HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Grande Ronde Basin Spring/Summer Chinook Program**
Species or Hatchery Stock:	**Spring/summer Chinook (Stock # 080, 085, 200, 201)**
Agency/Operator:	**Oregon Department of Fish and Wildlife**
Watershed and Region:	**Grande Ronde / Snake River / Columbia Basin / Oregon**
Date Submitted:	December 21, 2002
Date Last Updated:	Final Phase-1 December 20, 2002

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Grande Ronde Basin Spring Chinook Program

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

Grande Ronde River Spring Chinook Salmon. *Oncorhynchus tshawytscha*

ESA status: Threatened (Snake River spring/summer)

There are currently three broodstocks in the Grande Ronde basin using three different wild donor populations. These programs are addressed together in this HGMP:

Catherine Creek Population - (stock 201)
Lostine River Population - (stock 200)
Upper Grande Ronde River Population - (stock 080)

Lookingglass Creek (stock 085), in the Grande Ronde Basin, is primarily a naturalized hatchery composite stock of Rapid River and Carson descendents. The ESA status of the unmarked adults returning to Lookingglass Creek is unclear. The current Grande Ronde Basin Spring Chinook Hatchery Management Plan outlines procedures to eliminate the composite stock and restore a natural spawning population of chinook using Catherine Creek stock from captive brood hatchery production.

1.3) Responsible organization and individuals

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ODFW Hatchery Managers:

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Email: captivebrood@gorge.net

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

1. U. S. Fish and Wildlife Service – Lower Snake River Compensation Plan - Program funding/oversight
2. Confederated Tribes of the Umatilla Indian Reservation – Co-managers – Operators of acclimation and adult collection facilities
3. Nez Perce Tribes – Co-managers - Operators of acclimation and adult collection facilities
4. National Marine Fisheries Service – Manchester Marine Lab – Fish Culture – rearing parr to maturity in saltwater, Captive Brood propagation
5. National Marine Fisheries Service – Program oversight-ESA permitting
6. Bonneville Power Administration – Funding – acclimation and adult collection, Captive Brood propagation

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

The funding programs/sources are described in three components: Lower Snake River Compensation Plan (LSRCP), Endemic Program, and Captive Brood. Total cost is estimated at $2.66 million annually.

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 chinook program in Oregon includes an integrated Imnaha basin program as well. Staff are shared between the two programs at approximately 70% Grande Ronde basin and 30% Imnaha basin. Combined program staff includes: Hatchery Coordinator, (3) Hatchery Managers, one at Lookingglass Hatchery, one at Irrigon Hatchery, and one at Oxbow Hatchery, (2.5) hatchery technician positions, (2.25 liberation technicians, and (1) Trades Maintenance coordinator position. Annual operation and maintenance costs for the Grande Ronde portion of the FY 2002 program include: an estimated $700,000 for Lookingglass Hatchery, $30,000 for Irrigon, and $18,000 for Oxbow Hatchery.

Endemic Program (Conventional Brood)--This portion of the program is directed by the National Marine Fisheries Service (NMFS) to supplement Grande Ronde chinook with stocks indigenous to the sub-basin.

The Bonneville Power Administration (BPA) funds the Nez Perce Tribe (NPT) to operate the Lostine acclimation and adult collection facilities. Combined program staff is 3.2 NPT employees. Annual operation and maintenance costs are estimated at $340,000.

The BPA funds the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) to operate the Catherine Creek and Upper Grande Ronde acclimation and adult collection facilities. Combined program staff is 6.0 CTUIR employees. Annual operation and maintenance costs are estimated at $502,000.

The BPA funds the Oregon Department of Fish and Wildlife (ODFW) to integrate the Tribal and ODFW operations to limit duplication. Combined program staff is 3.41 ODFW employees. Annual operation and maintenance costs are estimated at $210,000.

Captive Brood-- This program was initiated as a conservation measure in response to severely declining run of Chinook salmon in the Grande Ronde sub-basin.

The BPA funds ODFW to rear multiple brood years to maturity. Combined program staff is 5.9 ODFW employees. Annual operation and maintenance costs are estimated at $420,000.

The BPA funds NPT to assist with rearing multiple brood years of the Lostine River stock to maturity. Combined program staff is 1.92 NPT employees. Annual operation and maintenance costs are estimated at $157,000.

The BPA funds NMFS to rear multiple brood years to maturity. Combined program staff is 1.1 NMFS employees. Annual operation and maintenance costs are estimated at $285,000.

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

1. *Early captive brood rearing, egg incubation, and juvenile rearing:*
   - Lookingglass hatchery (LGFH) is located 18 miles north of the town of Elgin, adjacent to Lookingglass Creek 2.2 miles above its confluence with the Grande Ronde River at about river mile 86. (ODFW watershed code 080440000) Elevation at the hatchery is 2,550 feet above sea level. Adult facilities consist of two traps and two concrete raceways (4,560 ft^3). Incubation is in 288 vertical incubator trays with a capacity of 2.3 million eggs to hatching. There are 32 Canadian troughs for starting fish each with a capacity of 100 to 125 pounds of fish. Rearing is in 18 concrete raceways (3,500 ft^3) each with a capacity of 4,000 lb (Lewis 1996).
   - Oxbow Hatchery is located 2 miles east of the town Cascade Locks, Oregon, adjacent to the

Columbia River. (ODFW watershed Herman Creek-code 0400200000) Elevation at the hatchery is 100 feet above sea level. Incubation facilities consist of 240 trays, 10 deep and 11 shallow troughs. Eleven Canadian troughs are used for inside rearing. One outside raceway (3,500 ft^3) is available.

- Irrigon Hatchery is located along the south bank of the Columbia River, above John Day Dam, near Irrigon, Oregon. Captive Brood eyed eggs are shipped to Irrigon for final incubation, hatching, and early rearing. Inside rearing containers include 68 circular tanks each with a rearing volume of 70 $ft.^3$ (6'x3'), and 288 incubation trays in 36 stacks.

2. *Captive brood rearing, spawning, and early egg incubation:*
   - Bonneville Hatchery (BOH) is located 4 miles west of the town of Cascade Locks, adjacent to the Columbia River at the base of Bonneville Dam (river mile 145.5). (ODFW watershed Tanner Creek-code 0400200000) Elevation at the hatchery is 46 feet above sea level. Conventional hatchery facilities are reported in Lewis (1996). In 1998 a new building and rearing facilities were added for the captive brood stock program. Those facilities consist of 19 circular fiberglass tanks; four 10 ft diameter (1,800 gal.), and fifteen 20ft diameter (9,400 gal.). Bonneville is used for freshwater rearing and spawning of Grande Ronde basin captive broodstocks.

3. *Captive brood rearing:*
   - The Manchester Marine Lab (MML) is a seawater facility located on Clam Bay in Puget Sound. This facility is utilized for a variety of experimental and developmental fish and shellfish efforts, including rearing a portion of the Redfish Lake sockeye captive brood stock program. Manchester is used for saltwater rearing of captive broodstocks for the Grande Ronde programs.
4. *Acclimation:*
   - The Nez Perce Tribes operates an acclimation (ODFW watershed Lostine River-code 080063999) and adult trapping (0800639998) facilities on the Lostine River. Acclimation occurs in four raceways approximately 8x85x3.25 (2,210 $ft.^3$) in size.
5. *Acclimation:*
   - The Confederated Tribes of the Umatilla Indian Reservation operate acclimation (ODFW watershed Catherine Creek-code 0800529999) and adult trapping (0800529998) facilities on the Catherine Creek and the Upper Grande Ronde River.
   - The Confederated Tribes of the Umatilla Indian Reservation operate acclimation (ODFW watershed Upper Grande Ronde River-code 0800509999) and adult trapping (0800509998) facilities on the Upper Grande Ronde River.
   - Acclimation occurs in eight raceways, four at each site. Raceway dimensions are approximately 8x85x3.25 (2,210 $ft.^3$) in size.

- **Other organizations involved and intent**

  The U.S. Army Corps of Engineers funded initial planning, construction and operation of Lower Snake River Compensation Plan (LSRCP) Lookingglass Hatchery. Currently, LSRCP funds production and operation expenditures at Lookingglass Hatchery through an agreement with Bonneville Power Administration (BPA). The National Marine Fisheries Service (NMFS) operates the Manchester Marine Lab. The Nez Perce Tribe, Oregon Department of Fish and Wildlife, and the Confederated Tribes of the Umatilla Indian Reservation are co-managers of the Grande Ronde River spring/summer chinook salmon program.

1.6) Type of program.

The Grande Ronde River spring chinook salmon (stocks 080, 200, 201) fish propagation project is a "supplementation" program intended to increase natural production of spring chinook in the Grande Ronde. The program utilizes "captive brood stock" technology with the intent to convert to a conventional approach to “supplementation” after target populations increase above minimum threshold levels. The program is also intended to contribute to LSRCP mitigation goals and harvest at higher production levels.

The Lookingglass Creek (stock 085) component of the Grande Ronde propagation project is currently eliminating the composite stock. This component to the program will be replaced with an integrated recovery intended to restore natural spawning chinook above Lookingglass Hatchery, as well as, provide limited harvest.

1.7) Purpose (Goal) of program.

The short-term goal is to use captive broodstock technology and conventional supplementation to prevent the extinction (preservation/conservation) of three wild chinook populations in the Grande Ronde Basin, provide a future basis to reverse the decline in stock abundance of Grande Ronde River chinook salmon, and ensure a high probability of population persistence well into the future once the causes of basin wide population declines have been addressed. Associated objectives include:

1) To prevent extinction of native wild chinook populations in the Lostine, upper Grande Ronde River and Catherine Creek,
2) Maintain genetic diversity of indigenous artificially propagated chinook populations,
3) Maintain genetic diversity in wild chinook populations specifically the Minan and Wenaha rivers,
4) Reintroduce spring/summer Chinook into Lookingglass Creek with Catherine Creek stock, which is indigenous to the Grande Ronde sub-basin,

An intermediate goal of this program is the restoration of spring chinook salmon in the Grande Ronde sub-basin using three indigenous stocks.

The long-term goal of this program is recovery, de-listing, and to mitigate for fish losses occurring as a result of the construction and operation of the four Lower Snake River Dams.

1.8) Justification for the program.

The Grande Ronde sub-basin hatchery program provides adult chinook for hatchery broodstock, adult chinook to supplement natural spawning, and limited recreational and tribal harvest within the Lower Snake River Compensation Plan mitigation area (Snake River and tributaries above Ice Harbor Dam). The program utilizes three (Catherine Creek, Lostine River, and Upper Grande Ronde) endemic chinook hatchery stocks that were founded on spring/summer chinook indigenous to the Grande Ronde sub-basin. Wild adults from three stocks are incorporated within the broodstock annually and portions of hatchery origin adults are allowed to spawn naturally in target tributaries each year. All adults returning from the captive brood origin smolts are allowed to spawn naturally in target tributaries. A portion of returning hatchery adults can be out planted in areas determined by the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al. 2002). The program will also attempt to restore naturally spawning chinook to Lookingglass Creek using Catherine Creek origin stock.

1.9) List of program "Performance Standards".

Legal Mandates - Provide adult spring/ summer chinook within the LSRCP mitigation area while minimizing adverse impacts to listed fish.
Performance Standard (1): Grande Ronde sub-basin chinook production contributes to fulfilling tribal trust legal mandates and treaty rights
Indicator 1(a): Estimated number of program chinook harvested in tribal fisheries by run year.
Performance Standard (2): Program contributes to annual mitigation goals
Indicator 2(a): Estimated annual harvest in LSRCP mitigation areas and annual escapement to the hatchery facility.

Harvest
Performance Standard (3): Fish are produced in a manner enabling effective harvest while avoiding over-harvest of non-target fish
Indicator 3(a): Estimated run year harvest and harvest related mortality for hatchery and wild fish, by fishery
Performance Standard (4): Release groups are marked to enable determination of impacts and benefits in fisheries
Indicator 4(a): Number of recovered marked fish reported in each fishery produces accurate estimates of harvest.
Indicator 4(b): Verify that mark rate, at release, is 95% to 100% for all smolt release groups.
Performance Standard (5): Non-monetary societal benefits for which the program is designed are achieved
Indicator 5(a): Number of recreational fishery angler days

Hatchery Performance
Performance Standard (6): The hatchery program produces smolts at a higher efficiency than would be achieved in nature.
Indicator 6(a): Survival of chinook, by life stage in the hatchery
Performance Standard (7): Artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation
Indicator 7(a): Scientifically based experimental design, with measurable objectives and hypotheses
Performance Standard (8): Facility operation complies with applicable fish health and facility operation standards and protocols
Indicator 8(a): Results of monthly fish health examinations
Indicator 8(b): Annual reports indicating level of compliance with applicable standards and criteria.
Performance Standard (9): Releases do not introduce new pathogens into local populations, and do not increase the levels of existing pathogens
Indicator 9(a): Results of monthly fish health examinations
Indicator 9(b): Certification of juvenile fish health immediately prior to release
Indicator 9(c): Juvenile rearing density
Performance Standard (11): Any distribution of carcasses or other products for nutrient enhancement meets appropriate disease control regulations and interagency agreements.
Indicator 11(a): Number and location of carcasses distributed for nutrient enrichment
Indicator 11(b): Disease examination of all carcasses to be used for nutrient enrichment
Indicator 11(c): Statement of compliance with applicable regulations and guidelines

Performance Standard (12): Effluent from artificial production facilities will not detrimentally affect populations.
Indicator 12(a): Verify that hatchery effluent is in compliance with existing NPDES permit conditions and water quality standards.
Performance Standard (13): Juvenile production costs are comparable to or less than other regional programs designed with similar objectives.
Indicator 12(a): Total cost of program operation
Indicator 12(b): Average cost of similar operations
Performance Standard (14): Hatchery program is sustainable.
Indicator 14(a): Number of broodstock collected is sufficient to maintain the hatchery brood.
Indicator 14(b): Number of smolts released produces equivalent adults (P:P ratio).

Conservation Objectives - Conserve genetic and life history diversity of Spring/summer chinook within the Grande Ronde River sub-basin.
Performance Standard (15): Broodstock collection does not reduce potential juvenile production in natural rearing areas.
Indicator 15(a): Number of wild spring/summer chinook retained for broodstock collection does not exceed 50% of the annual natural-origin escapement population.
Indicator 15(b): Percentage of natural-origin fish returning to the facility taken for broodstock comprises at least 30% of the brood population.
Performance Standard (16): Weir/trap operations do not result in significant stress, injury or mortality in natural populations
Indicator 16(a): Adult trapping mortality rate for natural-origin fish does not exceed 5%
Indicator 16(b): Adult trap is checked daily when in operation
Performance Standard (17): Juveniles are released after sufficient acclimation in the Catherine Creek, Lostine, and Upper Grande Ronde facilities to reduce handling stress and to maximize homing to target tributaries in the sub-basin.
Indicator 17(a): Smolts are acclimated for 2-6 weeks prior to release.
Indicator 17(b): The number of marked spring/summer chinook returning to the Grande Ronde facilities is equal to or greater than 95% of reported escapement.
Performance Standard (18): Patterns of genetic variation within and among natural-origin spring/summer chinook populations do not diverge as a result of artificial production programs.
Indicator 18(a): Compare genetic profiles and divergence of naturally produced juveniles from indicator areas within the Grande Ronde sub-basin over time
Performance Standard (19): Hatchery produced adults do not exceed an average of 70% of natural spawners in Catherine Creek and Lostine River above the collection facilities.
Comment [TL1]:
Indicator 19(a): Proportion of hatchery and natural-origin fish in key natural spawning areas.
Performance Standard (20): Broodstock selection strategies effectively maintain genetic and life history characteristics in the hatchery population.
Indicator 20(a): Percentage of natural-origin fish in the broodstock comprises at least 30% of the hatchery brood.
Indicator 20(b): Timing of hatchery adult returns to the collection facilities mimics natural-origin chinook returns.
Indicator 20(c): Genetic profile of natural-origin and hatchery fish in Grande Ronde sub-basin does not significantly diverge.
Indicator 20(d): Size and age composition of returning adults is consistent with natural-origin run over time.
Performance Standard (21): Broodstock collection does not significantly alter spatial and temporal distribution of naturally spawning spring/summer chinook populations
Indicator 21(a): Number of adult fish aggregating or spawning immediately below the adult weir

does not exceed historical distributions and spawning activity.
Indicator 21(b): Natural-origin spring/summer chinook are captured and sorted, and either retained, transported, or released according to annual run timing and run size.

Ecological Impacts
Performance Standard (22): Release numbers do not exceed habitat capacity for spawning, rearing, migration corridor, and estuarine and near-shore rearing.
Indicator 22(a): Smolts are released in March through April and are released into targeted locations to promote smolt emigration.
Indicator 22(b): Proportion of residual hatchery smolts in key natural rearing areas does not exceed 10%.
Indicator 22(c): Emigration behavior of hatchery smolts matches that of their wild counterparts.
Indicator 22(d): Releases parr and adults are made to under seeded outlet streams.
Performance Standard (23): Water withdrawal and diversion structures used in operation of artificial production facilities will not prevent access to natural spawning areas, affect spawning behavior of listed natural populations, or impact juvenile rearing
Indicator 23(a): Water withdrawals compared to applicable passage criteria
Indicator 23(b): Water withdrawal compared to NMFS juvenile screening criteria
Indicator 23(c): In stream flow between hatchery facility intake and out-fall are maintained in al facilities.
Indicator 23(d): Length of stream impacted by water withdrawal
Performance Standard (24): Predation by artificially produced fish on natural produced fish does not significantly reduce numbers of natural fish
Indicator 24(a): Size at, and time of juvenile release compared to size and timing of natural fish present

Monitoring and Evaluation:
Performance Standard (25): Monitoring and evaluation occurs on an appropriate schedule and scale to assess progress toward achieving experimental objectives and evaluating the beneficial and adverse affects on natural populations
Indicator 25(a): Monitoring and evaluation framework including detailed timeline
Indicator 25(b): Annual and final reports
Performance Standard (26): Release groups are marked to allow evaluation of effects on local natural populations
Indicator 26(a): Visible mark (Ad-clip) in captive brood hatchery-origin release groups. Two visible marks (Ad-clip and VIE) in conventional brood hatchery-origin for Catherine Creek and Lostine River release groups. No visible mark (Coded Wire Tagged (CWT) only) on conventional brood hatchery-origin in Upper Grande Ronde. All release groups represented with a percentage of CWT.

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

1.10.1) “Performance Indicators” addressing benefits.
See section 1.9

1.10.2) “Performance Indicators” addressing risks.
See section 1.9

1.11) Expected size of program.

Hatchery mitigation goal (Currently Permitted Program) for the Grande Ronde spring/summer chinook salmon is 900,000 smolts. We anticipate fish production around 750,000 fish due to final rearing constraints at Lookingglass Hatchery. Production is based on prioritization process outlined in the Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al 2002). Expected program size includes:

1. Up to 250,000 smolts released into Catherine Creek.
   - Captive number based on juvenile sliding scale.
   - Up to 150,000 from captive brood stock production.
   - Long term reduce to 150,000.
2. Up to 250,000 smolts released into Lostine River.
   - Up to 150,000 from captive brood stock production
3. Up to 250,000 smolts released into Upper Grande Ronde River.
4. Up to 150,000 smolts released into Lookingglass Creek.
   - Long term increase to 250,000.

