WDFW Snake River Stock Fall Chinook
Lyons Ferry Hatchery On-Station and Up-River Releases

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Snake River Fall Chinook salmon – Snake River Stock Program: Lyons Ferry Complex – Lyons Ferry Hatchery**
Species or Hatchery Stock:	Fall Chinook salmon – Snake River Stock *Oncorhynchus tshawytscha*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Snake River / Snake River Basin, Washington State
Date Submitted:	September 16, 2002
Date Last Updated:	August 18, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Hatchery: Lyons Ferry Complex (LFH).
Program: Snake River Fall Chinook Salmon – Snake River Stock Program

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

Fall Chinook Salmon *(O. tshawytscha),* Snake River Stock (threatened)

1.3) Responsible organization and individuals

Hatchery Evaluations Staff Lead Contact
Name (and title): Debbie Milks, Fall Chinook Evaluation Biologist
Agency or Tribe: Washington Dept. of Fish and Wildlife
Address: 401 South Cottonwood, Dayton, WA 99328
Telephone: (509)-382-1710, or 382-1004
Fax: (509) 382-2427
Email: milksdjm@dfw.wa.gov

Hatchery Operations Staff Lead Contact
Name (and title): Steve Rodgers, Lyons Ferry Complex Manager
Agency or Tribe: Washington Dept. of Fish and Wildlife
Address: PO Box 278, Starbuck, WA 99359
Telephone: (509) 646-3454
Fax: (509) 646-3400
Email: rodgesar@dfw.wa.gov

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

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

1. U. S. Fish and Wildlife Service – Lower Snake River Compensation Plan (LSRCP) - Program funding/oversight
2. Nez Perce Tribe (NPT) – Co-manager – Operates acclimation facilities above Lower Granite (LGR) Dam
3. Confederated Tribes of the Umatilla Indian Reservation – Co-manager
4. National Marine Fisheries Service (NMFS) – Co-operator operates adult trap at LGR Dam.

5. Idaho Power Company (IPC) – Co-operator – Mitigation for Hells Canyon Dam.
6. Idaho Department of Fish and Game (IDFG) – Co-operator – Rears IPC mitigation fish

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

The Lower Snake River Compensation Plan (LSRCP – US Fish and Wildlife Service) presently funds production of these mitigation fish (Snake River stock fall chinook). The program was established as mitigation for lost fish resources resulting from construction and operation of hydroelectric facilities in the Snake River. The LSRCP in Washington also has programs for spring chinook salmon, resident trout, and summer steelhead. Currently, fall chinook management for LSRCP mitigation in the Washington portion of the Snake River is mandated to provide 18,300 returning adult hatchery fall chinook. Both operational and evaluation costs described in this HGMP are presently covered by LSRCP.

The LFH staff includes the Hatchery Complex Manager, and 11 permanent fish hatchery specialists, one plant mechanic, and two seasonal fish hatchery workers. Not all hatchery staff is needed for the Snake River Stock program on an annual basis, although other programs require additional staff. Annual operation and maintenance costs for the program are estimated at $1,250,000. Evaluations also occur for each species produced at LFH and are conducted by a staff of 8-10 permanent and seasonal biologists and technicians. The Snake River Stock program represents a major portion of the annual evaluation budget. The estimated evaluations budget for 2005 includes approximately $175,000 for duties associated with fall chinook.

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

Incubation, rearing, and marking – 1) Lyons Ferry Hatchery – along the Snake River (Rkm 95), below the Palouse River, in Franklin County, Washington, 2) Oxbow Fish Hatchery – along the Snake River (Rkm 434) in Baker County, Oregon, and, 3) Umatilla Hatchery , along the Umatilla River, Umatilla County, Oregon (for rearing Idaho Power mitigation from eggs provided by LFH).

Juvenile Acclimation –1) Captain John Rapids Acclimation Facility – along the Snake River (Rkm 263), below the Grande Ronde River, in Asotin County, Washington, 2) Pittsburg Landing Acclimation Facility – along the Snake River (Rkm 346), above the Salmon River, in Idaho County, Idaho, and 3) Big Canyon Acclimation Facility – along the Clearwater River (Rkm 57) in Nez Perce County, Idaho.

Juvenile Release– 1) Lyons Ferry Hatchery – along the Snake River (Rkm 95), below the Palouse River, in Franklin County, Washington, 2) Captain John Rapids Acclimation Facility – along the Snake River (Rkm 263), below the Grande Ronde River, in Asotin County, Washington, 3) Couse Creek boat launch – along the Snake River (Rkm 254), downstream from Captain John Rapids Acclimation Facility and the Grande Ronde River, in Asotin County, Washington, 4) Pittsburg Landing Acclimation Facility – along the Snake River (Rkm 346), above the Salmon River, in Idaho County, Idaho, 5) Below Hells Canyon Dam - along the Snake River (Rkm 395) in Wallowa County, Oregon, and 6) Big

Canyon Acclimation Facility – along the Clearwater River (Rkm 57) in Nez Perce County, Idaho.

Adult Collection – 1) Lyons Ferry Hatchery – along the Snake River (Rkm 95), below the Palouse River, in Franklin County, Washington, 2) Lower Granite Dam Adult Trap - Snake River (Rkm 173) in Garfield County, Washington.

Adult Holding and Spawning - Lyons Ferry Hatchery – along the Snake River (Rkm 95), below the Palouse River, in Franklin County, Washington.

1.6) Type of program.

Integrated Recovery/Mitigation

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

1. **Integrated Recovery/Mitigation:** Continue to provide mitigation as specified under the LSRCP program (USACE 1975) while meeting conservation and recovery criteria established for the Snake River fall chinook ESU. Provide harvest opportunities established under *US v OR* for tribal and recreational fisheries.

1.8) Justification for the program.

Congress authorized the Lower Snake River Project on March 2, 1945 by Public Law 14, 79th Congress, First Session. The project was authorized under the Rivers and Harbors Act of 1945. It consists of Ice Harbor Dam (IHR), completed in 1962; Lower Monumental Dam, 1969; Little Goose Dam, 1970 and Lower Granite Dam, 1975. The project affected over 140 miles of the Snake River and tributaries from Pasco, Washington to upstream of Lewiston, Idaho. The authorized purposes of the project were primarily navigation and hydroelectric power production. The original authorizing legislation for the project made no mention of fish and wildlife measures needed to avoid or otherwise compensate for the losses or damage to these important resources.

