to the Deschutes River are made by ODFW for the area from Sherars Falls (River Mile 43) and upstream (Figure 6). Hence, any recoveries from the area below Sherars Falls may represent fish that might not necessarily stay within the Deschutes River to spawn. Further, many of the recovered tagged fish have been captured in the lower river fisheries in the late summer or early fall. These fish are likely seeking refuge from the

warmer water temperatures of the Columbia River, and are not necessarily straying into the Deschutes River. The question therefore becomes; which fish should be included in the analysis to determine stray rates. For this report, we have chosen to present two estimated stray rates, one based just on those fish recovered from Sherars Falls and above, and another that included all fish recovered regardless of timing and location. We believe the estimate including all fish likely represents a true stray rate because limited recovery locations above Sherars falls can only provide a minimum estimate.

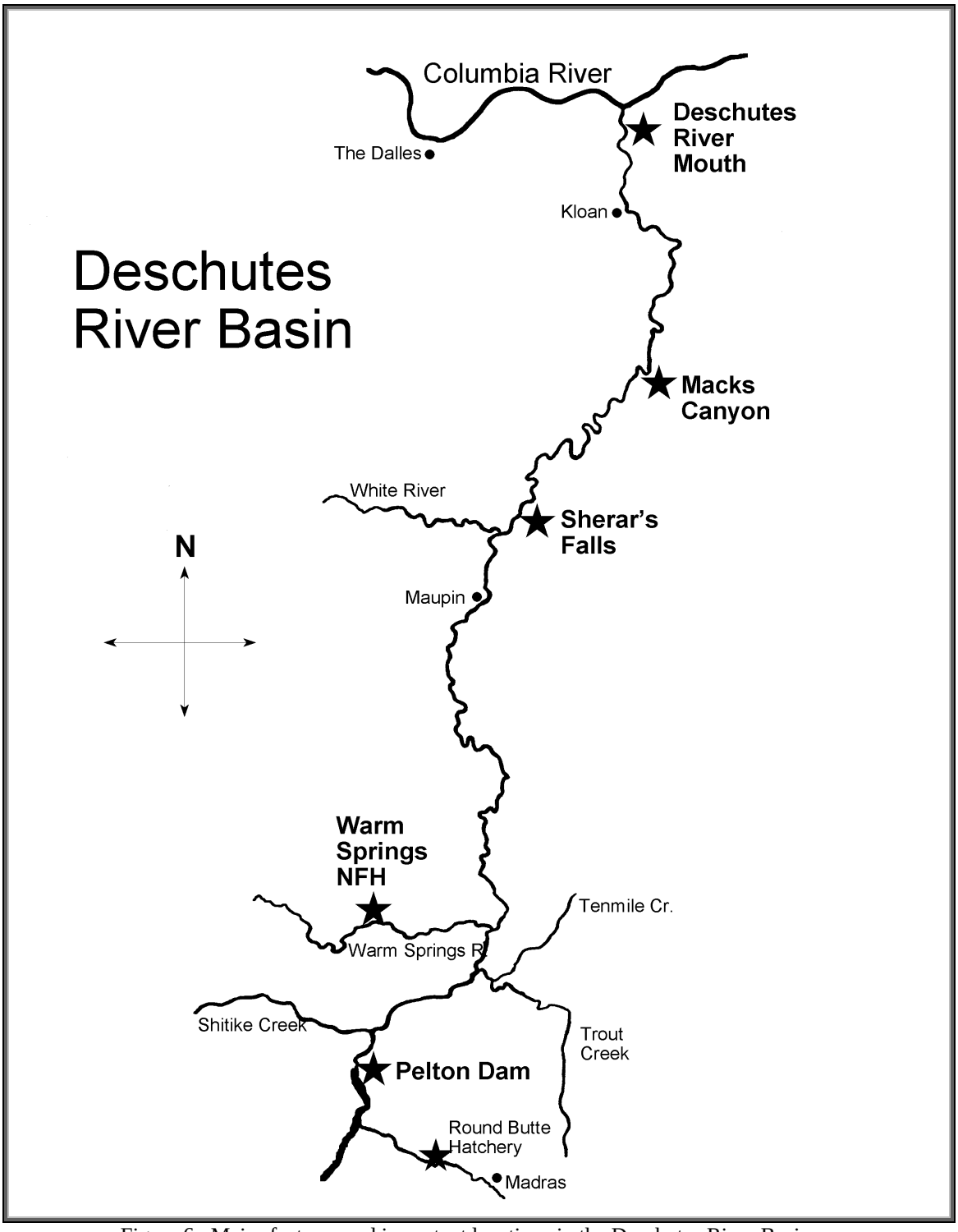

Figure 6. Major features and important locations in the Deschutes River Basin.

Methods

Study Groups

All Wallowa stock hatchery steelhead produced at LFC and released into the lower Grande Ronde River (direct stream or from Cottonwood AP) were marked with an adipose fin clip prior to release. For the 1985-1987, and 1997-present release years, study groups were marked/tagged with a combination of the following: CWT, left ventral fin clip, and freeze brand for specific survival and fishery contribution studies (Appendix A). All of the marked released groups were used to determine the stray rate of Cottonwood AP released Wallowa stock steelhead.

