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

TAKE PRIDE IN AMERICA

January 20, 2011

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

Dear Mr. Jones: Rob

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

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

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

Sincerely,

Scott Marshall
LSRCP Program Manager

Enclosures (1)

cc: Rich Johnson (FWS, Portland, OR)
Heather Bartlett (WDFW)
Mark Schuck (WDFW)
Jon Lovrak (WDFW)
Glen Mendel (WDFW)

Becky Johnson (NPT)
Brian Zimmerman (CTUIR)
Ron Costello (BPA)

State of Washington
Department of Fish and Wildlife
Mailing Address: 600 Capitol Way N, Olympia WA 98501-1091, (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building, 1111 Washington Street SE, Olympia WA

January 18, 2011

Mr. Scott Marshall
Lower Snake River Compensation Plan Office
1387 Vinnell Way, Suite 343
Boise, Idaho 83705

Dear Mr. Marshall: Scott

The final Hatchery Genetic Management Plan (HGMP) for the Washington Department of Fish and Wildlife's (WDFW) Wallowa summer steelhead stock program at Cottonwood Acclimation Pond in the Grande Ronde River has been completed and submitted. Submission of the HGMP is required for compliance under the Endangered Species Act. We submitted this HGMP for program consultation under Section 7 of the ESA.

Production and operational changes for this program were agreed to in the spring of 2010 by WDFW, Lower Snake River Compensation Program, and the co-managers (Nez Perce Tribe and Confederated Tribes of the Umatilla Indian Reservation). These agreed to changes have been incorporated into the HGMP. The production change was submitted through the U.S. *v.* Oregon Production Advisory Committee approval process and has been approved by the U.S. *v* Oregon policy group for incorporation into the court agreed to Production Plan.

If you have questions or wish to discuss the HGMP, please don't hesitate to contact Mark Schuck at the Snake River Lab, Jon Lovrak, Lyons Ferry Complex Manager, or me.

Sincerely,

Heather Bartlett
Hatchery Division Manager

cc: Jon Lovrak
Glen Mendel
Mark Schuck
Joe Bumgarner
James Dixon
Jon Anderson
Scott Marshall, LSRCP
Joe Krakker, LSRCP
Brian Zimmerman, CTUIR
Becky Johnson, NPT

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

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Grande Ronde River Summer Steelhead – Wallowa Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery**
Species or Hatchery Stock:	**Summer Steelhead - Wallowa Stock** ***Oncorhynchus mykiss***
Agency/Operator:	**Washington Department of Fish and Wildlife**
Watershed and Region:	**Grande Ronde River / Snake River Basin, Washington State**
Date Submitted:	**July 1, 2005** **October 7, 2010 (re-submission)**
Date Last Updated:	**January 24, 2011**

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

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

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

Summer Steelhead *(O. Mykiss)*, Grande Ronde River, Wallowa Stock (not-listed)

1.3) Responsible organization and individuals

Hatchery Evaluations Staff Lead Contact

Name (and title):	**Joe Bumgarner**, Steelhead Evaluation Biologist
Agency or Tribe:	Washington Dept. of Fish and Wildlife
Address:	401 South Cottonwood, Dayton, WA 99328
Telephone:	(509)-382-4755, or 382-1004
Fax:	(509) 382-2427
Email:	Joseph.Bumgarner@dfw.wa.gov

Hatchery Operations Staff Lead Contact

Name (and title):	**Jon Lovrak**, Lyons Ferry Complex Manager
Agency or Tribe:	Washington Dept. of Fish and Wildlife
Address:	PO Box 278, Starbuck, WA 99359
Telephone:	(509) 646-3454
Fax:	(509) 646-3400
Email:	Jon.Lovrak@dfw.wa.gov

Fish Management Staff Lead Contact

Name (and title):	**Glen Mendel**, District Fish Biologist
Agency or Tribe:	Washington Dept. of Fish and Wildlife
Address:	529 W. Main, Dayton, WA 99328
Telephone:	(509)-382-1005, or 382-1010
Fax:	(509) 382-1267
Email:	Glen.Mendel@dfw.wa.gov

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

- U. S. Fish and Wildlife Service – Lower Snake River Compensation Plan (LSRCP) – Provides Program funding/oversight and coordination responsibility between all LSRCP cooperators.
- Nez Perce Tribe (NPT) – Co-manager.
- Confederated Tribes of the Umatilla Indian Reservation – Co-manager.
- Oregon Department of Fish and Wildlife (ODFW) – Co-manager.
- NOAA Fisheries – Co-manager

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

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

Currently, LSRCP mitigation goals in the Washington portion of the Grande Ronde River is managed to provide 1,500 returning adult hatchery steelhead annually to the project area (i.e. above Ice Harbor Dam), or 4,500 into the Columbia River system. Both Operational and Evaluation costs are covered by LSRCP. The LFC staff includes the Hatchery Complex Manager, and 11 permanent fish hatchery specialists, 1 plant mechanic, and seasonal workers. Not all hatchery staff are needed for the Wallowa Stock program on an annual basis, as other programs require staff time. Annual operation and maintenance costs for the program are estimated at $189,000. A staff of 8-10 permanent and seasonal biologists and technicians conduct evaluations for each species produced at LFC. The Wallowa Stock program represents about 6.5% of the annual evaluation budget ($45,000).

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

Incubation, rearing, and marking - LFH – along the lower Snake River in Franklin County, Washington (RM 58), just below the mouth of the Palouse River.

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

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

1.6) Type of program. Mitigation Harvest

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

WDFW Preferred Alternative: The preferred option is to retain Wallowa stock steelhead and increase smolt production up to 200,000 to reach the LSRCP Columbia basin mitigation return goal of 4,500 adults.

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

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

Mitigation goals for the LSRCP were established in a three-step process (COE 1975). First the escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area. For steelhead, the escapement above Lower Granite Dam prior to construction of these dams was estimated at 114,800. Based on a 15% mortality rate for smolts transiting each of the four dams (48% total mortality), the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 55,100. This number established the LSRCP escapement mitigation goal. Based on a catch to escapement ratio of 2:1, the anticipated benefit to fisheries below Lower Granite Dam was expected to be 110,200 fish.

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

One component of the steelhead mitigation computations was accounting for the estimated loss of 130,000 recreational angler days of effort caused by transforming the free flowing Snake River into a series of reservoirs. The COE recommended purchasing land to provide access for sportsman to compensate for this loss. When computing expected benefits for this loss, the COE assumed this access would be provided, that the 130,000 angler days would be restored and that that one fish would be caught for each five hours of effort. As such, the COE expected that 26,000 of the 110,200 steelhead would be caught in the Snake River below Lower Granite Dam. Location of the hatchery facilities was a key decision and the COE recommended: " These [steelhead hatcheries] should be constructed upstream of the Lower Snake River Project to provide for the sport fisheries of eastern Oregon, Washington and Idaho as well as the downriver fisheries". While recognizing that some steelhead crossing Lower Granite Dam would be caught, and some used for hatchery broodstock, no other specific priorities or goals were established regarding how the remaining fish might be used.

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

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

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

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

The Cottonwood/Wallowa stock program was designed to escape 1,500 steelhead back to the project area after a harvest of 3,000. While recognizing the overarching purpose and goals established for the LSRCP, and realities regarding changes since the program was authorized, the following objectives for the beneficial uses of steelhead returns have been established for the period through 2017:

1. To contribute to the recreational, commercial and tribal fisheries in the mainstem Columbia River consistent with agreed abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
2. To trap 228-342 fish for broodstock to perpetuate this program.
3. Release up to 200,000 Wallowa stock steelhead smolts from Cottonwood AP annually.
4. Contribute 1,500 adult steelhead to the project area where they are available for sport and tribal fisheries, and broodstock needs.
    a. Manage program to support the recovery of natural populations of steelhead in the Grande Ronde basin. The primary means to accomplish this goal will be to undertake actions that will limit the frequency of adult strays from this hatchery program such that their relative proportion in the nearby natural populations (primarily Lower Grande Ronde and Joseph) is 5% or less.
    b. Maximize the beneficial uses of any fish that return to the project area, that are not used for broodstock, or harvest by distribution of such excess fish to tribal members upon request and to local food banks. Those fish not utilized for any of the previous purposes will be euthanized and buried to prevent the spread of waterborne fish diseases.

1.75 - Draft recovery plan goals

Background

The program goal is to support the maintenance and restoration of the Lower Grande and Joseph natural steelhead populations. This effort will be guided in part by the recovery plan currently under development for the Snake River ESU of steelhead. The primary units of the recovery plan are Major Population Groups (MPGs). The four steelhead populations that exist in the Grande Ronde basin (Lower Grande, Joseph, Upper Grande Ronde, and Wallowa) collectively represent one of these MPGs which the ICTRT refers to as the Grande Ronde MPG. For the ESU to achieve recovery, all MPGs must be viable. A determination of whether or not a MPG is viable is dependent on the status of the constitute populations. In the case of the Grande Ronde steelhead MPG the draft recovery plan describes a set of strategies that are intended to result in all four populations achieving viable status.

Currently, hatchery steelhead are released into the Lower Grande population (Cottonwood Creek) and the Wallowa basin, but not elsewhere in the Grande Ronde MPG. The incidence of hatchery fish straying into the Joseph Creek population is believed to be low and maintaining this condition is described in the recovery plan as being the conservation goal for both hatchery programs (Cottonwood and Wallowa). Further investigation of the amount of stray hatchery fish in to small tributaries of the Lower Grande Ronde population is needed.

Recovery Plan Strategy

Although there is considerably uncertainty in the estimate, the recent abundance level for natural origin spawners belonging to the Lower Grande Ronde and Joseph steelhead populations are 1,193 and 2,232, respectively (from draft NE Oregon MU recovery plan). Both of these levels, if they can be sustained represent population sizes that are greater than the minimum abundance threshold (MAT) determined by the ICTRT for these populations. The level of hatchery fish in the spawning population is also very low. Short and long-term management of the Lower Grande Ronde hatchery program will be to minimize the incidence of hatchery fish spawning with natural-origin fish such that they represent no more than five percent of the natural spawning population.

1.8) Justification for the program.

The Lower Snake River Compensation Plan is a congressionally mandated program pursuant to PL 99-662. The project was authorized under the Rivers and Harbors Act of 1945. It consists of Ice Harbor Dam (IHR), completed in 1962; Lower Monumental Dam, 1969; Little Goose Dam, 1970 and Lower Granite Dam, 1975. The project affected over 140 miles of the Snake River and tributaries from Pasco, Washington to upstream of Lewiston, Idaho. The authorized purposes of the project were primarily navigation and hydroelectric power production. The original authorizing legislation for the project made no mention of fish and wildlife measures needed to avoid or otherwise compensate for the losses or damage to these important resources.

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

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

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

The Wallowa Stock Summer Steelhead Program provides adult steelhead for recreational and tribal harvest outside of (Columbia River) and within the LSRCP compensation area (Snake River and tributaries). The program utilizes a non-endemic steelhead hatchery stock originally collected from the lower Snake River dams by Oregon Fish and Wildlife in the late 1970's following dam construction. Currently, hatchery origin adults trapped at Cottonwood Creek Adult Trap are used for the broodstock and natural origin adults (though likely produced from Wallowa stock hatchery parents spawning in Cottonwood Creek) are allowed to spawn naturally in Cottonwood Creek each year. In addition, during extreme low water years (times when there is little water in Cottonwood Creek); eggs may also be collected at the Oregon Department of Fish and Wildlife Wallowa Hatchery (same stock). Depending on the year, a large number of returning hatchery origin adults have been released into Cottonwood Creek to "isolate" excess hatchery adults that have escaped the fishery. By keeping them in Cottonwood Creek, WDFW believed it lessened any potential negative impacts on natural steelhead within the Grande Ronde River or other nearby tributaries. Beginning in 2010, adults excess to broodstock needs that enter Cottonwood Creek will be removed from the system, and only natural origin steelhead will be passed above the trap site during its operation.

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

Within the last nine years, smolt production was reduced from ≥250,000 to 160,000 to lessen the potential risk of hatchery strays impacting nearby listed populations, primarily the Lower Grande Ronde and Joseph populations. Because of these reductions, the adult returns were expected to be less than in past. Harvest regulations of steelhead in the lower Snake and Grande Ronde rivers have been liberalized in recent years in an attempt to remove more hatchery fish from the system (See WDFW Snake River FMEP). However, downriver fisheries have also changed in recent years to where more fish are now escaping from the lower river fisheries. As a result of these compensatory actions the escapement of hatchery steelhead into Cottonwood Creek has remained fairly stable.

1.9) List of program "Performance Standards".

Program standards are listed in Table 1 with additional associated detail discussed in the following Sections 1.10.1 and 1.10.2.

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

1.10.1) "Performance Indicators" addressing benefits.

***Recommended by the ICTRT for Monitoring and Evaluation (referenced as presented in the ICTRT document* "Viability Criteria for Application to Interior Columbia Basin Salmonid ESUs" (March 2007)**

Abundance/Productivity:

1. Snake River steelhead population specific abundance and productivity data: A majority of populations had little or no recruit/spawner information to assess abundance and productivity criteria; most status assessments relied on a Snake River aggregate (Lower Granite) data set. Population level assessments for steelhead can be difficult given environmental conditions at the time of spawning, the potential distribution across stream drainages, etc. Alternative techniques should be considered (e.g., redd based surveys, weir counts combined with juvenile surveys, etc), incorporating probabilistic sampling protocols for estimating abundance.

2. Snake River steelhead population specific hatchery fraction and age structure data: A majority of populations had inadequate or no hatchery fraction information to assess abundance and productivity criteria. In addition, there is inadequate data to estimate the number of hatchery spawners in the aggregate recruit/spawner analysis. A majority of populations had no or inadequate age structure information to assess abundance and productivity criteria; most status assessments relied on a Snake River aggregate (Lower Granite) data set.

3. SARs and juvenile productivity estimates for all Chinook ESUs and steelhead DPSs: Improve or collect information on SARs and juvenile productivity (i.e. smolts per spawner). SARs are essential for taking into account variability in survival during smolt outmigration and marine life stages in evaluating A&P criteria. The goal is to estimate SARs that are representative at the population level. There are a number of approaches to accomplish estimating these SARs (e.g. marking wild or hatchery smolts or estimating natural origin smolts and adult production). In addition, measures representing survival from spawning to out-migrating smolts would aid in partitioning productivity between freshwater and marine life-stages.

4. Population level effects of hatchery spawners on natural productivity for all ESUs and DPSs: For populations with hatchery spawners, develop representative estimates of the effects of hatchery spawners on population level productivity. Topics of interest include the effect of hatchery spawner contributions to the average natural productivity of a population and the relative effectiveness of hatchery spawners. In combination with adequate estimates of the relative levels of hatchery fish contributing to natural spawning for a particular population, this information would allow for more representative estimates of current and potential natural productivity levels.

Spatial Structure and Diversity

1. Steelhead populations' spawner distribution and habitat preference data: Many of populations had inadequate spawner distribution information to assess spatial structure and diversity criteria. In addition, estimates of historical distribution are dependent upon habitat preferences derived from available empirical studies. Those studies are limited in scope and number. Additional information on habitat/steelhead preference or production relationships could improve the assessment of steelhead populations against SS/D criteria.

2. Phenotypic characteristics for populations in all ESUs/DPSs: Little information was available to assess phenotypic changes. Representative estimates of current morphological, life history or behavioral traits are not available for many populations. Additional analysis of relationships between habitat characteristics and phenotypic traits would improve the ability to assess changes from historical patterns at the population level.

3. Steelhead genetics information, particularly for Upper Columbia and Mid Columbia populations: Genetic baseline information and periodic follow-up surveys specifically designed to evaluate the level of variation or differentiation among subcomponents within populations and among populations. Periodic follow-ups would support evaluation of responses to management actions designed to promote restoration of natural patterns of population structure.

4. Spawner composition for steelhead populations with hatchery spawners: Collect specific spawner composition information including proportion and source of hatchery spawners. Information on the relative distribution of hatchery spawners among production areas within populations would also improve the ability to assess status against ICTRT spatial structure criteria.

5. Selective mortality effects for populations in all ESUs/DPSs: Little information was available to assess selective mortality resulting from differential impacts of human induced mortality. Additional information is needed to better assess human induced mortality effects in each of the four Hs (habitat, hatcheries, harvest and hydropower)

   A NPCC "Artificial Production Review" document (2001) provides categories of standards for evaluating the effectiveness of hatchery programs and the risks they pose to associated natural populations. The categories are as follows: 1) legal mandates, 2) harvest, 3) conservation of wild/naturally produced spawning populations, 4) life history characteristics, 5) genetic characteristics, 6) quality of research activities, 7) artificial production facilities operations, and 8) socio-economic effectiveness. The NPCC standards represent the common knowledge up to 2001. Utilization of more recent reviews on the standardized methods for evaluation of hatcheries and supplementation at a basin wide ESU scale is warranted.

   In a report prepared for Northwest Power and Conservation Council, the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB) reviewed the nature of the demographic, genetic and ecological risks that could be associated with supplementation, and concluded that the current information available was insufficient to provide an adequate assessment of the magnitude of these effects under alternative management scenarios (ISRP and ISAB 2005). The ISRP and ISAB recommended that an interagency working group be formed to produce a design(s) for an evaluation of hatchery supplementation applicable at a basin-wide scale. Following on this recommendation, the *Ad Hoc* Supplementation Workgroup (AHSWG) was created and produced a guiding document (Galbreath et al. 2008) that describes framework for integrated hatchery research, monitoring, and evaluation to be evaluated at a basin-wide ESU scale.