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

The LSRCP is funded by the USFWS through the LSRCP Office with power production revenues provided by the Bonneville Power Administration. The WDFW administers and implements Washington's portion of the program. Specific mitigation goals include "in-place" and "in-kind" replacement of adult salmon and steelhead. The LSRCP program for

steelhead and trout in Washington was begun in 1982 and for salmon in 1984. The LSRCP program in Washington has been guided by the following objectives: 1) Establish broodstock(s) capable of meeting egg needs, 2) Maintain and enhance natural populations of native salmonids, 3) Return adults to the LSRCP area which meet designated goals, and 4) Improve or re-establish sport and tribal fisheries.

Indicate how the hatchery program will enhance or benefit the survival of the listed natural population (integrated or isolated recovery programs).

The Snake River Fall Chinook Program began as an egg bank program (1976) to maintain and increase the stock until the mitigation program could be initiated. The egg bank transformed into a mitigation program after 1984 that continued to increase population size and maintain stock integrity while building towards future harvest. From 1976-1984, adults were trapped from the Snake River and their progeny were marked and reared separately at several locations. This stock was then transferred to Lyons Ferry Hatchery in 1984.

The incidence of stray fish in the broodstock at Lyons Ferry increased until 1989 when it was determined after spawning that 41% of fish used for broodstock were stray non-Snake River origin, hatchery fish. Trapping at IHR was terminated and broodstock management was modified in an effort to maintain the genetic integrity of the stock. WDFW was concerned that spawning with hatchery strays was compromising the natural Snake River stock. The 1989 brood year was not used for broodstock when they returned as adults.

By 1990, coded wire tags were read to determine origin of fish prior to spawning. Also, to benefit the integrity of natural populations, since 1990 any fish of unknown origin were removed at LGR Dam and excluded from the broodstock used for supplementation. Through selection at Lyons Ferry Hatchery, only known Snake River stock chinook have been used as broodstock since 1990. Genetic sampling and analyses indicate that Snake River stock reared at Lyons Ferry Hatchery are closer to the natural population spawning in the Snake River, than the Columbia River stocks (Marshall et al, 2000).

The ESA listing of Snake River fall chinook in the early 1990s slightly changed the program focus towards stock recovery. By the mid to late 1990s, acclimation facilities above LGR Dam were included and the program changed to a supplementation program to enhance fall chinook production in the Snake River using Snake River stock. Trapping continued at Ice Harbor Dam (IHR) until 1991.

Currently, Snake River origin fish reared in the hatchery are trapped at Lyons Ferry Hatchery and Lower Granite Dam. Any trapped stray fish are removed from the Snake River system. In 2003 the program began including unmarked/untagged hatchery females in production. Based on scale analysis, only Snake River hatchery or wild fish are used. Any Snake River origin fish not needed for production are passed upstream to "supplement" the natural population. The majority of unmarked fish in the Snake River are allowed to spawn naturally in the Snake River each year. All smolts released by WDFW for the program are imprinted on the unique Lyons Ferry water so returning adults are less likely to stray into other rivers. In addition, acclimation sites above LGR Dam have been

used by the Nez Perce Tribe to encourage returning adults to spawn in the area of release, thus encouraging supplementation of Snake River stock raised at Lyons Ferry Hatchery with natural Snake River stock. Further, the program emphasis has been to release yearling smolts at 10 fish/pound to increase smolt to adult returns and quicken our success at reaching recovery or mitigation. To mimic the lifecycle of natural fish and maximize rearing capacity at LFH, we also rear and release subyearling smolts at 50 fish/pound.

1.9) List of program "Performance Standards".

(From NMFS *Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest*, January 17, 2001)

3.1 Legal Mandates
3.2 Harvest
3.3 Conservation of Wild/Naturally Spawning Populations
3.4 Life History Characteristics
3.5 Genetic Characteristics
3.6 Research Activities
3.7 Operation of Artificial Production Facilities
3.8 Socio-economic Effectiveness

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

1.10.1) "Performance Indicators" addressing benefits.

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

3.1.1 Program contributes to fulfilling tribal trust responsibility
- *Total number of fish harvested in tribal fisheries targeting this program.*

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

3.1.3 ESA consultation(s) under Section 7 have been completed.
- *Section 10 permits have been issued, or HGMP has been determined sufficient under Section 4(d), as applicable.*

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

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

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

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

3.4.1 Fish collected for broodstock are taken throughout the return or spawning period in proportions approximating the timing and age distribution of the population from which broodstock is taken.
- *Temporal distribution of broodstock collection, and of naturally produced population at point of collection.*
- *Age composition of broodstock collected, and of naturally produced population at point of collection.*

3.4.4 Annual release numbers do not exceed estimated basin-wide and local habitat capacity, including spawning, freshwater rearing, migration corridor, and estuarine and near shore rearing.
- *Annual release numbers from all programs in basin and sub basin, including size and life-stage at release, and length of acclimation, by program.*
- *Location of releases.*
- *Timing of hatchery releases, compared to natural populations.*
- *Migration behavior of releases from this program.*

3.5.1 Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.
- *Genetic profiles of naturally produced adults, as developed at program's outset (e.g. through DNA or allozyme procedures) and compared to genetic profiles developed each generation (every 5 years).*

3.5.2 Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.
- *Total number of natural spawners reaching the collection facility.*
- *Total number of spawners estimated to pass the collection facility to spawning areas, compared to minimum effective population size (when established) required for those natural populations.*
- *Timing of collection compared to overall run timing.*

3.5.4 Juveniles are released on-station, or after sufficient acclimation to maximize homing ability to intended return locations.
- *Location of juvenile releases.*
- *Length of acclimation period.*
- *Release type, whether forced, volitional, or direct stream release.*
- *Proportion of adult returns to program's intended return location, compared to returns to unintended dams, fisheries, and artificial or natural production areas.*

3.5.5 Juveniles are released at fully smolted stage.
- *Level of smoltification at release, compared to a regional smoltification index (when developed).*
- *Release type, whether forced, volitional, or direct stream release.*

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

3.6.2 The artificial propagation program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving the experimental objective and evaluate beneficial and adverse effects on natural populations.
- *Monitoring and evaluation framework including detailed time line.*
- *Annual and final reports.*

3.7.1 Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP.
- *Annual reports indicating level of compliance with applicable standards and criteria.*
- *Periodic audits indicating level of compliance with applicable standards and criteria.*

3.7.2 Effluent from artificial production facility will not detrimentally affect natural populations.
- *Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc.*

3.7.3 Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment.
- *Water withdrawals compared to applicable passage criteria.*
- *Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria.*
- *Number of adult fish passing water intake point.*
- *Proportion of diversion of total stream flow between intake and outfall.*

3.7.5 Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines.
- *Number and location(s) of carcasses or other products distributed for nutrient enrichment.*

- *Statement of compliance with applicable regulations and guidelines.*

3.7.6 Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population.
- *Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution.*

3.8.1 Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.
- *Total cost of program operation.*
- *Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits.*

(Note-Currently, no fisheries target this population. The run is being rebuilt for future fisheries. At that time, the above indicator will be addressed.)