Data Recovery

Coded-Wire Tag Data: The CWT data for this analysis were gathered from two sources. First, we queried the Regional Mark Information System (RMIS) Database maintained by the Pacific States Marine Fisheries Commission (PSMFC) for all WDFW Wallowa stock CWT's released from Cottonwood AP. Second, additional CWT recoveries from Lyons Ferry Hatchery, Cottonwood Creek Adult Trap, and fisheries in the Snake River Basin from WDFW prior to 1995 were obtained from WDFW LSRCP annual steelhead reports (Schuck et al 1986-1995). More recent CWT data from Snake River Basin fisheries (2000 to present) and Cottonwood or Lyons Ferry Hatchery have been compiled and expanded but have not been reported to RMIS at this time.

Freeze Brand Data: At Lower Granite Dam (LGD), NOAA Fisheries personnel operate the adult trapping facility to monitor the migration and passage of salmon and steelhead throughout the year (Jerry Harmon, NOAA Fisheries pers. comm. 2003). When the trap is being operated, fish containing CWT's or magnetized wire are diverted to a holding area where the fish are sampled. Tagged adult steelhead entering the LGD trap are sampled for fin clips and freeze brands, then released. Freeze brand readings have been provided to WDFW by NOAA Fisheries annually. Returns of freeze branded fish to LGD have been used to estimate return rates of WDFW steelhead release groups to the Snake River. Freeze brand observations provided by NOAA Fisheries for the release groups have been reported in WDFW LSRCP annual steelhead reports (Schuck et al. 1986-1998, Martin et al. 2000, Bumgarner et al. 2002, Bumgarner et al. 2003). For this analysis, we adjusted the freeze brand observations down by 5% to account for fall back and re-ascending rate at LGD based on radio tagging studies conducted by the University of Idaho (Keefer et al. 2002, Bjornn et al. 2003).

The number of freeze brands observed at LGD has always been greater than the number of fish we estimate were harvested in from fisheries above LGD and returns to Cottonwood Creek combined. The differences are likely caused by the inadequate adult trap capabilities at Cottonwood Creek, and poor fishery recovery rates above LGD in some years. As such, the numbers of freeze branded fish observed at LGD are likely a more accurate representation of returns of Cottonwood AP fish to the area above LGD.

Data Analysis

To examine timing and location of recovery within the Deschutes River, the RMIS database was queried for all Cottonwood AP fish by date from within the Deschutes River. This data was imported into an Excel spreadsheet for timing and location data extraction.

All extracted CWT recoveries from RMIS, and CWT recoveries and freeze brand data from LSRCP annual reports were put into an additional Excel spreadsheet. The data was organized by brood year, run year, CWT code and general recovery location for extraction into the analysis. As in the ODFW analysis, all recoveries below the Deschutes River (Ocean and Columbia River net and sport fisheries) were removed from the analysis (Carmichael et al. 2004).

Stray rates for this report has been defined in two ways, 1) within the Deschutes River, and 2) within the release group.

1) Of the total stray fish estimated in the Deschutes River above Sherars Falls, what percent of those fish are from the Cottonwood AP releases? This analysis was based solely on CWT recoveries reported in the RMIS database. Recoveries included in this analysis were from Sherars Falls, Pelton Dam, and Warm Springs National Fish Hatchery (Figure 6). Coded-wire tag recoveries were grouped by run year and then fully expanded to include all possible fish from the release group based on the CWT mark rate documented at release. For Cottonwood AP fish, the CWT mark rate has varied over the years, but has been relatively high (Range: 19-52%, See Appendix A for specific rates by brood year).

2) Of the total Cottonwood AP fish recovered in and above the Deschutes River, what percent of those were recovered in the Deschutes River? Recoveries within the Deschutes River for this analysis were from the following areas: Deschutes River mouth, Mack's Canyon, Sherars Falls, Pelton Dam, and Warm Springs National Fish Hatchery (Figure 6). To calculate the percent stray rate, we used two different data sets. We based the first analysis solely on CWT recoveries in and above the Deschutes River (includes Columbia and Snake rivers and their tributaries). We based the second analysis on CWT recoveries (Deschutes River, Columbia River, and Snake River below LGD) and freeze brand recoveries at LGD. Because of the relatively large numbers of freeze brands observed at LGD but not recovered from fisheries or traps upstream, we saw significant differences in the estimated stray rates depending on the method used.

Results

Timing and Recovery of Cottonwood Fish in the Deschutes River

A large number of the estimated fish recovered in the Deschutes River from Cottonwood AP releases have been recovered from the Deschutes River mouth and Mack's Canyon fisheries (Figure 7). These two locations represent 80% of the total recoveries of Wallowa stock steelhead released from Cottonwood AP that occurred within the Deschutes River (Deschutes River mouth = 75%, Mack's Canyon = 5%).

