WDFW LFH Stock Summer Steelhead Tucannon River Release

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Tucannon River Summer Steelhead –Lyons Ferry Hatchery Stock: Lyons Ferry Complex**
Species or Hatchery Stock:	**Summer Steelhead – Lyons Ferry Stock** ***Oncorhynchus mykiss***
Agency/Operator:	**Washington Department of Fish and Wildlife**
Watershed and Region:	**Tucannon 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: Tucannon River Summer Steelhead – Lyons Ferry Hatchery (LFH) Stock

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

Summer Steelhead *(O. Mykiss)*, Tucannon River, LFH 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.
3. Confederated Tribes of the Umatilla Indian Reservation – Co-manager.

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 fish (LFH 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 (Wallowa Stock, Tucannon Endemic Stock, Touchet Endemic Stock). Currently, LSRCP mitigation goal in the Tucannon River is managed to provide 875 returning adult hatchery steelhead annually. Both Operational and Evaluation costs are covered by the 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 LFH Stock steelhead program on an annual basis, as other programs require staff time. Annual operation and maintenance costs for the program is estimated at $180,000. A staff of 8-10 permanent and seasonal biologist and technicians conduct evaluations for each species produced at LFC. The LFH Stock program released into the Tucannon River from LFH represents about 10% of the annual evaluation budget ($65,000).

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

Adult Collection, Holding, Spawning, Incubation, rearing, marking, release - Lyons Ferry Hatchery – along the lower Snake River in Franklin County, Washington (RM 58), just below the mouth of the Palouse River.

1.6) Type of program.

Mitigation / Isolated Harvest

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

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

1.8) Justification for the program.

The Lower Snake River Project was authorized by Congress 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 LFH Stock summer steelhead program provides adult steelhead for recreational and tribal harvest within the LSRCP compensation area (Snake River and numerous tributaries above Ice Harbor Dam) and in the Columbia River. The LFH Stock program utilizes a non-endemic steelhead hatchery stock originally developed from Wells Hatchery (Wells Stock) on the upper Columbia River. Other steelhead stocks were also used in the past to fulfill production needs (Wallowa, Pahsimeroi, Oxbow, and Ringold stocks). Hatchery origin adults (mainly Wells and Wallowa stocks) were later trapped on site at LFH to build what WDFW currently labels the LFH stock summer steelhead. A large number of returning hatchery origin adults are trapped each year at LFH for broodstock (2,000-6,000 fish), most of which are eventually returned into the Snake River to be harvested. Released fish have been marked (top caudal fin clip) to document their presence in the fishery following release.

Currently, about 100,000 smolts of the 345,000 total LFH stock fish produced annually are released into the Tucannon River from LFH. The remaining 245,000 LFH stock smolts are released into the Touchet, and Walla Walla rivers, and directly into the Snake River from LFH (See Walla Walla Basin and Snake River Basin summer steelhead HGMP's). The program emphasis in recent years has been to release smolts at 4-5 fish/pound in the lower Tucannon River 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 Tucannon River, 4) increase smolt-to-adult survival of the hatchery reared smolt to increase hatchery cost efficiency, and meet adult return mitigation goals. Harvest limits in the Tucannon River have been increased (3 fish/day/angler) in an attempt to remove more harvestable fish from the system (See WDFW Snake River FMEP) that will hopefully lessen impacts to native stocks in the area.

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 overharvest 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 nearshore 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 overharvest 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 col4lection 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 Tucannon River Basin. The ability of the evaluation staff to estimate hatchery and natural proportions in the Tucannon 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 of the LFH stock (345,000), we estimate that 120 females are needed for spawning. This target number has been calculated from survival data collected over the years at LFH. Average eggs/female is about 4,750 eggs. Survival data collected to date indicates 75% survival from green egg to fry, and 85% survival from fry to smolt. Total eggtake therefore needs to equal ~525,000. Additional eggs may also be collected because of the incidence of Infectious Hematopoetic Necrosis virus (IHNV). The number of males used on an annual basis may vary, but for genetic reasons, we attempt to use two males for every spawned female. Therefore, total broodstock required is 360 fish for production (Table 1). Additional fish may be collected to account for pre-spawning loss and incidence of IHNV in egg lots that are destroyed. Only marked fish (those with adipose or ventral fin clips) will be collected for broodstock. Marked (CWT) fish in excess of broodstock needs will be sacrificed to obtain the CWT information. All unmarked fish are released back into the Snake River to spawn naturally (generally < 2% of trapped fish).

Table 1. Estimated number of LFH stock steelhead required to meet smolt production goals.

Eggs Needed	# of Females	# of Males	Total Broodstock
525,000	120	240	360

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

The total LFH stock smolt production level is currently 345,000 yearling smolts (Table 2) that are scattered among various release locations. Original smolt production goal was 681,200 smolts, but the goal has been reduced at various times over the years because of study results or ESA concerns (Table 3). Currently, 100,000 smolts are released each year in the Tucannon River. Releases into the Tucannon River were greater in the past (Table 3).

Table 2. Summer steelhead (LFH Stock) production from LFC destined for the Snake River.

Life Stage	Release Location (release method)	Stock	Production Goal	Maximum Annual Release Level [A]
Yearling	Lyons Ferry (direct)	LFH	60,000	66,000
Yearling	Tucannon River (direct)	LFH	100,000	110,000
Yearling	Touchet River (acclimated)	LFH	85,000	93,500
Yearling	Walla Walla River (direct)	LFH	100,000	110,000

[A] Represents a 10% allowance above the production goal because of difficulties in keeping accurate inventory at the hatchery (i.e. 2.1 acre rearing lakes).

Table 3. Release of LFH, Wallowa, Wells and Pahsimeroi stock steelhead smolts into the Tucannon River, 1983-2005 release years.

Release Year	Stock	Release Location	River Mile	Number of smolts
1983	Wells	Curl Lake	40	148,275
1984	Wallowa, Wells	Curl Lake	40	195,315
1985	Wallowa	Curl Lake	40	151,609
1986	Wallowa, Wells	Curl Lake	40	141,068
1987	LFH	Curl Lake	40	162,231
1988	LFH	Curl Lake	40	161,293
1989	LFH	Curl Lake	40	160,131
1990	Pahsimeroi	Curl Lake, Marengo	40, 25	119,264
1991	LFH	Curl Lake, Marengo Br., Curl (Direct)	40, 25, 40	200,336
1992	LFH	Curl Lake, Marengo Br, Curl (Direct)	40, 25, 40	130,040
1993	LFH	Curl Lake, Marengo Br, Curl Direct	40, 25, 40	108,937
1994	LFH	Curl Lake	40	135,359
1995	LFH	Curl Lake	40	146,070
1996	LFH	Curl Lake, Marengo Br	40, 25	169,706
1997	LFH	Curl Lake, Marengo Br	40, 25	139,971
1998	LFH	Marengo Br, Enrich Br	25, 17	160,068
1999	LFH	Marengo Br	25	179,089
2000	LFH	Marengo Br, Enrich Br	25, 17	145,768
2001	LFH	Marengo Br, Enrich Br	25, 17	121,390
2002	LFH	Marengo Br, Enrich Br	25, 17	135,203
2003	LFH	Enrich Br	17	115,496
2004	LFH	Enrich Br	17	83,726
2005	LFH	Westergreen Br	11	102,028

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 rates of LFH stock summer steelhead released into the Tucannon River have been estimated through coded-wire tag recoveries from fisheries and adult traps, or freeze-brand recoveries at Lower Granite Dam (Table 4). Data have been consolidated from WDFW's LSRCP Annual Reports for the Steelhead/Trout program at LFC. Under the original LSCRP goals, a smolt-to-adult return rate (SAR) of 0.5% back to the LSRCP area (above Ice Harbor Dam) would satisfy WDFW mitigation goal responsibilities. Based on freeze brand recoveries at Lower Granite Dam, releases into the Tucannon River have generally returned more than enough fish to satisfy the mitigation goal of 875 fish. Estimated SAR from coded-wire tag recoveries are slightly lower, but the conclusions are the same. As such, further reductions for Tucannon River releases of LFH Stock fish will likely occur in the future.

Table 4. Recoveries and estimated smolt-to-adult return rates from LFH stock steelhead released directly into the Tucannon River, or from Curl Lake Acclimation pond (1983-1996 BY). Recoveries are from sport fisheries, traps or at Lower Granite Dam.

