WDFW Tucannon River Endemic Stock Summer Steelhead-Tucannon River Release

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Snake River Summer Steelhead - Tucannon River Stock: Lyons Ferry Complex**
Species or Hatchery Stock:	**Tucannon River Summer Steelhead** *Oncorhynchus mykiss*
Agency/Operator:	**Washington Department of Fish Wildlife**
Watershed and Region:	**Tucannon River / Snake River / Columbia Basin, Washington State**
Date Submitted:	**March 1, 2001**
Date Last Updated:	**July 20, 2005**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Hatchery: Lyons Ferry Complex.
Program: Tucannon River Endemic Summer Steelhead Broodstock Program

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

Summer Steelhead *(O. Mykiss)*, Tucannon River (Snake River ESU)
Summer Steelhead (*O. Mykiss*), Lyons Ferry Stock (not-listed)

Both of the above stocks are currently produced at WDFW's Lyons Ferry Complex and released into the Tucannon River. The proposed plan may slowly phase out the Lyons Ferry Hatchery (LFH) stock from the Tucannon River. This will depend on the performance of the new Tucannon River endemic steelhead stock.

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:

- Confederated Tribes of the Umatilla Indian Reservation – co-manager
- Nez Perce Tribe – co-manager
- U.S. Fish and Wildlife Service – Funding Agency under the Lower Snake River Compensation Plan

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 mitigation fish (LFH stock summer steelhead established as a result of hydroelectric projects in the Snake River) that are released in the Tucannon River. The LSRCP program is committed to funding actions that are responsive to ESA needs for listed Snake River steelhead affected by LSRCP hatchery actions, while provided mitigation fisheries as detailed in the LSRCP. Currently, steelhead management for mitigation in the Tucannon River is mandated to provide 875 returning adult steelhead to the Tucannon River.

While both Operational and Evaluation costs are presently covered by LSRCP funding, additional funding will likely be required to fully develop the Tucannon River endemic summer steelhead broodstock program. For example, the current temporary adult trap used in the lower Tucannon River is inadequate. The river bottom is unstable, high flows disable the trap, and the location of the trap may be too low in the system, increasing the chance that other basin stocks may be collected as part of the new broodstock. The current trap location was determined by a large degree because of landowner access issues. These limitations will likely limit the progress of the program in the future unless a completely separate adult trap can be constructed, or returns to the upper basin increase and broodstock can removed without harming the run to the upper river. The other existing adult trap at the Tucannon Fish Hatchery is fully functional, but it's location in the upper basin, and the low number of natural origin steelhead in recent years would require mining nearly all the natural origin steelhead to fulfill broodstock needs.

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

Lyons Ferry Hatchery – Snake River in Franklin Co. Washington (RM 58)
Tucannon Hatchery – RM 36 on the Tucannon River (WRIA 35)
Temporary Adult Trap – RM 11 on the Tucannon River (WRIA 35)
Permanent Adult Trap – RM 36.5 on the Tucannon River (WRIA 35)

1.6) Type of program.

Integrated Recovery / Harvest

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

1. **Conservation:** Artificially maintain and/or increase numbers of naturally reproducing Tucannon River steelhead that successfully produce viable progeny which contribute to the conservation and recovery of the Tucannon River population and Snake River ESU.

2. **Mitigation:** Continue to provide mitigation as specified under the LSRCP program for losses to Tucannon River steelhead due to construction of Snake River Dams while meeting conservation and recovery criteria established for the Tucannon River population and Snake River ESU. Provide harvest opportunities established under *US v Oregon* for tribal and recreational fisheries.

1.8) Justification for the program.

The endemic population in the Tucannon River experienced a decline in abundance in the 1990s, culminating in its being listed as threatened under the ESA as part of the Snake River ESU (August 18, 1997; 62 FR 43937). The LSRCP program has been operated since 1983 to provide mitigation for adult steelhead lost because of the construction of the four lower Snake River dams. The program has used Lyons Ferry Hatchery (LFH) stock since the late 1980s (Schuck et al 1998). The LFH stock was derived from mainly Wells and Wallowa Hatchery stock, and returns back to Lyons Ferry Hatchery. It does not represent individuals that came from the Tucannon River system. The most recent Biological Opinion (April 2, 1999) by NMFS on the LSRCP-produced hatchery steelhead concluded that the continued use of hatchery steelhead stocks in the Snake River (including Lyons Ferry stock) jeopardized the continued existence and chance for recovery of wild steelhead populations within the Snake River. Recent genetic information from the Tucannon River also indicates that having LFH stock adults spawning in the Tucannon River may be contributing to the wild population's current depressed condition (Bumgarner et al 2003).

Development of a hatchery stock based on the endemic stock from the Tucannon River for mitigation production will not necessarily increase natural productivity, but can serve several purposes. 1) Hatchery production can attempt to maintain or increase the numbers of naturally reproducing Tucannon River steelhead in under-utilized spawning and rearing habitat. The intent of efforts within this ESU is to reduce the short-term extinction risk to the existing wild population and to increase the likelihood of their recovery to a healthy status. These objectives may be accomplished through the establishment of a supplemented population using an endemic brood stock. 2) Minimize the potential for genetic introgression and depression that may occur with continued use of the existing hatchery stock. In the early 1990's genetic allozyme data indicated little introgression between the native stock and the LFH stock had occurred. However, more recent microsatilite DNA data indicates some introgression between the two stocks has occurred (Bumgarner et al 2003). Given that information, interbreeding between hatchery and natural fish may be reducing productivity and fitness within the natural population. 3) Speed the recovery of Tucannon River steelhead once natural productivity

has reached or exceeded replacement as a result of habitat improvements within the basin. 4) Provide mitigation production under LSRCP while complying with NMFS's Reasonable and Prudent actions as listed in their Biological Opinion. Washington Department of Fish and Wildlife desires to maintain healthy, abundant populations of steelhead within the Snake River, but also wants to provide abundant fishery opportunities as provided for under the LSRCP mitigation program. 5) Potentially reduce straying within the Snake basin. Hatchery fish from the LFH program have been shown to stray into other Columbia basin steelhead rivers. While this program will consist of hatchery fish, the chance for straying may be reduced because the new hatchery stock will be developed from the endemic population. Mitigation goals will be fully integrated as conservation and recovery goals are achieved.

1.9) List of program "Performance Standards".

(From NMFS *Artificial Propagation Performance Standards and Indicators*, October 24, 2000 Draft)

3.1 Legal mandates
3.2 Harvest
3.3 Conservation of natural spawning populations
3.4 Life History Characteristics
3.5 Genetic Characteristics
3.6 Research Activities
3.7 Operation of Artificial Production Facilities

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

1.10.1) "Performance Indicators" addressing benefits.

(From NMFS *Artificial Propagation Performance Standards and Indicators*, October 24, 2000 Draft: numbers specific to that document)

3.1.2 Program contributes to mitigation requirements.
- *Number of fish returning as applicable to mitigation requirements.*

3.2.1 Fish are produced and released in a manner enabling effective harvest.
- *Number of target fish caught by fishery*
- *Number of non-target fish caught by fishery*
- *Angler days by fishery*
- *Escapement of target fish*

3.2.2 Release groups sufficiently marked to assess impacts.
- *Marking rate by type in each group*
- *Sampling rate by fishery*
- *Number of marks by type documented by fishery.*

3.3.1 Program contributes to an increasing number of spawners returning to natural spawning areas.
- *Number of spawners on spawning ground and at hatchery by age.*
- *Number of redds in production index areas.*
- *Spawner-recruit ratios.*

3.3.2 Juvenile releases are sufficiently marked for evaluation.
- *Mark rates by type*
- *Mark recoveries for juveniles and adult returns.*

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.

1.10.2) "Performance Indicators" addressing risks.
(From NMFS *Artificial Propagation Performance Standards and Indicators*, October 24, 2000 Draft: numbers specific to that document)

3.4.1 Fish collected for broodstock are taken throughout the return in proportions to the run distribution.
- *Timing of broodstock collection is documented and compared to entire return.*
- *Age composition of broodstock is documented though scale collection of entire run at adult trap.*

3.4.2 Broodstock collection does not reduce potential juvenile production in natural areas.
- *Broodstock collection and passage numbers are documented, and juvenile production will be documented on a yearly basis. Collection of broodstock will be adjusted (if possible) according to run size.*

3.4.3 Life history characteristics of artificially produced population do not diverge from natural population.
- *Life history characteristics of natural and endemic hatchery population are measured (age composition of smolts, smolt timing, size at smolting, smolt to adult return, adult sex ratio, age of adult return, fecundity, length/weight at age of return, temporal and spatial spawning distribution of returning adults).*

3.4.4 Annual release numbers do not exceed local, basin and migratory corridor capacities.
- *Annual release numbers of both LFH and endemic stock and their release locations and times documented.*
- *Natural production (juveniles and smolts) documented.*
- *Annual release numbers of juveniles and release locations.*

3.5.1 Patterns of genetic variation with natural populations do not change appreciably.
- *Genetic composition of naturally and artificially propagated adults is monitored and compared each generation (endemic stock only).*

3.5.2 Broodstock collection does not adversely affect the genetic diversity of the naturally spawning population.
- *Spawning escapement and composition documented.*
- *Timing of brood collection is documented.*

3.5.3 Artificially produced adults do not exceed appropriate proportion within the naturally spawning population.
- *Observed and estimated numbers of natural and endemic hatchery adults passing traps will be documented*

3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.
- *Time, type and locations of hatchery releases are documented*

3.5.5 Fully smolted juveniles are released from hatchery program.
- *Level of smoltification at release is documented.*
- *Size at release of fry plants is documented.*

3.6.1 Artificial production program uses standard scientific procedures to evaluate aspects of the program.
- *Scientifically based experimental design, with measurable objectives and hypotheses.*

3.6.2 The program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving objectives.
- *Monitoring and evaluation framework includes timelines.*
- *Annual and final reports are produced.*

3.7.1 Artificial production facilities are operated in compliance with all applicable operational and fish health standards and protocols.
- *Compliance with operational and fish health standards and protocols is documented in annual reports.*

3.7.2 Effluent from facilities will not detrimentally affect natural populations.
- *Discharge water complies with applicable water quality standards, and in this case is outside the basin where the natural population exists (except for acclimation time).*

3.7.3 Water withdrawls will not prevent access to spawning areas, affect spawning behavior of natural populations, or significantly impact juvenile rearing environment.
- *Water withdrawls are documented and for this program are out of target species basin, except for acclimation time at release*
- *NMFS Screening criteria is documented*
- *Adult passage at diversion point is documented.*

3.7.4 Releases do not result in introduction of pathogens into natural production areas.
- *Proposed releases will be Fish-Health-certified prior to release.*

3.7.5 Carcass distribution for nutrient enhancement is in compliance with appropriate regulations.
- *Carcass and/or kelt distribution is documented for the target stream*
- *Compliance is documented*

3.7.6 Broodstock collection does not significantly impede passage or alter spatial/temporal distribution of natural population.
- *Temporal/spatial distribution of population around traps is documented.*

3.7.7 Weirs/traps do not result in significant stress/injury/mortality to natural population.
- *Mortality rates in traps are documented.*
- *Visual observations of fish delay periodically made.*

3.7.8 Predation by artificially produced fish does not significantly reduce natural population.
- *Release information is documented and compared to natural population data.*
- *Majority of releases will occur downstream of juvenile rearing habitat.*

1.11) Expected size of program.

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

The current program level (production of 50,000 smolts on an annual basis) requires the collection of 36 natural-origin fish annually as the program is being evaluated. Should the endemic program be successful, adult collections will be increased (described in the following sections).

According to the 4-d rules, NMFS has determined that harvesting fish derived from listed populations will be warranted as long as approved management plan is in place (i.e. HGMP or FMEP). Therefore, should the endemic broodstock program be successful, WDFW is proposing the following for maximum production in the Tucannon River:

Collect 88 fish annually all of Tucannon River endemic stock (may consist of either natural or hatchery-origin) to meet production goals in Table 2. Percent of hatchery or natural origin fish in the broodstock will be determined at a later date with agreement among the co-managers, NOAA Fisheries and WDFW. Increasing the broodstock will take many years of development (see Section 1.14).

No LFH stock steelhead will be collected in the Tucannon River for hatchery propagation in this program. However, it is realized that some natural origin fish collected in the broodstock may likely have LFH stock parents that spawned in the Tucannon River. All LFH broodstock steelhead are currently trapped at LFH on the Snake River.

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

For at least the first five years of juvenile/smolt releases into the Tucannon River as the program is being developed and evaluated, the goal will be to produce 50,000 smolts that will be released into the upper watershed. Because in-hatchery survival of endemic origin fish is unknown, up to 75,000 smolts may be released. If greater than 75,000 smolts are anticipated to be released, then WDFW proposes that up to 25,000 fingerlings could be released into the upper Tucannon River basin in the fall before normal migration. In addition to that, 100,000 LFH stock smolts will continue to be released into the lower Tucannon River as part of the regular LSRCP mitigation production (Table 1).