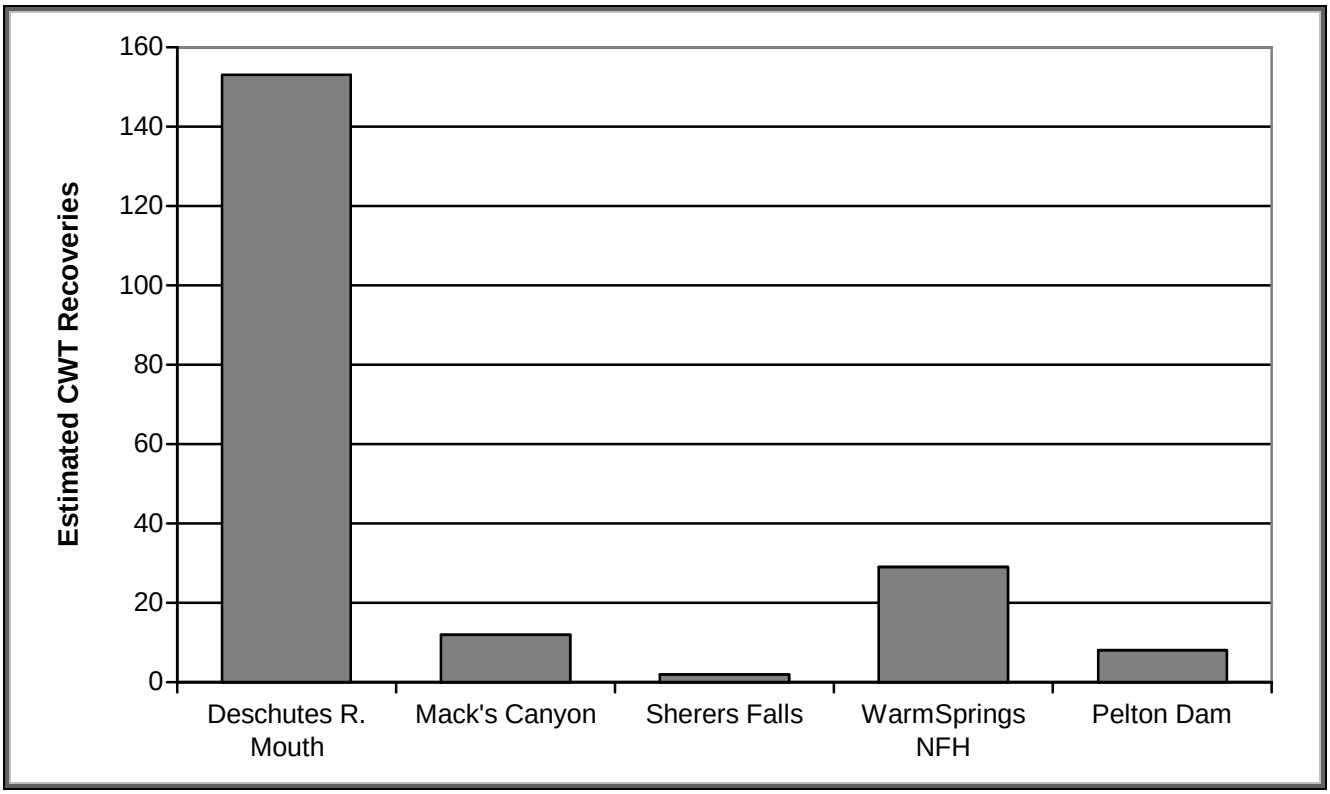

Figure 7. Estimated CWT recoveries from within the Deschutes River Basin of Cottonwood AP released fish.

All of the recoveries from the Deschutes River mouth and Mack's Canyon have occurred during July to October (Figure 8). Given their lower Deschutes River location and time of recovery, we believe that most of these fish would likely have moved out of the system to return to their point of origin and should not be considered part of the stray fish in question. Fish recovered from the Deschutes River Basin from July to October total 82.5% of all Cottonwood AP fish that have been recovered in the Deschutes River (Figure 9). However, to be conservative in the analysis to determine stray rates for the Cottonwood AP fish, only recoveries from the mouth and Mack's Canyon were removed. Early recoveries of fish at Sherars Falls (1 fish) and at Warm Springs NFH (2 fish) were not removed, as we felt these fish were likely to remain in the upper Deschutes River.

