United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
Umatilla Agency
Post Office Box 520
Pendleton, OR 97801

TAKE PRIDE IN AMERICA

JUL 15 2011

Mr. Rob Jones
Salmon Management Division
National Marine Fisheries Service
1201 NE Lloyd Blvd. Suite 1100
Portland, OR 97232

Dear Mr. Jones:

The Confederated Tribes of the Umatilla Indian Reservation, through the Bureau of Indian Affairs, submits this Upper Grande Ronde Spring Chinook Salmon Hatchery and Genetic Management Plan (HGMP). This HGMP was completed in consultation and coordination with program co-managers and is consistent with the provisions of the 2008-2017 US v. Oregon Management Agreement.

This HGMP is being submitted for ESA consultation on a Section 10(a)(1)(A) permit for artificial propagation purposes to enhance the survival of ESA listed Snake River spring/summer chinook salmon. Activities associated with this artificial propagation program were previously permitted through Section 10 permit #1011, and through annual Section 4D letters, NMFS file #1372.

Please contact the CTUIR's technical representative, Brian Zimmerman, at (541) 429-7285 should you have any questions regarding this request. We appreciate your assistance and prompt attention to this request.

Sincerely,

Superintendent

Enclosure

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESCSP)
Species or Hatchery Stock:	Snake River Spring/Summer Chinook Salmon Upper Grande Ronde River stock
Agency/Operator:	Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
Watershed and Region:	Grande Ronde River Basin
Date Submitted:	
Date Last Updated:	June 2011

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Grande Ronde Endemic Spring Chinook Salmon Supplementation Program (GRESCSP).

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

Upper Grande Ronde River Spring/Summer Chinook Salmon, *Oncorhynchus tshawytscha*
ESA status: Threatened (Snake River spring/summer).
Upper Grande Ronde River Population- (stock 80)

1.3) Responsible organization and individuals

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Name (and title): Roger Elmore, Manager, Lookingglass Hatchery
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Name (and title): Timothy Hoffnagle, LSRCP Chinook Salmon Project Leader
Agency or Tribe: Oregon Department of Fish and Wildlife
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:
Oregon Department of Fish and Wildlife (ODFW) – Co-manager - Operation of Lookingglass, Bonneville, Oxbow, and Wallowa hatcheries providing for adult holding and spawning, incubation, and rearing of Upper Grande Ronde River captive brood and conventional endemic stocks along with associated monitoring and evaluation..

Nez Perce Tribe (NPT) – Co-manager – Operation of acclimation and adult collection facilities on the Lostine River.

Bonneville Power Administration (BPA) – Funding – acclimation and adult collection as well as the captive broodstock program.

U.S. Fish and Wildlife Service (USFWS) – Funding - Provides funding of Lookingglass Hatchery for rearing of Upper Grande Ronde River Conventional and Captive broodstock production under the Lower Snake River Compensation Program (LSRCP).

National Marine Fisheries Service (NMFS) – ESA permitting.

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

LSRCP--The program is part of the federally mandated LSRCP mitigation program funded through the US Fish and Wildlife Service and designed to mitigate for fish losses at the Lower Snake River dams. The LSRCP spring/summer Chinook program in Northeast Oregon includes Lookingglass Hatchery, integrated with the Grande Ronde Basin Chinook program, Imnaha Basin program, and Safety Net program (SNP). Hatchery Coordinator, Hatchery Manager, Supervisor, 4 hatchery technician positions, one three month technician position shared with Wallowa Hatchery, one Facilities Operations Specialist, and 2 seasonal laborer positions constitute the staffing at Lookingglass Hatchery. Annual operation and maintenance costs for the Upper Grande Ronde River portion of the FY 2007 program are estimated at $170,000.

***BPA* --** BPA funds CTUIR to operate the Upper Grande Ronde River as well as the Catherine Creek Endemic Program (Conventional Broodstock) acclimation and adult collection facilities to supplement natural spring Chinook salmon populations in these areas. Operations and maintenance program staff is 3 full time and 4 seasonal CTUIR employees. Annual operation and maintenance costs are estimated at $550,251 (2010 budget). BPA also funds monitoring and evaluation staff, 3 full time and 2 seasonal, with annual costs estimated at $197,434 (2010 budget). Funds estimated to be spent on the

Upper Grande Ronde for both operations and maintenance and monitoring and evaluation is estimated at $367,842.

BPA also funds a captive broodstock component of the program. Captive brood was a conservation measure initiated in three subbasins within the Grande Ronde Basin including the Upper Grande Ronde River in response to severely declining abundance of spring Chinook salmon. The program was initiated in 1995 using parr collected from BY1994. Juveniles were reared to maturity, spawned, and the eggs incorporated into the LSRCP program. The FY2010 budget (ODFW) for the overall Grande Ronde River Captive Broodstock Program is $765,000. This program is being phased out with BY2007, however the Upper Grande Ronde River portion will continue under a Safety Net Program (SNP). The FY2010 budget for the SNP program is $25,000 (ODFW) but will increase significantly as the program reaches full size.

BPA funds ODFW to provide transportation and fish health service associated with the overall endemic program. Total cost is estimated at $70,000.

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

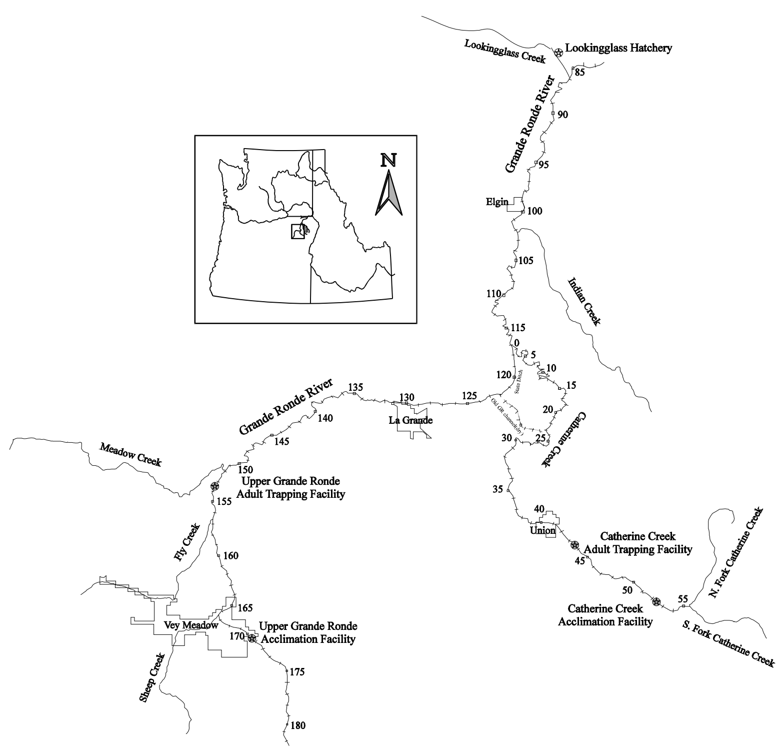
Grande Ronde River Adult Collection Facility:
rkm 247.0, Grande Ronde River (HUC 17060104), Oregon.

Grande Ronde River Juvenile Acclimation Facility:
rkm 319.4, Grande Ronde River (HUC 17060106), Oregon.

Lookingglass Hatchery:
Elgin, Oregon.

Wallowa Hatchery:
Enterprise, Oregon.

Bonneville Hatchery:
Cascade Locks, Oregon.



1.6) Type of program.

Integrated mitigation/recovery program.

1.7) Purpose (Goal) of program.

The goal of this program is the recovery/restoration of spring/summer Chinook salmon in the Upper Grande Ronde River using the indigenous stock and to mitigate for adult spring Chinook lost due to the construction and operation of four hydroelectric dams on the Lower Snake River in Washington. A safety net program is also in place to protect the genetic resource of the Upper Grande Ronde River population. Although a viable population is desirable, it is not necessary to recover the Major Population Group (MPG).

Mitigation goals were established under the LSRCP with the intended purpose 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).

The specific mitigation goal for the Grande Ronde watershed was a return of 5,720 adults based on the release of hatchery smolts into the Lostine, Lookingglass, Catherine Creek and Upper Grande Ronde (USACE 1975). To help achieve this overall goal, 250,000 smolts have been programmed for release into the Upper Grande Ronde population and are expected to survive at a sufficient rate (0.65%) that the number of returning adults will equal 1,625 adults. 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 4:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults needing to be produced.
- The listing of Spring Chinook 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 higher percentage of the annual run returning to the project area.
- The *U.S. v. Oregon* court stipulated Columbia River Fish Management Plan has established specific hatchery production agreements between the states, tribes and federal government. This agreement has substantially diversified the spring Chinook hatchery program by adding new off station releases sites and stocks designed to meet short term conservation objectives.

Program specific goals for the Upper Grande Ronde population include:

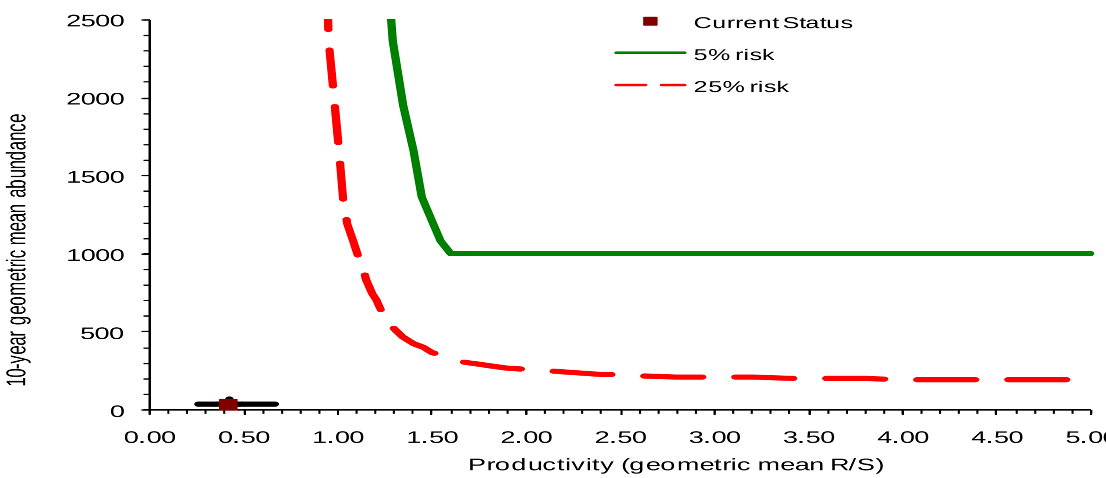
- Restore, maintain, and preserve a natural spawning population in the Upper Grande Ronde River.
- Contribute to the recreational, commercial and tribal fisheries in the mainstem Columbia River consistent with agreed abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
- Reestablish tribal and sport fisheries in the Grande Ronde River Basin.

- Establish an annual supply of brood fish that can provide an egg source capable of meeting mitigation goals. The Upper Grande Ronde River mitigation goal is 250,000 smolts which would require 85 females for broodstock.
- Provide adults that contribute toward meeting the LSRCP mitigation goal for the Grande Ronde River Basin.
- Minimize the impacts of the program on other indigenous fish species.

1.8) Justification for the program.

The LSRCP is a congressionally mandated program pursuant to PL 99-662. The goals of the LSRCP program are to provide adult Chinook for recreational and tribal harvest within the LSRCP mitigation area (Snake River and tributaries above Ice Harbor Dam), and the Columbia River as well as provide for hatchery broodstock. The Upper Grande Ronde River population is at high risk of extinction with the point estimate residing below the 25% risk curve (Figure 1)(ICTRT draft review 2007), and the program utilizes an integrated endemic Chinook hatchery stock in order to provide conservation benefits for the natural population.

Figure 1. Upper Grande Ronde River spring Chinook salmon population abundance and productivity compared to ESU viability curve. Ellipse = 1 SE. Error bars = 90% CI.



Natural origin spawners in the Upper Grande Ronde River spring Chinook salmon population have exhibited a substantial downward trend of 8% per year since 1980 (Table 1). Natural-origin spawning abundance estimates dropped during the early 1980s through 1990. While the Upper Grande Ronde River spawning did peak in 2001-2003, as did many other populations in this ESU, the relative increase during that period was lower than the corresponding levels for most other populations within the ESU. Carcass surveys indicated that a substantial proportion of spawners were of hatchery-origin in this population from 1985-1993, and from 2001-2009 (no hatchery salmon were released into the Upper Grande Ronde River from 1990-1999 - the 1988-1999 brood years). Prior to the 1993 return year, hatchery-origin spawners originated from non-local broodstock releases in the drainage. Assuming that hatchery and natural-origin spawners contribute to production at the same rate, the estimated intrinsic population growth rate over the most recent twenty year period has been well below replacement (0.82, 8% probability of exceeding 1.0). The estimate of population growth rate is sensitive to the assumption regarding relative hatchery effectiveness at the average level of hatchery-origin spawner proportion observed for the Catherine Creek spring/summer Chinook population. Setting the relative hatchery effectiveness value to 0.00, reflecting the opposite extreme assumption, results in an estimated average population growth rate of 0.95.

Table 1. Upper Grande Ronde River spring Chinook salmon population abundance and productivity.

Abundance/Productivity Statistics	**Estimate**	**(Range)**	
Abundance: natural-origin spawners (10-year geometric mean, range)	38	(4-140)	
Proportion: natural-origin spawners (10-year geometric mean, range)	0.52	(0.04-1.00)	
	Estimate	**(90% CI)** [b]	**SE**
sic productivity (20-year R/S, SAR adjusted & delimited) [a]	0.42	(0.27-0.67)	
Productivity (20-year Beverton-Holt fit, SAR adjusted)	0.67		
Trend Statistics (1980-2005)	**Estimate**	**(95% CI)**	**P>1.0**
ln(natural-origin spawner abundance)	0.92	(0.87-0.97)	
Population growth rate (λ): Hatchery effectiveness = **1.0**	0.82	(0.59-1.13)	0.08
Population growth rate (λ): Hatchery effectiveness = **0.0**	0.95	(0.77-1.17)	0.26

a. Delimited productivity for this population excludes recruit/spawner pair associated with parent escapements greater than 209. This is the greatest spawning escapement that has a recruits/spawner value (adjusted for marine survival) greater than 0.95. This approach attempts to remove density dependence effects that may influence the productivity estimate.
b. Lower end of the 90% CI on productivity is used in evaluating the impact of parameter uncertainty on risk.

The Upper Grande Ronde River spring Chinook salmon population does not meet viability criteria and the overall viability rating is considered at HIGH RISK (Figure 2). The abundance and productivity rating is at High Risk**.** The 10-year geometric mean abundance of natural-origin spawners is 38, which is only 3.8 % of the minimum abundance threshold of 1,000. The 20-year geometric mean of estimated intrinsic productivity (0.42 R/S) has the lower end of the 95% confidence interval (CI) near zero. This productivity is significantly lower than the target productivity of 1.58 R/S and is one of the lowest of any population in the Snake River spring/summer Chinook salmon ESU. The spatial structure and diversity rating is at High Risk as a result of numerous moderate and high risk ratings. In particular, the dramatic reduction in spawner distribution contributes substantially to the high risk rating.

Abundance/ Productivity Risk		Spatial Structure/Diversity Risk: Very Low	Low	Moderate	High
	Very Low (<1%)	**HV**	**HV**	**V**	**M**
	Low (1-5%)	**V**	**V**	**V**	**M**
	Moderate (6 – 25%)	**M**	**M**	**M**	**HR**
	High (>25%)	**HR**	**HR**	**HR**	**HR Upper Grande Ronde River**

Figure 2. Upper Grande Ronde River spring Chinook salmon population risk ratings integrated across the four viable salmonid population (VSP) metrics. *Viability Key: HV – Highly Viable; V – Viable; M – Maintained; HR – High Risk; Shaded cells - not meeting viability criteria (darkest cells are at greatest risk).*

1.9) List of program "Performance Standards".

(1) Augment the naturally spawning population in the Upper Grande Ronde River Basin using a conventional and captive hatchery program combination based on the indigenous stock from the Upper Grande Ronde River.
(2) Provide fish to satisfy legally mandated mitigation requirements in a manner which minimizes the risk of adverse effects on the genotype or phenotype of the listed wild populations.
(3) Because the recovery plan for the Grande Ronde/Imnaha MPG does not require the Upper Grande Ronde population to achieve full viable status, the following indicators and performance standards are advisory and not requirements.
(4) Beasley et al. (2008) developed a set of management objectives that we modified for use as performance measures for the program (Table 2).

Table 2. 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 (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. 2.1.2. Hatchery is operated as an integrated program 2.1.3. Hatchery is operated as a conservation 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.
	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, 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.
	2.7. Weir management and broodstock collection are consistent with best management practices for the program type.	2.7.1. Number of fish retained for broodstock for each origin and program are in compliance with AOPs and US vs. OR Management Agreement. 2.7.2. Number of fish of each origin and program released above the weir are in compliance with AOPs and US vs. OR Management Agreement.
RING REGION AL FOR AUGME NTATIO N AND	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.

Category	Standards	Indicators
	3.2. The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored.	3.2.1. Abundance of fish by life stage is monitored annually. 3.2.2. Adult to adult or juvenile to adult survivals are estimated. 3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored. 3.2.5. Ne and patterns of genetic variability are frequently enough to detect changes across generations.
	3.3. 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 natural salmon or other species.	3.3.1. Number of fish release by location estimated and in compliance with AOPs and US vs. OR Management Agreement. 3.3.2. Number if adult returns by release group harvested 3.3.3. Number of non-target species encountered in fisheries for targeted release group.
	3.4. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits.	3.4.1. 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. 3.4.2. Hatchery strays in non-target populations are predominately from in-subbasin releases. 3.4.3. Hatchery strays do not exceed 10% of the abundance of any out-of-basin natural population.
	3.5. Habitat is not a limiting factor for the affected supplemented population at the targeted level of supplementation.	3.5.1. Temporal and spatial trends in habitat capacity relative to spawning and rearing for target population. 3.5.2. Spatial and temporal trends among adult spawners and rearing juvenile fish in the available habitat.
	3.6. Supplementation of natural population with hatchery origin production does not negatively impact the viability of the target population.	3.6.1. Pre- and post-supplementation trends in abundance of fish by life stage is monitored annually. 3.6.2. Pre- and post-supplementation trends in adult to adult or juvenile to adult survivals are estimated. 3.6.3. Temporal and spatial distribution of natural origin and hatchery origin adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored. 3.6.4. Timing of juvenile outmigrations from rearing area and adult returns to spawning areas are monitored.
	3.7. Natural production of target population is maintained or enhanced by supplementation.	3.7.1. Adult progeny per parent (P:P) ratios for hatchery-produced fish significantly exceed those of natural-origin fish. 3.7.2. Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish. 3.7.3. Temporal and spatial distribution of hatchery-origin spawners in nature is similar to that of natural-origin fish. 3.7.4. Productivity of a supplemented population is similar to the natural productivity of the population had it not been supplemented (adjusted for density dependence). 3.7.5. Post-release life stage-specific survival is similar between hatchery and natural-origin population components.
	3.8. Life history characteristics and patterns of genetic diversity and variation within and among natural populations are similar and do not change significantly as a result of hatchery augmentation or supplementation programs.	3.8.1. Adult life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics observed in the natural population prior to hatchery influence. 3.8.2. Juvenile life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics in the natural population those prior to hatchery influence. 3.8.3. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations.
	3.9. Operate hatchery programs so that life history characteristics and genetic diversity of hatchery fish mimic natural fish.	3.9.1. Genetic characteristics of hatchery-origin fish are indistinguishable from natural-origin fish. 3.9.2. Life history characteristics of hatchery-origin adult fish are indistinguishable from natural-origin fish. 3.9.3. Juvenile emigration timing and survival differences between hatchery and natural-origin fish must be minimal.

Category	Standards	Indicators
	3.10. 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 among 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.
	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. Prespawning mortality rates of trapped fish in hatchery or after release.
	4.8. Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.	4.8.1. Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present. 4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition.
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.
	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.

Table 2A. Standardized performance measures and definitions for status and trends and hatchery effectiveness monitoring and the associated performance indicator from Table 2 that it addresses. (modified from Beasley 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
	Fish per Redd	Number of fish (all age classes) divided by the total number of redds. Applied by: The population estimate at a weir site, minus broodstock and mortalities and harvest, divided by the total number of redds located upstream of the weir.	3.2.1, 3.2.3, 3.2.4, 3.6.3, 3.7.3
	Female Spawner per Redd	Number of female spawners in nature divided by the total number of redds.	3.2.1, 3.2.3, 3.2.4, 3.6.3, 3.7.3
	Index of Spawner Abundance - redd counts	Counts of redds in spawning areas in index area(s) (trend), extensive areas, and supplemental areas. Reported as redds and/or redds/km.	3.2.3, 3.2.4, 3.6.3, 3.7.3, 4.6.1
	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 prespawning 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 tributaries (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
	Index of Juvenile Abundance (Density)	Parr abundance estimates using underwater survey methodology are made at pre-established transects. Densities (number per 100 m2) are recorded using protocol described in Thurow (1994). Hanken & Reeves estimator.	3.2.1, 3.5.1, 3.5.2
	Juvenile Emigrant Abundance	We estimate hatchery and natural smolt abundance separately. Hatchery smolt numbers are estimated by the numbers released – numbers at the last census minus mortalities. Natural smolt numbers are estimated using two separate estimates. First, we estimate spring tributary migrants using trap efficiency estimates by mark recapture methods. Additionally, natural parr abundance estimates are calculated (ODFW Early life History Project) and PIT-tagged parr are used to estimate smolt numbers from parr that left the system during the fall and were not available for capture at tributary traps. these two estimates are summed to estimate total natural smolt abundance.	3.2.1, 3.6.1, 3.7.4
	Smolts	Smolt estimates, which result from juvenile emigrant trapping and PIT tagging, are derived by estimating the proportion of the total juvenile abundance estimate at the tributary comprised of each juvenile life stage (parr, presmolt, smolt) that survive to first mainstem dam. It is calculated by multiplying the life stage specific abundance estimate (with standard error) by the life stage specific survival estimate to first mainstem dam (with standard error).	3.2.1, 3.6.1, 3.7.4