After at least the first five years, the endemic stock program will be evaluated and decisions will be made between the co-managers and NOAA Fisheries as to future production goals. Assuming the endemic program is successful, HGMP and FMEP's will be place to allow harvest, and the Tucannon River endemic stock is expanded to full production, only then would steelhead of Tucannon River endemic stock be released for harvest opportunities (See Section 1.14 for decision timelines). LFH stock releases into the Tucannon River would be discontinued at that time.

If such a decision is reached, WDFW proposes the following smolt release numbers (Table 2). The primary hatchery production goal for the endemic program in the long-term would release a maximum of 150,000 smolts (all direct stream released) into the upper Tucannon River. As mentioned above, greater in-hatchery survival may occur; hence, more smolts could be produced than currently anticipated. To ensure that all fish that were removed from the river for broodstock have the chance to contribute to the population, excess juvenile steelhead will be identified in October of the year prior to release and released into the Tucannon River as fingerlings.

Table 1. Short-term summer steelhead production from Lyons Ferry Complex destined for the Tucannon River. Represents initial releases of summer steelhead into the Tucannon River as the endemic program is started (approximately 5-7 years)

Life Stage	Release Location (release method)	Stock	Production Goal	Maximum Annual Release Level
Eyed Eggs			0	0
Unfed Fry			0	0
Fry			0	0
Fingerling	Tucannon River above RM 40 (direct)	Endemic	0	25,000
Yearling	Tucannon River above RM 40 (direct)	Endemic	50,000	75,000
Yearling	Tucannon River at RM 11 (direct)	LFH	100,000	100,000

Table 2. Proposed Long -term summer steelhead production from Lyons Ferry Complex destined for the Tucannon River. Represents releases of summer steelhead into the Tucannon River after full production of the endemic program has been reached. (This assumes that LFH stock was determined to cause jeopardy by NOAA Fisheries at any release level and that harvest will be allowed on endemic hatchery stock adults when they return)

Life Stage	Release Location (release method)	Stock	Production Goal	Maximum Annual Release Level
Eyed Eggs			0	0
Unfed Fry			0	0
Fry			0	0
Fingerling	Tucannon River above RM 40 (direct)	Endemic	0	25,000
Yearling	Tucannon River above RM 40 (direct)	Endemic	150,000	175,000

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

The Tucannon River endemic hatchery broodstock is a new program and has very little pre-existing performance data within the hatchery. Smolt-to-adult return rates (SAR) for several recent release years of LFH stock steelhead released into the Tucannon River have been documented (Table 3) and are provided below. Smolt-to-adult return rates have been estimated using a combination of coded-wire tag recoveries and freeze brand observations at Lower Granite Dam.

Table 3. 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.

Estimated natural escapement into the Tucannon River is believed to be below replacement in most run years, thus contributing to the decline of the population within the basin and within the ESU. Recent and historical performance of hatchery-reared steelhead in the Tucannon River has shown the program capable of returning adults above the replacement line in all but one year. Washington Department of Fish and Wildlife expects survival of the endemic brood hatchery reared fish to equal or exceed the SARs for its long-term hatchery stock. Early rearing survivals (egg-to-smolt) within the hatchery will far exceed those observed in the Tucannon River wild population. Fish returning from hatchery production of endemic brood will be allowed to spawn in the wild and contribute to filling available habitat, and increasing the number of naturally produced fish spawning in the wild one generation later. Spawner-to-spawner survival is expected to increase because of the broodstock program, but spawner-to-spawner survival of subsequent natural populations will depend upon improvements in basin productivity and migratory corridor survival.

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

The broodstock program began in the fall of 1999 with 2000 brood year fish collected from the lower Tucannon River adult trap. All fish were transported to Lyons Ferry for spawning, egg incubation, and juvenile rearing. The Tucannon River endemic program has now been in operation for four years.

1.14) Expected duration of program.

The first priority of the endemic program as proposed is for continued mitigation under the LSCRP. Unknowns about program success have made us take a cautious approach in phasing out the LFH hatchery stock in the basin. WDFW and the co-managers are proposing that the program be tested for a minimum of five years at a low production level (50,000 smolts) where it can be evaluated against pre-determined expectations. Over the next few years, WDFW will evaluate both in- and out- of hatchery performance to determine if the endemic program should be continued in the future. WDFW and the co-managers will then decide on production levels for both endemic and LFH stock releases into the Tucannon River. Should the endemic stock produce adults as expected, WDFW proposes the following (Table 4) to show the potential change in hatchery production within the Tucannon River.

Table 4. Proposed broodstock collection and smolt production of the Tucannon River summer steelhead endemic stock program.

Brood Year	Endemic Broodstock Collection	Endemic Smolts Released	LFH Stock Smolt Released
2000-2006	36 Adults	50,000	100,000
WDFW will examine all aspects of endemic stock program, and provide recommendations to co-managers and NMFS about continued production of the endemic stock and LFH stock within the Tucannon River. Assuming Endemic stock is successful, the phase out of the LFH program could be as follows.			
2007-2008	50 Adults	80,000	60,000
All 2007 and 2008 fish collected for broodstock would be natural origin			
2009-2010	64 Adults	100,000	50,000
Up to 25% of the fish collected in 2009 and 2010 for broodstock could be of hatchery-reared endemic stock origin.			
2011-2012	88 Adults	150,000	None
Up to 35% of the fish collected in 2011 and 2012 for broodstock could be of endemic stock origin.			

It is expected that conservation and recovery actions described within this program will continue until productivity within the basin has improved to a level where summer steelhead populations can accurately be determined to be at or above the replacement level most years (presumably a requirement which must be met for NMFS to de-list the population).

1.15) Watersheds targeted by program.

As stated earlier, this HGMP targets natural summer steelhead and proposed new hatchery production within the Tucannon River (WRIA 35).

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 LFH stock 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 native stock in the river. Genetic data recently collected indicate some genetic introgression has occurred between the wild fish and the LFH stock. 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 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 basin.

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. 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 years release in an attempt to determine stray rates and provide program changes based on those results.

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. Beginning with the 2005 release, hatchery smolts were released just below Pataha Creek. Releasing smolts further down may decrease the spatial overlap of spawning LFH stock and wild steelhead, thus reducing genetic introgression.

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 and 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 has historically has Section 10 Permits #1126 (research activities on the Tucannon and Asotin Creek), and #1129 (hatchery supplementation for Tucannon River spring chinook), which expired in 2004 but are to be replaced with one permit based on a new application; USFWS Consultation with NMFS for LSRCP actions and the NMFS Biological Opinion; statewide Section 6 Consultation with USFWS (Bull Trout), multiple HGMP documents on each species and stock produced at Lyons Ferry, and developed WDFW Fisheries Management and Enhancement Plans (FMEP's) for the Snake River and Mid-Columbia ESU's

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 estimated natural steelhead escapement into the Tucannon River since 1987. The largest natural-origin escapement was seen in 1988 when an estimated 525 fish spawned (WDFW 1999). Numbers have decreased steadily since 1990 and the spawning population was estimated at only 71 individuals in 1996 and 31 in 2000. Conversely, the number of hatchery origin fish on the spawning grounds has been estimated between 96-787 fish. Trapping data from the lower river temporary adult trap and the Tucannon Hatchery adult trap show the population to be made up of 3 and 4 year old individuals (primarily one and two year- old freshwater age, and one or two year ocean age). Age 2 and 5-year-old individuals are usually less than 10% of the returns. Tucannon steelhead are typical of "A" run summer steelhead with more fish returning as +1 salt age (55-70%) than as +2 salt (30-45%). One-saltwater age fish average 59 cm in length while two-salt age fish average 67 cm with individuals as large as 80 cm (Martin et al 2000). Sex ratio varies between years and can be heavily skewed to females (70%) but is generally believed to average between 50-60% females for most years. Age composition of natural origin since 2000 is variable (Table 5).

Table 5. Summary of fresh and salt-water age composition[a] of natural origin adult steelhead from the Tucannon River, 2000-2005 brood years.

Year	Age 1.1		Age 1.2		Age 2.1		Age 2.2		Age 3.1		Age 3.2		Repeat spawners
	N	%	N	%	N	%	N	%	N	%	N	%	
2000	18	25.0	6	8.3	36	50.0	7	9.7	5	6.9	0	0.0	NONE
2001	0	0	13	27.1	13	27.1	19	39.6	0	0.0	3	6.3	NONE
2002	5	8.8	10	17.5	29	50.9	10	17.5	3	5.3	0	0.0	NONE
2003	0	0	4	3.9	29	28.2	56	54.4	5	4.9	6	5.8	YES [b]
2004	0	0	0	0.0	42	68.9	13	21.3	5	4.9	0	0.0	YES [c]
2005	15	4.8	32	10.3	99	31.9	141	45.5	14	4.5	7	2.3	YES [d]
Combined	38	5.8	65	10.0	248	38.1	346	37.8	32	4.9	16	2.5	- - -

[a] Age reporting protocol is F.S, where F=freshwater years and S=saltwater years of age.
[b] Three fish sampled in 2003 were repeat spawners, one fish was 1.1S, two were 2.1S for 3.6% of the run.
[c] One fish sampled in 2004 was a repeat spawner (2.1S1).
[d] Two fish sampled in 2005 were repeat spawners, one fish was 1.1S, the other was 2.1S for 0.6% of the run.

Fish enter the river as early as July and as late as the following April. Spawning in the Tucannon has been observed from RM 3 upstream to RM 52, and in Tumalum, Cummings, Little Tucannon, and Panjab creeks. Spawning is believed to begin as early as late February and continue through May. Hatchery and natural fish enter and spawn concurrently throughout the basin. Anecdotal observations of hatchery fish spawning as early as January have been reported from the lower river.

Juvenile salmonids rear successfully in the Tucannon from RM 12-60 inclusive. Rearing success is dependent upon habitat and water quality, which is poor below RM 12 and only moderate between RM 12-20. Above RM 20 rearing conditions are generally good for steelhead. Based on smolt trapping data since 1997, juveniles will typically spend from one to three years in the Tucannon River before migrating as smolts. Age of smoltification is likely determined by both genetic and environmental factors (water temperature). The river is productive and yearling smolts have been identified emigrating from the lower reaches where spring/summer water temperatures allow for accelerated growth.

Yearling and age two and three smolts leave the Tucannon River primarily during April and May. Smolt size is highly variable (145 – 265 mm) but typically averages 185 – 195 mm. Hatchery smolts have averaged 195 – 215 mm at release for the duration of the program and were originally released from Curl Lake Acclimation Pond (RM 41) between 1986 and 1997. Since 1998, hatchery steelhead have been released at or below RM 24.7.

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

Tucannon River natural origin steelhead are part of the listed Snake River ESU and will be used to establish the new broodstock for conservation / mitigation.

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

Tucannon River spring and fall chinook and Columbia River basin bull trout may be incidentally affected. Juvenile steelhead may compete for food and space with naturally rearing salmonids as some degree of extended rearing by steelhead is expected for fish released from the hatchery program.

The proposed program may incidentally affect Tucannon River bull trout. Juvenile hatchery steelhead (either smolts or fingerlings) may compete for food and space with naturally rearing bull trout as some degree of extended rearing by steelhead is expected, but little overlap exists between the two species. Bull trout may also be captured in the adult trap. All bull trout captured will be sampled and immediately released after sampling. Trapping/sampling/handling of bull trout has been authorized by USFWS under a Section 6 Cooperative Agreement with WDFW. As a positive benefit to bull trout, any fingerlings that may be released into the system from the hatchery program, or additional natural production of juvenile steelhead in the Tucannon River from the hatchery program, may serve as prey for bull trout.

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

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

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 6).

Table 6. Estimated natural and hatchery adult steelhead escapement indices into the Tucannon River (1988-2004).

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	No Data *	No Data *
1998	97	200
1999	138	280
2000	31	226
2001	198	430
2002	No Data *	No Data *
2003	No Data *	No Data *
2004	59	152

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

- 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.

The data 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 – 2004 that can be used to estimate survivals for early life stages. WDFW has summer steelhead smolt production estimates since 1996.

- 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.

Spawning estimates were provided in Table 6. Juvenile steelhead abundance in the Tucannon River between RM 34.6-46.2 for recent years are provided (Figure 1). The WDFW has estimated that this river reach could produce 35,625 parr (> 0-age) at full seeding (unpublished WDFW data). WDFW has operated a rotary screw trap in the lower Tucannon River since 1996 (Table 7). Scales have been collected from natural origin summer steelhead to estimate outmigration by brood year. We hope to develop future relationships between summer parr densities and smolt outmigration to estimate survival between life stages.