3.8.2 Juvenile production costs are comparable to or less than other regional programs designed for similar objectives.
- *Total cost of program operation.*
- *Average total cost of activities with similar objectives.*

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

(Note: In addition, WDFW believes there is value in the recovery and increase of the population or stock and the maintenance of stock characteristics. The indicator would be the number of returning fish to the Snake River. The goal would be that set for mitigation in the LSRCP.)

WDFW will use the above indicators to determine whether the population has declined, remained stable, or has been recovered to sustainable levels whether the program has provided the expected benefits. The ability to estimate hatchery and natural proportions will be determined by implementation plans, budgets, and assessment priorities.

1.10.2) "Performance Indicators" addressing risks.

3.2.1 Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species.
- *Annual escapements of natural populations that are affected by fisheries targeting program fish.*

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

3.4.2 Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.
- *Number of spawners of natural origin removed for broodstock.*
- *Number and origin of spawners migrating to natural spawning areas.*

3.4.3 Life history characteristics of the natural population do not change as a result of this artificial production program.
- *Specific life history characteristics to be measured in the artificially produced population include:*
  - Juvenile dispersal timing
  - Juvenile size at emigration, and emigration age composition
  - Adult return timing
  - Adult return age and sex composition
  - Adult size at return
  - Spawn timing, distribution
  - Juvenile rearing densities and distribution
  - Juvenile condition factors and survivals at several growth stages prior to final release
  - Adult physical characteristics (length)
  - Fecundity and egg size

  In addition, WDFW believes that smolt-to-adult survivals be included as an indicator.
- *Specific life history characteristics of the natural population to be measured at the program's outset and each generation thereafter include:*
  - Adult run timing
  - Adult return age, and sex composition
  - Adult size at return
  - Spawn timing and distribution
  - Adult physical characteristics (length)
  - Fecundity and egg size
  - Emigration age composition (based on scale analysis)

[Note: Needs to be coordinated with NMFS at LGR adult trap and agreed upon by co-managers of fall chinook in the Snake River. Additional funding would need to be secured to address this task. See Snake River Fall Chinook Hatchery Management Plan (in development)].

3.5.3 Artificially produced adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.
- *The ratio of observed and/or estimated total numbers of artificially produced fish on natural spawning grounds, to total number of naturally produced fish, for each significant spawning area.*

- *Observed and estimated total numbers of naturally produced and artificially produced adults passing a counting station close to natural spawning areas.*

(Note: We will supply the Technical Advisory Committee with the data needed to estimate the run of fall chinook to Lower Granite Dam. In addition we will address any questions the Technical Advisory Committee or other co-managers have regarding the dataset.)

3.5.6 The number of adults returning to the hatchery that exceed broodstock needs is declining.
- *Number of adults available for broodstock (moving geometric mean, based on number of ages at return for this species).*

3.7.4 Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.
- *Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence*
- *Juvenile densities during artificial rearing.*

3.7.7 Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.
- *Mortality rates in trap.*
- *Pre-spawning mortality rates of trapped fish in hatchery.*

(Note-This standard is also listed under benefits. In 2003 the program began including unmarked/untagged hatchery females in production. We are allowed by NMFS to retain all unmarked/untagged fish caught at LGR Dam as part of a systematic sub-sample of the population (11-15%). Based on scale analysis only Snake River hatchery or wild fish are used for broodstock, while stray fish are euthanized unless fall chinook brood fish are needed in another basin.)

3.7.8 Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.
- *Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.*

WDFW will use the above indicators to determine whether the program has or is, causing unacceptable impacts, or poses unacceptable risks to the listed natural populations within the Snake River Basin. The ability of the evaluation staff to estimate hatchery and natural proportions in the Snake River and other basins will be determined by implementation plans, budgets, and assessment priorities.

1.11) Expected size of program.

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

Age composition and fecundity of adults varies from year to year. To meet current smolt production goals as described in the 2005-2007 Interim Management Agreement for upriver Chinook, Sockeye, Steelhead, Coho, and White Sturgeon (submitted to US *v* OR

Civil No 68-523-KI)(900,000 yearlings, 2,200,000 subyearlings, and 1,000,000 eyed eggs), we will need to collect 3,600 Snake River origin fall chinook adults to meet production goals through Tier 1. Of the 1,449 females collected, we anticipate 145 females being natural origin and the remaining 1,304 would be hatchery origin. The estimated collection number takes into account a 9% prespawning mortality, which should leave 1,320 females (132 wild and 1,188 hatchery) available for production. This target number has been calculated from the following information. Average eggs/female is about 3,500 eggs. Survival has been 78.6% from green egg to yearling release (BY 2000-2003 data), 90.2% survival from green egg to subyearling release (BY 2000-2004 data), and 96.5% survival from green egg to eyed egg. Total eggtake of Snake River hatchery or natural origin fish therefore needs to be 4,620,332 to cover priorities 1-12 (Tier 1) as listed in the 2005-2007 Interim Management Agreement. Broodstock will consist primarily of marked fish; those with CWTs or visual implanted elastomer tags (VIE) that indicate their origin as Snake River hatchery produced fish. Broodstock will be supplemented with unmarked/untagged females of Snake River origin (wild or hatchery), a change from the earlier protocol. Origin is determined through scale analysis, and strays are destroyed or shipped out of basin if the eggs are needed elsewhere.

Between 1990-2002, NMFS required us to collect all fish of unknown origin at LGR Dam to remove potential strays from the spawning population above LGR Dam. Beginning in 2003, trapping at LGR Dam was modified to systematically collect 11% of the total run to the dam. This procedure allowed most unmarked/untagged fall chinook (now considered to be of Snake River origin) to pass the dam. In 2004, the trapping rate began at 15% then was reduced to 13% to accommodate trapping restraints and sampling needs.