The AHSWG framework is structured around three categories of research monitoring and evaluation; 1) implementation and compliance monitoring, 2) hatchery effectiveness monitoring, and 3) uncertainty research. The hatchery effectiveness category addresses regional questions relative to both harvest augmentation and supplementation hatchery programs and defines a set of management objectives specific to supplementation projects. The framework utilizes a common set of standardized performance measures as established by the Collaborative System wide Monitoring and Evaluation Project (CSMEP). Adoption of this suite of performance measures and definitions across multiple study designs will facilitate coordinated analysis of findings from regional monitoring and evaluation efforts. This is needed to address management questions and critical uncertainties associated with the relationships between harvest augmentation and supplementation hatchery production, and ESA listed stock status/recovery.

The NPCC (2006) has called for integration of individual hatchery evaluations into a regional plan. While the RM&E framework in AHSWG document represents our current knowledge relative to monitoring hatchery programs to assess effects that they have on population and ESU productivity, it represents only a portion of the activities needed for how hatcheries are operated throughout the region. A union of the NPCC (2001) hatchery monitoring and evaluation standards and the AHSWG framework likely represents a larger scale more comprehensive set of assessment standards, legal mandates, production and harvest management processes, hatchery operations, and socio-economic standards addressed in the 2001 NPCC document (sections 3.1, 3.2, 3.7, and 3.8 respectively). These are not addressed in the AHSWG framework and should be included in this document. NPCC standards for conservation of wild/natural populations, life history characteristics, genetic characteristics and research activities (sections 3.3, 3.4, 3.5, and 3.6 respectively) are more thoroughly developed by the AHSWG, and the later standards should apply to this document. Table 1 represents the union of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Table 1. Compilation of performance standards described by the Northwest Power and Conservation Council (NPCC 2001), regional questions for monitoring and evaluation for harvest and supplementation programs, and performance standards and testable assumptions as described by the Ad Hoc Supplementation Work Group (Galbreath et al. 2008).

Category	Standards	Indicators
1. LEGAL MANDATES	1.1. Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington.	1.1.1. Total number of fish harvested in Tribal fisheries targeting this program. 1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal resident fisheries, by fishery. 1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights.
	1.2. Program contributes to mitigation requirements.	1.2.1. Number of fish released by program, returning, or caught, as applicable to given mitigation requirements.
	1.3. Program addresses ESA responsibilities.	1.3.1. Section 7, Section 10, 4d rule and annual consultation
2. IMPLEMENTATION AND COMPLIANCE	2.1. Program contributes to mitigation requirements.	2.1.1. Hatchery is operated as a segregated program.
	2.2. Program addresses ESA responsibilities.	2.2.1. Hatchery fish can be distinguished from natural fish in the hatchery broodstock and among spawners in supplemented or hatchery influenced population(s)
	2.3. Restore and maintain treaty-reserved tribal and non-treaty fisheries.	2.3.1. Hatchery and natural-origin adult returns can be adequately forecasted to guide harvest opportunities. 2.3.2. Hatchery adult returns are produced at a level of abundance adequate to support fisheries in most years with an acceptably limited impact to natural-spawner escapement.
	2.4. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	2.4.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 2.4.2. Number if adult returns by release group harvested 2.4.3. Number of non-target species encountered in fisheries for targeted release group.
	2.5. Hatchery incubation, rearing, and release practices are consistent with current best management practices for the program type.	2.5.1. Juvenile rearing densities and growth rates are monitored and reported. 2.5.2. Numbers of fish per release group are known and reported. 2.5.3. Average size, weight and condition of fish per release group are known and reported. 2.5.4. Date, acclimation period, and release location of each release group are known and reported.

Category	Standards	Indicators
	2.6. Hatchery production, harvest management, and monitoring and evaluation of hatchery production are coordinated among affected co-managers.	2.6.1. Production adheres to plans, documents developed by regional co-managers (e.g. US vs. OR Management agreement, AOPs etc.). 2.6.2. Harvest management, harvest sharing agreements, broodstock collection schedules, and disposition of fish trapped at hatcheries in excess of broodstock needs are coordinated among co-management agencies. 2.6.3. Co-managers react adaptively by consensus to monitoring and evaluation results. 2.6.4. Monitoring and evaluation results are reported to co-managers and regionally in a timely fashion.
3. HATCHERY EFFECTIVENESS MONITORING REGIONAL FOR AUGMENTATION AND SUPPLEMENTATION PROGRAMS	3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s) (e.g. in juvenile migration corridor, in fisheries, etc.).	3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely. 3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision.
	3.2. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.	3.2.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 3.2.2. Number of adult returns by release group harvested 3.2.3. Number of non-target species encountered in fisheries for targeted release group.
	3.3. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits.	3.3.1. Strays from a hatchery program (alone, or aggregated with strays from other hatcheries) do not comprise more than 10% of the naturally spawning fish in non-target populations. 3.3.2. Hatchery strays in non-target populations are predominately from in-subbasin releases. 3.3.3. Hatchery strays do not exceed 10% of the abundance of any out-of-basin natural population.
	3.4. The distribution and incidence of diseases, parasites and pathogens in natural populations and hatchery populations are known and releases of hatchery fish are designed to minimize potential spread or amplification of diseases, parasites, or pathogens among natural populations.	3.10. Detectable changes in rate of occurrence and spatial distribution of disease, parasite or pathogen between the affected hatchery and natural populations.
4. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES	4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.	4.1.1. Annual reports indicating level of compliance with applicable standards and criteria. 4.1.2. Periodic audits indicating level of compliance with applicable standards and criteria.

Category	Standards	Indicators
	4.2. Effluent from artificial production facility will not detrimentally affect natural populations.	4.2.1. Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.
	4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.	4.3.1. Water withdrawals compared to applicable passage criteria. 4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria. 4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point. 4.3.4. Number of adult fish passing water intake point. 4.3.5. Proportion of diversion of total stream flow between intake and outfall.
	4.4. Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.	4.4.1. Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence. 4.4.2. Juvenile densities during artificial rearing. 4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases.
	4.5. Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.	4.5.1. Number and location(s) of carcasses or other products distributed for nutrient enrichment. 4.5.2. Statement of compliance with applicable regulations and guidelines.
	4.6. Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.	4.6.1. Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.
	4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.	4.7.1. Mortality rates in trap. 4.7.2. Pre-spawning mortality rates of trapped fish in hatchery or after release.
5. SOCIO-ECONOMIC EFFECTIVENESS	5.1. Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.	5.1.1. Total cost of program operation. 5.1.2. Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.
	5.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.	5.2.1. Total cost of program operation. 5.2.2. Average total cost of activities with similar objectives.

Category	Standards	Indicators
	5.3. Non-monetary societal benefits for which the program is designed are achieved.	5.3.1. Number of adult fish available for tribal ceremonial use. 5.3.2. Recreational fishery angler days, length of seasons, and number of licenses purchased.

1.10.2) "Performance Indicators" addressing risks.

The suite of performance measures developed by the CSMEP represents a crosswalk mechanism that is needed to quantitatively monitor and evaluate the standards and indicators listed in

Table 1. The CSMEP measures have been adopted by the AHSWG (Galbreath et. al. 2008). The adoption of this regionally-applied means of assessment will facilitate coordinated analysis of findings from basin-wide M&E efforts and will provide the scientifically-based foundation to address the management questions and critical uncertainties associated with supplementation and ESA listed stock status/recovery.

Listed below (Table 2) are the suite of Performance Measures (modified from the management objectives listed in Galbreath et al. (2008), and the assumptions that need to be tested for each standard.

Table 2. Standardized performance measures and definitions for status and trends and hatchery effectiveness monitoring and the associated performance indicator that it addresses. (Taken from Galbreath et al. 2008).

Performance Measure		Definition	Related Indicator
Abundance	Adult Escapement to Tributary	Number of adults (including jacks) that have escaped to a certain point (i.e. - mouth of stream). Population based measure. Calculated with mark recapture methods from weir data adjusted for redds located downstream of weirs and in tributaries, and maximum net upstream approach for DIDSON and underwater video monitoring. Provides total escapement and wild only escapement. [Assumes tributary harvest is accounted for]. Uses TRT population definition where available	2.3.2, 3.1.2, 3.2.1, 3.2.2, 3.2.4, 3.6.1, 3.7.1, 3.7.4, 5.3.1
	Spawner Abundance	In-river: Estimated number of total spawners on the spawning ground. Calculated as the number of fish that return to an adult monitoring site, minus broodstock removals and weir mortalities and harvest if any, subtracts the number of female pre-spawning mortalities and expanded for redds located below weirs. Calculated in two ways: 1) total spawner abundance, and 2) wild spawner abundance which multiplies by the proportion of natural origin (wild) fish. Calculations include jack salmon. In-hatchery: Total number of fish actually used in hatchery production. Partitioned by gender and origin.	3.2.1, 3.2.3, 3.2.4, 3.6.3, 3.7.3
	Hatchery Fraction	Percent of fish on the spawning ground that originated from a hatchery. Applied in two ways: 1) Number of hatchery carcasses divided by the total number of known origin carcasses sampled. Uses carcasses above and below weirs, 2) Uses weir data to determine number of fish released above weir and calculate as in 1 above, and 3) Use 2 above and carcasses above and below weir.	2.2.1, 3.1.1, 3.4.1, 3.4.2, 3.4.3, 3.7.2, 3.7.4
	Ocean/Mainstem Harvest	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.	1.1.1, 1.1.2, 2.3.1, 2.4.2, 2.6.2, 3.3.2, 3.3.3
	Harvest Abundance in Tributary	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.	1.1.1, 1.1.2, 2.3.1, 2.4.2, 2.6.2, 3.3.2, 3.3.3
Survival – Productivity	Smolt-to-Adult Return Rate	The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior. SAR estimate with harvest. Accounts for all harvest below stream. *Smolt-to-adult return rates* are generated The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam: $Var\left(\frac{X}{Y}\right)=\left(\frac{EX}{EY}\right)^2\cdot\left(\frac{Var(Y)}{(EY)^2}\right)$	3.2.1, 3.2.2, 3.7.4
	Progeny-per- Parent Ratio	Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Estimates of this ratio for fish spawning and produced by the natural environment must be adjusted to account for the confounding effect of spawner density on this metric. Two variants calculated: 1) escapement, and 2) spawners.	3.2.1, 3.2.2, 3.7.4

Performance Measure		Definition	Related Indicator
	Juvenile Survival to first mainstem dam	Life stage survival (parr, presmolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary.	3.2.2, 3.6.2, 3.7.5, 3.9.3,
	Post-release Survival	Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e. screw traps) are used to calculate survival estimates.	3.2.2, 3.6.2, 3.7.5, 3.9.3,
	Stray Rate (percentage)	Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir.	3.4.1, 3.4.2, 3.4.3
Life History	Age Structure	Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screw trap are by dates; fry – prior to July 1; parr – July 1-August 31; pre-smolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated.	3.8.1, 3.8.2, 3.9.2
	Age–at–Return	Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.	3.8.1, 3.8.2, 3.9.2
	Size-at-Return	Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only.	3.8.1, 3.9.2
	Percent Females (adults)	The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish.	3.8.1, 3.9.2
	Adult Run-timing	Arrival timing of adults at adult monitoring sites (weir, DIDSON, video) calculated as range, 10%, median, 90% percentiles. Calculated for wild and hatchery origin fish separately, and total.	3.2.4, 3.6.4, 3.8.1, 3.9.2
	Hatchery Production Abundance	The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Method dependent upon marking program (census obtained when 100% are marked).	2.5.2, 2.5.3, 2.6.1, 4.4.2
	In-hatchery Life Stage Survival	In-hatchery survival is calculated during early life history stages of hatchery-origin juvenile Chinook. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CWT or VIE tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts. Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, pre-smolt, parr, etc.).	
In-Hatchery Measures	Size-at-Release	Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, pre-smolt, parr, etc.).	2.5.1, 2.5.3
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).	2.5.3,3.8.2, 3.9.2

Performance Measure		Definition	Related Indicator
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter.	3.8.1, 3.8.2, 3.9.2
	Spawn Timing	Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates.	3.2.4, 3.6.4, 3.8.1, 3.9.2
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include pre-spawning mortality.	2.2.1
	Hatchery Broodstock Pre-spawning Mortality	Percent of adults that die while retained in the hatchery, but before spawning.	4.7.2
	Female Spawner ELISA Values	Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum.*	3.10, 4.4.3
	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock	3.10, 4.4.3
	Length of Broodstock Spawner	Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging.	3.9.2
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent"	3.1.1, 3.1.2
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks).	3.1.1, 3.1.2
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).	2.5.4, 4.8.1
	Chemical Water Quality	Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities; ammonia (NH_3) nitrite (NO_2), -measured weekly only at reuse facilities	4.2.1
	Water Temperature	Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices.	

1.11) Expected size of program.

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

To meet current smolt production levels (up to 200,000); we estimate that eggs from up to 57 females (disease free) are needed. An equal complement of males is also needed for broodstock. Average eggs/female is about 5,200 eggs. Survival data collected from the last three years (since we started transporting eggs from Cottonwood with ovarian fluid) indicates a 90% survival from green egg to fry, and 75% survival from fry to smolt. Total egg take therefore may need to equal ~296,000. Additional females (more than recommended above for egg collection) would also be collected because of the incidence of IHNV positive females, or females with bad eggs. Only marked fish (those with adipose or adipose with ventral fin clips) will be retained for broodstock.

At this program size, WDFW and hatchery review panels (HSRG, HRT) have a concern about loss of within population diversity. For the past four years, WDFW has experimented with partial spawning of males and females at Cottonwood to increase the effective population size (N_b) of broodstock. This was done more as a test for the Touchet and Tucannon endemic stocks programs, but could be applied to Cottonwood as well to increase N_b. Partial spawning as with the endemics or partial use of more females and males would accomplish this need. WDFW is proposing to implement increased broodstock collection that would require about 114 females (disease free) and 114 males to complete the current program (200,000 smolts) needs, and provide ample individuals for population diversity.

Eggs may also be collected from ODFW's Wallowa Hatchery, when returning fish numbers to cottonwood creek are less than broodstock needs. Summer steelhead used at ODFW's Wallowa Hatchery are from the same parenting stock as Cottonwood.

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

The current production level is up to 200,000 yearling smolts. Original production goal was 250,000 smolts, but was reduced to 200,000 in 2001 due to ESA concerns and a jeopardy ruling by NMFS (Table 1), and further reduced to 160,000 in 2004 based on CWT studies that showed smolt-to-adult returns to the project area were well above mitigation goals. Recent returns and smolt-to-adult survival rates continue to be examined, but Columbia basin returns are below the mitigation goal, leading to WDFW's rationale for increasing the smolt release to 200,000 smolts in the near future.

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

Returns of summer steelhead released into the Washington portion of the Grande Ronde River have been estimated through coded-wire tag recoveries from fisheries and adult traps, freeze-brand recoveries at Lower Granite Dam, or from inference from other released groups in the Snake River Basin (Table 3, 4, and Figure 1). Data have been consolidated from WDFW's LSRCP Annual Reports for the Steelhead/Trout program at LFC. Under the original LSCRP goals, production returns of 0.5% back to the LSRCP area (above Ice Harbor Dam) would satisfy WDFW mitigation goal responsibilities to the Snake River and in the Grande Ronde River.

As evident from the returns of CWTs and freeze brands, survivals of the Cottonwood release groups have been higher than the compensation goal of 0.5%. These results formed the basis of our rationale to reduce the number of fish released from the program in 2001 and again in 2004.

Table 3. WDFW hatchery steelhead releases into the Washington portion of the Grande Ronde River, 1982-2010.