	Curl Lake Releases		Direct Stream Releases	
Brood Year	Freeze Brand Recoveries at Lower Granite Dam SAR to LSRCP area (%)	Coded-Wire Tag Recoveries SAR to LSRCP area (%)	Freeze Brand Recoveries at Lower Granite Dam [2] SAR to LSRCP area (%)	Coded-Wire Tag Recoveries SAR to LSRCP area (%)
1983	1,284 (1.12)	593 (0.30)		
1984	345 (0.45)	185 (0.12)		
1985	468 (0.58)	132 (0.09)		
1986	465 (0.77)	366 (0.23)		
1987	429 (0.72)	603 (0.37)		
1988	249 (0.43)	467 (0.29)		
1989	520 (1.34)	278 (0.35)	390 (1.03)	72 (0.18)
1990	163 (0.43)	764 (0.63)	880 (1.15)	937 (1.17)
1991	41 (0.14)	93 (0.13)	127 (0.21)	185 (0.31)
1992	212 (0.97)	540 (1.10)	235 (0.56)	309 (0.52)
1993	187 (0.37)	456 (0.34)		
1994	358 (0.97)	1060 (0.73)		
1995	37 (0.14)	178 (0.13)	257 (0.87)	175 (0.57)
1996	68 (0.25)	96 (0.09)	153 (0.52)	76 (0.25)
1997			640 (1.27)	451 (0.90)
1998			367 (0.90)	288 (0.71)
1999			590 (1.46)	645 (1.60)
2000 [1]			60 (0.30)	149 (0.74)

1 2000 returns are incomplete.

2 Note: Freeze Branding has been stopped beginning with the 2005 release year. Changes in the trapping of fish at Lower Granite Dam to obtain freeze brand information off adults has made the mark unusable for adult return data, and are reflected in the poor return rates noted in 2000 and 2001 brood year returns.

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

Releases of summer steelhead into the Tucannon River from LFH began in 1983.

1.14) Expected duration of program.

Compensation/Mitigation will continue under the LSCRP as long as the four Lower Snake River dams are in place.

1.15) Watersheds targeted by program.

As a compensation program, the primary function is to provide harvestable fish to the Tucannon River. These fish will provide sport and tribal harvest opportunities within the Snake and Columbia rivers 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 Tucannon River has been active since 1983. Non-endemic hatchery-origin summer steelhead stocks (mainly Wells and Wallowa stocks) were used to develop the current Lyons Ferry Hatchery (LFH) stock to achieve the mitigation goals. Returning adults are trapped for broodstock at LFH. Stock history and long-term use in the hatchery is known to have caused hatchery domestication. The NOAA Fisheries Biological Opinion (1999) concluded that continued use of LFH steelhead stock constituted jeopardy for the listed Snake River natural steelhead populations (includes the Tucannon River). The program has been very successful in returning adults to the Tucannon River for the mitigation fishery, but the fish that get past the fishery have mixed with the endemic stock in the river. Genetic data recently collected indicate some genetic introgression has occurred. Reductions in the LFH stock released in the Tucannon River in recent years because of ESA concerns, and development of endemic broodstocks has caused inefficient use of rearing space at LFH. The LFH was not originally designed to accommodate multiple stocks of fish, so current rearing vessels (large lakes) while excellent for rearing fish, do not allow efficient use of water and space. Further, bird predation in recent years (as high as 25%) has caused inefficient rearing. Modifications at the hatchery to reduce predation, and make more efficient use of rearing space for the different stocks need to occur.

1.16.2) Potential Alternatives to the Current Program

Alternative 1: Develop a new broodstock and eventually eliminate the LFH stock summer steelhead from the Tucannon River basin. WDFW is currently evaluating an endemic broodstock program in the Tucannon River. If successful, the primary purpose would be continued compensation/mitigation under the LSRCP for sport fisheries, while lessening the effects to the natural population because of use of an endemic stock. Fish not captured in the sport fishery will be allowed to access the desired spawning areas to assist in natural production stock recovery. This action will take at least one full generation to achieve the desired evaluation before production is increased or recommendations are available regarding the use of LFH stock in the Tucannon River.

Alternative 2: Eliminate all releases of LFH stock in the Tucannon River to protect the listed population of concern. This action would significantly reduce potential impacts to the remaining natural population from further introgression with the LFH stock; however it would not completely eliminate strays of LFH or other origin steelhead from entering and spawning in the Tucannon River. This alternative is not considered acceptable,

unless Alternative 1 is adopted for management for the river, as Washington is still legally due compensation under the LSRCP. Currently the compensation provided supports a very popular sport fishery in the Tucannon River and elsewhere.

Alternative 3: Reduce the LFH stock releases to a point where negative impacts to listed fish that may stray into other rivers with natural populations would be at an acceptable level. This alternative does not fully meet the intent of NOAA Fisheries Biological Opinion. However, the NOAA Fisheries has determined that non-native stocks that stray into other basins at less than a 5% stray rate do not jeopardize native stocks. If WDFW could determine that the LFH stock made up less than 5% of spawning steelhead in the Snake River or its tributaries, or that full spatial and temporal separation of hatchery and wild populations could be maintained, then the LFH stock releases could continue to provide for harvest mitigation. At present the true percent of genetic and demographic introgression is not known, and until this is known this alternative is not acceptable. WDFW has taken the first step by reducing the release number of LFH stock fish in the Tucannon River (160,000 to 100,000). Further, WDFW has tagged (CWT) continuously every year's release in an attempt to determine stray rates and provide program changes based on those results. Recoveries of these tagged fish into other streams has been low, but also limited by the ability to sustain traps during high springtime flows.

Alternative 4: Release all LFH stock smolts below the mouth of Pataha Creek. The majority of quality steelhead spawning and rearing habitat in the Tucannon River is above Pataha Creek, a small tributary at RM 11. Until 2005, all hatchery smolt releases occurred above Pataha Creek. As such, hatchery steelhead have been observed spawning far upstream. Releasing smolts further down may decrease the spatial overlap of spawning LFH stock and wild steelhead, thus reducing genetic introgression. In 2005, WDFW took the first step in addressing this alternative. All LFH stock smolts were released at a bridge a few hundred yards below the mouth of Pataha Creek. We hope that in the future Pataha Creek will provide a homing cue for returning adult hatchery steelhead, and they will have less chance in straying further upstream into the natural spawning areas.

1.16.3) Potential Reforms and Investments

Reform/Investment 1: Modify existing lakes, construct additional rearing ponds, or construct additional raceways with additional water at LFH for rearing more distinct groups of summer steelhead (i.e. more endemic broodstocks from local rivers instead of the LFH stock). Local broodstock may help reduce the overall risk of having non-native stock spawning in the local rivers. The current lakes are being underutilized given their capacity, and rearing endemic stocks in the lakes could potentially increase their survival. The cost to perform such a modification is currently estimated to be in the range $$$$.

Reform/Investment 2: Construct additional rearing ponds with additional water sources at LFH for rearing more distinct groups of summer steelhead. Small to medium size semi-natural ponds could improve smolt quality and out-migration success for traditional hatchery broodstocks and endemic broodstock. Costs for such construction are currently estimated to be in the range $$$$$.

Reform/Investment 3: Construct a terminal trap where all LFH stock, or other hatchery origin summer steelhead not intended for the Tucannon River could be removed from the system and put back in the fishery for harvest. By removing all non-native stock from the basin, we would protect the genetic integrity of the existing natural stock. The recycled fish would also be made available a second or third time to the sport fishery for harvest opportunity. In addition, this trap would allow for a more accurate account of the native and endemic stock fish returning on an annual basis. This reform will be very costly. Currently no specific area exists on the Tucannon River where a permanent trapping facility could be implemented. Estimated costs are in the range $$$$$.

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 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, HGMP's have been developed for the Tucannon and Touchet River Endemic Broodstock programs. Concurrent with this HGMP to satisfy Section 7 consultations, WDFW is writing HGMP's to cover all stock/programs produced at LFC (Snake River Fall Chinook (Snake River Stock), Snake River Summer Steelhead (LFH Stock), Walla Walla Basin Summer Steelhead (LFH Stock), Grande Ronde River Summer Steelhead (Wallowa Stock), and Rainbow Trout (Spokane 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 the Tucannon River through a combination of juvenile populations estimates, spawning surveys, and smolt trapping. The natural steelhead population in the Tucannon River is currently listed as "threatened" under the Snake River ESU. The population is also considered "depressed" (WDFW SASSI 2002 – Draft). Other ESA listed populations that may be affected by the program are: Tucannon River spring chinook, Snake River fall chinook, and bull trout.

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

Snake River Basin natural-origin steelhead are part of the listed Snake River ESU. Natural-origin adult steelhead (i.e. unmarked fish) are not directly collected for broodstock, but may be incidentally captured during broodstock collection at LFH. The number of unmarked fish captured on an annual basis since program inception has varied between 3-66 fish (<2% of total fish trapped). Trapping has typically begun in July and continued into mid-November. Since 2003, trapping does not begin until 1 September, with weekly trapping goals set based on broodstock needs. Trapping continues until mid-November. Sorting of collected broodstock takes place in late November. Any natural origin fish captured are delayed from their migration until they can be sorted and released back into the Snake.

ESA listed Columbia Basin bull trout, and Snake River spring/summer chinook, and fall

chinook are also present in the lower Snake River Basin at various times of the year. Bull trout have not, nor are expected to be encountered at the LFH Adult Trap when steelhead are being collected for broodstock. Listed spring/summer chinook and fall chinook will be captured if they swim into the trap at LFH. Any listed spring/summer/fall chinook captured will be sorted to the fall chinook holding ponds at LFH, where WDFW has a large fall chinook program (See LFH Fall Chinook HGMP for impacts to listed spring/summer and fall chinook).