Table 1. Fall chinook (Snake River Stock) production (2005 brood year) from LFH destined for the Snake River, based on in-season estimates of the run to LGR Dam.

Release Location (release method)	Stock	Production Goal	Life Stage
Lyons Ferry (direct)	Snake River	450,000	**Yearling**
Captain John (acclimated)	Snake River	150,000	**Yearling**
Pittsburg Landing (acclimated)	Snake River	150,000	**Yearling**
Lyons Ferry (direct)	Snake River	200,000	**Subyearling**
Captain John (acclimated)	Snake River	700,000	**Subyearling**
Pittsburg Landing (acclimated-IPC)	Snake River	400,000	**Subyearling**
Snake R. near Captain John (direct)	Snake River	400,000	**Subyearling**
Below Hells Canyon Dam (IPC)	Snake River	600,000	**Green egg**

Table 2. Fall chinook (Snake River Stock) production (2005 brood year) from LFH destined for the Clearwater River, based on the in-season estimates of the run to LGR Dam.			
Release Location (release method)	**Stock**	**Production Goal**	**Life Stage**
Big Canyon (acclimated)	Snake River	150,000	**Yearling**
Big Canyon (acclimated)	Snake River	500,000	**Subyearling**

Table 3. Fall chinook (Snake River Stock) production (2005 brood year) from LFH destined for the Grande Ronde River, based on the in-season estimates of the run to LGR Dam.			
Release Location (release method)	**Stock**	**Production Goal**	**Life Stage**
Grande Ronde near Cougar Creek (direct)	Snake River	400,000	**Subyearling**

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

The current production level for on-station releases at LFH is 450,000 yearling smolts and 200,000 subyearling smolts (Table 1). Production for releases above LGR Dam is 450,000 yearling smolts and 3,000,000 subyearling smolts (Table 2 and Table 3). Additionally, there are always requests for research fish. Managers consider existing agreements and the potential benefits from proposed research requests on a case-by-case basis. The original LSRCP production goal was 9,160,000 subyearling smolts at a density index of 0.53. To increase returns, the program was switched to some yearling production to yield a 11-fold benefit for smolt-to-adult returns. Current plans are to continue rearing yearlings until population abundance and subyearling survival increases. Total production has been reduced due to reflect rearing constraints at LFH. Loading densities have been lowered in an attempt to improve fish health and the quality of fish released from the hatchery.

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

Returns of fall chinook reared at LFH and released into the Snake River have been estimated through coded-wire tag recoveries from fisheries and adult traps, or from inference from other groups released in the Snake River Basin (Table 4). Fish over the age of 3 (total age) are considered adults, since fork lengths are not available for all recoveries. Original mitigation requirements used length of fall chinook seen at dams to designate adults. Table 4 is based on age by CWT recovery data and over-estimates the number of returning adults because of variations in fork lengths of younger fish (jacks). Data have been consolidated from WDFW's LSRCP Annual Reports for the fall chinook program at LFH. Under the original LSCRP goals, production returns of 0.2% back to the LSRCP area (above Ice Harbor Dam) would satisfy WDFW mitigation responsibilities in the Snake River. However, production was reduced from 9.160 M and ultimately adult returns are the measure of mitigation success, not meeting original SAR rates. Returns of fall chinook released from LSRCP release sites (LFH and NPT acclimation sites) have also been included in Table 5. Generally, returns have been well below the mitigation goal of 18,300 fall chinook.

Table 4. Preliminary smolt-to-adult survival rates from Snake River stock (hatchery produced) fall chinook released into the Snake River from Lyons Ferry Hatchery (1989-1998 broodyears, returns from onstation releases are combined with returns from barged releases. Releases from upstream acclimation sites are not included). Based on CWT recoveries and wire tagged fish returning to LGR Dam.

Brood year	Age at release	Total age at return	SAR to LSRCP area (%)		total SAR (%)
			Snake River	Columbia River	
1989	Subyearling	≥ 3	160 (0.033)	88 (0.018)	432 (0.089)
1990	Subyearling	≥ 3	196 (0.088)	79 (0.036)	461 (0.205)
1990	Yearling	≥ 3	260 (0.039)	93 (0.014)	456 (0.068)
1991	Yearling	≥ 3	672 (0.090)	160 (0.021)	1110 (0.148)
1992	Subyearling	≥ 3	472 (0.232)	193 (0.095)	819 (0.403)
1992	Yearling	≥ 3	1005 (0.168)	985 (0.165)	2610 (0.437)
1993	Yearling	≥ 3	2071 (0.596)	757 (0.218)	3644 (1.048)
1994	Yearling	≥ 3	1796 (0.442)	427 (0.122)	2532 (0.623)
1995	Yearling	≥ 3	6234 (1.431)	1338 (0.307)	9335 (2.533)
1996	Yearling	≥ 3	1771 (0.312)	491 (0.086)	2967 (0.522)
1997	Yearling	≥ 3	3796 (0.883)	1694 (0.394)	9030 (2.099)
1998	Subyearling	≥ 3	910 (0.449)	373 (0.184)	1808 (0.891)
1998	Yearling	≥ 3	4089 (0.902)	1510 (0.333)	8615 (1.900)

Table 5. Estimated adult returns of fall chinook from the LSRCP program to the Snake River Basin. Based on CWT recoveries at LFH, LGR adult trap, the Tucannon River, and the run reconstruction at LGR Dam. Includes recoveries from fall chinook returning from LFH and NPT acclimated releases. Jacks in this table are less than 53 cm fork length.

Return year	Returns to the Snake River Basin	
	Adults	Jacks
1995	1,274	2,071
1996	1,227	548
1997	1,227	711
1998	3,586	1,227
1999	4,091	1,209
2000 [a]	4,353	4,239
2001 [a]	9,009	4,995
2002 [a]	11,674	4,918
2003	10,780	6,775
2004 [b]	10,762	1,780

a Preliminary returns to the Snake River Basin based upon personal communication with [a] Norma Sands, NOAA on 9/17/04.

[b] Preliminary conservative estimate that will increase when run reconstruction to Lower Granite Dam is finalized. Estimate was made using a 15% trap rate although the majority of the season the trap rate was 13% at LGR Dam.

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

The egg bank program began in 1976. Releases of fall chinook into the Washington portion of the Snake River from LFH first occurred in 1985.

1.14) Expected duration of program.

Indefinitely continue mitigation under the LSCRP.