Release Year	Stock	Release Location	River Mile	Release Goal	Number of smolts
1982	Wallowa	Direct Stream	25	250,000	35,155
1983		- - - - -	- - - - -		- - - - -
1984		- - - - -	- - - - -		- - - - -
1985	Wallowa	Direct Stream, Cottonwood AP	25, 29	250,000	149,408
1986	Wallowa	Direct Stream, Cottonwood AP	25, 29	250,000	124,200
1987	Wallowa	Cottonwood AP	29	250,000	200,845
1988	Wallowa	Direct Stream, Cottonwood AP	25, 29	250,000	220,676
1989	Wallowa	Cottonwood AP	29	250,000	222,050
1990	Wallowa	Cottonwood AP	29	250,000	239,000
1991	Wallowa	Cottonwood AP	29	250,000	252,799

1992	Wallowa	Cottonwood AP	29	250,000	213,622
1993	Wallowa	Cottonwood AP	29	250,000	341,899
1994	Wallowa	Cottonwood AP	29	250,000	322,508
1995	Wallowa	Cottonwood AP	29	250,000	256,233
1996	Wallowa	Cottonwood AP	29	250,000	263,449
1997	Wallowa	Cottonwood AP	29	250,000	274,886
1998	Wallowa	Cottonwood AP	29	250,000	252,211
1999	Wallowa	Cottonwood AP	29	250,000	268,803
2000	Wallowa	Cottonwood AP	29	250,000	274,146
2001	Wallowa	Cottonwood AP	29	200,000	215,584
2002	Wallowa	Cottonwood AP	29	200,000	182,722
2003	Wallowa	Cottonwood AP	29	200,000	236,627
2004	Wallowa	Cottonwood AP	29	160,000	137,915
2005	Wallowa	Cottonwood AP	29	160,000	150,442
2006	Wallowa	Cottonwood AP	29	160,000	169,390
2007	Wallowa	Cottonwood AP	29	160,000	159,242
2008	Wallowa	Cottonwood AP	29	160,000	175,961
2009	Wallowa	Cottonwood AP	29	160,000	170,232
2010	Wallowa	Cottonwood AP	29	160,000	163,197

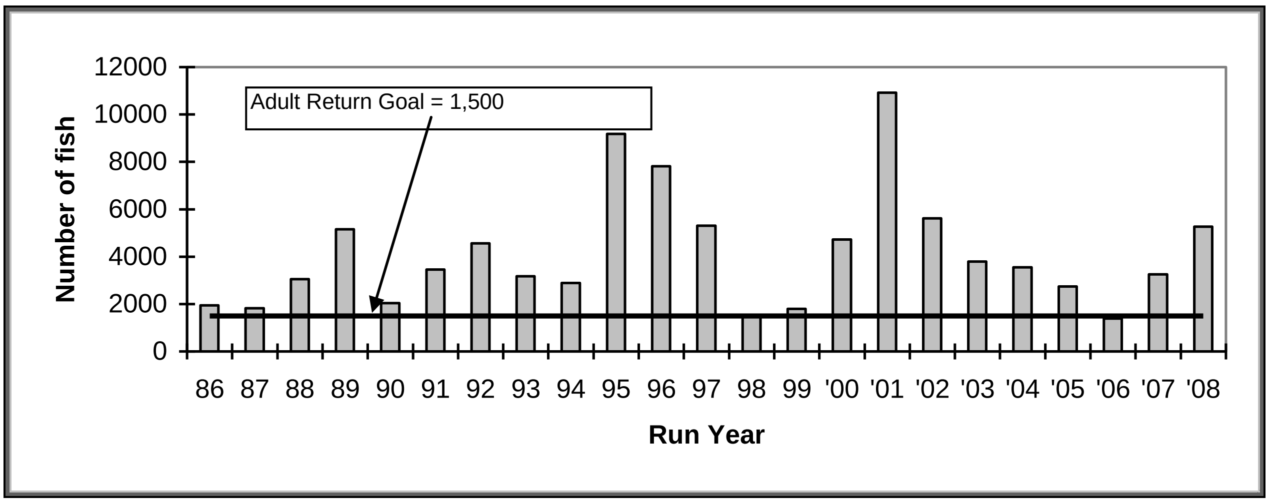

Figure 1. Estimated adult returns to the LSRCP project area (above Ice Harbor Dam) from WDFW Wallowa stock releases in the lower Grande Ronde River (adult return goal is 1,500).

Table 4. Smolt-to-adult survival rates from Wallowa stock steelhead released into the Grande Ronde River from Cottonwood Cr. AP, or direct stream releases for 1984-1986 BY, 1996-2005 BY.

Brood Year	Freeze Brand Recoveries at Lower Granite Dam SAR to LSRCP area (%)	Maximum Recoveries (Freeze Brand and CWT) SAR to LSRCP area (%)	Total Recoveries SAR to Columbia R. (%)
1984	1,489 (1.83)	1,515 (1.93)	2,191 (2.79)
1985	832 (1.39)	941 (1.58)	1,602 (2.68)
1986	1,178 (1.54)	1,200 (1.50)	1,984 (2.48)
1996	157 (0.41)	163 (0.42)	173 (0.45)
1997	441 (0.93)	478 (0.98)	532 (1.09)

Table 4. Smolt-to-adult survival rates from Wallowa stock steelhead released into the Grande Ronde River from Cottonwood Cr. AP, or direct stream releases for 1984-1986 BY, 1996-2005 BY.

Brood Year	Freeze Brand Recoveries at Lower Granite Dam SAR to LSRCP area (%)	Maximum Recoveries (Freeze Brand and CWT) SAR to LSRCP area (%)	Total Recoveries SAR to Columbia R. (%)
1998	1,797 (2.11)	1,804 (2.03)	2,154 (2.42)
1999	2,956 (3.99)	3,007 (4.00)	3,272 (4.35)
2000	823 (2.04)	862 (2.16)	913 (2.29)
2001	343 (0.88)	860 (2.12)	907 (2.24)
2002	NA	612 (1.52)	681 (1.69)
2003	NA	706 (1.77)	772 (1.93)
2004	NA	284 (0.79)	354 (0.99)
2005	NA	548 (2.74)	629 (3.15)
2006	NA	474 (2.54)	531 (2.85)
Mean	**1.68%**	**1.86%**	**2.24**

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

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

1.14) Expected duration of program.

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

1.15) Watersheds targeted by program.

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

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

1.16.1) Brief Overview of Key Issues

The LSRCP summer steelhead compensation program in the Washington portion of the Grande Ronde River has been active since 1982. A composite Snake River summer steelhead stock (Wallowa stock) has been used to achieve, and often greatly exceed, the hatchery mitigation goals of this program in terms of returns to the Snake basin established under the LSRCP (1,500 adult steelhead to the river). Although hatchery adult returns to the Columbia have generally not achieved the 3,000 adult fish harvest planned for the lower river, naturally produced steelhead in the Snake River Basin have not been self-sustaining at the levels assumed under the mitigation plan. Therefore, additional consideration and efforts are needed to recover naturally produced steelhead and ensure that mitigation hatchery programs are consistent with these restoration efforts.

Returning hatchery adults are trapped for broodstock in Cottonwood Creek adjacent to Cottonwood Acclimation Pond. Their long-term use in the hatchery is believed to have caused some domestication of the Wallowa stock. The Wallowa stock releases have been determined to stray into the Deschutes River, Oregon. The rate of straying is of concern, and has been determined by NOAA Fisheries to jeopardize listed steelhead populations in the Deschutes River, and potentially the tributary populations in the Grande Ronde River. WDFW has conducted limited adult trapping in very small tributaries near Cottonwood Creek and documented high percentages (i.e. 40-70%) of hatchery fish entering them. However, since the 1980s ODFW biologists conducting spawner surveys in the nearby Joseph Creek watershed (a separate steelhead population) have yet to encounter a stray hatchery fish; all fish observed to date have been naturally produced. Also, large returns to Cottonwood Creek have been documented even following an intensive fishery in the Grande Ronde to remove them.

In 2009 and 2010, scientific review groups have assessed the program extensively. Their findings are summarized as follows:

The Hatchery Scientific Review Group (HSRG) made two recommendations to improve the hatchery program.
- The HSRG recommends that managers discontinue passing hatchery fish upstream of the hatchery rack. The HSRG encourages managers to explore opportunities to increase the harvest contribution, such as increasing daily bag limits. The HSRG supports alternate uses of surplus fish such as distribution to local food banks and/or stream nutrification. **WDFW response: Beginning in 2010, WDFW will only pass unmarked steelhead above the weir. All hatchery fish will be removed. The WDFW will continue to explore the use of increased bag limits (similar to 2009) to remove more hatchery fish. However, creel survey data have shown that fisherman do not keep many of their fish during the late spring when most of the Cottonwood fish return to the Cottonwood Creek area, but rather catch and release. Therefore, an increase in the bag limits may not substantially increase harvest. Local food banks have been contacted in the past, but have expressed little interest in the numbers and quality of the fish that could be provided. Stream nutrification has been considered, but disease concerns (IHNV positive fish) has limited distribution of carcasses to stream with natural origin steelhead populations.**

- The HSRG recommends that managers improve the monitoring of steelhead abundance, productivity, spatial structure and diversity as well as straying of hatchery fish into natural production areas. **WDFW response: WDFW will explore additional monitoring (adult weirs, PIT tag arrays, other surveys) to determine the extent of hatchery fish straying into natural production areas of the lower Grande Ronde. WDFW and ODFW have discussed options for additional monitoring efforts in the lower Grande Ronde River population. However, the**

remote location of the area, and the cost of monitoring such a location has delayed such actions to date.

The Hatchery Review Team (HRT) provided 25 preliminary recommendations and 6 draft programmatic alternative actions. The draft recommendation should be considered to maintain the current program, which is alternative 1, and address the recommendations provided. Individual recommendations on the Facility, RM&E, Management, or Education and Outreach are presented below.

Issue CC-SS1: Based upon the history of the Wallowa stock steelhead program, harvest downstream of the project area is much lower than the assumptions used to establish harvest goals. *Current mitigation and, subsequently, harvest goals have been based upon the assumption that two-thirds of returning adults would be caught downstream of the project area (presumed 2:1 recreational-to-commercial catch ratio), while one third of the returning adults would be available for recreational and tribal/commercial fisheries within the project area (presumed 1:1 catch ratio). Harvest data indicates that 85% as opposed to 33% of the returning Wallowa steelhead are harvested in the Snake River project area. The adult mitigation and harvest goal for Wallowa Stock steelhead from Cottonwood Pond into the Grande Ronde is 1,501 and the program is achieving 4,250, with over 2,000 unharvested steelhead returning to the adult trap on Cottonwood Creek in 2009.*

Recommendation CC-SS1: Restate the return goal for the number of harvestable Wallowa stock steelhead or reduce the size of the program so that it is consistent with current harvest goals and is consistent with current and anticipated harvest regimes. Restate program goals in management documents based upon current and anticipated returns and harvest. For example, based on a 1.85% smolt-to-adult survival, to achieve a 1,501 adult return goal to the project area a release of 81,000 smolts would be required. **WDFW response: A result of recent meetings/negotiations with co-managers is agreement to re-state the adult return goals. Rather than using the LSRCP target area as the return goal, the original program goal of 4,500 adults to the Columbia River system should be used. Downriver fisheries have decreased in recent years, allowing more fish to return to the LSRCP project area. Those fisheries are out of local control and could increase again in the future. Reducing the program beyond the recent reductions that have taken place would be premature at this time.**

Issue CC-SS2a: Hatchery fish are passed above the adult trap on Cottonwood Creek with no clear objectives for hatchery and natural spawning other than to prevent straying to other tributaries in the Lower Grande Ronde River*. There appears to be no clear harvest, subsistence, or natural production benefits associated with additional hatchery fish in Cottonwood Creek. The natural spawning of Wallowa stock steelhead in the Lower Grande Ronde River also may not be consistent with Endangered Species Act and recovery of Snake River steelhead.* **WDFW response: Beginning in 2010, WDFW will only pass natural origin adult steelhead above the weir and is currently exploring options to donate hatchery fish excess to broodstock needs to area food banks, supply to agency fish processing contractors, or distributed for stream and river nutrification within the Grande Ronde River**

near Cottonwood Creek. Should those options prove unmanageable, WDFW has approved the euthanasia of hatchery adults directly from the trap, which will substantially reduce pHOS.

Issue CC-SS2b: ***Anadromous fish passed above the trap in Cottonwood Creek can be infected with the IHN virus, serving as a potential source of infection to the adults held in the trap, and the juveniles reared in the acclimation pond (the intake for the acclimation pond is located at the adult trap****). This potentially amplifies virus within the population, affecting future generations of the stock. In 2009, WDFW genotyped the virus strain infecting the Cottonwood steelhead adults to better ascertain management needs.*

Recommendation CC-SS2a: Define the desired benefits for passing steelhead upstream of the adult trap in Cottonwood Creek (e.g. natural spawning, benefits to ecosystem function, research) relative to the risks (disease transmission such as the IHN virus). If the benefits of passing steelhead upstream do not outweigh the risks, then discontinue passing the steelhead upstream of the trap and identify other beneficial uses for surplus hatchery fish. If it is determined that there is a benefit to passing steelhead upstream, then the number of fish passed up stream should be consistent with the capacity of the habitat and for the purpose that the fish are being passed upstream. If fish are passed upstream, a monitoring and evaluation program should be instituted. **WDFW response: By retaining all of the returning adults in Cottonwood Creek, they are no longer available to stray to other nearby streams where natural production is occurring. Large numbers of hatchery fish have been put upstream in Cottonwood Creek for years, effectively overwhelming natural steelhead production in the Cottonwood Creek. The risk of this practice is the IHN disease transmission to the broodstock adults and/or juveniles in the rearing pond, although the WDFW currently has no empirical evidence that such past actions have significantly increased the prevalence of IHNV or other pathogens in juveniles or adults. Beginning in 2010, WDFW plans to remove excess hatchery fish from the basin.**

WDFW may consider reducing the size of the program to reduce the number of fish returning to Cottonwood Creek. The Team agrees that removing Wallowa stock steelhead from the Grande Ronde River to reduce potential straying and risks to natural populations (Wenaha River and Joseph Creek) is the correct management strategy. **WDFW response: The option to reduce the total program smolts will be considered along with other options, but removal of excess adults is the preferred alternative at this time.**

The Service and WDFW should also determine whether purposefully allowing Wallowa stock steelhead to spawn naturally is consistent with the Endangered Species Act and recovery of Snake River populations. **WDFW response: The WDFW and USFWS have already consulted with NOAA Fisheries on this question. It was determined that the relative benefits outweigh the impact to Cottonwood Creek; however fish will be removed starting in 2010.**

Recommendation CC-SS2b: Use IHNV genotyping to allow management decisions to occur in a timely manner and to prevent the spread of a new variant of IHNV, particularly to the juveniles in the acclimation pond. The finding of a new virus variant of concern should be communicated to all fishery co-managers and aquaculture facilities (commercial, private, federal and state) so that appropriate biosecurity measures can be taken. A study of the IHNV prevalence in the adults transferred to LFH should be conducted. **WDFW response: The WDFW is currently working with USGS Seattle Lab to type all isolates of IHN virus. We plan on continuing this effort and will take appropriate actions based on the IHN virus types.**

Recommendation CC-SS2c: For monitoring purposes, sample the steelhead juveniles for IHNV and other pathogens of interest 2 – 4 weeks prior to release from acclimation pond. The minimum number of fish sampled should provide 95% confidence level to detect the pathogen if present in the population at a 5% prevalence of infection (i.e., 60 fish sample). **WDFW response: WDFW fish health staff questions the value of testing all fish for selected pathogens before release. If IHN virus, or other pathogens were detected, it is highly unlikely that we would destroy all the fish in the Cottonwood Pond, rather just document the infection.**

Hatchery and Natural Spawning, Adult Returns

Issue CC-SS3: The genetic effective number of breeders per year is minimal with respect to genetic guidelines. *The number of males and females spawned per year utilizing a 1:1 female:male spawning ratio most likely results in an effective population size that is less than 300 fish over one steelhead generation (three years). The effective population size for the hatchery broodstock over three years should be greater than 500 fish (Ne > 500) to minimize the loss of genetic variation due to small effective population size and genetic drift.*

Recommendation CC-SS3: Increase the minimum number of females and males spawned per year to 100 females and 200 males, respectively. Subdivide the eggs of each female in approximately equal proportions and fertilize each subgroup separately with a different male. The two egg subgroups from each female can be combined ***after one minute*** before water is added to increase overall fertilization rates to compensate for males with low sperm potency. Any culling of surplus eggs should be done randomly across all full-sib families with the goal of obtaining approximately equal numbers of fertilized eggs from each female and male parent. **WDFW response: Hatchery and Evaluation staffs have discussed this option. Our preferred option will be to partially spawn (approximately half the eggs) up to 114 females, and if allowable based on numbers, will collect one male for spawning with each female. The effective number of spawners will generally equal or exceed 200 fish each year, which will provide greater than 500 fish/ generation; satisfying the HRT recommendation.**

Issue CC-SS4: The continued release of an out-of-basin stock into the Lower Grande Ronde River poses genetic and ecological risks to the natural-origin steelhead populations in the Grande Ronde River basin. *Of special concern are Joseph Creek and Wenaha populations, which are managed for natural production only. The proportion of hatchery-origin Wallowa stock adults escaping to natural spawning grounds is unknown.*

Recommendation CC-SS4: Monitor the natural escapement to ensure that less than 5% of the naturally spawning populations are hatchery-origin Wallowa stock. This includes monitoring the selective fishery in the lower Wenaha to estimate the proportion of natural versus hatchery-origin steelhead. If it is determined that the proportion of hatchery fish spawning naturally is greater than 5%, consider reducing the program or converting to an in-basin broodstock. (This may include increasing the number of fish tagged to determine if Wallowa stock steelhead released from Cottonwood Ponds versus Wallowa Hatchery are straying to the spawning grounds. This may also require additional weirs for monitoring on selected streams.) **WDFW response: WDFW has proposed additional monitoring through the Power Council's RM&E planning process to address critical BiOp issues. Portions of that proposal would include monitoring efforts in the Grande Ronde basin to determine hatchery origin fish on the spawning grounds through the use of remote weirs and PIT tag detection arrays. The Nez Perce Tribe proposed and was approved to install a combination floating weir and PIT tag detection array on Joseph Creek, and will now be documenting the presence and origin of hatchery stray fish detected or captured at those facilities.**

Issue CC-SS5: Wallowa steelhead released in the Grande Ronde River stray into areas of the lower Columbia River basin, including the upper reaches of the Deschutes and John Day rivers. *These strays pose a genetic risk to other steelhead stocks in the Columbia River basin.*

Recommendation CC-SS5: Continue to monitor the stray rate of the Wallowa stock. Also continue researching broodstock management (e.g. utilizing early versus late returns) and rearing and release strategies. Consider reductions in releases or evaluate alternate broodstock sources if straying remains an issue (see Alternative 2). **WDFW response: The WDFW continues to use CWT and PIT tags to allow the monitoring of stray Wallowa stock hatchery fish into the Deschutes and John Day Rivers, Oregon. We are also waiting for the final results from the ODFW broodstock study on early versus late returning fish. Depending on the results, the broodstock could be changed to early returning Wallowa stock that ODFW is testing if it shows benefits to reduce straying. Utilization of another stock of Snake River steelhead may be considered but would depend on availability, potential effects, and preliminary studies to assess a stock's straying behavior when released from Cottonwood. Further reductions in the program at this point have been evaluated, but not proposed. See Recommendation CC-SS1.**

Incubation and Rearing

Issue CC-SS6: All steelhead female broodstock are tested for IHNV. The progeny from the females with virus titers of $<10^4$ pfu/ml (in the ovarian fluid) are kept for rearing. Management practices have improved adult returns so there is less need to keep excess progeny that may be infected with IHNV.