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

The hatchery production program may incidentally affect the listed Tucannon River summer steelhead population. In addition, the listed Tucannon River spring chinook population, Tucannon River fall chinook (Snake River Fall Chinook ESU) and Columbia Basin bull trout (Tucannon River) may be incidentally affected to a lesser degree.

<u>*Summer steelhead*</u> – Tucannon River summer steelhead are typical of A-run steelhead from the mid-Columbia and Snake basins. Most adults (70%) return to the basin after one year of ocean rearing. The remainder are two ocean age adults with an occasional three ocean age fish. 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 Snake River from July through April.

Spawning in the Tucannon River has been documented between January and May. It is believed that fish spawning in January and February in the lower Tucannon River are LFH Stock fish (Mark Schuck, WDFW pers. comm.). Natural origin juveniles utilize a wide range of habitats throughout the Tucannon River including areas adjacent to smolt release locations. However, the current smolt release location is below the prime rearing areas for natural summer steelhead in the Tucannon River. Most naturally produced smolts migrate after rearing for two years, though as high as 55% of a single migration year came from 1-year smolts (Bumgarner et al, 2002). We believe the high number of Age-1 smolts come from the LFH stock fish spawning in the lower river. Natural-origin smolt out-migration in the Tucannon River occurs mainly in April and May, thereby overlapping with hatchery steelhead smolts releases as described for this program. Peak smolt movement is generally associated with increased flow events and increasing water temperatures between mid-April and mid-May (Mike Gallinat – WDFW pers. comm).

Hatchery-origin steelhead from this program will likely stray into some of the natural spawning areas of the Tucannon River, and also into other tributaries where natural origin steelhead may spawn. Spawning with hatchery origin fish may reduce the reproductive success of natural spawners (Chilcote 2001). In addition, hatchery-origin steelhead from this program are the target of a major sport fishery in the Snake and Tucannon rivers. Incidental hooking of natural-origin summer steelhead occurs, with some losses expected due to hooking mortality and handling. Hooking rates on natural-origin steelhead in the Tucannon River can be found in WDFW's Snake River FMEP (2002)

Juvenile hatchery steelhead from this program 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 location. 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 utilize the Tucannon River for spawning and rearing. Overall returns, and spawning distribution and timing have been well documented since the mid-1980s (Gallinat et al, 2001). Juvenile distribution and population estimates have been calculated as well, with the relative distribution restricted by high summer water temperatures (Gallinat et al, 2001). Spring chinook juveniles in the Tucannon River rear for one year and smolt the following spring. Smolt migration from the Tucannon River generally begins in late March and extends through May, thereby overlapping with the hatchery steelhead production releases from this program.

Juvenile hatchery steelhead released into the Tucannon River 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/location. Predation of natural origin chinook smolts by LFH stock hatchery steelhead is unlikely due to size limitations (See Section 3.5).

Fall chinook – Fall chinook in the lower Tucannon River are considered a segment of the Snake River population. Adult Snake River fall chinook enter the Columbia River in July and migrate into the Snake River from mid-August through November. Spawning in the Tucannon River occurs from mid-October through early December, and is generally restricted between the mouth and the State Highway 12 Bridge (RM 13.7). Based on smolt trapping in the lower Tucannon River, fry emergence occurs during April and May. Fall chinook smolts from the Tucannon River migrate as sub-yearlings. Smolt migration from the Tucannon River occurs in late May through June. Competition for food and space with hatchery steelhead is possible, though likely minimal due to different microhabitat and food preference between steelhead smolts and juvenile fall chinook. However, predation on juvenile fall chinook from released hatchery steelhead is a possibility (See Section 3.5), because of the relatively small size of fall chinook smolts (70-100 mm).

Bull trout – It is suspected that both fluvial and resident life history forms of bull trout inhabit the Tucannon River (Glen Mendel – WDFW pers. comm.). The lower Tucannon River is likely utilized as a migration or over wintering corridor for the bull trout. Adults migrate into headwater areas during the late spring or early summer, generally following the same migration timing as the spring chinook. Spawning occurs in September and October in the upper Tucannon River and tributaries. Fry emerge over an extended period during the spring depending on incubation temperatures. Juvenile rearing is restricted to headwater areas because of 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 larger 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), and release location (far below most bull trout juvenile rearing areas). Predation of hatchery steelhead on bull trout in the migration corridor is unlikely due to size limitations (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.

Hooking and release mortality of bull trout during the steelhead harvest season may occur. This would likely happen during the fall and winter months after bull trout have completed spawning and have migrated to the lower river for the winter. Hooking/release mortality rates are unknown at this time.

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 Tucannon River are listed as "threatened" under the ESA as part of the Snake River ESU. Tucannon summer steelhead were classified as depressed because of chronically low escapement by WDFW (SASSI 1992). The population is likely at a "critical" population threshold because it is chronically depressed. The population is believed to be below replacement in most years, and stochastic events pose significant genetic risk to the population because of low absolute population numbers. Washington established an interim escapement goal in the 1992 SASSI document of 1,200 spawners. Present escapement is far below that goal (Table 5).

Spring/summer Chinook – Natural origin spring/summer chinook in the Tucannon River are listed as "threatened" under the ESA as part of the Snake River spring/summer chinook ESU. Status of the population within the Tucannon River is depressed (See Tucannon River Spring Chinook HGMP).

Fall Chinook – Natural origin fall chinook in the Tucannon River are listed as "threatened" under the ESA as part of the Snake River ESU. The spawning population in the lower Tucannon River is considered part of the larger composite population for the entire Snake River Basin. Carcasses recovered from spawners in the Tucannon River consist of natural and hatchery origin fish (Lyons Ferry and Umatilla Hatcheries).

Bull Trout – Natural origin fluvial and resident bull trout in the Tucannon River are listed as "threatened" under the ESA as part of the Columbia Basin Bull Trout Distinct Population Segment (DPS). In the Tucannon River, sub-populations of bull trout may exist in the mainstem Tucannon River, and Panjab/Meadow Creek (Glen Mendel – WDFW pers. comm.). Status of the bull trout population in the Tucannon River Basin is considered at low risk for extinction because of absolute numbers documented over the last 5 years (SASI 1998).

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

Progeny-to-parent survival data on natural summer steelhead are not currently available, but WDFW monitoring and evaluation actions have been undertaken to gather parent-progeny data. WDFW has juvenile production estimates for most years between 1986 – 2005 that can be used to estimate survivals for early life stages. WDFW has smolt production estimates since 1996. Table 5 provides a summary linking the data available to date.

Table 5. Estimated numbers of spawning steelhead (hatchery and wild origin), and offspring (fry, parr, and smolts) produced by brood year in the Tucannon River.

Live Stage	Description	Brood Year									
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	Spawners	377	393	NA	312	418	257	628	379	352	211
Age 0	Fry	93800	136300	123300	137500	66500	135600	116700	221700	151900	35800
Age 1+2	Parr	33400	31500	57800	40300	36800	44800	46200	53400	57200	NA
Smolts	Age1	5583	6069	16684	900	14897	11912	8050	9920	3537	NA
	Age 2	8967	11584	14095	25069	13747	10824	9085	10600	NA	NA
	Age 3	834	1133	3279	945	498	915	1300	NA	NA	NA
Total Smolts		15,384	18,786	34,058	35,014	29,142	23,651	18,435	NA	NA	NA

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

Table 6. Estimated natural and hatchery adult steelhead escapement indices into the Tucannon River. Data consolidated from WDFW Snake River Lab files.

Year	Natural Origin	Hatchery Origin
1988	525	787
1989	319	388
1990	416	343
1991	210	256
1992	166	513
1993	94	475
1994	151	96
1995	147	230
1996	71	322
1997 [A]	No Data	No Data
1998	109	203
1999	138	280
2000	31	226
2001	198	430
2002 [B]	146	233
2003 [B]	104	248
2004	59	152

[A] Flood conditions or high stream flows precluded spawning survey estimate of redds, which are the basis for escapement estimates.

[B] High stream flows limited our ability to conduct accurate redd surveys. Numbers provided are minimum estimates based on the number of fish captured at the lower Tucannon Adult Trap (temporary) and the Tucannon Fish Hatchery adult trap.

Estimated juvenile steelhead abundance (# x 1,000) in the Tucannon River between RM 34.6 and RM 46.2 for recent years are shown below. Washington Department of Fish and Wildlife has estimated based on the parr-production model that the river reach for which the estimates are provided could produce 35,625 parr (> 0-age) at full seeding (unpublished WDFW data). Current average for > 0-aged steelhead is about 13,000; about 36% of estimated capacity.