Performance Measure		Definition	Related Indicator
	Run Prediction	The number of mature salmon expected to return to a given stream, by origin and age, for a given run year. Methods for estimating these numbers are evolving and use numbers of smolts, ocean condition indices and abundance of a given brood year in the previous run year (e.g., the number of age 3 returns in run year x is used to predict the number of age 4 returns in run year x+1).	2.3.1
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. Calculated for wild and hatchery origin conventional and captive broodstock fish separately. Adult data applied in two ways: 1) SAR estimate to stream using population estimate to stream, 2) adult PIT tag SAR estimate to escapement monitoring site (weirs, LGR), and 3) SAR estimate with harvest. Smolt-toadult survival is calcualted as the number of smotls that left the stream divided by the sum of the adults recovered in all locations (i.e., returns to stream, strays and harvest). *Smolt-to-adult return rates* are generated for four performance periods; tributary to tributary, tributary to first mainstem dam, first mainstem dam to first mainstem dam, and first mainstem dam to tributary. *First mainstem dam to first mainstem dam S*AR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the estimated number of PIT tagged juveniles at first mainstem dam. Variances around the point estimates are calculated as described above. *Tributary to tributary SAR* estimates for natural and hatchery origin fish are calculated using PIT tag technology as well as direct counts of fish returning to the drainage. PIT tag SAR estimates are calculated by dividing the number of PIT tag adults returning to the tributary by the number of PIT tagged juvenile fish migrating from the tributary (by origin). *Tributary to* first mainstem dam SAR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the number of PIT tagged juveniles tagged in the tributary. There is no associated variance around this estimate. The adult detection probabilities at first mainstem dam are near 100 percent.	3.2.1, 3.2.2, 3.7.4
	Recruit-per-Spawner (R:S) Ratio	Adult-to-adult ratio calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of returning adults per parent. Two variants calculated: 1) escapement, and 2) actual spawners.	3.2.1, 3.2.2, 3.7.4
	Juveniles-per-spawner (J/S)(Smolt Equivalents per Redd or female)	Juvenile production to some life stage divided by adult spawner abundance. Derive adult escapement above juvenile trap multiplied by the prespawning mortality estimate. *Juveniles-per-spawner* estimates, or *juvenile abundance (can be various life stages or locations) per redd/female*, is used to index population productivity, since it represents the quantity of juvenile fish resulting from an average redd (total smolts divided by total redds) or female. Several forms of juvenile life stages are applicable. We utilize two measures: 1) juvenile abundance (parr, presmolt, smolt, total abundance) at the tributary mouth, and 2) smolt abundance at first mainstem dam.	3.2.1, 3.2.2, 3.7.4
	Pre-spawn Mortality	Percent of female adults that die after reaching the spawning grounds but before spawning. Calculated as the proportion of "25% spawned" females among the total number of female carcasses sampled. ("25% spawned" = a female that contains 75% of her egg compliment].	3.2.3, 4.5.1
	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,
	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.	3.2.2, 3.6.2, 3.7.5, 3.9.3,

Performance Measure		Definition	Related Indicator
	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,
Distribution	Adult Spawner Spatial Distribution	Extensive area tributary spawner distribution. Target GPS redd locations or reach specific summaries, with information from carcass recoveries to identify hatchery-origin vs. natural-origin spawners across spawning areas within populations. Female carcasses are used because of their greater fidelity to spawning locations.	3.2.3, 3.2.4, 3.6.3, 3.7.3, 4.3.3, 4.6.1
	Stray Rate (percentage)	There are two variants. 1) The percentage of total adults that returned to the Lostine River that originated in (smolted from) populations other than the Lostine river. Calculated as the number of stray salmon in a given stream divided by the total number of adult returns to that stream. 2) The percentage of smolts released from a given location that stray, as adults, into other spawning locations. Calculated as the number of stray salmon from a given brood year divided by the number of smolts for that brood year.	3.4.1, 3.4.2, 3.4.3
	Juvenile Rearing Distribution	Chinook rearing distribution observations are recorded using multiple divers who follow protocol described in Thurow (1994).	
	Disease Frequency	The percentage of salmon in a population showing evidence for a given disease. Bacterial kidney disease is the disease of greatest concern for this population. Hatcheries routinely sample fish for disease and natural mortalities are provided to certified fish health lab for routine disease testing protocols.	3.10, 4.4.3
Genetic	Genetic Diversity	Indices of genetic diversity – measured within a tributary) heterozygosity – allozymes, microsatellites), or among tributaries across population aggregates (e.g., FST).	3.2.5, 3.8.3, 3.9.1
	Reproductive Success (Nb/N)	Derived measure: determining hatchery:wild proportions, effective population size is modeled.	3.7.2
	Relative Reproductive Success (Parentage)	Derived measure: the relative production of offspring by a particular genotype. Parentage analyses using multilocus genotypes are used to assess reproductive success, mating patterns, kinship, and fitness in natural populations and are gaining widespread use of with the development of highly polymorphic molecular markers.	3.2.1, 3.2.2, 3.2.4, 3.6.1, 3.7.1, 3.7.2 3.7.4, 5.3.1
	Effective Population Size (Ne)	Derived measure: the number of breeding individuals in an idealized population that would show the same amount of dispersion of allele frequencies under random genetic drift or the same amount of inbreeding as the population under consideration.	3.2.5
	Proportionate Natural Influence	A ratio of the proportion of natural origin salmon in the hatchery broodstock divided by the sum of the proportion of natural origin salmon in the hatchery broodstock plus the proportion of hatchery origin adults spawning in nature.	2.6.1,2.6.3,2.7.1, 2.7.2,3.6.1,3.6.2, 3.6.3,3.6.4
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. Assessed 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 screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – 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. The age of hatchery-origin fish is determined through a CWTmarking program which identifies fish by brood year.	3.8.1, 3.8.2, 3.9.2
	Age–at–Return	Age distribution of adults returning to the spawning grounds. Calculated for wild and hatchery conventional and captive brood adult returns. Assessed via scale method, dorsal fin ray ageing, or mark recoveries.	3.8.1, 3.8.2, 3.9.2
	Age–at-Emigration	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 screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – 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 CWT marking program which identifies fish by brood year.	3.8.1, 3.8.2, 3.9.2
	Size-at-Return	Mean size, by age class, of adults using fork length and mid-eye hypural length.	3.8.1, 3.9.2

Performance Measure		Definition	Related Indicator
	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 lifestage-specific emigration period are generated (mean length by week then averaged by lifestage). For entire juvenile abundance leaving a weighted mean (by lifestage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery.	3.8.2, 3.9.2
	Condition of Juveniles at Emigration	Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^5)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992).	3.8.2, 3.9.2
	Percent Females (adults)	The percentage of females in the spawning population. Calculated using known origin carcass recoveries from spawning grounds and hatchery broodstock. 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
	Spawn-timing	Date of spawning at the hatchery or carcass recovery on the spawning grounds.	3.2.4, 3.6.4, 3.8.1, 3.9.2
	Juvenile Emigration Timing	Juvenile emigration timing is characterized by individual life stages at the rotary screw trap and Lower Granite Dam. Emigration timing at the rotary screw trap is expressed as the percent of total abundance over time while the median, 0%, 10, 50%, 90% and 100% detection dates are calculated for fish at first mainstem dam.	3.2.4, 3.6.4, 3.8.2, 3.9.2, 3.9.3, 4.8.1
	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 lifestage. 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 lifestage divided by tributary abundance estimate by lifestage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates.	3.2.4, 3.6.4, 3.8.2, 3.9.2, 3.9.3, 4.8.1
Habitat	Physical Habitat	TBD	
	Stream Network	TBD	
	Passage Barriers/Diversions	TBD	
	Instream Discharge	USGS gauges and also staff gauges	
	Water Temperature	Various, mainly Hobo and other temp loggers at screw trap sights and spread out throughout the streams	
	Chemical Water Quality	TBD	
	Macroinvertebrate Assemblage	TBD	
	Fish and Amphibian Assemblage	Observations through rotary screwtrap catch and while conducting snorkel surveys.	2.4.3, 3.3.3, 3.4.1
In-Hatchery Measures	Hatchery Production Abundance	The number of hatchery juveniles of a given brood year 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, premolt, parr, etc.).	2.5.1, 2.5.2, 2.5.3, 2.5.4

Performance Measure		Definition	Related Indicator
	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, premolt, 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
	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
	Egg Size	Mean weight (g) of individual eggs, estimated from samples of 20 individual egg weights per female.	3.8.1,3.8.2,3.8.3, 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 prespawn mortality.	2.2.1
	Hatchery Broodstock Prespawn 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 kidney tissue. The enzyme linked immunosorbent assay (ELISA) detects antigen of *Renibacterium. salmoninarum*, the causative agent of BKD.	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
	Size of Broodstock Spawner	Mean fork length and weight by age measured in millimeters or grams, respectively, 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 marked hatchery group that have retained a mark 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 tagged hatchery group that have retained a tag 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.	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 (Kooskia Fish Hatchery).	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.	

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

"Performance Indicators" determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.

The NPCC "Artificial Production Review" document referenced above presents a list of draft "Performance Indicators" that, when linked with the appropriate performance standard, stand as examples of indicators that could be applied for the hatchery program. If an ESU-wide hatchery plan is available, use the performance indicator list already compiled. Essential 'Performance Indicators" that should be included are monitoring and evaluation of overall fishery contribution and survival rates, stray rates, and divergence of hatchery fish morphological and behavioral characteristics from natural populations.

The list of "Performance Indicators" should be separated into two categories: "benefits" that the hatchery program will provide to the listed species, or in meeting harvest objectives while protecting listed species; and "risks" to listed fish that may be posed by the hatchery program, including indicators that respond to uncertainties regarding program effects associated with a lack of data.

1.10.1) "Performance Indicators" addressing benefits.

Evaluation of the Upper Grande Ronde program utilizes the performance standards and associated performance indicators in Section 1.9 and Table 1. These will be utilized for addressing the project benefits and risks. In addition to yearly evaluations, every five years the Upper Grande Ronde project performs a comprehensive review of the program to include adaptive management recommendations addressing the benefits and risks of the program. The recommendations will incorporate the findings from studies conducted on Upper Grande Ronde and other hatchery programs that may lead to greater program benefits to the natural Upper Grande Ronde population and attainment of mitigation level adult returns.

1.10.2) "Performance Indicators" addressing risks.

Evaluation of the Upper Grande Ronde program utilizes the performance standards and associated performance indicators in Section 1.9 and Table 1. These indicators will be utilized for addressing the project benefits and risks. In addition to yearly evaluations, every five years the Upper Grande Ronde project performs a comprehensive review of the program to in include adaptive management recommendations addressing the benefits and risks of the program. These recommendations will incorporate the findings from studies conducted on Upper Grande Ronde and other hatchery programs that may lead to a further reduction in program risks to the Upper Grande Ronde population.

1.11) Expected size of program.

The production goal for the Upper Grande Ronde River is 250,000 smolts. The Safety Net Program (SNP) will be utilized to maintain a minimum smolt release of 150,000. For example, if we were only able to collect enough broodstock for 75,000 smolts, the SNP fish would be used to bring the release to 150,000.

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

The number of females needed to meet the production goal of 250,000 hatchery smolts is 91 (182 adults). The average smolt/female collected from 2001 to 2010 is 2,742. The SNP is derived from the collection of 300 eggs from the conventional broodstock.

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

Life Stage	Release Location	Annual Release Level
Eyed Eggs	Sheep Creek, Meadow Creek	Unknown – Potential surplus from the SNP program.
Unfed Fry	Sheep Creek, Meadow Creek	None planned
Fry	Sheep Creek, Meadow Creek	None planned
Fingerling	Sheep Creek, Meadow Creek	None planned
Yearling	Grande Ronde River	250,000
Adult	Sheep Creek, Meadow Creek	Unknown – Potential surplus from the SNP program.

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

Table 3. Return year summary for natural origin spring Chinook salmon from the Upper Grande Ronde River 1997 to 2010 (McLean et al. 2008).

Return year	Origin	Est. Return to trib.				Broodstock				Est. Spawning esc.			
		3	4	5	Total	3	4	5	Total	3	4	5	Total
1997	Nat.	0	62	18	80	0	0	0	0	0	62	18	80
1998	Nat.	0	16	81	97	0	0	0	0	0	16	77	93
1999	Nat.	0	3	0	3	0	0	0	0	0	3	0	3
2000	Nat.	0	64	0	64	0	0	0	0	0	62	0	62
2001	Nat.	0	70	4	75	0	19	2	21	0	51	2	54
2002	Nat.	1	80	28	109	1	36	12	49	0	42	16	58
2003	Nat.	1	10	212	224	0	5	67	72	0	5	145	151
2004	Nat.	4	43	0	47	1	15	0	16	3	28	0	32
2005	Nat.	0	12	9	21	0	3	4	7	0	9	5	14
2006	Nat.	5	52	2	59	2	26	0	28	3	26	2	32
2007	Nat.	0	25	11	35	0	13	4	17	0	9	7	15
2008	Nat.	81	150	21	252	0	8	1	9	81	142	20	243
2009	Nat.	9	65	9	83	2	12	5	19	6	53	4	62
2010	Nat.	11	94	10	115	4	28	1	33	7	66	9	82

Table 4. Return year summary for captive origin spring Chinook salmon from the Upper Grande Ronde River 1997 to 2010 (McLean et al. 2008).

		Est. Return to trib.				Broodstock				Est. Spawning esc.			
Returnyear	**Origin**	**3**	**4**	**5**	**Total**	**3**	**4**	**5**	**Total**	**3**	**4**	**5**	**Total**
2001	Capt.	0			0	0			0	0			0
2002	Capt.	0	3		3	0	3		3	0	3		3
2003	Capt.	52	10	0	62	0	3	0	3	20	10	0	30
2004	Capt.	69	555	6	630	0	3	0	3	42	551	6	599
2005	Capt.	0	266	25	292	0	3	0	3	0	265	25	291
2006	Capt.	0	1	7	9	0	3	0	3	0	1	7	9
2007	Capt.	0	0	0	0	0	3	0	3	0	0	0	0
2008	Capt.	6	0	0	6	0	3	0	3	1	0	0	1
2009	Capt.	0	55	0	55	0	3	0	3	0	55	0	55
2010	Capt.	26	0	45	71	0	3	0	3	26	0	45	71

Table 5. Return year summary for conventional origin spring Chinook salmon from the Upper Grande Ronde River 1997 to 2010 (McLean et al. 2010).

		Est. Return to trib.				Broodstock				Est. Spawning esc.			
Returnyear	**Origin**	**3**	**4**	**5**	**Total**	**3**	**4**	**5**	**Total**	**3**	**4**	**5**	**Total**
2004	Conv.	13			13	1			1	11			11
2005	Conv.	9	89		98	5	59		64	4	30		34
2006	Conv.	2	150	0	152	1	123	0	124	1	27	0	28
2007	Conv.	18	28	9	55	2	26	8	36	3	0	0	3
2008	Conv.	225	9	1	235	3	8	1	12	133	1	0	134
2009	Conv.	313	280	51	644	11	127	19	157	35	153	32	220
2010	Conv.	32	2,236	65	2,333	0	135	6	141	32	2,097	59	2,188

Table 6. Outmigrant and broodyear summary for natural origin spring Chinook salmon from the Upper Grande Ronde River 1996 to 2005 brood years (McLean et al. 2010).

					Est. Return to trib.				
Brood Year	**Rel. loc.**	**Life stage**	**Origin**	**Est. smolts**	**3**	**4**	**5**	**Total**	**SAR**
1996	River	Smolt	Nat.	6,922	0	64	4	68	0.98
1997	River	Smolt	Nat.	14,858	0	70	28	98	0.66
1998	River	Smolt	Nat.	14,780	0	80	212	292	1.98
1999	River	Smolt	Nat.	51	1	10	0	11	22.07
2000	River	Smolt	Nat.	9,133	1	43	9	53	0.58
2001	River	Smolt	Nat.	4,922	4	12	2	18	0.37
2002	River	Smolt	Nat.	4,854	0	52	11	63	1.30
2003	River	Smolt	Nat.	6,257	5	25	21	51	0.82
2004	River	Smolt	Nat.	34,672	0	150	9	159	0.46
2005	River	Smolt	Nat.	17,109	81	65	10	155	0.91

Table 7. Release and broodyear summary for captive origin spring Chinook salmon from the Upper Grande Ronde River 1998 to 2005 brood years (McLean et al. 2010).

Brood Year	Rel. loc.	Life stage	Origin	Est. smolts	Est. Return to trib.				SAR
					3	4	5	Total	
1998	Accl.	Smolt	Capt.	1,508	0	3	0	3	0.21
1999	Accl.	Smolt	Capt.	2,544	0	10	6	16	0.64
2000	River	Parr	Capt.	76,941	14	151	7	172	0.22
2000	Accl.	Smolt	Capt.	151,444	38	404	18	460	0.30
2001	River	Parr	Capt.	32,800	0	0	0	0	0.00
2001	Accl.	Smolt	Capt.	210,637	69	266	7	343	0.16
2002	Accl.	Smolt	Capt.	77,204	0	1	0	1	0.00
2003	Accl.	Smolt	Capt.	1,022	0	0	0	0	0.00
2004	Accl.	Smolt	Capt.	76	0	0	0	0	0.01
2005	Accl.	Smolt	Capt.	20,620	6	55	45	106	0.52

Table 8. Release and broodyear summary for conventional origin spring Chinook salmon from the Upper Grande Ronde River 2001 to 2005 brood years (McLean et al. 2010).

Brood Year	Rel. loc.	Life stage	Origin	Est. smolts	Est. Return to trib.				SAR
					3	4	5	Total	
2001	Accl.	Smolt	Conv.	26,923	13	89	0	102	0.38
2002	Accl.	Smolt	Conv.	70,088	9	150	9	168	0.24
2003	Accl.	Smolt	Conv.	104,347	2	28	1	31	0.03
2004	Accl.	Smolt	Conv.	18,901	18	9	51	78	0.41
2005	Accl.	Smolt	Conv.	118,803	225	280	65	570	0.48

Table 9. Upper Grande Ronde River spring/summer Chinook salmon captive broodstock summary 1994 to 2009 (ODFW 2008).

Brood year	Parr coll.	Eggs coll.	Spawn year	Males spawned	Females spawned	Spawning ratio F/M	Average fecundity	Total Egg Take	Eyed Eggs	Dead Eggs
1994	110									
1995	0									
1996	500									
1997	500									
1998	500		1998	7	4	0.6:1	1,041	4,165	1,875	2,290
1999	0		1999	26	5	0.2:1	1,209	6,043	3,565	2,478
2000	502		2000	187	188	1.0:0	1,651	310,368	267,485	42,883
2001	461		2001	179	199	1.1:1	2,184	434,668	375,345	59,323
2002	503		2002	35	56	1.6:1	1,873	104,873	98,077	6,799
2003	500		2003	5	1	0.2:1	1,548	1,548	1,133	415
2004	309		2004	4	1	0.3:1	693	693	500	193
2005	150	150	2005	70	58	0.8:1	1,072	62,188	51,332	10,856
2006	157	156	2006	14	5	0.4:1	746	3,731	2,174	1,557
2007		320	2007	159	77	0.5:1	1,457	112,216	89,752	22,461
2008	153	150	2008	133	109	0.8:1	2,142	233,482	213,298	20,184
2009		300	2009	125	132	1.1:1	1,769	233,492		

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

There was an initial release of smolts produced at Marion Forks Hatchery (Willamette Subbasin) into the Upper Grande Ronde River in 1972. There were no more releases until the LSRCP program completed Lookingglass Hatchery in 1982. Since the hatchery construction, releases were made into the Upper Grand Ronde in 1984 (Carson stock) and 1990 (Rapid River stock). The Upper Grande Ronde River endemic program began in 1995 with the collection of wild parr for the captive brood program. The first adults (natural) for conventional broodstock were trapped in 2001. The first releases of captive smolts occurred in 2000 and the first releases of conventional smolts occurred in 2003. The SNP component of the program was initiated with the 2008 broodyear.

1.14) Expected duration of program.

Ongoing until populations reach sustainable and harvestable levels.

1.15) Watersheds targeted by program.

Upper Grande Ronde River (HUC 17060104)

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

Alternative action: No intervention.
Reason for no action: Since the population is well below replacement levels, there is a risk that the population may go extinct and the genetic resources will be lost.

Alternative action: Use Rapid River stock from Lookingglass Hatchery to rebuild Upper Grande Ronde population.
Reason for no action: A scientific review panel concluded that the Rapid River stock or a Grande Ronde basin composite stock would not be suitable for supplementation of the upper Grande Ronde and that a Grande Ronde River endemic stock would be a better fit (US v. Oregon Dispute Resolution 1996). The co-managers reached agreement to use only Upper Grande River fish rather than a composite or Rapid River stock.

The HSRG management recommendations (HSRG 2009) for this hatchery program are described as follows.
This program should operate in the ‘safety net’ mode until salmon habitat has been improved to a level that is sufficient to support a self-sustaining natural population. In years when adult escapement is low (e.g., less than 50 fish), managers should incorporate all returning natural-origin adults into the hatchery broodstock. These recommendations are meant to provide an interim conservation strategy until habitat issues are addressed. When population productivity and capacity have increased, the managers will need to develop plans to transition to a properly integrated program (e.g., PNI $\geq$ 0.50).

The HRT in September 2009 developed four draft alternatives for the Upper Grande Ronde program as summarized below.

Alternative 1: Current program with recommendations

Continue to maintain the Upper Grande Ronde River stock of spring Chinook, using captive and conventional artificial propagation techniques as necessary until habitat and out-of-subbasin survival issues are improved enough to allow other management options.

Alternative 2. Reduce the size of the Upper Grande Ronde program with an exclusive focus on maintaining the population, and increase the Lookingglass or Lostine programs to better meet harvest mitigation benefits for the Grande Ronde basin

Reduce the program size and focus on maintaining the Upper Grande Ronde spring Chinook population over the short term while implementing an aggressive habitat restoration effort in the Upper Grande Ronde River basin. Reduce the Upper Grande Ronde River Stock program to annual releases of 120,000 with the intent of maintaining and annual broodstock size that is a minimum of 60 females and 60 males. Suspend the captive broodstock (SNP) component of the program. Based upon the history of the program, approximately 6 out of 7 years, the broodstock goals can be met when only 120,000 fish are released. Use the rearing space at Lookingglass FH to increase the Lookingglass or Lostine spring Chinook programs to better meet harvest mitigation objectives for the Grande Ronde basin.

Alternative 3: Transfer production for the Upper Grande Ronde spring Chinook program to new and/or other existing hatchery facilities AND rear only Lookingglass program spring Chinook and Imnaha spring Chinook at Lookingglass FH to meet mitigation goals for the Oregon portion of the LSRCP

See Alternative 5 for the Lookingglass spring Chinook program.

Alternative 4: Terminate the program and decommission the Upper Grande Ronde trap and acclimation site

Decommission hatchery in favor of alternative mitigation strategies such as habitat restoration, passage improvements, or alternative hatchery production at another site.

Reason for no action: As outlined in the 2002 Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al. 2002), a diverse hatchery management approach has been implemented in four tributary areas of the Grande Ronde River Basin. Until evaluation of these various management strategies is completed determining which approach has the most potential for recovering these listed populations the current management strategies for the Upper Grande Ronde River will continue to be implemented.

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

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

HGMP 2002
NMFS 4d (online, annually)
USFWS Bulltrout TE 844468-5

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

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

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

Snake River spring/summer Chinook salmon, specifically the Upper Grande Ronde River population.

Spring Chinook – Historically, spring Chinook salmon spawned in the mainstem and headwater areas throughout the Grande Ronde River Basin （GRSS 2001). Currently, five core populations have been identified. Three populations are targeted for hatchery supplementation: Catherine Creek, Lostine River, Upper Grande Ronde River and two populations are managed for natural production: Minam and Wenaha rivers. Another major population in the basin, Lookingglass Creek, was extirpated due to the construction and operation of Lookingglass Fish Hatchery (LFH) in 1982. There has been an ongoing effort by CTUIR to reestablish a naturally spawning population in Upper Lookingglass Creek since the construction of LFH.

Adult spring Chinook salmon enter the Columbia River in March through May. Movement into summer holding areas ranges from April through July. Age 4 fish typically dominate returns to the Grande Ronde River Basin (Table 10). Spawning occurs from early August through September and generally peaks in late August. Fry emergence begins in January and extends through June. Fry expand their distribution after emerging in the spring. The extent and direction of fry movement depends on environmental conditions. Juveniles rear for one year and smolt the spring of the year following emergence. Smolt migration from the subbasin begins in January and extends through late June.

The Interior Columbia Technical Recovery Team (ICTRT) established biological viability criteria to monitor recovery efforts in the ESUs for salmon and steelhead listed under the Endangered Species Act (Table 11). The viability criteria were based on guidelines in NOAA Technical Memorandum *Viable Salmonid Populations and the Recovery of Evolutionary Significant Units* (McElhany et al. 2000). These guidelines were used to describe the Upper Grande Ronde River spring/summer

Chinook population and other populations within the Major Population Group (MPG).