1.15) Watersheds targeted by program.

Snake River.

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

1.16.1) Brief Overview of Key Issues

A comprehensive fall chinook hatchery management plan is needed to reduce annual repetitive discussions on continuing issues, and to assure all players are focusing on the same plan. This plan should improve coordination of programs in the basin. The relationship between *US v Oregon* and LSRCP goals should be clarified. *US v Oregon* states 33,500 fish to McNary Dam as a goal while the LSRCP was based upon 97,500 fish to McNary or 32,663 fish to the Snake River.

The continued operation of the LGR Dam trap for, stock identification, broodstock collection, and management purposes is in question. The trap at LGR Dam was designed for research sampling, not for examination of the run at large. In years prior to 2003, run reconstruction efforts were done without confidence intervals. The experimental technique employed in 2003 allowed for estimates of the run with confidence intervals. With increased returns of salmon and steelhead to the Snake River, the trap at LGR Dam is able to sample just a small portion of the return. In 2003, the trapping schedule was modified to trap 11% of the returns to LGR Dam. All fish were trapped equally regardless of the presence or absence of wire. The final analysis of the 2003 run will be completed by November 2004. In 2004, the trapping schedule was increased to 15% but was reduced to 13% because of trapping and sampling restraints. In the future we hope to continue with a fixed sampling scheme to provide an accurate run reconstruction.

Another issue of concern is the inability to determine the status of the natural origin returns to the Snake River and the survival of their progeny. To accomplish this, adequate marking of hatchery releases is needed to track their return to the region as adults. In the past, unmarked/untagged, unassociated hatchery fish have been allowed above LGR Dam. These fish complicated the estimates of true wild fish. Currently we are scale-sampling at LGR Dam to determine the origin of a sub-sample of unmarked/untagged fish which will be used in the run reconstruction. Studies to compare the relative reproductive success of

hatchery origin and natural origin fall chinook need to occur to determine the effects hatchery fish have on natural fish. A study to address this issue by using a mixture analysis approach began in 2004. Phase I of this study will determine how different the genetics of natural fish are compared to hatchery fish to determine if this genetic tool is capable of being used to assess questions of reproductive success.

Stray fall chinook to LGR are a serious concern of NOAA Fisheries, who have required trapping and removal of them at the LGR Dam adult trap facility in the past. Again, with increased fish returns it is impossible to remove all strays at LGR Dam with the research trap. Increased releases of Snake River fall chinook above LGR Dam, and decreased numbers of yearling fall chinook released from Umatilla Hatchery, have decreased the rate of strays detected in the fall chinook return to the Snake River. Based on these findings, NOAA allowed percentage sub-sampling without further stray removal to occur at LGR Dam in 2003 and 2004.

Multiple juvenile release strategies (size and time of release, direct vs. acclimated, location of release, etc.) need to be evaluated to allow greater program flexibility and options for success. The original LSRCP Plan stated that 9,160,000 subyearling smolts returning at 0.2% were expected to return 18,300 hatchery fall chinook to the Snake River. Lyons Ferry hatchery (LFH) was built to produce these fish. However, with current constraints at LFH that require decreased rearing densities to reduce disease problems, the goal of LSRCP may never be met at survival rates (SAR) presently being measured. Currently only 1.1 million yearlings and 2.2 million subyearlings can be reared at LFH. No expansion of numbers reared/released at LFH can occur without facility expansion. If LFH were expanded, other release sites or methods may need to be investigated to help us achieve our goal with this endemic brood chinook. Recent production years (2001 & 2002) have taxed existing release facilities above LGR Dam. Some of the Nez Perce Tribe's FCAP facilities have been used to release up to three different groups of yearlings and subyearlings. Washington is concerned that late releases may subject juveniles to poor in-river conditions, not coinciding with the best release timing for optimum survival. This may be exacerbated as NPTH reaches full production and facility space is more constrained. Washington suggests releases of LSRCP fish from the Big Canyon facility be reduced or shifted in the future to meet other management needs, but there is significant disagreement on this issue at this time. Acclimation and release numbers are currently being discussed during development of the Snake River Hatchery Fall Chinook Management Plan, and disagreements may be resolved in that forum.

Even with future LFH expansion, fishery manipulation within the Columbia basin can affect escapement to the Snake. To help ensure LSRCP program success, a Snake River escapement goal needs to be negotiated through the US v OR process. Without a Snake River goal, natural production escapement, hatchery brood escapement and potential future fisheries can be driven by Columbia River fall chinook abundance as measured at McNary Dam.

LFH hatchery initially used Snake River stock fall Chinook as broodstock and now uses known Lyons Ferry hatchery returns. The broodstock began using run-of-the-river fall chinook in the late 1970s. In 1989 the composition of run-of-the-river fish had a large

component of strays. Stray fish observed at LGR Dam raised the question of the integrity of the natural run above LGR. Managers agreed that future LFH produced salmon (of known Snake River stock) would be used to supplement the run. In 2004 LFH hatchery began including naturally produced Snake River fish with known Hatchery Snake River Stock in their broodstock. Broodstock may eventually contain up to 20% natural origin salmon.

Increased demand for LFH origin eggs and fish to be released above LGR (Idaho Power, Nez Perce Tribal Hatchery, Grande Ronde River releases) may tax the ability of LFH to provide these products. Expanded broodstock collection locations and options may be needed (NPTH, Hells Canyon Dam, expanded LGR facility). Normalization of fish health standards, especially relating to Bacterial Kidney Disease (BKD), must occur for expanded inter-state transfer of gametes or fertilized eggs. Fish health managers will especially need to reach agreement on the disposition of eggs or fish from high ELISA females.

Another issue involves some of the basic premises for mitigation for Snake River fall Chinook. Mitigation was based on compensation for a 48% loss of fall chinook salmon abundance because of the four Lower Snake River dams, plus compensation for 5,000 adults that would have spawned in the lower Snake River. It was assumed that the remaining fall Chinook run would be self-sustaining. The naturally producing portion of the run has declined. Dams and reservoirs limit survival of both hatchery and wild fish, reduce spawning and rearing habitat, and limit harvest opportunities in much of the lower Snake River. Therefore, dam removal or additional mitigation should be considered to meet the intent of the LSRCP.