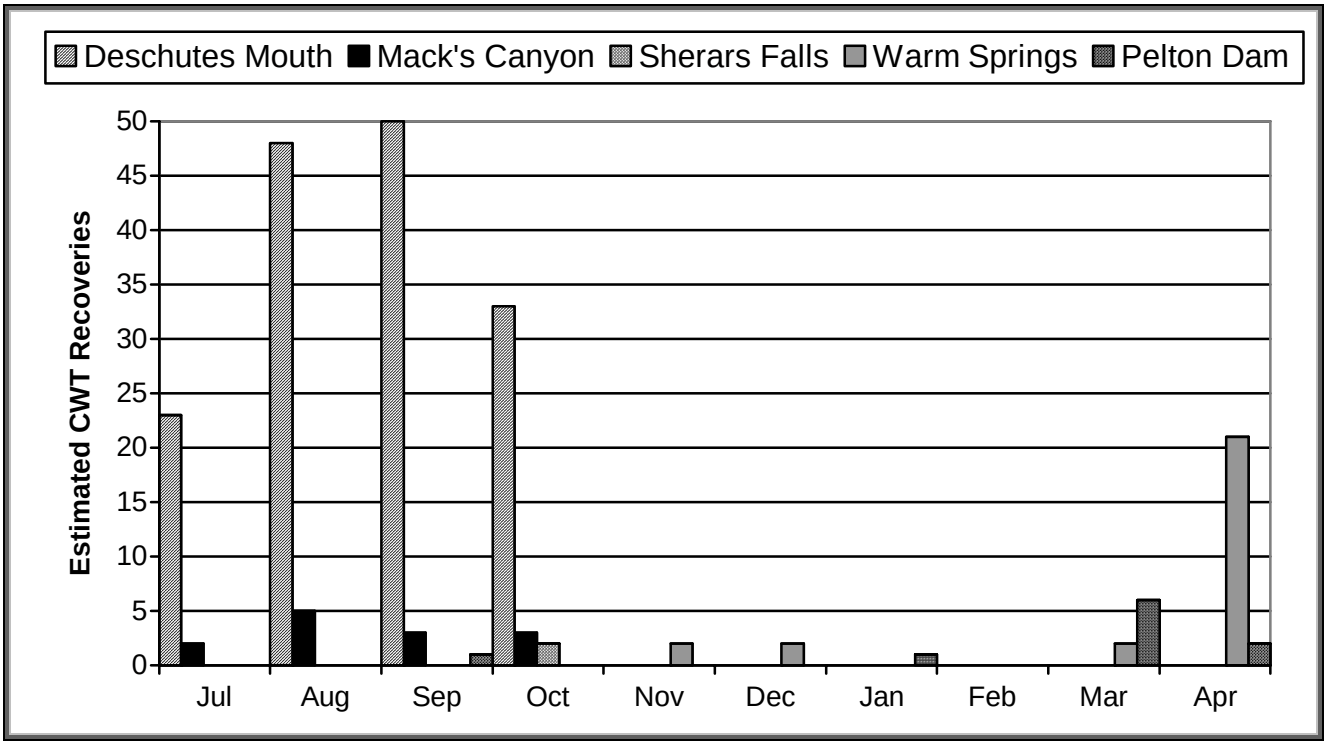

Figure 8. Estimated CWT recoveries by month from locations within the Deschutes River Basin of Cottonwood AP released fish.

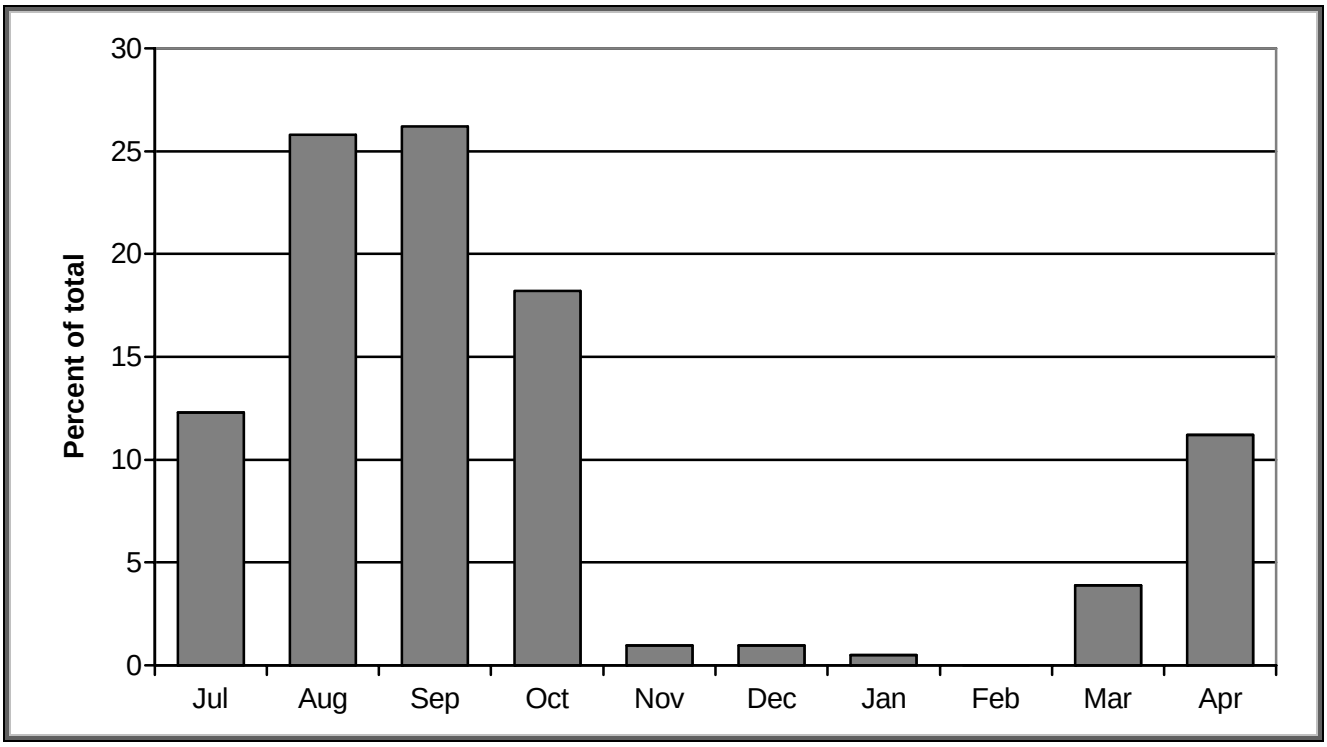

Figure 9. Percent of total CWT recoveries by month within the Deschutes River Basin of Cottonwood AP released fish.