All Grande Ronde River/Imnaha River MPG populations were assessed at high risk (>5%) of extinction in the next 100 year period. Two populations are extinct (Carmichael et al 2006).

Table 10. Age structure from spring Chinook salmon recovered on the spawning ground and trapped at the Upper Grande Ronde River. (trapping began in 1998)(ODFW survey unpublished, CTUIR weir data unpublished).

	Natural age				**Hatchery age**			
	3	4	5	Total	3	4	5	Total
1984-1997	6	257	136	399				
%	1.5	64.4	34.1					
1998-2005	19	331	175	525	229	1174	153	1556
%	3.6	63.0	33.3		14.7	75.4	9.8	

Table 11. Grande Ronde River/Imnaha River spring/summer Chinook major population groupings.

Population	**ICTRT size**	**Status**	**TRT viability**	**HSRG**
Big Sheep	Basic	Extinct	na	stabilizing
Catherine Creek	Large/ Intermediate*	High Risk	Viable	Primary
Imnaha	Intermediate	High Risk	Viable	Primary
Lookingglass Creek	Basic	Extinct	na	stabilizing
Lostine/Wallowa	Large	High Risk	Highly Viable	Primary
Minam	Intermediate	High risk	Viable	Primary
Upper Grande Ronde River	Large	High risk	na	Safety Net /Contributing
Wenaha	Intermediate	High risk	Viable	Primary
ICTRT size • Basic 500 • Intermediate 750 • Large 1,000 • Very Large 1,500		TRT Viability • High <1% • Viable <5% Likelihood of extinction in 100 year period	HSRG criteria • Primary PNI 67% • Contributing PNI 52% • Stabilizing PNI no stated goals	
*Catherine Creek weir is managed at the Intermediate level due to main stem reach considerations				

Due to the fact that a portion of the population was spawning below the initial weir location, the weir was moved (2007) downstream in an attempt to capture a more complete cross section of the entire Upper Grande Ronde River population. After moving the weir the run timing appears to have extended longer into the season (Table 12). This could mean that we are now catching the later returning fish that were not making it to the old upper weir site or that we are delaying the run at the new lower trap site.

The sex ratio observed for adult spring Chinook captured at the Upper Grande Weir reflects a domination of the return by females (Table 13). The mean size of natural produced females has ranged from 683 to 856 and for hatchery females from 697 to 744 (Table 14). The weir used to count returning adults is located at river km 247.0 and spawning fish utilize the upstream portion of the river from km 292.2 to 329.9 (Table 15). Naturally produced juvenile migrate in nearly every month of the year with peak periods occurring in November, February, and March (Table 16).

Table 12. Mean weekly percent of the total adult spring Chinook salmon trapped at the Upper Grande Ronde River weir site (CTUIR weir data unpublished).

	Upper Weir Site (rkm 262)		**Lower Weir Site (rkm 247)**	
Week Ending	**Natural 1997-2006**	**Hatchery 2002-2006**	**Natural 2007-2009**	**Hatchery 2007-2009**
13-May	0.0	0.0	0.0	0.0
20-May	0.0	0.0	0.0	0.0
27-May	5.1	0.0	7.4	2.3
3-Jun	7.7	2.5	18.5	9.2
10-Jun	28.2	15.2	7.4	9.2
17-Jun	17.9	27.2	18.5	20.7
24-Jun	23.1	39.9	11.1	8.0
1-Jul	10.3	10.8	14.8	17.2
8-Jul	2.6	3.8	14.8	21.8
15-Jul	5.1	0.6	3.7	2.3
22-Jul	0.0	0.0	3.7	3.4
29-Jul	0.0	0.0	0.0	2.3
5-Aug	0.0	0.0	0.0	3.4
12-Aug	0.0	0.0		

Table 13. Sex ratios for adult spring Chinook salmon trapped at the Upper Grande Ronde River weir (CTUIR weir data unpublished).

Year	Natural			Hatchery		
	Females	Males	Ratio F:M	Females	Males	Ratio F:M
1998	19	14	1.4:1			
1999	0	0				
2000	9	8	1.1:1			
2001	40	40	1.0:1			
2002	50	51	1.0:1	4	0	
2003	80	70	1.1:1	3	3	1.0:1
2004	11	20	0.6:1	206	173	1.2:1
2005	8	6	1.3:1	138	119	1.2:1
2006	31	23	1.3:1	91	59	1.5:1
2007	17	19	0.9:1	24	13	1.8:1
2008	10	7	1.4:1	5	4	1.3:1
2009	19	14	1.4:1	117	98	1.2:1

Table 14. Fork length range for adult spring Chinook salmon trapped at the Upper Grande Ronde River weir (CTUIR weir data unpublished).

Year	Natural						Hatchery					
	Jack	Mean	Males	Mean	Females	Mean	Jack	Mean	Males	Mean	Females	Mean
1997			800-904	852	710-760	733						
1998			710-985	883	740-910	848						
1999												
2000			660-785	744	658-775	701						
2001			685-820	743	665-775	735						
2002	503	503	649-907	767	651-902	739					696-747	718
2003	480	480	605-1090	884	703-935	856	410-562	500	729-740	734	673-740	707
2004	409-545	478	610-791	704	621-763	683	380-600	520	618-846	710	616-782	701
2005	470-584	516	682-933	771	682-845	790			606-923	737	625-851	725
2006	475-599	556	574-805	706	613-842	703	420-592	506	610-889	709	633-856	708
2007			670-948	775	617-883	751	402-503	450	694-906	777	666-861	744
2008	460-545	489	710-817	753	667-930	712	405-590	508	640-897	749	650-737	697
2009	392-555	479	694-905	789	640-835	723	415-595	516	603-843	760	625-820	747

Table 15. Spawning timing and distribution, facility locations and basin characteristics for spring Chinook salmon in the Upper Grande Ronde River.

Spawning timing:	**mid August – mid September**
Spawning distribution (rkm):	292.9-329.9
Acclimation Site (rkm):	319.4
Adult Weir Site (rkm):	247.0
Elevation of spawning area:	1,008.9 - 1,411.8 m
Drainage Flow:	Northeast
Drainage Size:	~547.2 km2

Table 16. Mean monthly juvenile outmigration timing for the Upper Grande Ronde River (ODFW Early Life History Project 1994-1997).

Month	Percent of total outmigration
Jul	0.57
Aug	0.67
Sep	0.96
Oct	3.01
Nov	16.43
Dec	1.14
Presmolt total	**22.78**
Jan	2.33
Feb	34.26
Mar	34.57
Apr	5.44
May	0.62
Jun	0.00
Smolt total	**77.22**

- Identify the NMFS ESA-listed population(s) that may be incidentally affected by the program.

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

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

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

The entire Grande Ronde River Basin once supported large runs of Chinook salmon with estimated escapements in excess of 10,000 as recently as the late 1950's (USACOE 1975). Natural escapement declines in the Grande Ronde River Basin have paralleled those of other Snake River stocks. Reduced numbers of spawners combined with human manipulation of previously important spawning habitat have resulted in decreased spawning distribution and population fragmentation.

The Upper Grande Ronde River was historically one of the most productive populations in the Grande Ronde River Basin (Carmichael and Boyce 1986). Escapement levels in the Upper Grande Ronde River dropped to alarmingly low levels in 1994 and 1995. Four redds were observed in the Upper Grande Ronde River in 1994 and 7 redds in 1995. In contrast, the estimated number of redds in 1957 was 893. We are presently in an emergency situation where dramatic and unprecedented efforts are needed to prevent extinction and preserve any future options for use of natural fish for artificial propagation programs for recovery and mitigation.

The overall viability rating for the Upper Grande Ronde River population does not meet viability criteria and is considered high risk. The 10-year geomean (1981-2000) natural origin abundance is 38 adults, which is only 3.8% of the "large" size population threshold of 1,000 adults.

- 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 progeny-to-parent ratios, expressed as recruits per spawner (R/S), for the brood years 1981 through 2004 averaged 0.59 with a range from 0.02 to 2.06 (Table 17). We note that these values were calculated with parents represented by the total spawner abundance (both natural and hatchery fish) and progeny represented as natural fish only. Further, the interpretation of annual variations in progeny to parent ratios of naturally reproducing fish is difficult because the confounding effect of spawner density has not been removed. 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.

In addition to progeny to parent ratios, the production and survival of pre-smolt juveniles within the Upper Grande Ronde to passage over Lower Granite Dam on their migration to the ocean has been determined for a number of years (Table 17).

Table 17. Upper Grande Ronde River spring Chinook salmon population abundance and productivity data used for curve fits and R/S analysis. Data from Technical Recovery Team, Snake River spring//summer Chinook salmon ESU.

Brood Year	Adult Spawners	% Wild	Natural Adults	Natural Returns	Recruit/ Spawner	SAR adj. Factor	Adjusted Returns	Adjusted Recruit/Spawner
1981	208	1.00	208	316	1.52	1.59	199	0.96
1982	149	1.00	149	119	0.80	1.96	61	0.41
1983	190	1.00	190	145	0.76	1.74	83	0.44
1984	150	1.00	150	18	0.12	0.61	30	0.20
1985	332	1.00	332	13	0.04	0.64	21	0.06
1986	205	0.86	176	52	0.25	0.71	74	0.36
1987	692	0.18	125	20	0.03	0.55	37	0.05
1988	539	0.08	43	145	0.27	1.34	108	0.20
1989	3	0.00	0	8	2.67	0.56	15	1.00
1990	105	0.50	53	2	0.02	0.21	8	0.07
1991	39	0.60	23	21	0.54	0.33	64	1.62
1992	390	0.21	82	75	0.19	0.60	124	0.32
1993	327	0.23	75	112	0.34	0.62	180	0.55
1994	13	0.33	4	22	1.69	0.96	23	1.86
1995	20	1.00	20	4	0.20	1.67	2	0.11
1996	68	1.00	68	46	0.68	1.84	25	0.37
1997	59	1.00	59	63	1.07	3.38	19	0.32
1998	83	1.00	83	171	2.06	3.37	51	0.61
1999	4	1.00	4	5	1.25	1.54	3	1.00
2000	44	1.00	44	30	0.68	1.32	22	0.51
2001	50	1.00	50	12	0.24	0.44	28	0.55
2002	54	0.95	51	25	0.46	0.73	34	0.64
2003	148	0.81	120	12	0.08	0.29	43	0.29
2004	532	0.05	27	44	0.08	-	-	-
2005	314	0.04	13	-	-	-	-	-

The returns and R/S values above are adjusted to represent an average set of migration and ocean conditions to remove the variance and get a standardized recruit per spawner dataset.

The SAR data come from a long time series of estimated natural origin smolts at Lower Granite Dam and the resulting adult returns. What the adjustment does is reduce the R/S values when ocean conditions are good and raise them when conditions are bad, thus focusing on the freshwater productivity. Adjusted by SAR values to compensate results for variations in smolt to adult survivals

Table 18. Upper Grande Ronde River spring Chinook salmon juvenile population abundance and productivity data. Data from Early Life History Project (ODFW).

Brood year	Redds above screw trap	Population estimate	95% CI	Fall migrants	Spring migrants	Survival probability to LGD			
						Summer	Fall	Winter	Spring
1992	121	24,791	3,193	2,616	22,175	0.144	0.348	0.248	0.462
1993	104	38,725	12,960	4,859	33,866	0.173	0.228	0.151	0.609
1994	4	1,118	192	13	1,105	-	-	-	0.512
1995	7	82	30	68	14	-	-	-	-
1996	22	6,922	622	2,408	4,514	-	0.286	0.113	0.548
1997	19	14,858	3,122	2,440	12,418	-	0.269	0.118	0.538
1998	25	14,780	2,070	3,839	10,941	-	0.341	0.133	0.560
1999	0	51	31	6	45	-	-	-	-
2000	20	9,133	1,545	1,625	7,508	-	0.308	-	0.499
2001	15	4,922	470	1,350	3,572	-	0.184	-	0.397
2002	14	4,854	642	467	4,387	-	0.164	0.296	0.420
2003	29	6,257	834	1,094	5,163	-	0.138	0.207	0.374
2004	169	34,672	5,319	7,846	26,826	-	0.171	0.080	0.398
2005	90	17,109	1,708	5,356	11,753	-	0.242	0.169	0.373
2006	18	11,684	3,310	4,576	7,108	0.264	0.338	0.361	0.418
2007	1	34	13	8	26	-	-	-	-

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

Spawning abundance estimates for the Upper Grande Ronde River until 1997 are based largely on redd counts and Imnaha fish/redd expansion (3.2). In 1997 a weir was installed on the river and marked to unmarked ratios of carcass recoveries were used to estimate spawning abundance. From 1986 to 1994 (hatchery influence), the abundance of naturally produced spawners has ranged from 0 to 176, from 1995 to 2001 (no hatchery influence) ranged from 4 to 83, and from 2002 to 2010 (hatchery influence) ranged from 7-120. The 1988 broodyear was the last intentional release of juveniles into the upper Grande Ronde River until the 1998 broodyear. Since 1986 there have been unmarked hatchery fish on the spawning grounds. Hatchery releases from Lookingglass Hatchery were 100% marked beginning with the 1989 broodyear.

Table 19. Annual Redd counts from the Upper Grande Ronde River. The redd counts are minimum values and do not reflect spatial or temporal expansions (Tranquilli et al. 2004; ODFW unpublished, CTUIR unpublished, Technical Recovery Team Snake River spring//summer Chinook salmon ESU).

Year	Survey Sections								Total Redds	Total adult spawner est.	Natural adult spawner est.	pW
	1	2	3	4	5	6	7	8				
1986	18	19	1	6	4	0	NS	NS	48	205	176	0.86
1987	65	78	2	22	18	0	NS	NS	185	692	125	0.18
1988	77	34	0	3	2	0	NS	NS	116	539	43	0.08
1989	0	0	0	0	0	0	NS	NS	0	3	0	0.00
1990	21	11	0	0	0	0	NS	NS	32	105	53	0.50
1991	1	13	0	0	0	0	NS	NS	14	39	23	0.59
1992	88	26	0	1	1	0	NS	NS	116	390	82	0.21
1993	56	43	0	2	2	0	NS	NS	103	327	75	0.23
1994	2	2	0	0	0	0	NS	NS	4	13	4	0.31
1995	0	7	0	0	0	0	NS	NS	7	20	20	1.00
1996	11	11	0	0	0	0	NS	NS	22	68	68	1.00
1997	13	NS	1	2	3	0	NS	NS	19	59	59	1.00
1998	23	NS	0	2	0	0	NS	NS	25	83	83	1.00
1999	0	NS	0	0	0	0	NS	NS	0	4	4	1.00
2000	6	2	1	6	5	0	NS	NS	20	44	44	1.00
2001	7	0	1	3	4	0	NS	NS	15	50	50	1.00
2002	12	NS	0	2	0	0	NS	NS	14	54	51	0.94
2003	10	NS	0	10	9	0	NS	NS	29	148	120	0.81
2004	88	43	3	18	17	16	NS	NS	185	532	27	0.05
2005	12	34	6	23	15	0	NS	NS	90	314	13	0.04
2006	14	NS	0	3	1	0	NS	NS	18	64	17	0.27
2007	0	NS	0	0	1	0	0	NS	1	15	7	0.47
2008	22	NS	0	1	3	1	5	NS	32	119	48	0.40
2009	44	NS	0	3	2	1	2	NS	52	244	29	0.12
2010	169	NS	0	56	29	64	8	8	334	2216	117	0.05

From 1986 to 1996 there was no weir in place spawner estimates were made using 3.2 fish/redd estimate from the Imnaha River. From 1997 to 2010 a weir has been in place and spawner estimates were made from marked to unmarked ratios in the carcass recoveries. The survey sections are as follows: 1=3 penny to Forest Service boundary 2=Vey Meadow 3=Vey Meadow to River Campground 4=River CG to Time and a half 5=Time and a half to Spoolcart CG 6=Spoolcart to Weir 7=Weir to Starkey Store 8=Store to Meadow Cr. The weir was initially installed at River CG in 1997. In 2007 the weir was moved downstream to just above Starkey Store. 2002 marked the first returns of hatchery fish from our supplementation program.

- 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.

Since 1997, the average proportion of hatchery fish in the natural spawning population has averaged 0.42, with a range from 0.00 to 94.7 (Table 20). However, most of the hatchery influence has occurred in the period after 2002.

Table 20. Trapping and recovery of hatchery fish (Hat) and natural fish (Nat) from the Upper Grande Ronde River from 1997 to 2010 (CTUIR unpublished, ODFW unpublished); the presence or absence of fin clips was the criteria used to assign the recovered fish to either the Hat or Nat category from 1997 to 2005. From 2006 to 2010 some hatchery fish were unclipped with only a CWT to distinguish them from natural fish so H/W ratio was based on a combination of CWT recoveries and fin clips.

	Trapped		Carcasses		Estimated for Population		Proportion for Population[a]	
Year	**Hat**	**Nat**	**Hat**	**Nat**	**Hat**	**Nat**	**Ph**	**Pw**
1997	0	9	1	9	0	59	0.0	100.0
1998	0	33	0	30	0	83	0.0	100.0
1999	0	1	0	0	0	4	0.0	100.0
2000	0	17	0	14	0	44	0.0	100.0
2001	0	50	0	6	0	50	0.0	100.0
2002	3	102	0	8	3	51	5.6	94.4
2003	43	146	2	15	28	120	18.9	81.1
2004	433	33	146	9	505	27	94.9	5.1
2005	263	14	72	6	301	13	95.9	4.1
2006	150	56	5	1	47	17	73.4	26.6
2007	55	36	0	1	8	7	53.3	46.7
2008	112	21	19	11	71	48	59.7	40.3
2009	620	65	139	8	215	29	88.1	11.9
2010	1186	70	NA	NA	2099	117	94.7	5.3

[a] Proportion of spawning population that was either hatchery fish (Ph) or natural fish (Pw).

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

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

Operation of juvenile acclimation facilities: Operation from February to April. Incidental mortality associated with fish culture practices (Tables 21 and 22). The loading and unloading of fish into transport trucks and the initial stress when placed into the raceways at the acclimation facility (Table 23). Occasionally fish will not metabolize the food being fed to them in colder water temperatures, and when this happens, the situation is usually rectified after the mortality is observed. We see losses in the pond that are not associated with any activities on our part and are probably dying of disease.

Operation of weir: Operation from February to September for broodstock collection. Complete blockage of stream into an adult fish trap possibly causing a migrational delay. Trapping and handling of adult fish could cause increased mortality due to stress, injuries, or poaching. Trap in operation during smolt outmigration. Increased mortality to smolts passing weir may occur due to descaling on instream structures (Table 24).

Broodstock collection for the SNP program (captive broodstock): 300 Eggs are taken to Wallowa Hatchery from the Conventional Program (Lookingglass Hatchery) for use in the SNP program (Table 25).

Spawning ground surveys: Occurs from August to September during adult spawning. Stream surveys are completed by walking downstream throughout the spawning areas and below the weir. Monitoring and evaluation activity may increase redd abandonment and stress on fish due to disturbance.

Operation of a rotary screw traps (Spoolcart/Elgin): Rotary screw traps are operated to enumerate the natural production resulting from the program in the Upper Grande Ronde River. Take can occur from handling of the juveniles, a portion of these fish will be PIT tagged for survival and arrival timing to the mainstem dams. Trap in operation during smolt outmigration may also increase mortality to smolts due to descaling on the trap.

Pit tagging of wild caught parr annually: Parr are captured and PIT tagged in the rearing areas for estimation of survival and arrival timing to the mainstem dams. Take can occur from handling and tagging the fish as well as capturing the fish.

Spawning, incubation and rearing – Adult fish are killed during the spawning process. Eggs and resulting progeny are subject to mortality during incubation and rearing due to monitoring and evaluation, developmental problems, disease, injury and other causes. Every effort is made in the hatchery environment to ensure maximum survival of Chinook at all life stages.

Monitoring and evaluation projects associated with the Upper Grande Ronde River spring Chinook program:

- CTUIR (BPA) project # 2007-083-00 Grande Ronde River Supplementation M&E
    - Spawning data collection
    - Spawning ground surveys
- ODFW (BPA) project # 1992-026-04 Early Life History
    - Operation of rotary screw traps at Spoolcart and Elgin.
    - PIT tagging of parr from the Upper rearing areas.

ODFW (LSRCP) Oregon Evaluation Studies

Spawning ground surveys

Sampling of fish at the hatchery (genetics, spawning, incubation, pre-release/CWT, PIT tag).

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

As described in the previous section the observed mortality and take rates for listed fish are provided for egg loss (Tables 21 and 22), eyed egg to smolt release stage (Table 23), broodstock and pre-spawning mortality (Table 24), and natural parr collected for captive broodstock program (Table 25).

Table 21. Egg take and egg loss data for Grande Ronde River spring Chinook at Lookingglass Hatchery, 2001-2008 (ODFW unpublished).

Year	Egg Take Total	Egg Loss		Percent Survival to eyed egg Stage
		Total	% Loss	
2001	29,580	4,241	14.3	85.7
2002	89,156	17,384	19.5	80.5
2003	120,703	16,609	13.8	86.2
2004	20,858	1,832	8.8	91.2
2005	155,070	34,339	22.1	77.9
2006	297,271	29,299	9.9	90.1
2007	122,752	23,616	19.2	80.8
2008	47,402	5,130	10.8	89.2

Table 22. Egg take and egg loss data for Grande Ronde River Captive spring Chinook at Bonneville Hatchery, 1998-2008 (ODFW unpublished).

Year	Egg Take Total	Egg Loss		Percent Survival to eyed egg Stage
		Total	% Loss	
1998	4,165	2,290	55.0	45.0
1999	6,043	2,478	41.0	59.0
2000	310,368	42,883	13.8	86.2
2001	434,668	59,323	13.6	86.4
2002	104,873	6,799	6.5	93.5
2003	1,548	415	26.8	73.2
2004	693	193	27.8	72.2
2005	62,188	10,856	17.5	82.5
2006	3,731	1,557	41.7	58.3
2007	112,216	22,461	20.0	80.0
2008	233,482	20,184	8.6	91.4

Table 23. Green eggs collected, eyed eggs, parr and smolts released and number of smolt prerelease mortalities for Upper Grande Ronde River Chinook salmon, 1998-2009 brood years. (ODFW, CTUIR unpublished).

Brood Year	Green Eggs Capt.	Green Eggs Conven.	Eggs rel. Capt.	Parr rel. Capt.	Smolts rel. Capt.	Smolts rel. Conven.	Smolt Mortality
1998	4,165	0			1,508	0	4
1999	6,043	0			2,544	0	26
2000	310,368	0		76,941	151,444	0	50,514
2001	434,668	29,580		32,800	210,637	26,923	240
2002	104,873	89,156			77,204	70,088	224
2003	1,548	120,703			1,022	104,347	49
2004	693	20,858			76	18,901	9
2005	62,188	155,070			20,620	118,803	37
2006	3,731	297,271	1,263		0	259,932	121
2007	112,216	122,752			52,404	94,148	71
2008	233,482	47,402					
2009	233,492	240,950	180,000				

Table 24. Collection of broodstock, prespawn mortality, and intentional sacrifice (jacks) of Upper Grande Ronde River fish associated with the broodstock collection process (trapping at Upper Grande Ronde River and adult holding at Lookingglass Hatchery) (CTUIR unpublished). Numbers of hatchery fish trapped include only conventional stock. Captive stock hatchery fish were trapped but are not used in the broodstock.