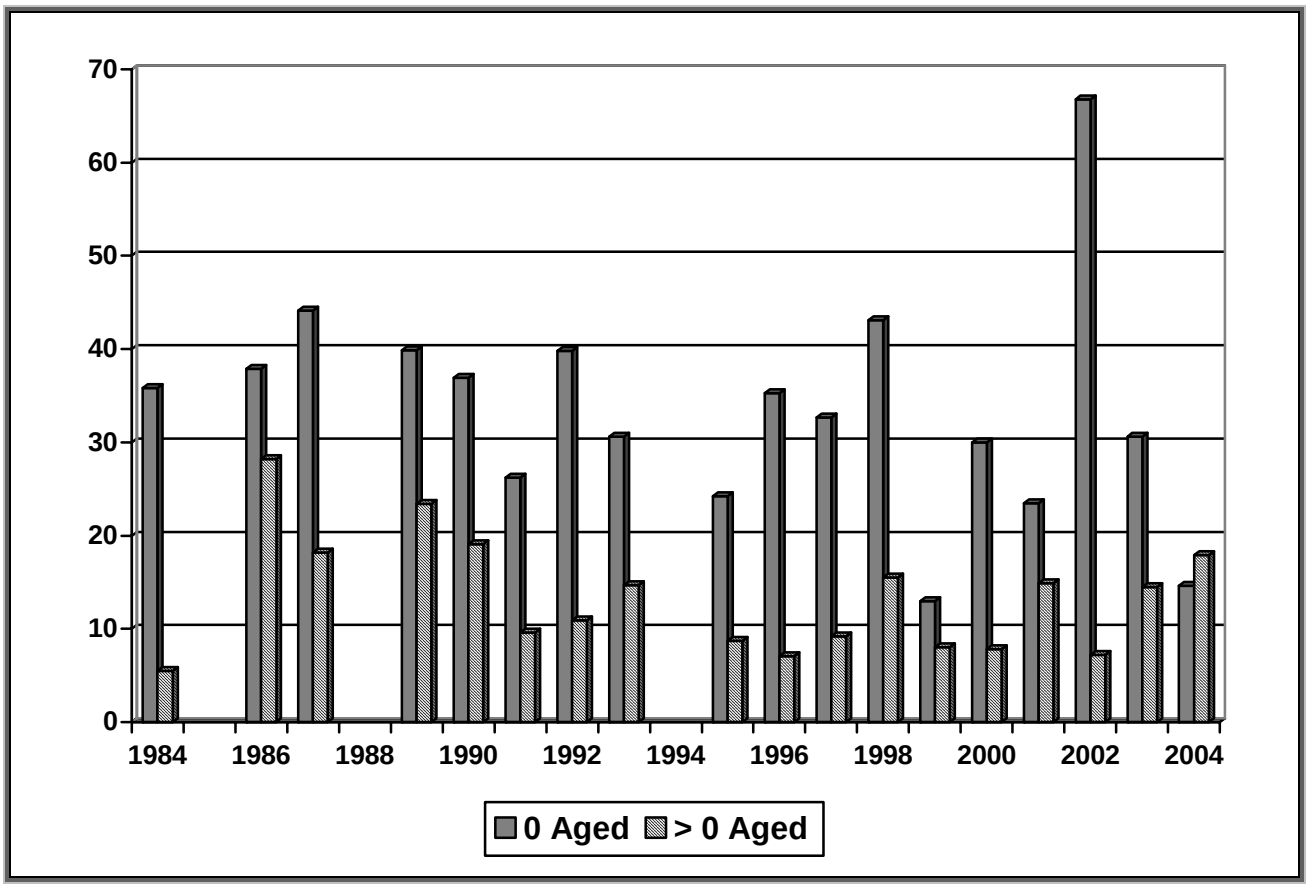

Figure 1. Estimates of natural juvenile steelhead abundance in the Tucannon River from Campground 1 (Rkm 55.4) upstream 19.1 Rkm to Panjab Bridge, for most years between 1984-2003.

- Provide the most recent 12 year (e.g. 1988-2000) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

See Table 6 above.

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

<u>Broodstock Trapping:</u> Listed summer steelhead adults (Snake River ESU) will be incidentally trapped from September through mid-November at the LFH adult trap, which constitutes an indirect take of listed fish (Take Table 1). All natural origin adults captured are eventually released back into the Snake River to spawn naturally in their tributary of choice (late November). Based on LFH trapping records, it is generally anticipated that less than 40 natural origin adults will be captured and handled in any given year.

Spawning, Rearing and Releases: Release of summer steelhead from LFH into the Tucannon River has a potential for indirect take of listed summer steelhead that may be present in the Tucannon River. The release of LFH Stock summer steelhead may incidentally affect other listed salmonids (bull trout, spring/summer chinook, fall chinook) in the Tucannon River by displacement, competition, or predation. 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 from September through mid-November 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 enter and are captured in the trap. However, the current trap is not operated every day for collection purposes, and fish entering the trap will be shunted immediately back to the river on days of non-collection.

Evaluation staff monitors the natural production of juvenile and migrant steelhead smolts in the Tucannon River with electrofishing surveys or smolt trapping. Part of those objectives also monitor the occurrence/ distribution of hatchery steelhead smolts released from this program. Similar objectives have been outlined in the Tucannon River Endemic Steelhead Broodstock HGMP. Estimated take levels for these activities have been addressed in that HGMP and will not be repeated here.

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

Table 7 provides the number of wild (unmarked) steelhead that died in the broodstock collection/holding/sorting at LFH for the last seven years. We believe this is representative of mortality to be expected during typical years at LFH.

Table 7. Number and percent of listed (unmarked) summer steelhead captured and held during broodstock collection at LFH for the 2000 and 2004 run years.

Run Year	Total Collected	Wild Collected	% Wild Collected	Mortalities	Percent Died
1998	2,973	23	0.77	0	0.00
1999	3,808	12	0.32	0	0.00
2000	2,928	66	2.25	1	0.08
2001	7,596	7	0.09	1	0.04
2002	2,535	0	0.00	0	0.00
2003	2,109	3	0.14	0	0.00
2004	1,926	5	0.26	0	0.00

-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 LFH Adult Trap, natural origin fish are eventually returned back to the Snake River. Fish are sorted 1-3 times a year depending on how many fish have been trapped for the season. 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 LFH Stock steelhead is part of legally required compensation provided to Washington under the LSRCP. 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, WDFW 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 Snake River steelhead reported spawning in other rivers (specifically of the Wallow Stock fish in the Deschutes River, Oregon – See Wallowa Stock HGMP). NMFS based their ruling on preliminary data analysis that suggested Wallowa Stock and other Snake River origin hatchery steelhead stocks were straying above the 5% rate. However, analysis by ODFW (Carmichael et al 2004) indicates that LFH stock fish released in the Tucannon River do not stray heavily into the Deschutes River. A separate analysis conducted by WDFW for the Tucannon River releases indicates the same (Table 8).

Table 8. Number of CWT's recovered from the Deschutes River, and expanded number based on mark rate.

Brood Year	Total CWT's recovered from Deschutes River and above	CWT's recovered within Deschutes River		Percent of total CWT's recovered		Expanded number of fish in Deschutes River based on mark rate	
		Total	- Mouth fishery recoveries	Total	- Mouth fishery recoveries	Total	- Mouth fishery recoveries
1983	403	0	0	0.00	0.00	0	0
1984	157	4	0	2.55	0.00	8	0
1985	104	2	0	1.92	0.00	4	0
1986	111	6	0	5.41	0.00	16	0
1987	262	2	0	0.76	0.00	5	0
1988	188	2	0	1.06	0.00	5	0
1989	190	6	4	3.16	2.11	9	6
1990	655	10	1	1.53	0.15	17	2
1991	155	0	0	0.00	0.00	0	0
1992	591	19	8	3.21	1.35	32	13
1993	222	19	3	8.56	1.35	52	8
1994	469	16	5	3.41	1.07	44	14
1995	236	3	0	1.27	0.00	9	0
1996	88	0	0	0.00	0.00	0	0
1997	499	2	0	0.40	0.00	6	0
1998	356	5	0	1.40	0.00	22	0
1999	837	26	2	3.11	0.24	94	7
2000	220	34	21	15.50	9.55	204	126
Totals	5,742	156	44			527	176
Average	319	8.7	2.4	2.96	0.88	29.3	9.8

Regardless, NMFS proposed elimination of the LFH Stock by 2008 (1999 BiOP), 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. Development and evaluation of an endemic broodstock for the Tucannon River summer steelhead is currently under way. Therefore, future actions proposed within this HGMP are consistent with the Reasonable and Prudent Actions suggested by NMFS.

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 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 negotiations to develop a CRFMP (see below) will identify production level from the Tucannon River.
- *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).* – FMEP's for Snake River fisheries are currently being drafted by WDFW that will describe in detail the current fisheries management within the Tucannon River. 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. Stray rates of the LFH Stock outside of the Tucannon River do not appear to be a problem. However, the high proportion of the LFH stock (originally released into the Tucannon) spawning in the Tucannon River is of concern. Successful development of the Tucannon Endemic Broodstock program would improve compliance with the Wild Salmonid Policy.

3.3) Relationship to harvest objectives.

As a strictly Mitigation / Isolated Harvest Program, the use of the LFH Stock in the Tucannon 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 Tucannon River. Summer steelhead from Tucannon River releases have been documented in Columbia River net and sport fisheries at a very high rate. They have also been harvested successfully in the mainstem Snake and Tucannon rivers (WDFW 1987-1999).

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 Snake River FMEP – in progress). Sport fishing regulations in the Snake and Tucannon rivers have been set to reduce the incidental mortality to 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 LFH Stock summer steelhead into the Tucannon River and nearby tributaries.