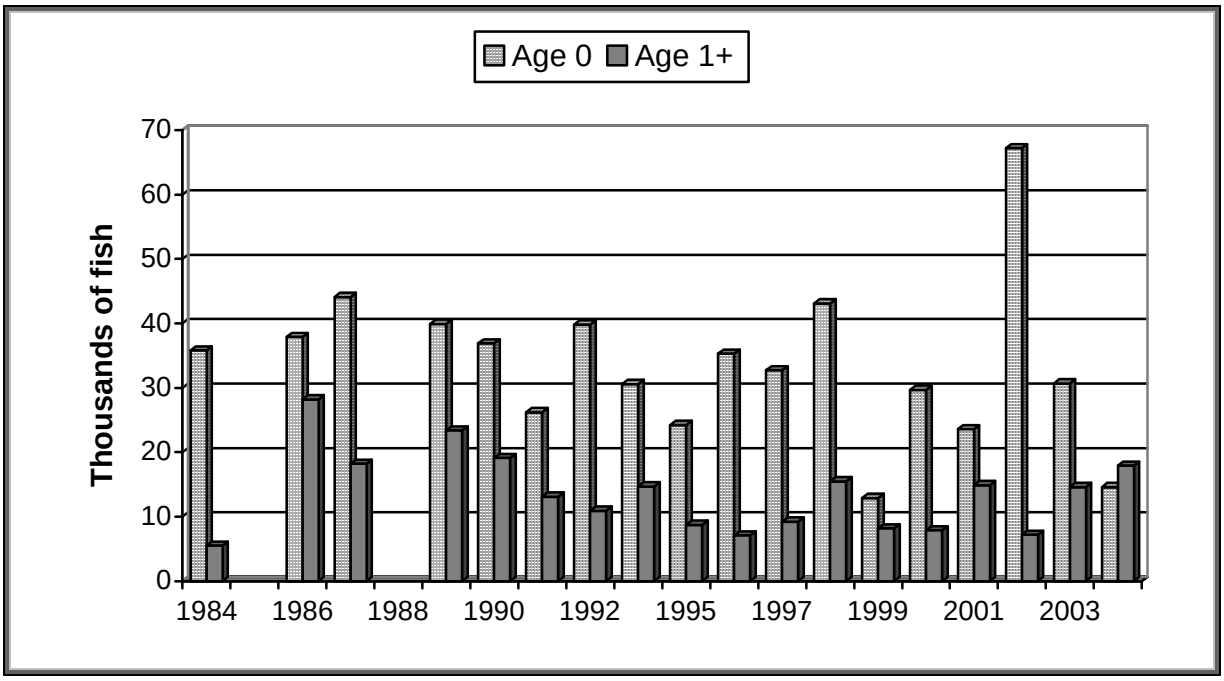

Figure 1. Estimates of natural juvenile steelhead abundance in the Tucannon River from Campground 1 (rkm 55.4) upstream 19.1 rkm to Panjab Bridge, from most years between 1984-2004.

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

See tables or figures above and below.

Table 1. Estimated production of natural-origin steelhead smolts from the Tucannon River by migration (1996-2004) and brood year (1995-2003).

Migration year	Brood Year									Totals
	1995	1996	1997	1998	1999	2000	2001	2002	2003	
1995/1996 [a]	5,583									14,667
1996/1997 [a]	8,967	6,069								15,944
1997/1998	834	11,584	16,684							29,096
1998/1999		1,133	14,095	9,000						24,229
1999/2000		37	3,279	25,069	14,897					43,282
2000/2001			8	945	13,747	11,912				26,612
2001/2002				17	498	10,824	8,050			19,389
2002/2003						915	9,085	9,920		19,920
2003/2004						31	1,318	10,626	3,537	15,512
Totals	15,384	18,823	34,066	35,031	29,142	23,682	18,453	20,546	- - -	

[a] Scales were not collected during the 1995/1996 or 1996/1997 migration years. Age composition for those years are based on mean age composition from the 1998/1999 to 2000/2001 migration years. Age 4 fish were not included in the calculation based on their low frequency.

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

Broodstock Trapping: Listed summer steelhead adults will be trapped and collected for broodstock from September through April, which constitutes a direct take. Other listed summer steelhead adults will be trapped, handled, and passed upstream during trap operation, which may lead to injury to listed fish. The lower temporary trap is located on private property. Human disturbance or poaching of summer steelhead held in the trap has not been experienced during operation of the trap between 1999-2005. The upper trap (Tucannon Hatchery) is permanent, with security measures to keep the general public away from the listed fish. Takes (mortality) associated with the upper trap have been non-existent since 1997.

Spring and fall chinook salmon and bull trout are indigenous to Tucannon River, and incidental takes of all species are anticipated through the broodstock collection program. Any chinook salmon or bull trout encountered at the lower temporary trap will be passed by hand upstream daily, with minimal delay. Any spring chinook or bull trout encountered at the Tucannon Hatchery adult trap will be handled, collected (spring chinook only), or sampled (length, sex, scale sample and DNA sample), and passed upstream with minimal delay. Trapping and collection of ESA listed Tucannon River spring chinook is currently awaiting re-issuance of Section 10 Permit #1129 which has expired. However actions continue as authorized by NMFS with receipt of a new permit application (Tucannon Spring Chinook HGMP). Trapping and sampling of bull trout has been authorized by USFWS in accordance with a Section 6 Cooperative Agreement for the Endangered and Threatened Fish and Wildlife Program – Washington.

Spawning, Rearing and Releases: Spawning, incubation, rearing and release of summer steelhead for 14 months from March through the following April has a high potential for lethal take of listed summer steelhead (fish from the program are considered listed even in the hatchery). Mortality can occur in association with fish culture activities and conditions that affect fish health and development, from handling procedures, fertilization procedures, water temperature, water quality, water flow, feeding success, transport. The release of endemic origin hatchery-reared Tucannon River summer steelhead may incidentally affect (take) other listed salmonids in the Snake and Columbia basins.

Monitoring and Evaluation: Contact with summer steelhead during spawning ground surveys (March through May), smolt trapping operations (October through June), summer population monitoring (snorkeling / electrofishing), and PIT tagging programs have a potential to take listed summer steelhead. Each of these activities is described in more detail below.

Spawning Ground Surveys: Takes (see Take Table 2) associated with spawning ground surveys will occur in the form of "observe/harass" and from occasional carcass recovery of kelts. Spawning surveys for listed steelhead are conducted from early March to early May, and conducted once a week when possible, with the intent to estimate total

spawning escapement into the Tucannon River. Index sections, about 3-miles in length, are surveyed multiple times throughout the season to document redds and how quickly redds fade from sight of the surveyors. During each survey, surveyors walk out of the water when possible. Experienced surveyors look for redds, record and mark their location, and look for live and dead fish, with little disturbance. At the end of the season, more extensive areas of the river are walked. The "final survey" and redd visibility rate are then used to estimate spawning escapement. Properly conducted surveys are not expected to result in any direct mortality to spawning steelhead.

Snorkeling: Takes in the form of "observe/harass" occur during snorkel surveys (see Appendix Table 2). Snorkel surveys occur July or August, and are conducted to monitor distribution and abundance of juvenile salmonids (chinook salmon, bull trout, and whitefish) in the Tucannon River. Surveys are conducted with two people, both starting at the lower end of an index site. Each snorkeler moves upstream counting about ½ of the site. The total number of fish is then recorded and the site length and width are measured for total surface area. Total time to complete an index site varies, but is generally less than 15 minutes. Washington Department of Fish and Wildlife has no estimate of the degree of harm, injury, or mortality to listed fish associated with snorkeling activities, but it is believed to be very low. Based on observations during snorkeling, the fish observed move slightly when the snorkelers pass, but quickly re-establish themselves near their original location.

Electrofishing: Takes of listed natural origin steelhead in the Tucannon River will occur during electrofishing surveys (see Appendix Table 2). Electrofishing surveys occur during July through September, and are conducted to monitor distribution and abundance of natural steelhead (similar to snorkeling). WDFW determined through previous studies that Age 0 steelhead juveniles couldn't accurately be snorkeled in some areas of the river; hence electrofishing surveys are necessary to estimate the production of Age 0 natural steelhead. Estimating the abundance and density of age-0 steelhead will be critical in the overall evaluation of success from the proposed hatchery program, and documenting potential negative effects of hatchery and wild fish spawning in the natural environment.

A modified Smith-Root Type 11A backpack electroshocker with upgraded, state of the art electronic components is used. Use of this programmable output waveform electroshocker has decreased the incidence of injury to small fish within the basin. Electrofishing guidelines from NMFS and WDFW will be followed when conducting all surveys. Washington Department of Fish and Wildlife personnel will also record all pertinent environmental information during surveys (conductivity and temperature for each site), as specified in Section 10 Permit #1126.

PIT Tagging: Takes of listed natural and hatchery origin steelhead will occur during PIT tag studies (see Appendix Table 2). Tagging will occur at the hatchery prior to smolt release, and at the Tucannon River smolt trap (described in the next section). Tagging of listed hatchery-reared fish will provide information on downstream migration performance (relative survival, migration speed, and timing) from various release points in the Tucannon River, and will also assist in the program evaluation by determining

smolt-to-adult survival rates. PIT tagging procedures follow established protocols used throughout the Snake River Basin by other agencies. Mortality of the fish PIT tagged is expected to be less than 1%.

Smolt Trapping: Takes of outmigrating listed juvenile steelhead (natural and hatchery origin) will occur at WDFW's smolt trap located on the lower Tucannon River (see Appendix Table 2). The trap is operated October-June to capture natural and hatchery chinook salmon and steelhead to enable WDFW staff to estimate smolt production from the Tucannon River. Fish generally are captured, measured, weighed and released. Small groups of fish receive a partial caudal fin clip for external identification and are transported back upstream one mile and released to calculate trap efficiency. Other groups of fish (~100/group) may be PIT tagged from the smolt trap to determine migration speed and relative survival. During peak outmigration fish may be held in live boxes for two to three hours before release (mark/recapture trial, or PIT tagged). At other times of year the trap may be checked only once a day. Delayed migration will result for fish captured in the trap, and delayed mortality as a result of injury or increased susceptibility to predation may also result. All trap operations pertaining to spring and fall chinook are currently authorized by NMFS upon receipt of a new Section 10 permit application for re-issuance of permits #1126 and 1129.

- 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 lower weir/trap during fall and early spring has a low potential to take listed fall chinook salmon, bull trout and spring chinook salmon. Trap operation occurs above most fall chinook spawning but may prevent or delay upstream migration of a very small number of salmon that approach the weir. Bull trout may encounter the weir post-spawning, as adfluvial spawners from high in the basin move downstream into the Snake River. Fish may be delayed or descaled as they pass over/through the weir downstream. Bull trout could also impinge upon the weir while attempting to pass downstream if individuals are weakened from spawning. However, the trap/weir is periodically opened to allow unrestricted passage of all fish species. Spring chinook may experience a slight migrational delay, or be compromised from capture and handling stress associated with the lower weir. The chance is very low of spring chinook encountering the weir however, as it will be removed before most spring chinook enter the river (early April).

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

Washington Department of Fish and Wildlife has operated the lower trap (RM 11) during the fall through early spring each year since 1999. The number of natural origin fish trapped, released, or taken for broodstock are provided in Table 8. Pre-spawning mortality from fish trapped or captured for broodstock has varied over the last four years. More aggressive formalin treatments during holding at Lyons Ferry have reduced mortality.

Table 8. Number of natural origin summer steelhead captured, passed, and collected at the lower Tucannon River adult trap for the endemic broodstock program.

Year	Captured	Passed	Collected	Pre-spawn Mortality
1999/2000	35	3	46 [a]	10 (21.7%)
2000/2001	35	9	36 [b]	6 (16.7%)
2001/2002	74	38	36	6 (16.7%)
2002/2003	86	50	36	0 (0%)
2003/2004	67	34	33	0 (0%)
2004/2005	372	336	36	0 (0%)

[a] 14 fish were collected by hook and line method.

[b] 10 fish were collected by hook and line method.

During the first year, fish were live spawned and retained at LFH for rejuvenation and possible re-use. However, rejuvenation efforts failed and all fish died. No further attempts at rejuvenation will be made until current research in the Columbia basin on kelt rejuvenation has been completed.

WDFW has operated a trap at the Tucannon Hatchery intake (RM 36.5) for spring chinook salmon since 1986 (NMFS Section 10 Permit #1129). Summer run steelhead are regularly trapped in the facility that was re-designed and updated in 1997. Returns of natural steelhead have varied greatly over the years at the Tucannon Adult Trap (1999 = 22; 2000 = 16; 2001 = 11; 2002 = 177; 2003 = 64, 2004 = 33, 2005 = 42). Handling may induce delayed mortality but the level of that mortality has not been documented. During high river flows, fish are capable of passing the diversion dam that directs fish through the ladder and trap. Current trapping protocols restrict all LFH stock fish at the Tucannon Adult Trap, and they are released downstream of the trap.

- **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 Appendix Table 1.

- **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.**

The temporary trap located in the lower river is not 100% efficient at trapping steelhead. The design allows fish to pass over the structure during high flows. To further allow for unrestricted passage of steelhead, a slide gate in the trap box can be opened to allow free passage through the trap. In cases where WDFW personnel are unable to check the trap daily, weir panels can be removed or sunk to allow unrestricted passage without fish having to enter the trap box. This ensures that fish are not injured or unnecessarily delayed. Where projected take of ESA listed summer steelhead or another species may be exceeded, the trap is easily removed from the river channel.

Operation of the Tucannon Hatchery intake trap functions integrally with a ladder designed to pass fish around the diversion dam. The trap can be opened; allowing fish unrestricted passage through the ladder and trap.

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.