	Trapped		Brood coll.		From LGC		Spawned		Killed		Mortality	
Year	Hat.	Wild	Hat.	Wild	Hat.	Wild	Hat.	Wild	Hat.	Wild	Hat.	Wild
2001		50		21		0		15		0		6
2002		102		49		0		42		0		7
2003		146		72		0		45		0		27
2004	9	33	1	16	0	0	1	14	0	0	0	2
2005	66	14	64	7	2	0	60	5	0	0	6	2
2006	142	56	124	28	14	0	120	26	5	0	13	2
2007	55	36	36	17	21	0	45	14	8	1	4	2
2008	107	21	12	9	29	0	16	9	24	0	1	0
2009	580	65	157	19	11	0	101	15	2	0	65	4
2010	1153	70	141	33	0	0	126	30	1	0	14	3

Table 25. Number of natural parr collected and eyed eggs from the Conventional Broodstock Program incorporated into the Captive Broodstock Program, 1994-2009 brood years.

Brood year	**Natural parr**	**Conventional Broodstock eggs**
1994	110	0
1995	0	0
1996	500	0
1997	500	0
1998	500	0
1999	0	0
2000	500	0
2001	461	0
2002	503	0
2003	500	0
2004	301	0
2005	150	180
2006	152	168
2007	320	0
2008 (SNP)	153	162
2009 (SNP)	0	300

- 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).

Table 26. Estimated maximum take levels of listed Upper Grande Ronde River spring/summer Chinook by hatchery activities.

Listed species affected: Spring/Summer Chinook **ESU/Population:** Snake River				
Activity: Upper Grande Ronde River spring/summer Chinook hatchery program				
Location of hatchery activity: Upper Grande Ronde River Basin **Dates of activity:** Annual				
Hatchery program operator: ODFW, CTUIR				
Type of Take	**Annual Take of Listed Fish By Life Stage (*Number of Fish*)**			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	Unknown	0	1,500	0
Collect for transport b)	300	0	200	0
Capture, handle, and release c)	0	56,500	10	0
Capture, handle, tag/mark/tissue sample, and release d)	0	255,000	1,300	300
Removal (e.g., broodstock) with the proportion of natural and hatchery origin fish as described in Section 6.2.2 and Section 7.2 e)	0	0	200	0
Intentional lethal take f)	0	0	200	0
Unintentional lethal take g)	5	4700	50	0
Other Take (specify) h)	0	0	0	0

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

Table 27. Estimated maximum take levels of listed wild summer steelhead.

Listed species affected: Summer steelhead	**ESU/Population:** Snake River			
Activity: Upper Grande Ronde River spring/summer Chinook hatchery program				
Location of hatchery activity: Upper Grande Ronde River Basin	**Dates of activity:** Annual			
Hatchery program operator: ODFW, CTUIR				
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	500	50	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	6,500	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	3,000	0	25
Removal (e.g., broodstock) e)	0	0		0
Intentional lethal take f)	0	0		0
Unintentional lethal take g)	0	150	7	0
Other Take (specify) h)	0	0	0	0

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

- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.

During the adult trapping period all mortalities would be investigated. Appropriate modifications will be made to operating procedures or facilities to prevent future occurrences. Handling events will only occur when water temperatures are below 18.0^{o}C. When the daily instantaneous maximum water temperatures exceed 20.0^{o}C, trapping will be discontinued (weir removed) and fish will be allowed to pass freely. Updates to any contingency plans will be made annually to reduce the amount of mortality observed.

During the acclimation period, daily mortality will be monitored. When an increase in daily mortality is observed the ODFW fish pathologist will be notified. If the fish are sick we will follow ODFW pathology policy regarding the release of sick fish. When dealing with catastrophic loss of fish due to equipment failure or operator negligence, attempts at rectifying the cause of event will be made. If it is determined that the cause of the loss cannot be corrected, the remaining fish will be immediately released into the environment. If it is possible to correct the problem, we will do so and continue with the acclimation until the scheduled release of the remaining fish. Updates to any contingency plans will be made annually to reduce the amount of mortality observed.

During screw trapping when dealing with catastrophic loss of fish due to equipment failure or operator negligence, attempts at rectifying the cause of event will be made or trapping will cease.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

This hatchery program is consistent with the NPPC Annual Production Review (Report and Recommendations), Grande Ronde/Imnaha sub-basin summary, HGMP submitted in 2002, and addresses issues of concern outlined in the 1999 NMFS Hatchery Biological Opinion.

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

- *Lower Snake River Compensation Plan* **–** The program is consistent with smolt production levels as outlined in original LSRCP.
- *US v. Oregon* - The hatchery program outlined within this HGMP is consistent with the 2008-2017 US vs Oregon management agreement (Attachment B). .
- *Columbia River Fish Management Plan* – The program would continue to provide harvest in Zone 6 tribal net fisheries as well as in-basin tribal harvest opportunity.

- *Grande Ronde Basin Spring Chinook Hatchery Management Plan* – The program is consistent with production levels agreed to by co-managers.
- *Grande Ronde Annual Operations Plan* – The program is consistent with the hatchery plan developed annually by basin co-managers.
- *2008 and 2010 Supplemental FCRPS Section 7 ESA Consultation Biological Opinion* – The program is consistent with the 2008 and 2010 Biological Opinion, including but not limited to RPAs 39-42.

3.3) Relationship to harvest objectives.

The level of hatchery production proposed by this program contributes to meeting the tribal and sport fishery objectives. Evidence to the magnitude of this contribution is presented in the next section (3.3.1).

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

Fisheries that benefit from the hatchery fish produced by this program occur mainly in the mainstem Columbia River (Tables 28 and 29) Program contributions to ocean fisheries are minimal, as is the case for all Snake River spring/summer Chinook. The tributary harvest is minimal as the natural population is still too depressed to open fisheries on the stock. A description of the various fisheries that benefit from the Upper Grande Ronde hatchery production follows.

Lower Columbia River non-tribal commercial fisheries. Lower Columbia River non-tribal commercial fisheries occur below Bonneville Dam in the mainstem (statistical zones 1-5) and in Select Areas (off-channel fishing areas). The lower Columbia River commercial fisheries target spring Chinook beginning in early March. In some years, target spring Chinook fisheries may not occur until April and can occasionally extend through the spring season (mid-April through June 15).

Lower Columbia River non-tribal recreational fisheries. The lower Columbia River mainstem below Bonneville Dam is separated into two main areas for recreational harvest; Buoy 10 (ocean/in-river boundary) to the Rocky Point/Tongue Point line, and the Rocky Point/Tongue Point line to Bonneville Dam. These fisheries are mark-selective for spring Chinook. Catch in recreational fisheries above Bonneville is very low compared to the fisheries below Bonneville. These fisheries are managed under the jurisdiction of U.S. v. Oregon. The U.S. v. Oregon Management Agreement for 2008-2017 implements abundance-based management on Snake River Chinook and steelhead in the lower mainstem and treaty mainstem fisheries such that fishery impacts increase in proportion to the abundance of natural-origin fish forecast to return once a minimum run-size has been achieved.

Mainstem Columbia tribal fisheries. Treaty tribal harvest includes commercial and ceremonial and subsistence (C&S) fisheries. The tribal C&S fisheries are of highest priority and generally occur before tribal commercial fishing. The tribal set net fishery above Bonneville Dam (statistical Zone 6) involves members of the four Columbia River treaty Indian tribes: Yakama Nation, Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation and Confederated Tribes of the Warm Springs Reservation. These fisheries are managed under the jurisdiction of U.S. v. Oregon. The U.S. v. Oregon Management Agreement for 2008-2017 implements abundance-based management on Snake River Chinook and steelhead in the lower mainstem and treaty mainstem fisheries such that fishery impacts increase in proportion to the abundance of natural-origin fish forecast to return once a minimum run-size has been achieved.

Tributary fisheries. Fishing occurs in the Snake River and the Grande Ronde basin (Wallowa system) for spring/summer Chinook. Annual fishery impact rates are beginning to be set pre-season consistent with fishery management protocol developed within FEMPs and TRMPs and authorized by NOAA Fisheries. This protocol is based on a sliding scale that ties allowed fishery impact rates to forecast return of natural-origin adults. When the return of natural-origin spawners is low, then the fishery will be managed to keep impact rates low. When a large number of natural-origin fish is expected, allowable fishery impact levels will be higher. The allowable impact for each year's fishery is then allocated by the tribal and state managers. Co-managers report catch statistics in season and all fishing stops when the allowable impact for the year is met.

Table 28. Estimated catch of captive broodstock Upper Grande Ronde hatchery adult spring/summer Chinook salmon in tribal and non-tribal fisheries for the 1998-2005 brood years. Estimated CWT recovery data was obtained from the PSMFC Regional Mark Processing Center (RMPC) database (www.rmpc.org).

Broodyear	Rel. no.	Ocean	Columbia R.		Treaty	Snake R. Sport	Stray	Rack and spawning ground	Comments
			Comm.	Sport					
1998	1,508	0	0	0	0	0	1	1	
1999	2,483	0	0	0	0	0	0	0	
2000	132,108	4	22	103	15	11	10	150	
2001	202,767	4	14	59	0	0	14	59	
2002	73,470	0	0	0	0	0	0	1	
2003	1,022	0	0	0	0	0	0	0	
2004	0	0	0	0	0	0	0	0	
2005	20,620	0	0	4	4	0	3	28	Includes only 3 and 4 year fish
2000	57,441	0	4	11	4	4	9	28	Released as Parr
2001	32,158	0	0	0	0	0	0	0	Released as Parr

Table 29. Estimated catch of conventional broodstock Upper Grande Ronde hatchery adult spring/summer Chinook salmon in tribal and non-tribal fisheries for the 2001-2005 brood years. Estimated CWT recovery data was obtained from the PSMFC Regional Mark Processing Center (RMPC) database (www.rmpc.org).

Broodyear	Rel. no.	Ocean	Columbia R. Comm.	Columbia R. Sport	Treaty	Snake R. Sport	Stray	Rack and spawning ground	Comments
2001	26,131	0	4	9	0	0	3	77	
2002	69,577	4	0	0	0	0	5	149	Fish were not AD clipped
2003	104,347	0	0	0	0	0	0	30	Fish were not AD clipped
2004	18,901	0	0	0	0	0	0	45	Fish were not AD clipped
2005	118,803	0	1	0	2	0	9	413	Fish were not AD clipped Includes only 3 and 4 year fish

3.4) Relationship to habitat protection and recovery strategies.

Human development and land management impacts consistent with those identified across the Columbia Basin affect Chinook production in the Grande Ronde River Basin. Loss of channel diversity, sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawal, water temperature and fragmentation of habitat all affect productivity of natural Chinook populations within the watershed. State programs in place through the Department of Environmental Quality, Department of Forestry and Division of State Lands along with federal Clean Water Act and Corps of Engineers 404 regulations provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or those that are federally funded must additionally meet Endangered Species Act listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Policy Act (NEPA) review.

These habitat protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an improvement in Chinook and steelhead habitat in many Grande Ronde River Basin tributaries. Most watershed restoration/improvement projects are funded through the Grande Ronde Model Watershed Program, Oregon Watershed Enhancement Board, Bonneville Power Administration funded Northwest Power Conservation Council's Fish and Wildlife Program, Mitchell Act Program and Natural Resource Conservation Service's (NRCS) Conservation Reserve Enhancement Program (CREP). Efforts include fencing streamside corridors to promote riparian vegetative recovery, improved fish passage at road crossings and diversions, reduced sediment production from roads and cropland and screening of irrigation diversions. Some programs like the Mitchell Act screening program began almost 50 years ago, while others like CREP are very recent. Taken together, habitat protection and improvement measures are (and will continue to be) improving habitat, and productivity, for the basin's wild spring/summer Chinook.

3.5) Ecological interactions.

Predation- Little evidence exists of predation by hatchery released spring Chinook on other salmonids. Hatchery spring Chinook smolts are programmed for release in the Upper Grande Ronde River at a mean weight of 23 g (20 fish per pound) and should range in length from 100 to 150 mm fork length. Release timing and methods (volitional release following acclimation) are intended to result in rapid emigration and limit interaction with other species in the river. The small size of hatchery migrants, rapid migration from the Upper Grande Ronde River, and limited time for conversion from a hatchery diet to a natural diet reduce the likelihood of predation by hatchery Chinook on other salmonids in the basin.

There is potential for predation by other salmonids, especially bull trout, on hatchery and natural Chinook. Releases of hatchery Chinook and any potential increase in natural production of Chinook resulting from the LSRCP program could enhance listed bull trout populations by increasing available forage.

Avian predation, especially mergansers, cormorants, and Herons, on hatchery and natural Chinook are concern post release. Total consumption is unknown. However, PIT tag recoveries at heron rookeries along Catherine Creek indicate a minimum mortality rate of 1-3% per year for juvenile Chinook salmon (ODFW, unpublished data).

Competition- Hatchery Chinook smolts have the potential to compete with natural Chinook, natural steelhead and bull trout juveniles for food, space, and habitat. If significant interaction does occur in the Upper Grande Ronde River, it is restricted to a short duration as smolts move downstream or to the immediate vicinity of release sites where hatchery fish are most concentrated. Rapid departure of hatchery Chinook smolts from the tributary is likely to limit competition with rearing wild Chinook, steelhead, and bull trout. Differences in food habits and habitat preferences are likely to limit competition with bull trout.

There is potential for competitive interactions between hatchery Chinook and wild Chinook and steelhead smolts in migration corridors. We do not have information to assess competitive interactions during downstream migration; however, hatchery Chinook smolts are released at a weight similar to or slightly larger than natural Chinook smolts (23 g) and may have a competitive advantage as a result of size.

Behavioral - There are limited data describing adverse behavioral effects of hatchery Chinook salmon releases on natural/wild Chinook salmon populations. Hillman and Mullan (1989) reported that larger hatchery fingerling Chinook salmon, released in June and July in the Wenatchee River in Washington, apparently "pulled" smaller wild/natural Chinook salmon with them as they drifted downstream resulting in predation on the smaller fish by other salmonids. While the effects of migrating hatchery smolts (yearlings) on wild/natural Chinook salmon are unknown at this time the potential for similar effects exists especially with large concentrated releases within natural rearing areas.

Fish Health - Hatchery operations potentially amplify and concentrate fish pathogens and parasites that could affect wild Chinook, steelhead and bull trout growth and survival. Because the hatchery produced spring Chinook for the Upper Grande Ronde River program are reared at Lookingglass Hatchery, potential disease impacts on wild salmonids are limited to periods of smolt acclimation and migration, adult returns, trapping, holding, and natural spawning. There are several diseases of concern including bacterial kidney disease (BKD) and infectious hematopoietic necrosis (IHN). Infectious hematopoietic necrosis virus (IHNV) has become more prevalent at Lookingglass Hatchery in recent years (personal communication ODFW Pathology). Vertical transmission (parent to progeny) of IHNV is prevented by the ongoing prudent fish culture practice of draining coelomic fluid at spawning and disinfecting eggs in iodophor. Steps have been taken to prevent horizontal transmission (fish to fish) of IHNV and other pathogens present in the surface water supply by the installation of a ultraviolet light water disinfection system. Prudent fish health actions of culling eggs from females with higher levels of *Renibacterium salmoninarum* antigens have helped with controlling BKD. In general, fish have demonstrated good health when reared at Lookingglass Hatchery, and therefore indicates there is potential for minimal to low level transmission of any agents they harbor to natural population. Documentation of fish health status of Upper Grande Ronde River hatchery Chinook is accomplished through monthly and a pre-liberation fish health examination. Examination of hatchery and natural adults spawned at Lookingglass Fish Hatchery are screened for BKD. There is no evidence of increasing prevalence of diseases (e.g., BKD) (Hoffnagle et al. 2009). Kidney samples are also collected on spawning ground surveys to monitor for potential increase in BKD prevalence due to hatchery adult spawning in nature (O'Connor and Hoffnagle 2007). In Grande Ronde Basin streams from 1997-2008, enzyme-linked immunosorbent assay optical density levels were generally low, with 97% of the samples being <0.2 OD units (no evidence of disease).

Incidental Take at Trapping Facilities – Operation of the Upper Grande Ronde River weir and trapping facility for collection of adult Chinook broodstock has the potential to affect wild steelhead and bull trout. These facilities could delay or otherwise alter migrations and some handling of listed species will occur. When adult steelhead are trapped, they will be checked for marks and passed above the trapping facilities. Kelts observed upstream of trapping facilities that can be captured (netted) will be checked for adipose clips and immediately passed downstream.

Only two bull trout have been captured (2006) at the Upper Grande Ronde River trapping facility since trapping began in 1997. Bull trout that are trapped are passed upstream with minimal handling and an "eyeball" estimate of their length is recorded (whether greater than or less than 300 mm in length).

Hatchery Effluent—Hatchery effluent discharges directly into Lookingglass Creek, after passing through the settling basin, and may affect survival, growth, and migration of spring Chinook salmon. The pollution abatement system was designed to provide for NPDES (0300-J) permit compliance. The settling basin has a 2 hour retention time, based on a continuous inflow of 1500 gpm, and has an active water volume above the sludge reservation of 27,000 ft^3. Effluent discharges meet DEQ criteria and there is no indication that the effluent is affecting fish or fish habitat in Lookingglass Creek. There are no plans to study effluent effects in the creek.

Chemicals used at the hatchery include iodophor, erythromycin, and formalin. These chemicals are approved fishery compounds and their use is regulated by label instruction or Investigative New Animals Drug (INAD) permits. Both iodophor and formalin undergo high dilution rates before entering the stream, which renders them innocuous to the fish and the ecosystem. Erythromycin is injected into broodstock adults or fed to juvenile fish for 28 days. A second 28 day erythromycin medicated feed treatment is administered to progeny of Captive broodstock parents with moderate to high ELISA levels. By either route, the drug is assimilated and metabolized within the fish. Any residual antibiotic present in the effluent would come almost exclusively from uneaten food. It is highly unlikely the effluent containing erythromycin would affect the ecosystem in any way.

Water Withdrawal—Water withdrawals to operate facilities, Lookingglass Hatchery in specific, may affect egg survival, juvenile growth and abundance, adult migrations and spawning of Chinook salmon. Lookingglass Hatchery water intake diverts a maximum of 50 cfs that results in reduced flows between the diversion and the out fall of the hatchery, approximately 500 meters. These reduced flows are most prominent during late July, August, and September when hatchery water demands are high and the creek is at its lowest flow. During this period, adult upstream passage is restricted; however, there is enough water to allow some passage, spawning activity and juvenile rearing.

Redds have been observed in the section of river that has reduced flow because of hatchery water withdrawal. Spawning takes place from mid-August until late September. Spawning in this area would be initiated during the time of the lowest flow, so de-watering of redds is unlikely.

It is highly unlikely that water withdrawals are a problem at any of the Upper Grande Ronde River facilities.

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.

The main water source for Lookingglass Hatchery is Lookingglass Creek (72 cfs water right). Water temperature fluctuates daily and seasonally with mean daily temperature ranging between 1^o and 16^oC. Additional water sources includes one well (6.39 cfs water right) used for fish culture that is capable of pumping 5 cfs of 14.5^o C. Water discharged is monitored under the general NPDES 0300 J permits.

The Upper Grande Ronde River acclimation facility uses gravity fed surface water to acclimate juveniles prior to release into their natal streams. There are no significant differences in water temperature regime or quality between the acclimation facility water sources and the "natal" water used by the naturally spawning populations. We have permits to withdraw up to 5 cfs from the Upper Grande Ronde River from February through April. Currently, the facility produces less than 20,000 pounds of fish per year; therefore, NPDES general permits (300-J) are not required (per. comm. Sellars 2001). Hatchery intake screens conform to NMFS screening guidelines.

The water source at Bonneville Hatchery, which rears the captive broodstock from smolt to spawning adult is a combination of well water and surface water from Tanner Creek. The water source at Oxbow Hatchery (captive brood incubation to eyed stage) is spring water with a mean temperature of approximately 5^{o}C. Water can be chilled to 3^{o}C for incubation. Intake screens are in compliance with NMFS criteria. Water discharged is monitored under the general NPDES 0300 J permits.

The Wallowa Hatchery captive brood program has 2 water sources; spring and well. The spring water flows by gravity pressure to the captive brood building. The spring supplies an average of 110 gallons per minute. The spring has a seasonal temperature range of 42-52 degrees Fahrenheit. The well water is a combination of 2 wells on the hatchery grounds. The Upper well supplies an average of 42 gpm and the lower well supplies an average of 26 gallons per minute for a total of 68 gpm. The wells temperature ranges from 52-56 degrees Fahrenheit. Dissolved oxygen ranges from 6.8 – 9.0 ppm between the two water sources. The spring water has a low D.O. level (~5.0 ppm) which is increased up to an average of 7.2 ppm by flowing through individual aeration towers on each tank. The well water is pumped through a large aeration tower and then is directly plumbed into each tank.

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.

Lookingglass Hatchery intake screens conform to NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish. We comply with the Oregon Water Resources minimum instream flow requirement in the facility bypass reaches.

The Captive Brood water supply at Bonneville Hatchery for rearing immature fish is 100% well water. Mature fish are held on Tanner Creek water from March through October. Currently, migrating adults are excluded from Tanner Creek.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

The adult facility is located at rkm 247.0 of the Grande Ronde River which is below most of the critical spawning habitat in the subbasin. The adult collection facility consists of a floating weir and trap spanning the full channel. Trapping is accomplished by directing adults into a trap and holding area (11'x 10'x 2.5'= 275ft^3, variable depending on flows and associated depth change). The most fish observed in our trap in a one day period has been 172 (2004). The trap is covered with steel grating and is fully secure with a lock. Adults that are to be transported are transferred from the trap to the transport vehicle by using a water-filled tube. Instream work is conducted annually to excavate the trap and holding area to maintain adequate depths needed to hold fish. We place a travel trailer at the facility to allow for 24hr 7 day a week operation of the facility by up to 3 operators.

Broodstock collection for the captive program consists of systematically taking a total of 300 fertilized eggs from all of the conventional females and transporting them to Wallowa Hatchery for rearing.

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

A trailer mounted 240 gallon transport tank with oxygen diffuser and recirculation pump is used to haul broodstock to the hatchery.

5.3) Broodstock holding and spawning facilities.

All conventional broodstock collected for the program are held and spawned at Lookingglass Hatchery. Captive broodstock for the program are reared and held at Wallowa and Bonneville hatcheries.

Conventional Broodstock-- Lookingglass Hatchery consists of one hatchery building complex (11,588 ft^2). The complex includes an office, spawning room, incubation and rearing room, cold fish feed storage area, shop, laboratory, visitor center, and dormitory. The spawning room consists of an anesthetizing tank, brail, spawning table, fish health and fish research stations, and adult return tubes to the four adult holding ponds (~3,200 ft.^{3} each 80'x10'x4'). There is also secondary building containing 3 circular ponds (1,100 ft^3 each 20'x4') used for holding adult broodstock. The Grande Ronde stock was held there until 2010 when they were moved to the outside ponds due to density concerns in the circular tanks.

Ripe adults are spawned and the eggs fertilized, water hardened, and transferred to the hatchery building for incubation.

Captive Brood--A portion of Bonneville Hatchery (BOH) is used for the Grande Ronde River Captive Brood program. In 1998, a new building and rearing facilities were added for the captive brood stock program. Maturing adults are held in three circular fiberglass tanks, each 942 ft.^{3} (20' x 3') in size. An additional four circular tanks (236 ft.^{3} ea.) are available for holding and segregation. The spawning area consists of an anesthetizing tank, spawning table, fish health, fish research, and data entry stations. Embryos are transferred to Oxbow Hatchery for incubation.

5.4) Incubation facilities.