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 have affected natural steelhead production in the Tucannon River.

In 1999, the Columbia Conservation District completed the Draft Tucannon Model Watershed Management Plan (CCD 1997), which reviewed the ecological health of the Tucannon River Watershed in relation to salmonid population status and recovery. Limiting factors such as water temperature, channel stability, sediment, and instream habitat were addressed. These same limiting factors have been summarized with recommendations provided by Kuttle (2002). Fish & Wildlife and land managers, in association with private landowners and the Columbia Conservation District, described approaches to habitat improvement, both instream and upland, that are required as part of salmonid recovery in the Columbia basin. The plan has been used as a template to guide actions taken by multiple agencies to request funds for habitat improvement. Short and long term goals included bank stabilization, constructing instream fish habitat, riparian revegetation, meander reconstruction, construction of sediment basins, and altered farming practices to decrease sediment delivery to the river. This suite of actions will have increasing benefits (e.g.: maturing trees planted in riparian areas) over time. Managers were committed to improving habitat as fish and wildlife programs strive to increase escapement of salmon and steelhead to spawning/rearing areas.

Managers identified similar limiting factors in the Subbasin Summary (NWPPC 2001). Actions to address the limiting factors are more fully addressed in the Subbasin Plans, completed in 2004.

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.

Since this is strictly a Compensation/Mitigation Program for harvestable steelhead, relationship to the habitat recovery efforts for the listed species in the Tucannon River is not applicable. However, since current steelhead releases are below the main production areas for natural salmon and steelhead (except fall chinook), impacts to habitat by anglers during the steelhead season are limited, and will not create any further habitat degradation.

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 in the Tucannon River (mid-April) and the distribution of listed-species fry that could be preyed upon limit potential interactions. Further, the hatchery release site for this program is below most documented spring/summer chinook spawning areas and the opportunity for spring chinook fry to move into the steelhead migration corridor is limited. Hatchery steelhead smolts are however planted above the natural fall chinook rearing area, and there will be interactions between the two during migration. Naturally produced steelhead fry (a small percentage) are also present in the migration corridor of the Tucannon River, and smolts and fry will mix. Therefore predation on fall chinook and a small percentage of natural steelhead fry is likely. Bull trout fry tend to rear in headwater spawning areas and thus avoid interaction with steelhead smolts. Actively migrating steelhead are less likely to prey on fry as their primary focus is to migrate to the ocean, hence their impact to listed species will be minimal. However, steelhead smolts that residualize in the areas of fry production will have greater impacts due to their active pursuit of prey items for survival.

Fall chinook that spawn in the tailraces below the four Lower Snake River dams will 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.

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 Tucannon 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). Estimates of residual steelhead in recent years from the Tucannon River have been estimated by mid-summer electrofishing surveys. During the 2000 and 2001 surveys, the percent of residual steelhead captured represented 4.8% and 1.0%, respectively (WDFW – Unpublished data from Snake River Lab – 2002).

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; Jonnason et. al. 1995).

Steelhead residuals normally remain near their release point (Whitesel et. al. 1993; Jonasson et. al. 1994 and 1995; Canamela 1992). Partridge (1986) noted that most residual steelhead were within about 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 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 entirely at LFH, disease impacts by this stock on Tucannon River 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 Tucannon River from LFH. Furthermore, IHNV testing occurs during spawning and eggs from infected fish are destroyed as necessary.

Returning adult steelhead held for spawning at the LFH 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 LFH 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 rearing site for LFH stock summer steelhead. Adults are collected and spawned, eggs are fertilized and disinfected, hatched and juveniles reared to smolts. Currently, 100,000 of the smolts are then trucked to the lower Tucannon River for 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 for 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. Rearing space, not water supply, limits production at LFH.

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 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 LFH adult trap. Depending on the trapping schedule, the trap will be checked and emptied daily. Collection protocols will determine if fish will be collected or returned to the river on any given day.

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

Captured adults are not transported beyond LFH. Adults are either diverted directly from the trapping structure to the adult holding raceways through a series of 12-inch PVC pipes with running water or returned immediately to the Snake River.

5.3) Broodstock holding and spawning facilities.

Broodstock to be kept are diverted directly from the trapping structure to the adult holding raceways through a series of 12-inch PVC pipes with running water. The holding raceways are 10'(w) x 80'(l) x 6'(d). A permanent building covers 1/3 of the adult raceways. Sorting and spawning of the broodstock occurs within the building.

5.4) Incubation facilities.

The incubation room at LFH is designed to accept and incubate eggs from individual females through the eyed stage. Colanders nested in PVC buckets receive water via individual plastic tubes. 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 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.

LFH stock fish are reared in the 2.1 acre rearing ponds at LFH. Each year, a portion of the stock (~100,000) are moved to standard concrete raceways (10'x 80') for marking purposes. Currently mark groups are allocated for all release points. Each year ~ 20,000 of the 100,000 fish destined for the Tucannon River release are marked (ADLV/CWT). After at least two weeks, fish are then pumped into a truck and released directly into the Tucannon River at Westergreen Bridge. The remaining 80,000 fish are removed from the 2.1 acre pond via a concrete release structure, and then hauled directly to the Tucannon River at the same location. No acclimation is provided for any of the fish released into the Tucannon River.

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

Catastrophic losses have occurred in the LFH summer steelhead stock due to IHNV in the past (BY1989 100% loss). Following the loss in 1989, strict spawning protocols and procedures were implemented to prevent a similar event. These protocols and procedures have and will continue to be strictly followed with the LFH stock program.

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. Where possible, remedial actions identified in a 1996 IHOT compliance audit are implemented. Staff are available to respond to critical operational problems at all times. Water flow and low water alarm systems, and emergency generator power supply systems to provide incubation and rearing water to the facilities are installed at LFH. Fish health monitoring occurs monthly, or more often, as required in cases of disease epizootics. Fish health practices follow PNWFHPC (1989) protocol.

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 (LFH Stock) captured in the LFH adult trap will be used for the hatchery broodstock.

6.2) Supporting information.

6.2.1) History.

The LFH Stock steelhead was originally derived in the early 1980's from a combination of Wells Hatchery and Wallowa Hatchery steelhead stocks released at LFH. The adult returns from those releases were then used to create the LFH stock currently used. The LFH stock is considered an "A" run steelhead, typical of most Columbia River stocks.

6.2.2) Annual size.

The proposed use of 120 females captured in the LFH adult trap will provide program needs, of which the LFH on-station release is a part. Additional females may also be spawned for extra eggs in case IHNV is detected in the broodstock, or in case pre-spawn loss is higher than expected. Eggs in excess of program needs will be destroyed once virology results have been confirmed, or progeny from excess eggs may be stocked into area lakes for put-take fisheries. Eggs from all non-IHNV positive spawned adults are represented in the yearling program.

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

Unmarked fish (i.e. presumably natural origin) have not been included in the broodstock to date. Unmarked fish will continue to be excluded from the broodstock under present management practices.

6.2.4) Genetic or ecological differences.

The LFH hatchery broodstock is likely very genetically similar to Wallowa and Wells summer steelhead stocks, it is unlikely any significant change has occurred over the last 10-15 years. Genetic samples (fin clips or punches) will periodically be collected from hatchery origin (LFH Stock) summer steelhead in the future for population structure and genetic variation.

6.2.5) Reasons for choosing.

The LFH Stock steelhead has been propagated over many generations by WDFW. The stock performance indicates that it is highly successful in 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 LFH Stock (at lower production levels than original LSRCP goals) will diminish the potential negative effects to the natural population's genetic structure. In addition, we will continue to release fish in the lower river to increase the spatial overlap of natural and hatchery fish in the river. Broodstock for the LFH stock program will be collected over the majority of run timing. Spawning will occur on five separate dates when possible (generally representing five weeks). Further reductions in the total number of LFH stock smolts (Tucannon, Touchet and Walla Walla releases) will likely occur in the future following more complete coded-wire tag returns, and evaluation of those resultant studies. Other possibilities include switching to a locally endemic broodstock in the Tucannon River and elimination of LFH stock releases.

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 the Snake River from July through April. Returning fish find the LFH effluent water and enter the ladder that leads up to the fish trap. Because of the trap system, trapping has occurred each day the ladder/trap is supplied with water (every day). However, collection of fish for broodstock does not have to occur each day. Fish that enter the trap can easily be cycled back to the river through 12" PVC tubes. On days where broodstock are desired, slide gates in the sorting chute are used to divert fish into the adult holding raceways. Trapping begins in September and continues through mid-November.

7.3) Identity.

Currently, 100% of the LFH stock steelhead are marked with an adipose fin clip for harvest management. In addition, a portion (~100,000 of the 345,000 production) are coded wire tagged and freeze-branded, 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. All unclipped fish, or fish with other fin marks are released back the river and not incorporated into the broodstock.

7.4) Proposed number to be collected:

7.4.1) Program adult broodstock goal:

Short Term: 360 Adults (120 females, 240 males).
Long Term: Unknown, will depend on future production goals and performance of endemic stock development.