1.16.2) Potential Alternatives to the Current Program

Alternative 1: Evaluate direct stream releases of sub-yearlings.
Under new low density rearing strategies at LFH, there will be production constraints that limit the size of the program. Direct releases would allow us to release fish at optimal size, health and release time to match river flow; potentially optimizing survival. Because of capacity constraints at acclimation sites, fish scheduled for the late (second) release are held back at LFH until the acclimation pond has completed its first release. This delay in timing of releases may subject these fish to higher water temperatures and lower river flow. Although handling of chinook smolts by trucking has been shown to decrease their survival rate in some cases this would be a very cost effective approach versus construction and O&M costs associated with new acclimation facilities. Direct stream releases are currently being discussed as an option. (Note: a study began in 2005 to address this alternative, which will compare direct releases near Captain John Rapids Acclimation facility with an acclimated release at the same site)

Alternative 2: Build more acclimation facilities above LGR Dam.
This would allow more fish to be released in better condition because of timing and densities. This option could produce better survival and homing from fall chinook than using Alternative 1, but is a very expensive alternative and should not be pursued until completion of a study to measure the efficacy of direct releases is completed. Acceptable acclimation sites are limited in the basin. Additional discussion is needed before this can move forward.

Alternative 3: Use Cottonwood acclimation pond for fall chinook acclimation.
Cottonwood pond is located on the lower Grande Ronde River, a tributary to the Snake River, and is currently used for steelhead but could be modified for fall chinook use by providing a new intake system. These modifications have already been identified as part of the NEOH process and would be considerably more cost effective then new construction. Acclimation would return adults to an area of the Grande Ronde with relatively poor fall chinook habitat, but could improve juvenile survival and provide flexible release timing options. Additional discussion is needed before this alternative can proceed. Discussions may benefit from results from direct stream releases in Alternative 1. (Note: a direct release of fish into the Grande Ronde occurred in 2005. Returns of these fish will provide an idea of what to expect from releases into the Grande Ronde River)

Alternative 4: Implement broodstock trapping for the Snake River fall chinook program at NPTH and Hells Canyon Dam for IPC and NPTH program needs.
Broodstock collection at LFH to cover all programs is difficult. Variable trapping rates can limit LFH's ability to meet broodstock needs in some years. Conversely, during large run years adult holding capacity could be exceeded, causing unnecessary stress on broodstock. Moreover, facility limitations at Lower Granite Dam have been identified and managers began a new sampling protocol to improve data quality for run reconstruction and management decision making. This protocol limits the ability of LGR to provide fall chinook broodstock to any facility. This alternative would reduce pressure on LGR and LFH by diversifying collection to other locations, and meet a similar goal identified in the Draft Snake River Fall Chinook Management Plan. By diversifying collection sites to include NPTH and a trap at HC Dam, trapping at LFH and LGR could decrease to the level needed for run reconstruction purposes and the monitoring of the natural population above LGR Dam. It would also allow WDFW to focus on meeting LSRCP needs at LFH. Additional discussion is needed under the fall Chinook management plan.

Alternative 5: Modify the adult trap at LFH to facilitate broodstock selection and handling.
Modifying the adult trap at LFH by attaching an anesthetic tank and handling chute would allow fish to be sampled immediately and released to the river or retained for broodstock. This would benefit natural origin fish by allowing them to return to the river the same day they are captured. In addition, we would be able to target an exact number of females to retain. Currently, any fish trapped is retained up to 45 days until sorting. At that time, with our current broodstock constraints, unmarked/untagged fish (possibly natural origin) are sampled and hauled back to the Snake River and excess females are returned to the river. By handling and sorting fish immediately, we could reduce the number of fish on hand in the broodstock ponds, which may help address concerns raised in Alternative 4. This option is being considered.

Alternative 6: Convert Umatilla River fall chinook production to Snake River stock.
Fish released in the Umatilla River are consistently the number one contributor to strays in the Snake River and at LFH. Lyons Ferry is presently the sole distributor of Snake River stock fall chinook eggs to the Snake River basin. This alternative would decrease the effect these fish have on the natural spawning populations in the Snake River and simplify spawning protocol at LFH. The conversion would require difficult decisions by managers

about allocation of eggs for production, and LFH would not be able to provide all the eggs needed for changing of stock for the Umatilla River without a reduction in egg requests by other agencies. It is unknown if this stock change would exacerbate straying from the Columbia River to the Snake River, or if it would present a problem to other Columbia River stocks if they strayed elsewhere. Mixed genetic parentage during the conversion to a new stock in the Umatilla could pose significant tagging or identification problems, especially if the progeny then strayed into the Snake River. This option will be discussed further, but it may cause more straying problems than it alleviates and it may reduce the LSRCP production in the Snake River basin from Lyons Ferry Hatchery.

Alternative 7: Release an additional 200 K subyearlings at LFH.
Pros: This would allow for studies to compare size and time of release to maximize SAR from subyearling production. This would also increase the abundance of fish for broodstock at LFH to meet increasing demands, but may not be possible without increased rearing space at LFH. This option is still under discussion.

1.16.3) Potential Reforms and Investments

Reform/Investment 1: Complete a comprehensive Snake River Fall Chinook Hatchery Management Plan. This plan has been in the works for many years. Because of the diversity of players in the Snake Basin, conflicting goals listed in *US v Oregon* and LSRCP documents, and differing opinions on ranking of release sites and production needs, crafting of the Plan has been delayed. The returning adult goals for fall chinook as listed in the *US v Oregon* documents and the LSRCP goal need to be aligned. By using an escapement goal at McNary that is less than originally used in the LSRCP, Snake River fish can be harvested at a greater rate in the lower Columbia R., thus decreasing the number of fall chinook available to spawn or for harvest in the Snake River. This process is currently underway and is expected to be completed by late 2005 at a cost of $.

Reform/Investment 2: The current need for multiple release groups and sizes of groups to meet US v OR, LSRCP and IPC production has over taxed the facility at LFH. Increased rearing space (raceways or rearing ponds) with additional water supply would provide for increased production and flexibility to meet the growing demand for Snake River stock fall chinook in the basin, while not crowding out (competing for space with) other programs at LFH. Encouraging more self-reliance by the NPTH and IPC programs will help alleviate this problem as well. New construction is very costly but may be the only answer for the basin. $$$$$

Reform/Investment 3: Fund increased evaluation marking. Mark more fish in the basin so that all release groups can be evaluated upon return. The use of PIT tags for hatchery release groups could be cost effective compared to modifying the trap at LGR (**R/I-5**), but natural production probably could not be tagged representatively. Increased costs could be $$$

Reform/Investment 4: Construct or modify alternate release sites like Cottonwood Pond on the Grande Ronde River. Cost would be highly variable. Modifying Cottonwood could be in the $$$ range, while building new sites could range from $$$$ to $$$$$.