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

Captive Brood--Juvenile collection is not expected to exceed 1,500 parr, i.e., 500 fish from each of the three target tributaries: Catherine Creek (CC), Lostine River (LR), and Upper Grande Ronde (UGR). Fish are reared to maturity and used for broodstock (DeHart and Carmichael 1996).

Conventional Brood--Adult (ages four and five) collection is not expected to exceed 360 males and 360 females. Age composition and fecundity of adults varies from year to year. However, given expected program adult pre-spawning survival, female fecundity and egg to smolt survival 720 adults (1:1 sex ratio) will produce approximately 900,000 smolts. For the year 2002, co-managers targeted a collection of 50 males and 50 females per tributary to produced 360,000 smolts (AOP 2002, LSRCP). In 2003, co-managers will targeted a collection of 60 males and 60 females per tributary (Catherine Creek, Lostine River, and Upper Grande Ronde) to produced 390,000 smolts.

Maximum by stock:

Catherine Creek—200 adults decreasing to 120 adults
Lookingglass Creek—120 adults increasing to 200 adults
Lostine River—200 adults
Upper Grande Ronde—200 adults

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

Specific details are outlined in the Grand Ronde Basin Chinook Hatchery Management Plan (Zimmerman et al. 2002).

Life Stage	Release Location	Annual Release Level
Eyed Eggs	**Captive Brood production only** CC stock – Lookingglass Cr., Indian Cr. LR stock – Bear Cr., Wallowa R., Hurricane Cr. UGR—Sheep Cr., Meadow Cr. UGR below weir	None anticipated; however, eyed eggs can be outplanted when surplus to smolt production goals.
Unfed Fry	None	None
Fry	None	None
Fingerling	CC stock – Lookingglass Cr., Indian Cr. LR stock – Bear Cr., Wallowa R., Hurricane Cr. UGR—Sheep Cr., Meadow Cr. UGR below weir	None anticipated; however, parr can be released when surplus to smolt production goals and rearing space.
Yearling	Catherine Creek	250,000
Yearling	Lostine River	250,000
Yearling	Upper Grande Ronde	250,000
Yearling	Lookingglass Creek	150,000

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

Current program performance has not been determined due to the formative status of the program. There is no data completed regarding smolt-to-adult survival rate, total adult production number, and escapement numbers to target areas at this time.

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

The LSRCP program completed Lookingglass Hatchery in 1982. The first releases of Rapid River stock spring/summer chinook salmon occurred, however, in 1980 (1978 brood) in Lookingglass Creek. Rapid River and Carson origin fish were released in the early 1980's. The last Rapid River fish were released as parr in Lookingglass Creek in 2000. Currently, production from Lookingglass Hatchery has transitioned from composite stocks to indigenous Grande Ronde sub-basin stocks using captive and conventional brood stocks.

Captive Brood--In 1995, the program started the transition to endemic stocks; However due to the low escapement levels of natural adults in Catherine Creek, Lostine River, and Upper Grande Ronde, the captive brood program was initiated in the same year with the first collection of juvenile spring chinook salmon parr (1994 brood year) from the three target populations.

In 2000, the Captive Brood program released their first smolts in CC, LR, and UGR.

Conventional Brood--In 1997, 2000, 2001, and 2002 Lostine adults were collected and spawned using conventional hatchery technology. In 2001 and 2002, Catherine Creek and Upper Grande Ronde adults were collected and spawned using conventional hatchery technology.

In 1999, the conventional brood program released the first smolts in the Lostine River. The first

scheduled releases in CC and UPGR should occur in 2003.

1.14) Expected duration of program.

The Captive Brood component--This program, including experimental captive brood stock artificial propagation programs and associated monitoring and evaluation programs, is planned to continue through the year 2015 (DeHart and Carmichael 1996). Collection of naturally produced parr is expected to continue at least through 2004 with program review in 2005. It is anticipated that the captive-brood programs will transition to conventional smolt programs when adult escapement increases and adult collection becomes more reliable.

The Conventional Brood/LSRCP Grande Ronde spring chinook salmon program is an ongoing project.

1.15) Watersheds targeted by program.

Catherine Creek (ODFW watershed 0800529999)
Lostine River (ODFW watershed 0800639999)
Upper Grande Ronde (ODFW watershed 0800509999)
Lookingglass Creek (ODFW watershed 0800440000)

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

Given the listed status of Snake River spring/summer chinook, maintaining a hatchery program is currently the only method of supplementing the natural population and providing harvest opportunity on hatchery produced fish in the LSRCP mitigation area.

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

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

- ESA Section 10 permit #1011 (CTUIR may submit an additional application for their ongoing activities on Catherine Creek and Upper Grande Ronde River).
- ESA Section 10 permit #1049 (The NPT may submit an application for their ongoing activities on the Lostine River).
- NPDES 0300J (site number 64492)
- DEQ MOA Water Quality Limited stream list. (carcass disposal)
- Aqui-S INAD 10-541-0202 (permit number for 2002)
- Erythromycin INAD 020RLOSCS1 (permit number for 2002)
- Grande Ronde Spring Chinook Hatchery Management Plan (Zimmerman et al. 2002)
- Lower Snake River Compensation Plan (2002 AOP)
- Captive Brood (2002 AOP)
- US v. Oregon
- NMFS 4 (d) – Section 7 consultation with USFWS
- Oregon Scientific Taking Permit OR2002-043
- Oregon Scientific Taking Permit OR2002-077

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

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

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

Spring chinook – Historically, spring chinook spawned throughout the mainstem and headwater areas of the Grande Ronde sub-basin (Olsen et al. 1994). Currently, five core populations have been identified. Three populations are targeted for hatchery intervention: Catherine Creek, Lostine River, Upper Grande Ronde. Two populations are managed for natural production: Minam and Wenaha.

Adult spring chinook 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. Spawning occurs from early August through September and generally peaks in late August. Emergence begins in January and extends through June. Fry expand their distribution after emergence in the spring. The extent and direction of fry movement depends on environmental conditions. A fall pre-smolt movement appears to involve a substantial portion of the population in some streams. Juveniles rear for one year and smolt the spring of the year following emergence. Smolt migration from the basins begins in January and extends through early July.

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

The hatchery production program may incidentally affect listed Snake River summer steelhead populations. In addition, listed Snake River spring chinook populations from other basins, Snake River fall chinook, and Columbia Basin bull trout may be affected to a lesser degree. The magnitude of that affect is unknown, however, it is expected that affects will be reduced from past levels through program modifications outlined in this document.

Summer steelhead - Grande Ronde basin summer steelhead are typical of A-run steelhead from the mid-Columbia and Snake basins. Most adults returning to the Grande Ronde basin do so after one year of ocean rearing (60%). The remainder are 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 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 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 basin extends from late winter until late spring. Peak smolt movement is associated with increased flow events between mid-April and mid-May (Setter, ODFW, pers.com.)

A conservative description of potential steelhead population structure within the Grande Ronde basin is outlined below.

1. Lower Grande Ronde River
    1. Wenaha River
    2. Lower Grande Ronde River tributaries in Oregon

2. Joseph Creek and tributaries
3. Wallowa River
   - Wallowa River tributaries from North
   - Wallowa River tributaries from South (except Minam)
   - Prairie Creek
   - Minam and tributaries
4. Upper Grande Ronde River
   - Lookingglass
   - Middle Grande Ronde (Grande Ronde tributaries between Wallowa and the upper end of the Grande Ronde Valley except Lookingglass, Catherine and Willow creeks)
   - Willow Creek
   - Catherine Creek
   - Upper Mainstem and tributaries above the Grande Ronde Valley up to and including Meadow Creek
   - South Upper Mainstem (basin above Meadow Creek)

This identified steelhead population structure in Grande Ronde basin streams represents a conservative approach to population delineation due to a lack of data and our desire to minimize risk of population impacts resulting from management decisions. The identified structure is based upon basin size and differences in hydrology, elevation, geology, temperature regime, aspect and spawning time. For the purposes of this plan populations are grouped into management units as indicated to accommodate inference from existing data analysis. Individuals from Catherine Creek, Lostine River and Upper Grande Ronde populations may be intercepted and handled during broodstock collection. All the above listed populations may be intercepted and handled in recreational fisheries.

Fall chinook – Fall chinook in the lower reaches of the Grande Ronde Rivers are considered segments of the Snake River population and exhibit similar life histories. Adult Snake River fall chinook enter the Columbia River in July and migrate into the Snake River from mid-August through October. Spawning occurs from late October through early December, with fry emergence during March and April. Outmigration occurs within 3-4 months following emergence with peak migration past Lower Granite Dam in late June.

Bull trout – Both fluvial and resident life history forms of bull trout inhabit the Grande Ronde River and a number of tributaries. Habitat conditions and influence of introduced brook trout vary widely across the basin and affect bull trout productivity in some areas. As a result, the basins bull trout population(s) vary from areas of relative strength in wilderness streams where brook trout are not currently a problem to areas where habitat condition and/or interaction with brook trout result in substantially depressed bull trout productivity. Fluvial adults migrate into headwater areas during and summer and early fall after over-wintering in mainstem tributaries and the Snake River. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge in during the spring. Juvenile summer rearing is restricted to headwater areas by increasing water temperatures downstream.

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

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

The Grande Ronde 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 basin have paralleled those of other Snake River stocks. Reduced spawner numbers combined with human manipulation of previously important spawning habitat have resulted in decreased spawning distribution and population fragmentation.

Catherine Creek and the Grande Ronde and Lostine rivers were historically three of the most productive populations in the Grande Ronde basin (Carmichael and Boyce 1986). Escapement levels in Catherine Creek and Grande Ronde and Lostine rivers dropped to alarmingly low levels in 1994 and 1995. A total of 11, 16, and 3 redds were observed in Catherine Creek, Lostine River, and upper Grande Ronde River in 1994, respectively, and in 1995, 14, 11, and 6 redds were observed in those same streams (Table 2.2.2A). In contrast, the estimated number of redds in 1957 was 374 (not including North Fork Catherine Creek), 893 and 478 in these rivers, respectively. 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.

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

No data available at this time.

- Provide the most recent 12 year (e.g. 1986-2001) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.
ODFW has been monitoring spawning spring/summer chinook since the late 1940's and early 1950's. Since 1986, ODFW has conducted spawning ground surveys on the majority of the available spawning habitat including the five core populations in the Grande Ronde sub-basin (Table 2.2.2A).

Table 2.2.2A. Redd counts observed in selected tributaries in the Grande Ronde sub-basin, 1986-2002 (per. comm. Walters).

Year	Catherine Creek	Lostine River	Upper Grande Ronde	Minam	Wenaha
1986	94	90	48	63	68
1987	234	94	207	103	152
1988	212	182	115	96	170
1989	46	52	Na	38	18
1990	39	27	31	67	83
1991	20	28	10	50	58
1992	49	36	116	95	183
1993	84	102	103	88	100
1994	11	16	3	29	42
1995	14	11	6	15	21
1996	15	27	22	84	102
1997	46	49	19	48	72
1998	34	35	25	57	65
1999	40	57	0	40	22

2000	34	64	20	128	119
2001	133	118	15	179	262

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

There have been some hatchery-origin adults on the spawning grounds from the current program; however, this information has not been summarized at this time.

Hatchery fish have been present in the Grande Ronde basin during the 1990s from releases of Rapid River stock. The use of Rapid River stock in the Grande Ronde has been discontinued. The proportion of marked carcasses recovered during 1994 through 1997 spawning ground surveys in the Grande Ronde River sub-basin is reported in Table 2.2.2B.

Table 2.2.2B. Origin of spring chinook salmon carcasses (Rapid River stock), based on marking of hatchery fish, recovered during spawning ground surveys in the Grande Ronde River sub-basin. Data from: 1994 and 1996 (Keniry 1999); 1995 (Parker et. al. 1995); and 1997 (Parker and Keefe 1997).

Run Year	Marked	Unmarked	Percent Marked
1994	26	46	36.1%
1995	1	19	5.0%
1996	8	136	5.6%
1997	13	219	5.6%

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

- 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.

Adult broodstock collection - Annual broodstock collection includes conventional marked and unmarked listed chinook returning to Catherine Creek, Lostine, and Upper Grande Ronde weirs. Adults collected are incorporated into a matrix spawning protocol to maintain genetic similarity between hatchery-origin and natural-origin populations. Adults are collected from June (as early as stream conditions allow) to September based on systematic approach to pass fish above the weir, out-plant, or retaining for broodstock based on origin, sex, and age. The approach is based on pre-season estimate of returning adults and is modified as the run develops.

Initially, broodstock collection for Lookingglass Creek will comprise of only marked fish returning from captive brood production through 2007.

Adult collections may result in injury, mortality or delayed mortality.

Parr broodstock collection – A maximum of 500 parr are collected for broodstock in Catherine Creek, Lostine River, and Upper Grande Ronde. Fish are collected in natural rearing zones in

areas redds where observed the previous year.

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

Juvenile's trapped – Wild juvenile steelhead, bull trout, and chinook moving upstream may enter the adult trap during operation. This may result in injury and/or mortality.

Spawning surveys – Foot surveys are conducted to determine natural spawning, density and proportion of hatchery-origin fish in key natural spawning areas. These surveys are conducted annually in various reaches of spawning habitat from August through September. Experienced surveyors walk along the stream, crossing when necessary, avoiding and counting redds and observing fish. Although every effort is made to observe adults and determine their origin without disturbance, spawners are occasionally forced to seek cover. These encounters are brief and spawning fish generally resume their activity within a short period of time.

Juvenile surveys/collections – Rotary traps are used to monitor early life history of juvenile fish. Collection and handling may result in injury, mortality of delayed mortality. Electro-fishing, snorkeling and hook and line sampling may be used to monitor density, size and food habits of residual hatchery steelhead and to collect genetic samples from naturally produced steelhead. These activities, which generally occur from May through October, will result in take of juvenile listed steelhead and occasionally spring chinook and bull trout. Electro-fishing efforts conform to NMFS guidelines to minimize disturbance and injury to listed fish. Snorkeling is a low impact sampling method that may be used to identify relative proportion of residual hatchery steelhead in key stream reaches. Disturbance of rearing juveniles associated with snorkeling is generally limited to forcing individuals to seek cover and is a short duration effect. Snorkeling surveys will be conducted when stream temperatures are low, so as to minimize potential for stress and incidental mortality to listed fish.

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

Grande Ronde sub-basin adults held at Lookingglass Hatchery since 1999.

Table 2.2.3A. Pre-spawning and handling mortality at Lookingglass Hatchery, 1997-2002.

Year	Catherine Creek			Lostine River			U. Grande Ronde		
	Adult	Mort.	%	Adult	Mort.	%	Adult	Mort.	%
1997	na	na	na	8	0	0.0	na	na	na
1998	na	na	na	0	0	0	na	na	na
1999	na	na	na	0	0	0	na	na	na
2000	na	na	na	32	0	0	na	na	na
2001	24	1	4.2	81	1	1.2	21	5	23.8
2002	47	3	6.4	72	7	9.7	49	14	28.6
No Catherine Creek adults have been collected and held for Lookingglass Creek production.									

Refer to Section 6.2 for a description of adult collection and egg take since 1997.

Table 2.2.3B. Grande Ronde sub-basin parr collected for captive broodstock from 1995 to 2002.

Year	Catherine Creek	Lostine River	Upper Grande Ronde
1995	498	499	110
1996	500	481	0
1997	500	501	500
1998	500	500	500
1999	500	498	500
2000	503	500	0
2001	503	502	503
2002	500	500	461

-

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).

Tables in section 2.2.3 includes projected take for the hatchery program, includes take for program monitoring, includes take of hatchery reared fish which as a group include progeny of listed wild fish and are therefore part of the ESU.

Table 2.2.3B. Estimated maximum take levels of listed Catherine Creek salmonids by hatchery activities.

Listed species affected: Spring/Summer Chinook			**ESU/Population:** Snake River	
Activity: Catherine Creek spring/summer chinook hatchery program				
Location of hatchery activity: Catherine Creek and Snake Basin			**Dates of activity:** Annual	
Hatchery program operator: ODFW				
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	2,500	500	200
Collect for transport b)	357,000	503	200	200
Capture, handle, and release c)	0	2,000	700	0
Capture, handle, tag/mark/tissue sample, and release d)	250,000	250,000	700	0
Removal (e.g. broodstock) e)	0	0	200	0
Intentional lethal take f)	35,000	500	200	0

Listed species affected: Spring/Summer Chinook			**ESU/Population:** Snake River	
Activity: Catherine Creek spring/summer chinook hatchery program				
Location of hatchery activity: Catherine Creek and Snake Basin			**Dates of activity:** Annual	
Hatchery program operator: ODFW				
Unintentional lethal take g)	52,000	20,000	25	0
Other Take (specify) h)	0	150,000	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. (Take assumes mortality from the captive brood program)

Table 2.2.3C. Estimated maximum take levels of listed Lostine River salmonids by hatchery activities.

Listed species affected: Spring/Summer Chinook			**ESU/Population:** Snake River	
Activity: Lostine River spring/summer chinook hatchery program				
Location of hatchery activity: Lostine River and Snake Basin			**Dates of activity:** Annual	
Hatchery program operator: ODFW				
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	2,500	500	200
Collect for transport b)	357,000	503	200	200
Capture, handle, and release c)	0	2,000	700	0
Capture, handle, tag/mark/tissue sample, and release d)	250,000	250,000	700	0
Removal (e.g. broodstock) e)	0	0	200	0
Intentional lethal take f)	35,000	480	200	0
Unintentional lethal take g)	52,000	20,000	25	0
Other Take (specify) h)	0	150,000	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. (Take assumes mortality from the captive brood program)

Table 2.2.3D. Estimated maximum take levels of listed Upper Grande Ronde salmonids by hatchery activities.

Listed species affected: Spring/Summer Chinook			**ESU/Population:** Snake River	
Activity: Upper Grande Ronde spring/summer chinook hatchery program				
Location of hatchery activity: Upper Grande Ronde and Snake Basin			**Dates of activity:** Annual	
Hatchery program operator: ODFW				
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	2,500	500	200
Collect for transport b)	357,000	503	200	200
Capture, handle, and release c)	0	2,000	700	0
Capture, handle, tag/mark/tissue sample, and release d)	250,000	250,000	700	0
Removal (e.g. broodstock) e)	0	0	200	0
Intentional lethal take f)	35,000	480	200	0
Unintentional lethal take g)	52,000	20,000	25	0
Other Take (specify) h)	0	150,000	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. (Take assumes mortality from the captive brood program)

Table 2.2.3E. Estimated maximum take levels of listed Lookingglass Creek salmonids by hatchery activities.

Listed species affected: Spring/Summer Chinook			**ESU/Population:** Snake River	
Activity: Lookingglass Creek spring/summer chinook hatchery program				
Location of hatchery activity: Lookingglass Creek and Snake Basin			**Dates of activity:** Annual	
Hatchery program operator: ODFW				
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	2,500	500	200
Collect for transport b)	357,000	250	200	200
Capture, handle, and release c)	0	2,000	700	0
Capture, handle, tag/mark/tissue sample, and release d)	250,000	250,000	700	0
Removal (e.g. broodstock) e)	0	0	200	0
Intentional lethal take f)	35,000	480	200	0
Unintentional lethal take g)	52,000	20,000	25	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.