Percent of Cottonwood Fish Among All Strays in the Deschutes River

Tagged fish from Cottonwood AP would be available to be recovered in the Deschutes River from 1986-1990, and 1997-present. The following (Table 2) shows the estimated CWT recoveries from RMIS, and the expanded total fish from the release group based on mark rate for each individual CWT code. The estimates for stray steelhead in the Deschutes River are calculated from mark/recapture estimates for the area from Sherars Falls and above (Rod French, ODFW-The Dalles District Biologist, pers. comm. 2003). Based on the CWT recoveries, Wallowa stock fish released from Cottonwood AP on average represent about one-tenth of one percent of the total strays in the Deschutes River. Even when recoveries from the lower river fisheries (mouth and Mack's Canyon) are included in the analysis (we did this because we don't know if those fish would have strayed into the upper basin or not), the average is 0.67% of the total strays.

Table 2. Estimated and expanded (by mark rate) totals of Cottonwood AP released fish recovered in the Deschutes River Basin by run year (1986-1989, and 1998-2001), as a percent of the estimated hatchery strays within the Deschutes River.

Run Year	Release Year	Total Strays[1]	Estimated Recovery[2]	Expanded by mark rate	% of Total Strays	Estimated Recovery[3]	Expanded by mark rate	% of Total Strays
1986	'85	6,862	6	12	0.17	6	12	0.17
1987	'85, '86	8,367	13	26	0.31	80	159	1.90
1988	'86, '87	2,909	12	29	0.99	18	42	1.44
1989	'87	1,098	5	12	1.09	15	37	3.37
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1998	'97	7,777	1	5	0.06	1	5	0.06
1999	'97, '98	13,785	1	5	0.04	4	18	0.13
2000	'98, '99	15,072	0	0	0.00	1	4	0.03
2001	'99, '00	25,263	1	3	0.01	79	264	0.78
Total		**81,133**	**39**	**92**	**0.11**	**204**	**541**	**0.67**

[1] The 1986 and 1998 run year estimates provided represent 70% of the actual to account for only 1-salt returns, the 1989 run year estimate provided represents 30% of the actual to account for 2-salt returns only.

[2] Recoveries listed are from Sherars Falls, Pelton Dam, and Warm Springs NFH combined.

[3] Recoveries listed include all locations within the Deschutes River Basin (Deschutes River mouth, Mack's Canyon, Sherars Falls, Pelton Dam, and Warm Springs National Fish Hatchery).

The following (Table 3) shows the same CWT recoveries for Cottonwood AP fish, but in relation to the estimated number of natural-origin steelhead in the Deschutes River. Based on the CWT recoveries, Wallowa stock fish released from Cottonwood AP on average represent 0.23% of the total natural origin steelhead in the Deschutes River. Even when recoveries from the lower river fisheries (mouth and Mack's Canyon) are included in the analysis, the average is 1.36%.

Table 3. Estimated and expanded (by mark rate) totals of Cottonwood AP released fish recovered in the Deschutes River Basin by run year (1986-1989, and 1998-2001), as a percent of the estimated natural steelhead in the Deschutes River.

Run Year	Release Year	Total Strays[1]	Estimated Recovery[2]	Expanded by mark rate	% of Total Strays	Estimated Recovery[3]	Expanded by mark rate	% of Total Strays
1986	'85	4,344	6	12	0.28	6	12	0.28
1987	'85, '86	5,367	13	26	0.48	80	159	2.96
1988	'86, '87	3,546	12	29	0.99	18	42	1.18
1989	'87	1,283	5	12	0.94	15	37	2.88
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1998	'97	2,660	1	5	0.19	1	5	0.19
1999	'97, '98	4,970	1	5	0.10	4	18	0.36
2000	'98, '99	8,985	0	0	0.00	1	4	0.04
2001	'99, '00	8,749	1	3	0.03	79	264	3.02
Total		**39,904**	**39**	**92**	**0.23**	**204**	**541**	**1.36**

[1] The 1986 and 1998 run year estimates provided represent 70% of the actual to account for only 1-salt returns, the 1989 run year estimate provided represents 30% of the actual to account for 2-salt returns only.

[2] Recoveries listed are from Sherars Falls, Pelton Dam, and Warm Springs NFH combined.

[3] Recoveries listed include all locations within the Deschutes River Basin (Deschutes River mouth, Mack's Canyon, Sherars Falls, Pelton Dam, and Warm Springs National Fish Hatchery).