Lyons Ferry Complex is part of the LSRCP Program. The current program's steelhead actions were stated as causing jeopardy to the listed natural population of summer steelhead under the NMFS Biological Opinion, and actions proposed under this HGMP are consistent with the Reasonable and Prudent Actions suggested by NMFS. Implementation of this HGMP will result in the development of a new endemic stock of steelhead for release into the Tucannon River. Depending on success of this stock and decisions to be made in the future the program may eventually drastically reduce, or eliminate, the current releases of LFH stock steelhead in the Tucannon River. If that occurs, eventually all releases of hatchery-origin summer steelhead into the Tucannon River will be derived from the endemic broodstock proposed within this HGMP.

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

- *U.S. v. Oregon* Management Plan for the Columbia River (currently under negotiation).
- Lower Snake River Compensation Plan goals as authorized by Congress direct actions to mitigate for losses that resulted from construction of the four Lower Snake River hydropower projects.
- No other comprehensive management agreements are in effect. State and Departmental management guidelines to conserve and protect fish and wildlife populations within Washington (e.g.: WDFW Wild Salmonid Policy) direct WDFW.
- Fisheries Management and Evaluation Plan (FMEP). A plan is currently being developed by WDFW for Snake River Basin fisheries management. Fishery management objectives within the FMEP and HGMP are consistent.

3.3) Relationship to harvest objectives.

As an integrated conservation/mitigation program, development and use of local Tucannon River broodstock is intended to fulfill both conservation and mitigation harvest goals. The LSRCP, as a mitigation program, defined replacement of adults "in place" and "in kind" for appropriate state management purposes. In addition, WDFW has identified the maintenance of abundant naturally spawning populations and harvest as valuable management goals (WDFW Wild Salmonid Policy, 1999).

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.

During the period 1986–2002, recreational harvest from the Tucannon River ranged between 180-842 fish annually during a September through March fishery (WDFW 1987-2002 – Table 9). This represents a 25% -70% harvest rate on fish estimated to have returned to the Columbia River basin (Tucannon origin fish have also contributed to fisheries in the Columbia and Snake Rivers). These fisheries are consistent with LSRCP goals and with *U.S. v. Oregon* management plans and principles for Tribal and recreational fisheries. All sport fisheries within the region are selective for hatchery-reared fish and require release of natural origin fish. Recreational fishing regulations within the Tucannon River have been altered in recent years to reduce the incidental catch of wild fish by closing spawning areas of the river. These actions work in concert with focused fishing effort on hatchery origin fish to maximize wild escapement and minimize escapement of hatchery fish of an unacceptable stock. Selective marking of endemic brood releases will regulate their take in fisheries.

There is no harvest history on endemic Tucannon River steelhead. The existing LFH stock used within the Tucannon River has provided harvestable steelhead annually since 1985. No harvest is expected to occur on adults returning from local broodstock smolt releases until full production is reached and return goals have been met. Limited hooking mortality is expected to occur as a result of recreational fisheries on adults returning from local stock smolt releases. Eventually all LFH origin steelhead releases may be discontinued and replaced with local brood smolt releases. At full production, WDFW desires that all or most of the smolts will be marked to allow harvest.

Table 9. Estimated number of hatchery steelhead (LFH stock) harvested from the Tucannon River from the 1987-2002 run years. Estimates are derived from WDFW punch card estimates.

Run Year	Harvested Steelhead
1987	189
1988	255
1989	309
1990	340
1991	326
1992	358
1993	159
1994	164
1995	590
1996	848
1997	748
1998	290
1999	1140
2000	612
2001	1751
2002	1106

3.4) Relationship to habitat protection and recovery strategies.

The Tucannon Model Watershed Management Plan (CCD 1996) reviewed the ecological health of the Tucannon Watershed in relation to salmonid population status and recovery. Limiting factors such as water temperature, channel stability, sediment, and instream habitat were addressed. 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 re-vegetation, 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. This management approach has been updated most recently with completion of the Tucannon Subbasin and Snake River Salmon Recovery plans. These plans capture current knowledge and best management practices into cohesive, locally implemented habitat and population recovery strategies.

3.5) Ecological interactions.

The following sections describe ecological interactions that could occur from the program on native fishes (predation, competition and disease). For the first several years of production, returning adults from the program will not be subject to harvest and will be allowed to escape in the basin to supplement naturally produced steelhead. Supplementation is an experimental procedure to stabilize or increase depressed populations while actions are taken to correct basin specific and out-of-basin productivity problems. Tucannon natural steelhead have been affected by numerous long-term and stochastic habitat degradations. The LSRCP program has been shown to effectively return adult steelhead to their point of release (i.e. Snake River Mitigation), but has used an unacceptable stock for this mitigation to date. Once full production has been achieved with the new stock, replacing the existing stock will provide the opportunity to allow supplementation to work, while concurrently providing mitigation (harvest opportunity). There may be short-term (3-5 years) increases in steelhead production from LFH while the endemic broodstock is being developed and mitigation production continues.

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 spring and fall chinook, timing of hatchery steelhead smolt releases from the endemic program and the distribution of listed species fry limit potential interaction. Hatchery steelhead smolts are released in late March to early May, approximately mid-way through the spring chinook emergence period. Residuals from the endemic releases will be present in spring chinook emergence areas. However, based on previous studies (Martin et al, 1993), predation will be limited. Based on where fall chinook spawn however, they will completely overlap with the hatchery steelhead smolt migration corridor. Fall chinook fry will likely be seeking habitat areas near stream margins. Bjornn and Reiser (1991) reviewed literature on habitat preferences of juvenile salmonids and concluded that newly emerged fry prefer shallow areas of low velocity (<10 cm/s) and larger fish occupy deeper and faster areas. Partitioning of habitat by chinook fry and steelhead smolts minimizes direct interaction between the two species. Naturally produced steelhead fry likely emerge during May-June, long after the majority of released hatchery steelhead smolts from this program have migrated from the system. Bull trout fry tend to rear in headwater spawning areas and thus avoid interaction with steelhead smolts.

A varying percentage of hatchery steelhead releases do not migrate from the system. WDFW considers hatchery steelhead remaining after June 15 to be residuals. These fish, by remaining in the upper Tucannon River near the release point will have an increased opportunity to interact with juvenile listed fish (spring chinook and natural summer steelhead). Although most residual rates vary from a few percent (Viola and Schuck 1991) to 10% (Partridge 1985, 1986), some estimates have been higher than 25% (Viola and Schuck 1991; Crisp and Bjornn 1978).

Studies of the effect of size at release and acclimation on rates of hatchery steelhead residualism have been conducted in Idaho, Washington, and Oregon. Results are in some cases contradictory. Larger smolts may residualize at a higher rate than smaller smolts (Partridge 1985, 1986) although some minimum size is necessary for outmigration (Crisp and Bjornnn 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 likelihood for interaction, and adverse ecological effects to listed natural chinook salmon juveniles, bull trout, and steelhead.

Bull trout associated with areas influenced by residual hatchery steelhead are generally fluvial adults and are more likely to out compete and prey on hatchery steelhead because of a significant size advantage. Returning adults are expected to spawn concurrently with natural steelhead throughout their entire range in the Tucannon, increasing the abundance of juvenile steelhead throughout the basin and filling available habitat. Complete marking of hatchery-reared endemic brood juvenile will allow returning adults to be enumerated and their contribution to the escapement (in absolute numbers and as a proportion of the run) documented. Some studies suggest that domestication of hatchery-reared salmonids may decrease their reproductive fitness. This loss of fitness could be transmitted to the offspring of these spawning adults. Life history characteristics of the hatchery-reared fish will be documented to compare their performance with the natural population. Size at migration, migration timing and performance, adult return timing and spawn timing will be documented and reported as part of the LSRCP Monitoring and Evaluation project.

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 endemic program are reared outside the watershed most of their life, 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.

Documentation of the disease status of the adult steelhead stocks is accomplished through annual fish health examinations of both spawning adults and pre-spawning mortality. Results of these examinations over the past years indicate a low prevalence and incidence of serious fish pathogens and parasites in these stocks. For the Wallowa Stock program described here, the viral pathogen IHNV has not been prevalent to date. 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 will be where adults are held and spawned, eggs hatched, and juveniles reared through the pre-smolt stage. Because of good water quality and improved prespawning survival that results, adult fish are held at LFH rather than TFH. 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 enters the Snake River and does not affect Tucannon River water quality. LFH complies with all NPDES standards for pollution discharge.

The Tucannon River is a productive watershed flowing from the Blue Mountains of southeast Washington. Winter temperatures approach freezing and rise to 80^0 F or greater during the summer near the mouth. Water for Tucannon Fish Hatchery (TFH) is provided by springs, wells and from the Tucannon River. Water withdrawls for hatchery use do not significantly reduce natural production capabilities nor affect adult upstream or downstream passage within the 0.75 miles of affected river reach (hatchery withdrawl to hatchery outfall). Steelhead spawn in the Tucannon River during spring when high river flows provide ample water for passage and spawning.

Acclimation of pre-smolts within the Tucannon River basin may occur at Tucannon Hatchery. Located at RM 36 on the Tucannon River, the hatchery has the capability to hold fish in river water. Five to six weeks of acclimation may occur before releasing local brood smolts into the upper river. Water for the Tucannon Hatchery is removed from the river under permit for non-consumptive fish propagation purposes. Additional water for rearing is provided by springs and wells location on the hatchery site. Tucannon Hatchery complies with all NPDES standards for pollution discharge.

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.

Hatchery intake screens meet current NMFS screening guidelines, and effluent discharge is monitored, reported, and currently complies with NPDES standards.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock will be collected at a temporary/portable trap in the lower river (see above) and possibly at the Tucannon Hatchery trap (see also above). Either one of these traps does not permanently alter or degrade Tucannon River habitat. The temporary trap consists of a floating PVC picket weir and a metal box. The trap box is constructed of steel and rounded metal conduit pipe with 2' x 2' inlet opening, and fitted with an adjustable bypass gate to allow unrestricted passage. Each day the trap is operated, personnel will check for fish. The trap may be checked more than once during the day if a large number of fish are expected to be captured. Fish are netted from the trap box, and placed in a v-shaped trough filled with water. The trough has a calming effect on the fish so they can be sampled gently. After origin (natural, hatchery supplementation, or hatchery production-LFH stock) has been determined, the fish will either be collected for broodstock or passed upstream. Most natural origin fish will have scales and DNA samples collected from them before release.

The TFH trap consists of a concrete ladder associated with the hatchery water intake. An enlarged section of the ladder is designed to operate as a trap or counting channel where fish can be enumerated without handling. When fish are sampled from the trap, they can be released into the ladder and allowed to migrate upstream, or removed and hauled to LFH for holding.

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

Following sampling and origin determination, adults from the temporary trap are netted into a plastic transport tank fitted with re-circulation/aeration capability, and hauled in the back of a pickup truck. Up to five adults can be transported in the tank. Broodstock trapped at TFH would be hauled by tank truck, fitted with re-circulation and oxygenation capability, to LFH.

5.3) Broodstock holding and spawning facilities.

Fish are hauled to LFH where they are placed in an adult holding raceway (10'x 6'x 80') that receives constant temperature well water. Adults are held separate from other hatchery stock adults to prevent any accidental co-mingling of the stocks and to control disease transmission. The raceways are enclosed over the middle one-third of the raceway length by the spawning building, where spawning occurs. Gametes are crossed, and water hardening begins within the spawning building. Fertilized eggs are then transported to the hatchery building for incubation.

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 allow disease sampling, detection and control. After eyeing is complete and virus sample results are received, eggs are consolidated into hatching baskets and transferred to hatching troughs.

5.5) Rearing facilities.

Lyons Ferry Hatchery has four intermediate indoor rearing tanks and 37 outside raceways available for rearing juveniles. Water is supplied from wells as previously described. Feeding occurs by hand, through demand feeders, or by pneumatic feeders that can be programmed to feed throughout daylight hours.

Tucannon Hatchery has six round ponds, a large raceway designed for rearing spring chinook salmon and two large raceways designed to rear and release steelhead/trout. Water is supplied from river, well and spring sources as described above. Feeding is by hand several times during the day, usually until the fish are saturated.

a. Acclimation/release facilities.

An extended acclimation period of 5-10 weeks is planned for smolts at Tucannon Hatchery. Fish will be reared at LFH through January, then transported to raceways at Tucannon Hatchery that allow for acclimatization to river water. After acclimation, fish will be pumped from the raceways and trucked to numerous locations at or above RM 41 and released directly into the Tucannon River.

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

No significant mortality of Tucannon River natural steelhead has occurred to date. Pre-spawning mortality losses have contributed the majority of fish mortality, but has been cut back recently by more aggressive fungus treatments as prescribed by a WDFW fish health specialist. Mortality to juvenile fishes in the hatchery has been kept to a minimum through standard hatchery practices.

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.

Lyons Ferry Hatchery follows strict operational procedures as laid out by the Integrated Hatchery Optimization Team (IHOT 1993). Where possible, remedial actions identified in a 1996 IHOT compliance audit were implemented. Staff is available to respond to critical operational problems at all times. Both LFH and TFH are equipped with water flow and low water alarm systems and with emergency generator power supply systems to provide incubation and rearing water to the facilities. Fish health is monitored 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.