The number of days spring/summer chinook are trapped at the Upper Grande Ronde weir will be reduced when temperature exceed 21.1^{o}C for consecutive three days. Trapping will be discontinued and fish will be allowed to pass freely.

When water temperatures exceed 18.3^{o}C, trapped fish will be passed without handling on Catherine Creek, Lostine River and Upper Grande Ronde weirs.

In 2002, the take level for Upper Grande Ronde smolts was exceeded due to the icing event that blocked the water inflow. *Contingency*--The number of days spring/summer chinook smolts are acclimated at Catherine Creek, Lostine River and Upper Grande Ronde facilities will be reduced if environmental factors prevent the reliable operation on water intakes. Smolts can be released early into target tributaries.

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.

The proposed program outlined in this HGMP is consistent with the NPPC Annual Production Review (Report and Recommendations), draft Grande Ronde Imnaha sub-basin summary, current section 10 permits (1011, 1049), and addresses issues of concern outlined in the NMFS Hatchery Biological Opinion (1999).

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. The proposed program will continue to support a substantial tribal and sport harvest level.
- *US vs Oregon* - The hatchery program outlined within this HGMP is consistent with the now out-dated Appendix B hatchery smolt production agreements of the *US vs Oregon* negotiations and the intent to provide fish for harvest in tribal and sport fisheries into the future.
- *Columbia River Fish Management Plan* – The program would continue to provide substantial harvest in Zone 6 tribal net fisheries as well as in-basin tribal harvest opportunity.
- *Grande Ronde Spring Chinook Hatchery Management Plan* –The program is consistent with production levels agreed to by co-mangers (Zimmerman et al. 2002).
- *Annual Operation Plan (AOP 2002 LSRCP)*—The program is consistent with co-manager agreements outlined in annual operations.
- *Annual Operation Plan (AOP 2002 Captive Brood*—The program is consistent with co-manager agreements outlined in annual operations

3.3) Relationship to harvest objectives.

The Grande Ronde sub-basin harvest plan has not been developed.

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

In the 1990's, the composite Rapid River/Carson stock hatchery fish were not intercepted in limited sport fisheries from the ocean to the Grande Ronde River. However, in 2001 and 2002, artificially propagated endemic Catherine Creek, Lostine River, and Upper Grande Ronde River stocks, as well as, the Rapid River/Carson composite stock were available to sport harvest from the ocean to the mouth of the Grande Ronde River. The composite stock was also available for harvest in 2.2 miles section of Lookingglass Creek. This information has not been summarized.

Tribal harvest from the ocean to the Grande Ronde River is unknown.

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 sub-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 Engineer 404 regulations provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or 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 Protection Act (NEPA) review.

These protection programs in conjunction with ongoing private and publicly funded restoration efforts have resulted in an upward trend in chinook and steelhead habitat in many Grande Ronde sub-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 Planning Council's (NPPC) 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, reduce 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) improving habitat, and productivity, for the basin's wild spring/summer chinook.

3.5) Ecological interactions.

Salmon supplementation contains uncertainties. Cuenco et al. (1993) and Waples (1995) outlined potential benefits that include:

1. Reduce short-term extinction risk
2. Provide survival advantage for depressed stocks
3. Speed recovery or rebuilding to carrying capacity
4. Help maintain population while factors for decline are being addressed
5. Establish a reserve population for use if wild/natural population suffers a catastrophic loss
6. Reseed vacant or barren habitat
7. Provide scientific information for use of supplementation in conservation of wild/natural populations

Increased Abundance (i.e. lower risk of extinction)--Spring Chinook salmon populations in the Grande Ronde sub-basin in the mid-1990 were at extreme risk of extirpation because of low productivity and low abundance of spawners. Co-managers hope to use artificial propagation to increase the number of individuals, while maintaining genetic and life history characteristics.

The primary benefit we expect from this program is a reduction in demographic risk and risk of extirpation of spring chinook salmon populations in Catherine Creek, Lostine River, and the Upper Grande Ronde. The greatest short-term risk to these populations is the risk of extirpation

and we expect our captive brood stock programs to provide an increase in number of natural spawners to forestall extirpation while other factors affecting the productivity of these populations are corrected. Our experience with spring/summer chinook in the Imnaha River suggest that rearing chinook from egg to smolt in a hatchery has provided a substantial survival advantage and has increased the total number of returning chinook adults and number of natural spawners in the basin. If we are successful at stabilizing and preserving genetic resources of Grande Ronde Chinook populations, and other factors are addressed to improve productivity, the hatchery programs should accelerate the restoration of these populations.

Increased nutrient input into ecosystem—Other ecological and social benefits could result from these efforts including improved nutrient cycling through an increase in number of chinook carcasses in the ecosystem, improved ability to meet LSRCP mitigation goals if productivity improves, and increase potential of reestablishing sport and tribal fisheries.

Research Benefits—Opportunity for improving our understanding of the role supplementation can play in the recovery of chinook populations can gbe gained from this project. Data from acclimated release studies will increase our knowledge of smolt migration and survival rates. Information on adult escapement and interaction between hatchery and naturally reared chinook may also be gained. In addition, the trapping facilities and monitoring and evaluation components of the program will improve our knowledge of abundance and life history of Grande Ronde basin spring/summer chinook salmon.

Cuenco et al (1993) and Waples (1995) outlined potentil risks that include:

1. No supplementation action
2. Genetic effects
    a. Loss of diversity
        - Within Population (inbreeding depression, genetic drift, selection, and hatchery vs. wild/natural environment)
        - Between Populations (outbreeding depression, broodstock collection, and straying/stock transfers).
3. Partial or total failure in the hatchery
4. Predation
5. Competition
6. Disease
7. Habitat Utilization
8. Non-genetic production effects
9. Marking
10. Power to detect adverse effect
11. Unexpected effects
12. Program Termination

Genetic Risks with an Artificially Propagated Population—Some risks to population genetic diversity have been minimized in this project. Care will be taken to prevent collection of adults that selects for certain components. This will preclude a potentially large contribution to subsequent generations from a small segment of the parent population. The adult spawning is being planned to prevent introduced bias towards one group of fish.

Competition and Predation with the Wild/Natural Populations—Competition is a concern from supplementation-released parr, and to lesser degree smolts, in natural spawning and rearing areas.

Juvenile hatchery fish may interact with wild/natural fish for food, cover, or space (territory) (Waples 1995). To minimize competition effects, the planned juvenile release will occur at the smolt stage. Releases at other life stage will occur over several locations in low population abundance determined by the previous years redd counts. Predation by hatchery released spring chinook is rare.

Behavioral—There are limited data describing adverse effect of hatchery chinook salmon releases on wild/natural spring chinook populations. While the effects of migrating hatchery smolts (yearlings) on wild/natural chinook salmon are unknown, the potential for negative interaction exists especially with large concentrated sub-yearling releases above or in natural rearing areas.

Harvest—The effect on listed species of the harvest of Lookingglass Program fish in the ocean and in-river fisheries has been minimal; however, harvest data has not been compiled for the more recent 2001 and 2002 Columbia River fisheries.

Fish Disease—Hatchery operations potential concentrate and amplify fish pathogens and parasites that could effect wild/natural chinook salmon growth and survival in the immediate vicinity of the hatchery, acclimated release locations, and mainstem fish collection facilities (dams). The disease-producing agents identified in spring chinook salmon at Lookingglass hatchery are known to also occur in naturally produced fish. The disease of grievance concern is Bacterial Kidney Disease (BKD). Prudent fish health actions of culling eggs from females with high level of antigens have helped with controlling this disease. In general, fish have demonstrated good health and lack of diseases in fish reared at Lookingglass Hatchery, and therefore indicates that there would be minimal transmission of any agents they harbor to natural populations.

Hatchery Effluent—Hatchery effluent discharges directly into Lookingglass Creek 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 detention 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.

Fish chemical used at the hatchery include iodophore, erythromycin, formalin, and Aqui-S. Chemicals are approved fishery compounds and their use is regulated by label instruction or Investigative New Animals Drug (INADS) permits. Both iodophore and formalin undergo high dilution rates before entering the stream, which renders them innocuous to the fish and ecosystem. Aqui-S is not discharged into the receiving stream. Erythromycin is injected into brood adults or fed to juvenile fish twice (up to 56 days) during rearing. 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 effect egg survival, juvenile growth and abundance, adult migrations and spawning of chinook salmon. Lookingglass Hatchery water intake diverts a maximum of 50cfs 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 additional dewatering of redds is unlikely.

It is highly unlikely that water withdrawals are a problem at Catherine Creek, Lostine River, and Upper Grande Ronde acclimation facilities at this time. However, there is concern that water withdrawal for the proposed expansion of the Lostine River facility will be a problem.

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 (50 CFS water right). Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 1 ^{o} and 16^{o}C. Additional water sources include 2 wells that are capable of pumping 5 CFS of 14.5^{o}C. Water discharged is monitored under the general NPDES 0300 J permits. High spring run-off has created problems with turbid water and sediment disposition. Compliance for screening criteria will be evaluated.

The main water sources for Lostine facilities are the Lostine River. The acclimation facility has uses approximately 5 CFS from February to April. The adult collection facility is located in stream. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ^{o} and 16^{o}C. Compliance for intake screening criteria will be evaluated in NEOH process.

The main water sources for Catherine Creek acclimation and adult trapping facilities are the Catherine Creek. The acclimation facility has a 5 CFS water right February through April and the adult collections facility utilizes approximately 5 CFS April through September. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ^{o} and 16^{o}C. Compliance for intake screening criteria is currently (2002/03) being evaluated in NEOH. Currently, the facility produces less than 20,000 pounds of fish per year; therefore, the NPDES general permit (No. 300-J) is not required (per. comm.. Sellars 2001).

The main water sources for Upper Grande Ronde acclimation and adult trapping facilities are the Upper Grande Ronde River. The acclimation facility has a 5 CFS water right February through April and the adult collections facility utilizes approximately 5 CFS April through September. Water temperatures fluctuate daily and seasonally with mean daily temperatures ranging between 0.5 ^{o} and 16^{o}C. Compliance for intake screening criteria is currently (2002/03) being evaluated in NEOH. Currently, the facility produces less than 20,000 pounds of fish per year; therefore, the NPDES general permit (no. 300-J) is not required (personal communication Sellars 2001).

The water source for the Irrigon Hatchery consists of five remote wells that are capable of pumping 31,000 gpm (69 CFS) with temperature ranging from 10°C to 16°C. Water is chilled to

5°C for incubation. Water discharged is monitored under the general NPDES 0300 J permits.

The water source at Oxbow Hatchery is spring water with a mean temperature of approximately 5°C. Water can be chilled to 3°C for incubation. Intake screens are in compliance with NMFS criteria. Water discharged is monitored under the general NPDES 0300 J permits.

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.

Intake Screens were replaced at Lookingglass Hatchery in 1999. Intake screens evaluations are scheduled in 2003 (funding available) for compliance with the current criteria.

The potential for entrapment of listed fish exists at the Lostine, Catherine Creek, and Upper Grande Ronde acclimation and adult collection sites. These screens will also be evaluated during the NEOH 3-step process.

Irrigon Hatchery is 100% well water.

Oxbow Hatchery conforms to the NMFS screening guidelines.

Effluent water quality at Lookingglass, Irrigon and Oxbow is monitored quarterly under a general 0300-J NPDES permit. Water quality standards and conditions have been good over the past 5 years.

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 form Tanner Creek.

The Captive Brood water supply at Manchester Marine Lab for rearing immature fish is 100% pumped Puget Sound saltwater. Mature fish are transferred to Bonneville Hatchery. Hatchery intake screens conform to screening guidelines to minimize entrainment of juvenile fish.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Facilities

Four facilities are used to collect adults in the Grande Ronde sub-basin. Facilities include: Lookingglass Hatchery (operated by ODFW), Lostine (operated by NPT), and Catherine Creek and Upper Grande Ronde (operated by CTUIR).

Lookingglass—The Lookingglass Hatchery consists of three permanent resident to provide facility security. Two adult traps can be operated. The upper trap is located at the facility intake. A block weir directs fish into ladder and through vee trap into a holding area. Fish are handled daily. The lower trap is located adjacent to the hatchery-building complex. A floating weir can be installed to direct fish into fish ladder. The ladder is operated with hatchery water effluent. Typically, the floating weir is not installed and fish volunteer into the ladder and holding pond. The main water source for Lookingglass Hatchery is

Lookingglass Creek (50 CFS water right). During full production (1.39 million), withdrawal of 50cfs can create fish passage problems in some years. Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 1 ^{o} and 16^{o}C. Additional water source include 2 wells that are capable of pumping 5 CFS of 14.5^{o}C.

Lostine--The Lostine facility consists of one travel trailer. Adult trap consists of a picket weir installed at a 45^{o} angle to the flow with a vee trap and holding area near the upstream end of the weir. Holding area is constructed of picket panels and can vary in size from 192 ft.^{3} (8x12x2) to 600 ft.^{3} (12x24x2) and hold 75 adults for 24 hours. Collected adults are passed above the weir or transported to Lookingglass Hatchery within 48 hours of collection.

The main water source for the Lostine weir is the Lostine River Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 1^{o} and 17^{o}C.

Catherine Creek--The Catherine Creek facility consists of one temporary travel trailer that provide facility security. Adult trap consists of a hydraulic weir that is attached at the bottom sill of a full channel width pool and chute type ladder. Adults are collected by directing fish into an off channel ladder leading to a trapping and holding area of 825ft^{3} (25'x 6' x 5.5'). The trap is covered with aluminum grating and is fully lockable. A maximum of 82 adults can be held for 48 hours. Adults handled for transported are transferred using a water-filled tube or elevator system. The fish are taken to Lookingglass Hatchery for holding until spawning. Collected adults are passed above the weir or transported to Lookingglass Hatchery within 48 hours of collection.

The main water source for the Catherine Creek weir is Catherine Creek. Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 1^{o}C and 17^{o}C.

Grande Ronde--The Upper Grande Ronde facility consists of one temporary travel trailer that provides facility security. Adult trap consists of a floating weir and holding area. Fish are directed through a vee trap into the holding area. The holding area varies with water depth but is approximately 275ft^{3} (11'x 10'x 2.5'). The trap is covered with steel grating and is fully lockable. A maximum of 27 adults can be held for 48 hours. Adults handled for transported are transferred using a water-filled tube. Collected adults are passed above the weir or transported to Lookingglass Hatchery within 48 hours of collection.

The main water source for the Upper Grande Ronde weir is Grande Ronde River. Water temperatures fluctuate daily and seasonally with mean temperatures ranging between 0.1^{o}C and 18^{o}C.

Collections

Catherine Creek--The Catherine Creek spring/summer chinook program uses the endemic population for hatchery broodstock.. Broodstock collection guidelines (sliding scale) are based on estimated escapement to the mouth. The sliding scale was developed cooperatively with co-mangers (Table 5.1.). No captive progeny adults (F-1) will be used for brood.

The following management guidelines were used to form the basis for implementation of the sliding scale. For adult escapement of <250, three uses of hatchery and natural fish are identified:

1. Collect for hatchery broodstock and spawn
2. Release above the weir to spawn naturally
3. Tribal ceremonial use

For adult escapement above >250, five uses of hatchery and natural fish are identified:

1. Collect for hatchery broodstock and spawn

2. Release above the weir to spawn naturally
3. Tribal ceremonial use
4. Outplant hatchery adults (Zimmerman et al 2002)
5. Recreational fishing on hatchery origin fish

Lostine--The Lostine spring/summer chinook program uses the endemic population for hatchery broodstock.. Broodstock collection guidelines (sliding scale) are based on estimated escapement to the mouth of Lostine River. The sliding scale was developed cooperatively with co-managers (Table 5.1.A). No captive progeny adults (F-1) will be used for brood.

The following management guidelines were used to form the basis for implementation of the sliding scale. For adult escapement of <250, three uses of hatchery and natural fish are identified:

1. Collect for hatchery broodstock and spawn
2. Release above the weir to spawn naturally
3. Tribal ceremonial use

For adult escapement above >250, five uses of hatchery and natural fish are identified:

1. Collect for hatchery broodstock and spawn
2. Release above the weir to spawn naturally
3. Tribal ceremonial use
4. Outplant hatchery adults (Zimmerman et al 2002)
5. Recreational fishing on hatchery origin fish

Table 5.1.A. Sliding Scale Management Plan for the Catherine Creek and Lostine River Spring Chinook Artificial Propagation Program.

Estimated total adult escapement to the Lostine River mouth (hatchery plus natural) [a]	Ratio of hatchery to natural adults at the mouth	Maximum % of natural adults to retain for broodstock	% of hatchery adults to retain for broodstock [b]	% of adults released above the weir can be of hatchery origin	Minimum % of broodstock of natural origin	% Strays allowed above the weir [c]
<250	Any	40	40	d	d	≤5
251-500	Any	20 [d]	20	≤70	≥20	≤5
>500	Any	≤20	[e]	≤50	≥30	≤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 to exceed 130,000 smolt production initially
[e] Not decision factor at this level of escapement, percentage determined by other criteria

Upper Grande Ronde-- The Upper Grande Ronde spring/summer chinook program uses the endemic population for hatchery broodstock. Broodstock collection guidelines do not follow the adult sliding scale. No captive progeny adults (F-1) will be used for brood. Broodstock collection guidelines will be as follows:

1. Up to 50% of the wild fish returning to the weir can be collected.
2. Conventional progeny hatchery fish can be collected at a rate necessary to meet the remainder of

the broodstock goal (could be up to 100% of returning conventional adults).

Lookingglass Creek-- The Lookingglass Creek spring/summer chinook restoration program will use captive brood progeny adults (F-1) from the Catherine Creek stock. The first goal is to develop a broodstock from known Catherine Creek origin fish. Unmarked adults expected to be of Rapid River/Carson origin will be removed from Lookingglass Creek and distributed for Tribal subsistence. The first potential return of unmarked adults escaping above the weir will be 2008. Until then, only marked fish of known Catherine Creek origin will be released above the Lookingglass Hatchery intake.

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

Adults are transported within 48 hours of collection to Lookingglass Hatchery in one of three sized insulated containers: 550-gallon, 400-gallon, and 240-gallon tanks. Tanks are equipped with supplemental oxygen, aeration, and alarms. NPT is responsible to transport fish from the Lostine and CTUIR is responsible to transport fish from Catherine Creek and upper Grande Ronde to Lookingglass Hatchery.

5.3) Broodstock holding and spawning facilities.

Captive Brood--A portion of Bonneville Hatchery (BOH) is used for the Grande Ronde Captive Brood program. In 1998, a new building and rearing facilities were added for the captive brood stock program. Maturing adults (sorted at Bonneville and Manchester) 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.

Conventional Brood--The Lookingglass Hatchery consists of one Hatchery building complex (11,588 $ft.^2$). The complex includes an office, spawning room, incubation, rearing, cold storage, shop, lab, 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 holding pond.