Percent of Cottonwood Fish that Stray into the Deschutes River

CWT Only Analysis: The majority of fish recovered in the Deschutes River from Cottonwood AP fish have been collected from the mouth and Mack's Canyon fisheries. The percent of strays from the total Cottonwood return varies significantly (Figure 10) depending on whether those recoveries are included. When all locations within the Deschutes River are included, the average stray rate is 5.02%. When the mouth and Mack's Canyon fisheries are removed, the average stray rate drops to 0.96%.

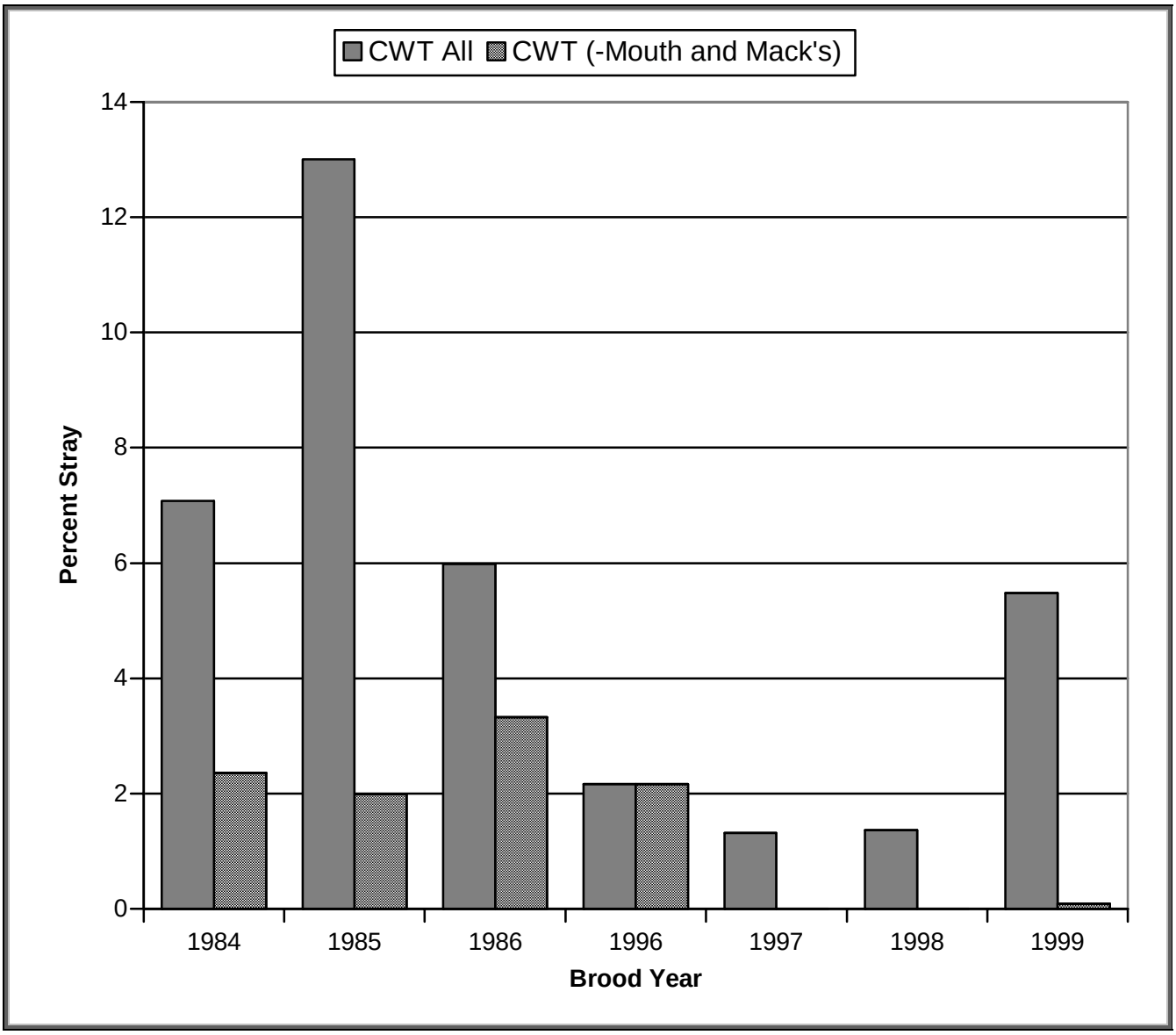

Figure 10. Estimated stray rate of Cottonwood AP released fish based on CWT recoveries within and above the Deschutes River. Solid bars include all CWT recoveries; checkered bars have the Deschutes River mouth and Mack's Canyon fishery recoveries removed.

CWT and Freeze Brand Analysis: The number of freeze brands observed at LGD is typically 2-3 times greater than estimated CWT recoveries above LGD. Hence, when the freeze brand data is used to estimate stray rate of Cottonwood AP fish into the Deschutes River, those rates drop to more than half compared to the CWT only analysis (Figure 11). When all locations within the Deschutes River are included, the average stray rate is 2.32%. When the mouth and Mack's Canyon fisheries are removed, the average stray rate drops to 0.44%.