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

See Table 8:

Table 8. Number of male and females summer steelhead collected and spawned at Lyons Ferry Fish Hatchery from 1987-2005 Brood Years.

Brood Year	Females Collected	Males Collected	Spawned Females	Spawned Males	Eggs Collected
1987	767	446	250	NA	1,111,506
1988	613	468	267	NA	941,756
1989	1314	1212	243	576	1,263,237
1990	1509	1039	437	955	2,570,676
1991	1436	998	261	532	1,296,249
1992	1348	687	240	100	1,239,055
1993	2034	1509	234	100	1,211,053
1994	2092	711	253	NA	1,352,296
1995	2151	1858	343	NA	1,772,477
1996	3537	2383	330	NA	1,614,636
1997	3073	2525	217	246	1,090,638
1998	3328	2619	279	280	1,460,967
1999	1,780	1,193	227	253	1,140,813
2000	2,238	1,570	183	188	871,856
2001	1,758	1,170	151	242	800,350
2002	4,254	3,342	194	231	941,223
2003	1,483	1,052	126	257	483,462
2004	1,129	1,016	133	259	494,380
2005	1,129	797	133	263	571,185

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

Generally, all unspawned fish are released back into the Snake River for harvest. However, exceptions have been made to fish containing CWTs from study groups. These have been, and will continue to be killed to recover CWTs.

7.6) Fish transportation and holding methods.

Live adults are not transported from the hatchery. They are returned to the river adjacent to the LFH.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock are held in the adult steelhead holding raceways at LFH. Treatments for fungal infections have not been applied to the broodstock, as pre-spawn loss has generally not been a problem. The number of adults kept at any one time is limited by the capacity of the holding area raceways. WDFW has determined that the maximum number of adults in the holding raceways is 3,000 fish. To maintain healthy broodstock, the current goal is to not exceed 1,200 fish in raceways for broodstock. Following sorting, there is generally about 800 fish in the raceway.

7.8) Disposition of carcasses.

All fish spawned for hatchery broodstock are eventually killed. 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 carcasses from killed fish are buried on-site at LFH. Nutrient enhancement has not been aggressively pursued because of disease concerns from LFH fish into the natural environment.

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.

Hatchery-origin adults are collected over the migration period to minimize potential affects on spawning time.

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 kept for broodstock following sorting will be examined weekly during the spawning season to determine ripeness. Fish will be selected at random during the spawning process. The first 20-25 ripe hatchery females selected for the day will comprise the egg collection. The same will be true for the first 40-50 ripe hatchery males (if possible). Spawned females are individually sampled for IHNV. Samples are sent to WDFW virology lab for culturing. Eggs from individual females with positive results for the virus will be discarded.

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 320, as derived from the following formula:

$$N_e = 4(N_M)(N_F) / (N_M + N_F) = 4(240)(120) / 360 = 320 \text{ adults}$$

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

Discarded eggs from IHNV positive females will lower the effective population size.

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. As such, reduction in the number of males and females required to meet broodstock may occur in the future.

In order to maintain genetic diversity, each female's eggs will be split into two lots. Two separate males will be used as a primary male on one half the eggs from a female. After the semen has been added and the eggs and sperm mixed for the appropriate amount of time, the eggs lots will be combined. A small amount of well water will be added to the bucket that represents each female, and the gametes will be allowed set time to finish fertilizing. 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.

Not Applicable – Natural origin adults are not spawned as part of this 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 LFH stock steelhead eggs annually. Following is the egg survival information at LFH for the ten most recent brood years of LFH Stock steelhead collected (Table 9). (**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 LFH 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 8 would indicate that these goals have generally been met for the LFH Stock.

Table 9. History of egg loss for the LFH Stock summer steelhead at WDFW's LFC from 1987-2005 Brood Years.

Brood Year	Eggs Taken	Eggs Retained	% Retained	Fry Produced	% Egg-to-fry survival[1]	Smolts Produced	% Fry-to-Smolt Survival
1987	1,111,506	1,095,906	98.6	983,901	89.8	665,658	[2] 67.3
1988	941,756	818,148	86.9	793,240	96.9	597,607	75.3
1989	1,263,237	957,074	75.8	941,000	98.3	0	[3] 0.0
1990	2,570,676	1,483,485	57.7	1,002,320	67.6	635,635	63.4
1991	1,296,249	1,165,315	89.9	1,115,368	95.7	357,497	[4] 32.1
1992	1,239,055	905,438	73.1	416,265	46.0	387,767	[5] 93.2
1993	1,211,053	940,022	77.6	860,983	91.6	611,417	71.0
1994	1,352,296	899,350	66.5	845,316	94.0	558,130	66.0
1995	1,772,477	929,597	52.4	895,882	96.4	610,545	68.2
1996	1,614,636	1,151,363	71.3	1,148,114	99.7	807,253	[6] 70.3
1997	1,090,638	962,705	88.3	809,845	84.1	569,264	[7] 70.3
1998	1,460,967	934,247	[8] 63.9	768,522	82.3	567,732	73.9
1999	1,140,813	807,374	70.8	807,374	100.0	495,864	61.4
2000	871,856	650,867	74.7	617,380	94.9	381,686	61.8
2001	800,350	636,727	79.6	505,451	79.4	423,067	83.7
2002	941,223	768,832	81.9	732,566	95.3	[9] 378,917	60.4
2003	483,462	418,195	86.5	408,944	95.8	310,209	75.9
2004	494,380	414,258	83.8	408,462	98.7	355,362	87.0
2005	571,185	465,991	81.6				
Average			**77.4**		**89.2**		**68.4**

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 An additional 203,857 were outplanted as pre-smolts (fry-outplant survival was 88.4%)
3 Losses to IHNV = 100%
4 Includes 92,116 fish planted as sub-smolts: an estimated 172,000 fish lost to bird predation.
5 Destroyed 378,257 fish infected with IHNV
6 Includes 191,000 fry planted into Sprague Lake.
7 Included 15,207 fry planted into Rock Lake.

8 308,666 eggs discarded from IHNV positive females.
9 Does not include 105,5023 fish that were planted ad fry into Sprague Lake because of over production.

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 will be spawned during each eggtake as necessary. 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. All eggs in excess of program needs will be destroyed, or reared and planted in area lakes as fry. (Note: present disease control protocol requires the disposal of eggs from IHNV positive females to control outbreaks of the disease within the hatchery).

9.1.3) Loading densities applied during incubation.

LFH stock steelhead females have averaged 5,130 eggs (224/oz) between the 1990 and 2002 spawning years (Total Samples = 2,803 females). Eggs from individual females will be incubated individually in 2-quart colanders through eye-up. Water flow through each colander is ~2g/min. After eye-up, eggs of similar size/oz are placed in hatching baskets in shallow troughs with a hatching capacity of 20,000 fry for each trough.

9.1.4) Incubation conditions.

Incubation, as with rearing, occurs with sediment free, 51-53 ^{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 from the baskets into the troughs where they remain for 4-8 weeks after feeding commences. Fish are fed after all are 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 late August when fish are about 30-40 fish/lb), they are adipose fin clipped, and placed into the 2.1 acre rearing pond.

9.1.6) Fish health maintenance and monitoring.

Eggs are examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by a WDFW fish health specialist, and may include treatment with formalin or other accepted fungicides. Non-viable eggs and sac-fry are removed by hand picking with egg pickers or bulb-syringe.

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) Rearing:

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 8 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. When steelhead are reared in the large rearing ponds at LFH or in the acclimation ponds, densities can be 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 was historically used to raise steelhead. The 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) water to the raceway 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, large surface area, 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 lakes, 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 9.

Table 9. Growth and size of LFH 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
2/99	NA	NA	2/00	1,200.0	0.4	2/01	NA	NA
3/99	1,100.0	0.4	3/00	700.0	0.6	3/01	1,218	0.4
4/99	349.0	1.3	4/00	341.0	1.3	4/01	330.0	1.4
5/99	195.8	2.3	5/00	177.0	2.6	5/01	141.0	3.2
6/99	103.8	434	6/00	90.0	5.0	6/01	69.0	6.6
7/99	49.9	9.1	7/00	42.2	10.7	7/01	42.6	10.6
8/99	36.0	12.6	8/00	31.1	14.6	8/01	34.0	13.3
9/99	17.2	26.4	9/00	16.1	28.2	9/01	20.7	21.9
10/99	12.2	37.2	10/00	12.1	37.5	10/01	13.0	34.9
11/99	9.6	47.3	11/00	8.1	56.0	11/01	9.1	49.8
12/99	7.1	63.9	12/00	7.0	64.8	12/01	8.4	54.0
1/00	6.2	73.2	1/01	4.6	98.6	1/02	6.9	65.7
2/00	5.5	82.5	2/01	4.1	110.6	2/02	4.2	108
3/00	4.9	92.6	3/01	3.9	116.3	3/02	3.4	133.4
4/00	4.2	108.0	4/01	3.2	141.8	4/02	3.4	133.4

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

See Table 10 above.

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 Fish 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 affected due to low stocking density.