Lostine adults are held at Lookingglass Hatchery in one adult pond 6,400 $ft.^3$ (20'x80'x4') with a maximum inflow of 3,990 gpm. Maximum holding capacity is 800 adults (1 adult/8 $ft.^3$). Green eggs and semen are transferred to Oxbow Hatchery for fertilization and incubation.

Catherine Creek and Upper Grande Ronde are held in the BPA endemic building at Lookingglass Hatchery. Containers include three circular tanks, each 942 $ft.^3$ (20'x3') in size with a holding capacity of 118 fish (1 adult/8 $ft.^3$). Original design was for 150 adults based on water inflow of 150 gallons per minute (1 adult/1 gallon inflow). Ripe adults are transferred and processed in the hatchery building complex spawning room.

5.4) Incubation facilities.

Lookingglass Hatchery contains 32 inside rearing containers and 288 incubation trays in 36 stacks. Approximately 150 gpm of chilled well water is available for incubation and early rearing. Currently, conventional production from Catherine Creek and Upper Grande Ronde chinook are incubated and early reared at Lookingglass Hatchery.

Oxbow Hatchery (located in Oregon) is a Mitchell Act Hatchery. A portion of the facility is used to provide incubation and early rearing for the conventional production of Lostine chinook and

incubation only for captive brood stocks stock.
Lostine conventional--Green eggs and semen collected at Lookingglass Hatchery are transferred to Oxbow Hatchery for fertilization and incubation. Embryos are incubated in vertical stacks of incubation trays (240 available in 16 stacks). Chilled spring water is available.

Captive Brood--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 Irrigon Hatchery.

Irrigon Hatchery is used for hatching captive brood production. The incubations facility includes 288 incubation trays in 24 stacks. Chilled well water is available for incubation.

5.5) Rearing facilities.

Lookingglass-Outside rearing containers include 18 raceways with rearing volume 3500 $ft.^3$ (10'x100'x3.5'), 2 adult holding raceways 6,400 $ft.^3$ (20'x80'x4'), three adult circular holding tanks 942 $ft.^3$ (20'x3'). Inside rearing containers include 32 troughs and 288 incubation trays in 36 stacks.

Irrigon--Inside rearing containers include 68 circular tanks each with a rearing volume of 70 $ft.^3$ (6'x3').

Oxbow--Inside rearing containers include 11 Canadian troughs (volume of 63.4 $ft.^3$). One outside rearing container (volume 8,000 $ft.^3$) is available.

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

Manchester Marine Lab--Rearing facilities consist of 18 circular fiberglass tanks; three 10'x3' (235 $ft.^3$) for salt water sentinels, and fifteen 20'x3'(942 $ft.^3$).

5.6) Acclimation/release facilities.

Lookingglass—Chinook released in Lookingglass Creek would be reared in one or more raceways for 12 to 18 months. Raceway dimensions are 100x10x3.5 (3,500 $ft.^3$)

Lostine--The NPT operates an acclimation facility on the Lostine River. Acclimation occurs in four raceways approximately 8'x85'x3.25' (2,210 $ft.^3$) in size.

Catherine Creek--The CTUIR operates an acclimation facility on the Catherine Creek. Acclimation occurs in four raceways approximately 8'x85'x3.25' (2,210 $ft.^3$) in size.

Upper Grande Ronde River--The CTUIR operates an acclimation facility on the upper Grande Ronde River. Acclimation occurs in four raceways approximately 8'x85'x3.25' (2,210 $ft.^3$) in size.

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

1. Icing events at Lookingglass Hatchery intake. Three scenarios can cause ice buildup and blockage of the intake:
   - Icing of Lookingglass Creek under a slow 1 to 3 week period brought on by sub-zero air temperatures.

- Icing of Lookingglass Creek under a slow 1 to 3 week period followed by heavy snow that results in slush ice.
- Icing events on Lookingglass Creek followed by quick warming temperatures that result in sheet ice dams that break loose and lodge against the intake.

2. Freezing temperatures at the Upper Grande Ronde resulted in an icing event stop inflow of water into one acclimation pond. The low-water alarm was frozen in place and therefore was not trigger to respond. The event resulted in the death of 50,100 smolts.

3. Spring flows resulted in debris and turbid water conditions. Events have lead to early releases form acclimation ponds. No fish have been lost due to spring run-off.

4. Gamete transfer--temperature control (too cold) for green egg transferred from Lookingglass Hatchery to Irrigon and Oxbow hatcheries resulted in below average of survival in 2001.

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.

Lookingglass Hatchery

- Lookingglass Hatchery is staffed full time (24/7/365), and equipped with various water alarm systems to help prevent catastrophic fish loss resulting from water failure.
- Operate intake well (TW2) for icing emergencies
- Maintain back-up diesel motor for TW2
- TW2 alarms
- Low water alarms
- Monitor facilities operation during high flow events
- Maintain screens in working order
- Keep trap and ladder area free of debris
- Available back-up water supply to chilled well water is Lookingglass Creek.

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

Acclimations Sites

- Acclimation facilities are staffed full time (24/7), and equipped with low water alarms to help prevent catastrophic fish loss resulting from water flow failure.
- Transfer to acclimation sites delayed until early March
- Communications for early releases
- Monitor facilities operation during high flow events
- Maintain screens in working order

Gamete Transfers

- Incubate and early rear Catherine Creek and Upper Grande Ronde stocks at Lookingglass Hatchery. Incubate Lostine River stock to eyed egg stage at Lookingglass and transfer to Oxbow Hatchery for hatching and early rearing.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

Lookingglass Creek—Release to date have been from Rapid River/Carson out-of-basin stocks. The last marked adults returned in 2002. Unmarked adults, considered naturalized from Rapid River/Carson stocks, continue to return. The intent is to phase out this composite stock (remove unmarked component through 2008) and replace with Catherine Creek stock using surplus production from captive brood. Future brood stock for Lookingglass Creek will be collected from Catherine Creek adults that returned from Captive Brood produced smolts. The first return (jack) could occur in 2003 from parr released in 2001. Adults will be trapped in the upper Lookingglass Hatchery trap.

Lostine—Conventional brood stock for the Lostine spring/summer chinook salmon program is collected from adult returns trapped at Lostine weir and then transferred to Lookingglass hatchery for spawning. This includes primarily naturally and few conventional produced hatchery fish. The ratio of hatchery to wild fish collected for broodstock is based on adult escapement sliding scale (Table 5.1.A.). Captive brood stock for the Lostine is derived from chinook parr collected in stratified random manner along natural production areas in the Lostine River. Collection is based on proportion of total redds within each section. The goal is to provide a good probability of representing all families and to provide as much genetic variability in the collection as possible. Parr are collected during August and September, approximately 12 month after eggs were fertilized. Parr surviving to adults are spawned for smolt production. Adults returning from captive brood production are released to spawn naturally.

Catherine Creek—Conventional brood stock for Catherine Creek spring/summer chinook salmon program is collected from adult returns trapped at the Catherine Creek weir and then transferred to Lookingglass hatchery for spawning. This includes naturally produced hatchery fish. Future brood will include conventional hatchery produced adults. The ratio of hatchery to wild fish collected for broodstock is based on adult escapement sliding scale (Table 5.1.A). Captive brood stock for Catherine Creek is derived from chinook parr randomly collected in stratified manner along natural production areas in Catherine Creek. Collection is based on proportion of total redds within each section. The goal is to provide a good probability of representing all families and to provide as much genetic variability in the collection as possible. Parr are collected during August and September, approximately 12 month after eggs were fertilized. Parr surviving to adults are spawned for smolt production. Adults returning from captive brood production are released to spawn naturally.

Upper Grande Ronde—Conventional brood stock for the Upper Grande Ronde spring/summer chinook salmon program is collected from adult returns trapped at the Upper Grande Ronde weir and then transferred to Lookingglass hatchery for spawning. This includes naturally produced hatchery fish. Future brood will include conventional hatchery produced adults. The ratio of hatchery to wild fish collected for broodstock is based on Grande Ronde Basin Hatchery Management Plan (Zimmerman et al. 2002).Captive brood stock for the Upper Grande Ronde is derived from chinook parr randomly collected in stratified natural production areas in the Grande Ronde. Collection is based on proportion of total redds within each section. The goal is to provide a good probability of representing all families and to provide as much genetic variability in the collection as possible. Parr are collected during August and September, approximately 12

month after eggs were fertilized. Parr surviving to adults are spawned for smolt production. Adults returning from captive brood production are released to spawn naturally.

6.2) Supporting information.

6.2.1) History.

During the construction phases of Lookingglass Hatchery in the late 1970's, it was thought there were too few natural fish returning to Lookingglass Creek to develop adequate brood stock in a short time frame. ODFW decided that brood stock development and smolt production goals could be promptly achieved by importing hatchery stock from outside the basin. In 1978 the first eggs were taken from Rapid River stock (Idaho) and smolts were released in Lookingglass Creek in 1980. Due to egg availability and disease concerns, Carson stock replaced the Rapid River in the mid 1980's. Rapid River stock was imported through out the late 1980's and early 1990's (Lower Snake River Compensation Plan Status Review Symposium 1998).

In the early 1990's, two major policy rulings influenced the Grande Ronde spring chinook salmon hatchery program. In 1990, ODFW adopted the Wild Fish Management Policy, which established guidelines for the maximum acceptable level of non-local origin hatchery fish that would spawn in nature with local populations. In 1992, naturally produced Grande Ronde Basin spring chinook were listed as endangered by the National Marine Fisheries Service (NMFS) under the ESA. The hatchery operations were inconsistent with conservation and recovery opinions.

A genetic assessment by an Independent Scientific panel in the US v Oregon dispute resolution indicated that there remained significant genetic differentiation between natural populations and between hatchery populations and the natural populations; Even though significant out planting and straying of non-local hatchery fish had occurred. There was still significant genetic differentiation between hatchery and natural populations and between the Minam, Wenaha, Grande Ronde, Lostine rivers and Catherine Creek natural spawners (Currens et al. 1996; Waples et al 1993).

Given the uncertainties of using artificial production to increase natural production, two approaches to hatchery supplementation were implemented using endemic stocks.

- Captive Brood
- Conventional Brood

The intent of the Captive Brood program is to maintain natural escapement above a minimum threshold to prevent extinction. As natural production and escapement increases, a more traditional or conventional approach to supplementation can be implemented to achieve LSRCP objectives.

Captive Brood program was initiated because Catherine Creek, Lostine River, and Upper Grande Ronde populations were below viable populations thresholds with spawning escapement below 50 fish during mid-1990 (LSRCP Symposium 1998). Captive brood stock for this program is based on collecting naturally produced spring chinook salmon parr from each of three populations. We plan to collect naturally-produced parr for a minimum of ten years to evaluate the efficacy of the program, rear the juveniles to near smolt stage at Lookingglass Fish Hatchery (LGFH), transport two-thirds as smolts to Bonneville Fish Hatchery (BOH) and one-third as smolts to NMFS Manchester Marine Lab (MML), respectively, rear fish at those facilities to maturity. Maturing adults will be transported from MML to BOH and all fish spawned at BOH. Captive brood stock progeny will be incubated to eyed stage at BOH then transported to LGFH

for final incubation and rearing to the smolt stage. Resulting smolts will be released into the river of parent origin and/or other chinook producing streams within that drainage.

6.2.1.A. Catherine Creek captive brood stock spawning data for the 1998 through 2002 brood years.

Brood Year	Males Spawned	Females Spawned	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
1998	93	69	0.75	1,380	95.25	42.7	38.0
1999	164	162	0.98	1,619	262.35	153.5	136.8
2000	176	177	1.00	1894	335.17	199.8	180.0
2001	218	124	0.57	1966	243.77	140.0	Na
2002	138	128	0.93	1600	204.85	Na	Na

6.2.1.B. Lostine River captive brood stock spawning data for the 1998-2002 brood years.

Brood Year	Males Spawned	Females Spawned	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
1998	98	47	0.48	1,455	68.37	39.9	35.0
1999	174	140	0.80	1,739	243.47	150.2	133.9
2000	215	92	0.43	1,851	170.27	67.8	77.6
2001	197	131	0.67	2,125	278.34	177.5	Na
2002	174	144	0.83	1,589	228.79	Na	Na

6.2.1.C. Upper Grande Ronde captive brood stock spawning data for the 1998-2002 brood years.

Brood Year	Males Spawned	Females Spawned	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
1998	5	4	0.80	1,050	4.20	1.7	1.5
1999	16	5	0.31	1,209	6.04	2.8	2.6
2000	186	188	1.01	1,664	312.82	227.7	151.4
2001	179	199	1.11	2,031	404.18	284.0	Na
2002	39	56	1.44	1,750	97.98	Na	Na

The Conventional Brood program was initiated in 1997 to supplement natural populations in Catherine Creek, Lostine River, and Upper Grande Ronde River. However, the populations were below critical escapement preventing the collection of adults in Catherine Creek and Upper Grande Ronde from 1997 through 2000. Escapement was higher, but still below critical threshold in Lostine, which allowed collections in 1997, 2000, 2001, and 2002. Spawning data is summarized in Tables 6.2.1 A-C.

6.2.1.D. Lostine River spring/summer chinook salmon spawning data for the 1997 through 2002 brood years.

Brood Year	Marked Males Spawned	Marked Females Spawned	Unmarked Males Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
1997	0	0	4	4	100%	0.92	4,496	17	12	11.8
1998	0	0	0	0	Na	Na	-	-	-	-
1999	0	0	0	0	Na	Na	-	-	-	-
2000	0	0	*24	8	100%	0.33	4,329	35	32	31

2001	5	11	29	25	76%	1.06	4,463	161	103	Est. 101

*Twelve three-year olds males (jacks) are included in the unmarked males spawned. Milt was pooled and used to fertilize a maximum of 10% of the available eggs; therefore, the % marked fish and spawning ratio (F/M) are skewed.

6.2.1.E. Catherine Creek spring/summer chinook salmon spawning data for the 2001 and 2002 brood years.

Brood Year	Marked Males Spawned	Marked Females Spawned	Unmarked Males Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
2001	0	0	7	12	100%	1.71	3,651	43.8	25	na
2002	0	0	17	20	100%	1.18	4,096	81.9	70	

6.2.1.F. Upper Grande Ronde River spring/summer chinook salmon spawning data for the 2001 and 2002 brood years.

Brood Year	Marked Males Spawned	Marked Females Spawned	Unmarked Males Spawned	Unmarked Females Spawned	% Un-marked	Spawning Ratio F/M	Average Fecundity	Egg Take (1,000's)	Fry Ponded (1,000's)	Smolt releases (1,000's)
2001	0	0	8	8	100%	1.00	4,420	35.4	27.5	na
2002	0	0	23	25	100%	1.09	3,454	86.3	70.0	Na

6.2.2) Annual size.

The LSRCP objective is to produce 900,000 smolts for release in the Grande Ronde sub-basin. Production is derived from both conventional and captive brood sources at Lookingglass Hatchery. Lookingglass Hatchery is unable to meet the low density and early rearing fish on pathogen free water desires of co-managers, therefore production is expected to be around 750,000 smolts.

Captive Brood-The annual brood stock collection goal is 1,500 naturally produced parr to rear through maturity and spawned to produce 450,000 smolts; however, production above 360,000 (120,000 per stock) is prioritized according to available rearing space (Zimmerman et al. 2002). Actual number of fish spawned and released are reported in Tables 6.2.1A, 6.2.1B, 6.2.1C.

Conventional Brood--The program annual brood stock collection goal is 720 adults spawned to produce 900,000 smolts; however, in the short term 360 adults (sex ratio 1:1) can be collected to produce 390,000 smolts. The green egg take goal for 2002 was 530,000 with a broodstock comprised of >30% unmarked fish (AOP 2002). Actual collection goals are established each year through development of the annual operation plan that is based on adult sliding scale (Table 5.1.A). Actual number of males and females spawned are reported in Tables 6.2.1D, 6.2.1E, 6.2.1F.

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

Naturally spawning fish included in the brood stock, are reported in tables from section 6.2.1. The portion of naturally produced fish to hatchery produced used for brood stock is directed by guidelines outlined in section 5.1.

6.2.4) Genetic or ecological differences.

There is currently 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. However, adults collected in 2001 at Catherine

Creek and Upper Grande Ronde were late arrivals due to the difficulties of operating the weir early in the adult migration.

6.2.5) Reasons for choosing.

Broodstock are indigenous to the Grande Ronde sub-basin. Fish are collected at tributary weirs and from natural production areas in the three target tributaries; therefore, brood stock sources incorporate naturally produced fish in order to maintain local adaptation and wild type characteristics

Catherine Creek was chosen for brood stock in Lookingglass Creek primarily due to the availability of eggs.

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.

Conventional adult brood stock is selected systematically from across the run time that the weirs are operational. Pass/keep ratio varies annually, depending on return projections and is adjusted in-season to insure representation from across the run (See Table 5.1.A.). Captive brood stock is selected in stratified sections of the natural production areas, typically where redds were observed the previous year.

SECTION 7. BROODSTOCK COLLECTION

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

Captive Brood—Parr
Conventional Brood-Adults

7.2) Collection or sampling design.

All adults that enter the Catherine Creek, Lostine River, or Upper Grande Ronde weir traps are sorted by origin (marked conventional, marked captive brood or unmarked), sex and age. Fish are retained for brood stock, out-planted, or released above the weir. Ratios vary annually depending on escapement estimates and the guidelines outlined in Table 5..A1 and Grande Ronde Hatchery Management Plan (Zimmerman et al. 2002). Adults are selected randomly from the available fish for the brood stock. Broodstock are implanted with a PIT tag. Fish not retained for brood stock are marked with an opercle punch and released above the weir or out-planted. Hatchery jacks may be placed above the weir up to 10% of the total males passed.

Trap efficiency appears to vary by location and year. Trapping efficiency has not been determined.

Table 7.2. A Catherine Creek weir operation, spring/summer chinook salmon collected and spawning dates from 1997 to 2002.

Run	Operation of Catherine Creek trap		Collection at Catherine Creek trap		Spawning at Lookingglass Hatchery	
Year	Beginning	Ending	Beginning	Ending	Beginning	Ending
1997	10-Jul	3-Sep	22-Jul	26-Jul	Na	Na
1998	9-Jun	30-Sep	13-Jun	4-Sep	Na	Na
1999	7-May	30-Jul	18-Jun	30-Jul	Na	Na

2000	30-March	4-Aug	26-May	4-Aug	Na	Na
2001	31-March	17-Aug	25-May	13-Jul	23-Aug	9-Sep
2002	12-March	13-Aug	20-May	31-Jul	16-Aug	6-Sep

Table 7.2.B. Lostine weir operation, spring/summer chinook salmon collected and spawning dates from 1997 to 2002.

Run	Operation of Lostine trap		Collection at Lostine Weir		Spawning at Lookingglass Hatchery	
Year	Beginning	Ending	Beginning	Ending	Beginning	Ending
1997	17-Jul	1-Oct	18-Jul	22-Sep	26-Aug	5-Sep
1998	17-Jun	31-Sep	19-Jun	2-Aug	Na	Na
1999	6-May	2-Oct	29-Jul	3-Sep	Na	Na
2000	19-May	22-Sep	22-Jun	22-Sep	7-Sep	14-Sep
2001	27-Apr	3-Oct	8-Jun	21-Sep	16-Aug	18-Sep
2002	26-Apr	1-Oct	13-Jun	20-Sep	21-Aug	11-Sep

Table 7.2.C Upper Grande Ronde weir operation, spring/summer chinook salmon collected and spawning dates from 1997 to 2002.