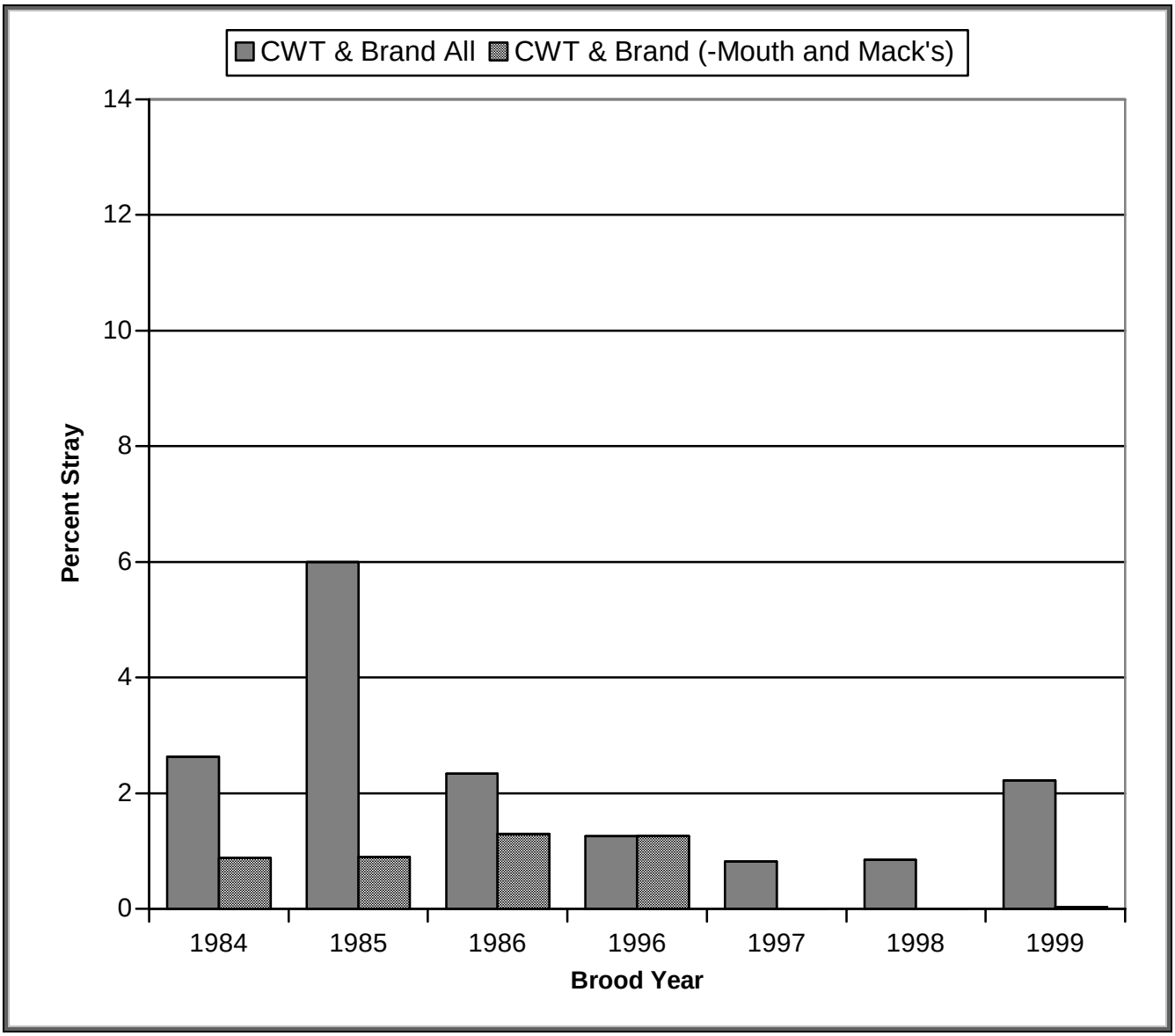

Figure 11. Estimated stray rate of Cottonwood AP released fish based on; 1) CWT recoveries within the Deschutes River, 2) plus CWT recoveries from the Deschutes River upstream to Lower Granite Dam, 3) and plus freeze brand observations at Lower Granite Dam. Solid bars include all recoveries; checkered bars have the Deschutes River mouth and Mack's Canyon fishery recoveries removed.

Discussion

The number of stray hatchery origin summer steelhead in the Deschutes River makes up a substantial part of the annual run, and the concerns for the natural steelhead in the Deschutes River brought forth by NOAA Fisheries and ODFW are justified. Wallowa stock summer steelhead released by ODFW facilities in the upper Grande Ronde River make up a large percent (5-20%) of the stray hatchery steelhead in the Deschutes River on an annual basis (Carmichael et al. 2004). However, data from the Cottonwood AP releases do not show such a high stray rate into the Deschutes River. The reason for the disparity between the upper and lower Grande Ronde River release groups cannot be explained at this time.