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

Program goal for the LFH on-station release will be to release fish between near mid-April 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 LFH 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 being cover with algae) 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 and mammal predators at Lyons Ferry add some learned avoidance behavior to the fish in the rearing ponds as well. The 2.1 acre rearing lakes have been covered with bird netting, so overall predation has been reduced.

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 pumps supply LFH, it has several emergency power generation 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 LFH Stock smolt releases (goal and maximum).

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

Stream, river, or watercourse:	Tucannon River
Release point:	RM 11 (Westergreen Bridge on the Tucannon River)
Major watershed:	Tucannon River
Basin or Region:	Snake River Basin

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

The number of LFH Stock steelhead released into the Tucannon River has varied since program inception (see Table 3). For the current program, only yearling smolts are programmed for release, at an approximate size of 4.5 fish/lb.

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

All LFH Stock production in range of release goals will be direct released from LFH. Release will generally occur no earlier than 15 April, and may be as late as 25 April. 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 loaded into two possible fish transportation trucks at LFH. One truck has the capacity for 1,450 gallons of water that can transport about 1,200 lbs of steelhead at 4 fish/lb. The other truck has the capacity for 2,000 gallons of water and can transport about 1,500 steelhead at 4 fish/lb. Each of the truck is equipped with oxygen and an aeration system to provide water circulation during transport. Transportation time to the Tucannon River from Lyons Ferry to Westergreen Bridge is approximately 15 minutes.

10.6) Acclimation procedures.

Steelhead released into the Tucannon River from LFH are not acclimated to Tucannon River water. Acclimation is not considered necessary. Comparison studies of direct and acclimated releases during the 1990's found greater survival for lower river direct releases (USFWS 1998). Further, this allows releases to occur below most natural production areas.

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 with an adipose fin clip so they can easily be identified in the fishery. 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 Snake and Columbia river fisheries, 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 LFH Stock summer steelhead in excess of program needs will be planted as resident rainbow trout in SE Washington area lakes (non-escapable) for put-take fisheries.

10.0) 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: By removing the discharge screen(s), pulling the wooden stoplogs and forcing the fish over the short concrete stoplog wall that the wooden stoplogs sit-on. The fish will be flushed 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 the fish out of 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), pulling the discharge stoplogs and flushing the 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.

Note: The adult exclusion bar-screen located were the discharge water enters the river should be removed to prevent injury to juvenile fish during an emergency release. In addition, be sure the discharge water supply pump that provides water to the adult separation holding pond is turned off so it doesn't hurt fish going by it. It is currently not screened off.

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 document mark rate for each release location.
  - (*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)*
- Conduct creel studies in the Tucannon and Snake rivers and other tributaries 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 Monumental, McNary, John Day, and Bonneville Dam.
  - *(Indicators: 3.4.4a-d, 3.5.4a-c, 3.5.5a, 3.4.3a)*
- Monitor adult collection at LFH adult trap, record numbers, status and disposition. Monitor returns of hatchery steelhead adults at the lower and upper Tucannon River adult traps.
  - *(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 LFH Stock fish.
  - *(Indicators: 3.4.3a, 3.7.4a-b)*
- Determine proportion of natural and hatchery origin adults in LFH adult trap via observation and/or through inference from adult trapping. Determine proportion of natural and hatchery origin adults in the lower and upper Tucannon River adult traps.
  - *(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 the LFH hatchery steelhead populations for comparisons to natural populations in SE Washington.
  - *(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 better estimates on ratios of hatchery and wild fish in natural spawning areas and genetic monitoring will require commitment of additional resources.

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

Monitoring and evaluation efforts for the LFH stock in the Tucannon 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 Tucannon River. Anglers fishing on a daily basis would likely have greater effects from disturbance or from incidental hooking (See WDFW's Snake River FMEP).

Other Monitoring and Evaluations activities occur, but none are solely directed at the LFH steelhead stock. Smolt trapping, electrofishing, and operation of the lower and upper Tucannon Adult steelhead traps will incidentally allow us to collected data on LFH stock steelhead in the Tucannon River. Potential genetic and ecological effects to listed species from these activities have been previously covered in the Tucannon River Endemic Broodstock Program.

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 Tucannon 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

12.3) Principle investigator or project supervisor and staff.

Mark Schuck	Glen Mendel	Joe Bumgarner	Jeremy Jording
Mike Herr	Jerry Dedloff	Lance Ross	John Johnston
Debbie Milks	Michelle Varney	Temporary field technicians	

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 at LFH Adult trap* - Adult steelhead will be captured and enumerated at the LFH adult trap. Additional ADLV fish may be sacrificed at other permanent or temporary trapping facilities on the Tucannon and Touchet River to document presence and stray rate of fish released into the Tucannon River. See section 2.2.3. For fish released back into the Snake River at LFH, a top caudal fin clip is used to document their capture in the fishery, determine their final destination after release, and to document recapture at LFH.

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

September-May (Adult Trapping (LFH, Tucannon, and Touchet) and Creel Surveys). Creel surveys do not encounter unmarked fish. Trapping on the Tucannon and Touchet Rivers are covered under HGMP's for each rivers endemic stock program. Takes for these rivers are not listed in the take tables at the back of this document.

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

Handling of listed fish will generally be restricted to enumeration and release at the site of capture (LFH adult trap). Listed fish will be anesthetized prior to human handling. For other Monitoring and Evaluation activities (creel, electrofishing, smolt trapping, and adult trapping on the Tucannon River) in which data can be obtained from LFH Stock fish, care and maintenance has been previously covered under the Tucannon River Endemic Broodstock Program.

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

Injury due to capture is inevitable. Injuries from trapping can be lethal. However, precautions have been taken to make sure trapping PVC pipes are free of sharp objects that may injure fish.

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".

Not Applicable.

12.10) Alternative methods to achieve project objectives.

Not Applicable.

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

Not Applicable.

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.

Not Applicable

SECTION 13. ATTACHMENTS AND CITATIONS

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

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

Bumgarner, J., M. Schuck, S. Martin, J. Dedloff, L. Ross. 2002. Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead and Trout Report – 1998, 1999, and 2000 Run Years. Washington Department of Fish and Wildlife Report to the USFWS. FPA02-09.

Bumgarner, J., Small, M., L. Ross, and J. Dedloff. 2003. Lyons Ferry Complex Hatchery Evaluation: Summer Steelhead and Trout Report – 2001 and 2002 Run Years. Washington Department of Fish and Wildlife Report to the USFWS. FPA03-15.

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

CBFWA (Columbia Basin Fish and Wildlife Authority). 1996. Draft programmatic environmental impact statement - impacts of artificial salmon and steelhead production strategies in the Columbia River basin. USFWS, NMFS, and Bonneville Power Administration. Portland, OR. December 10, 1996 draft.

Chilcote, M.W. In Preparation. Conservation Assessment of Steelhead in Oregon. Oregon Department of Fish and Wildlife. Portland.

Chilcote, M.W. Relationship between natural productivity and the frequency of wild fish in mixed spawning populations of wild and hatchery steelhead (Oncorhynchus mykiss). 2003. Canadian Journal of Fisheries and Aquatic Sciences. 60:1057-1067.

Columbia Conservation District and Bonneville Power Administration. July 1997 (Draft). Tucannon River Model Watershed Plan.

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

Gallinat, M. P., 2002. Washington Department of Fish and Wildlife. Personnel communication.

Gallinat, M. P., J. Bumgarner, L. Ross, and M. Varney. 2001. Tucannon River Spring Chinook Salmon Hatchery Evaluation Program: 2000 Annual Report to USFWS LSRCP Office. Report #FPA01-05.

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

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

IHOT (Integrated Hatchery Operations Team). 1993. Existing policy affecting hatcheries in the Columbia Basin: combined reports. Annual Report 1992. Bonneville Power Administration, Portland, OR. Project Number 92-043.

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

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

Kuttle, M. 2002. Salmonid habitat Limiting Factors Water Resource Inventory Areas 33 (Lower) & 35 (Middle) Snake Watersheds, & Lower Six Miles of the Palouse River. Final Report. Washington State Conservation Commission, Olympia, Washington.

Martin, S., M. Schuck, J. Bumgarner, J. Dedloff and A. Viola. 2000. Lyons Ferry Trout Evaluation Study: 1997-98 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. FPA00-06.

Martin, S.W., A.E. Viola, and M.L. Schuck. 1993. Investigation of Interactiions Among Hatchery Reared Summer Steelhead, Rainbow Trout, and Wild Spring Chinook Salmon in Southesast Washington. Washington Department of Wildlife Report to USFWS. Report #Aff 1/LSR-93-1.

Mendel, G.W. 2002. Washington Department of Fish and Wildlife. Personnel communication.

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

National Marine Fisheries Service. 1995. Biological Opinion for 1995 to 1998 hatchery operations in the Columbia River Basin. NOAA/NMFS, April 5, 1995. 82 pp.

National Marine Fisheries Service. 1999. Biological Opinion on Artificial Propagation in the Columbia Basin – Section 7 Consultation. NOAA/NMFS, March 29, 1999. 175 pp.

National Marine Fisheries Service. 2001. Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest. 19pp.