Recommendation CC-SS6: Cull progeny from all females that are positive for IHNV. **WDFW response: We have culled eggs of IHN virus positive females for many years. However, if the prevalence is very high, and there are no other options for obtaining fish for program needs, we will retain eggs from lower titer IHN virus positive females. We have successfully done this on two occasions at LFH.**

Issue CC-SS7a: Rearing densities in the indoor nursery tanks "shallow troughs" (1.15 max DI) exceed culture guidelines for steelhead, thus increasing fish health risks. Due to space limitations in the intermediate and outdoor raceways, steelhead are held in the troughs beyond recommended rearing densities for steelhead. This protocol results in density indexes attaining D.I. = 1.21 in the indoor nursery tanks prior to transfer to the outdoor raceways.

Issue CC-SS7b: High rearing densities during early rearing may be contributing to the later onset of cold water disease.

Recommendation CC-SS7: Reduce rearing densities in the shallow troughs to a maximum of D.I. = 0.5 by increasing the number of nursery rearing or intermediate rearing tanks (see LF-SS12), by reducing the total number of LFH steelhead reared, by reducing the number of fish reared in other programs, or by reducing the total number of stocks reared at LFH. **WDFW response: The WDFW will continue to investigate the possibility of expanding the number of intermediate rearing tanks at LFH. Tanks used to rear the Spring Chinook Captive Broodstock Program are unused at this time. The 20ft circular round tanks may be removed, and additional intermediate rearing tanks installed. However, it will be vital to also enclose this area. Stock reductions and program changes are currently being considered, but mitigation responsibilities and binding agreements may limit this action.**

*I**ssue CC-SS8: Delayed treatment of cold water disease may make it difficult to control mortality associated with the progression of the disease.** Cold water disease causes 3.5-5% mortality in the LFH stock steelhead annually. When fish mortalities reach about 100 per raceway per day, they are treated with medicated feed (florfenicol). Formerly, fish were fed pills coated with 15 mg drug/kg of fish weight as prescribed by a veterinarian. New regulations now require the use of florfenicol medicated feed at 10 mg drug/kg fish weight with a Veterinary Feed Directive. The medicated feed is less effective in controlling disease and delivery time from the feed company is slow, resulting in less efficacious treatment.*

Recommendation CC-SS8: Test the therapeutic value of early florfenicol treatment by comparing treated and untreated fry in the shallow troughs (i.e., before coldwater mortality starts). In conjunction with this, test new diagnostic methods (e.g., PCR, QPCR) and/or culturing alternate tissues (such as brain) for earlier detection of cold water disease to ascertain if medication is warranted prior to ponding into the raceways. Also consider investigating different densities (1.21, 0.5, and 0.2 DI) of fry in the troughs to determine whether early rearing densities influence the development of coldwater disease. Continue working with the Bacterial Coldwater Disease Research Group, as supported by the Pacific Northwest Fish Health Protection Committee, to develop fish culture practices and treatment options to control or eliminate coldwater disease. **WDFW response: Yes, bacterial coldwater disease has caused problems in rainbow and steelhead at LFH. The BCWD outbreaks have been successfully controlled with florfenicol medicated fish feed. Any experimental efforts will be first tested on rainbow trout and if successful, will be applied to steelhead.**

<u>Release and Outmigration</u>

Issue CC-SS9: *Pre-release exams, which include testing for virus, bacteria and parasites, are not done at the LFH Complex and associated acclimation sites****.*** *There is a potential risk that endemic or vertically transmitted diseases might be undetected in released juveniles. This could affect their future survival and/or infected fish could serve as vectors in infecting other aquatic animals. Pre-release inspections, done 4-6 weeks before release or transfer are required by USFWS fish health policy FW 713 and the Integrated Hatchery Operations Team (IHOT) Policy and Procedures.*

Recommendation CC-SS9: Sample 60 fish for pre-release inspections to meet the American Fisheries Society – Fish Health Section Blue Book requirements to ensure a 95% confidence in detecting pathogens at the minimum assumed pathogen prevalence level of 5%. Additional testing for non-reportable pathogens, such as *Flavobacterium psychrophilum* and *Nucleospora salmonis*, may be informative for co-managers. **WDFW response: Additional testing for other pathogens such as *Nucleospora sp.* should be accomplished since past efforts have been sporadic and localized. However, *Nucleospora sp.* surveillance using PCR testing is expensive with cost at $ 30.00 per sample and may be limited. WDFW fish health staff questions the value of testing all fish for selected pathogens before release. If IHN virus or other pathogens were detected, we would not likely destroy all the fish in the Cottonwood Pond, rather just document the infection.**

Issue CC-SS10*:* ***Anadromous fish passed above the trap in Cottonwood Creek can be infected with the IHN virus, serving as a potential source of infection to the adults held in the trap and to the juveniles reared in the acclimation pond (the intake for the acclimation pond is located at the adult trap****).*

Recommendation CC-SS10: Sample the steelhead juveniles for IHNV and other pathogens of interest 2 – 4 weeks prior to release from acclimation pond. The minimum number of fish sampled should provide 95% confidence level to detect the pathogen if present in the population at a 5% prevalence of infection (i.e., 60 fish sample). If IHNV is found, genotyping should be done. **WDFW Response: The WDFW is currently working with USGS Seattle Lab to type all isolates of IHN virus. We plan on continuing this effort and will take appropriate actions based on the IHN virus types.**

Facilities/Operations

LFH

Issue LF-SS11: The number of stocks reared at LFH is not consistent with the design of the facility. *This creates the potential for exceeding maximum rearing densities in raceways that are over loaded, and adds complexity to marking schedules and evaluation. LFH, with its few, large rearing containers, was designed to produce a large number of a few stocks of fish. Endangered Species Act considerations have led to the development of multiple endemic hatchery programs (each with a specific stock to be reared) tailored to conserve threatened natural populations and to provide harvest opportunities where non-endemic stocks have historically been released. Additionally, LFH is authorized under the LSRCP to rear catchable rainbow trout for Washington and Idaho lake fisheries. In addition to the 2 stocks of rainbow* *trout 7 salmonid stocks are reared at LFH (LFH fall Chinook, Tucannon spring Chinook, LFH steelhead, Wallowa steelhead, and Tucannon and Touchet endemic program steelhead) with several distinct tag groups associated with release locations, creating several lots that must be reared separately.*

Recommendation LF-SS11: Reduce the number of stocks reared at LFH or modify LFH so that it can appropriately accommodate the number of programs. One option may be for LSRCP to provide funding for rearing rainbow trout at an existing Washington State trout hatchery. Facility modification options brought to the attention of the Team include:

- Dividing the three lakes into multiple rearing ponds.
- Dividing the adult holding containers.
- Expanding early rearing space (LF-SS12).
- Establishing water heating/chilling capacity to appropriately manipulate production.

WDFW response: These issues and suggested ideas have been a common theme at LFH since 2000, when the Touchet and Tucannon endemic steelhead programs were started. WDFW realized that should these programs expand, and with the expanding fall Chinook and spring Chinook programs at LFH there isn't enough flexible rearing space at the hatchery. The summer steelhead programs at LFH will likely change to some degree as WDFW finishes the Steelhead Management Plan for SE Washington. These options and/or program changes, as well as others that have been identified by WDFW staff, will all be considered for possible modifications to LFH.

Issue LF-SS12: Existing early rearing space is not sufficient for the numbers and types of fish reared at LFH resulting in high densities during early rearing (see LF-SS7a).

Recommendation LF-SS12: Consult with Engineering to increase early rearing capacity by modifying the existing, underutilized tank pad formerly used for captive brood production. Include multiple rearing vessels and, at a minimum, cover the area with a shed roof to provide shade and protection. **WDFW response: See Recommendation CC-SS7 above.**

Issue LF-SS13: The discharge of untreated effluent from the steelhead and spring Chinook spawning area directly into the Snake River poses a fish health risk and potential water quality risk to fish and other species downstream of LFH. *The health risk is increased since adults are transferred from other watersheds and may not maintain the same disease profile as returns to LFH.*

Recommendation LF-SS13: As a best management practice, investigate retaining or redirecting spawning effluent to the pollution abatement pond or to a special containment area with possible effluent disinfection. **WDFW response: Since this issue is one that concerns all hatcheries, LSCRP should contract with an engineering firm to evaluate the feasibility and cost of treating adult holding pond effluent at all LSRCP hatcheries.**

<u>Cottonwood Acclimation Facility</u>

Issue CC-SS11: The adult trap on Cottonwood Creek has no hand railing on the downstream side of the trap, posing a safety risk to staff and visitors.

Recommendation CC-SS11: Insert a hand railing that can be removed to provide access to the trap as needed. **WDFW response: WDFW will consider installing a handrail on the downstream side of the trap as long as it does not hinder trap and/or broodstock collection activities.**

Issue CC-SS12: High holding densities combined with the small size of the adult trap on Cottonwood Creek may increase stress and pose fish health risks and mortality to the adult steelhead or their progeny. *The size of the adult trap is insufficient to accommodate the current run size and satisfy current management strategies. Currently, over 2,000 Wallowa stock steelhead return to Cottonwood Creek annually. Management practices are to collect steelhead at the trap and either hold them for broodstock or pass them upstream.*

Recommendation CC-SS12: Consult with engineering to redesign the trap to meet the program needs. **WDFW response: The WDFW will consider a redesign of the trap area.**

Issue CC-SS13: Security for the adult trap is limited. *Currently, there is no fence to prevent unauthorized access to the trap. This poses human safety risks to the general public and increases the potential for catastrophic fish loss due to poaching or vandalism.*

Recommendation CC-SS13: Consult with engineering to construct a security fence. **WDFW response: A redesign of the Cottonwood Trap with a security fence included and covered spawning area would protect the resource and provide safety to the personnel who manage the trap and intake arena.**

Issue CC-SS14: The water intake screen for the Cottonwood Acclimation Facility does not comply with current NOAA Fisheries ESA screening criteria. The screen mesh is 1/8"; however, NOAA requires 3/32" mesh. NOAA criteria also include parameters for water approach velocity, sweeping velocity, and screen angle.

Recommendation CC-SS14: Replace the water intake screen for the Cottonwood Acclimation Facility so that it complies with NOAA Fisheries criteria. This may require modifications such as revolving drum screens to prevent debris accumulation that could obstruct the water supply. **WDFW response: A redesign of the intake structure that will accommodate reduced screen sizing will require analysis from an engineer consultant to ensure sufficient water collection ability. Currently, the concrete structure is not compatible for smaller screening.**

Issue CC-SS15: The Lower Snake River Compensation Plan office is reviewing the ownership status of water rights associated with all the facilities which divert water for fish production that are operated by the co-managers. *Although ownership of several of the facilities has been transferred to the Service, the appropriate documentation to transfer the water rights may not have been filed in the respective state agency which administers water rights. Moreover, facility staff may not consistently or adequately record water use to ensure* *documentation of beneficial use in support of its water right(s) and as required by state law . Adequate documentation and reporting are required to maintain the right to divert water.*

Recommendation CC-SS15: Work with the Lower Snake River Compensation Plan office to ensure water diverted to Cottonwood Acclimation Pond for fish production is measured and reported correctly and the Service's, Region 1 Engineering, Division of Water Resources maintain the information. **WDFW response: The WDFW will work with the Lower Snake River Compensation Plan office to ensure water diverted for fish culture is measured and reported correctly.**

Research, Monitoring, and Accountability

Issue LF-FC24: A consistent mechanism for dealing with contingencies that are not covered in management documents or through the Annual Operation Plan process appears to be lacking*. The co-managers meet on an annual basis to agree upon program actions; however, if contingencies arise, there is no apparent, agreed upon process to discuss and reach agreement. Additionally, management documents designed to facilitate contingency planning, such as HGMPs or Statement of Works (SOWs), are not updated on a regular basis, and, in the case of HGMPs, have not been approved which means a formal ESA consultation process has not been completed for salmon and steelhead.*

Recommendation LF-FC24: Continue to work with the co-managers to establish such a consistent mechanism, such as within the AOP process and including the finalization and approval of all HGMPs. **WDFW response: The WDFW will work with the Lower Snake River Compensation Plan office to ensure completion of HGMPs and timely updating of management documents.**

Issue LF-FC25: The evaluation and dissemination of sampling data for LSRCP programs is inadequate, inhibiting the ability for managers to make decisions based on current information. *There exists a backlog of annual reports. The LSRCP office has increased staff and has begun reducing the backlog. However, reporting is not yet timely enough.*

Recommendation LF-FC25: Continue work through the backlog of annual reports. Complete annual reports in a timely fashion (e.g. within one year of the previous year's work). **WDFW response: The WDFW agrees that timely reports are desirable. However, data retrieval time lags will likely prevent completion of annual reports within one year of run year completion.**

Issue LF-FC26: The evaluation and dissemination of sampling data are inadequate, inhibiting the ability for managers to make decisions based on current information. *Data reporting does not meet the specified standards of the Pacific Salmon Commission.*[1] *Those*

[1] Pacific Salmon Commission's Data Standard Work Group. December 2005. Specifications and Definitions for the Exchange of Coded-Wire Tag Data for the North American Pacific Coast. PSC Format Version 4. Regional Mark Processing Center, Portland, OR. www.rmpc.org.

standards require preliminary reporting of data for the current calendar year no later than January 31 of the following year.

Recommendation LF-FC26: The Service should work with LSRCP co-managers to develop a data management plan that incorporates tagging goals and objectives, data management, and reporting requirements of coded-wire tag data at both the program and regional levels. The Service should incorporate reporting requirements of coded-wire tag data into the cooperative agreement between the LSRCP office and co-managers (WDFW and tribes). **WDFW response: The WDFW agrees that timely reporting of data is important for proper management, but such regional data retrieval and recording protocols need to be applied across all geopolitical boundaries for the data to be useful in a timely manner.**

Education and Outreach

Issue LF27: The LFH displays and handouts are outdated. *The existing LFH displays were installed in the 1980's-early 90's when the facility was constructed.*

Recommendation LF27: Update the displays and handouts so that they accurately reflect the present state of salmon and steelhead and the associated programs at LFH. **WDFW response: The WDFW agrees that updated displays and handouts are desirable.**

Issue LF28: The information available to the public in regards to the LFH and its associated programs is inadequate. *The LSRCP web site lacks information for public consumption. Additionally, WDFW does not currently manage a web page for LFH.*

Recommendation LF28: Information in regards to the harvest and conservation benefits the programs provide should be made available by the Service and WDFW in a format for public consumption (e.g. simple brochures, interactive web pages, etc.). For example, fishery benefits provided by the program for each hatchery could be updated annually on the LSRCP web site and provided in a brochure at the hatchery. This information should include contribution of hatchery-origin Snake River fall Chinook to marine fisheries in Canada and Alaska. If the LSRCP web site is the primary source of information for the program, any WDFW page for LFH should be linked to this site. **WDFW response: The WDFW agrees and will work with the LSRCP office to that end.**

1.16.1a) Hatchery Review Team Alternatives to the Current Program

Alternative 1: Current program with recommendations
Alternative 2: Replace the segregated Cottonwood Creek hatchery steelhead program with an endemic Lower Grande Ronde River stock program (e.g. Joseph Creek)
Alternative 3: Increase the size of the Cottonwood Creek hatchery steelhead program to compensate for reductions or terminations of LFH stock releases elsewhere
Alternative 4: Rear Cottonwood Creek hatchery steelhead at Irrigon FH
Alternative 5: Discontinue the Cottonwood Creek hatchery steelhead program and increase the Wallowa hatchery steelhead program
Alternative 6: Terminate the program and decommission the Cottonwood Pond Acclimation

Facility

1.16.2) WDFW Potential Alternatives to the Current Program

Alternative 1: Develop a new broodstock and eventually eliminate the Wallowa Stock summer steelhead from the Grande Ronde River. Should a new endemic stock be developed by WDFW or ODFW, the primary purpose would be continued compensation/mitigation under the LSRCP for sport fisheries, while lessening the potential negative effects to the natural populations through use of an endemic stock. The potential to develop a new endemic stock from Grande Ronde River tributaries in Washington is not good because, 1) there are many very small streams with limited production of natural steelhead, 2) some are larger streams, but isolated and in remote locations that would be logistically difficult to manage for endemic broodstock development, 3) to achieve the genetic intent, the development of an endemic type hatchery stock must sample individuals that are representative across the entire population and it not clear how this could be accomplished given the dispersed nature of spawning tributaries utilized by the LGR population, and 4) areas that are accessible for broodstock development (e.g. Cottonwood Creek) have been influenced by stray Wallowa Stock hatchery fish in the past, and therefore may not represent the genetic legacy of the Lower Grande Ronde natural steelhead population. This latter point has been supported by a recent genetic study completed by Paul Moran (NOAA Fisheries, unpublished data) that demonstrates that tributaries in the Washington portion of the Grande Ronde River are very similar to Wallowa stock steelhead. ***For the reasons stated above, this alternative is not being pursued.***