Lookingglass Hatchery contains 504 incubation trays. Incubation can occur using up to 150gpm of chilled well water and/or UV treated river water. Currently, eggs are eyed on chilled river water and transferred to UV treated water for hatching, button-up, and early rearing. Lookingglass Hatchery is in the process of buying moist air incubators for incubation to the eyed stage and utilizing hatch boxes located inside the early rearing troughs.   The intent would be to reduce the demand for chillers and eliminate some of the heath stacks. This action would result in more floor space for add additional rearing troughs to lower early rearing densities.

Captive brood adults are spawned at Bonneville Hatchery. Embryos are transferred to Oxbow Hatchery for incubation in 10 deep and 11 shallow troughs. Eyed eggs are transferred to Lookingglass Hatchery.

Incubation facilities at Wallowa Hatchery include 1 stack of 12 heath trays in the captive brood building which is supplied with spring water. Incubation has also occurred using the egg trays suspended directly in the rearing tanks where temperature can be manipulated using the two water sources.

5.5) Rearing facilities.

Lookingglass Hatchery outside rearing containers include 18 raceways with rearing volume of 3,000 ft^3 (10'x100'x3') each. Inside rearing containers include 28 Canadian troughs. Currently, 5 early rearing troughs and 4 outside raceways are allocated to the Grande Ronde River program.

Bonneville Hatchery rearing facilities consist of 19 circular fiberglass tanks; four 10 ft diameter (1,800 gal.), and fifteen 20ft diameter (9,400 gal.).

Rearing facilities at Wallowa Hatchery are indoors and consist of twelve - 4' circular fiberglass tanks which have a working volume of 115 gallons (15.37 ft^3) each. Each tank can use spring, well, or a combination of both at a flow rate up to 7 gpm for each water source.

5.6) Acclimation/release facilities.

The progeny are acclimated in portable raceways before release into the stream that the adults were taken from. Up to 2 travel trailers are placed on site to allow for 24hour and 7 day a week operation of the facility by up to 3 operators. The water supply system consists of a screened gravity flow head box that diverts river water and can deliver up to 5 cfs into the facility to split among 4 raceways. Each raceway is 86x8x3 = 2064 ft^3. There is also a backup water system that consists of a diesel powered centrifugal pump and a piping system that is above ground and supplies water to all raceways. Each raceway also has a liquid oxygen delivery system as a backup. The raceway outflow is through four 8" pipes that discharge directly into the stream 100' below the raceways and 700' below the intake. This setup is also the release mechanism for the facility.   We will need to do instream work annually to excavate the intake area.

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

In one instance, freezing temperatures at the acclimation site in 2002 caused one raceway inflow pipe to freeze, thereby blocking water flow which resulted in the death of all fish in the raceway. The problem was not noticed by the facility operator due to inexperience and the fact that the all of the raceways were frozen over with ice with the water inflow entering the pond under the ice and both the low water and inflow alarms were frozen and inoperable. We lost the entire raceway (50,100 fish). In another instances, the water intake screens have iced over allowing no water to flow into the water intake structure. Also, Maintenance of the water intake at Lookingglass Hatchery in 2009 (deepening for more water) caused the mortality of over 60 (out of around 170) Upper Grande Ronde River broodstock being held in a circular. The maintenance stopped flow into the circular and the fish used all of the oxygen before water flow could be returned. And finally, gamete transfer--temperature control (too cold) for green egg transferred from Oxbow hatchery resulted in below average of survival in 2001.

Three scenarios for icing events at Lookingglass Hatchery intake that cause ice buildup and blockage of the intake are:

- Icing caused by 1 to 3 week period of sub-zero air temperatures.
- 1 to 3 week period of sub-zero air temperatures followed by heavy snow resulting in slush ice.
- Quick warming temperature resulting in blocks of ice breaking loose from Lookingglass Creek and lodging against the intake screens.

In December of 2009 a large ice flow coming down Lookingglass Creek blocked the water intake completely. Flow was lost to the incubator trays and some mortality occurred. High spring run-off has created problems with turbid water and sediment deposition in egg incubation trays, early rearing troughs, large raceways, and associated water delivery pipes. Compliance for screening criteria will be evaluated. In April of 2010 high flows with lots of debris caused a screen to plug in the UV system. This caused shutdown of flow into the rearing troughs causing the mortality of the fish in the troughs.

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.

The acclimation facility is staffed 7 days a week, 24 hours a day by 1 to 3 project personnel for cleaning the intake screens and monitoring water flows during freezing and high flow conditions. There are low water and flow alarms that can alert the operators day or night of water flow problems in the raceways. Oxygen tanks and delivery systems are in place in all raceways to deliver oxygen if water flow cannot be restored immediately. Water inflow to all raceways cascades into the raceway so that the operators can visually confirm that there is flow into each raceway. Heat tape is applied to the raceway inflow pipes to prevent freezing. Raceway ice cover is removed daily. Inspection of the screens, inflows, and outflows will be made every 2-4 hours by the operators during freezing or high flow conditions. The dates of acclimation will be adjusted (later in spring, or until weather breaks) so fish are not in the facilities during severe weather conditions. An emergency fish release procedure document has been developed, and all operators will be required to read and understand it. The project leader will also implement and test emergency procedures scenario at the facilities which will include several mock emergencies before and during the acclimation period.

Lookingglass Hatchery is staffed full time and is equipped with various water alarm systems to help prevent catastrophic fish loss resulting from water delivery failure. Several new alarms were installed in light of the UV system blockage mortality event. The intake well (TW2) is operated for icing emergencies. There is a backup diesel motor for TW2. There are low water alarms on all raceways and circulars. Annual removal of gravel deposition near the intake and screen maintenance occurs. Due to the adult mortality incident in the captive building adult holding circular ponds a change was made to hold a different stock of fish in that building that would be at a much lower density than when the accident occurred.

Bonneville and Oxbow are equipped with various water alarm systems to help prevent catastrophic fish loss resulting from water failure.

At Wallowa Hatchery spring water is the primary source of water for this program which is a gravity flow system. When well water is in use there is a risk of power outage and stoppage of inflow. The hatchery has a back-up generator and automatic switching gear which supplies power to the well pumps.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

6.1) Source.

The broodstock for the conventional component of the program originated from natural returns to the Upper Grande Ronde River. As hatchery fish began returning from conventional releases, the program incorporated some of these returns into the broodstock. Since there was a Captive Broodstock Program operating simultaneously with the Conventional Program we did not take any F1 generation Captive Broodstock fish into the Conventional Broodstock, all were allowed to spawn naturally. These fish are listed as threatened under the Snake River ESU. Our collection goal is based on criteria outlined in the GRSCHMP (Appendix A.).

There is also a safety net captive broodstock production program (SNP) for the Upper Grande Ronde River. Brood for this component of the program are collected as eggs from the conventional program and reared to maturity in captivity. The goal is to collect 300 eggs from the conventional program each year. These eggs represent all families spawned in the Conventional Broodstock Program and hopefully, will provide as much genetic variability in the collection as possible. Eggs are collected at the eyed stage and those surviving to maturity with be spawned for smolt production when needed. SNP adults not needed for production will be outplanted into the Upper Grande Ronde River tributaries to spawn in nature.

6.2) Supporting information.

6.2.1) History.

The entire Grande Ronde River Basin once supported large runs of Chinook salmon with estimated escapements in excess of 10,000 as recently as the late 1950's (USACOE 1975). Natural escapement declines in the Grande Ronde River Basin have paralleled those of other Snake River stocks. Reduced numbers of spawners combined with human manipulation of previously important spawning habitat have resulted in decreased spawning distribution and population fragmentation.

The Upper Grande Ronde River was historically one of the most productive populations in the Grande Ronde River Basin (Carmichael and Boyce 1986). In the past, both juveniles and adults of Carson and Rapid River stock origin were outplanted into the Upper Grande Ronde River. Even though non-local origin hatchery fish have been outplanted extensively in the basin there remains a high degree of differentiation among populations and the genetic profile of the Rapid River and Carson hatchery stock is not similar to any of the natural populations (Waples et al. 1993). Escapement levels in the Upper Grande Ronde River dropped to alarmingly low levels in 1994 and escapements in 1995 were comparable to those in 1994. Four redds were observed in the Upper Grande Ronde River in 1994 and 7 redds in 1995 (Table 15). In contrast, the estimated number of redds in 1957 was 893. The current situation is therefore an emergency where dramatic and unprecedented efforts are needed to prevent extinction and preserve any future options for use of natural fish for artificial propagation programs for recovery and mitigation.

The overall viability rating for the Upper Grande Ronde River population does not meet viability criteria and is considered high risk. The 10-year geomean (1981-2000) natural origin abundance is 38 adults, which is only 3.8% of the "large" size population threshold of 1,000 adults.

The broodstock for the Upper Grande Ronde River Conventional Hatchery Program initially came from naturally spawning adults from the Upper Grande Ronde River in 2001. A Captive Broodstock program was already underway since 1995 with the first releases of a small number of smolts in 2000 and 2001 increasing substantially in 2002 (Hoffnagle et al. 2003; ODFW 2004; 2005; 2006; 2007; 2008). The broodstock for the Captive Program initially came from wild parr collected each year since 1995. We did not see any significant returns of hatchery fish from the Captive Program until 2004. It was agreed by co-managers that returns from Captive Broodstock releases would be allowed to spawn naturally and not taken for the Conventional Broodstock Program. Natural broodstock continued to make up the entire Conventional Program until 2005 when the first returns of the Conventional releases were taken into the broodstock (Monzyk et al. 2008). Currently the broodstock for the Captive Program comes from a combination of natural parr (150) and conventional eggs (150). The future broodstock for this program will come entirely from eggs from the conventional program.

6.2.2) Annual size.

The smolt release goal for the Upper Grande Ronde River is 250,000. Production for the Upper Grande Ronde River has been derived from both Conventional and Captive Broodstock sources. The broodstock goal for the Upper Grande Ronde River stock conventional program is 178 adults (age 4 and 5 conventional and natural origin only, no captive returns). We will attempt to collect males and females at a 1:1 ratio. We will limit the jack portion of the broodstock to be no more than 20% (1 jack for every 5 adult fish). Natural fish are incorporated into the broodstock when available (collection allows for 50% collection of natural fish and 100% collection of conventional returns). We attempt to have 20 to 30% of the broodstock be made up of natural fish but there is no limit on the percentage of hatchery fish in the broodstock (could be 100%). By using the localized endemic stock we can help increase natural productivity and stabilize this population and hopefully move the population to a viable status.

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

The maximum percentage of the natural origin adults currently retained for hatchery broodstock is 50%, as described in the GRSCHMP (Appendix A.). In some years when the hatchery return to the weir is high and the natural return is very low, the percentage of natural fish in the broodstock will be low, per the GRSCHMP. In other years when the return of natural fish is high the percentage of natural fish in the broodstock will be high. The actual collections and use of hatchery and natural origin fish for the hatchery broodstock is described in Table 24 and Table 30 for the conventional hatchery program and Table 25 and Table 31 for the captive hatchery program.

6.2.4) Genetic or ecological differences.

There is no information about genetic and ecological differences between the currently used hatchery stocks and wild stocks. Broodstock annually incorporates locally adapted naturally produced fish that should minimize differences. We attempt to collect broodstock from a random cross section of the entire return.

6.2.5) Reasons for choosing.

Endemic broodstock for the subbasin being supplemented was selected to reduce the risk of genetic diversity loss of the natural population found there.

Table 30. Upper Grande Ronde River spring/summer Chinook salmon conventional broodstock program spawning data for 2001-2010 (ODFW and CTUIR unpublished).

Brood year	Marked females spawned	Unmarked females spawned	% unmarked	Spawning ratio F/M	Average fecundity	Egg take	Fry ponded	Smolt releases
2001	0	8	100%	1.0:1	3,698	29,580	25,232	26,923
2002	0	25	100%	1.5:1	3,566	89,156	71,772	70,088
2003	0	23	100%	1.1:1	5,248	120,703	104,094	104,347
2004	0	7	100%	1.0:1	2,980	20,858	18,977	18,901
2005	38	2	5%	1.6:1	3,877	155,070	119,963	118,803
2006	72	13	15%	1.5:1	3,497	297,271	263,432	259,932
2007	25	6	19%	1.1:1	3,960	122,752	97,615	94,148
2008	8	4	33%	0.9:1	3,950	47,402	41,962	41,819
2009	52	9	15%	1.3:1	3,950	240,950	193,571	189,268
2010	69	13	16%	0.9:1	3,607	295,767	290,682	289,236 est.
Total	264	110	29%	1.2:1	3,833	1,419,509	1,227,300	1,213,465

Table 31. Upper Grande Ronde River spring/summer Chinook salmon captive broodstock program spawning data for 1998-2010 (ODFW and CTUIR unpublished).

Brood year	Marked females spawned	Unmarked females spawned	% unmarked	Spawning ratio F/M	Average fecundity	Egg take	Fry ponded	Smolt releases
1998	0	4	100%	0.6:1	1,041	4,165	1,683	1,508
1999	0	5	100%	0.2:1	1,209	6,043	2,772	2,544
2000	0	188	100%	1.0:1	1,651	310,368	227,700	151,444
2001	0	199	100%	1.1:1	2,184	434,668	334,056	210,637
2002	0	56	100%	1.6:1	1,873	104,873	95,079	77,204
2003	0	1	100%	0.2:1	1,548	1,548	1,114	1,022
2004	0	1	100%	0.3:1	693	693	238	76
2005	0	58	100%	0.8:1	1,072	62,188	24,185	20,620
2006	0	5	100%	0.4:1	746	3,731	0	0
2007	0	77	100%	0.5:1	1,457	112,216	64,842	52,404
2008	0	109	100%	0.8:1	2,142	233,482	195,421	190,531
2009	0	132	100%	1.1:1	1,769	233,475	55,176	53,114
2010	0	138	100%	1.0:1	2,025	279,511	0	0
Total	0	973	100%	0.7:1	1,493	1,786,961	1,002,266	1,050,340

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.

By selecting the endemic stock from the area of supplementation we expect to reduce the risk of genetic diversity loss of this population. Each year we will attempt to incorporate natural broodstock into the hatchery program to decrease the risk of domestication in the hatchery stock. We will also attempt to collect the broodstock from a random cross section of the entire return. Any adult returns from the captive broodstock releases will not be incorporated into the conventional broodstock program.

SECTION 7. BROODSTOCK COLLECTION

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

Adults are collected for the conventional program. Eggs from conventional females are collected for the SNP.

7.2) Collection or sampling design.

Adult spring Chinook salmon for the conventional program are captured using a weir trap operated from April through September on the Upper Grande Ronde River. Peak capture at the facility usually occurs from May to June. We attempt to install the weir early enough to capture the entire return. High flows in May and early June sometimes cause problems with the weir efficiency. This is evidenced by the recovery of carcasses above the weir that had not been sampled at the weir (no opercle punch). We have moved to using floating instead of a stationary picket weir to reduce to effects of the high flows. This weir design modification has enabled us to fish in higher flows with less risk of the weir getting washed out. In the past (2001, 2003, and 2009) we also used a beach seine to capture adults below the Upper Grande Ronde River weir. This was done to ensure that we had enough broodstock to start the program and to remove fish from a high temperature (lethal) area of the river when they seemed to be unwilling to enter the weir trap.

All adults that enter the Upper Grande Ronde River weir trap are sorted by origin (marked conventional, marked captive brood or unmarked), sex and age. Fish are retained for brood stock (including jacks) or released above the weir based on predetermined ratios and collections rates outlined in the sliding scale (Appendix B) and the GRSCHMP (Appendix A). Adults are selected haphazardly from the available fish for the broodstock. Broodstock are tagged with an opercle tag for identification at spawning. Fish not retained for broodstock are marked with an opercle punch (doubles as genetic sample) and released above the weir. Hatchery jacks may be placed above the weir at a rate of up to 10% of the males passed above the weir.

7.3) Identity.

The natural component of the target population is unmarked and cannot be distinguished from natural strays from other basins. All fish are scanned for CWT at the trap to account for the non-finclipped hatchery fish. The conventional and captive/SNP hatchery components of the target populations are identified by a range of marking schemes based on the amount and source of production as well as US v. Oregon. The goal is to use 100% conventional smolts in the program, however, when conventional production falls short, the shortfall could be made up of captive/SNP broodstock.

Some different marking scenarios might be:

Conv. (%)	Capt. (%)	Ad clip, CWT (%)	CWT only (%)	Ad clip only (%)
100	0	25	50	25
50	50	25	50 (conv. fish)	25
25	75	25	25 (conv. Fish)	50
0	100	25	0	75

7.4) Proposed number to be collected:

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

Our broodstock collection goal for the Upper Grande Ronde River, based on past production and fecundity estimates is 89 females and 89 males, with up to 17 jacks. Refer to the GRSCHMP (Appendix A.) and the Annual Operations Plan (AOP) for more specific details in season.

7.4.2) Broodstock collection levels for the last twelve years, or for most recent years available:

The conventional broodstock program began supplying production for the 2001 broodyear (Tables 24 and 30). The captive broodstock program began supplying production for the 1998 broodyear (Tables 25 and 31).

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

The protocols for broodstock collection and hatchery/wild fish ratios above the weir on the Upper Grande Ronde River are such that the only surplus hatchery-origin fish will be jacks. Consistent with the long-term draft recovery plan strategy described in Section 1.73, there is no restriction on the percentage of hatchery adults escaping above the weir or allowed in the broodstock. The surplus jacks will be sacrificed for tribal subsistence or food bank.

Surplus adults from the captive broodstock program can be outplanted into Meadow or Sheep creeks and monitored for survival, spawning, and production.

7.6) Fish transportation and holding methods.

Fish are not anesthetized at the trap due to concerns with tribal harvest above the weir. Fish taken for broodstock are given injections of oxytetracycline and erythromycin based on the age of the fish (dosage based on size of fish). The fish are then placed in the transport tank. The 320 gallon fish transport tank, compressed oxygen and aeration system, is mounted on a flatbed trailer. The tank is filled with water from the tributary stream and the dissolved oxygen of the water is maintained at a minimum of 10 ppm. Poly-aqua is added at a level of 5 mL (1 teaspoon) per 10 gallons of water to reduce transport stress and aid in wound healing. Fish are transported from the weir location to Lookingglass Fish Hatchery. The transport time is about 1.5 hours (with a stop midway to check on oxygen, temperature, and fish in tank). The midway stop is near the Grande Ronde River and, should problems occur, none to date, (complete loss of dissolved oxygen or water loss), the fish will be released back into the river at that point.

All adult holding occurs at Lookingglass Hatchery. Upper Grande Ronde River adults are now held in an outdoor rectangular pond (~3,200 ft^3 80'x10'x4') due to density issues with the circular tanks (1,100 ft^3 20'x4') they were previously held in. A net covering are kept on the circular tank at all times, a cyclone fence surrounds the outdoor pond. A formalin drip system is also in place for fungus and ectoparasites prevention and treatment.

For the Captive Broodstock Program, eyed eggs are transported from Lookingglass Hatchery to Wallowa Hatchery and smolts from Wallowa Hatchery to Bonneville Hatchery, where they will stay until they are spawned as adults. The resulting eggs are shipped to Lookingglass Hatchery for rearing to the smolt stage, at which time they are transported to an acclimation facility on their parents' natal stream. If the adult Captive Broodstock fish are not spawned, they will be loaded into the 240 gallon fish transport tank and taken to Meadow or Sheep creeks for release into the wild.

7.7) Describe fish health maintenance and sanitation procedures applied.

This section was developed over the years of fish health work by the ODFW fish health section. Fish collected for broodstock are given two injections at the weir; oxytetracycline (3 year .125cc, 4 year .25cc, 5 year .50cc) and erythromycin (Erythro-200, 3 year .25cc, 4 year .50cc, 5 year 1.00cc) (doses are developed by ODFW fish pathology using the size of the fish).

Holding--At Lookingglass Hatchery, formalin is dripped into the inflowing water to achieve a concentration of 167 ppm. The treatment is applied for a minimum of three days per week for one hour to control fungus and parasites. Frequency of treatment is adjusted on an as needed basis.

Spawning--All hatchery-spawned females are screened for *R. salmoninarum*, the causative agent of BKD, using enzyme-linked immunosorbent assay (ELISA). A minimum of 20 adults (if available) are examined for systemic bacteria and BKD. A minimum of 60 spawned fish are sampled for culturable viruses using ovarian fluid and caeca/kidney/spleen sample pools of up to 5 fish.

Progeny-- Eggs are water hardened in 100 ppm iodophor solution for a minimum of 15 minutes to control vertical transmission of pathogens including IHNV and *R. salmoninarum*. Eggs are culled or segregated in groups based on BKD ELISA titers whenever possible. Groups are identified by the following titer ranges:

- $\leq$ 0.199 =Low
- 0.2 - 0.399 = Moderate/Low
- 0.4 - 0.799 = Moderate/High
- $\geq$ 0.800 = Clinical

Progeny receive a minimum of one 28 day erythromycin (Aquamycin) feed treatments (INAD 020RLOSCS1) to control BKD. Captive Broodstock progeny with moderate to high ELISA titers receive two 28 day therapeutic Aquamycin feed treatments.

Disease outbreaks are treated on a case-by-case basis. Therapies and remedial measures are based on conventional and available treatments, new information, and innovation. Warm water therapy can be used if EIBS becomes a problem. It would be used, based on priorities of stocks and raceways affected, after consultation with appropriate entities. Formalin treatments, at the recommendation of Fish Health Services, can be implemented for parasitic infestations.

Captive Broodstock - There continues to be no reliable and scientifically proven non-lethal or non-invasive sampling techniques for infectious diseases that could potentially occur in the spring/summer Chinook collected and maintained in the Captive Broodstock Program. Infectious diseases that have been observed in Chinook salmon in Oregon include: bacterial kidney disease (BKD), erythrocytic inclusion body syndrome (EIBS), bacterial cold water disease (CWD), enteric redmouth disease (ERM), aeromonad-pseudomonad septicemia (APS), bacterial gill disease (BGD), furunculosis, columnaris and infectious hematopoietic necrosis (IHN). External fungus on the body or gills is always a threat and infestations by ectoparasites are possible. By far, the most survival-threatening infection continues be BKD.

Monitoring of morbidity and mortality is critical. This monitoring will provide the primary basis of the need for antibiotic or chemical treatments for diseases for which these therapies are appropriate. Daily observation of the fish by hatchery personnel and periodic inspections by fish health personnel may also help to identify conditions requiring treatment before clinical disease occurs. Below are specific monitoring and therapy protocols for each of the conditions identified above.

Fish Health Monitoring and Treatment Responsibilities

Optimal fish culture techniques and only minimal and essential handling are vital to long term survival in confinement. Modifications to conventional fish husbandry methods are already designed into the Captive Broodstock Program and other adjustments may be implemented as needed. By keeping the fish at very low densities and minimizing handling it is unlikely that most infections and infestations will occur, and if they did, fish-to-fish transmission would be minimal. Bacterial kidney disease is the primary concern.

By rearing the captive broodstock in pathogen-free water and maintaining stringent isolation of the fish and eggs at BOH and Oxbow Fish Hatchery (OFH) the risk for introducing infectious agents back into the Grande Ronde River basin is very low. The threat goes up with respect to BKD if higher risk progeny from BKD infected females are brought back to NE Oregon. Progeny of captive broodstock fish will be monitored for health and disease under currently established monthly and pre-liberation protocols.

Bacterial Kidney Disease (BKD)

The greatest continuing threat to fish health in the Captive Broodstock Program is BKD. Most fish health management activities have been targeted at controlling this disease.

With the Grande Ronde River SNP fish, the approach will be to not treat for BKD unless a problem occurs. This approach worked for the Washington Department of Fish and Wildlife's Captive Broodstock program selected from eggs. Therefore there are no plans to give prophylactic medicated feedings or antibiotic injections to these fish.