When considering stray rates, two types of stray rates need to be remembered and examined separately. The first is as a proportion of the total or stray fish in another system (i.e. Deschutes River), and the second is by the release group. These two can be significantly different from one another. For example, if we estimate a total of 3,000 fish returned from Cottonwood AP, and 100 of those were captured in the Deschutes River, we would estimate a 3.0% stray rate from the release group. If the estimated total number of natural-origin and hatchery strays within the Deschutes River for the same year was 300 and 1,000 fish, respectively, then the proportion of our fish (% stray) would be 33% and 10%, a cause for alarm for the natural population within the Deschutes River.

Our analysis showed the following.

1) Cottonwood AP fish show up abundantly in the Deschutes River – but primarily in the mouth and Mack's Canyon fisheries (80% of total recoveries), and primarily in the late-summer and early fall (82.5% of total recoveries were from July to October).

2) Recovered Cottonwood AP fish above Sherars Falls are a small percent (average of 0.11%) of the estimated total stray fish in the Deschutes River above Sherars Falls.

3) Recovered Cottonwood AP fish above Sherars Falls are a small percent (average of 0.23%) of the estimated total natural origin fish in the Deschutes River above Sherars Falls.

4) Cottonwood AP fish prevalence is highly variable in the Deschutes River, but still well below a problem level.

5) Within release group stray rates varies depending on the method used (CWT or CWT+freeze brand data), and which recovery locations within the Deschutes are used. Excluding the mouth and Mack's Canyon fisheries from the analysis determines <1% stray rate into the Deschutes River.

Conclusion

1) Coded-wire tag data from the Cottonwood AP summer steelhead releases do not support the hypothesis that Cottonwood AP fish behaved similarly to ODFW releases of the same stock.

2) Cottonwood AP summer steelhead enter the Deschutes River, but their persistence and penetration into the upper Deschutes River Basin are very limited.

3) Recent reductions (35%) in summer steelhead release numbers from Cottonwood AP will commensurately reduce adult presence in the Deschutes River.

Cottonwood AP steelhead are present in very low numbers in the Deschutes River and appear to show high fidelity to the their point of release as returning adults. We do not believe they contribute significant risk to the long-term health of natural-origin Deschutes River summer steelhead.

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Appendix A

Estimated coded-wire tag and freeze brand observations from various fisheries and locations of Wallowa stock summer steelhead released from Cottonwood AP

Table 1. Estimated coded-wire tag and freeze brand observations from various fisheries and locations of Wallowa stock summer steelhead released from Cottonwood AP

Release Year	1985	1986	1987	1997	1998	1999	2000
CWT Codes	62-16-27 62-16-28	63-33-05 63-33-06 63-33-49	63-38-40 63-38-41 63-38-42 63-38-43	63-63-39	63-61-27 63-61-28	63-04-60	63-13-09
Fin Clips	ADLV	ADLV	ADLV	ADLV	ADLV	ADLV	ADLV
Freeze Brand Code	RA-17-1, 3	RA-IJ-1, 2, 3, 4	RA-IC-1, 2, 3, 4	RA-IL-3	RA-IJ-1, 3	RA-IT-3	RA-2-2
# Marked Release	78,431	60,477	80,461	39,534	48,958	90,333	80,201
# Unmarked Release	70,977	63,723	120,384	171,119	201,886	178,470	193,945
Total Release	149,408	124,200	200,845	210,728	250,844	268,803	274,146
Percent Marked	52.4	48.7	40.1	18.8	19.5	33.6	29.3
Ocean Recoveries	4	1	1	0	0	0	0
Columbia R. Mouth to Deschutes R. Recoveries							
Col River Net Fishery	550	558	667	0	5	38	67
Col River Sport Fishery	76	51	79	4	20	71	70
Deschutes R. Recoveries							
Mouth Fishery	19	42	12	0	4	15	61
Mack's Canyon	7	3	0	0	0	0	2
Sherars Falls	0	0	2	0	0	0	0
Pelton Dam	3	3	2	0	0	0	0
Warm Spring NFH	10	5	11	2	0	0	1
Columbia R. and Tribs Above Deschutes R							
Columbia River Sport	0	0	4	4	2	11	12
Three Mile Dam Umatilla R.	0	1	6	0	0	0	0
Priest Rapids Dam	0	2	2	0	0	0	0
Touchet River	0	0	3	0	0	0	0
Columbia River Net	0	0	0	0	13	35	9
Snake R. and Tribs below Lower Granite Dam							
Snake River Sport	59	9	7	6	52	0	59
Lyons Ferry Hatchery	13	73	9	0	1	5	0
Tucannon River	0	9	4	0	0	0	0

Snake R. and Tribs above Lower Granite Dam							
Salmon River Sport	16	0	14	0	0	0	0
Clearwater River Sport	5	0	6	0	0	0	0
Snake River Sport	339	77	194	36	55	237	331
Pahsimeroi Hatchery	1	0	0	0	0	0	0
Grande Ronde River							
Grande Ronde Sport	1	163	202	29	139	641	447
Cottonwood Trap	117	68	0	16	42	162	308
Big Canyon Trap	0	0	0	1	0	1	2
Freeze Brand Recoveries at LGR	1,409	790	1,119	149	419	1,706	2,808

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