Alternative 2: Partner with ODFW in the development of a Lower Grande Ronde endemic steelhead stock for hatchery production. Because of the lack of a significant, accessible, non-hatchery altered endemic stock(s) within Washington, we could partner with Oregon Department of Fish and Wildlife (ODFW) to develop an endemic stock for use in the lower Grande Ronde River. The problems with developing such a stock are largely the same as for Alternative 1 in terms of how to ensure the LGR population was sampled randomly for hatchery broodstock. ***This alternative is not currently the preferred action.***

Alternative 3: Develop an early returning form of Wallowa stock steelhead to minimize its impact on downriver (e.g. – Deschutes River) populations**.** The ODFW is evaluating an alternative to their current Wallowa stock program. They have tested collecting early Wallowa stock arrivals in the lower Grande Ronde River. They reason that early arrivals may show fewer tendencies to stray into the Deschutes River (which has been the main concern for the Wallowa stock program). If they are correct, then perhaps the development of these early arrivals into a new, improved Wallowa stock will provide an alternative to the WDFW program. While this alternative does not address Wallowa stock straying into areas of the Grande Ronde River, it may eliminate them as a major concern in the Deschutes River. The ODFW collected early returning Wallowa stock fish from the lower Grande Ronde in the fall of 2003 to begin this evaluation. WDFW will assist ODFW as necessary to gather return information from these groups. ***WDFW believes this may be a future preferred alternative for this program, but that decision will depend on the results of ODFW's stock performance evaluation.***

Alternative 4: Eliminate the releases of Wallowa stock summer steelhead from the Cottonwood Acclimation Pond to protect the listed populations of concern. This action would decrease the potential impacts to natural populations from further introgression with the Wallowa stock. Washington is presently evaluating tag data to determine the extent of straying of fish released from Cottonwood pond. Early indications from the data seem to show less tendency for Cottonwood pond acclimated fish to stray into the Deschutes River of Oregon. These fish may not jeopardize Deschutes River steelhead because of their fidelity to the Grande Ronde, obviating the need for this extreme alternative. ***Therefore, this alternative is not acceptable as Washington is legally due compensation under the LSRCP. Currently the compensation provides a popular sport fishery in the Grande Ronde River and elsewhere.***

Alternative 5: Reduce the current Wallowa stock releases to a point where negative impacts to listed natural fish will be minimized. This alternative does not fully meet the intent of NOAA Fisheries Biological Opinion. However, the NOAA Fisheries ruled that non-native stocks that stray into other basins at less than a 5% stray rate do not jeopardize native stocks. If the Wallowa stock (WDFW origin) made up less than 5% of spawning steelhead in other river basins, then the releases could continue to provide for harvest mitigation. Current production has been reduced to 160,000 from 250,000 in recent years. Further, WDFW re-initiated annual tagging (CWT) with the 1996 brood year Wallowa stock to determine stray rates and provide program changes based on those results as they become available. In addition, PIT tags are implanted in a portion of the smolts released annually to help us determine their return distribution (see **Alternative 3**). ***This alternative is not acceptable as Washington is legally due compensation under the LSRCP. Currently the compensation provides a popular sport fishery in the Grande Ronde River and elsewhere. However Washington is willing to consider further reductions to the program once monitoring data are provided that can guide the degree of reduction needed.***

Alternative 6: Use LFH stock steelhead to replace the Wallowa stock. One of the main issues over the years with the Wallowa stock is the straying into the Deschutes River, Oregon. Adults of the LFH steelhead stock stray considerably less into the Deschutes River (Table 5). Recoveries within the lower reaches of the Deschutes are about ½ for the LFH stock releases compared to the Wallowa stock, and those from the upper Deschutes (Sherars Falls, Warm Springs, and Pelton) are about 1/20th of the Wallowa stock. Further, broodstock collection uncertainty (not enough fish or fish that are very high in IHNV levels) would be less of a concern since the broodstock would be collected at LFH at the same time we collect broodstock for the on-station, and other program releases. In addition, this action would potentially free up more rearing space at LFH for other LSRCP programs (Lake #3 could be used for another program). A full evaluation of this alternative would have to occur, including potential effects on current fisheries. LFH stock adults tend to be smaller and return younger as adults than Wallowa stock steelhead, which could negatively affect this very popular sport fishery. ***Co-manager agreement (Tribal and the State of Oregon) would have to occur before this option could move forward. Currently the use of the existing Wallowa stock or the early returning Wallowa variant are considered better options.***

Table 5. Comparison of Wallowa and LFH Stock summer steelhead releases (1996-2005 Brood Years) and recoveries within the Deschutes River, Oregon

Stock	CWT fish released	Total number released	Proportion tagged of total release	Maximum Return Total	Percent of Total Return that was observed in the Deschutes River: Mouth/Macks Canyon/Kloan	Sherars Falls	Warm Springs NFH	Pelton Dam
Wallowa	429,267	1,887,840	0.41	9,958	2.27	0.02	0.17	0.59
LFH	845,059	3,074,025	0.41	16,293	1.39	0.00	0.00	0.04

Alternative 7: Increase mitigation to compensate for unanticipated losses of naturally produced steelhead. This option is under discussion, but it may be partly accomplished under ESA recovery implementation.

WDFW Preferred Alternative: The preferred option is to retain Wallowa stock steelhead and increase smolt production up to 200,000 to reach the LSRCP Columbia basin mitigation return goal. WDFW is currently developing a Steelhead Management Plan for SE Washington. Under the management plan we will evaluate using the early Wallowa broodstock being investigated by the ODFW as a replacement. Results from ODFW's study will be available in the next few years. Co-managers have reviewed and approved our proposed preferred option to continue using Wallowa stock under the US v OR process and have approved continuation of this program. Once results from ODFW's study of early returning Wallowa broodstock are available WDFW will evaluate the potential benefits of shifting to the early Wallowa stock as broodstock for Cottonwood.

1.16.3) Potential Reforms and Investments

Reform/Investment 1: The incidence of stray hatchery steelhead from the Cottonwood Pond program in the Lower Grande River population is poorly understood. Additional adult trapping facilities or PIT tag arrays should be implemented in Grande Ronde tributaries where healthy populations of natural origin summer steelhead still exist. Determining the extent of stray Wallowa stock fish throughout the basin would provide for better management and decisions regarding hatchery usage in the basin. Cost estimate: $100,000 to $1,000,000.

Reform/Investment 2: Implement development of an endemic broodstock with ODFW. This implies that agreement has been reached on how to develop endemic broodstock for the hatchery program. However, the collection of broodstock from across the LGR population would be labor expensive and likely require costly adult trapping facilities. The estimated cost is $50,000 to $500,000.

Reform/Investment 3: Due to the multiple species at LFH, and program changes over the years, juvenile rearing space at LFH has become limited. Additional rearing vessels (raceways, rearing ponds, and inside intermediate rearing tanks) would allow more flexibility and may provide a decrease in disease outbreaks (i.e. coldwater disease in steelhead). A full engineering design and feasibility consultation will be required at LFH to identify any facility improvements or modifications needed to address the all program changes. Cost is likely to be $100,000 to $500,000. Program changes cannot occur until infrastructure needs are addressed. Depending on what is needed for additional water and raceways, the estimated cost could be $1.0 to $5.0 million.

As the current process unfolds in developing these Hatchery Genetic Management Plans for all stocks reared in the Lower Snake River Basin and programs are to be modified to meet the standards addressed by the Hatchery Review Team (HRT) and the Hatchery Scientific Review Team (HSRG), the requirements for rearing space and water supply issues within the hatcheries must be addressed. Considering the "stepping-stone" approach to stock rearing as the management tool NOAA, the states, and the Tribes may agree to implement for some programs, rearing space and water is essential. New water sources (i.e. wells), pipeline structures, permanent rearing vessels, a backup generator, and a pollution abatement (PA) system may be incorporated into the existing PA system at the LFH. But these facility upgrades and improvements will have to occur.

Reform/Investment 4: Improving the current intake at the Cottonwood Pond is needed to address the water intake screening requirement and to enlarge the adult trapping section of the intake to allow for holding more adults for removal. Estimated cost is: $100,000 to $500,000.

Reform/Investment 5: Investigate and/or develop a well to augment flow into the pond during years of low stream flow to maintain Cottonwood Creek flows sufficient to allow adult immigration and juvenile emigration. Estimated cost is: $50,000 to $100,000.

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

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

WDFW assists the USFWS in Consultation with NMFS for LSRCP actions and the NMFS Biological Opinion. Further, Washington has a statewide Section 6 Consultation with USFWS (Bull Trout). In addition, HGMPs have been developed for the Tucannon and Touchet River Endemic Broodstock programs. Concurrent with this HGMP to satisfy Section 7 consultations, WDFW is writing HGMPs to cover all stock/programs produced at LFC (Snake River Fall Chinook (Snake River Stock)), Tucannon Summer Steelhead (LFH Stock), Walla Walla Basin Summer Steelhead (LFH Stock), and Snake River Summer Steelhead (LFH Stock) on-station releases.

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

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

Washington Department of Fish and Wildlife has documented natural steelhead (Snake River ESU) in small tributaries of the Snake and Grande Ronde rivers in Washington State. Hatchery fish released from Cottonwood Pond are known to return and spawn in Cottonwood Creek and locally in several other small tributaries (see Table 7 below). For example, in 2000 WDFW operated an adult trap in Rattlesnake Creek about three miles below Cottonwood Creek. We captured a total of 55 steelhead, 43 of which were hatchery origin. In 2001, WDFW operated an adult trap on Menatchee Creek, about 5 miles above Cottonwood Creek. We captured a total of 17 steelhead, only four of which were hatchery origin. However, for the nearby Joseph Creek population no stray hatchery fish have ever been observed during spawning ground surveys conducted by ODFW personnel over the same time period. Likewise naturally spawning hatchery steelhead, presumably from the program operated by ODFW on the Wallowa River, are apparently rare in the other two MPG populations, Wallowa and the Upper Grande Ronde. It should be noted however that the collection of stray hatchery fish would have come from spawning ground surveys, which are not effective at sampling a interoparous species such as steelhead that do not die post spawn. Beginning in 2011 the NPT will be operating a floating weir and trap and a PIT tag detection array on Joseph Creek that will provide substantially more reliable data on hatchery stray proportion and their origin of release. Therefore, the primary population impacted by the Cottonwood Pond steelhead program is probably the Lower Grande Ronde population.

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

The Lower Grande Ronde population is one of the four steelhead populations that comprise the Grande Ronde MPG, which is a member of the Snake River DPS and listed as a threatened species. Natural-origin adult steelhead are not collected for broodstock, and therefore not directly affected by this compensation program. ESA listed Columbia Basin bull trout, and Snake River spring/summer Chinook, and fall Chinook are also present in the lower Grande Ronde Basin. Bull trout, spring/summer and fall Chinook have not, nor are they expected to be encountered at the Cottonwood Adult trapping site when steelhead are present. None of these salmonid species is anticipated to be directly affected by the compensation program as described.

However, natural origin steelhead returning to Cottonwood Creek could be delayed by the adult trap in Cottonwood Creek. Delays at the adult trap are expected to be minimal as the trap is checked, and fish are removed and passed daily when in operation.

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

The hatchery production program may incidentally affect listed Snake River summer steelhead populations. In addition, listed Snake River spring Chinook populations, Snake River fall Chinook and Columbia Basin bull trout may be affected to a lesser degree.

<u>Natural summer steelhead</u> (the Lower Grande Ronde River steelhead population is most likely to be affected by this hatchery program) – Spawning begins in March in the tributaries and continues until May. Juveniles utilize a wide range of habitats throughout the basin including

areas adjacent to smolt release locations. Most naturally produced smolts migrate after rearing for two years. A much lower percentage emigrates after one or three years. Smolt out-migration through the lower Grande Ronde Basin extends from late winter until late spring, thereby overlapping with hatchery steelhead smolts releases as described for this program. Peak smolt movement is associated with increased flow events between mid-April and mid-May (Ann Setter – ODFW, pers comm.).

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

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

Spring Chinook –Spring Chinook adults utilize the lower Grande Ronde River primarily as a migration corridor to reach to the headwater streams in the Wenaha and upper Grande Ronde Basin (i.e. Minam, Lostine, Wallowa). Juvenile utilization in the lower Grande Ronde River is minimal due to high summer water temperatures. Juveniles in the Grande Ronde Basin rear for one year, become smolts, and emigrate the following spring. Smolt migration from the basin begins in late January and extends through early July, thereby overlapping with the hatchery steelhead production from this program (Ann Setter (ODFW) pers. comm. 2002).

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

Fall Chinook – Fall Chinook in the lower reaches of the Grande Ronde River are considered part of the Snake River population. The WDFW and Nez Perce Tribe (NPT) has documented the number of fall Chinook redds in the Grande Ronde since 1986 (Glen Mendel (WDFW) and Bill Arnsberg, (NPT) pers. comm. 2002). Redd counts have ranged from 0-197 since 1986 in the area between the mouth and the mouth of Wildcat Creek above Troy, Oregon. Adult Snake River fall Chinook enter the Columbia River in July and migrate into the Snake River from mid-August through November. Spawning occurs from late October through early December, with fry emergence during April. Outmigration occurs within several months following emergence with peak migration past Lower Granite Dam in late June. Competition for food and space is possible, though likely minimal due to different microhabitat preference between steelhead smolts and juvenile fall Chinook. However, predation on juvenile fall Chinook from hatchery steelhead is a possibility (See Section 3.5). Note that large numbers of steelhead anglers in the lower Grande Ronde River may disturb spawning fall Chinook, or disturb redds, in October, November and early December.

Bull trout – Both ad-fluvial and resident life history forms of bull trout inhabit a number of tributaries in the Grande Ronde River. The lower mainstem in Washington State is utilized as a migration or over-wintering corridor (see Baxter (2002), or the draft Bull Trout Recovery Plan (USFWS 2004)). Fluvial adults migrate into headwater areas during summer and early fall. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge during the spring. Juvenile rearing is restricted to headwater areas by increasing water temperatures downstream, and therefore will not be located in areas of hatchery steelhead juveniles from this program.

However, juvenile hatchery steelhead released as smolts may compete for food and space with the fluvial and resident forms of bull trout as some degree of extended rearing by hatchery steelhead following release is expected. Time spent together may be limited because of release size, condition of fish at release (smolts), release method (volitional release), and release location (far below most bull trout juvenile rearing areas). Predation of hatchery steelhead on bull trout in the migration corridor is likely limited due to size (See Section 3.5). Bull trout associated with areas influenced by migrating or residual hatchery steelhead are generally fluvial adults and are more likely to out-compete or prey on hatchery steelhead due to a significant size advantage. As with the other species, hatchery-origin steelhead from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Strict protocols will be followed to ensure healthy fish upon release.

2.2.2) <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.

Summer steelhead - The Interior Columbia Basin Technical Recovery Team (ICTRT) recommend a minimum of two Grande Ronde basin populations be at viable status for the Major Population Group (MPG) to be viable, and at least one of them must be rated as highly viable. At least one of the other three populations (all rated as intermediate in size and complexity) also must be viable. The Joseph Creek population is rated highly viable, while the Lower Grande Ronde population was unknown (ICTRTa, 2007). Natural production units of steelhead utilizing small tributaries within the Washington portion of the Grande Ronde are either depressed (due to their relatively small size), or unknown (WDFW unpublished data). Remoteness and inaccessible areas have limited WDFW’s ability to assess stock status. To achieve a viable rating, the Upper Grande Ronde, Wallowa, or Lower River populations must improve in abundance/productivity criteria (Table 6).

Table 6. List of the natural steelhead populations, "Viable Population" thresholds, and associated hatchery stocks within the Grande Ronde basin (ICTRT, *in prep.*).

Management Units (see above for description of population structure within Management Units)	Critical Thresholds (Abundance[a], R/S[b])	Current Values (Abundance[a], R/S[b])	Associated hatchery stock(s)
Lower Grande Ronde ²	Abundance: 1,000 R/S = 1.15	Abundance: unknown (1,193)[d] R/S = 2.29-2.62	
Joseph Creek	Abundance: 500 R/S = 1.27	Abundance: 2,132 R/S = 2.58	
Wallowa River ³	Abundance: 1,000 R/S = 1.15	Abundance: 172[c] (1,220)[d] R/S = 1.73	Wallowa stock summer steelhead (#56)
Upper Grande Ronde	Abundance: 1,500 R/S = 2.29	Abundance: 1,226 R/S =1.22	

[a] 10-year geometric mean abundance of natural origin spawners.
[b] Recruits per spawner.
[c] Abundance estimate from three index areas. Actual Wallowa River steelhead abundance is likely much higher.
[d] Abundance estimates from HSRG review and recommendations report

Spring/summer Chinook – Natural origin spring/summer Chinook in the Grande Ronde Basin are listed as "threatened" under the ESA as part of the Snake River spring/summer Chinook ESU. Of the four extant populations in the Grande Ronde basin, the distribution of only one, the Wenaha, includes portions of Washington. ODFW routinely monitors the status of spring Chinook in the major production area of the Wenaha which occurs in Oregon. That portion of the Wenaha which is within Washington is believed to be a minor contributor to the population recruitment. In addition the remoteness of this area limits the ability of WDFW to assess the status of this production unit. The mainstem Grande Ronde River in Washington does not likely contain a spring Chinook population due to limited rearing capabilities for juveniles because of high summer water temperatures in the lower basin.