In contrast, parr collected from the wild and brought into the Captive Broodstock program since 1995 have been treated aggressively for BKD. This approach will continue with fish produced from natural parr. The primary components of this plan employ the use of erythromycin and other antibiotics to control the disease within the Captive Broodstock population.

Erythromycin therapy: Erythromycin is the standard medication to be used for BKD in this program. All collected captive broodstock groups will receive at least two erythromycin treatments annually. SNP fish will only receive treatments when an outbreak occurs. Planned BKD disease treatments with fish pills are planned for spring and fall. Other treatments will be implemented as necessary in response to increased loss due to BKD.

Spawning and maturity sorts: All maturing fish will receive a dorsal sinus (DS) injection of erythromycin @ 40 mg/kg body weight in August before the onset of spawning

Screening of female spawners for BKD: All females from which eggs are collected will be screened for BKD using ELISA. These results will be used to implement BKD prevention control through culling of eggs known to be of higher risk. The BKD ELISA and ranges that have been used in this program are: Low (<0.200), Low-Mod (0.2-0.399), Hi-Mod (0.4-0.799), Clinical (0.8-1.999) and Gross (≥ 2.000).

<u>Other diseases and maladies</u>
Most of the treatments listed below are standard and quite specific in some cases. However, it is often necessary to make adjustments from standard protocols to accomplish recovery of fish from infections and infestations. Indeed, other Captive Broodstock programs have encountered unexpected and even previously unknown diseases and fish health problems. Such situations may call for the use of non-standard or innovative therapies.

External Fungus: Hatchery and fish health personnel will monitor for external lesions at all opportunities. Fish sorted as maturing should be monitored daily. Any rearing unit in which a fish with fungus is observed will immediately be treated for three consecutive days with formalin for one hour at 200 ppm (1:5,000) at water temperatures below 10° C and at 167 ppm (1:6,000) at water temperatures above 10° C. If dilution (or ventilation) requirements for formalin cannot be met, hydrogen peroxide treatments will be given for three consecutive days at 1:3500 for one hour. Baths can be used in lieu of flushes if this does not cause undo stress on the fish. Feed should be withheld on afternoons before treatment days and on days of treatment. Fish may be fed a few hours following treatment if no treatment is scheduled the following day. Persistent fungus problems in maturing adults, may require a weekly regimen of every other day treatments (Monday, Wednesday, and Friday), and with minimal feedings on non-treatment days, if the fish are non-maturing. Fungus treatment may require an adaptive approach that is dependent upon the fish culture environment. The use of formalin for external fungus must be under a prescription and achieve dilution and other DEQ requirements. A prophylactic formalin treatment at 1:6,000 will be given for two consecutive days following PIT-tagging. Prophylactic treatments of hydrogen peroxide at 1:3500 for one hour will be given for fungus control for 3-5 consecutive days following VI tagging.

Erythrocytic Inclusion Body Syndrome (EIBS): Monitoring can be done by lifting the operculum and observing for pale gills (anemia). This activity requires mild anesthesia and handling of the fish. If this condition is observed and confirmation deemed necessary a blood sample will be collected, if possible, by non-lethal sampling techniques. The sample will be examined to confirm if EIBS is the cause of the anemia. If EIBS is confirmed, any activities that may be stressful must be minimized. If secondary infections are indicated, appropriate antibiotic therapy will be initiated.

Systemic Gram Negative Infections (Cold Water Disease (CWD)e, Columnaris, Enteric Redmouth Disease(ERM), Aeromonad-Pseudomonad Septicemia & Furunculosis): Monitoring will be by streaking smears from kidneys for morbidity and mortality on TYES agar plates incubated at 18° C. Dietary or parenteral oxytetracycline treatment would be initiated if a weekly mortality rate of $\geq$ 1.0% (2/150) due to any single agent occurs in a tank or raceway. The same treatment would be initiated if external lesions typical of CWD were observed. Romet would be used for furunculosis if oxytetracycline resistance were indicated. The use of oxytetracycline for CWD and ERM must be under an INAD protocol. Parenteral oxytetracycline should be given by intraperitoneal injection at 10 or 20 mg/kg body weight.

Bacterial Gill Disease (BGD): Monitoring will be by culturing smears from gills of mortalities showing signs of BGD. Anytime BGD is suspected, wet mounts of gill tissue from moribund or fresh-dead fish will immediately be made and smears from gills collected on sterile cotton swabs will be made on TYE-S agar plates and incubated at 18° C. If gill disease bacteria are observed microscopically or if gill disease bacteria are isolated, chloramine -T treatments according to INAD protocols, will begin immediately in the rearing unit involved. The treatment regimen will depend on the degree of BGD determined. The use of chloramine -T must be under an INAD protocol. If chloramines-T is not available an alternative treatment will be given such as Diquat (also under INAD). Additionally, if BGD outbreaks occur, water quality analysis will be conducted on the ponds where it is observed to determine ammonia levels which could be a cause of the outbreak.

Infectious Hematopoietic Necrosis (IHN): If a $\geq$ 1.0% (1/150) mortality per week occurs without identification of etiological agents or causes, or if signs consistent with IHN are observed, assays for IHN and other viruses from morbidity and mortality would be made according to Fish Health Section Bluebook methods. There are no treatments for IHN. Management of the disease could be attempted through density reduction if conditions warranted such measures.

Ectoparasites: Hatchery personnel will monitor the fish daily for signs of parasite infestation such as flashing. Fish health personnel will collect gill clip and skin scrape samples from freshly dead or moribund fish. If numbers of *Salmoncola* sp. exceed 5 /side or if the majority of fish examined approach this level, treatments will be initiated. The fish health section will decide the form of treatment, Ivermectin, physical removal, or other technique after consultation among the fish pathologists. Treatments for most other ectoparasites will be in the form of formalin or hydrogen peroxide flushes, as described for fungal treatments at the discretion of the responsible pathologist.

Tumors: During handling events personnel should look for signs of abnormal tissue. If early or any stage of abnormal tissue is observed, tissue samples should be collected, from two fish (lethal sample) if possible, for histology and placed in 10% neutral buffered formalin. This should be done by or in consultation with fish health personnel. Additional samples may be taken at the discretion of fish health personnel in consultation with tumor specialists or toxicologists. Any unfrozen mortality with signs of abnormal tissue development will be sampled for histology.

Health and Disease Monitoring at Spawning
All spawned females will be sampled individually for the presence of *Renibacterium salmoninarum* (BKD). At a minimum, subsamples of ovarian fluid will be collected from across the whole spawning period to detect the presence of culturable viruses. Sub-samples of each stock, brood year or stock/brood year group will be taken for culturable virus. Levels of sampling will be determined by the fish health staff based on an assessment of risk of infection. New sampling will be implemented as necessary. Spawned fish will be visually examined externally and internally and lesions, fungus or other anomalies noted. All observations will be recorded and maintained in a database.

7.8) Disposition of carcasses.

Hatchery origin jacks surplus to broodstock and natural spawning needs will be sacrificed and use for tribal subsistence or food bank programs. Prespawn mortality carcasses recovered at the weir are frozen for ODFW pathology inspection. Spawned fish carcasses at the weir are sampled and returned to the stream. Hatchery-spawned carcasses are disposed of in the hatchery landfill. Surplus carcasses may be screened for pathogens BKD, IHN, and *M. cerebralis* and used for nutrient enhancement consistent with MOA between ODFW and Oregon DEQ.

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.

The weir is constructed to be strong enough to withstand the highest spring flows so that broodstock can be collected across the entire run timing. The weir is snorkeled weekly to look for holes in the weir that adult fish could swim through.

Fish collected for broodstock are systematically sampled, by sex, from the entire run based on the collection rate in the adult sliding scale (Appendix B) and the GRSCHMP (Appendix A). The jack component of the broodstock will be limited to no more than 20% (1 jack for every 5 adult fish) of the fish collected from the Upper Grande Ronde River.

Adult fish that are collected for broodstock are given antibiotic injections. The risk of fish disease amplification will be minimized by consulting with Fish Pathologist and following Fish Health Policy sanitation and fish health maintenance recommendations discussed annually with co-managers during the development of the AOP (2009). The trap is checked at least 3 days/week and up to 7 days/week when high numbers of fish are present in the stream. Adult fish surveys below the weir are completed weekly. High water temperature triggers (instantaneous maximum of 20^{o}C) can stop the trapping process and allow upstream passage for the fish by removing the weir.

SECTION 8. MATING

8.1) Selection method.

At Lookingglass Hatchery, fish are sorted for ripeness at least once a week or more often as needed. Spawners are selected during these ripeness sorts.

8.2) Males.

Enough ripe males are chosen randomly to spawn all ripe females selected that day. Males are split using a spawning matrix, no back up males are used. All males are recycled back to the pond with an identifying mark for possible reuse if necessary. Recycled males are used only if no unused males are available on that day. Jacks will be incorporated into the spawning matrix at a level determined in the AOP based on the number of adult males available for broodstock.

8.3) Fertilization.

For each spawning day, matings are random. Spawning matrices used are based on the number of ripe females and males available that day and the sex ratio in the population. Two by two matrices are preferred. One by two matrices (1 female: 2 males) may be used if there are an odd number of females on a given spawn day. The goal is to stay away from crosses that include only natural origin fish, this is to maximize the natural contribution to the broodstock. At fertilization the eggs are drained and water hardened with iodophor for 45 minutes to an hour.

8.4) Cryopreserved gametes.

Cryopreserved gametes are available but would only be used as the last option due to the very low fertilization rates. Cryopreserved gametes have not been used to date in the Upper Grande Ronde River conventional program and only infrequently in the Captive Broodstock Program.

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

Matrix spawning will be used to reduce the risk of loss of genetic diversity within the population being supplemented. Matings are chosen randomly.

SECTION 9. INCUBATION AND REARING

There is no current goal for egg and juvenile survival; however, the current program achieves a 87% survival from green egg to smolt. For modeling purposes, we expect a 90% survival of green egg to fry.

9.1) Incubation.

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

Adult collections and spawning have occurred from 2001-2010. In 2004, we started using an egg counter to determine fecundity of females.

Table 32. Egg take and egg loss data for conventional Grande Ronde River stock spring Chinook salmon at Lookingglass Hatchery, 2001-2010.

Year	Total egg take	Total egg loss	% loss	% survival to eyed egg
2001	29,580	4,348	14.7	85.3
2002	89,156	17,384	19.5	80.5
2003	120,703	16,609	13.8	86.2
2004	20,858	1,881	9.0	91.0
2005	155,070	35,107	22.6	77.4
2006	297,271	33,839	11.4	88.6
2007	122,752	25,137	20.5	79.5
2008	47,402	5,440	11.5	88.5
2009	240,950	47,379	19.7	80.3
2010	295,767	5,085	1.7	98.3

Table 33. Egg take and egg loss data for Captive Broodstock Upper Grande Ronde River stock spring Chinook salmon at Bonneville Hatchery, 1998-2010.

Year	Total egg take	Total egg loss	% loss	% survival to eyed egg
1998	4,165	2,482	59.6	40.4
1999	6,043	3,271	54.1	45.9
2000	310,368	82,668	26.6	73.4
2001	434,668	100,612	23.1	76.9
2002	104,873	9,794	9.3	90.7
2003	1,548	434	28.0	72.0
2004	693	455	65.7	34.3
2005	62,188	38,003	61.1	38.9
2006	3,731			eggs outplanted
2007	112,216	47,374	42.2	57.8
2008	233,482	38,061	16.3	83.7
2009	233,475			eggs outplanted
2010	279,511			eggs outplanted

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

In some years the returning adults may have higher fecundities than planned for. We can use the BKD culling to bring the production to the goal. Surplus eggs may be released at the eyed stage directly into streambed gravels of Sheep or Meadow creeks.

SNP eggs produced by the program that are not needed to maintain the minimum 150,000 conventional smolt release will be outplanted into streambed gravels of Sheep or Meadow creeks at the eyed stage.

9.1.3) Loading densities applied during incubation.

Currently most of the eggs are incubated in vertical Heath trays with one female per tray from fertilization to the eyed stage. After ELISA values are known, eggs are re-counted at the eyed stage and 5,000 eggs are put into each tray. Flows are regulated at 4.5 to 6 gpm per vertical stack.

Moist air incubators are also being used. Approximately 1,500 eggs will be loaded in 1.2 liter containers. After eye-up, they will be transferred to hatch boxes located inside the early rearing trough units.

9.1.4) Incubation conditions.

Eggs in the Heath trays are incubated on chilled well water supplemented with UV treated Lookingglass Creek water until the ambient water temperature of Lookingglass Creek subsides, historically around the 3rd week of September. After Lookingglass Creek temperatures cool, only UV treated creek water is used to incubate eggs. Eggs from late spawning Conventional and Captive broodstock females can be incubated in creek water supplemented with pathogen free well water. The well water is 14^{o} C and is used to temper the cold creek water temperatures common in winter, to accelerate growth and development.

Water temperature is monitored using thermometers and recorded daily in the morning and afternoon. Daily thermal units (CTU's) are calculated to determine developmental stages. Eggs are picked at approximately 325-350 CTU's (585 - 630 FTU's). Fry are visually inspected to determine if they are buttoned up prior to ponding and feeding. At approximately 1,000 CTU's (1,800 FTU's) feed is presented to the swim-up fry.

Eggs in the moist air incubators are move to upwelling incubators or hatching boxes that are inside the early rearing trough.

At Wallowa Hatchery temperature units are recorded daily to follow the progression of egg development. Temperature manipulation can occur using the two different water sources. Dissolved oxygen ranges from 6.8 – 9.0 ppm. The Upper Grande Ronde River Captive broodstock fish are currently incubated reared on the spring water which provides a growth rate more closely related to fish in nature.

9.1.5) Ponding.

Fry are ponded in double deep troughs at approximately 50,000 fish per container.

Conventional Broodstock--Fry are ready to pond at about 1,000 CTU's (1,800 TU). Fry weight is estimated at approximately 0.4 grams (1,200-1,300 fish per pound).

Captive Broodstock—Fry are ready to pond at about 1,000 CTU's (1,800 TU). Fry weight is estimated at approximately 0.3 grams (1,500 fish per pound).

9.1.6) Fish health maintenance and monitoring.

Fungus is controlled with formalin treatments at a concentration of 1,667 ppm. Treatments are scheduled three times per week for 15 minutes; however, daily treatment will be applied if needed. Little mortality has been attributed to yolk-sac malformation. After eyeing, dead eggs and fry are hand picked and enumerated. Inventory adjustments are made in the HMIS system.

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.

Green eggs are incubated at Lookingglass and Oxbow hatchery on pathogen-free UV treated creek water, pumped well, or spring water. Eggs are fertilized at each hatchery and water hardened in 100 ppm iodophor for a minimum of 45 minutes to one hour.

9.2) Rearing

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years, or for years dependable data are available.

From 2001 to 2008 the observed green egg to smolt survival at Lookingglass Hatchery for the conventional hatchery stock has ranged from 0.767 to 0.910, with an average of 0.839 (Table 34). For the captive rood program the egg to smolt survival was lower, with a range from 0.110 to 0.736 and an average of 0.451 (Table 34).

Table 34. Green and eyed egg, fry, parr, and smolt counts as well as eggs, parr, and smolts released for the conventional and captive broodstock hatchery programs.

UGR conventionals

Year	Green eggs	Eyed eggs released	Fry	Parr	Parr Released	Smolts released	Green egg to Smolt Survival
2001	29,580	0	25,232	24,816	0	26,923	0.910
2002	89,156	0	71,772	70,483	0	70,088	0.786
2003	120,703	0	104,094	105,827	0	104,347	0.864
2004	20,858	0	18,977	19,045	0	18,901	0.906
2005	155,070	0	119,963	119,236	0	118,803	0.766
2006	297,271	0	263,432	258,563	0	259,932	0.874
2007	122,752	0	97,615	95,280	0	94,148	0.767
2008	47,402	0	41,962	42,611	0	41819	0.882
2009	240,950	0	193,571			189268	0.786
2010	295,767	0	290,682			289,236 est.	0.978

UGR captives

Year	Green eggs	Eyed eggs released	Fry	Parr	Parr Released	Smolts released	Green egg to Smolt Survival
1998	4,165	0	1,683	1,639	0	1,508	0.362
1999	6,043	0	2,772	2,603	0	2,544	0.421
2000	310,368	0	227,700	219,985	76,941	151,444	0.488
2001	434,668	0	334,056	221,122	32,800	210,637	0.485
2002	104,873	0	95,079	83,071	0	77,204	0.736
2003	1,548	0	1,114	1,022	0	1,022	0.660
2004	693	0	238	77	0	76	0.110
2005	62,188	0	24,185	20,773	0	20,620	0.332
2006	3,731	1,263	0	0	0	0	0.000
2007	112,216	0	64,842	59,351	0	52,404	0.467
2008	233,482	0	195,421	194,251	0	190531	0.816
2009	233,475	143,349	55,176	NA	0	53114	-
2010	279,511	251,107	0	0	0	0	-

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

Lookingglass Hatchery

Early rearing- Upper Grande Ronde River fish are loaded in Lookingglass Hatchery early rearing double deep troughs at maximum of 50,000 to 60,000 fish per trough. Fry are reared to approximately 250 to 300fpp before transferred to outside raceways. The expected flow 50gpm and the rearing volume is 120 ft^3.

Fish culture indices:
Fish/rcy: 50,000
Density: 1.39 lb/ft^3
Density Index: 0.66
Flow: 3.3 lbs/gpm
Flow Index: 1.59

Raceway rearing—Upper Grande Ronde River fish are loaded in Lookingglass Hatchery raceways for final rearing at maximum of 62,500 fish per raceway. Target fish size is 20fpp with an expected inflow of 400 to 800gpm(720 use for indices). Pond volume is 3,000 ft^3.

Fish culture indices:
Fish/rcy: 62,500
Density: 1.04 lb/ft^3
Density Index: 0.28
Flow: 4.2 lbs/gpm
Flow Index: 0.76

Upper Grande Ronde River acclimation facility:
Measures (fish size=20 fpp, inflow=300 gpm, volume=2,064 ft^3)
Maximum number fish/rcy: 31,250
Density: 0.76 lb/ft^3
Density Index: 0.14
Flow: 5.2 lbs/gpm
Flow Index: 0.95

The loading criteria for the Captive Broodstock Program at Bonneville Hatchery are determined by the number of fish taken into the program each year. Our current goal is 300 fish, which are split between two 20'- diameter circular ponds. Densities range from 0.01 lbs/ft3 to 0.43 lbs/ft3 in these 35.6 m^3 tanks. Flows are adjusted for the number and size of fish in the tank to maintain a level of dissolved oxygen well above 7.0 mg/L.

At Wallowa Hatchery the current maximum loading and density are 1.8 lbs / gpm and 0.6 lbs / ft^3. Currently, the capacity is 150 fish per tank.

9.2.3) Fish rearing conditions

Lookingglass Hatchery (early rearing in 2009)- Fish are reared in UV treated creek and pathogen free well water (5 - 10° C) from late-January to April. Flows are set to maintain acceptable flow indices (Piper et al. 1982); however the UV system limits flow capacity to a maximum of 50gpm. Troughs are cleaned and mortalities removed daily.

Lookingglass Hatchery (final rearing)--Fish are transferred to outside raceways in April and early May and reared in untreated Lookingglass Creek water. Fish remain in the raceways until March and April of the following year when they are transferred to acclimation sites or released directly into Lookingglass Creek. Water temperature varies seasonally from 0.5 - 20° C. Raceways are cleaned weekly and mortalities picked daily. During spring run off, raceway cleaning is suspended.

Bonneville Hatchery - Immature/juvenile fish are reared in well water (ranging from 8°C - 11°C) year round. Any fish deemed as maturing are moved to separate ponds in April and held until they are spawned on Tanner Creek water (ranging from 6°C - 11°C). Flows are adjusted for the number and size of fish in the tank to maintain a level of dissolved oxygen well above 7.0 mg/L. Mortalities are removed daily if present and ponds are cleaned as needed.

Wallowa Hatchery - During the winter months 300 eggs from females with low ELISA values (low BKD) in the Grande Ronde River Supplementation Program are transferred from Lookingglass to Wallowa Hatchery and reared for the SNP. Hatchery personnel conduct daily observations, feeding, and cleaning. The goal of Wallowa Hatchery is to rear the fish to a 20 gram smolt (22 fish per lb) by the end of April. Photoperiod is adjusted with timers every two weeks to simulate the natural photoperiod. Temperature and feeding strategies are consistent between groups. Fish are reared on spring water for the entire growth period. At the time of smoltification (April-May) the fish are transferred to Bonneville Hatchery for freshwater rearing to maturation and spawning.

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.

Table 35. Growth summary by month from initial ponding to release for Upper Grande Ronde Conventional Broodstock at Lookingglass Hatchery, 2007 Brood Year.

Month	Weight (g)	Fish /Pound
January		Not Ponded
February	0.50	900
March	0.98	461
April	2.18	208
May	3.11	146
June	5.04	90
July	6.39	71
Aug	12.27	37
Sept	15.13	30
Oct	16.81	27
Nov	16.81	27
Dec	17.46	26
Jan	18.16	25
Feb	19.74	23
Mar	21.62	21
Apr		Liberated

Table 36. Growth summary for Upper Grande Ronde Captive Broodstock at Bonneville Hatchery, 2007 Brood Year.

Month	Weight (g)	Fork length	Condition factor
June	2.2	55	1.32
November	12.7	98	1.35
January	15.2	105	1.31
April	22.2	124	1.16
July	79	180	1.35

Table 37. Monthly growth summary for Upper Grande Ronde Captive Broodstock at Wallowa Hatchery, 2007 Brood Year.

Month	Fish /Pound
March	1,175
April	680
May	388
June	160
July	119
Aug	91
Sept	71
Oct	56
Nov	43
Dec	37
Jan	34
Feb	30
Mar	25
Apr	21

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

No data available.

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

At Lookingglass Hatchery, fish are fed BioOregon's Bio-Diet starter and fry feeds. The feed is distributed to the raceways with air blower feeders and by hand during periods of cold temperatures. One 28-day erythromycin medicated feed treatment is given in July using Bio-Oregon moist at a target body weight of 1.9%.

Feeding Rate:
Start - 5.0% body weight/day
November through January fish are fed intermittently at "maintenance" ration 0.1-0.2%.
Final rearing - 0.1-0.2% body weight/day.
Overall food conversions are 1.1-1.3.

Bonneville - Smolts transferred to Bonneville are given Bio-Oregon Bio-Olympic Fry until they reach 400 grams when they are transitioned to BioBrood HE. Two 28-day medicated feed treatments are given using Bio-Diet feeds at 4.4% body weight. Feed is distributed by hand and belt feeders.

Wallowa Hatchery uses Bio-Oregons' Bio Vita Starter and Bio Vita Fry feed. To initiate a feeding response of wild collected parr to palletized feed, we mix freeze dried krill and "Cyclopeeze" to the Bio Vita feed. Once they show good feeding behavior, usually about 1 month, the krill and "Cyclopeeze" are reduced until only the Bio Vita Fry feed is used. Feeding rate ranges from 0.3 – 2.0% body weight. Total food conversion averages 1.0

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
Monthly samples of about 10 (or available) moribund and/or dead fish will be examined for *R. salmoninarum* (BKD) and systemic bacteria. Every other month, five grab-sampled fish per stock and any moribund fish (monthly) will be examined for erythrocytic inclusion body syndrome (EIBS) using blood smears and hematocrits. If EIBS is detected monitoring on the affected raceway will be expanded to 10 fish per month. Gill and skin wet mounts by microscopy will be derived from a minimum of five fish sample. These samples may be derived from a combination of moribund and healthy fish. If bacterial gill or cold water disease is suspected, smears from the gills on agar medium will be used for disease detection.