Only natural steelhead captured within the Tucannon River above RM 11 will be used for broodstock. A combination of fish captured hook and line, trapped at a lower-river temporary adult trap, or trapped at Tucannon Hatchery may be used in some years. Propagation and release of LFH stock will continue for several more years until the local stock can be documented to be performing as expected.

6.2) Supporting information.

6.2.1) History.

Mitigation production releases into the Tucannon River began in 1983. Broodstock originated from the Wells Hatchery (upper Columbia) and/or the Wallowa Hatchery (Snake River) programs through 1986. Returns of both Wells and Wallowa stock hatchery fish to Lyons Ferry Hatchery were used to define the Lyons Ferry stock. Complete losses at LFH of the BY1989 production because of IHNV caused the release of Idaho origin (Pahsimeroi Hatchery) steelhead in 1990. Since 1991, only LFH origin broodstock have been used for Tucannon River releases. Because of the inconsistent and incompatible nature of broodstock used in the past, as well as generally poor stock performance in the Tucannon River from releases at Curl Lake, WDFW and co-managers desire to transition to a local broodstock to continue mitigation and assist with recovery under ESA. In 1999-2000 broodstock were taken randomly from the endemic population, so no direct or unintentional selection is believed to have occurred. Samples for DNA characterization were collected from the endemic broodstock and other natural origin adults for the past five years. These samples will serve as a baseline to measure potential future genetic changes in the stock.

6.2.2) Annual size.

The proposed eventual use of 40 pair of steelhead for broodstock (should the entire program be switched to the endemic stock) ranges between 15% and 258% of the estimated natural fish escaping to spawn in the Tucannon since 1989. Because of that range, and the likelihood that in some years broodstock needs could not be met, it is critical that we fully evaluate the program before switching to the endemic stock. The collection is targeted to produce a yearly release group of artificially propagated, Tucannon River steelhead smolts without jeopardizing natural production, a feat that may be difficult unless adult run size of natural origin fish increases. The recent Listing under the ESA and the critical population level has spurred WDFW and co-managers to replace existing hatchery broodstock with a local broodstock. The direct and indirect supplementation effect, coupled with habitat restoration efforts ongoing in the basin are expected to aid in boosting the population to above the viable threshold.

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

The broodstock will consist entirely of endemic, naturally reared fish through BY2005. All returning adults from BY2000 and BY2005 will be allowed to spawn naturally and not be used for broodstock (because the small founding population from these years may present genetic concerns). Potentially starting in BY2006, collection of endemic brood may increase as the program expands. Potentially by BY2009, up to 25% of the broodstock collected may be of first generation hatchery-reared endemic brood, but will likely depend on returns of natural origin fish. At full production (80 spawning adults), no more than 35% of the broodstock collected will be of identifiable first generation hatchery-origin endemic stock.

6.2.4) Genetic or ecological differences.

Hatchery endemic broodstock will initially be developed solely from natural-origin adults and should retain the genetic structure of the natural population. Genetic samples (fin clips or punches) will be collected from hatchery and natural-origin summer steelhead in the Tucannon River every year. Samples will periodically be analyzed for population structure and genetic variation.

In 2004, we had acquired multiple years of genetic data from the Tucannon River endemic population, and from other areas in SE Washington, including the Lyons Ferry stock. Presented in this next section is a genetic analysis summary provided in 2004 by the WDFW Genetics Lab, Olympia Washington. This section was pulled from the Lyons Ferry Complex Steelhead Evaluation Report for the 2003 run year (Bumgarner et al, 2004).

Genetic Summary

Since 1998, the Snake River Lab and WDFW's Fish Management staff have periodically collected samples from SE Washington summer steelhead populations (adult and juvenile) for genetic stock analysis. Samples have been collected from the Walla Walla, Touchet and Tucannon River basins, and LFH stock. The following two graphs represent a brief summary of the analysis completed to date (Figures 2 and 3). A more complete analysis is available upon request. Results indicate that each of these natural stocks (Tucannon (Green), Touchet (Blue [adults] and Black [juveniles], and Walla Walla (Orange)) remain genetically distinct from the LFH stock despite years of hatchery stocking in each basin. Tucannon and LFH stocks are more similar and indicate some introgression between the two. Further analysis of additional samples from more years and other locations needs to occur, and long-term monitoring of the genetic characteristics of the new endemic broodstock(s) should occur because of the small founding populations sizes currently used for the endemic programs.

6.2.5) Reasons for choosing.

Endemic steelhead are optimally adapted for survival in the Tucannon River. They will be most capable of surviving, returning to and effectively spawning in the Tucannon River.

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.

Use of endemic adult steelhead for broodstock will provide the greatest protection of the population's genetic structure in a conservation/mitigation program. Broodstock will be collected from the entire run. Further, adults will be collected from the lower river site whenever possible to reduce the relative impact to the population arriving at the TFH trap (RM36).

SECTION 7. BROODSTOCK COLLECTION

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

Adults.

7.2) Collection or sampling design.

Natural steelhead may enter the Tucannon River from September through April, but their most active entry and migration times occur in the early spring (February-March). Trapping operations will occur primarily in the lower river where adults from the entire watershed pass the trap site. Hook and line sampling for broodstock may also occur in some years. Because of the trap design, fish can pass the trap at higher flows, ensuring that the run is not delayed by trapping efforts. Fish entering the trap (or captured hook and line) are considered to be a random sub-sample of the population, but WDFW will strive to collect equal numbers of adults from the fall and spring migration periods to ensure a full representation of the run. Since we began trapping in 1999/2000, we've generally been able to trap into March, effectively sampling nearly the entire run time. During stock development years, trapping of broodstock from the upper site will only occur if the lower trap is disabled.

After full production with endemic broodstock has been attained, broodstock could then be collected at the TFH trap (RM 41.5). The trap would be operated for steelhead collection from February through May. Brood fish would be collected in proportion to the expected run timing.

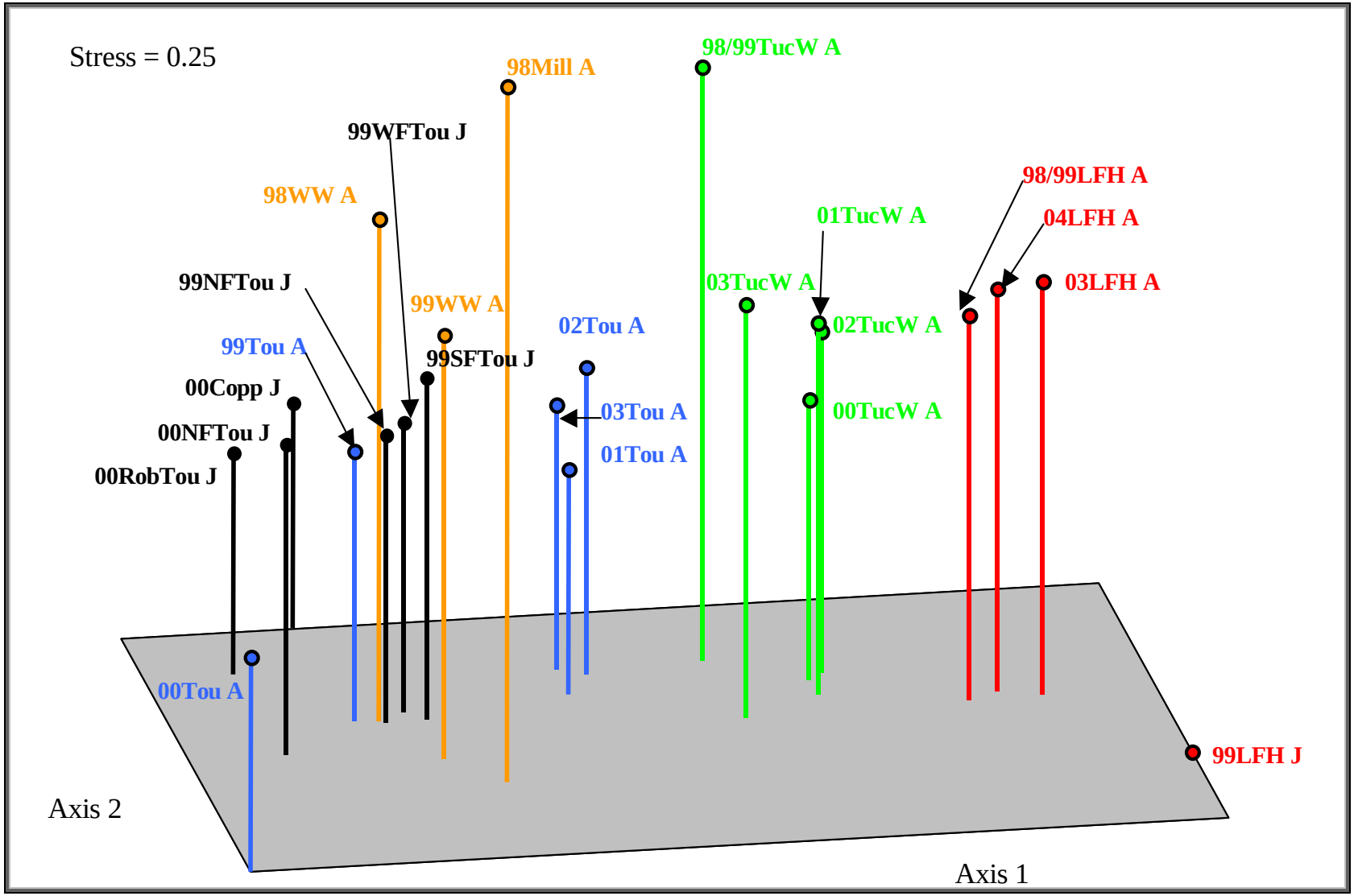

Figure 1. MDS of genetic distances among Tucannon and Touchet steelhead collections from NTSYS-pc. Genetic distances (Cavalli-Sforza and Edwards) were calculated using GENDIST in PHYLIP. Samples were collected either for adults (A) or juveniles (J). Lyons Ferry Stock fish are indicted in red, Tucannon wild stock are indicated in green, Touchet wild stock adult samples are indicated in blue, Walla Walla River wild stock are indicated in orange, and Touchet River tributary juvenile samples are indicated in black.

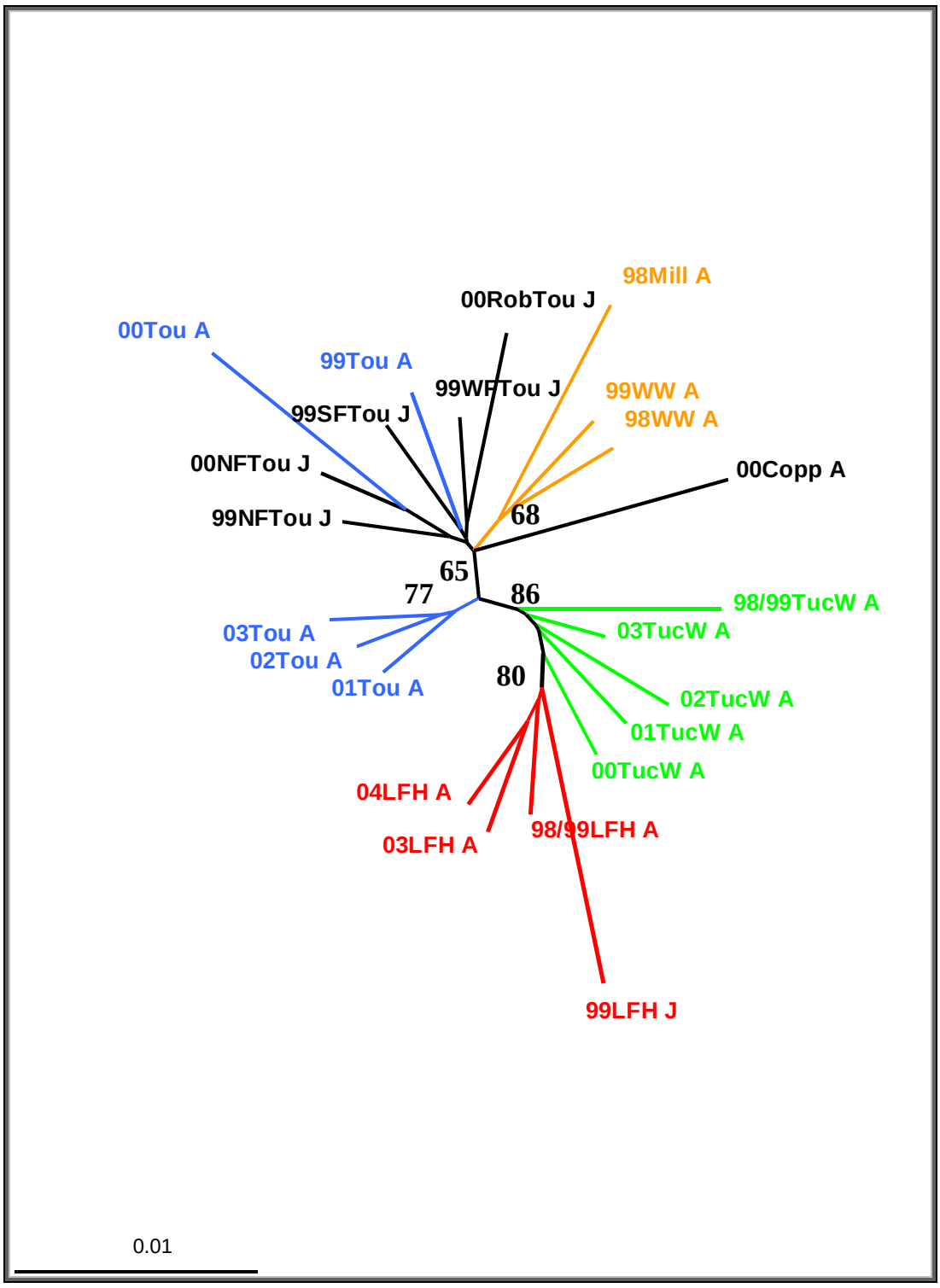

Figure 2. Neighbor-joining consensus tree of Cavalli-Sforza and Edwards distances among collections from PHYLIP. Numbers at the nodes indicate the percentage of 10,000 trees in which the collections beyond the node grouped together and only values over 65% are shown. Lyons Ferry Stock fish are indicted in red, Tucannon wild stock are green, Touchet wild stock adult samples are blue, Walla Walla River wild stock are orange, and Touchet River tributary juvenile samples are in black.