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

Bull trout – Natural origin fluvial and resident bull trout in the Grande Ronde River are listed as "threatened" under the ESA as part of the Columbia Basin Bull Trout Distinct Population Segment (DPS). In the Washington portion of the Grande Ronde, sub-populations of bull trout exist in the Wenaha River tributaries, and potentially Menatchee Creek. Status of the bull trout population in the Wenaha River is considered at low risk for extinction (Buchanan et al. 1997, USFWS 2004), while status of the Menatchee Creek population is unknown because of limited data to document its existence.

- Provide the most recent 12 year progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data. The Lower Grande Ronde steelhead population is the primary population effected by this program for which there are no data from which to determine progeny-to-parent ratios. It is noted that the interpretation of annual variations in progeny to parent ratios of naturally reproducing fish is difficult because the confounding effect of spawner density needs to be removed as one step of the analysis. The progeny to parent ratio observed when the parental numbers are many, will invariably be lower than when the parental numbers are few. Without means for standardizing this density dependent dynamic, the comparison of progeny to parent ratios among different years can easily lead to erroneous conclusions about population status. In addition, this population is exposed to large variations in downstream passage and ocean survival. These variations also can seriously confound the interpretation of progeny to parent ratios, unless standardization is developed for this factor as well. In the case of this population smolt to adult survival estimates are available which could be used to a tool for this standardization.

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

Broodstock trapping at Cottonwood Creek provides some indication of the abundance of natural spawners returning to Cottonwood Creek. Additional adult trapping on Rattlesnake Creek (2000) and Menatchee Creek (2001) is also provided (Table 7). The HSRG in their review of the steelhead programs in the Snake basin estimated that the current natural spawner abundance level for this population was 1,193.

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

Table 7 provides trapping data back to Cottonwood Creek Adult Trap. An unknown number of adult fish are able to pass the trap during years when spring stream flows get high. We assume the proportion of trapped fish (hatchery and wild origin) represents similar proportions on the spawning grounds. However, across the entire population, the overall frequency of hatchery fish is believed to be much lower than observed for Cottonwood Creek. For example, the HSRG estimates that the current proportion of hatchery fish in the Lower Grande Ronde population is 5%. Additional surveys and data collection is necessary to validate this estimate, however given the lack of hatchery strays in the nearby Joseph Creek population and the lower frequency of hatchery strays observed in Menatchee Creek compared to Cottonwood Creek, it seems possible that the incidence of hatchery fish in the primary spawning areas for this population is probably quite low and perhaps in the 5% range.

Table 7. Number of natural and hatchery origin spawners documented in small tributaries to the Grande Ronde River. Numbers provided are trapped fish.

	Cottonwood Creek (rkm 45)		Rattlesnake Creek (rkm 40)		Menatchee Creek (rkm 53)	
Year	Natural	Hatchery	Natural	Hatchery	Natural	Hatchery
1992		397				
1993		362				
1994		308				
1995	1992-2003	450				
1996	Undocumented	430				
1997	but generally	233				
1998	thought < 10	720				
1999	natural fish	276				
2000	annually	288	12	43		
2001		749			13	4
2002		1,712				
2003		480				
2004	16	844				
2005	3	1,009				
2006	35	2,006				
2007	18	558				
2008	30	1,497				
2009	20	2,313				
2010	59	1,409				

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

<u>Broodstock Trapping:</u> Listed summer steelhead adults (Snake River ESU) will be incidentally trapped from March through April at the Cottonwood Creek adult trap, which constitutes an indirect take of listed fish (Appendix 1). All natural origin adults captured are passed upstream to spawn naturally. Based on trapping records, and limited juvenile production from Cottonwood Creek, it is anticipated that 10-50 natural origin adults will be captured and handled in any given year. Because of the high number of Wallowa stock fish allowed to pass and spawn in Cottonwood Creek in past years, we assume that nearly all natural fish returning are likely to be offspring of hatchery parents.

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

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.

Current trap operations may prevent or delay upstream migration of a small number of summer steelhead that approach the trap. However, the current trap is estimated to be 80-90% efficient depending on stream flows, and fish entering the trap are processed daily, allowing natural origin fish to be passed generally within 24 hours of trapping.

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

See Table 7 Above. No injuries or mortalities to listed fish have been recorded.

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

See Appendix 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.

At the Cottonwood Creek Adult Trap, natural origin fish are passed above the trap to spawn naturally. Fish are sorted on a daily basis by trap operators, or during the hatchery broodstock spawning operations. Some steelhead (both origins) can pass when stream flows are very high. Exceeding expected take levels is not likely.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery or other regionally accepted policies (e.g. the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

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

In 2009, Washington's Fish and Wildlife Commission adopted their "Policy on Hatchery Reform". Its purpose was: "To advance the conservation and recovery of wild salmon and steelhead by promoting and guiding the implementation of hatchery reform. Hatchery reform is the scientific and systematic redesign of hatchery programs to help recover wild salmon and steelhead and support sustainable fisheries. The intent of hatchery reform is to improve hatchery effectiveness, ensure compatibility between hatchery production and salmon recovery plans and rebuilding programs, and support sustainable fisheries." This HGMP is consistent with the intent of the policy (see full policy at: Washington Fish and Wildlife Commission Policy: POL-C3619).

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

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

- *Lower Snake River Compensation Plan* – LSRCP goals as authorized by Congress direct actions to mitigate for losses that resulted from construction and operation of the four Lower Snake River hydropower projects. The program is consistent with smolt production but lower than levels as outlined in original LSRCP. The proposed program will continue to support a substantial tribal and sport harvest.
- *US vs Oregon* - The hatchery program outlined within this HGMP is consistent with Appendix B hatchery smolt production agreements of the *US vs Oregon* negotiations and the intent to provide fish for harvest in tribal and sport fisheries into the future.
- *Columbia River Fish Management Plan* – Continue to provide substantial harvest in Zone 6 tribal net fisheries as well as in-basin tribal harvest opportunity.
- *Fisheries Management and Evaluation Plan (FMEP).* – The FMEP for Snake River fisheries within southeast WA has been drafted by WDFW and submitted to NOAA Fisheries, which describes in detail the current fisheries management (excluding spring Chinook) within the Snake River Basin (including the Grande Ronde). Fishery management objectives within the FMEP and this HGMP are consistent.
- *WDFW Wild Salmonid Policy.* Washington Department of Fish and Wildlife is directed by State and Departmental management guidelines to conserve and protect native fish and wildlife populations. No other comprehensive management agreements are in effect.
- *Washington Statewide Steelhead Management Plan* - Restore and maintain the abundance, distribution, diversity, and long-term productivity of Washington's wild steelhead and their habitats to assure healthy stocks. In a manner consistent with this goal, the Department will seek to protect and restore steelhead to achieve cultural, economic, and ecosystem benefits for current and future residents of Washington State.
- *Snake River Salmon Recovery Plan* – The Governor of the State of Washington committed WDFW to cooperate and partner with regional governments to develop a science based and community supported strategy for salmon recovery. A draft plan was completed in December 2006. The draft plan is being updated and combined with Oregon and Idaho plans to develop a DPS-wide plan for the Snake Basin. WDFW will continue to work with regional governments and processes to recover salmon and steelhead populations in the

Snake River Basin.

3.3) Relationship to harvest objectives.

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

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.

Multiple fisheries benefit from the summer steelhead compensation program in the Grande Ronde River. Summer steelhead from Grande Ronde releases were documented to have been caught in Columbia River net and sport fisheries at a very high rate in the mid-1980s, however in recent years (1997-2004) the distribution of the catch has shifted such that 85% of the catch now occurs within the project area (Table 8). They have also been harvested successfully in the Snake and Grande Ronde rivers. Unfortunately, WDFW did not release CWTs in the Grande Ronde for many years. Hence, data to show long-term harvest rates in the Grande Ronde River in the 1990's is not available except for the last few years.

Table 8. Percent contribution of Wallowa stock summer steelhead to commercial and sport fisheries below the project area, or within the project area based on the brood years provided.

	Below Project Area				Project Area
Hatchery Stock Brood Years	% Ocean fishery	% Net fishery	% Sport fishery	% Total	% Sport fishery
Wallowa Stock					
1984-1986	0.2	55.7	3.2	59.1	40.9
1997-2004	0.0	4.9	9.8	14.7	85.3

Over the years, WDFW and ODFW have cooperated in a joint creel survey effort in the Grande Ronde River. Annually since 1987, ODFW has provided estimates of steelhead harvest (Flesher 1994-2003) to WDFW for the lower Grande Ronde River from Bogan's Oasis (RM 41.9) to the Oregon Border (RM 61.9). Since ODFW also releases Wallowa Stock fish in the upper Grande Ronde Basin, the fishery captures both States' releases. During run years 1988–2005, hatchery origin sport catch in the Washington portion of the Grande Ronde River ranged from 697-6,268 fish (Table 9) for the September through mid-April fishery. Natural origin fish captured and released in the fishery has ranged between 211 and 1,508 fish on an annual basis.

Table 9. Estimated angler effort, with estimated natural and hatchery catch for steelhead anglers on a portion of the Grande Ronde River in Washington 1988-2005 run years.

Run Year	Effort Hours	Hatchery Catch	Natural Catch	Percent Wild
1988	7,440	697	393	36.1
1989	9,468	1,910	267	12.3
1990	8,446	1,241	269	17.8
1991	21,278	3,109	412	11.7
1992	15,097	1,028	264	20.4
1993	17,812	1,910	426	18.2
1994	12,021	1,335	220	14.1
1995	13,685	2,040	211	9.4
1996	14,770	2,300	267	11.6
1997	19,984	2,325	422	15.4
1998	16,667	2,050	350	14.6
1999	22,036	1,958	500	20.3
2000	27,764	4,621	921	16.6
2001	29,173	6,268	1,508	19.4
2002	28,366	3,872	1,023	20.9
2003	24,076	3,506	851	19.5
2004	27,264	3,568	1,193	25.1
2005	26,288	5,181	1,083	17.3
2006	29,509	3,258	755	18.8
2007	24,255	3,621	394	9.8
Average	***19,770***	***2,790***	***586***	***17.4***

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

3.4) Relationship to habitat protection and recovery strategies.

None

3.5) Ecological interactions.

Predation **-** Predation requires opportunity, physical ability and predilection on the part of the predator. Opportunity only occurs when distribution of predator and prey species overlaps. This overlap must occur not only in broad sense but at a microhabitat level as well.

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

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

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

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

Based on where fall Chinook spawn however, they will completely overlap with the hatchery steelhead migration corridor. Fall Chinook fry will likely be seeking habitat areas near stream margins. Bjornn and Reiser (1991) reviewed literature on habitat preferences of juvenile salmonids and concluded that newly emerged fry prefer shallow areas of low velocity (<10 cm/s) and larger fish occupy deeper and faster areas. Partitioning of habitat by Chinook fry and steelhead smolts minimizes direct interaction between the two species. Naturally produced steelhead fry likely emerge during May-June, long after the majority of released hatchery steelhead smolts from this program have migrated from the system. Bull trout fry tend to rear in headwater spawning areas and thus avoid interaction with steelhead smolts.

A varying percentage of hatchery steelhead releases do not migrate from the system. WDFW considers hatchery steelhead remaining after June 15 to be residuals. These fish, by remaining in the lower Grande Ronde River have an increased opportunity to interact with juvenile listed fish. Although most residual rates vary from a few percent (Viola and Schuck 1991) to 10% (Partridge 1985, 1986), higher rates in the range of 25% have been observed by Viola and Schuck (1991) and Crisp and Bjornn (1978).

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

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

The number of residual steelhead appears to decline steadily throughout the summer in most Snake River basin release areas. This may be due to harvest, other mortality, and outmigration. Viola and Schuck (1991) noted that residual populations in the Tucannon River of Washington declined at a rate of about 50% per month from June to October (declining from 4.3 to 0.8% of the total released). Whitesel et al. (1993) found residual steelhead up to twelve months after release, however, densities declined rapidly over time.

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

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

The size difference between residual steelhead and Chinook fry will probably result in selection of different habitat areas (Bjornn and Reiser 1991) and further reduce the likelihood of interactions between species. Direct competition between hatchery smolts or residuals and natural smolts and rearing juveniles is likely due to the substantial overlap in macro and microhabitat. A study of interaction between resident rainbow and hatchery steelhead residuals concluded that in a situation where the two were held together in pens, the smaller resident rainbow showed decreased growth when compared to controls (McMichael, et. al. 1997). This suggests similar influence on smaller juvenile steelhead. In a natural situation juvenile fish can move to alternate habitats to avoid the negative interaction. Although the ultimate result of this type of interaction in the natural environment is unknown, shifts to what may be less suitable habitat may also result in impacts to growth.

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

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

Disease - Hatchery operations potentially amplify and concentrate fish pathogens that could affect listed Chinook, steelhead, and bull trout growth and survival. Because the hatchery produced summer steelhead for the compensation program are reared outside the watershed most of their life, disease impacts by this stock on Grande Ronde Basin salmonids are reduced. LFH is supplied with constant temperature well water; as a result, disease occurrence and the presence of pathogens and parasites are infrequent. When infestations or infections have occurred, they have been effectively treated. Further evidence for the relative disease-free status of this stock at LFH 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 pre-liberation fish health examinations. No transfers of steelhead juveniles with known clinical infections or infestations have been made to the Grande Ronde River basin from LFH. Further, IHNV testing on all spawned females during spawning and infected eggs/fry are destroyed as necessary after results are obtained.

Returning adult steelhead held for spawning at the Cottonwood Creek adult trap potentially create a concentrated source of pathogens and parasites. The increase in risk posed to natural Chinook, steelhead and bull trout by these fish is considered minimal for several reasons. First, it is unlikely that the hatchery steelhead adults that return to the production facilities harbor any agents that naturally spawning steelhead do not also carry. Second, cold water temperatures during the winter and the combination of cool water temperatures and high flows during spring holding season for steelhead adults are not conducive to infectious processes. This reduces the potential for transmission between adults in holding ponds and from fish-to-fish in the natural habitat. Documentation of the disease status of the adult steelhead stocks is accomplished through annual fish health examinations of both spawning adults and pre-spawning mortality. Results of these examinations over the past years indicate a low prevalence and incidence of serious fish pathogens and parasites in these stocks. For the Wallowa Stock program described here, the viral pathogen IHNV has been most prevalent. Procedures described for this viral disease later (See Section 8 and Section 9) limit the possibilities of outbreaks in the hatchery.

SECTION 4. WATER SOURCE

4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Presently, LFH is the main rearing site for Wallowa stock summer steelhead. Gametes are collected at Cottonwood Creek Adult Trap, and transported to LFH. Eggs are fertilized, hatched and juveniles reared to the pre-smolt stage (early February of the following year). In early February, pre-smolts are transported to Cottonwood AP for extended acclimation and volitional release. LFH has eight wells that produce up to 150 cfs or 67,970 gpm of nearly constant 52^0 F, well water. Discharge from LFH complies with all NPDES standards and enters the Snake River.

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

4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.

Water intake screens at Cottonwood AP do not meet current NMFS screening guidelines. Effluent discharge is monitored, reported, and currently complies with NPDES standards. The chance of a potential “Take” of listed species from water withdrawal, screening or effluent discharge at Cottonwood increases depending on stream flows in Cottonwood Creek. Since the pond has been in operation, there have been a couple of times when all water from the creek was diverted for the acclimation pond, thereby stranding any naturally produced smolts from leaving Cottonwood Creek, and preventing or delaying any natural origin adults from the stream. During those times, juveniles were collected and transported to the Grande Ronde River. Water withdrawal at LFH is through wells, and effluent is discharged to the Snake River, in compliance with NPDES standards. The WDFW believes that the chance of a potential “Take” of listed species from water withdrawal, screening or effluent discharge at LFH is very low, however, an engineering review of the costs to upgrade the facility with new screens has been proposed.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Broodstock will be collected at the adult trap on Cottonwood Creek, a small tributary to the Grande Ronde River. The trap will be checked daily or more than once a day if many fish are expected to be captured. During years of low water and most or all the stream is being diverted for the acclimation pond, WDFW may also get broodstock (eggs) from ODFW to fulfill production goals. Returning adults may bypass the trap on the left side during high spring flows (Photo 1). Stream flows are generally much less than pictured and enter the trap area by the spill near the center of the channel (Photo 1). Fish are netted out by hand one at a time. Depending on origin of the fish or broodstock needs, fish will be passed (only natural fish will be passed starting in 2010) or held for spawning, CWT recovery, or removal.

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

Beginning in 2010, Captured adults for broodstock are to be transported from Cottonwood to LFH in a 1,500 gal hatchery tank truck equipped with water aeration, circulation and supplemental oxygen.

Photo 1. Cottonwood Adult Trap during high stream flows. Fish can bypass the trap in the left channel. The trapping area is located where is the spill is on the right channel.

5.3) Broodstock holding and spawning facilities.

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

Captured hatchery fish will be held in the holding area until approximately 200-300 fish are present. Hatchery origin fish needed for broodstock will be loaded into the hatchery tank truck for transport. Other hatchery origin fish are either 1) killed to collect Coded-Wire tags, 2) offered to local food banks 3) offered to Tribal members for subsistence consumption, or 4) killed outright to prevent hatchery swamping of natural origin spawners. Spawning, fertilization, disinfection, and water hardening are then completed at LFH.