Run	Operation of U. Grande Ronde trap		Collection at U. Grande Ronde trap		Spawning at Lookingglass Hatchery	
Year	Beginning	Ending	Beginning	Ending	Beginning	Ending
1997	20-Jun	3-Sep	27-Jun	5-Jul	Na	Na
1998	16-May	23-Jul	4-Jun	19-Jul	Na	Na
1999	6-May	1-Oct	16-Jul	16-Jul	Na	Na
2000	24-Mar	4-Aug	16-Jun	28-Jul	Na	Na
2001	31-Mar	17-Aug	25-May	30-Jul	30-Aug	11-Sep
2002	22-Apr	24-Jul	30-May	13-Jul	16-Aug	6-Sep

Table 7.2. Lookingglass Hatchery weir operation, spring/summer chinook salmon collected and spawning dates from 1994 to 2002.

Run	Operation of Lookingglass weirs		Collection at Lookingglass		Spawning at Lookingglass Hatchery	
Year	Beginning	Ending	Beginning	Ending	Beginning	Ending
1994	24-May	21-Sep	2-Jun	8-Sep	24-Aug	21-Sep
1995	26-Apr	21-Sep	2-Jun	31-Aug	24-Aug	21-Sep
1996	1-May	10-Sep	22-May	5-Sep	20-Aug	26-Sep
1997	28-Apr	15-Sep	5-Jun	15-Sep	*	*
1998	1-Apr	30-Sep	2-Jun	3-Sep	**	**
1999	16-Jun	9-Sep	16-Jun	9-Sep	**	**
2000	19-May	1-Sep	22-May	1-Sep	***	***
2001	9-May	15-Sep	9-May	10-Sep	***	***
2002	21-Mar	3-Oct	5-Jun	21-Aug	***	***

Notes: Rapid River/Carson stock only. Composite stock phased out with last spawning in 1999.
*Spawned at Wallowa Hatchery
**Spawned at So. Fk. Walla Walla and Lyons Ferry
***Adults returned to Lookingglass Creek

7.3) Identity.

Methods for identifying target populations (if more than one population may be present).

Naturally produced fish are identified based on lack of marks or tags.

Methods for identifying captive brood and conventional brood hatchery origin fish from naturally spawned fish.

Captive brood hatchery fish released in the three target tributaries have been marked with an adipose fin clip (AD) and implanted with a coded-wire tag (CWT).

In Brood Years (BY) 1997, 2000, and 2001, conventional brood hatchery fish released in the three target tributaries have been marked with an adipose fin clip (AD), implanted with a coded-wire tag (CWT), and injected with Visual Implant Elastomer (VIE) tag behind the eye. VIE mark is rotated between right side on even number brood years and left side on odd number brood years. Stocks are designated by color: Catherine Creek-green; Lostine River-red; and Grande Ronde-orange.

Starting with BY2002 (release in 2004), conventional brood hatchery fish released in Catherine Creek and Lostine River will be marked the same; however, fish released in Upper Grande Ronde will be implanted with a CWT only with no external visual mark. Captive Brood production in excess of evaluation groups will be AD clipped only.

7.4) Proposed number to be collected:

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

Collection is not expected to exceed 720 adults (360 males and 360 females). Co-managers have targeted a collection of 360 adults (60 males and 60 females) to produced 390,000 smolts for brood year 2003. Full production is not expected with limited facilities.

7.4.2) Broodstock collection levels for the last five years, 1997-02:

Captive Brood stock collect levels are listed in table 2.2.3B.

Conventional brood stock collections will focus on Catherine Creek, Lostine River, and Upper Grande Ronde from 1997 to 2002. Rapid River/Carson stock collected in Lookingglass Creek are not included.

Table 7.4.2A. Brood stock collection level in Catherine Creek, 2001 and 2002.

Year	Adults Females	Males	Jacks	Green Eggs	Juveniles
2001	12	7	0	43,813	24,500
2002	20			81,926	

Table 7.4.2B. Brood stock collection level in Lostine River, 2001 and 2002.

Year	Adults Females	Males	Jacks	Green Eggs	Juveniles
1997-Lostine	4	4	0	18,100	11,870

Year	Adults Females	Males	Jacks	Green Eggs	Juveniles
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	8	11	13	34,630	31,460
2001	36	33	….	160,680	103,000
2002	28	….	….	….	….

Table 7.4.2C. Brood stock collection level in Upper Grande Ronde, 2001 and 2002.

Year	Adults Females	Males	Jacks	Green Eggs	Juveniles
2001	8	7	0	35,360	27,000
2002	24	….	….	86,355	….

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

- Adults are passed upstream consistent with the adult sliding scale guidelines outlined in Table 5.1.A in Catherine Creek and Lostine River. In the Upper Grande Ronde, all adults collected and not used for brood stock are passed upstream.
- Out-plant hatchery adults (including captive brood) in designated areas (Zimmerman 2002).
- Tribal and recreational fisheries
- Tribal ceremonial purposes
- Nutrient enhancement (hatchery origin jacks)

7.6) Fish transportation and holding methods.

Adults moving upstream in are impeded and diverted into holding area (See section 5.1.A). Fish are sorted (release above the weir, broodstock, or out-plant) daily. Fish may be held a maximum of 48 hours.

Adults are anesthetized with MS 222 or Aqui-S prior to biological sampling and antibiotic injections. Broodstock are injected with oxytetracycline (10mg/kg) and erythromycin (Erthro-200 @ 20mg/Kg).

Adults retained for broodstock are transported to Lookingglass Hatchery in 250-gallon to 550-gallon tanks. Transportation time is less than 2.0 hours from all collection facilities to Lookingglass Hatchery.

Lostine adults are held in one adult pond 6,400 $ft.^3$ (20'x80'x4') with a maximum inflow of 3,990 gpm. Maximum holding capacity is 800 adults (1 adult/8 $ft.^3$). Fish are treated with formalin at 167 ppm every other day to control fungus. On or about August 1, early arriving fish (before July 15) are injected a second time with oxytetracycline (10mg/kg) and erythromycin (Erthro-200 @ 20mg/Kg).

Catherine Creek and Upper Grande Ronde adults are held in two circular ponds 942 ft.^{3} (20'x3') with a maximum inflow of 150 gpm. Maximum holding capacity is 150 adults (1 gpm/adult) per pond. A third pond is available. Fish are treated with formalin at 167 ppm every other day to control fungus. On or about August 1, early arriving fish (before July 15) are injected a second time with oxytetracycline (10mg/kg) and erythromycin (Erthro-200 @ 20mg/Kg).

7.7) Describe fish health maintenance and sanitation procedures applied.

Collection--Adults retained for broodstock are injected with oxytetracycline (10mg/kg) and erythromycin (Erthro-200 @ 20mg/Kg) at the collection facility.

Holding--At Lookingglass Hatchery, formalin is dripped into the inflowing water to achieve a maximum concentration of 167 ppm. The treatment is applied for one hour to control fungus and parasites three times per week. After September 1, the frequency is adjusted as necessary. On or about August 1, early arriving fish (before July 15) held at Lookingglass Hatchery are injected a second time at the same dose.

Spawning--All hatchery-spawned females are screened for *R. salmoninarum* using enzyme-linked immunosorbent assay (ELISA) techniques (Onjukka 2002, per. comm.). Male kidneys are visually inspected for lesions. A minimum of 20 adults is examined by culture for systemic bacteria and *C. Shasta*. A minimum of 60 spawned fish is sampled for culturable viruses using ovarian fluid and caeca/kidney/spleen in 5 fish sample pools.

Progeny-- Eggs are water hardened in 75ppm iodophore solution for up to 60 minutes to control vertical transmission of pathogen including IHNV. Vertical transmission of BKD (*R. Salmoninarum*) is also a concern. Eggs are culled or segregated in groups based on ELISA titers whenever possible. Groups are identified by the following titer ranges:

- Less than .199 =Low
- 0.2 - 0.399 = Moderate/Low
- 0.4 - 0.799 = Moderate/High
- Greater than 0.800 = High

Progeny receive two 28-day erythromycin prophylactic feed treatments (INAD 020RLOSCS1) to control BKD.

There has been no epizootic outbreak in past 5 years; however, numerous facilitative pathogens have been detected in juveniles, as well as, obligate pathogens BKD and IHNV. 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 would be implemented for all parasitic infestations.

Disinfections and sanitation guidelines for Lookingglass Hatchery are outlined in Table 7.7.

Table 7.7 Summary of Recommended Disinfectants (Concentration and time) and Application

Disinfectant	Application	Concentration	Time	Comment
Iodophor	Nets, gear and equipment, clipping & tagging van, PIT tag stations, large tub disinfectant containers, spawning colanders and buckets, lib truck, footbaths	100 ppm Note: to make 100 ppm solution mix 6.7 oz of jug strength iodophor to 5 gallons H_2O or 6.7 oz.=189ml	10 min.	-Equipment should be pre-rinsed to remove dirt, mucus or other organic material which reduces the efficacy of disinfectant -Rinse equipment to remove harmful residue if equipment is going into standing water containing fish or fish are being placed into the equipment (tank or bucket) -Argentyne or other buffered iodophors such as Western Chemicals "PVP iodine" would be acceptable
Isopropyl Alcohol	PIT tag needles and any other apparatus used to insert into fish	70%	10 min. Note: Air dry	-No re-use until air dried -use drying oven to enhance air drying step
Vesphene-II	Recommended for footbaths	As per label 1 oz/ Gallon H_20	Per label	Effective activity holds longer than Iodophor
Chlorine or Aqueous solution as sodium hypochlorite (Household Bleach)	Lib truck tanks	100 ppm	10 min.	Organic matter binds and neutralizes

7.8) Disposition of carcasses.

Landfill for disposal. Carcasses maybe screened for pathogens BKD, IHN, and *m. cerebralis.* Adults testing negative can be used for nutrient enhancement adhering to MOA between ODFW and 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 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-mangers during the development of the AOP (2002). Prudent fish health measures can be implemented to cull eggs from females

with gross signs of BKD.

- Adult sliding scale in Catherine Creek and Lostine River (Table 5.1.A)
- Surveys below weirs (AOP 2002 LSRCP)
- Temperature triggers to stop adult collections (AOP 2002 LSRCP)

SECTION 8. MATING

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

8.1) Selection method.

Captive Brood--Parr are collected from throughout the rearing range in each stream based on known distribution of rearing juveniles (AOP 2002, Captive Brood). Rearing sections are stratified, and collection numbers based on proportion of total redds within each section. The goal is to provide a good probability of representing all families in the sub-basin and to provide as much genetic variability in the collection as possible. Parr are collected during August and September, approximately 12 months after eggs were fertilized. Fish are large enough at this time to minimize handling mortality, and this time period is also prior to fall migration in these streams.

Conventional Brood--Adults are collected daily through out the operation of the weir. From the collected fish, a predetermined number of adults by age, sex, and origin, are selected systematically based on the ratios outlined in the adult slide scale (Table 5.1). Hatchery broodstock are selected at random for spawning as they mature.

8.2) Males.

We do not expect to use additional males as "backup" to increase fertility rates. However, some males are used to fertilize eggs within a brood year, with additional contribution collected for cryopreservation. Semen is stored in a germ plasm repository at the University of Idaho and Washington State University (contacts Wheeler and Cloud). One goal is to prevent sibling crosses; therefore, adults within the same age are not crossed. Cryopreserved semen and semen from age-two males (mini-jacks) are used to achieve this goal. For more details refer to section 8.3. Rarely are males used multiple times.

Conventional Brood--We do not expect to use additional males as "backup" to increase fertility rates. Three-year-old males (jacks) are included in the gene pool; however, when an abundant number of jacks, typically hatchery origin, are collected milt can be pooled in groups of 5 and used to fertilize a portion (cell) of one female's eggs. A cell is either one-half or one-third of one female eggs. A maximum of 10% of the available eggs can be fertilized with jacks. Occasionally, natural origin males are used multiple times to increase their contribution.

8.3) Fertilization.

Captive Brood--The goal of the spawning protocol in this captive brood stock program is to maximize the genetic diversity of the population of embryos while at the same time minimizing the effects of gametes with low viability and the risk of losing gametes to donor mortality. Our approach to this considers the total spawning population, multiple age classes, and cyropreserved semen as well as a balance with the logistic limitations associated with spawning. Furthermore, we have some concern about potential sibling crosses and inbreeding. We will attempt to use the following decision-making process to spawn captive brood. We may need to adjust these

protocols as we learn more about the process, but will follow similar principles. We assumed that females will mature at age 4 and 5 and that males will mature at age 3, 4, and 5. The general spawning routine will follow procedures established at Lookingglass Hatchery for Imnaha stock, spring/summer chinook.

Maturation within the spawning year will be determined using ultra sound technology or gross morphological observations (i.e. coloration). Once near March/April (ultra sound) and once near mid-August (observation), maturing fish will be separated from immature fish. Maturing fish from Manchester (MML) will be transported to Bonneville Hatchery (BOH). At BOH, all mature fish from MML and BOH will be held in Tanner Creek water so they can experience water temperature fluctuations and held under natural photoperiod to help synchronize spawning. Once maturing fish have been sorted from immature fish and hauled to BOH, they near will be assessed for ripeness weekly begin in late- August. Each week, ripe fish will be isolated and placed in a holding container. This will allow enumeration of four and five year-old females as well as three, four, and five year-old males. This information is used to determine the female: male ratio of fish that are ready to spawn and the daily spawning matrices.

The female:male ratio will determine the type and number of matrices to be used during spawning. We focused on making each parent's contribution to the next generation as equal as possible, increasing the numbers of fish in a matrix, making sure females were fertilized by more than one male, and having the highest numbers in each matrix cell for a given number of spawners (i.e. a 2 x 2 matrix is preferred over a 1 x 3 matrix). Based on genetic and logistics considerations, the preferred ratio to work with is even numbers of males and females, where we would use 3 x 3, 2 x 2, or 1 x 1 matrices (in that order) during spawning. The female:male ratio (x) will fall into one of seven categories: A) $x > 4{:}1$, B) $4{:}1 \geq x > 3{:}2$, C) $3{:}2 \geq x > 1{:}1$, D) $x = 1{:}1$, E) $1{:}1 > x \geq 2{:}3$, F) $2{:}3 > x \geq 1{:}4$, or G) $1{:}4 > x$. Generally we hope to be in category C, D, or E. Each category is associated with a particular spawning matrix. After the first matrix is assigned we will recalculate the female:male ratio of the remaining spawners. If the new ratio is in the same category, we will use the same matrix design. If the ratio is in a new category we will use the new, appropriate matrix. This is an iterative process that will occur after each successive matrix assignment.

The preferred ratio is one that falls in Category D. Under Category D we will spawn fish in a 3 female x 3 male matrix. If fewer than six spawners are available, then we will spawn fish in either a 2 female x 2 male or 1 female x 1 male matrix (in that order of preference).

If the ratio of available spawners reaches Category E, we will spawn fish in a 2 female x 3 male matrix. If the ratio of available spawners reaches Category F, we will develop a working ratio by inverting the original ratio (i.e. if the female:male ratio is 0.32:1, the working ratio would be 1:0.32 or 3.125:1 males:females). We will then round up to the nearest whole number the males in the ratio (i.e. if the ratio is 3.125:1, round to 4:1). We will spawn the fish using a matrix design equal to the rounded ratio (for example, a 1 female x 4 male matrix). We will continue to use this matrix until the ratio of available spawners changes to a new category or all fish are spawned. If this matrix is used throughout the spawning cycle, it is imperative to make sure that the last group of fish are accounted for appropriately in a final matrix. In categories E and F we will attempt to make sure that the minimum number of either sex in a matrix is two (for example, if the ratio is 1:2 we will use a 2 x 4 matrix) and the maximum number of either sex in a matrix is four.

If the ratio of available spawners reaches Category C, we will spawn fish in a 3 female x 2 male

matrix. If the ratio of available spawners reaches Category B, we will round up to the nearest whole number the females in the ratio (i.e. if the ratio is 2.4:1, round to 3:1.). We will spawn the fish using a matrix design equal to the rounded ratio (for example, a 3 female x 1 male matrix). We will continue to use this matrix until the ratio of available spawners changes to a new category or all fish are spawned. If this matrix is used throughout the spawning cycle, it is imperative to make sure that the last group of fish are accounted for appropriately in a final matrix. In categories B and C we will attempt to make sure that the minimum number of either sex in a matrix is two (for example, if the ratio is 2:1 we will use a 4 x 2 matrix) and the maximum number of either sex in a matrix is four.

If the ratio reaches Category G we will develop matrices using the protocols for Category F. We will cryopreserve a semen sample from males in excess of a 1 female:4 male ratio. We will recycle the males from which semen is cryopreserved so they may be incorporated into the brood during later spawns.

If the ratio reaches Category A we will attempt to use cryopreserved semen samples to increase the parent population to a 4 female:1 male ratio. If too few cryopreserved semen samples are available to accomplish a 4:1 ratio, we will attempt to use recycled males to increase the parent population to a 4:1 ratio. If too few cryopreserved semen samples and recycled males are available to achieve this ratio, and if brood stock was available from Grande Ronde River stocks, we will consider using conventional male brood stock to increase the parent populations to a 4:1 ratio. If all of these options combined do not allow us to achieve a 4:1 ratio, we will modify the spawning matrix to ensure that all eggs are fertilized using whatever matrices are necessary.

Table 8.3A. Example of matrix assignment. The overall spawning protocol consists of two, 2 female x 3 male matrices; one, 2 female x 4 male matrix; and one, 1 female x 1 male matrix.

Fish ready to spawn on a given day: four age 4 females three age 5 females six age 3 males four age 4 males one age 5 males				
Therefore: female:male ratio = 7:11 = Category F Therefore: begin with a 2 x 4 spawning matrix.				
# of females:	7 - 2 = 5	5 - 2 = 3	3 - 2 = 1	
# of males:	11 - 4 = 7	7 - 3 = 4	4 - 3 = 1	
Iteration:	1	2	3	4
Matrix #:	1	2	3	4
# of available spawners	17	13	7	2
Female:male ratio:	0.389	0.417	0.429	0.500
Category:	F	E	E	Final matrix
Category change:		Yes	No	Yes

The overall matrix design and age distribution of the spawners will be used to assign fish of a specific age and sex to each matrix. Our goal is to promote crosses from different age classes and maximize crosses between all age classes. Thus, we will use the following guidelines to assign

fish to each matrix based on their age. This protocol is based on the number and sex of fish in a given matrix and the associated preferences of age distribution. In general, we will try to achieve different ages and no duplicate ages within each matrix. For example, if we were using a matrix that called for 3 males, our preference would be to have 1 male from each age class. Our second choice in this example would be to have 2 males from one age class and 1 male from a second age class. Our last choice would be to have 3 males from 1 age class, especially the same age class as the female. We will begin by assigning females, then males to matrix 1, then to matrix 2, then to matrix 3, and so on. When we have to use more than one fish from a given age class, we will initially target mates from a different age class and then target mates from the age class with the greatest number of fish. Using these protocols, the following is a hierarchical preference structure of age distributions within a matrix:

Table 8.3B. Hierarchical preference of age distributions[a]

Sex in matrix	# in matrix	Possible age distributions			preference in matrix
		Age L	Age M	Age N	
female	5	2	3	-	1
		1	4	-	2
		0	5	-	3
	4	2	2	-	1
		1	3	-	2
		0	4	-	3
	3	2	1	-	1
		0	3	-	2
	2	1	1	-	1
		0	2	-	2
male	5	2	2	1	1
		3	1	1	2
		3	2	0	3
		4	1	0	4
		5	0	0	5
	4	2	1	1	1
		2	2	0	2
		3	1	0	3
		4	0	0	4
	3	1	1	1	1
		2	1	0	2
		3	0	0	3
	2	1	1	0	1
		2	0	0	2
	1	1	0	0	1

[a] For the sake of design, assume 2 age classes for females and 3 age classes for males.