7.3) Identity.

Endemic origin naturally produced steelhead are unmarked. All hatchery fish (LFH stock) presently released into the Tucannon River receive an adipose clip or a combination adipose/left ventral/CWT. Releases of smolts from endemic origin fish will receive a CWT/visual implant elastomer (VI) tag in the adipose eye tissue for external identification, or some other effective mark that can be identified upon return.

7.4) Proposed number to be collected:

7.4.1) Program goal (assuming 1:1 sex ratio for adults): 88 adults. This number allows for pre-spawning loss that could occur at the hatchery while holding fish, or if fish are detected with high levels of IHNV.

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

Table 10. Number of spawners, average fecundity, and survival by life state of Tucannon Endemic stock steelhead spawned at LFH, 2000-2005.

	Spawned									
BY	female	male	Average fecundity	Eggs taken	Live eggs	Percent survival	Fry	Egg-fry survival[a]	Smolts	Fry-smolt survival
2000	16	21	5,053	80,850	71,971	89.0	71,971	100.0	60,020	83.4
2001[b]	15	15	7,571	113,563	101,497	89.4	98,836	97.4	58,616	82.7
2002	13	16	5,708	74,204	66,969	90.3	51,713	77.2	43,688	84.5
2003	11	19	5,676	79,464	52,034	65.5	51,119	98.2	42,967	95.0
2004	16	15	4,723	75,560	59,911	79.3	58,882	98.3	61,238	100.0
2005	13	25	5,509	77,131	71,933	93.3				

[a] The imprecision of hatchery methods at times measures survival between life stages as >100% 100% is reported as a maximum.

[b] 24,948 fingerlings were released in October 2001. Fry to smolt survival is calculated from fry minus fingerling release minus 3,000 loss between fry and fingerling outplant.

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

Hatchery origin (LFH stock) fish collected at the lower trap are passed upstream into a recreational fishery. LFH stock fish collected at the Tucannon Hatchery trap will be removed or passed downstream of the trap to keep them from the upper basin. Returning hatchery-reared adults of endemic origin will be passed at both traps to contribute to the spawning population. Until run size has rebuilt to a level that will allow WDFW to collect the required broodstock for full program (88 adults), only a limited number of hatchery reared endemic origin adults (F_1 generation) will be used for broodstock (see 6.2.3 above).

7.6) Fish transportation and holding methods.

Adults are transported in plastic tubs or tank trucks with re-circulation aeration and/or oxygenation. To ameliorate hauling stress, salt (NaCl) is added to the water in quantities appropriate to the tank volume (as described in WDFW fish health manual). Hauling time from the lower river trap site to LFH is approximately 15 minutes. Hauling time from TFH to LFH is approximately 45 minutes.

Fish are held in brood stock raceways at LFH as described above. Fish are anesthetized using MS-222 to determine degree of ripeness. Fish may be treated with a suite of approved chemicals to control fungus, parasites and bacterial diseases, as prescribed by a WDFW fish health specialist.

7.7) Describe fish health maintenance and sanitation procedures applied.

Monthly fish health inspections occur at LFH. Because of very low numbers of adults held in broodstock raceways, raceway cleaning is unnecessary. Treatments for fungal infections are applied as chemical flushes through the raceways.

7.8) Disposition of carcasses.

In 2000, fish were live spawned and surviving males and females were retained in an attempt to rejuvenate them for subsequent re-spawning in 2001. Rejuvenation efforts failed however and all fish died. No further attempts at rejuvenation will be made until current research in the Columbia basin on kelt rejuvenation has been completed. Carcasses will be sampled for DNA if a fish dies pre-spawning, and may be buried on station. Spawned carcasses may be returned to the Tucannon River for nutrient enhancement after approval by a WDFW fish health specialist if such release of carcasses is determined not to pose a significant fish health risk for the natural population. Carcasses of endemic broodstock would be returned to the upper Tucannon River above RM 20.

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.

Broodstock will be collected from throughout the natural run period to provide for random selection of adults from the entire adult population, prevent run timing divergence of the hatchery reared population from the natural population, and provide for natural fish escapement into the habitat to spawn. Returning adults from natural brood smolt releases will be allowed to enter the spawning population without being used for the hatchery supplementation program. As the local brood program expands, trapping at the Tucannon Hatchery site will begin to remove returning LFH stock adults from the river to reduce their possible effect on the natural population.

Disease control efforts at LFH and TFH (in accordance with PNWFHC and IHOT standards) will effectively control expansion of species specific or general salmonid diseases.

SECTION 8. MATING

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

8.1) Selection method.

All males and females that have been collected for broodstock will be examined weekly during the spawning season to determine ripeness, and all fish will be spawned when ripe. The priority will be to use any males that have not yet contributed in spawning. All males are PIT tagged for identification purposes after they have been spawned to track the number times a particular male may contribute.

8.2) Males.

Mating occurs in a 2x2 factorial cross to ensure the highest likelihood of fertilization. Jack or precocious steelhead (<20" TL) are generally not seen in the population. Likewise, repeat spawners are not known to exist in significant numbers in the population. However, this proposed action is experimental at this time and was not successful at LFH in 2000.

8.3) Fertilization.

Equal sex ratios in the spawning population were originally identified as a goal for the program. However, problems getting enough ripe males to spawn with females was a problem. Further, fecundity has generally been greater than originally planned. As such current program goals can be reached by spawning on 13-14 females. As such, additional males will be collected, or live spawned and released at the adult trap to ensure adequate number of males are available. During spawning, a 2x2 factorial spawning occurs (or a 1x2 when only one female is available) to increase the number of crosses. The small number of fish ripe on individual days usually limits spawning options. Males are usually limited to primary status on one half the eggs from two females. Where insufficient males are available to meet these criteria, males can be used as primary more than twice. In those circumstances, males will be used no more than four times as primary spawners (egg equivalent = 2 females). After fertilization, eggs are rinsed in a buffered iodine solution (100 ppm) to control viral and bacterial disease, and allowed to water harden for one hour in the same solution.

8.4) Cryopreserved gametes.

Cryopreservation has not been attempted for this endemic population, but may be used in future brood years to increase diversity. Currently, no semen from natural origin males has been preserved to use in the program.

8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

Broodstock collection protocol will ensure that adults represent a proportional, temporal distribution of the natural population. A 2x2 factorial mating scheme has been and will be applied to reduce the risk of loss of within-population genetic diversity for the small steelhead population that is the subject of this conservation/mitigation 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.

LFH collects large numbers of LFH stock steelhead eggs annually. Following is the egg survival information at LFH for the ten most recent brood years. Only six years of egg take information is available for endemic Tucannon River steelhead (Table 11). (**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.)

Table 11. History of egg loss for LFH and Tucannon River endemic stock summer steelhead at WDFW's Lyons Ferry Hatchery from 1994-2005.

Brood Year	Eggs Taken	% Loss to eye-up	Stock Origin
1994	1,352,296	33.5	LFH
1995	1,772,477	47.6	LFH
1996	1,614,636	28.7	LFH
1997	1,090,638	11.7	LFH
1998	1,460,967	36.1	LFH
1999	1,140,813	17.7	LFH
2000	871,856	29.2	LFH
2001	800,350	36.9	LFH
2002	941,223	22.2	LFH
2003	483,462	13.5	LFH
2004	494,380	16.2	LFH
2005	571,185	20.9	LFH
2000	80,850	11.0	Tucannon Endemic
2001	113,563	10.6	Tucannon Endemic
2002	74,204	9.7	Tucannon Endemic
2003	79,464	34.5 [a]	Tucannon Endemic
2004	75,560	20.7	Tucannon Endemic
2005	77,131	6.7	Tucannon Endemic

[a] Three of the females spawned in 2003 had bad egg quality, and egg loss was nearly 100% for all three fish. Removal of these three fish would result in 13.6% egg loss.

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

Estimated egg take and fecundity is based on six ears of spawning data. Also, egg survival to eye-up has generally been consistently higher than that for the existing stocks of steelhead used at LFH. Number of eggs collected from adults trapped and ultimately the number of fry could exceed program needs. Furthermore, the disease history of natural broodstock is not known. Eggs is excess of program may be retained to ensure the goal is met in case of unexpected loss from IHNV or other unexpected circumstances. Eggs from females determined to be IHNV positive would not necessarily be destroyed.

The LFH Complex manager and a WDFW Fish Health specialist will make the decision. Excess fingerlings produced from the program will be released within the Tucannon River basin in areas of underseeded habitat.

9.1.3) Loading densities applied during incubation.

Eggs from individual females are incubated individually in 2-quart colanders through eye-up. Water flow through each colander is 2g/min. After eye-up, eggs are placed in hatching baskets with a capacity of 20,000 eggs each, depending on egg size.

9.1.4) Incubation conditions.

Incubation, as with rearing, occurs with pathogen free, sediment free, 51-53 ^{0}F 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 from baskets and drop into 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.

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 bulb-syringe, or from egg pickers.

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.

Eggs are incubated in pathogen free, silt free well water to ensure maximum egg survival and minimize potential loss from disease. The hatchery incubation room is protected by a separate low water alarm system and an automatic water reuse pumping system, and by the use of wells separate from the hatchery's main well field.

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 dependable data are available.

See Tables 10 and 12 for relevant data on either LFH or Tucannon Endemic Stock.

Table 12. Number of spawners, average fecundity, and survival by life state of LFH stock steelhead spawned at LFH, 1987-2005.

	Spawned									
BY	female	male	Average fecundity	Eggs taken	Eggs retained	Percent retained	Fry	Egg-fry survival[a]	Smolts	Fry-smolt survival
1987	250	NA	4,446	1,111,506	1,095,906	98.6	983,901	89.8	665,658	67.3[b]
1988	267	NA	3,527	941,756	818,148	86.9	793,240	96.9	597,607	75.3
1989	243	576	5,198	1,263,237	957,074	75.8	941,000	98.3	0	0.0[c]
1990	437	955	5,883	2,570,676	1,483,485	57.7	1002,320	67.6	635,635	63.4
1991	261	532	4,966	1,296,249	1,165,315	89.9	1115,368	95.7	357,497	32.1[d]
1992	240	100	5,162	1,239,055	905,438	73.1	416,265	46.0	387,767	93.2[e]
1993	234	100	5,175	1,211,053	940,022	77.6	860,983	91.6	611,417	71.0
1994	253	NA	5,345	1,352,296	899,350	66.5	845,316	94.0	558,130	66.0
1995	343	NA	5,168	1,772,477	929,597	52.4	895,882	96.4	610,545	68.2
1996	330	NA	4,893	1,614,636	1,151,363	71.3	1148,114	99.7	807,253	70.3[f]
1997	217	246	5,025	1,090,638	962,705	88.3	809,845	84.1	569,264	70.3[g]
1998	279	280	5,236	1,460,967	934,247[h]	63.9	768,522	82.3	567,732	73.9
1999	227	253	5,025	1,140,813	807,374	70.8	807,374	100.0	495,864	61.4
2000	183	188	4,764	871,856	650,867	74.7	617,380	94.9	381,686	61.8
2001	151	242	5,300	800,350	636,727	79.6	505,451	79.4	423,065	83.7
2002	194	231	4,954	941,223	768,832	81.6	732,566	95.3	378,917[i]	60.4
2003	126	257	4,524	483,462	418,195	86.5	408,944	97.8	310,209	75.9
2004	133	259	3,832	494,380	414,258	83.8	408,462	98.6	355,362	87.0
2005	133	263	4,428	571,185	452,011	79.1				

[a] The imprecision of hatchery methods at times measures survival between life stages as >100% 100% is reported as a maximum.
[b] An additional 203,857 were outplanted as pre-smolts (fry-outplant survival was 88.4%)
[c] Losses to IHNV = 100%
[d] Includes 92,116 fish planted as sub-smolts: an estimate 172,000 fish lost to bird predation.
[e] Destroyed 378,257 fish infected with IHNV
[f] Includes 191,000 fry planted into Sprague Lake.
[g] Included 15,207 fry planted into Rock Lake.
[h] 308,666 eggs discarded from IHNV positive females.
i Does not include 105,502 fish that were planted as fry in to Sprague Lake.