BKD – One 28-day therapeutic erythromycin (Aquamycin) medicated feed treatment is scheduled except for progeny of captive brood with moderate to high ELISA values which will receive two medicated feed treatments. The first treatment for Captive Broodstock progeny, if needed, is administered in April or May. All fish will receive a medicated feed treatment in July.

EIBS - There is no prophylaxis for EIBS except avoidance of the infectious agent. Bacterial coldwater disease is the most common secondary infection. Oxytetracycline or Aquaflor prophylaxis will likely be implemented based on the sensitive nature of this stock if conditions warrant its use.

Fungus - Formalin treatments are given for one-hour treatment for two consecutive days after fin clipping operations, PIT-tagging and VIE marking. Following Fish Health Services recommendations, formalin treatments can be implemented for parasitic infestations.

Disease Outbreak Plan - Disease outbreaks are treated on a case-by-case basis. Therapies and remedial measures are based on conventional and available treatments, new information, and innovation. Warm water therapy may be used if EIBS becomes a problem. It would be used, based on priorities of stocks and raceways affected, after consultation with co-managers.

Table 38. Disease history (2003 to present) of Upper Grande Ronde River Conventional and Captive Broodstock adults and all progeny[a].

Disease or Organism	**Conventional Adults**	**Captive Brood**	**All Progeny**
IHN Virus	Yes	No	Yes
EIBS Virus	No	No	No
Aeromonas salmonicida	No	No	No
Aeromonas/Pseudomonas	Yes	Yes	Yes
Flavobacterium psychrophilum	Yes	Yes	Yes
Fl. columnare	No	No	No
Renibacterium salmoninarum	Yes	Yes[b]	Yes
Yersinia ruckeri	Yes	No	Yes
Carnobacterium sp.	No	No	No
Ichthyobodo	No	No	Yes
Gyrodactylus	No	No	No
Ichthyophthirius multifilis	No	No	No
Epistylis	No	No	Yes
Ambiphrya (Scyphidia)	No	No	Yes
Trichodinids	No	No	No
Gill Copepods	Yes	No	No
Coagulated Yolk Disease	No	No	Yes
External Fungi	Yes	Yes	Yes
Internal Fungi	No	No	Yes
Myxobolus cerebralis	No	Yes	No
Ceratomyxa shasta	Yes	No	No

[a] "Yes" indicates detection of the pathogen but in many cases no disease or fish loss was associated with presence of the pathogen. "No" indicates the pathogen has not been detected in that stock.
[b] BKD is the leading cause of death in the Captive Broodstock Program.

Note: the Grande Ronde River Chinook Fish Health Monitoring Plan for Captive Broodstock progeny and the Conventional Program is explained in the Lower Snake Program Operation Plan document developed annually by the co-managers in this program. The Grande Ronde River Basin Captive Broodstock Annual Operation Plan covers fish health monitoring plans for the Captive Broodstock. Refer to section 7 for fish health and sanitation procedures.

9.2.8) Smolt development indices (e.g., gill ATPase activity), if applicable.
No data.

9.2.9) Indicate the use of "natural" rearing methods as applied in the program.
Traditional hatchery rearing methods are applied at Lookingglass Hatchery. After eggs are eyed; fish are reared on natural water temperatures and photoperiods. Daily feed rations are primarily distributed with automatic feeders to limit human interaction.

Fish are acclimated in the Upper Grande Ronde River 2 to 3 weeks prior to release.

Traditional rearing methods are applied at Bonneville Hatchery; however, fish are reared with natural photoperiods. Maturing fish are taken off feed and Tanner Creek water is used to stimulate maturation through diurnal temperature changes.

Traditional rearing methods are applied at Wallowa; however, fish are reared with natural photoperiods.

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.

The incorporation of natural fish into program production is intended to slow the rate of domestication and associated divergence of both hatchery and natural fish from the historical character of the original natural population. Progeny are reared and released as smolts. Fish are released to mimic natural fish emigration timing and reduce natural and hatchery fish interactions in freshwater.

A spawning matrix is used at Bonneville Hatchery for the Captive Broodstock spawning. Adults returning from Captive Broodstock releases are not taken into the program as broodstock, they are allowed to spawn naturally.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels.

Table 39. Proposed fish release levels for the Upper Grande Ronde River.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs[a]	Unknown (eyed)			Meadow and Sheep creeks
Unfed Fry	None			
Fry	None			
Fingerling[a]	None			
Yearling	250,000	17-20	Mid April	UGR accl. Site
Adult (SNP)	500		August	Meadow Creek

[a] Additional production above the captive smolt goal will be outplanted as eggs into Sheep Creek or Meadow Creek. Outplanting into the Upper Grande Ronde River, especially if they are unmarked, will adversely impact the monitoring of the hatchery and natural production below the primary production area.

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

Stream, river, or watercourse: Upper Grande Ronde River (HUC-17060104)
Release point: rkm 319.4
Major watershed: Grande Ronde River
Basin or Region: Snake River/Columbia River

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

Table 40. Summary of spring Chinook releases by stock, number, and size (fpp) in the Upper Grande Ronde River, 2000-2010. Fingerlings released into mainstem Grande Ronde River (2001) and Sheep Creek (2002), eggs released into Meadow Creek.

Rel. Year	Location	Life stage	Treatment	Size (fpp)	Number released
2006	River	Egg	Captive	-	1,263
2009	River	Egg	Captive	-	143,349
2010	River	Egg	Captive	-	251,107
2001	River	Parr	Captive	-	76,941
2002	River	Parr	Captive	-	32,800
2000	Acc.	Smolt	Captive	19.4	1,508
2001	Acc.	Smolt	Captive	13.9	2,544
2002	Acc.	Smolt	Captive	18.4	151,444
2003	Acc.	Smolt	Captive	13.9	210,637
2003	Acc.	Smolt	Conventional	13.7	26,923
2004	Acc.	Smolt	Captive	20.3	77,204
2004	Acc.	Smolt	Conventional	22.4	70,088
2005	Acc.	Smolt	Captive	21.0	1,022
2005	Acc.	Smolt	Conventional	21.0	104,347
2006	Acc.	Smolt	Captive	29.3	76
2006	Acc.	Smolt	Conventional	29.3	18,901
2007	Acc.	Smolt	Captive	23.2	20,620
2007	Acc.	Smolt	Conventional	21.7	118,803
2008	Acc.	Smolt	Conventional	21.4	259,932
2009	Acc.	Smolt	Conventional	22.7	94,148
2009	Acc.	Smolt	Captive	21.1	52,404
2010	Acc.	Smolt	Conventional	22.2	41,819
2010	Acc.	Smolt	Captive	28.3	190,531

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

Smolts are transferred to the acclimation facility two to eight weeks prior to target release date. After being held for at least one week, fish are allowed to move volitionally into their natal stream. On the last day of acclimation, or before the transfer of another group of fish into the acclimation facility, the remaining fish in the raceways are forced into the stream. Volitional outmigration is monitored by PIT tag detectors on the outflow pipes. The general timeframe for release is designed to limit the amount of time the hatchery fish spend in the natal stream as smolts. Fish are released during the period of increased spring flow which occurs in April through mid-May accelerating outmigration. This increase in flows also coincides with natural fish migration to the ocean. Specific dates of release are selected within that general time frame to accommodate production and transportation schedules. Parr and egg releases are made directly into the stream.

Table 41. Smolt releases from the Upper Grande Ronde River Acclimation Facility.

Facility/ rel. Yr	Group[a]	Acclimation period	Volitional began	Temp.°C		DO mg/l		Volitional	
				Min.	Max.	Min.	Max.	migration	%
GR 00	Single	2/28-3/14	(none)	-0.5	2.7	-	-	(none)	
GR 01	Single	2/27-3/27	(none)	-0.7	3.8	8.7	12.1	(none)	
GR 02	Single	2/27-4/15	4/2	0.0	3.5	9.2	12.7	68,200	44.9
GR 03	Early	3/10-3/23	3/17	0.0	4.4	10.0	11.9	31,900	30.0
GR 03	Late	3/24-4/14	3/30	0.0	6.6	9.0	11.9	37,900	29.7
GR 04	Early	3/9-3/22	3/15	-0.1	5.9	11.3	14.7	12,889	16.3
GR 04	Late	3/25-4/12	3/31	-0.1	7.1	10.6	12.3	34,085	48.6
GR 05	Single	3/8-3/14	None	-0.1	3.4	10.3	11.9	None	
GR 06	Single	3/13-4/12	3/27	-0.7	4.5	10.3	12.3	10,461	55.1
GR 07	Early	3/12-3/25	3/19	-0.1	5.4	8.7	12.7	2,932	11.6
GR 07	Late	3/26-4/11	4/2	-0.1	6.9	8.5	11.9	28,718	24.2
GR 08	Early	3/11-3/24	3/17	-5.8	2.6	na	na	29,065	22.8
GR 08	Late	3/25-4/14	4/7	-5.9	4.3	na	na	10,880	8.2
GR 09	1	3/16 – 4/13	3/23	-0.1	4.0	11.3	13.5	54,859	58.3
GR 09	2	3/16 – 3/23	3/18	-0.1	1.8	11.3	13.5	3,013	10.7
GR 09	3	3/24 – 4/13	4/1	-0.1	4.0	11.7	13.5	10,264	42.2

[a] *Single= one acclimation period. Early=1st of 2 groups. Late= 2nd of 2 groups.*

Table 36. Parr and egg releases made into the Upper Grande Ronde River, Sheep and Meadow creeks.

Year	Life stage	Release	Location
2001	Parr	October	Mainstem Upper Grande Ronde River
2002	Parr	May	Sheep Creek
2006	Egg	October	Meadow Creek

10.5) Fish transportation procedures, if applicable.

Chinook smolts are loaded into the tanker truck with water using a fish pump. Fish are separated from the water and transferred into liberation tankers ranging in capacity from 2,400 to 5,000-gallons. Fish are loaded at a rate of 1.0 lbs/gallon. Transport time from Lookingglass Hatchery to acclimation sites is less than two hours. Supplemental oxygen and aeration is provided and temperature is monitored during transport.

10.6) Acclimation procedures.

In general, Chinook smolts arrive at the acclimation facilities in early March and are held on river water for a minimum of one week. After at least a week, screens are removed and fish are allowed to volitionally leave the pond until force out. All fish are forced out in late March or mid-April.

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

All of the hatchery fish released have a coded wire tag and/or adipose clip and will be scanned with a CWT wand on their return. Through brood year 2012, all the captive brood production will be marked with an adipose clip and coded wire tag. The conventional production will be unclipped with a coded wire tag unless the full production is attained with conventional broodstock. In that event 50% would receive an adipose clip with representative coded wire tag group. For long term marking plans refer to Attachment C of the U.S. v. OR Management Agreement Production Tables.

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

Juvenile hatchery fish in excess of program production levels would be released at an earlier life stage into Meadow or Sheep Creeks or outplanted as eggs.

10.9) Fish health certification procedures applied pre-release.

Sixty normal appearing grab-sampled smolts are sampled at Lookingglass Hatchery prior to transfer to the acclimation sites. Pretransfer grab-sampled numbers may vary depending on the disease history and number of fish for a given brood year. Individual fish are examined for *R. salmoninarum* by ELISA. Five grab-sampled fish per raceway are tested for EIBS. In addition a target of 10 moribund and/or dead fish are tested for *R. salmoninarum* by ELISA and systemic bacteria. A sub-sample of mortalities is tested for virus. Gill/kidney/spleen from grab-sampled fish are examined in 3-fish sample pools and assayed for viruses. Wet mounts of skin and gill tissue from a minimum of five live fish are examined by microscopy. If smolt groups are held at acclimation sites longer than three weeks they are evaluated with a lesser number of grab-sampled fish as in protocol above. At a minimum, a target of 10 (or available) moribund and/or dead fish will be sampled from acclimation sites for *R. salmoninarum* (BKD) and systemic bacteria. A sub-sample of these fish will be tested for viruses.

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

Environmental conditions are a concern at all acclimation sites and may lead to early releases. The Lookingglass Hatchery manager and facility operators have the authority to release fish in an emergency. Section (5.7) describes winter icing conditions that can result in the intake becoming blocked to inflowing water. Emergency releases may be conducted at all life stages.

In the event of an emergency release, the Hatchery Manager and Facility Operators will notify their immediate supervisor, ODFW Regional Manager, co-mangers, and federal cooperators of any action taken.

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

Chinook smolts are acclimated and released in late March or mid-April after a volitional release opportunity. Releases coincide with warming water temperature and increasing river flow. The intent is to reduce the time fish reside in freshwater and thereby minimizing the period of interaction with naturally produced Chinook and steelhead.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

This section describes how "Performance Indicators" listed in Section 1.10 will be monitored. Results of "Performance Indicator" monitoring will be evaluated annually and used to adaptively manage the hatchery program, as needed, to meet "Performance Standards".

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

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

- Mark all smolts (CWT and/or fin clip) and determine mark rate
  - (*Indicators: 1a, 1b, 2b, 3a, 4a, 4b, 7a, 26a)*
- Analyze marked fish recovery data collected by others from Columbia River, Snake River and other fisheries to determine harvest numbers and rate
  - *(Indicators: 1a, 1b, 2b, 3a, 25a, 25b, 26a)*
- Conduct statistically valid creel studies in the system to determine effort and harvest of hatchery fish and incidental handling rate for other fish
  - *(Indicators: 2a, 3a, 3b, 4a, 5a, 25a, 25b)*
- Monitor smolt release size, numbers, timing, location and smolt movement
  - *(Indicators: 7a, 14b, 17a, 22a, 22b, 22c, 24a, 25a, 25b)*
- Monitor adult collection, numbers, status and disposition
  - *(Indicators: 2b, 3a, 11a, 11b, 11c, 14a, 15a, 15b, 16a, 16b, 17b, 19a, 20a, 20b, 20c, 20d, 25a, 25b)*
- Monitor survival, growth and performance of hatchery fish in the hatchery and in nature
  - *(Indicators: 6a, 25a, 25b)*

- Determine proportion of hatchery adults in key natural spawning areas and the population as a whole via adult mortality recoveries or other methods.
    - *(Indicators: 19a, 25a, 25b)*
- Develop genetic profiles for hatchery and natural Chinook populations in the basin and conduct regular monitoring
    - *(Indicators: 18a, 20c, 25a, 25b)*
- Monitor wild fish escapement trend in key natural spawning areas and the population as a whole via redd count surveys and adult origin reconstruction via adult mortality recoveries and other methods.
    - *(Indicators: 15a, 17b, 19a, 20b, 21a, 21b, 25a, 25b)*
- Develop and implement evaluation plans and report findings consistent with needs of the program for adaptive management
    - *(Indicators: 25a, 25b)*
- Monitor discharge water quality and water withdrawals and report annually on compliance with related permits.
    - *(Indicators: 12a, 23a, 23b, 23c, 23d)*
- Monitor health of adult and juvenile Chinook associated with hatchery production.
    - *(Indicators: 8a, 8b, 9a, 9b, 9c, 11b)*

It is expected that these monitoring activities will provide the basic information needed to evaluate this program and its impact on the natural population (both positive and negative). However, additional data or analyses may be necessary to ensure the following key pieces of information are available to evaluate this program. The key information pieces are:

1 - A time series of wild and hatchery spawner escapement estimates for the entire Upper Grande Ronde population
2 - Distribution of spawners within the watershed that the population occupies,
3 - Proportion of hatchery fish in the adult return, by year, for the entire population,
4 - Age composition of spawners, preferably by year, but if not a summary from multiple years that is useable;
5 - Estimated annual impact of tributary and downstream fisheries (including mainstem Columbia and ocean as appropriate);
6 - Number of wild fish removed for hatchery broodstock and proportion of the hatchery broodstock that are wild fish (i.e. pNOB);
7 - Green egg to smolt survival for hatchery program
8 - Smolt to adult survival for hatchery releases;
9 - Hatchery strays recovered from other basins based on CWT or PIT recoveries;
10 - The size of hatchery smolts relative to wild fish;
11 - The timing of the hatchery smolt release versus out-migration timing of the wild smolts;
12 - An index on how quickly the hatchery smolts migrate after release and how many of them do not migrate at all (residualize).

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, further studies and monitoring may be needed to improve the Upper Grande Ronde River Chinook Salmon Hatchery Program, which will require increased funding. Given the concern regarding the influence that hatchery supplementation may exert on natural populations, it is imperative that we examine potential methodologies for eliminating or minimizing those effects. Our desire is to find ways to improve the hatchery program and our ability to manage it.

Database Development and Maintenance – **High Importance**
We see the need for a "data steward" within the ODFW LSRCP Program to develop and maintain the databases needed for organizing the data collected while monitoring the LSRCP hatchery programs and supplemented natural populations. These databases will allow us to conduct analyses within specific populations, as well as among LSRCP Chinook salmon populations, and will facilitate the effective compilation and transfer of information to the LSRCP databases. They will also have to be coordinated with those from LSRCP, BPA and NOAA Fisheries, the agencies to which we will submit these data, and be available to all co-management agencies.

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.

- NMFS guidelines are followed in all electrofishing activities.
- Experienced surveyors are utilized to conduct spawning surveys. Surveyors will walk in the stream, crossing when necessary, to avoid disturbing redds and adults.
- Experienced fish culturists and pathologists perform activities associated with fish production within the hatcheries.
- Experienced fish culturists respond to alarms 24 hours per day 7 days per week.

SECTION 12. RESEARCH

12.1) Objective or purpose.

Research and monitoring have been an integral part of the Captive Broodstock and Conventional Hatchery programs since their inception. The purpose of all past, present or planned research projects in these programs is to find ways to improve these and other hatchery programs.

Upper Grande Ronde River spring Chinook salmon reared at Lookingglass Fish Hatchery come from either the Captive Broodstock Program or the Conventional Hatchery Program. Each program has specific protocols and emphases.

Captive Broodstock— Since its inception, the Grande Ronde Basin Spring Chinook Salmon Captive Broodstock Program had a research emphasis. It began with an examination of four methodologies for captive rearing of Chinook salmon to find the best way to rear Chinook salmon to maturation in captivity. We evaluated growth, health, survival and production of salmon reared under one of two pre-smolt and two post-smolt rearing regimes. Currently, we are examining the effectiveness of prophylactic antibiotic treatments and injection sites (do these treatments affect survival or fecundity?), BKD vaccines, evaluating populating captive broodstock programs using natural parr vs. eggs from a conventional hatchery program (growth, age and size at maturity, health, fecundity, fertility, etc.) and comparing growth and health in partially vs. fully covered tanks.

The Captive Broodstock Program is designed to rapidly increase numbers of salmon in stocks that are in imminent danger of extirpation. It is operated under the adaptive management philosophy and relies extensively on monitoring and evaluation results to develop new knowledge for making decisions and adapting program approaches. Each evaluation has varying degrees of risk to, or impact on, the population associated with an experiment. Since we are working with ESA-listed stocks of spring Chinook salmon, we need to balance information needs and the resulting benefits with potential risks to the captive populations. Thus, we evaluate aspects of captive rearing and breeding that address important programmatic uncertainties but will have minimal impact to the groups of fish being studied.

As stated above, four methodologies for captive rearing of Chinook salmon are begin evaluated in terms of fish growth, health, survival and production of two pre-smolt and two post-smolt rearing regimes. Pre-smolt rearing was conducted under either a simulated natural regime (seasonally varying temperature, 5-14° C) or an accelerated growth regime (constant 14° C). Growth rates were manipulated using water temperature and feeding levels. Following smoltification, the fish were reared in either freshwater (Bonneville Fish Hatchery) or saltwater (Manchester Research Station). Variables other than environmental salinity and juvenile growth rate were as similar as possible between treatments. Captive fish are reared through maturation, spawned and then their progeny are reared through the yearling smolt stage, when they are released to complete their life cycle in nature.

Each captive brood cycle begins when natural fish are collected from the field, approximately 12 months after eggs were fertilized. Approximately one month after collection (13 months after fertilization) each fish is tagged with a Passive Integrated Transponder (PIT) tag. Fish are reared at Wallowa Fish Hatchery until smoltification, approximately 20 months after fertilization. After transport to Bonneville Fish Hatchery (BOH) or Manchester Research Station (MRS), due to the potential for PIT tag loss and difficulty reading PIT tags as fish mature, a visual implant (VI) tag is also implanted to further insure identification of individual fish. The combination of PIT and VI tags allows us to identify individual fish during rearing and spawning operations. This entire cycle takes approximately 5.5 years. For example, fish collected in September of 1995 (1994 brood year) would spawn at age 4 in September of 1998 and the resulting progeny would be released as smolts in the spring of 2000.

Maturation of fish is judged by gross morphological characteristics (e.g., coloration) and by using ultrasound and/or near infrared spectroscopy, which we tested. Mature fish from MRS are transported in the spring to BOH where they will be held with mature fish from BOH under a simulated natural photoperiod and in Tanner Creek water, so they can experience natural water temperature fluctuations, to help synchronize maturation. When fish become ripe, they are spawned at BOH. The spawning season lasts from early September to mid-October.

The F_1 generation is incubated at Lookingglass Fish Hatchery (LOOH) for rearing to smolt, targeted for a mean weight of 23 g and a mean fork length of 125 mm, at their release as yearling smolts. All fish are marked differentially by raceway and a portion of fish from each raceway is PIT-tagged to monitor outmigration survival and characteristics. In March or April, fish are transported to acclimation facilities located within the area of their parents' natal stream where natural fish spawn. Acclimation sites are supplied with unfiltered ambient stream water and fish at these sites are given supplemental feed. In March and April, after a 14-30 day period of acclimation, fish are released into the stream, first volitionally and then forced out about two weeks later.

The Captive Broodstock F_1s mature one, two, three, or four summers after they are released. Some of these fish are captured in fisheries while others return to the Grande Ronde Basin. A weir placed on the Upper Grande Ronde River, upstream of the town of La Grande, monitors returning adults. Of those adults returning, some will be allowed to spawn naturally and some may be collected at weirs for use as spawners in unseeded habitat.

F_1 generation fish that spawn naturally may reproduce with natural fish or other F_1 generation fish. Progeny produced from these matings (the F_2 generation) migrate to the ocean as yearlings and return when they are 3, 4 and 5 years old. We have been and will continue to monitor the production and life history characteristics of the F_2 generation fish.

Conventional Hatchery Program—The Conventional Hatchery Program also relies on monitoring and evaluation of results. It is integrated with the Captive Broodstock Program described above and we compare specific parameters of the two programs. Additionally, we have conducted experiments to improve the effectiveness of hatchery rearing, including examining the effect of exercise on smolt physiology and subsequent survival to maturation. We have also examined the effectiveness of different rearing densities and sizes at release. Future research may examine methods for reducing the rate of jacking and straying in hatchery salmon and increasing survival to adulthood and program efficiency (e.g., do we need to acclimate smolts prior to release?).

Conventional Broodstock fish are collected from the weir on the Upper Grande Ronde River in the spring through summer and held at LOOH until they are spawned in August/September. The eggs are incubated at LOOH and the resulting offspring are reared until the smolt stage, when they are transferred to acclimation sites on their parents' natal stream and released after 14-30 days of acclimation.

Following fertilization, the Conventional Broodstock F_1 generation is treated the same as the Captive Broodstock fish and can be directly compared. Collaboration with the Captive Broodstock and Early Life History programs and spawning ground surveys are necessary to evaluate the Conventional Broodstock Program. Conventional Broodstock fish are compared with both Captive Broodstock and natural fish. Size, age, fecundity and time of maturation of adults, as well as fertility, egg size, and health, growth and survival of the F_1 generation are some of the variables compared.