5.4) Incubation facilities.

The incubation room at LFH is designed to accept and incubate eggs from individual females through the eyed stage. Isolated incubation vessels allows isolation of eggs from individual females on separate water supplies while lab testing for virus from ovarian fluid tests taken at spawning are conducted. If the presence of virus such as IHNV is detected, eggs from infected individual females can be removed from the incubation facility without infecting eggs from other females. After eyeing is complete and virus sample results are received, eggs are consolidated into hatching baskets and transferred to hatching troughs. As the eggs hatch, fry fall through the hatching baskets, and settle to the bottom of the rearing troughs where they absorb their egg sacks, and eventually start feeding. Substrate has not been recommended at this time in the hatching troughs due to questions about cleaning and disease control.

5.5) Rearing facilities.

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

a. Acclimation/release facilities.

Cottonwood AP has a volume of 357,192 ft^3, and is supplied with a maximum of 2,694 gpm (~6 cfs (ft^3/sec) river water that comes directly from Cottonwood Creek. Acclimation on Cottonwood Creek water occurs from February through mid-May. The screens that block the pond outlet are generally removed around the last week of March. This allows the fish to volitionally migrate from the pond until as late as the middle of May, after which all fish are forced from the pond into the Grande Ronde River.

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

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

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

Strict operational procedures as laid out by Integrated Hatchery Operation Team (IHOT 1993) are followed at LFH and Cottonwood AP. Where possible, remedial actions identified in a 1996 IHOT compliance audit are implemented. Staff is available to respond to critical operational problems at all times. LFH has water flow and lower water alarm systems to monitor water supplies to its incubation, raring and adult holding facilities. Because pumps supply LFH, it has several emergency power generation systems to operate its pumps during electrical power outages. Fish health monitoring occurs monthly, or more often, as required in cases of disease epizootics. Fish health practices follow PNWFHPC (1989) protocol. Personnel are present at Cottonwood AP 24 hours/day to respond to water flow or fish health problems.

5.9) Maintenance

Annual Maintenance

- Annual water supply pump rehabilitation at LFH. (***Please reference Snake River Fall Chinook HGMP***).
- Clean-out drainage ditch near Cottonwood Creek road. ($500).
- Acclimation pond vegetation management ($450).
- Domestic water system sampling and service ($500).
- Vehicle maintenance ($500).
- Annual fish transportation; 33,375 lbs. smolts hauled from LFH to Cottonwood AF each February ($6,500).

Non-recurring Maintenance (next 5 years)

- Stop log replacement for intake, fish ladder and acclimation pond outlet ($3,500)
- New adult spawning equipment ($1,500)
- Replace existing intake/diversion screens to meet compliance on juvenile fish migration. Current screening is 1/8”. Updated standards are 3/32”. Engineering and const. ($100,000)

- Add a new well for ensuring water availability at Cottonwood Creek AP without dewatering the stream. ($100,000)
- Stop log replacement for Lake # 3 at LFH. ($1,500)
- Expand adult trap and holding area. Engineering and const. ($50,000 - $150,000)
- Grade and gravel acclimation pond sides and access areas. ($4,500)

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Hatchery-origin steelhead (Wallowa Stock) captured in the Cottonwood Creek adult trap will be used for the hatchery broodstock, or eggs can also be provided from ODFW if they are of Wallowa Stock origin (Wallowa Hatchery or Big Canyon Facility).

6.2) Supporting information.

6.2.1) History.

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

6.2.2) Annual size.

The proposed use of 114 females (half spawned) captured in the Cottonwood Creek Adult Trap will provide program needs. Up to 5-10 additional females may also be spawned for extra eggs in case IHNV is detected in the broodstock. If more eggs are available then needed, an appropriate percent of eggs from all IHNV negative females will be used to provide the greatest genetic variation in the program. Eggs in excess of program needs will be used for fry plants into area lakes.

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

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

6.2.4) Genetic or ecological differences.

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

6.2.5) Reasons for choosing.

The Wallowa Stock steelhead has been propagated over many generations by WDFW and ODFW (Wallowa Hatchery). The stock performance indicates that it is highly successful at producing harvestable fish for the program. Straying continues to be a problem in some mid-Columbia River tributaries and may require modification to (early returning), or replacement of this stock in the future.

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.

Natural origin fish are not collected for broodstock in this program. It is WDFW's intent that all hatchery fish returning to Cottonwood Creek be captured and either used for broodstock or sacrificed. This lessens the likelihood that they wander to another stream with ESA listed summer steelhead, thereby lessening the genetic or ecological effects.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

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

7.3) Identity.

Currently, 100% of the Wallowa stock steelhead are marked with an adipose fin clip for harvest management. In addition, about 20,000 are coded-wire tagged and the left ventral fin is removed. All of these marks allow for external identification upon adult return for fishery and broodstock purposes. Further, this will allow for a more complete evaluation of the success and/or failure of the program in the future and assess stray rates into other river basins.

7.4) Proposed number to be collected:

7.4.1) Program adult broodstock goal :

Short Term: Minimum of 228 Adults (114 females (half spawned), 114 males). This goal is consistent with HRT recommendations to have a minimum of 500 spawners in the broodstock over a generation (3 years).

Long Term: Unknown, could be reduced depending on survival and the ability of the program to maintain the mitigation goal as set forth under the LSRCP program. The broodstock could also be changed to an early arriving variant of the Wallowa fish, or be replaced with another stock completely.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: (See Table 10.)

Table 10. Trapped and spawned adults, and eggs collected from summer steelhead (Wallowa Stock only – does not include natural origin adults) at Cottonwood Creek Adult Trap from 1992-2010.

Brood Year	Trapped Adults Female	Male	Total	Spawned Adults Female	Male	Effective Population Size[d]	Eggs Collected
1992	169	228	397	113	225	300	558,437
1993	198	164	362	96	206	262	533,995
1994	212	96	308	118	204	299	644,886
1995	281	169	450	99	61	151	511,283
1996	317	113	430	124	109	232	601,979
1997	189	44	233	92	92	184	536,723
1998	383	337	720	173	164	337	868,973
1999	130	146	276	126	119	245	601,699
2000	157	131	288	105	119	223	523,011
2001	422	327	749	94	108	201	504,182
2002	1,084	628	1,712	82	87	169	422,441
2003	322	158	480	65	65	130	254,418
2004	495	349	844	68	105	165	318,430
2005	453	481	934	20	20		88,177
2005 [A]	---	---		40	40	120	194,498
2006	1,376	630	2,006	120	115	235	316,059
2007	313	245	558	81	81	162	265,538
2008	946	551	1,497	73	73	146	275,958
2009	1,329	984	2,313	47	48		159,753
2009 [B]	---	---	---	8	8	111	43,810
2010 [C]	858	551	1,409	48	56	103	244,487

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

[B] High incidence of IHNV in the broodstock forced us to acquire eggs from ODFW's Wallowa hatchery.

[C] Low water in 2010 prevented fish from reaching the trap area. All broodstock were taken from ODFW Big Canyon Facility. Once juveniles were released from the Acclimation Pond, more water was available and 1,407 adults were trapped.

[d] Effective population size (Ne) was calculated using Equation 1 (Section 8.2) .

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

In the past, generally all unspawned fish trapped at the adult trap were passed upstream to spawn naturally, regardless of origin. The exceptions were fish that contained coded-wire tags or other tags that were for research/monitoring efforts. This decision was based on the idea that it would be better to have the excess hatchery fish concentrated in one spawning stream, rather than having them stray more into other local streams where natural fish may still be present. Beginning in 2010, only natural origin (unmarked) fish were passed upstream in Cottonwood Creek. All marked hatchery fish were removed at the trap, hauled back to LFH, and buried. Food banks and local tribes were contacted to see if they were interested in having some of the fish, but neither were interested. This plan will continue into the future.

7.6) Fish transportation and holding methods.

Beginning in 2010, Captured adults for broodstock are to be transported from Cottonwood to LFH in a 1,500 gal hatchery tank truck equipped with water aeration, circulation and supplemental oxygen. Broodstock will be held in the steelhead broodstock holding raceways as described in the LFH stock HGMP. Fish will be given therapeutic treatments of formalin every other day to control fungus.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock will be held temporarily in the holding area of Cottonwood Creek. As such, treatments for fungal infections cannot be applied to the holding broodstock while there, but will be once they have been transported to LFH. The number of adults kept at any one time is limited by the capacity of the holding area. WDFW has determined that the maximum number of adults in the holding area is 300 fish. When the 300 fish have been captured, hatchery staff will send over the transport truck and they will be hauled back to LFH. Once broodstock needs are met, all other hatchery fish will be retained, and will be sacrificed as needed to not exceed the 300 fish limit.

7.8) Disposition of carcasses.

All fish spawned for the hatchery broodstock are kill spawned. Males may be live spawned if a shortage exists. Live spawned males will be operculum punched to identify them in future spawns. In the past, many of the spawned carcasses had been placed into upper Cottonwood Creek watershed for nutrient enhancement, or taken back to LFH and buried. In addition, some fish not used for spawning are killed outright to obtain coded-wire tag information from study groups.

To maximize the beneficial uses of any fish that return to the project area, which are not used for broodstock, or harvest, specific priorities and objectives are:

- Distribute excess fish to local food banks (amount based on demand and logistical feasibility)
- Distribute excess fish to tribal members upon request (amount based on demand)
- Euthanize excess fish and either distribute carcasses for nutrient enhancement or bury the carcasses if needed to prevent the spread of waterborne fish diseases (all fish not utilized by a or b, above).

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.

WDFW is proposing to continue trapping and removing hatchery adults in Cottonwood Creek to lessen the potential negative effects if these fish spawned in other adjacent tributaries. Further by passing only natural fish upstream of the Cottonwood Creek trap, it is believed that eventually the natural fish will become adapted to this location and effectively result in a production unit of natural steelhead that will make the most efficient use of available rearing habitat as possible. Further, the natural origin fish from Cottonwood Creek that stray into other locations occupied by the Lower Grande Ronde population are expected to have less adverse impact given that most will be offspring of natural and not hatchery fish.

SECTION 8. MATING

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

8.1) Selection method.

All males and females that have been collected for broodstock will be examined weekly during the spawning season to determine ripeness. Fish will be selected at random during the sorting process. Approximately 500 hatchery fish (females + males) will be trapped from Cottonwood Creek in March and April, and will serve as the population from which spawners will be selected. Only some of the ripe fish will be spawned (see above goals) and the remaining will be euthanized.

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

8.2) Matings.

One half the eggs from a 1x1 cross mating (1 female to 1 male) will be used when possible to ensure the highest likelihood of fertilization, increase genetic diversity, and to increase the effective population size given the relatively small size of the program. If minimum program needs are met, the effective population size per year will be 228; with effective population size per generation of 684, as derived from the following formula:

Equation 1) $N_e = 4(N_M)(N_F) / (N_M + N_F) = 4(114)(114) / 228 = 228$ adults $N_b=684$

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

8.3) Fertilization.

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

Hatchery personnel have recently questioned two parts of the fertilization process; 1) should the ovarian fluid be drained, and 2) should more time be allowed for the semen to complete fertilization. It was believed that one or both of these may be contributing to the poor green-egg to shock loss that has been documented for both the Wallowa and LFH stocks. As such, an experiment was conducted in 2003 with the LFH stock of fish to determine if changes in the fertilization/spawning process would increase fertilization success. Results from the LFH experiment were presented (Bumgarner et al 2003) and determined future fertilization procedures for all steelhead stocks at LFC. Current fertilization protocols are as follows: 1) Ovarian fluid is not immediately drained, 2) semen is added and mixed, and allowed to sit on the eggs for approximately 1 minute, 3) following the minute, a ½ cup of water is added to the eggs and semen for final fertilization, 4) Eggs and semen and then poured into a colander and drained, placed back into a buck and filled with the buffered iodine solution (see below). We continue to evaluate the success of fertilization following this experiment in 2003. Green egg to eyed-egg survival rates have appeared to improve with mortality from green egg to eye-up has decreased from 25% to only 5%. As such, the number of males and females required to meet broodstock (presented in this HGMP) have been altered based on the most recent survival data from the last few years.

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

8.4) Cryopreserved gametes.

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

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

scheme.

Broodstock collection protocol will ensure that adults represent a proportional temporal distribution of the run. The 1x1 factorial mating scheme, and the use of partial lots of females will reduce the risk of loss of within-population genetic diversity for this relatively small steelhead production program.

SECTION 9. INCUBATION AND REARING

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

9.1) Incubation:

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

LFH staff collects Wallowa stock steelhead eggs annually. Following is the egg survival information at LFH for the 10 most recent brood years of Wallowa stock steelhead collected from Cottonwood (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 Wallowa Stock, so figures may not represent true egg survival, but correctly depict survival under existing hatchery management protocol). Current hatchery protocols call for 75% survival from green egg to fry, and 75% survival from fry to smolt stage. Data presented in Table 11 would indicate that these goals have generally been met for the Wallowa Stock.

Table 11. Numbers of males and females spawned, eggs taken, and estimated survival by life stage of Wallowa stock summer steelhead spawned at Cottonwood Creek and transferred to LFH, 1992 to 2009 brood years.

BY	Spawned Female	Spawned Male	Eggs taken	Eggs retained [a]	Percent retained	Fry	Egg to fry survival	Smolts	Fry to smolt survival	Egg to smolt survival
1992	113	225	558,437	447,117	80.1	419,842	93.9	341,899	81.4	80.5
1993	96	206	533,995	392,595	73.5	369,039	94.0	322,508	87.4	82.1
1994	118	204	644,886	366,115	56.8	302,397	82.6	256,233	84.7	70.0
1995	99	61	511,283	335,489	65.6	321,050	95.7	263,449	82.0	78.5
1996	124	109	301,979	430,394	71.5	447,569	100.0	274,886	64.1	63.8
1997	92	92	536,723	401,270	74.8	317,590	79.1	252,211	79.4	62.9
1998	173	164	868,973	479,606	55.2	475,181	99.1	268,803 [b]	83.2	82.4
1999	126	116	601,699	389,664	64.8	377,974	97.0	274,146 [c]	84.6	82.1
2000	105	116	523,011	322,238	61.6	312,570	97.0	215,584 [d]	85.1	82.5
2001	94	108	504,182	381,427	75.7	253,743	66.5	182,722	72.0	47.9
2002	82	87	422,441	319,479	75.6	261,335	81.8	236,627	90.5	74.1
2003	65	65	301,090	215,097	71.4	206,062	95.8	137,915 [e]	100.0	96.9
2004	68	105	318,430	290,391	91.2	286,536	98.7	150,442 [f]	100.0	100.0
2005	60	70	282,675	274,586	97.1	273,608	96.8	169,390	61.9 [g]	61.7
2006	120	115	316,059	290,903	92.0	287,761	98.9	159,242 [h]	91.0	93.5
2007	106	97	340,589	242,710	71.3	233,704	96.3	175,961	75.3	72.5
2008	85	85	275,958	214,695	77.8	213,319	99.4	170,232	79.8	79.3
2009 [i]	113	113	482,500	172,367	37.2	171,194	99.3	163,197	95.3	94.7
2010	48	56	244,487	212,618	87.0					

[a] The number of eggs retained includes all losses from green egg to eye up (mortality and eggs destroyed due to IHNV).
[b] A total of 126,361 fry/parr/fingerlings were planted into area lakes from over production.
[c] A total of 45,824 fry/parr/fingerlings were planted into area lakes from over production.
[d] Program production was changed during the rearing cycle, a total of 50,270 fish were planted in to area lakes to support the rainbow trout catchable program.
[e] An estimated 70,455 fry/parr/fingerlings were planted into area lakes from overproduction, that created a fry-smolt survival of >100%.
[f] An estimated 146,481 fry/parr/fingerlings were planted into area lakes from overproduction, that created a fry-smolt and egg-smolt survival of >100%.
[g] High fry to smolt loss attributed to excessive bird predation at LFH
[h] A total of 112,751 fry/parr/fingerlings were planted into area lakes from over production.
[i] A high incidence of IHNV required the large egg take. In the end only 55 females and 56 males were spawned to produce the egg retention totals. Egg retention totals also include 43,810 eggs collected from ODFW's Wallowa Hatchery.

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

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

9.1.3) Loading densities applied during incubation.

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

9.1.4) Incubation conditions.

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

9.1.5) Ponding.

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

9.1.6) Fish health maintenance and monitoring.

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

9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.

Not Applicable – Fish in this program are not listed.

9.2) Rearing:

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

See Table 11 Above.

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

LFH raceway rearing density index criteria for steelhead will not exceed 0.26 lbs fish/ft^3. For steelhead that are reared in the large rearing ponds at LFH or in the acclimation ponds, densities can be as low as 10% of maximum.

9.2.3) Fish rearing conditions

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

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available. See Table 12**.**

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

See below Table 12.

9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing .

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

Table 12. Growth and size of Wallowa Stock Steelhead at LFH for the 1999-2001 Brood Years.