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

LFH raceway rearing density index criteria for steelhead will not exceed 0.25 lbs fish/ft^3. Where steelhead are reared in rearing ponds, densities can be 10% of the raceway maximum. Generally, indigenous brood juveniles will rear in vessels at a density index much less than 0.26 lbs fish/ft^3.

9.2.3) Fish rearing conditions

Raceways are supplied with oxygenated water from the hatchery's central degassing building. Approximately 1,000 gpm water enters each raceway through secondary degassing cans. 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. 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.

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.

Growth rate information for the Lyons Ferry and Wallowa stock steelhead.

Lyons Ferry Steelhead

Year	F/Kg	W/GRAMS	L/CM	Growth-cm/Mo.	"K" Factor
March/99	24.39	0.41	3.49		3.48
April/99	776	1.29	5.10	1.61	3.51
May/99	441	2.27	6.16	1.06	3.51
June/99	225	4.45	7.71	1.55	3.50
July/99	109	9.16	9.82	2.11	3.49
August/99	80	12.43	10.87	1.05	3.49
September/99	38	26.22	13.94	3.07	3.49
October/99	27	37.10	15.65	1.71	3.49
November/99	22	46.27	16.84	1.19	3.50
December/99	16	64.41	18.80	1.96	3.50
January/00	12	82.55	20.43	1.63	3.49
February/00	10	100.70	21.82	1.39	3.50

Wallowa Steelhead

Year	F/KG	W/GRAMS	L/CM	Growth-cm/Mo.	"K" Factor
May/99	2417	0.41	3.50		3.45
June/99	634	1.58	5.46	1.95	3.50
July/99	298	3.36	7.02	1.56	3.50
August/99	90	11.16	10.48	3.46	3.50
September/99	57	17.51	12.19	1.70	3.50
October/99	35	28.76	14.37	2.19	3.50
November/99	22	46.27	16.84	2.49	3.50
December/99	16	64.41	18.80	1.96	3.50
January/00	14	71.67	19.49	0.69	3.49
February/00	12	82.55	20.43	0.94	3.50
March//00	10	97.07	21.56	1.13	3.50
April/00	10	100.70	21.82	0.26	1.06

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

See above tables.

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 semi-moist trout/salmon diet. Feeding occurs several times daily as necessary to provide the diet at a range of 0.7 – 1.1% B.W./day. Feed conversion is expected to fall in a range of 1.1 – 1.4 pounds fed to pounds produced. Due to the duration of spawning time for the natural steelhead, a variety of starter diets and feed schedules may be used to achieve a similar size among the fish before they are moved outside to the rearing raceways. This strategy will reduce length variation (CV) of juveniles within the supplemented population.

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. Hatchery Specialists under the direction of the Fish Health Specialist provide treatment for disease. Sanitation consists of raceway cleaning three times each week by brushing, and disinfecting equipment between raceways and/or between species on the hatchery site.

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

Program goal for the endemic program will be to release fish between April 1-30 at 4.5 fish/lb. Pre-liberation samples will note smolt development visually based on degree of silvering, presence/absence of parr marks, fin clarity and banding of the caudal fin. No gill ATPase activity or blood chemistry samples to determine degree of smoltification, or to guide fish release timing is anticipated.

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

Camouflage covers or water sprayers over the outside raceways are planned at this time to help maintain the fright response of the endemic program fish. Demand or pneumatic feeders may also be used where possible to limit human disturbance or habituation to humans. Raceways are old enough that the walls and bottoms are of nearly natural coloration and texture, and promote natural looking fish.

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.

Lyons Ferry Complex facilities are manned by professional personnel trained in fish cultural procedures. 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. Final rearing/acclimation at Tucannon Hatchery will occur on river water to provide acclimation/imprinting time and begin the conversion to natural feed sources present in river water.

SECTION 10. RELEASE

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

The following (Table 14) shows proposed WDFW endemic stock juvenile or smolt releases (goal and maximum) into the Tucannon River for the next five years while the program is being evaluated at initial production levels.

Table 14. Short-term steelhead production releases (by stock) into the Tucannon River.

Age Class	Maximum Number	Goal	Size (fpp)	Release Date	Location	Stock
Eggs						
Unfed Fry						
Fry						
Fingerling	25,000	0	50	1 October	Upper Tucannon River (direct)	Tucannon
Yearling	100,000	100,000	4 - 5	1-30 April	Enrich or HWY 12 Bridges	LFH
Yearling	75,000	50,000	4 - 5	1-30 April	Curl Lake Intake (direct)	Tucannon

10.1a) Proposed fish release levels

The following table (Table 15) shows proposed WDFW endemic stock juvenile or smolt releases (goal and maximum) into the Tucannon River after the proposed full production has been reached. At this proposed level the LFH stock will have been removed from the Tucannon River.

Table 15. Proposed long-term steelhead production of Tucannon River Endemic Stock into the Tucannon River.

Age Class	Maximum Number	Goal	Size (fpp)	Release Date	Location	Stock
Eggs						
Unfed Fry						
Fry						
Fingerling	25,000	0	50	1 October	Upper Tucannon River (direct)	Tucannon
Yearling	175,000	150,000	4 - 5	1-30 April	Upper Tucannon River (direct)	Tucannon

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

Stream, river, or watercourse: Tucannon River (WRIA 35)
Release point: RM 40-60
Major watershed: Tucannon River
Basin or Region: Snake River

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

Date of Release (4/9-4/10) - 2000 BY - 2001 Release – Yearling Smolt – 60,020 (5.8 fish/lb)
Date of Release (10/05) - 2001 BY - 2001 Release – Fingerling – 24,938 (28.5 fish/lb)
Date of Release (4/2) - 2001 BY - 2002 Release – Yearling Smolt – 58,616 (5.49 fish/lb)
Date of Release (4/15) - 2002 BY - 2003 Release – Yearling Smolt – 43,688 (5.30 fish/lb)
Date of Release (4/6-26) - 2003 BY - 2004 Release – Yearling Smolt – 42,967 (4.8 fish/lb)
Date of Release (3/29-31) - 2004 BY - 2005 Release – Yearling Smolt – 61,238 (4.8 fish/lb)

Also, see Figures 4a, and 4b that demonstrates how the program has done in meeting the smolt production goal and size at release goal for the Tucannon River endemic stock program.

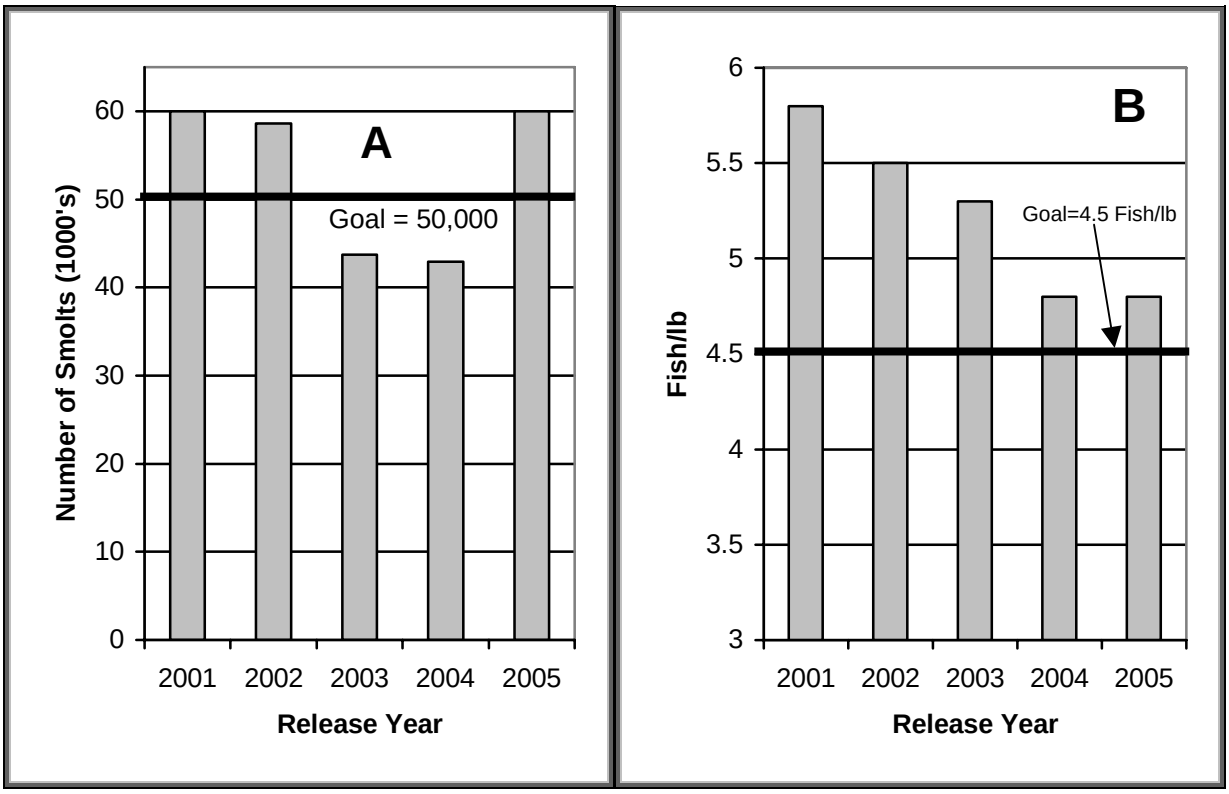

Figure 3. Endemic stock smolt production (A) and average size at release (B) from 2001-2005 release years.

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

See 10.3 above for dates of release for endemic broodstock fish. Fish will be transferred from LFH to TFH in February of the release year and placed in ponds supplied with river water (see 10.6 below). Fish will be fed while at TFH. During April of the release year, when fish appear to be visibly smolted, fish are their approximate release size, or river conditions will provide optimum migration, they will be loaded into trucks and hauled to the upper river (≥ RM 41) and released.

10.5) Fish transportation procedures, if applicable.

Fish will be transported from LFH to TFH and from TFH to release sites above the hatchery by tank truck. Transportation time from LFH will usually be less than one hour and from TFH to release sites will usually be less than 30 minutes.

10.6) Acclimation procedures.

Fish will be reared at TFH from early to mid February through release in April (5-9 weeks). Rearing will occur on Tucannon River water, which will provide acclimation to the chemistry and temperature regime of the Tucannon basin.

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

In the initial years of the program, all natural brood origin smolts will receive a coded wire tag in the snout and a VI tag in the adipose eye tissue for external identification upon return as adults. Should fingerling need to be released in October, they would be similarly marked, but a different VI tag color would be used to evaluate the success of fry/parr releases into the basin. In 2001, we used a VIE tag in the anal fish to distinguish fingerling releases upon adult return. When/if full program is reached in the future, a majority of them will be marked for harvest (adipose fin clipped), and a portion will remain unmarked for conservation needs.

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

Monitoring of fish numbers, growth and mortality at the hatcheries will provide reasonably accurate estimates of live fish throughout their rearing life. Surplus fish were identified early in the rearing cycle of the 2001 BY. The surplus portion of this group was released as fingerlings in the upper Tucannon River watershed in October of 2001. Adjustments were made to broodstock collections following 2001 (i.e. higher fecundities have been observed for wild fish compared to the LFH stock fish). By adjusting the broodstock numbers (number of females to spawn), we've been able to better reach program smolts goals.

Because fish are of Tucannon River origin, all fish will be released into the Tucannon River either as smolts or fingerlings. Fingerlings would be outplanted into the basin at that time, targeting river reaches that had population densities below carrying capacity. Any surplus production of fingerlings in the future is expected to be small.

10.9) Fish health certification procedures applied pre-release.

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

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

Under conditions requiring release of fish at either hatchery in response to a water system failure, all fish would be hauled by truck to the upper Tucannon River and released.

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

All fish will be released into the upper river basin, which is currently underseeded by steelhead. Since the standard release strategy will consist of releasing smolts, most will orient to the river for a short time (1-10 days) and then emigrate. Some smaller fish may not be developmentally ready to emigrate and could assume residence in the river for up to another year. This number would be much greater in the case of fall fingerling plants. However, because the river is presently underseeded, WDFW does not expect these fish to represent a problem for juvenile salmon, steelhead or bull trout in the system. Fish rearing for an additional year within the Tucannon will contribute to the conservation/ recovery goal for the program as a life history variant of those emigrating as yearlings.

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 (CBFWA 1996). 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.

The Species Interaction Work Group (SIWG 1984) reported that potential impacts from competition between hatchery and wild fish is 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 at some unknown, but lower level as smolts move downstream through the migration corridor. Steward and Bjornn (1990), however, concluded that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmonids) may have different food and habitat preferences than wild fish, and that hatchery fish will be unlikely to out-compete wild fish. Hatchery-produced smolts emigrate seaward soon after liberation, minimizing the potential for competition with wild fish (Steward and Bjornn 1990). 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).