The following uses the age distribution protocol to assign fish in the Table 4 example of matrix development, and completes the example.
matrix 1: 2x4
- 2 females; ages 4, and 5 - 4 males; ages 3, 4, 5, and 3.

matrix 2: 2x3
- 2 females; ages 4, and 5 - 3 males; ages 3, 4, and 3.
matrix 3: 2x3
- 2 females; ages 4 and 5 - 3 males; ages 3, 4, and 4.
matrix 4: 1x1
- 1 female; age 4 - 1 male; age 3.

Conventional Brood-- The goal of the program is to produce a minimum mating of 100 family pairs. Matrix or factorial spawning is generally accomplished in 2x2 or 3x3 combinations; therefore each matrix generates four to nine family pairs. The goal is that 30% of the progency is produced from natural-origin adults.

Target sex ratio for this program has been a 1:1 male-to-female adult spawning ratio. Occasionally, natural origin males have been used multiple times to fertilize eggs. However, we expect additional production of hatchery origin jacks, therefore, ratios are often skewed towards males. To maximize contribution of jacks, milt can be pooled from 5 fish and used to fertilize a maximum of 10% of the available eggs.

Refer to section 7 for fish health and sanitation procedures.

8.4) Cryopreserved gametes.

Captive Brood- Males in excess of those needed to spawn have their semen collected and cryopreserved. Approximately one-half of these samples are being stored at BOH and the other half at the regional germ plasm repository at the University of Idaho, Moscow. Germ plasma has been used in nearly every year of the program depending on the availability of live males consist with guidelines outlined in Table 8.4.

All spawning was done using spawning matrices developed following guidelines identified in the 2001 Captive Broodstock AOP and modifications to these guidelines following TOT recommendations in early September 2001.

Table 8.4. Spawning categories with associated sex ratios and spawning matrices used for spawning in the Captive Broodstock Program.

Spawn Category	Spawning Population Sex Ratio (Female / Male)	Spawning Ratio (F:M)	Spawning Criteria and Comments
A	X > 77.5 / 22.5	4 : 1	4 x 4; 1 fresh, and 12 cryo (1 fresh with 3 cryo / female) 50% eggs w/ fresh
B	77.5 / 22.5 ≥ X > 69.5 / 30.5	3 : 1	3 x 4; 1 fresh, and 9 cryo (1 fresh with 3 cryo / female) 50% eggs w / fresh
C	69.5 / 30.5 ≥ X > 63.0 / 37.0	2 : 1	2 x 4; 1 fresh, and 6 cryo (1 fresh with 3 cryo / female) 50% eggs w / fresh
D	63.0 / 37.0 ≥ X > 58.5 / 41.5	3 : 2	Matrix matches spawning matrix ratio
E	58.5 / 41.5 ≥ X > 55.0 / 45.0	4 : 3	Matrix matches spawning matrix ratio
F	55.0 / 45.0 ≥ x > 45.0 / 55.0	1 : 1	Matrix matches spawning matrix ratio
G	45.0 / 55.0 ≥ X > 41.5 / 58.5	3 : 4	Matrix matches spawning matrix ratio
H	41.5 / 58.5 ≥ X > 37.0 / 63.0	2 : 3	Matrix matches spawning matrix ratio

I	37.0 / 63.0 ≥ X > 27.0 / 73.0	1 : 2	Matrix matches spawning matrix ratio
J	27.0 / 73.0 ≥ X > 22.5 / 77.5	1 : 3	Matrix matches spawning matrix ratio
K	22.5 / 77.5 ≥ X	1 : 4	Matrix matches spawning matrix ratio

-

Conventional Brood--Cryopreserved semen is collected and maintained by the Nez Perce Tribe at the University of Idaho and Washington State University, but is not readily available.

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.

Refer to section 8.3.

SECTION 9. INCUBATION AND REARING -

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

- There is no current goal, however, an estimate of 75% survival from green egg to smolt survival is used to determine adult collections in the sliding scale.

9.1) Incubation:

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

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Captive Brood—The fish culture technology continues to improve survival rates of captive brood progeny. Survival rates, however, do not include loss due to prudent fish culture methodology of culling eggs from high BKD titer females. Data from Hoffnagle et al 2000, 2001, 2002 annual reports.

Table 9.1A. Oxbow Hatchery egg takes and egg loss data for Catherine Creek spring/summer chinook produced from captive brood, 2000-02.

Year	Egg Take	Egg Loss		Percent Survival
	Total	Total	% Loss	to eyed egg Stage
2000	291,970	64,488	22.1	77.9
2001	227,690	27,700	12.2	87.8
2002	227,459	-	-	-

Table 9.1B. Oxbow Hatchery egg takes and egg loss data for Lostine River spring/summer chinook produced from captive brood, 2000-02.

Year	Egg Take	Egg Loss	Percent Survival

	Total	Total	% Loss	to eyed egg Stage
2000	155,398	43,837	28.2	71.8
2001	266,739	24,379	9.1	90.9
2002	249,939	-	-	-

Table 9.1.C. Oxbow Hatchery egg takes and egg loss data for Upper Grande Ronde River spring/summer chinook produced from captive brood, 2000-02.

Year	**Egg Take**	**Egg Loss**		**Percent Survival**
	Total	Total	% Loss	to eyed egg Stage
2000	302,299	46,286	15.3	84.7
2001	434,670	59,323	13.6	86.4
2002*	99,619	1,636	1.6	98.4
*No eggs were culled due to BKD				

Conventional Brood—Adult collections and spawning has only occurred in 2001 and 2002 for all three stocks. In the Lostine River, eggs were also collected in 1997 and 2000. All the data has not been summarized for 2002.

Table 9.1.D. Egg take and egg loss data for Catherine Creek spring/summer chinook at Lookingglass Hatchery, 2001 and 2002.

Year	**Egg Take**	**Egg Loss**		**Percent Survival**
	Total	Total	% Loss	to eyed egg Stage
2001	43,813	17,387	39.7	60.3
2002	81,926	10,176	12.4	87.5

Table 9.1.E. Egg take and egg loss data for Lostine River spring/summer chinook at Lookingglass Hatchery, 1997-2002 brood years.

Year	**Egg Take**	**Egg Loss**		**Percent Survival**
	Total	Total	% Loss	to eyed egg Stage
1997	17,984	unk	unk	unk
1998	-	-	-	-
1999	-	-	-	-
2000	34,630	1,084	3.1	96.7
2001	160,680	63,187	39.3	60.7
2002	-	-	-	-

Table 9.1.F. Egg take and egg loss data for spring/summer chinook at Upper Grande Ronde, 2001-2002 brood years.

Year	Egg Take	Egg Loss		Percent Survival
	Total	Total	% Loss	to eyed egg Stage
2001	35,360	10,021	28.3	71.7
2002	86,355	16,105	18.6	81.4

There have been no egg takes for the Lookingglass Creek restoration effort.

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

Captive Brood—Surplus eggs to the program goals are produced when survival to maturity is higher than expected. The disposition of surplus can be outplanted as eyed eggs or parr consistent with the Grande Ronde Hatchery Management Plan (Zimmerman 2002).

Conventional Brood--There have been no surplus eggs taken to date in conventional program.

9.1.3) Loading densities applied during incubation.

Captive Brood—Eggs are incubated in isolets stacked in troughs. Standard loading (@500 eggs/islets) is one quarter of the female's eggs. On occasion, eggs are incubated in vertical Heath trays. Flows are regulated at 10 to 12 gpm per trough and 4 to 6 gpm per vertical stack.

Conventional Brood--Eggs are incubated in vertical Heath trays. Standard loading (@5,000 eggss/tray) are eggs from one female in one tray. On occasion, trays are loaded with two females worth of eggs. Flows are regulated at 4 to 6 gpm per vertical stack.

9.1.4) Incubation conditions.

Captive Brood— Water temperature is monitored via recording thermograph or via chillers for water entering incubation trays. Daily Celsius thermal units (CTU's) and Fahrenheit thermal units (TU's) are calculated to determine developmental stages. Eggs are picked at approximately 325-350 CTU's (585 - 630 TU's). After picking, eggs incubated at Irrigon are transferred to Oxbow Hatchery for hatching and early rearing. At approximately 1,000 CTU's, feed is present to the swim-up fry. Water temperatures are controlled and moderated in individual vertical stacks to synchronize the date of first feeding in late January. Dissolved oxygen, typically greater than 90% saturation, has never presented a problem for egg survival.

Conventional Brood--Co-managers have agreed to transfer green eggs from Lostine River to either Oxbow or Irrigon hatcheries for incubations and early rearing on pathogen "free" water. Incubation to first feeding fry occurs on chilled well water at Irrigon Hatchery (5^{o}C) and spring water (6^{o}C) or chilled spring water (3^{o}C) at Oxbow Hatchery. Sediment is not a problem at either site

Water temperature is monitored via recording thermograph or via chillers for water entering incubation trays. Daily thermal units (CTU's) are calculated to determine developmental stages. Eggs are picked at approximately 325-350 CTU's (585 - 630 TU's). At approximately 1,000 CTU's (1,800 TU's) feed is presented to the swim-up fry. Fry are visually inspected prior to feeding. Water temperatures are controlled and moderated in individual vertical stacks to synchronize the date of first feeding in late January or early February. Dissolved oxygen, typically greater than 90% saturation, has never presented a problem for egg survival.

Lookingglass Hatchery— Co-managers have agreed to incubate Catherine Creek and Upper Grande Ronde eggs at Lookingglass Hatchery using chilled well water (5°C). Silt is not a concern. Dissolved oxygen has never presented a problem for egg survival. Incubation has not recently occurred at Lookingglass Hatchery due to the availability of pathogen "free" water source from chilled well water. The back-up water source is raw Lookingglass Creek water. Lookingglass Creek water was used to incubate Rapid River/Carson stock eggs.

9.1.5) Ponding.

Captive Brood—Fry are ready to pond at about 1,000 CTU's (1,800 TU). Fry weigh is estimated at approximately 0.2 grams (2,000 fish per pound). Forced ponding can occur in February.

Conventional Brood--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). Forced ponding can occur in January or February.

9.1.6) Fish health maintenance and monitoring.

In both brood programs, fungus is controlled with formalin treatments at a concentration of 1,667ppm. 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 are hand picked.

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, Irrigon, and Oxbow hatcheries on pathogen "free" well or spring water. Eggs are fertilized at the each hatchery and water hardened in 75 ppm iodophore for a minimum of 15 minutes. Eggs are incubated on well water or spring water to minimize the risk of disease transfer from raw Lookingglass Creek water and loss due to siltation.

9.2) <u>Rearing</u>:

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 (1988-99), or for years dependable data are available..

Captive Brood—Survival data has been variable in the early stages of the program primarily due to the incidence of BKD. Fish Culture techniques are also improving the survival rates. The program is faced with the challenges of culling high titer progeny or rearing them to smolts. Average program performance is not relevant at this time; however, production goals are modeled using 55% survival of green eggs to smolt. The categorized survival assumptions include:

Green to eye-egg: 74%
Eye-egg to swim-up fry: 85%
Swim-up fry to fingerling (marking): 90%
Fingerling to smolt (marking to release): 98%

We expect to adjust assumptions as the program proceeds.

Conventional Brood—The program can not provide relevant survival data at this time; however, production goals are modeled using 75% survival of green eggs to smolt. The categorize survival assumptions include:

Green to eye-egg: 90%

Eye-egg to swim-up fry: 91%
Swim-up fry to fingerling (marking): 93%
Fingerling to smolt (marking to release): 99%

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

Lookingglass Hatchery

Co-managers agreed to various loading rate; Captive Brood 60,000 smolts per raceway; conventional brood 65,000 smolts per raceway; Captive Brood (Lookingglass Creek production) 75,000 smolts per raceway (Zimmerman et al. 2002).

Goals: Measures (fish size=20 fpp, inflow=750 gpm, volume=3,500 ft.^{3})

Captive Brood	Conventional Brood	Captive Brood (LC)
No. fish/rcy: 60,000	No. fish/rcy: 65,000	No. fish/rcy: 75,000
Density: 0.86 lbs/ft.^{3}	Density: 0.93 lbs/ft.^{3}	Density: 1.07 lbs/ft.^{3}
Density Index: 0.16	Density Index: 0.18	Density Index: 0.20
Flow: 4 lbs./gpm	Flow: 4.3 lbs./gpm	Flow: 5.0 lbs./gpm
Flow Index: 0.76	Flow Index: 0.83	Flow Index: 0.95

Acclimation (Catherine Creek, Lostine River, U. Grande Ronde)
Measures (fish size=20 fpp, inflow=560 gpm, volume=2,210 ft.^{3})
Acclimation
Number fish/rcy: 33,000
Density: 0.75 lbs/ft.3
Density Index: 0.13
Flow: 3.0 lbs./gpm
Flow Index: 0.54

Actual BY2000: Measures (fish size=17 fpp, inflow=750 gpm, volume=3,500 ft.^{3})

Captive Brood	Conventional Brood	Captive Brood (LC)
No. fish/rcy: 73,000	No. fish/rcy: 31,000	No fish production
Density: 1.23 lbs/ft.^{3}	Density: 0.59 lbs/ft.^{3}	
Density Index: 0.22	Density Index: 0.10	
Flow: 5.73 lbs./gpm	Flow: 2.76 lbs./gpm	
Flow Index: 1.02	Flow Index: 0.46	

*The increased loading in the captive brood was a result of two valves failing and prevented the use of two raceways.

Acclimation highest loading (Catherine Creek)
*Measures (fish size=17 fpp, inflow=560 gpm, volume=2,210 ft.3)
Single Acclimation
Number fish/rcy: 56,000
Density: 1.49 lbs/ft.^{3}
Density Index: 0.27
Flow: 5.88 lbs./gpm
Flow Index: 1.07

9.2.3) Fish rearing conditions

Oxbow--Fish are reared in spring water (seasonal temperature variations 4°C to 6°C) from late-January to April. Flows are adjusted to maintain dissolved oxygen levels at a minimum of 70%

saturation (@ 8.4 mg/l). Troughs are cleaned and mortalities are picked daily.

Irrigon-- Fish are reared in well water (seasonal temperature variations 11°C to 13°C) from late-January to April. Flows are adjusted to maintain dissolved oxygen levels at a minimum of 70% saturation (@ 7.4 mg/l). Troughs are cleaned and mortalities are picked daily.

Lookingglass (early rearing in 2003)-- Fish are reared in well water (5°C to 10°C) from late-January to April. Flows are adjusted to maintain dissolved oxygen levels at a minimum of 70% saturation (@ 7.4 mg/l). Troughs are cleaned and mortalities removed regularly.

Lookingglass (final rearing)—Fish are transferred to Lookingglass Creek in April and reared in raw Lookingglass Creek water (seasonal temperature variations 1°C to 16°C). Flows are adjusted to maintain dissolved oxygen levels at a minimum 6.1 mg/L or 70% saturation). Water is typically rationed in late July and early August during low Creek flows. Raceways are cleaned weekly and mortalities picked daily. During spring turbid water conditions and during prophylactic feeding of erythromycin cleaning can be suspended.

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.

Actual growth information for all three stocks has not been determined. The information presented is from Lostine River BY2000.

Table 9.2.4. Estimated monthly weights of Lostine juveniles, 2001and 2002.

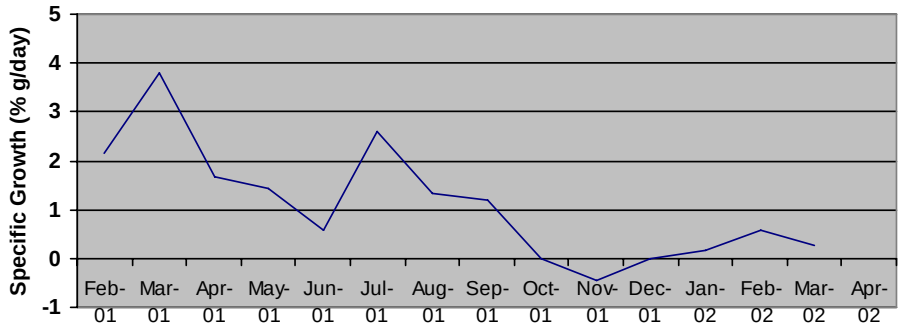
Month	Weight (g)	Fish /Pound
January	0.3	1500
February	0.57	800
March	1.79	253
April	2.97	153
May	4.59	99.0
June	5.47	83.0
July	11.9	38.0
Aug	17.8	25.5
Sept	25.5	19.6
Oct	25.5	19.6
Nov	22.3	20.4
Dec	22.3	20.4
Jan	23.4	19.4
Feb	27.9	16.3
Mar	30.3	15.0
Apr	30.3	15.0

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

The specific growth rate was calculated from the growth modeled in Table 9.2.4. The highest growth rates occurred in March 2001, i.e., first feeding fry at Oxbow Hatchery. Growth rates declined March through June. The slow growth rate is attributed increased fish size, transfer to

Lookingglass (cold April and May water temperatures), and fish marking (Ad clip and coded wire tags). In July, fish reflect an increased growth rate due to the prophylactic medicated feed treatment. The treatment targets a daily ration of approximately 2.5% (1.7% and 3.3%) body weight per day. After the medicated feed treatment, specific growth rates declined August through October with decreasing water temperatures and photoperiod. Fish appeared to lose weight in November (PIT tagging and VIE marking) with no weight gain in December. A slight increase in growth rates was observed in January and February 2002 prior to transfer to the Lostine acclimation facility.

Figure 9.2.5. Estimated specific growth rates for BY00 Lostine Chinook.



No hepatosomatic index (liver weight/body weight) and body moisture content was collected to estimate body fat concentration during rearing.

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 Oxbow Hatchery swim-up fry are started on Biodiet and transitioned to Moore Clark Nutra fry at about 250 fpp. One 28-day erythromycin medicated feed treatment is given using Biodiet at 4.4% body weight Feed is distributed by hand.

At Irrigon hatchery, swim-up fry are started on Bio-Oregon moist. One 28-day erythromycin medicated feed treatment is given using Bio-Oregon moist diet at 4.4% body weight. Feed is distributed by hand.

At Lookingglass Hatchery, fish are fed Moore Clark's Nutra plus diet. The feed is distributed to the raceways with Garon feeders. One 28-day erythromycin medicated feed treatment is given using Bio-Oregon moist at a target body weight of 2.2%. Medicated feed is fed by hand.