Northwest Power Planning Council. 1999. Artificial Production Review – Report and Recommendation of the Northwest Power Planning Council. Council Document 99-15. 30pp.

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

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

PNWFHPC (Pacific Northwest Fish Health Protection Committee). 1989. Model comprehensive fish health protection program.

Schuck, M.L. 2002. Washington Department of Fish and Wildlife. Personnel communication.

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

Schuck, M., A. Viola, J. Bumgarner and J. Dedloff. 1998. Lyons Ferry Trout Evaluation Study: 1996-97 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H98-10.

Schuck, M., A. Viola, and J. Dedloff. 1997. Lyons Ferry Trout Evaluation Study: 1995-96 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H97-08.

Schuck, M., A. Viola, and M. G. Keller. 1996. Lyons Ferry Trout Evaluation Study: 1994-95 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H96-06.

Schuck, M., A. Viola, and M. Keller. 1995. Lyons Ferry Trout Evaluation Study: 1993-94 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. H95-06.

Schuck, M., A. Viola, and M. Keller. 1994. Lyons Ferry Evaluation Study: 1992-93 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. 94-06.

Schuck, M., A. Viola, S. Nostrant, and M. Keller. 1993. Lyons Ferry Evaluation Study: 1992-93 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. 93-29.

Schuck, M., A. Viola, and S. Nostrant. 1991. Lyons Ferry Evaluation Study: 1989-90 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. AFF 1/LSR-91-08.

Schuck, M., A. Viola, and S. Nostrant. 1990. Lyons Ferry Evaluation Study: 1988-89 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. FM No. 90-11.

Schuck, M., G. Mendel, and S. Nostrant. 1989. Lyons Ferry Evaluation Study: 1987-88 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. 89-11.

Schuck, M., G. Mendel, and S. Nostrant. 1988. Lyons Ferry Evaluation Study: 1986-87 Annual Report. Washington Department of Fish and Wildlife Report to the USFWS. Report No. AFF 1/LSR-89-01.

SIWG (Species Interaction Work Group). 1984. Evaluation of potential interaction effects in the planning and selection of salmonid enhancement projects. J. Rensel, chairman and K. Fresh editor. Report prepared for the Enhancement Planning Team for implementation of the Salmon and Steelhead Conservation and Enhancement Act of 1980. Washington Dept. Fish and Wildlife. Olympia, WA. 80 pp.

Steward, C.R. and T.C. Bjornnn. 1990. Supplementation of salmon and steelhead stocks with hatchery fish: a synthesis of published literature. Tech. Rpt. 90-1. Idaho Cooperative Fish and Wildlife Research Unit. University of Idaho, Moscow, ID.

U.S. Army Corps of Engineers District, Walla Walla Washington. 1975. Special Report: Lower Snake River Fish and Wildlife Compensation Plan. 95 p.

U.S. Fish and Wildlife Service - Lower Snake River Compensation Plan Office, Boise Idaho. 1998. Proceeding of the Lower Snake River Compensation Plan Status Review Symposium. 275 p.

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

Washington Department of Fish and Wildlife. 2002 in progress. FMEP (Fisheries Management and Evaluation Plan) for Snake River Region. Prepared by the Washington Department of Fish and Wildlife.

Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Indian Tribes (WWTIT). 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Wash. Dept. Fish Wildlife, Olympia, 212 p. and 5 regional volumes. Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091.

Washington Department of Fish and Wildlife. 1987-1999. Steelhead Sport Catch Summaries for Washington State.

Washington Department of Fish and Wildlife. 1999. Unpublished data from the files of the Snake River Lab.

WDFW-Tribal Wild Salmonid Policy. 1997. Policy of Washington Department of Fish and Wildlife and Western Washington Treaty Tribes Concerning Wild Salmonids. Adopted by Washington Fish and Wildlife Commission, 1997. 46pp.

Washington Department of Fish and Wildlife. 2002. Washington State salmon and steelhead stock inventory (SASSI) - In Draft.

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

Witty, K., C. Willis, and S. Cramer. 1995. A review of potential impacts of hatchery fish on naturally produced salmonids in the migration corridor of the Snake and Columbia rivers. Comprehensive Environmental Assessment - Final Report. S.P Cramer and Associates. Gresham, OR. 76 pp.

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 11), 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 suspected to be found in the area where the LFH Stock production program occurs (i.e. Lyons Ferry Hatchery and the Tucannon River). Species such as the Gray Wolf, the Grizzly Bear, the Canadian Lynx, and the northern spotted owl were once likely found occasionally in the Tucannon River, but their current existence is unlikely. 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 11. 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 world's 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 southern 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 Tucannon River is unknown. Bald eagles are sighted nearly every year around the Tucannon Fish Hatchery. Generally, the eagles prey on rainbow trout being reared at the Tucannon Fish Hatchery rearing pond (Doug Maxey – WDFW Tucannon Hatchery Manager pers. comm. 2002). Nesting sites have not been confirmed, but may exist in the Tucannon River Watershed as habitat requirements are suitable.

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 tree line, 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, has been confirmed to be 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 Columbia County not available. However, portions of the Tucannon River Basin could contain the listed species. However, the current steelhead program as described would not affect the listed species.

15.3) <u>Analysis of effects.</u>

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, which would likely benefit the listed species. Further, the current fishery associated with harvest on the adult steelhead will not likely disturb the behavior (territory, nesting, etc.) of the eagles in the area. The surrounding habitat associated with this hatchery compensation program will not be altered, which would be the only other source of negative "take" possible to the listed species, again unlikely given the habitat requirements of the bald eagle.

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 have not been substantiated.

<u>Hatchery operations</u> - 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 LFH adult trap will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at LFH. Activities at LFH 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 LFH meets state water quality standards and is therefore not a concern.

<u>Fish health</u> - 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 LFH) would follow label directions for proper use, eliminating any potential "take".

Ecological/biological - competition, behavioral, etc.

Behavioral disturbances to the listed species could occur if fishing pressure and eagle abundance overlap. This is not likely due to the current fishing areas most utilized by the steelhead anglers, and habitat limitations that seem to preclude the use of bald eagles in the highest fishing areas.

Predation -

A positive benefit to adult or juvenile bald eagles in this case (food source).

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

Both the LFH and lower Tucannon River adult trap are not in the suitable habitat areas of the bald eagle. Operation of the upper Tucannon River adult trap could possible disturb any bald eagles that are in the vicinity of the Tucannon Hatchery. However, that activity of the adult trap in itself is minor compared to the other activities that occur daily in the area (campers, trout fishery in Tucannon Lakes, outdoor recreation)

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 LFH adult trap will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not seem to apply at LFH. 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 LFH 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.).

Not Applicable.

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. Only minor disturbance to bald eagles will likely occur in the area (not directly related to this program), and land disturbance where Spalding's Catchfly may habitat will not occur over the course of the program.

15.5 References

Gamon, J. 1991. Report on the status in Washington of *Silene spaldingii* Wats. Report prepared for Washington State Department of Natural Resources by the Washington Natural Heritage Program, Olympia. 53pp.

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.

Knight, R.L., and K.J. Gutzwiller. 1985. Wildlife and Recreationists, Island Press, Washington D.C.

Retfalvi, L. 1970. food of nesting bald eagles on San Juan Island, Washington. Condor 72:358-361

Schassberger, L.A. 1988 Report on the conservation status of *Silene spaldingii* , a candidate threatened species. Montana Natural Heritage Program, Helena. 71pp.

Stalmaster, M.V. 1976. Winter ecology and effects of human activity on bald eagles in the Nooksack River Valley, Washington. Thesis, Western Washington State University, Bellingham, Washington, USA.

Stinson, D.W., J.W. Watson, and K.R. McAllister. 2001. Washington State status report for the bald eagle. Washington Department of Fish and Wildlife, Olympia, Washington.

USFWS. 1986. Bald eagle management guidelines, Oregon-Washington. US Fish and Wildlife Region 1 Office, Portland, Oregon.

Watson, J.W., and D.J. Peirce. 1988. Ecology of bald eagles in western Washington with an emphasis on the effects of human activity. Final Report, Washington Department of Fish and Wildlife, Olympia, Washington, USA.

Watson, J.W., M.G. Garrett, and R. T. Anthony. 1991. Foraging ecology of bald eagles in the Columbia River Estuary. Journal of Wildlife Management 55:492-499.

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

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

Listed species affected: Summer Steelhead ESU/Population: Snake River / Tucannon River Activity: Broodstock Collection, spawning, rearing and releases, and Genetic Monitoring of adult population				
Location of hatchery activity: Lyons Ferry Adult Trap, Dates of activity: July-November Hatchery program operator: Steve Rodgers				
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	100	0
Capture, handle, tag/mark/tissue sample, and released d)	0	0	0	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 LFH Adult Trap.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Estimated number of natural origin summer steelhead adults that may be handled on an annual basis at LFH adult trap.
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 / Tucannon River Activity: Broodstock Collection				
Location of hatchery activity: Lyons Ferry Hatchery Dates of activity: NA Research/ Monitoring / Evaluation program operator: Mark Schuck				
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	0	0	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	0	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.