Reform/Investment 5: Modify the adult trap at LGR Dam to provide a facility capable of handling more fish during peak run periods. The present facility was constructed as a research trap and was never intended to be used for management of runs (stray fall chinook removal) or to sample all fish passing the dam. Run reconstruction for management and as required by US v OR needs to attain greater confidence in the estimates of hatchery and wild fish to the Snake River. This will be very costly and will require close coordination with COE, but is an extremely critical area for overall Columbia basin management decisions $$$$$.

Reform/Investment 6: Management might be enhanced if an alternative dam were chosen as the site of fall chinook management. The Snake River Fall Chinook Hatchery Management Plan (currently in draft) identifies Lower Monumental Dam as that site. McNary Dam, located on the Columbia River below the mouth of the Snake River, enumerates, and has an escapement goal, for all upriver bright fall chinook. To better estimate Snake River brights, we suggest establishing return goals and enumerating at Lower Monumental Dam, the second dam on the Snake River. Lower Monumental Dam is preferred over Ice Harbor because of the occurrence of Hanford/Columbia River fish dipping into the Snake River, which can elevate the estimate of fall chinook in the Snake River. The error rate in ladder counts at IHR Dam was documented to be as high as 64% in 1993, during a telemetry study done by Mendel and Milks (1997). These fish have been documented as dipping into the Snake River, crossing IHR Dam and eventually being detected on spawning grounds in the Yakima or Columbia rivers above the confluence to the Snake River. If additional costs would be incurred at Lower Monumental Dam for adult counts they may be in the range of $ or $$.

Reform/Investment 7: The co-managers have identified the need to include natural origin recruit (NOR) adults into the broodstock at LFH to prevent genetic separation of the hatchery and wild populations. Presently, unmarked strays and untagged/unmarked Snake River stock fall chinook released above LGR are difficult or impossible to identify in a timely manner during the spawning process at LFH. This has prevented inclusion of NORs in the broodstock since 1990. A uniform marking strategy within the basin is needed to be able to monitor straying into the Snake River. Utilizing scale analysis to determine NORs from hatchery origin recruits could be an interim solution that would allow NORs to be included. This reform could be instituted with adoption of **R/I #3** above. Additional genetic or scale sampling should cost $. (Note: In 2004 we began including NOR adults (based on scale analysis) in the broodstock at Lyons Ferry Hatchery)

For reference

$	<$50,000
$$	$50,000-<$100,000
$$$	$100,000-<$500,000
$$$$	$500,000-<$1,000,000
$$$$$	$1,000,000-<$5,000,000
$$$$$$	Over $5,000,000

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

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

For the Lyons Ferry LSRCP program, WDFW currently has submitted an application for a Section 10 Permit to replace Permits #1126 (research activities on the Tucannon and Asotin Creek), and #1129 (hatchery supplementation for Tucannon River spring chinook) and another Section 10 permit pending for the operation of Lower Granite Trap; USFWS Consultation with NMFS for LSRCP actions and the NMFS Biological Opinion; and a statewide Section 6 Consultation with USFWS (Bull Trout). In addition, HGMPs have been developed for the Tucannon and Touchet River Endemic steelhead broodstock programs (Touchet River is still under review), Snake River Fall Chinook (Snake River Stock), Tucannon Summer Steelhead (Tucannon and LFH Stock), Walla Walla Basin Summer Steelhead (LFH Stock), Snake River Summer Steelhead (LFH Stock), and Grande Ronde River Summer Steelhead (Wallowa Stock).

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

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

Washington Department of Fish and Wildlife has documented natural fall chinook populations (Snake River ESU) in the Snake River in Washington State. In addition, ESA listed Columbia Basin bull trout, Snake River spring/summer chinook, and Snake River natural-origin steelhead are within Snake River Basin areas that may be affected by this program.

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

Snake River Basin natural and hatchery origin fall chinook are part of the listed Snake River ESU. Both natural and hatchery origin adult fall chinook are intentionally collected for broodstock. We anticipate needing 3,600 adults of Snake River origin fall chinook (natural and hatchery). It is difficult to determine at what level the natural fish are present in our broodstock since not all hatchery releases into the Snake River are presently tagged or marked. Based upon scales analysis of unmarked/untagged volunteer fall chinook at LFH in 2003, 3.7% were of natural origin, 80.2% were from LFH origin subyearling releases, 14.8% were from out-of-basin yearling releases (assumed stray), and 1.2% were of unknown origin because of unreadable scales.

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

Trapping for program needs:

ESA listed Snake River spring/summer chinook, and summer steelhead are incidentally trapped at LFH and LGR Dam while fall chinook are being targeted. Trapping begins August 18 at LGR Dam to avoid trapping most summer chinook run. Similarly, the LFH adult trap does not open until September 1 to avoid trapping spring/summer chinook. At that time it is still possible that listed Snake River spring/summer chinook may be captured. When trapped, the fish are immediately shunted into a raceway and not sorted again until the last week of September. Spring/summer chinook are documented at the traps through CWT recoveries. The average number of CWT spring/summer chinook incidentally caught over the last five years during fall chinook trapping is six fish.

Natural-origin adult steelhead can be incidentally collected during the trapping for fall chinook broodstock at LFH, although it is very rare (Snake River Steelhead HGMP). These fish are sorted out at spawning and returned to the river. Under the new trapping protocol at LGR Dam, 11-15% of natural origin steelhead may be handled and released during the fall chinook trapping period. Fish are examined for marks and released immediately back into the fish ladder.

ESA listed Columbia Basin bull trout are also present in the lower Snake River Basin, although they have never been documented as being trapped at LFH or LGR Dam during fall chinook trapping. Therefore, Columbia Basin bull trout have not been directly affected by the trapping portion of the mitigation program as described. For more information regarding bull trout, please refer to the USFWS Lower Snake River bull trout recovery plan.

In river concerns regarding fish released or returning from this program:

The hatchery production program may incidentally affect listed Snake River summer steelhead, Snake River spring chinook, and Columbia Basin bull trout.