Feed rate:

Start - 5.0% body weight/day

November through January fish are fed intermittently at "maintenance" ration 0.1%.

End - 0.1% body weight/day

Overall food conversions are 1.1

9.2.7) Fish health monitoring, disease treatment, and sanitation procedures.
Monthly sample of about 10 (or available) moribund and/or dead fish will be examined for *R. salmoninarum* (BKD) and systemic bacteria. Every other month, examine 5 grab-sampled fish per raceway and any moribund fish for erythrocytic inclusion body syndrome (EIBS) using blood smears and hematocrits. Perform glucose assays on the plasma from the 5 grab-sampled fish. If EIBS is detected expand monitoring on that raceway to 10 fish per month. Examine gill and skin wet mounts by microscopy from a minimum of five fish. These may be from a combination of moribund and healthy fish. If bacterial gill or cold water disease is suspected, make smears from the gills on agar medium.
BKD – Two 28-day erythromycin prophylactic feed treatments are scheduled: The first in early February at Oxbow or Irrigon, the second at Lookingglass Hatchery in August. The target dose is 100 mg erythromycin per kilogram fish.
EIBS - There is no prophylaxis for EIBS except avoidance of the infectious agent. Bacterial coldwater disease is the most common secondary infection. Oxytetracycline prophylaxis will likely be implemented based on the sensitive nature of this stock if conditions warrant its use.
Fungus - Formalin flushes under a prescription from a consulting veterinarian. Flushes are one-hour treatments for two consecutive days after fin clipping operations, PIT-tagging and VIE marking--water temperatures allowing (>42^{o}F).
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 appropriate entities. Formalin treatments would be implemented for all parasitic infestations.

Table 9.2.7A. Disease history (2001 and 2002) of Catherine Creek conventional, (1998 to present) captive brood adults and all progeny[a].

Disease or Organism	Conventional Adults	Captive Brood	All Progeny
IHN Virus	No	No	No
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[c]
Yersinia ruckeri	Yes	No	Yes
Carnobacterium sp.	No	No	No
Ichthyobodo	No	No	No
Gyrodactylus	No	No	No
Ichthyophthirius multifilis	No	No	No
Epistylis	No	No	Yes
Scyphidia	No	No	Yes
Trichodinids	No	No	No
Gill Copepods	Yes	Yes	No
Coagulated Yolk Disease	No	No	Yes
External Fungi	Yes	Yes	Yes
Internal Fungi	No	Yes	Yes
Myxobolus cerebralis	No	No	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 program.
[c] BKD caused significant loss with some raceways of the BY99 captive brood F1's resulting in cumulative % mortality as high as 30%.

Note: the Catherine Creek chinook Fish Health Monitoring Plan for captive brood 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 Basin Captive Broodstock Annual Operation Plan covers fish health monitoring plans for the Captive Broodstock.

Table 9.2.7B. Disease history (1997 and 2000-2002) of Lostine River conventional, (1998 to present) captive brood adults and all progeny[a].

Disease or Organism	Conventional Adults	Captive Brood	All Progeny
IHN Virus	Yes	No	No
EIBS Virus	No	No	No
Aeromonas salmonicida	Yes	Yes	No
Aeromonas/Pseudomonas	Yes	Yes	Yes
Flavobacterium psychrophilum	No	Yes	Yes
Fl. columnare	No	No	No
Renibacterium salmoninarum	Yes	Yes[b]	Yes[c]
Yersinia ruckeri	Yes	No	No
Carnobacterium sp.	No	No	No
Ichthyobodo	No	No	No
Gyrodactylus	No	No	No
Ichthyophthirius multifilis	No	No	No
Epistylis	No	No	Yes
Scyphidia	No	No	Yes
Trichodinids	No	No	No
Gill Copepods	Yes	Yes	No
Coagulated Yolk Disease	No	No	Yes
External Fungi	Yes	Yes	Yes
Internal Fungi	No	Yes	Yes
Myxobolus cerebralis	No[d]	Yes	Yes[e]
Ceratomyxa shasta	No	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 program.
[c] BKD caused significant loss with some raceways of the BY99 captive brood F1's resulting in cumulative % mortality of ~13%; BY2000 progeny suffered a cumulative loss of nearly 3% in one raceway.
[d] All samples taken for *M. cerebralis* from adults in the conventional program have been negative.
[e] Only one positive for *M. cerebralis* by polymerase chain reaction (PCR) methodology in a 97 brood year conventional smolt acclimated at the Lostine River acclimation site in the spring of 1999.

Note: the Lostine River chinook Fish Health Monitoring Plan for captive brood 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 Basin Captive

Broodstock Annual Operation Plan covers fish health monitoring plans for the Captive Broodstock.

Table 9.2.7C. Disease history (2001 and 2002) of Grande Ronde River conventional, (1998 to present) captive brood adults and all progeny[a].

Disease or Organism	ConventionalAdults	Captive Brood	All Progeny
IHN Virus	No	No	No
EIBS Virus	No	No	No
Aeromonas salmonicida	No	No	No
Aeromonas/Pseudomonas	Yes	Yes	Yes
Flavobacterium psychrophilum	No	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	No
Gyrodactylus	No	No	No
Ichthyophthirius multifilis	No	No	No
Epistylis	No	No	Yes
Scyphidia	No	No	Yes
Trichodinids	No	No	No
Gill Copepods	Yes	Yes	No
Coagulated Yolk Disease	No	No	Yes
External Fungi	Yes	Yes	Yes
Internal Fungi	No	Yes	Yes
Myxobolus cerebralis	No	No	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 program.

Note: the Grande Ronde River chinook Fish Health Monitoring Plan for captive brood 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 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.

NA

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

Traditional rearing methods are applied at Oxbow and Irrigon hatcheries; however, fish are reared with natural photoperiods. After transfer to Lookingglass Hatchery, fingerlings are reared with natural water temperatures and photoperiods. Daily feed rations are distributed with automatic

feeders to limit human interaction; however, the 28-day prophylactic feeding of erythromycin is administered by hand to increase efficacy. Fish are reared with modest densities and flows (Section 9.2.2).

Fish are acclimated in the Catherine Creek, Lostine, and Upper Grande Ronde tributary basins 4 to 6 weeks prior to release; however, as production increases from the convention brood program "duel" acclimation periods will be implemented. Acclimation period will be reduced to 2 to 3 weeks each.

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.
Adults are collected using a sliding scale that incorporates natural origin fish into the broodstock (Table 5.1.A). The incorporation of natural fish into production is intended to reduce the long-term impacts of domestication. Progeny are reared and released at a smolt size. Fish are released to mimic natural fish emigration timing and reduce the natural and hatchery fish interactions in freshwater.

After 2004, a juvenile sliding scale will be incorporated in Catherine Creek. The intent is maintaining hatchery production in proportion to natural production of juveniles.

SECTION 10. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.
Refer to Grande Ronde Spring Chinook Hatchery Management Plan for specific details.

10.1) Proposed fish release levels. *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g. "Elwha River").)*
Fish production surplus to program goals and rearing space at Lookingglass Hatchery can be out planted at various age class stages (Zimmerman et al 2002). Production releases target smolt age class.

Table 10.A1. Releases number for Catherine Creek, Lostine River, and Upper Grande Ronde tributaries (includes production from captive brood and conventional brood).

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	-	-	-	-
Unfed Fry	-	-	-	-
Fry	-	-	-	-
Fingerling	-	-	-	-
Yearling	250,000	17-20	April	Catherine Creek
Yearling	250,000	17-20	April	Lostine River
Yearling	250,000	17- 20	April	U. Grande Ronde

Fish production for Lookingglass Creek is comprised of surplus Captive Brood from Catherine Creek; inasmuch as, Lookingglass Creek is an out let release location. Up to 250,000 parr can be produced if rearing space for full term smolt is not available at Lookingglass Hatchery. If space is available, smolts

will be produced and parr production reduced proportionately.

Table 10.2 Releases numbers for Lookingglass Creek Captive Brood production.

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs	-	-	-	-
Unfed Fry	-	-	-	-
Fry	-	-	-	-
Fingerling	250,000	40- 60	July	Lookingglass Cr
Yearling	150,000	17- 20	April	Lookingglass Cr.

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

Stream, river, or watercourse: Catherine Creek (HUC-17060104)
Release point: River Mile 21.5
Major watershed: Grande Ronde
Basin or Region: Snake River

Stream, river, or watercourse: Lostine River-
Release point: River Mile 11.5
Major watershed: Grande Ronde
Basin or Region: Snake River

Stream, river, or watercourse: Upper Grande Ronde- HUC-17060104)
Release point: River Mile 145.5
Major watershed: Grande Ronde
Basin or Region: Snake River

Stream, river, or watercourse: Lookingglass Creek (HUC-17060104)
Release point: River Mile 2.2
Major watershed: Grande Ronde
Basin or Region: Snake River

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

Lookingglass Creek. Summary of spring chinook releases by stock, number, and size in Lookingglass Creek and surrounding tributaries, 1987-2002. Note: Fish have been 100% marked since BY1990 released in 1992.

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Parr	Avg size	Smolts	Avg size

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Parr	Avg size	Smolts	Avg size
1987	RR/Carson					338,318	27.93	558,157	11.1
1988	RR					312,954	24.3	345,943	13.5
1989	RR					126,700	36.2	417,354	15.2
1990	RR							619,630	15.8
1991	RR					17,404	60.6	836,304	18.4
1992	RR							950,868	17.1
1993 (100% marking)	RR							448,291	20.0
1994	RR							764,183	18.9
1995	RR							658,230	21.9
1996	RR					30,880[a]	151.5	139,112	20.0
1997	RR					7,230	176.3	153,478	18.9
1998	RR					98	54.8	295,559	24.1
1999	RR					57,290	127.3	312,145	21.6
2000	RR					24,201	71.4		
2001	CC-Captive Brood					51,864	24.5		
2002	CC-Captive Brood					35,883	55.9		
Average						61,553		406,203	

a-From total, 9,657 fish were released in Little Lookingglass Creek

Catherine Creek. Summary of spring chinook releases by stock, number, and size in Catherine Creek, 1987-2002. Note: Fish have been 100% marked since BY1998 released in 2000.

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Smolts	Avg size
1987	-	-	-	-	-	-	-	88,667	10.9
1988	RR/Carson							151,888	20.6
1989	RR/Carson							83,100	13.2
1990	RR							70,002	19.9
1991-99	-	-	-	-	-	-	-	-	

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Smolts	Avg size
2000	CC-Captive Brood							37,980	22.5
2001	CC-Captive Brood							136,833	19.7
2002	CC-Captive Brood							180,343	18.6

Lostine/Wallowa Drainage. Summary of spring chinook releases by stock, number, and size in Catherine Creek, 1987-2002. Note: Fish have been 100% marked since BY1998 released in 2000.

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1990	RR							26,438[a]	20.7
1990	RR							26,442[b]	20.7
1991-98	-	-	-	-	-	-	-	-	-
1999	Conventional Brood							11,871	18.5
2000	Captive Brood							34,986	21.0
2001	Captive Brood							133,883	19.6
2002	Captive Brood					4,666[c]	78.5	77,551	16.9
2002	Conventional Brood							31,464	15.8

a-Deer Creek (100% Ad clipped)
b-Hurricane Creek (no mark)
c-Wallowa River (no mark)
d-Bear Creek (AdCWT)

Upper Grande Ronde Summary of spring chinook releases by stock, number, and size in the Upper Grande Ronde River, 1987-2002. Note: Fish have been 100% marked since BY1992 released in 1994.

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1987	RR/Carson							111,711	17.1

Release year	Stock	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988-89	-	-	-	-	-	-	-	-	-
1990	RR							80,043	19.5
1991-93	-	-	-	-	-	-	-	-	-
1994	RR							84,558	19.4
1995-99	-	-	-	-	-	-	-	-	-
2000	Captive Brood							1,508	19.5
2001	Captive Brood					76,951	24.0	2,560	13.9
2002	Captive Brood					32,803[a] .	61.7	151,444	17.9

a-Sheep Creek

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

Fingerlings are released from the transport vehicle in several locations. Locations are typically high in basin or in nearby tributaries with low number of redds observed the previous year.

Smolts are released in mid-April to mimic natural fish emigration timing and reduce the natural and hatchery fish interactions in freshwater. During the last four years, fish have been acclimated for 4 to 6 weeks, allowed to volitional emigrate for up to 21 days before forced into the river in mid-April. The forced release occurs in late afternoon or early evening. No culling is applied to non-migrants. It is anticipated that acclimation time will be reduced to a minimum of 14 days due to the numbers of fish produced and the size of the acclimation containers.

Table 10.4A. Summary of Catherine Creek acclimation and release dates since 1998.

Year	Arrival	Volitional Release	Forced release
1998	March 10	NA	Aril 6
1999	March 1	March 22	April 15
2000	March 2 and 3	March 22	April 18
2001	March 1 and 2	March 21	April 19
2002	March 1, 4 and 5	March 21	April 17

Table 10.4. Summary of Lostine acclimation and release dates since 1998.

Year	Arrival	Volitional Release	Forced release
1998	March 10	NA	Aril 6
1999	March 1	March 22	April 15
2000	March 2 and 3	March 22	April 18
2001	March 1 and 2	March 21	April 19
2002	March 1, 4 and 5	March 21	April 17

Table 10.4C. Summary of Upper Grande Ronde acclimation and release dates since 1998.

Year	Arrival	Volitional Release	Forced release
1998	March 10	NA	Aril 6
1999	March 1	March 22	April 15
2000	March 2 and 3	March 22	April 18
2001	March 1 and 2	March 21	April 19
2002	March 1, 4 and 5	March 21	April 17

10.5) Fish transportation procedures, if applicable.

Chinook smolts are loaded with water using a fish pump. Fish are separated from the water and transferred into insulated liberation tankers ranging in capacity from 2,000 to 5,000-gallons. Fish are loaded at maximum 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 two weeks. After two weeks, screens are removed and fish are allowed to volitionally leave the pond for additional week. All fish are forced out mid-April or late March during duel acclimation.

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

Marking strategy has been determined through Brood Year 2004 (Zimmermann et al. 2002). Currently, 100% fish are marked with numerous releases with multiple marks.

Captive Brood production is visually identified with Ad-clip. Fish used in evaluation are implanted with a coded wire tag (CWT).

Conventional Brood production in Catherine Creek and Lostine River is visually identified with an Ad-Clip and VIE (red-Lostine; orange-Catherine) marks. There is no planned external mark on Upper Grande Ronde production in brood years 2002-2004. Detection of CWT is required to identify conventional brood releases. Fish used in evaluation are implanted with a coded wire tag (CWT).

A portion of all releases is PIT tagged to evaluate out migration performance and survival.

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

There is no plan for surplus smolt production. Fish surplus to programmed needs would be released at an earlier life stage or culled as eggs.

10.9) Fish health certification procedures applied pre-release.

A total of 60 normal appearing yearling pre-smolts are sampled at Lookingglass Hatchery two weeks prior to transfer to the acclimation sites. Individual fish are examined for ***R. salmoninarum*** by ELISA, EIBS, and plasma glucose. Gill/kidney/spleen are examined in 3-fish samples and assayed for viruses. Wet mounts of skin and gill tissue from a minimum of five will be examined

by microscopy. At each acclimation site, thirty healthy appearing fish will be examined for *R. salmoninarum* (ELISA), EIBS and plasma glucose. Gill/kidney/spleen samples as 3 fish sample pools will be assayed for viruses. Wet mounts of skin and gill tissue from a minimum of five will be examined by microscopy. These will be sampled within one week of the forced release. A target of 10 (or available) moribund and/or dead fish will be sampled for *R. salmoninarum* (BKD) and systemic bacteria.

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

The Lookingglass Hatchery manager and facility operators have the authority to release fish in an emergency. Section (5.7.2) describes winter icing conditions that can result in the intake blocked from inflowing water. Environmental conditions are a concern at all acclimation sites and may lead to early releases.

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.

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 temperatures and increasing river flows. The intent is to reduce the time fish reside in freshwater, therefore, reducing the interactions with naturally produced chinook and steelhead.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

- Mark all smolts and determine mark rate
  - (*Indicators: 1a, 1b, 2b, 3a, 4a, 4b, 7a, 26a)*
- Analyze marked fish recovery data collected by others from Columbia, 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
  - *(Indicators: 6a, 25a, 25b)*
- Determine proportion of hatchery adults in key natural spawning areas via adult mortality recoveries

- *(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 via redd count surveys and adult origin reconstruction via adult mortality recoveries
  - *(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)*

11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.
Current monitoring and evaluation funding covers most activities listed above. However, funding to monitor potential hatchery/wild interaction, hatchery-origin contribution, and genetic monitoring will require commitment of additional resources.

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

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

SECTION 12. RESEARCH

12.1) Objective or purpose.

Captive Brood--This program will be operated under the adaptive management philosophy and will rely extensively on monitoring and evaluation results and new knowledge for making future decisions and adapting program approaches. There are numerous uncertainties associated with salmonid captive broodstock programs (Flagg and Mahnken 1995). There is a need to experimentally evaluate various aspects of rearing and spawning captive adults. However, each evaluation has varying degrees of risk to, or impact on, the population associated with an experiment. Since we are working with endangered stocks of spring chinook salmon, we need to balance information needs with risks to the captive populations. Thus, we are proposing to evaluate aspects of captive rearing and breeding that address relatively important uncertainties but will have minimal impact to the groups of fish being studied.

The first evaluation we proposed is a comparison of fish reared exclusively in fresh water to those

reared in freshwater as juveniles, saltwater as adults and returned to freshwater for final maturation. The second evaluation we propose is a comparison of fish that, as juveniles, are grown at either a semi-natural rate or an accelerated rate. Growth rates will be manipulated using water temperature and feeding levels. Fish growing at a natural rate will be reared in water temperatures ranging from 5-14° C that simulates the natural winter water temperature cycle. Fish growing at an accelerated rate will be reared in constant 14° C water. Feeding will be adjusted according to metabolic needs that vary with water temperature. In each evaluation, we will compare overall performance of captive brood F_1 production, and potentially adult returns.

Controlled evaluations were not conducted with the 1994 cohort of captive fish. Rather, these fish were monitored during the course of their development in an effort to fine tune future evaluations. The 1995 - 1999 cohorts of captive fish were evaluated by dividing each stock of captive fish into three groups (by cohort). Thus, for any given cohort we had a total of nine groups of fish (Table 12.1A). Approximately two-thirds of the fish were reared in fresh water while the other third was reared in saltwater for post-smolt rearing. The freshwater, natural growth group of each stock served as a control for both other treatments. We had difficulty achieving the accelerated growth profile through the 1998 brood year, however we corrected the problems and achieved our experimental design with the 1999 cohort. Beginning with the 2000 cohort, we will have four treatment groups. One half of the fish will be reared under each of the natural and accelerated pre-smoltification growth regimes and one half of each of these groups will be reared in each of saltwater and freshwater following smoltification for a total of twelve groups (four treatments for each stock). Rearing space at Manchester Marine Lab may limit treatment groups.