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.

Estimate the contribution of conservation / mitigation program-origin summer steelhead to the basin and compare performance to the natural population.

Indicators: *1.1, 2.1, 2.3, 3.1, 3.2, 3.3, 3.4, 4.2, 5.1, 5.3, 5.4*

1. Differentially mark all hatchery-reared summer steelhead fingerling to allow for distinction from natural-origin fish upon return as adults on the spawning grounds. Coded wire and visible implant elastomer tagging or another permanent, effective method will be used to accomplish this task. Adipose fin clipping may be used after 2004/ 2005 if the program is successful.

Indicators: *3.1, 3.2, 3.3, 3.4, 4.1, 5.1, 6.6, 6.7*

2. Conduct trapping at permanent and temporary trap locations throughout the summer steelhead return to collect broodstock for the hatchery conservation/mitigation program, enumerate overall returns, and to collect information regarding fish origin for the spawning escapement, and age class composition.

Indicators: *3.2, 3.3, 4.2, 5.2, 6.6*

3. Conduct spawning ground surveys to estimate spawners, and use in conjunction with trapping data to estimate the proportions of natural, endemic brood hatchery, and other hatchery origin steelhead in the spawning population.

Indicators: *3.2, 3.3, 4.2, 5.2, 6*

4. Estimate the number of natural and naturally spawning hatchery-origin summer steelhead contributing to the Tucannon River annual escapement.

Indicators: *3.4, 4.2, 4.3, 4.4*

5. Conduct summer electrofishing and snorkel surveys to estimate densities and populations of Age 0 and Age 1+ summer steelhead throughout the Tucannon River basin to compare to historical records. Electrofishing and snorkel surveys will also be able to determine the degree of residual steelhead left in the river from hatchery supplementation releases.

Indicators: *3.4, 3.6, 4.2, 4.3, 4.4*

6. Operate a smolt trap on the Tucannon River to: 1) Estimate the number, timing, and age composition of natural origin steelhead smolts from the river, 2) estimate the migration success to the smolt trap from releases of hatchery supplementation steelhead in the upper basin, and 3) allow downriver migration comparison between natural and hatchery propagated by PIT tagging at the smolt trap.

Indicators: *2.3, 3.1, 3.3, 3.4, 4.2, 5.3, 5.4, 5.5*

7. Calculate SARs by brood year to determine if fish are surviving. Estimate escapement to hatchery, spawning grounds and harvest.

Monitor and evaluate any changes in the genetic, phenotypic, or ecological characteristics of the populations potentially affected by the program.

Indicators: *5.1*

1. Collect GSI data (allozyme or DNA-based) from regional summer steelhead adult populations to determine the degree to which discrete populations persist in the individual watersheds. Allozyme collections will be used for comparison with past collections to monitor changes in allelic characteristics, and with the intent to assess whether the supplementation program negatively affects the genetic diversity of the natural population in the Tucannon River.

Indicators: *3.4, 4.2, 5.3, 5.4*

2. Collect length and scale samples from all adults (natural and hatchery) returning to traps on the Tucannon River. Assess age structure of returning hatchery origin fish and compare with natural fish. Compare length at age of natural and hatchery reared returning adults.

Indicators: *4.2, 4.3*

3. Conduct summer electrofishing and snorkel surveys to estimate densities and populations of Age 0 and Age 1+ summer steelhead throughout the Tucannon River basin to compare to historical records. Electrofishing and snorkel surveys will also be able to determine the degree of residual steelhead left in the river from hatchery supplementation releases.

Indicators: *5.5, 5.6*

4. Operate a smolt trap on the Tucannon River to: 1) Estimate the number, timing, and age composition of natural origin steelhead smolts from the river, 2) estimate the migration success to the smolt trap from releases of hatchery supplementation steelhead in the upper basin, and 3) allow downriver migration comparison between natural and hatchery supplementation by PIT tagging at the smolt trap.

Assess the need and methods for improvement of conservation / mitigation activities in order to meet program objectives, or the need to discontinue the program because of failure to meet objectives.

Indicators: *3.6, 4.4, 5.5, 6.1*

1. Determine the pre-spawning and green-egg to released smolt survivals for the program.

a. Monitor growth and feed conversion for fingerling.
b. Determine green-egg to eyed-egg, eyed-egg to fry, and fry to released-smolt survival rates.

c. Maintain and compile records of cultural techniques used for each life stage, such as: collection and handling procedures, and trap holding durations for broodstock; fish and egg condition at time of spawning; fertilization procedures, incubation methods/densities, temperature unit records by developmental stage, shocking methods, and fungus treatment methods for eggs; ponding methods, rearing/pond loading densities, feeding schedules and rates for juveniles; and release methods.
d. Summarize results of tasks for presentation in annual reports.
e. Identify where the propagation program is falling short of objectives, and make recommendations for improved production as needed.

Indicators: *4.1, 4.2, 4.3, 5.2, 5.4, 6.4, 6.6, 6.7*

1. Determine if broodstock procurement methods are collecting the required number of adults that represent the demographics of the donor population with minimal injuries and stress to the fish.
   A. Monitor operation of adult trapping operations to ensure compliance with established broodstock collection protocols.
   B. Monitor timing, duration, composition, and magnitude of run at each adult collection site.
   C. Maintain daily records of trap operation and maintenance (e.g. time of collection), number and condition of fish trapped, and environmental conditions (e.g. river level, water temperature).
   D. Collect biological information on collection-related mortalities. Determine causes of mortality, and use carcasses for stock profile sampling, if possible.
   E. Summarize results for presentation in annual reports. Provide recommendations on means to improve broodstock collection, and refine protocols if needed for application in subsequent seasons.

Indicators: *6.1, 6.5*

2. Monitor fish health, specifically as related to cultural practices that can be adapted to prevent fish health problems. Professional fish health specialists supplied by WDFW will monitor fish health.
   a. A fish health specialist will conduct fish health monitoring. Significant fish mortality to unknown causes will be sampled for histopathological study.
   b. The incidence of viral pathogens in broodstock will be determined by sampling fish at spawning in accordance with procedures set forth in PNWFHPC. Recommendations on fish cultural practices will be provided on a monthly basis based upon the fish health condition of juveniles.
   c. Fish health monitoring results will be summarized as part of an annual report.

Collect and evaluate information on adult returns.

This element will be addressed through consideration of the results of previous elements, and through the collection of information required under adaptive criteria. All will be used as the basis for determining the success of progress toward program goals and whether the program should continue.

Indicators: *1.1, 2.3 3.1, 3.2, 3.3, 5.1*

1. Monitor the incidental harvest of artificially produced endemic stock Tucannon and hatchery stock steelhead in recreational and treaty fisheries. Document trends in abundance.
2. Collect age, sex, length, average egg size, and fecundity data from a representative sample of broodstock used in the supplementation program for use as baseline data to document any phenotypic changes in the populations.
3. Compare newly acquired electrophoretic analysis data reporting allele frequency variation of returning hatchery and natural fish with baseline genetic data. Determine if there is evidence of a loss in genetic variation (not expected from random drift) that may have resulted from the supplementation program.
4. Commencing with the first year of returns of progeny from naturally-spawned, hatchery-origin summer steelhead, evaluate results of spawning ground surveys and age class data collections to:
    a. Estimate the abundance and trends in abundance of spawners;
    b. Estimate the proportion of the escapement comprised by steelhead of hatchery lineage, and of natural lineage;
    c. Through mark sampling, estimate brood year contribution for hatchery lineage and natural-origin fish.

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. Once natural populations have attained the ability to replace themselves, the focus of the program will shift form conservation and recovery of the population, to achieving mitigation goals defined under LSRCP.

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

The LSRCP program as part of the ongoing mitigation program has provided funding for Monitoring and Evaluation. However recent budget constraints may require scaling back or eliminating portions of the evaluation program.

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

1. Juvenile sampling at hatchery facilities will be conducted with accepted procedures to minimize stress and mortality from sampling. Sample sizes will be the minimum necessary to achieve statistically valid results for growth, tag retention and fish health.
2. Smolt trapping operations will ensure that holding time, stress and potential for injury of captured migrants is minimized. Marked groups for assessing trap efficiency will be the minimum necessary to achieve statistically valid results.

3. Adult trapping facilities will be monitored daily, or more often as necessary to prevent injury and unnecessary delay.
4. Spawning ground surveys will be conducted in such a manner to avoid scaring spawning fish off redds. Also, staff will carefully walk in areas with redds so eggs won't be accidentally crushed.
5. Snorkel surveys will be conducted only at a minimum number of sites necessary to achieve statistically valid results for population estimates. Displacement of fish will be kept to a minimum by snorkeling on days when water clarity and visibility are at maximum.
6. Electrofishing surveys will be conducted only at a minimum number of sites necessary to achieve statistically valid results for population estimates. If possible surveys will be conducted when water temperatures are below stressful levels to fish. WDFW will follow NMFS and WDFW electrofishing guidelines by: not shocking near redds or spawning adults, use of approved electroshockers, having experienced crew members during all shocking surveys, using DC current, recording temperature, conductivity and electroshocker settings, and providing a good environment for fish holding/sampling after capture.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing LSRCP program research is designed to:

- Determine the feasibility of an endemic stock program on the Tucannon River to replace the existing LFH stock fish from the basin.

- 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 – Funding Agency

Nez Perce Tribe – Co-manager
Confederated Tribes of the Umatilla Indian Reservation – Co-manager

12.3) Principle investigator or project supervisor and staff.

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

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

Year Round. Endemic stock fish are present in the hatchery during all times of the year due to the overlap or juvenile rearing/release and adult collection time for broodstock. Specific times for activities conducted under research and monitoring are described below.

Broodstock Trapping – September through March
Spawning – February through April
Juvenile Rearing – March though following April

Smolt Trapping – October through June
Electrofishing – July though September
Spawning Ground Surveys – March though May
PIT Tagging – March though May

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 (Lower Tucannon Adult trap, Tucannon Fish Hatchery Trap, Smolt Trap, Electrofishing Sites). Listed fish will generally be anesthetized prior to human handling, except at the adult traps where sampling troughs are used.

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

Injury due to capture and sampling is inevitable. However, precautions have been taken during all activities to make sure that mortalities are kept to a minimum.

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

See attached "take table" for anticipated mortalities to listed fish that could occur.

12.10) Alternative methods to achieve project objectives.

Alternatives to the current program were described in Section 1.16.

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

Other listed species that may be potentially affected by this program have been described in Section 2.2 (Fall chinook, Spring chinook, and bull trout)

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.

WDFW and the other co-mangers within the basin, along with NOAA Fisheries have take all known necessary steps to eliminate and/or minimize ecological effects, injury, and mortality to listed fish as part of this hatchery program. Any specific research conducted on listed fish will be approved by NOAA fisheries before proceeding.

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. D., M. P. Small, 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

Bumgarner, J., M. Schuck, S. Martin, J. Dedloff, L. Ross. 2003. 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. FPA-02-09

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.

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 Tucannon River endemic steelhead 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 lower Tucannon River 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 there. Activities at TFH 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 TFH meets state water quality standards and is therefore not a concern.

Fish health - pathogen transmission, therapeutics, chemicals.

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

Appendix Table 1. Estimated listed salmonid take levels of by hatchery activity.

Listed species affected: Summer Steelhead ESU/Population: Snake / Tucannon Activity: Broodstock Collection, spawning, rearing and releases

Location of hatchery activity: Lyons Ferry Complex Dates of activity: Year Round 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	200	0
Collect for transport b)	0	0	20	0
Capture, handle, and release c)	0	0	800	0
Capture, handle, tag/mark/tissue sample, and release d)	0	12,000	0	400
Removal (e.g. broodstock) e)	0	0	88	0
Intentional lethal take f)	0	0	80	0
Unintentional lethal take g)	0	0	20	0
Other Take (specify) h)	0	0	0	0

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

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.*

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

Listed species affected: Summer Steelhead ESU/Population: Snake / Tucannon Activity: Spawning, Snorkel, Electrofish surveys and smolt trapping

Location of hatchery activity: Tucannon River (Various locations) Dates of activity: Year Round Research/Monditoring/Evaluation program operator: Mark Schuck and Joe Bumgarner

Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	2500	2500	20	0
Collect for transport b)	0	2000	0	0
Capture, handle, and release c)	6000	6000	20	0
Capture, handle, tag/mark/tissue sample, and release d)	0	6000	50 (i)	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	500	400	0	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through snorkeling.
b. Take (non-lethal) of juveniles/smolts captured and marked (caudal clip) for smolt trap efficiency tests.
c. Take associated with smolt trapping operations and electrofishing where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to PIT tagging and/or bio-sampling (length/weight and scales) of fish collected through smolt trapping operations or electrofishing surveys prior to release.
e. Listed fish removed from the wild and collected for use as broodstock.f. Intentional mortality of listed fish during smolt trapping or electrofishing.
g. Unintentional mortality of listed fish, including loss of fish during transport during smolt trapping or holding after electrofishing.
h. Other takes not identified above as a category.
i. Rainbow trout mature

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.