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

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

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

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

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

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

“NATURES” rearing concepts will not directly be applied to the Wallowa Stock Program. However, certain aspects of the “NATURES” techniques are used by default at LFH. For instance, the concrete rearing raceways are old enough that the walls and bottoms are of nearly natural coloration (after an algae cover develops) and texture, and promote natural looking fish. Once the fish are removed from the raceways, they are placed in the large semi-natural rearing ponds at LFH, which greatly reduces density, and also lessens the incidence of fin erosion that is typical of hatchery steelhead reared to full-term smolts in traditional hatchery raceways. The large ponds at LFH are constructed with rock banks, and produce natural feed. While the fish must still come to the surface to feed, avian predators at LFH add some learned avoidance behavior to the fish in the rearing ponds as well. At Cottonwood AP, acclimation occurs in a semi-natural pond, with rock sides and natural feed present in the water supply.

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

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

SECTION 10. RELEASE

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

10.1) Proposed fish release levels

Refer to Table 3 (Section 1.11.2) that shows proposed WDFW Wallowa Stock smolt releases (goal and maximum) into the Grande Ronde River from Cottonwood AP.

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

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

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

The number of Wallowa Stock steelhead released into the Washington portion of the Grande Ronde River has varied since program inception (Table 3). Prior to 1992, WDFW had to rely on ODFW for eggs to meet program needs. Release goals were reduced in 2001 and 2004 due to ESA listing and concerns for natural origin Snake River Summer Steelhead. Release goals will again be adjusted in 2011 to reflect WDFW preferred alternative for this program.

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

All Wallowa Stock smolts are allowed the opportunity to volitionally emigrate from Cottonwood AP, but eventually all fish are forced from the pond. Volitional releases may begin as early as 25 March, and continue through 10 May. Yearly adjustments may occur based on water conditions, smolt size, and other environmental conditions. Any proposed releases occurring earlier than stated above will be coordinated with the co-managers and NOAA Fisheries.

10.5) Fish transportation procedures, if applicable.

Juvenile fish are transported from LFH to Cottonwood AP during February each year. Transportation time is about three hours, but depends on road conditions. Fish are removed from the lakes by drawn down of the rearing pond into a release structure. Fish are then pumped from the release structure directly into the transportation truck. The 5,000 gallon transportation truck is equipped with oxygen and aerators.

10.6) Acclimation procedures.

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

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

Since this program is for Mitigation / Isolated Harvest, 100% of the smolts released are marked so they can easily be identified in the fishery. Adipose fins are removed from 100% of the fish prior to release. In addition, ~20,000 are left ventral fin clipped and coded-wire tagged for evaluation purposes. Tagged fish allow for expanded harvest estimates both in the Grande Ronde fishery and fisheries within the Snake and Columbia rivers, and to document stray rates. In more recent years, we have put in 4,000-6,000 PIT tags to allow an additional method of estimating total adult returns to the project area.

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

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

10.0) Fish health certification procedures applied pre-release.

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

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

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

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

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

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

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

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

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

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

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Table 13. Monitoring and Evaluation performance measures and their status for Wallowa stock steelhead released from Cottonwood AP into the Grande Ronde River.

Performance Measure		Definition	Performance Measures Currently Completed (Yes, No, Partial)
Abundance	Adult Escapement to Tributary	Number of adults that have escaped to a certain point (i.e. - mouth of stream). Population based measure. Calculated with mark recapture methods from weir data adjusted for redds located downstream of weirs and in tributaries, and maximum net upstream approach for DIDSON and underwater video monitoring. Provides total escapement and wild only escapement. [Assumes tributary harvest is accounted for]. Uses TRT population definition where available	YES
	Hatchery Fraction	Percent of fish on the spawning ground that originated from a hatchery. Uses weir data to determine number of fish released above weir and calculate.	YES
	Ocean/Mainstem Harvest	Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin.	PARTIAL hatchery fish only
	Harvest Abundance in Tributary	Number of fish caught in tributary (tribal, sport, or commercial) by hatchery and natural origin.	YES
	Run Prediction	This will not be in the raw or summarized performance database.	NO
Survival – Productivity	Smolt-to-Adult Return Rate	The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior.) SAR estimate with harvest. Accounts for all harvest below stream. The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam : $Var\left(\frac{X}{Y}\right)=\left(\frac{EX}{EY}\right)^2\cdot\left(\frac{Var(Y)}{(EY)^2}\right)$	YES
	Progeny-per- Parent Ratio	Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Estimates of this ratio for fish spawning and produced by the natural environment must be adjusted to account for the confounding effect of spawner density on this metric Two variants calculated: 1) escapement, and 2) spawners.	YES
	Juvenile Survival to first mainstem dam	Life stage survival (parr, pre-smolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary.	YES
	Juvenile Survival to all Mainstem Dams	*Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s)*, which is estimated using PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tags are available from the stream. Using tags from all life stages combined we will calculate (SURPH) the survival to all mainstem dams.	YES
	Post-release Survival	Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e. screw traps) are used to calculate survival estimates.	YES
	Stray Rate (percentage)	Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir.	PARTIAL
Life History	Age Structure	Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.	YES hatchery fish only
	Age–at–Return	Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries.	YES hatchery fish only
	Size-at-Return	Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only.	YES hatchery fish only

	Size-at-Emigration	Fork length (mm) and weight (g) are representatively collected weekly from natural juveniles captured in emigration traps. Mean fork length and variance for all samples within a life stage-specific emigration period are generated (mean length by week then averaged by life stage). For entire juvenile abundance leaving a weighted mean (by life stage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery.	YES hatchery fish only
	Percent Females (adults)	The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish.	YES
	Mainstem Arrival Timing (Lower Granite)	Unique detections of juvenile PIT-tagged fish at first mainstem dam are used to estimate migration timing for natural and hatchery origin tag groups by life stage. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by life stage divided by tributary abundance estimate by life stage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.	YES
In-Hatchery Measures	Hatchery Production Abundance	The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Method dependent upon marking program (census obtained when 100% are marked).	YES
	In-hatchery Life Stage Survival	In-hatchery survival is calculated during early life history stages of hatchery-origin juvenile Chinook. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CWT or VIE tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts. Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, pre-smolt, parr, etc.).	YES
	Size-at-Release	Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, pre-smolt, parr, etc.).	YES
	Juvenile Condition Factor	Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).	YES
	Fecundity by Age	The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter.	YES
	Spawn Timing	Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates.	YES
	Hatchery Broodstock Fraction	Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality.	YES
	Hatchery Broodstock Prespawn Mortality	Percent of adults that die while retained in the hatchery, but before spawning.	YES
	In-Hatchery Juvenile Disease Monitoring	Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock	PARITAL
	Length of Broodstock Spawner	Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging.	YES
	Prerelease Mark Retention	Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent"	YES
	Prerelease Tag Retention	Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks).	YES
	Hatchery Release Timing	Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases).	YES
	Chemical Water Quality	Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities.	PARTIAL
	Water Temperature	Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices.	PARTIAL

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

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

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

1. Adult trapping facilities are monitored daily as necessary to prevent injury and unnecessary delay or any natural origin fish. In addition, all marked fish not needed for broodstock will be removed from Cottonwood Creek and euthanized to prevent them from straying unnecessarily into other small nearby tributaries.

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

3. Expanded monitoring of hatchery fish straying into other Grande Ronde tributaries has been proposed. To minimize the effects of this monitoring, PIT tag arrays to identify the presence of stray hatchery fish will be used where possible. Where weirs/traps are used, operational protocols to minimize fish delay and handling stress will be invoked.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing LSRCP program research is designed to:

- Document hatchery rearing and release activities and subsequent adult returns.
- Determine success of the program in meeting mitigation goals and adult returns to the Grande Ronde River, Lower Granite Dam, or the Snake River Basin.
- Provide management recommendations aimed at improving program effectiveness and efficiency.
- Provide management recommendations aimed at reducing program impacts on listed fish.

12.2) Cooperating and funding agencies.

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

Oregon Department of Fish and Wildlife

12.3) Principle investigator or project supervisor and staff.

Joe Bumgarner Jerry Dedloff Mark Schuck Glen Mendel

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

Same as described in Section 2.

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

1) *Monitoring hatchery/wild ratios in natural spawning streams* - Adult steelhead will be captured and enumerated at the existing Cottonwood Creek Adult Trap. See section 2.2.3. However, the long-term goal is to estimate the proportion of hatchery fish in the overall Lower Grande Ronde population. Cottonwood Creek represents a very small portion of the total spawning habitat for this population and therefore a significant geographical expansion in monitoring efforts would be needed to estimate the proportion of hatchery fish for the entire Lower Grande Ronde population. Monitoring may be expanded under BPA required BiOp measures to assess hatchery effects. Portable weirs and traps, and PIT detection arrays will be used to assess the extent and degree of hatchery strays entering other Grande Ronde tributaries (see Appendix 2).

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

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

1. September – May
2. September-April

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

Handling of listed fish will generally be restricted to enumeration and release at the site of capture. If handling involves more than determining species and enumeration i.e., measurement, marking or tissue sampling, fish will be anesthetized before the procedure and allowed to recover before release.

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

Injury due to capture, marking and tissue sampling is inevitable. This mortality in addition to occasional direct loss due to capture and handling account for the lethal take estimates that may occur during monitoring and evaluation activities.

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

See Appendix 2.

12.10) Alternative methods to achieve project objectives.

NA

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

NA

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.

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

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

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

As of August 5, 2009, there are 44 separate listings of Federal Status endangered/threatened species within the State of Washington (http://ecos.fws.gov), 58 listings in Oregon, and 22 listings in Idaho. In the lists below (Tables 1-3), are all non-salmonid listed species and their current status ratings. Of the following species listed only the plant species Spalding's Catchfly is confirmed to be found in the area where the Snake River Stock production program occurs (i.e. Snake River, Grande Ronde River, LFH). Species such as the Gray Wolf, the Grizzly Bear, the Canadian Lynx, and the northern spotted owl were once likely found in the Grande Ronde River basin, but their current existence is not verified. The geographic distributions of the other listed species were generally limited to the Cascade Mountain Range, the Selkirk Mountains in NE Washington, the Willamette Valley (Oregon), Puget Sound and Coastal areas.

Table 1. 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	Curlew, Eskimo (*Numenius borealis*)
Endangered	Deer, Columbian white-tailed (*Odocoileus virginianus leucurus*)
Threatened	Lynx, Canada (lower 48 States DPS) (*Lynx canadensis*)
Threatened	Murrelet, marbled (CA, OR, WA) (*Brachyramphus marmoratus marmoratus*)
Threatened	Otter, southern sea except where EXPN (*Enhydra lutris nereis*)
Threatened	Owl, northern spotted (*Strix occidentalis caurina*)
Endangered	Pelican, brown (*Pelecanus occidentalis*)
Threatened	Plover, western snowy (Pacific coastal pop.) (*Charadrius alexandrinus nivosus*)
Endangered	Rabbit, pygmy Columbia Basin DPS (*Brachylagus idahoensis*)
Threatened	Sea turtle, green (*Chelonia mydas*)
Endangered	Sea turtle, leatherback (*Dermochelys coriacea*)
Threatened	Sea-lion, Steller eastern pop. (*Eumetopias jubatus*)
Endangered	Sea-lion, Steller western pop. (*Eumetopias jubatus*)
Endangered	Whale, humpback (*Megaptera novaeangliae*)
Endangered	Whale, killer Southern Resident DPS (*Orchinus orca*)
Endangered	Wolf, gray (lower 48 states, except where delisted and where EXPN) (*Canis lupus*)
	PLANTS
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*)

Table 2. List of current ESA listed species (animal and plant) listed and occurring in the State of Oregon.	
Status Rating	**Species**
ANIMALS	
Endangered	Albatross, short-tailed (*Phoebastria (=Diomedea) albatrus*)
Threatened	Bear, grizzly (*Ursus arctos horribilis*)
Endangered	Butterfly, Fender’s blue (*Icaricia icarioides fenderi*)
Threatened	Butterfly, Oregon silverspot (*Speyeria zerene hippolyta*)
Endangered	Condor, California U.S.A. only (*Gymnogyps californianus*)
Endangered	Curlew, Eskimo (*Numenius borealis*)
Threatened	Lynx, Canada (lower 48 States DPS) (*Lynx canadensis*)
Threatened	Murrelet, marbled (CA, OR, WA) (*Brachyramphus marmoratus marmoratus*)
Threatened	Otter, southern sea except where EXPN (*Enhydra lutris nereis*)
Threatened	Owl, northern spotted (*Strix occidentalis caurina*)
Endangered	Pelican, brown (*Pelecanus occidentalis*)
Threatened	Plover, western snowy (Pacific coastal pop.) (*Charadrius alexandrinus nivosus*)
Endangered	Rabbit, pygmy Columbia Basin DPS (*Brachylagus idahoensis*)
Threatened	Sea turtle, green (*Chelonia mydas*)
Endangered	Sea turtle, leatherback (*Dermochelys coriacea*)
Threatened	Sea turtle, loggerhead (*Caretta caretta*)
Threatened	Sea-lion, Steller eastern pop. (*Eumetopias jubatus*)
Endangered	Sea-lion, Steller western pop. (*Eumetopias jubatus*)
Endangered	Whale, humpback (*Megaptera novaeangliae*)
Endangered	Whale, killer Southern Resident DPS (*Orchinus orca*)
Endangered	Wolf, gray (lower 48 states, except where delisted and where EXPN) (*Canis lupus*)
PLANTS	
Threatened	Paintbrush, golden (*Castilleja levisecta*)
Endangered	Rock-cress, McDonald’s (*Arabis macdonaldiana*)
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*)
Threatened	Catchfly, Spalding's (*Silene spaldingii*)
Endangered	Daisy, Willamette (*Erigeron decumbens var.decumbens*)
Threatened	Four-o’clock, MacFarlane’s (*Mirabilis macfarlanei*)
Endangered	Fritillary, Gentner’s (*Fritillaria gentneri*)
Endangered	Lily, Western (*Lilium occidentale*)
Endangered	Lomatium, Cook’s (*Lomatium cookii*)
Endangered	Meadowfoam, large-flowered woolly (*Limnanthes floccosa ssp. Grandiflora*)
Endangered	Milk-vetch, Applegate’s (*Astragalus applegatei*)
Endangered	Popcornflower, rough (*Plagiobothrys hirtus*)
Threatened	Thelypody, Howell’s spectacular (*Thelypodium howellii spectabilis*)
Endangered	Wire-lettuce, Malheur (*Stephanomeria malheurensis*)

Table 3. List of current ESA listed species (animal and plant) listed and occurring within the State of Idaho.	
Status Rating	**Species**
ANIMALS	
Threatened	Bear, grizzly (*Ursus arctos horribilis*)
Endangered	Caribou, woodland (ID, WA, B.C.) (*Rangifer tarandus caribou*)
Endangered	Curlew, Eskimo (*Numenius borealis*)Limpet, Banbury Springs (*Lanx sp*.)
Threatened	Lynx, Canada (lower 48 States DPS) (*Lynx canadensis*)
Endangered	Rabbit, pygmy Columbia Basin DPS (*Brachylagus idahoensis*)
Threatened	Snail, Bliss Rapids (*Taylorconcha serpenticola*)
Endangered	Snail, Snake River physa (*Physa natricina*)
Endangered	Snail, Utah valvata (*Valvata utahensis*)
Endangered	Springsnail, Bruneau Hot (*Pyrgulopsis bruneauensis*)
Threatened	Squirrel, northern Idaho ground (*Spermophilus brunneus brunneus*)
Endangered	Wolf, gray (lower 48 states, except where delisted and where EXPN) (*Canis lupus*)
PLANTS	
Threatened	Howellia, water (*Howellia aquatilis*)
Threatened	Catchfly, Spalding's (*Silene spaldingii*)
Threatened	Four-o'clock, MacFarlane's (*Mirabilis macfarlanei*)
Threatened	Ladies'-tresses, Ute (*Spiranthes diluvialis*)

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

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) <u>Description of non-anadromous salmonid species and habitat that may be affected by hatchery program.</u>

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

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

Site-specific findings in Franklin County not available.

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

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 mitigation program will not be altered, which would be the only source of "take" possible to the listed species. Interactions with the fall chinook will not occur.

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

None (past or projected future)

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

Operation of the Adult Trap or incubation/rearing areas at LFH will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at the LFH adult trap or hatchery facility. Activities at LFH all take place on existing hatchery grounds. No new construction activities are planned for the program that could impact the listed species. Effluent from the hatchery 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.

Ecological/biological - competition, behavioral, etc.

Not Applicable - Non-overlapping habitats between the fall chinook and the flower.

Predation -

Not Applicable - Hatchery fall chinook do not prey on the flower.

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

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

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

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

15.4 Actions taken to mitigate for potential effects.

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

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

15.5 References

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

Listed species affected: **Summer Steelhead** **ESU/Population:** **Snake River / Grande Ronde River** **Activity:** **Broodstock Collection, spawning, rearing and releases, and Genetic Monitoring of adult population**				
Location of hatchery activity: **Cottonwood Adult Trap,** **Dates of activity:** **March-May** **Hatchery program operator:** **Jon Lovrak**				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	50	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	2000	0	0
Capture, handle, tag/mark/tissue sample, and released d)	0	0	100	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	20	5	0
Other Take (specify) h)	0	0	0	0

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

Instructions:

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

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

Listed species affected: _Summer Steelhead_ ESU/Population: Snake River / Grande Ronde River Activity: None Identified at this time

Location of hatchery activity: Grande Ronde River (Various Tributaries in the State of Washington) Dates of activity: None identified at this time
Research/ Monitoring / Evaluation program operator: Joe Bumgarner

Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	100
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	0	400	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	0	20	0
Other Take (specify) h)	0	0	0	0

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

Instructions:

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