Variables other than environmental salinity, juvenile growth rate and perhaps adult diet will remain as similar between treatments as possible. For example, at all times, all fish will be reared under a simulated natural photoperiod. Fish from different brood years within a treatment group will be spawned together. After spawning, F_1 generation fish resulting from parents of a certain treatment group will be kept separate from those produced from parents of a different treatment group at least until time of tagging whenever possible.

Captive fish are reared through maturation, spawned and then their progeny are reared through the yearling smolt stage. This entire cycle should take approximately 5.5 years. For example, fish collected in September of 1995 (1994 brood year) would spawn at age 5 in September of 1999 and the resulting progeny would be released as smolts in the spring of 2001. For the purpose of clarifying the terminology associated with the monitoring and evaluation plan, we have divided this cycle into four periods (Table 12.1B). The Captive Juvenile Period begins at collection and ends once fish have been transferred to BOH or MML. It is composed of two phases: pre-smolt growth and smoltification. The Captive Adult Period begins once fish have been transferred to BOH or MML and ends once fish have been spawned or die. The Captive Adult Period is composed of three shorter phases: post-smolt growth, maturation and spawning. The F_1 Generation Period begins once embryos from captive fish are formed and ends when fish from these embryos die. This period is composed of the incubation, juvenile rearing, smolt release and maturation phases. The F_2 Generation Period begins once embryos from F_1 Generation fish are formed (in the wild) and ends when fish from these embryos die. The F_2 Generation Period is composed of the pre-smolt, smolt and post-smolt phases.

Table 12.1A. Approximate number and rearing location for captive brood post-smolts from the 1994-1999 cohorts and 2000 and future cohorts.

Treatment	Stock		
	Lostine River	Catherine Creek	Grande Ronde River
1994-1999 cohorts			
Freshwater - Bonneville Fish Hatchery			
Accelerated growth	166	166	166
Natural growth	166	166	166
Saltwater - Manchester Marine Laboratory			
Natural growth	166	166	166
2000 and future cohorts			
Freshwater - Bonneville Fish Hatchery			
Accelerated growth	125	125	125
Natural growth	125	125	125
Saltwater - Manchester Marine Laboratory			
Accelerated growth	125	125	125
Natural growth	125	125	125

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) (Prentice et al. 1986; 1990) in accordance with the PIT Tag Marking Manual (PIT Tag Steering Committee 1993). Fish are taken from the troughs and anesthetized using 40-50 ppm MS-222. We inject PIT tags manually using modified hypodermic syringes, which are disinfected for at least 10 minutes in 70% ethanol prior to tagging. Fish are allowed to recover in fresh water before being returned to their rearing facility. PIT tags allow us to identify individual fish during rearing and spawning and losses associated with tagging operations have been minimal. Fish are reared at LFH until smoltification, approximately 20 months after fertilization. After transport to

Table 12.1B. Captive broodstock monitoring and evaluation terminology and example time scale.

Period/phase	Example of approximate actual time period for fish maturing at age four
Captive Juvenile Period	Sep 1995 - Jun 1996
pre-smolt growth phase	Sep 1995 - Apr 1996
smoltification phase	Apr 1996 - Jun 1996
Captive Adult Period	Jun 1996 - Sep 1998

post-smolt growth phase	Jul 1996 - Jun 1998
maturation phase	Jun 1998 - Sep 1998
spawning phase	Sep 1998
F_1-Generation Period	Sep 1998 - Sep 2002
incubation phase	Sep 1998 - Feb 99
juvenile rearing phase	Feb 1999 - Apr 2000
smolt release phase	Apr 2000
adult return phase	Jun 2002 - Sep 2002
F_2-Generation Period	Sep 2002 - Sep 2007
pre-smolt phase	Sep 2002 - Mar 2004
smolt phase	Apr 2004 - Jun 2004
post-smolt phase	Jul 2004 - Sep 2007

BOH or MML, 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.

To minimize stress around the smolt period in April and May, handling is minimized (19 - 20 months after fertilization) with the exception of vibrio inoculations and hauling them to either MML or BOH. Fish receive food during these three months, mortalities are removed from the rearing tanks, pathological treatments may be applied and tanks are cleaned periodically.

The 2001 cohort will be transferred to MML or BOH for the Captive Adult Period rearing near 1 June 2003. The specific time of this transfer will be decided based on the performance of ten sentinels sent to MML in mid-May. After fish are transported to the MML, they will be placed into circular tanks along with the water from the transportation vehicle. This water (0 ppt salinity) will be aerated to maintain dissolved oxygen levels of at least 9 ppm. Saltwater will be added gradually so that the fish acclimate to full strength salinity of 26-29 ppt salinity with ≥ 98% oxygen saturation.

Fish to be reared at BOH will be transported at the same time as fish are transported to MML. Once at BOH, fish will be placed into circular tanks filled with well water (0 ppt salinity, ≥ 98% oxygen saturation) at temperatures similar to those at LFH and to those in the transport vehicle. With the exception of a freshwater environment, these fish will be reared under conditions as similar as possible to those experienced by fish at MML (e.g., tank size, tank type, loading factors, feeding).

Maturation of fish will be judged by gross morphological characteristics (e.g., coloration) and by using ultrasound and/or near infrared spectroscopy. Mature fish from MML will be 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. We anticipate that peak maturation will occur during September. When fish become ripe, they will be spawned (see Spawning Protocols) at

BOH according to the general procedures used at LFH for Imnaha stock chinook salmon. This includes stripping the eggs into a colander to remove ovarian fluid and water-hardening in a 75 ppm Argentyne solution. After fertilization, F_1 generation embryos from a given male-female pairing will be kept separate from embryos from other pairs at Oxbow and Irrigon hatcheries. Embryos will be kept distinguishable by female until the eyed stage. Fry will be transported to LFH for completion of rearing to smoltification.

F_1 generation fry will be reared in Canadian troughs following standard protocols for LFH. They will be moved into outdoor ponds around April. They will be fin-marked and coded-wire-tagged during June and July. Progeny from each treatment group will be tagged to permit later identification. At full program, approximately 50,000 fish will be reared in each pond. Fish will be reared and sampled according to standard protocols at LFH and targeted for 23 g, or a mean fork length of 125 mm, at their release as yearling smolts. A portion of fish from selected raceways will be PIT-tagged to monitor outmigration survival and characteristics.

In March or April, fish will be transported to acclimation facilities located within the area of their parents' natal stream where natural fish spawn. A proportionate number of fish from each evaluation group within a given stock will be mixed together at the time of transportation. Acclimation sites will be supplied with ambient stream water and fish at these sites given supplemental feed. In March and April, after a 14-30 day period of acclimation, fish will be released into the stream.

We anticipate that some of these fish will mature two, three, or four summers after they are released. Some of these fish may be captured in fisheries while others will return to the Grande Ronde Basin. Weirs will be placed near the mouth of the Lostine River, on Catherine Creek near the town of Union and on the upper Grande Ronde River upstream of the town of La Grande. 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. No returning adults from the Captive Broodstock F_1 generation will be incorporated into any conventional adult collection supplementation program.

F_1 generation fish that are allowed to spawn naturally may reproduce with other natural fish or other F_1 generation fish. The majority of the successful progeny produced from these matings are expected to migrate to the ocean as yearlings and return when they are 3, 4 and 5 years old. We will monitor the production and life history characteristics of the F_2 generation fish. Standard sampling will be conducted on pre-smolts to determine their relative abundance and to collect morphometric data and tissue for subsequent genetic analysis. Some fish may also be tagged so their migratory behavior can be evaluated. Juvenile migrant traps and weirs will be placed in Lostine and upper Grande Ronde rivers as well as Catherine Creek. The production and timing of fish migrating to and from the ocean will be monitored. Characteristics of each study population will be evaluated prior to, during and (potentially) after the captive broodstock program.

The following outline describes the monitoring that will be done during each period and phase of the captive brood cycle. At all times, great care will be taken to minimize stress and any adverse impacts that monitoring may have on the fish. When possible, all variables will be associated with the tag code of an individual fish. The monitoring aspect of this program is designed to allow us to make comparisons among groups in our experimental evaluations, to monitor the basic progress of the fish, to detect areas of concern that may need our immediate attention and to judge the adequacy of the benchmarks we have used to design the overall captive broodstock program (for example: 75% egg viability of the captive brood adults). In general, along with the pathological sampling, we will record length, weight, maturity and gonad development of all mortalities.

i. Captive Juvenile period

a) Pre-smolt growth phase:

- Measure the fork length of each fish and weight of a sample of fish at collection.
- Calculate mean fork length, weight and condition factor at collection.
- Measure the fork length and weight of a sample of fish at tagging and during the following November and January.
- Assess the growth profile and condition of the captive fish.
- Sample and conduct a complete inventory of fish, by tag code, in March (18 months after fertilization).
- Calculate the overall survival rate of the fish during this period.

b) Smoltification phase:

- To minimize handling stress, no sampling is scheduled.

ii. Captive Adult period.

a) Post-smolt growth phase:

- Measure the fork length and weight of a sample of the fish during VI-tagging approximately 23 months after fertilization).
- Measure the fork length and weight of a sample of fish when any rearing parameters change (i.e. if there is a shift in the diet from pellet food to krill).
- Assess the growth profile and condition of the fish whenever they are sampled for culture purposes.

b) Maturation phase:

- During routine culture operations, make standardized visual observations of the fish for signs of maturation.
- Examine the external morphology (color, jaw development, humping back, swelling abdomen) of each fish for signs of maturation during July and August of each year.
- Record the date and time of transportation of each maturing fish from MML to BOH.
- Record mortalities and calculate the mortality rate during transportation to BOH.
- Examine the degree of ripeness (size and firmness of the abdominal cavity) each week on all maturing fish.
- Include this data in calculations of age and time of maturation. Compare these values between treatments.
- Assess whether information on the growth and condition of the fish at earlier life stages can be used to predict age or time of maturity.

c) Spawning phase:

- Measure the fork length and weight of all spawned fish.
- Calculate and compare the size at maturity between treatment groups.
- Measure the spermatocrit and sperm viability of all male fish that are spawned.
- Calculate and compare the measures of male fertility between treatment groups.
- Measure the gonad condition of all fish.
- Measure an egg weight sample of all female fish.
- Calculate and compare the mean egg size between treatment groups.
- Measure the number of unfertilized eggs from each spawned female.
- Calculate the rate of egg fertilization for all spawned females.
- Calculate and compare the rate of egg fertilization between treatment groups.
- Record the age of each spawned fish as well as the date of spawning.
- Include this data in calculations of age and time of maturation. Compare these values

between treatments.

iii. F_1-Generation.

a) Incubation phase:
- Measure and compare fecundity between treatment groups.
- Measure and compare the fertilization success of each family group.
- Measure and compare the hatching time of each family group.
- Measure and compare the hatching success of each family group.
- Measure and compare the mean embryo weight of each family group.
- Calculate the green-egg to eyed-egg survival for each family group.
- Compare the green-egg to eyed-egg survival between treatment groups.

b) Juvenile rearing phase:
- Measure hatchling length and weight for each family group and compare between treatments.
- Measure the conversion rate to exogenous food for a sample of family groups and compare between treatments.
- Measure the fork length and weight of a sample of fish during each month from ponding as fry to release as smolts.
- Assess the growth profile and condition of the fish as well as compare between treatments.
- Calculate and compare the fry-to-smolt survival rates between treatments.

c) Smolt releases phase:
- Conduct standard pre-release sampling on each pond of fish prior to their release a smolts.
- Compare release groups.
- Record PIT tag detections at traps and dams below release sites.
- Calculate and compare survival indices and migration timing of fish from different treatments.

d) Adult return phase:
- Record the date of arrival for each fish captured at the weir.
- Calculate and assess run-timing to the streams.
- Beginning in 2002, conduct intensive spawning ground surveys (twice each week) on the Lostine River, Catherine Creek and the upper Grande Ronde River.
- Document spawning and sample carcasses recovered in each river.
- From carcasses, collect the dorsal region of the head to recover coded-wire tags, examine the degree of spawning for females, measure the length of each fish and collect a scale sample for age determination.
- Survey other streams in NE Oregon where spring/summer chinook salmon spawn to look for captive brood fish that did not return to their ancestral stream.
- Gather information from as many additional sources as possible.
- Calculate and compare smolt-to-adult survival rates, age-at-return, spawning success, length at age by sex and time-at-return for each treatment group.

iv. F_2-Generation.

a) Pre-smolt phase:
- Estimate abundance at various index sites in each study stream.
- Measure subyearling size to calculate growth characteristics.
- Collect tissue samples for genetic analysis.
- Measure bilateral meristic characteristics.

- PIT-tag a sample of fish to monitor the juvenile migration timing.

b) Smolt phase:
- Estimate the number of juvenile migrants produced from each study stream.
- Measure and collect scales from a sample of smolts to determine size and age at smoltification.
- Monitor PIT tag recoveries at traps in the migratory corridor to calculate travel time.

c) Post-smolt phase:
- Record the time, number, age and sex of adults returning to weirs in the study streams.
-Conduct spawning ground surveys in each study stream to monitor redd production and fish:redd ratios.
- Calculate and compare life history characteristics.

Conventional Brood—The conventional broodstock program also relies on monitoring and evaluation of results. It is integrated with the captive broodstock program described above and results of the two programs are compared.

Conventional broodstock fish are collected from weirs on Catherine Creek, Grande Ronde River and Lostine River. Adults are collected at weirs in the spring through summer and held at Lookingglass Fish Hatchery until they are spawned in August. The eggs are incubated at Lookingglass, Oxbow or Irrigon fish hatcheries and the resulting offspring are reared until the smolt stage at Lookingglass Fish Hatchery. Upon smoltification, the offspring are transferred to acclimation sites on the natal stream of their parents and released after 14-30 days of acclimation.

Conventional broodstock fish are compared with both captive broodstock and wild fish. Collaboration with the captive broodstock and early life history programs and spawning ground surveys are necessary to evaluate the conventional broodstock program.

The conventional program is compared to the captive program at several critical stages that fall within the Captive Adult and F_1 Generation periods outlined for the captive broodstock program. Size, age and fecundity of adults, time of maturation, egg size and fertility are some of the variables compared during spawning and incubation. Following fertilization, the conventional broodstock F_1 generation is treated the same as the captive broodstock fish and can be directly compared through the adult return phase of the F_1 generation (see captive broodstock, above). For the F_2 generation, captive and conventional fish will be combined as offspring of "hatchery" fish, as we will probably not be able to discriminate between them.

Hatchery vs. wild comparisons will be made using both captive and conventional fish. We can compare production of fish in the hatchery and wild and size and downstream and upstream migration timing and return rates of their offspring. Using genetic parental analyses, we can also compare spawning success (production of an F_2 generation) in the wild 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
- National Marine Fishery Service

12.3) Principle investigator or project supervisor and staff.

Richard W. Carmichael
Timothy Hoffnagle
Pat Keniry
William Knoll
Matt Snook
Debra Eddy

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 Brood Collections--Juvenile spring chinook salmon are collected from the wild 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 of nontarget fish, such as adult chinook salmon and juvenile steelehead, 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 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 and all nontarget fish are then immediately released at the site of capture. If adult chinook salmon are seen, the snorkelers immediately leave the water and move to a new site.

Conventional Brood--
1. Monitoring hatchery/wild ratios in natural spawning streams - Adult summer/spring chinook will be captured and enumerated at the three existing facilities, Catherine Creek, Lostine River, and Upper Grande Ronde. See section 2.2.3.
Spawning surveys – In addition to adult trapping, density and hatchery/wild ratio of spawners in selected natural spawning areas will be monitored via observation. See section 2.2.3.

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

Research is an ongoing activity, February through November.

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

Captive Brood-See section 12.5-After collection, fish are transported to the rearing hatchery in approximately 1.5 hours.

Conventional Brood--Handling of listed fish will generally be restricted to enumeration, measurement and release at the site of capture. Fish will be held in containers with well-aerated water of suitable temperatures less than 18° C. If handling involves more than determining species and enumeration i.e., measurement, marking or tissue sampling, fish will be anesthetized with MS-222 or Aqui-S before the procedure and allowed to recover before release. Transport will be by hand in water-filled containers with a holding period of up to two hours.

Comment [CS2]:

Adults will be transported to Lookingglass hatchery 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 (Table 2.2.3B). Injury due to capture, marking and tissue sampling is inevitable. Hooking wounds, electro-fishing injury and other physical damage is 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).

See Table 2.2.3B

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.

Occasionally, we expect to encounter summer steelhead juveniles and bull trout during sampling. However, the number of encounters and as a result the level of mortality, is expected to be less than ten juvenile fish per species per tributary.

12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

- Listed steelhead, chinook and bull trout sampled during the residual steelhead study and genetic monitoring will be collected in compliance with NMFS Electrofishing Guidelines to minimize the risk of injury or immediate mortality.

- Every effort will be made to insure that adult trapping facilities do not delay movement of 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 foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

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

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

Unknown.

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

Bull trout – Both fluvial and resident life history forms of bull trout inhabit the Grande Ronde sub-basin include the Minam, Wenaha, Catherine Creek, Lostine River, and Upper Grande Ronde. Bull trout utilize suitable habitat within the sub-basin. Fluvial adults migrate into headwater areas during summer and early fall after over-wintering in mainstem tributaries and the Snake River. Spawning for both resident and fluvial adults occurs in September and October. Fry emerge during the spring. Juvenile rearing is restricted to headwater areas where water remains cooler.

15.3) Analysis of effects.

The only identified direct effect of the hatchery operation on bull trout is trapping migrant fluvial fish in the adult chinook traps on Catherine Creek, Lostine River, and Upper Grande Ronde facilities. The traps are operated March through September. Number of fish trapped annually ranges from 0 to 20. Fish are held a maximum of two days, handled and passed upstream.

Hatchery operations - Water withdrawal for chinook smolt acclimation occurs in the late winter and spring at a time when stream flow is high. Adequate bypass reach passage flow is maintained for adult steelhead as well as migrant fluvial bull trout. Facility maintenance, i.e., intake excavation, occurs in the summer months when water temperatures preclude the presence of bull trout.

Fish health – The facilities are located within juvenile/resident rearing areas. However hatchery program juveniles are likely to encounter holding fluvial bull trout on their seaward migration in the Grande Ronde system. Adult hatchery chinook can be released out lets streams (Zimmerman et al 2002). Also see section 3.5 and 7.7.

Ecological/biological - Releases of smolts and juveniles occur downstream of most bull trout rearing areas minimizing potential competition and predation. Releases of listed hatchery steelhead may however provide substantial forage for larger fluvial bull trout over-wintering in the lower reaches of the system (see section 3.5).

Predation/competition – Fingerling releases can interact with bull trout in the rearing distribution. Some limited predation of and competition with smaller bull trout may occur in these areas.

Monitoring and evaluations - see section 12.11.

Habitat – It is unknown the effects of the Lookingglass Creek, Catherine Creek, Lostine River, and Upper Grande Ronde facilities on juvenile/resident bull trout rearing habitat. Migratory behavior of fluvial bull trout is, however, disrupted briefly as they encounter the adult chinook traps during its operation.

15.4 Actions taken to mitigate for potential effects.

- Smolts are released at a time and size designed to optimize the percentage migrating out of the system and minimize interaction with bull trout.
- Bull trout handled at the adult trap are sorted and released immediately upstream.

15.5 References