Finally, we also compare the performance of hatchery vs. natural salmon and comparisons are made using both Captive and Conventional fish. E.g., using genetic parental analyses, we can compare spawning success (production of an F_2 generation) in nature between fish reared in nature vs. those reared to smolt stage in a hatchery.

12.2) Cooperating and funding agencies.

- Lower Snake River Compensation Program
- Nez Perce Tribe
- Confederated Tribes of the Umatilla Indian Reservation
- Bonneville Power Administration
- NOAA Fisheries

12.3) Principle investigator or project supervisor and staff.

Richard W. Carmichael
Timothy Hoffnagle
Joseph Feldhaus
Don Hair
Debra Eddy
Sally Gee
Shelby Warren
Nick Albrecht

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.

Captive Broodstock Collections--Juvenile spring Chinook salmon are collected from nature as parr using a method that employs snorkelers to find and herd fish into a seine. This method of fish capture reduces habitat disturbance, stress of all captured fish and capture or harassment of nontarget fish, such as juvenile steelhead and adult Chinook salmon, which may be found in the same area of stream. Several protocols are employed to reduce disturbance to nontarget ESA-listed fish. The use of snorkelers means that sampling is conducted only in sites where juvenile Chinook salmon are seen, which reduces the number of sampling efforts and nontarget catch. Snorkelers herd Chinook salmon parr into the net and avoid chasing other species, further reducing nontarget catch. Chinook salmon parr are then quickly netted out of the seine and placed in a 19L bucket. All nontarget fish are immediately released at the site of capture. If adult Chinook salmon are seen, snorkelers immediately leave the water and move to a new site.

Conventional Broodstock--

1. Monitoring hatchery/wild ratios in natural spawning streams - Adult spring/summer Chinook are captured and enumerated at the Upper Grande Ronde River weir. See Section 2.2.3.

Spawning surveys – In addition to adult trapping, density and hatchery/wild ratio of spawners in natural spawning areas are monitored via direct observation. See Section 2.2.3.

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

Research and monitoring are ongoing activities.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.
Captive Broodstock-See Section 12.5-After collection, Chinook parr are transported to the rearing hatchery in approximately 1.5 hours.

Conventional Broodstock—Fish are handled for enumeration, measurement, gender identification, marking and release or collection at the site of capture. Fish are held in containers with well-aerated water of suitable temperatures <18° C. If handling involves more than determining species and enumeration (e.g., measurement, marking and/or tissue sampling) fish are anesthetized with MS-222 before the procedure and allowed to fully recover before release. Adults are transported to LOOH or released upstream within 48 hours of capture.

12.8) Expected type and effects of take and potential for injury or mortality.
Monitoring and evaluation will involve take of all types. Injury due to capture, marking and tissue sampling is inevitable. Hooking wounds, electrofishing injury and other physical damage are generally temporary in nature. Some fish, however, succumb to the effects of such injury. This mortality, in addition to occasional direct loss due to capture and handling, account for the lethal take estimates that may occur during monitoring and evaluation activities.

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" (Table 1).

12.10) Alternative methods to achieve project objectives.
Unknown.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
We encounter juvenile summer steelhead during sampling. However, due to our collection methods which allow us to identify the fish before attempting to capture them, the number of encounters is expected to be less than ten juvenile fish per species per tributary, and as a result the level of mortality is expected to be low.

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 or cause injury to listed fish, including daily trap checks.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the information provided 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 (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (Anadromous salmonid effects are addressed in Section 2)

15.1) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

The Upper Grande Ronde River hatchery program and associated monitoring and evaluation activities affecting bull trout are conducted under USFWS Section 10 permit #TE-844468-8 (CTUIR) and a section 6 agreement between the USFWS and ODFW. Threaten Species Permit TE844468-8 (which expires on May 25, 2012) authorizes CTUIR to annually take (harass by survey, capture, handle, mark, and release) listed bull trout while conducting the project. These activities are conducted in accordance with the study plans or biological assessment (as modified by the Special Terms and Conditions) accompanying the permit application. Estimated annual take is 20 individuals of all age classes, with less than 3% mortality.

15.2) Describe USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species and habitat that may be affected by hatchery program.

LISTED

Common Name	Scientific Name	Status
Fish:		
Bull trout [1]	*Salvelinus confluentus*	Threatened

[1] listing unit is the Columbia River Distinct Population Segment

Columbia Basin bull trout (*Salvelinus confluentus*) are listed as Threatened and occur in the project area. There are two life history types in the Upper Grande Ronde River, the resident type and the ad-fluvial life history type which includes bull trout that migrate down to the lower mainstem Grande Ronde and Snake rivers. These fish are usually larger than the resident types.

PROPOSED

None

CANDIDATE

Common Name	Scientific Name
Columbia spotted frog	*Rana luteiventris*
Western Boreal Toad	*Bufo boreas*

CRITICAL HABITAT

Critical habitat for bull trout has been designated in subbasin.

15.3) Analyze effects.

The program effects on listed species is incidental. Only two bulltrout have been captured at the weir since 2002 and less than ten have been captured in the screwtrap. The area above the weir does not have a large population of bulltrout.

15.4 Actions taken to minimize potential effects.

When bulltrout are captured at the weir or in the screwtrap or seines they are measured and released quickly to minimize handling time.

15.5 References

None.

Appendix A.

Grande Ronde Spring Chinook Hatchery Management Plan – September, 2002

Table 1. Evaluation Period – Through Brood Year 2004 Production

Location	Stock	Smolt Type	Number	Surplus Outplanting Locations[1/]	Purpose	Marking	Restrictions		
							JV Number	Adult Esc	Brood
UGRR	UGRR	Captive Evaluation	120,000	NA	Evaluation and Natural Production	ADCWT	No[2]	No	Yes
		Conventional	130,000 Combined	NA	Natural Production and Brood	No Ad Clip – CWT only	No	No	No
		Captive Non-evaluation		Sheep Ck Meadow Ck UGRR	Natural Production	AD only	No[3]	No	Yes
Lostine	Lostine	Captive Evaluation	120,000	NA	Evaluation and Natural Production	ADCWT	No[2]	Yes	Yes
		Conventional	130,000 Combined[4]	NA	Natural Production and Brood	ADCWT + VIE	No	Yes	No
		Captive Non-evaluation		Bear Ck Wallowa R. Hurricane Ck	Natural Production	AD only	Yes	Yes	Yes
CC	CC	Captive Evaluation	120,000	NA	Evaluation and Natural Production	ADCWT	No[2]	Yes	Yes
		Conventional	130,000 Combined	NA	Natural Production and Brood	ADCWT + VIE	No	Yes	No
		Captive Non-evaluation		LG Ck Indian Ck	Natural Production	AD only	Yes	Yes	Yes
LGC	CC	Captive Non-evaluation	150,000	NA	Broodstock Development and Natural Production for LGC	AD only + ADCWT[6]	No	Yes[5]	No

1/ Outplanting locations for excess eggs, presmolts, or hatchery adults returning to weirs
2/ No near term restriction up to the 120,000 smolt production level identified as needed for evaluation
3/ However, priority is for conventional brood source smolts
4/ Includes a maximum of 30,000 captive brood smolts (assuming cap is in place)
5/ Escapement restricted to 100 adults above hatchery until NEOH water treatment modifications completed
6/ Up to 60K of this group will be marked for production evaluation with an ADCWT

Table 2. Post Evaluation Period – Beginning With Brood Year 2005 Production

Location	Stock	Smolt Type	Number	Surplus Outplanting Locations[1/]	Purpose	Marking	Restrictions		
							JV Number	Adult Esc	Brood
UGRR	UGRR	Captive	250,000 Combined	Sheep Ck Meadow Ck UGRR	Natural Production	Differential – Captive vs Conventional	No[2]	No	Yes
		Conventional		NA	Natural Production and Brood		No	No	No
Lostine	Lostine	Captive	250,000 Combined[3]	Bear Ck Wallowa R. Hurricane Ck	Natural Production	Differential – Captive vs Conventional	Yes	Yes	Yes
		Conventional		NA	Natural Production and Brood		No	Yes	No
CC	CC	Captive	150,000 Combined	LG Ck Indian Ck	Natural Production	Differential – Captive vs Conventional	Yes	Yes	Yes
		Conventional		NA	Natural Production and Brood		No	Yes	No
LGC	CC	Captive	250,000 Combined	NA	Broodstock Development LGC Natural Production Harvest Augmentation	Differential – Captive vs Conventional	No[2]	Yes[4]	No
	LGC	Conventional		NA			No	Yes[3]	No

1/ Outplanting locations for excess eggs, presmolts, or hatchery adults returning to weirs
2/ However, priority is for conventional brood source smolts
3/ Captive brood smolt cap of 150,000 (assuming cap is in place)
4/ Escapement restricted to 100 adults above hatchery until NEOH water treatment modifications completed

Grande Ronde Basin Spring Chinook Hatchery Management Plan

September 2002

The Grande Ronde Basin spring Chinook hatchery program consists of two integral parts: the Lower Snake River Compensation Plan (LSRCP) mitigation program and the Bonneville Power Administration (BPA) captive broodstock program. The LSRCP has a specific spring/summer Chinook goal to return 58,700 adults into the Snake River of which 5,820 adults comprise the Grande Ronde component of the overall goal. To meet the LSRCP Grande Ronde adult goal, a juvenile production target of 900,000 fish at 15 to 20 fish per pound has been identified. The BPA program was established with the intent of maintaining a minimum critical threshold population of 150 adult spawners per tributary for the Upper Grande Ronde River, Catherine Creek, and Lostine River. The Tribes and ODFW have identified other adult return goals in various documents. A major objective of this plan is to integrate these two artificial production components into a coordinated restoration effort.

Grande Ronde Basin co-managers have agreed to a diversified approach for managing the spring Chinook hatchery programs in the Upper Grande Ronde River, Catherine Creek, and Lostine River. This plan outlines strategies for the Upper Grande Ronde River, Catherine Creek, and Lostine River subbasins that incorporate various levels of hatchery intervention and genetic risk management. In addition, the plan outlines a strategy for the reintroduction of spring Chinook into Lookingglass Creek. The co-managers will develop additional management details specific to Lookingglass Creek that are consistent with this document. These details will be incorporated into section 10 and 7 permits and HGMPs for Lookingglass similar to existing documents for Upper Grande Ronde, Catherine Creek, and Lostine River.

This plan is broken out into two time frame components; a near term period while the captive broodstock performance evaluation is being conducted and a long term period after the evaluation has been completed. A full review and assessment of the plan will occur in 2005. A more thorough narrative of the specific subbasin details follows along with a discussion of the production logistics assumptions made for Lookingglass Hatchery.

<u>Upper Grande Ronde River</u>

* The adult sliding scale outlined in NMFS permits #1011, Modification 2 and #1049 will not be used for management in the Upper Grande Ronde River. There is no restriction on the % of hatchery adults (conventional + captive) escaping above the weir.

* Broodstock collection guidelines will be as follows:

    -Up to 50% of the wild fish returning to the weir can be collected.

    -Conventional progeny hatchery fish will be collected at a rate necessary to meet the remainder of the broodstock goal (could be up to 100% of returning conventional adults).

    -No captive progeny adults (F-1) will be used for brood.

* A juvenile sliding scale will not be used to determine smolt production limits.

* Implement an overall production goal (captive + conventional) of 250,000 smolts without any specific cap for each type of production but with a priority for conventional.

* A target of 130,000 conventional smolts will be produced in the near term (while the captive evaluation is ongoing), increasing to 250,000 in the long term.

* During the initial phase of the restoration program, the goal is to release 120,000 captive brood smolts and 130,000 conventional brood smolts to meet the research study design. However, if production of either the proposed captive or conventional smolt groups is limited or unavailable, additional smolts could be released, if available, from the other broodstock group, up to the overall production goal of 250,000.

* Additional production above the captive smolt goal will be outplanted as eggs or presmolts into Sheep Creek, Meadow Creek, and/or Upper Grande Ronde River below the primary production area.

* No outplanting of progeny of another program stock will occur into this tributary.

Lostine River

* The adult sliding scale outlined in NMFS permit #1149 will be used to provide guidance for broodstock collection and escapement criteria at the weir.

* Priority for hatchery adults released above the weir will be for conventional adults.

* Excess hatchery adults arriving at the weir based on adult sliding scale restrictions will be outplanted into Bear Creek, Upper Wallowa River (above Prairie Creek), and/or Hurricane Creek.

* No captive brood progeny (F-1) will be taken for hatchery broodstock.

* A juvenile sliding scale will not be used to determine smolt production limits.

* Implement an overall production goal (captive + conventional) of 250,000 smolts with a specific cap of 150,000 for captive brood production and with a priority for conventional. The cap may be exceeded under emergency conditions if agreed to by all co-managers.

* A target of 130,000 conventional smolts will be produced in the near term (while the captive evaluation is ongoing), increasing to 250,000 in the long term.

* During the initial phase of the restoration program, the goal is to release 120,000 captive brood smolts and 130,000 conventional brood smolts to meet the research study design. If production of the proposed captive brood smolt group is limited, additional smolts could be released from the conventional broodstock group up to the overall production goal. However, if production of the proposed conventional smolt group is limited or unavailable, only up to an additional 30,000 captive brood smolts could be released if the cap is in place.

* Additional production above the captive smolt cap will be outplanted as eggs or presmolts into Bear Creek, Upper Wallowa River (above Prairie Creek), Hurricane Creek, and/or Upper Lostine River (if no research conflicts).

* No outplanting of progeny of another program stock will occur into this tributary.

Catherine Creek

* The adult sliding scale outlined in NMFS permits #1011, Modification 2 and #1049 will be used to provide guidance for broodstock collection and escapement criteria at the weir.

* Priority for hatchery adults released above the weir will be for conventional adults.

* **Excess hatchery adults arriving at the weir based on adult sliding scale restrictions can be outplanted into Lookingglass Creek for natural production and/or harvest augmentation or used as broodstock for Lookingglass Creek conventional production.**

* No captive brood progeny (F-1) will be taken at the weir for hatchery broodstock.

* The juvenile sliding scale outlined in NMFS permits #1011, Modification 2 and #1049 will be used to determine captive brood smolt production limits. However, during the evaluation period 120,000 captive brood smolts will be released into Catherine Creek.

* In the near term period, implement an overall production goal (captive + conventional) of 250,000 smolts with a specific target for captive brood production based on evaluation needs.

* A target of 130,000 conventional smolts will be produced in the near term (while the captive evaluation is ongoing), increasing to 150,000 in the long term.

* During the initial phase of the restoration program, the goal is to release 120,000 captive brood smolts and 130,000 conventional brood smolts to meet the research study design. However, if production of the proposed captive brood smolt group is limited, additional smolts could be released from the conventional broodstock group up to the overall production goal.

* After the captive brood evaluation is completed, the overall production goal would be reduced to 150,000 smolts with a specific cap for captive brood production based on the juvenile sliding scale.

* Additional production above the captive brood smolt goals for both Catherine Creek and Lookingglass Creek will be outplanted as eggs or presmolts into Lookingglass Creek or Indian Creek.

* No outplanting of progeny of another program stock will occur into this tributary. Once Catherine Creek stock has been established into Lookingglass Creek, these fish could be utilized, if needed, in Catherine Creek for restoration purposes.

Lookingglass Creek

* No adult sliding scale will be used for management in Lookingglass Creek. There is no restriction on the % of hatchery adults escaping above the weir. The first potential return of unmarked adults from Catherine Creek stock releases in Lookingglass Creek will be in 2008. Until then, only marked fish of known Catherine Creek origin will be released above the Lookingglass Hatchery intake weir.

* Unmarked adults determined to be of Rapid River origin (unmarked fish returning prior to 2008) will be removed from Lookingglass Creek and distributed for subsistence.

* Any adults (conventional or captive) from known Catherine Creek stock releases can be used for broodstock to develop a conventional Lookingglass Creek stock. In the future, it is intended that unmarked fish of Catherine Creek stock (unmarked fish returning in 2008 and after) will be incorporated into the broodstock for the Lookingglass Creek conventional program.

* A juvenile sliding scale will not be used to determine smolt production limits.

* In the near term period, implement a production level cap of 150,000 smolts from Catherine Creek stock.

* After the captive brood evaluation is completed, the production goal will increase to 250,000 smolts in conjunction with lowering the Catherine Creek production goal to 150,000 smolts.

* If smolt production space is limited by the other three tributary's production then a presmolt program of up to 250,000 will be implemented in conjunction with or in place of smolt production. If smolt production is at full capacity, no presmolts will be released. Total releases within a brood year will be limited to 250,000 fish.

Lookingglass Hatchery Details

* During the periods while the captive brood performance evaluation is ongoing and prior to NEOH being implemented, space limitations will affect the goals outlined in the management tables. The following criteria have been outlined for production at Lookingglass Hatchery:

    - There are 12 raceways available for Grande Ronde tributary production. Allocation of raceway space will be made in the AOP process based on the prioritization sequence outlined below. If additional raceway space becomes available the extra space will be allocated in the same manner as other raceway space at the facility using the same prioritization sequence.

1) 2 raceways each for captive broodstock evaluation production for Lostine, Catherine Ck, and Upper Grande Ronde (6 total).
2) 2 raceways each for conventional production for Lostine, Catherine Ck, and Upper Grande Ronde (6 total).
3) 2 raceways for Lookingglass Creek production (as available).
4) Non-evaluation (i.e. production) captive brood for Lostine, Catherine Ck, and Upper Grande Ronde. Within this group, priority for space will be allocated based on which tributary(s) has the least production available from the evaluation and conventional groups (as available).
5) Segregated BKD groups above 0.8 ELISA reading (as available).

- The captive brood evaluation groups for Lostine, Catherine Ck, and Upper Grande Ronde will be loaded at a target of 60,000 smolts per raceway.

- Lostine, Catherine Ck, and Upper Grande Ronde conventional/non-evaluation captive production ponds will be loaded at a target of 65,000 smolts per pond.

- Lookingglass Creek production ponds will be loaded at a target of 75,000 smolts per pond.

- Conventional and non-evaluation captive brood production for Lostine, Catherine Ck, and Upper Grande Ronde can be mixed (within each specific stock) after tagging to balance raceway loadings.

* Production Goals – Every attempt will be made to adhere to the production goals identified in the tables. No captive brood adults (F0) will be outplanted unless for experimental purposes. All captive brood adults will be spawned but only enough eggs will be retained in order to meet that specific year's production need. Similarly, only enough conventional brood will be collected to meet the stated goals. It is projected that eight adults (at a 1:1 male/female ratio) are required for every 10,000 smolts of production. At that rate, 104 adults (52 females) will be collected to meet the 130,000 smolt goal, 120 adults (60 females) will be collected to meet the 150,000 smolt goal, and 200 adults (100 females) will be collected to meet the 250,000 smolt goal.

* Excess Production – Excess production can occur from two sources; eggs taken over those needed to meet identified goals or lack of hatchery space for production of a specific group based on raceway prioritization. Excess eggs will be outplanted as outlined below in the "BKD Culling" section.

* BKD Culling – BKD ELISA ranges will be established as follows; <0.2, 0.2-0.39, 0.4-0.59, 0.6-0.79, and >=0.8. Additional egg outplants to meet production targets will occur from across all family groups beginning with the highest ELISA range and proceeding downward by range until the production target is met. No segregation between production groups with ELISA readings below 0.8 will occur. If space is available, groups with ELISA readings above 0.8 may be segregated and reared. If space is unavailable, eggs from adults with an ELISA value of 0.8 or higher will be culled from the program.

<u>Other Program Details</u>

* Production Transition – There are three points where significant transitions will occur in the production program. The first is when fixed production for the captive broodstock evaluation is concluded and the evaluation no longer determines the production priorities for the program. This will begin with brood year 2005 production after the initial captive brood evaluation treatments have been completed. As stated in the introduction, a full review and assessment of this plan will occur in 2005. The second point is when the conventional broodstocks are built up to a level that the captive brood programs can be phased down to a safety net status or discontinued. The last point is when natural populations have been increased to a level where the focus of hatchery production can be switched from restoration to a mitigation priority. The timeline on these last two transition periods cannot be determined at this time.

* Water Treatment – During the period prior to the NEOH improvements at Lookingglass Hatchery, a maximum of 50 pair of adults will be allowed to escape above the hatchery into Upper Lookingglass Creek. After the NEOH improvements are completed, the adult restriction above the hatchery will be lifted. CTUIR will operate a weir approximately 150 yards above the Lookingglass Hatchery water intake to intercept dead and/or fallback fish as well as monitor and evaluate adult releases into Upper Lookingglass Creek.

* Jack Management – Jacks will be managed at the Lostine, Catherine Ck, and Grande Ronde weirs as follows;

  - Lostine River and Catherine Creek jacks will be managed according to the adult sliding scale outlined in NMFS permits #1011 - Modification 2 and #1049.

  - For Upper Grande Ronde and Lookingglass Creek, jacks will be managed as follows:

    - Wild and conventional jacks will be incorporated into the broodstock at a rate of 1 for every 5 adult fish. Captive jacks may be incorporated into the Lookingglass Creek broodstock at 10% of the adult males.
    - All wild jacks not taken for brood will be released upriver.
    - The number of hatchery jacks to be released upriver (or outplanted) will not exceed, in combination with wild jacks released, a total of 1 jack for every 10 male fish. Priority for hatchery jacks released above the weir will be for conventional jacks. Surplus hatchery jacks will be provided for substistence or charitable purposes.

* NEOH – After the NEOH production facilities (Lostine and Imnaha) are completed, the previously identified pond loadings will be reevaluated for all production groups in order to take advantage of the additional space at Lookingglass Hatchery. In addition, the LSRCP production goal of 900,000 smolts will be reevaluated in relation to the NEOH program.

* Marking – The marking schemes for the four tributary programs during the evaluation period of the agreement are outlined below. Marking strategies will be reevaluated in 2005 as part of the overall program reassessment.

  - All evaluation captive brood production will be marked with an adipose fin clip and have a coded-wire-tag implanted.

  - Conventional brood production groups for Lostine River and Catherine Creek will have an adipose fin clip with a coded-wire-tag implanted in combination with an external mark (VIE) to differentiate between conventional and captive adults.

  - Conventional brood production for the Upper Grande Ronde River will have a coded-wire-tag implanted only and will not be fin clipped.

  - All non-evaluation captive brood production will be marked with an adipose fin clip only.

  - For Lookingglass Creek, a representative group (up to 60K) will be ADCWT marked for production evaluation. The remainder of the production will be marked with an adipose fin clip only.

* Harvest – Harvest augmentation has been identified as an objective of the Lookingglass Creek reintroduction effort in conjunction with natural spawning and broodstock development objectives. Harvest as an objective has also been identified for the other three tributaries but is a longer term goal.

Appendix B.

Sliding Scale Management Plan for the Upper Grande Ronde Spring Chinook Artificial Propagation Program.

Estimated total adult escapement to the mouth (hatchery plus natural) [a]	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of conventional hatchery adults to retain for broodstock [b]	% of adults released above the weir that can be of hatchery origin	Minimum % of broodstock of natural origin	% Strays allowed above the weir [c]
UGR	Any	Up to 50	Up to 100	Up to 100	[d]	≤5

a Pre-season estimate of total escapement

b Conventional hatchery adults only, all captive brood adults released to spawn naturally or outplanted

c For hatchery adults originating from different gene conservation groups (Rapid River stock or strays from outside the Grande Ronde Basin)

d Not decision factor at this level of escapement, percentage determined by other criteria