Fall chinook –Fall chinook are generally considered an 'ocean-type' (after sea-type, in Gilbert, 1913) run of salmon which migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate. Adults enter the mouth of the Columbia River in the early fall and spawn during October and November (Rondorf and Miller, 1993; Dauble and Watson, 1997). Adult Snake River fall chinook enter the Columbia River in August and migrate into the Snake River from late August through November.

Fall chinook in the Snake River primarily spawn in the Hells Canyon reach between Hells Canyon Dam and the Clearwater River. Fall chinook in the Clearwater, Grande Ronde, Imnaha, and Salmon rivers are considered segments of the Snake River population. Nez Perce Tribe and WDFW biologists have documented the number of fall chinook redds in the Grande Ronde since 1986 (Glen Mendel, WDFW pers. comm. 2002). Redd counts have ranged from 0-197 since 1986 in the area between the mouth and Troy, Oregon (Rkm 73). The ten-year most recent (1995-2004) average is 70 (SD=67.7). Approximately 87.6% of the redds observed in 2004 and 78.0% of the redds observed in 2003 were located between the Grande Ronde River mouth and Cottonwood Creek. Spawning occurs from

late October through early December, with fry emergence during April. Most out-migration occurs within several months following emergence with peak migration past Lower Granite Dam in late June. Some migrate out through fall and some over-winter before migrating (Connor et al. 2005). Competition for food and space is possible.

Hatchery-origin fall chinook (from this program) are intended to primarily spawn upstream of LGR Dam into local or other tributaries where natural origin fall chinook spawn. Spawning with hatchery origin fish may reduce the reproductive success of natural spawners, but at this time it is unknown to what extent, if any.

Juvenile hatchery fall chinook released as smolts may compete for food and space with naturally reared fall chinook during the migration period. It has also been documented that reservoir rearing is also occurring in the Snake River, which would increase the chance that these fish are competing for food and space with the naturally reared fall chinook. In 2004, scale samples were taken on unmarked/untagged returning adults. Of 443 fish that were determined to be of natural Snake River Origin, 257 (58.0%) showed yearling outmigrant patterns indicating they reservoir reared. Reservoir rearing is also occurring in unmarked/untagged Snake River Origin hatchery fish at a rate of 55.9%, based upon scale sampling of 463 fish during spawning activities at Lyons Ferry Hatchery. This phenomenon is occurring in subyearlings released above LGR Dam. Competition with reservoir-reared fish, however, is generally minimized because of release size (yearlings and larger than natural subyearlings), condition of fish at release (smolts), and release method (volitional release). Further, hatchery-origin fall chinook from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Regional protocols are followed to ensure healthy fish upon release.

Summer steelhead – Snake River basin summer steelhead are comprised both of A-run and B-run components. Most A-run adults (60%) return to the basin after one year of ocean rearing. The remainder are two-ocean age adults with an occasional three-ocean age fish. Females generally predominate with a 60/40 sex ratio on average. Returning adults range in size from 54 to 85 cm and 1.4 to 6.8 kg. Adults generally enter the Columbia River from May through August, subsequently entering the Snake River from July through the following March. Adults in the lower Snake River basin (Washington State) may utilize tributaries to the mainstem. Most B-run adults (60%+) return as two ocean age fish, with less returning as 3-ocean, and the least as one-ocean age. Adults generally return in size from 70-100 cm and 3.0-10.0 kg. B-run fish enter the Columbia beginning in August and continue through early October. The extent of mainstem spawning for both runs is not well documented.

Spawning begins in March in the tributaries and continues until May. Juveniles utilize a wide range of habitats throughout the basin including areas adjacent to smolt release locations. Most naturally produced smolts migrate after rearing for two years. A much lower percentage migrate after one or three years. Smolt out-migration through the lower Grande Ronde Basin extends from late winter until late spring, thereby overlapping with hatchery fall chinook smolts releases as described for this program. Peak smolt movement is associated with increased flow events between mid-April and mid-May (Ann Setter – ODFW, pers. comm.).

Spring chinook –Spring chinook adults utilize the Snake River primarily as a migration corridor to reach to the headwater streams in the Tucannon, Clearwater, Grande Ronde, Imnaha, and Salmon River basins. Spawning in the mainstem has not been well documented. Juvenile utilization in the Snake River is minimal due to high summer water temperatures. Natural origin spring chinook juveniles in the mainstem Snake River would likely rear for one year and smolt the following spring. However, due to growth potential, it may be possible to produce a subyearling smolt. Smolt migration from the basin begins in November (earlier in the Tucannon) and extends through early July, thereby overlapping with the hatchery fall chinook production from this program (Fish Passage Center).

Juvenile hatchery fall chinook released as smolts may compete for food and space with naturally reared spring chinook following release. However, this is generally minimized because of release size, condition of fish at release (smolts), release method (volitional release), and migration timing. Predation by chinook smolts is unlikely due to size constraints (See Section 3.5). As with the other species, hatchery-origin fall chinook from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Regional protocols are followed to ensure healthy fish upon release.

Bull trout – Both fluvial and ad-fluvial life history forms of bull trout inhabit a number of tributaries to the lower Snake River. The lower mainstem in Washington State is likely utilized as a migration or over-wintering corridor. Fluvial adults migrate into tributary headwater areas during summer and early fall. Spawning for both resident and fluvial adults occurs in late August through October. Fry emerge during the spring or summer. Juvenile rearing is restricted to headwater areas by higher water temperatures downstream, and therefore bull trout juveniles will not be located in areas of hatchery fall chinook juveniles from this program.

However, juvenile hatchery fall chinook released as smolts may compete for food and space with the fluvial and resident forms of bull trout as some degree of extended rearing by hatchery fall chinook following release is expected. Time spent together may be limited because of release size, condition of fish at release (smolts), release method (volitional release), and time of release. Predation of hatchery fall chinook on bull trout in the migration corridor is not likely limited due to size (See Section 3.5). Bull trout associated with areas influenced by migrating or residual hatchery fall chinook are generally fluvial adults and are more likely to out-compete or prey on hatchery fall chinook due to a significant size advantage. As with the other species, hatchery-origin fall chinook from this program have the chance to spread diseases to natural ESA listed populations during the migration period. Regional protocols will be followed to ensure healthy fall chinook at release.

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**.

Fall Chinook – Natural and hatchery origin fall chinook in the Snake River are listed as "threatened" under the ESA as part of the Snake River ESU. The spawning populations in the lower Grande Ronde, Clearwater, Imnaha, and Salmon rivers are considered part of the larger composite population for the entire Snake River Basin. Spawners consist of natural and hatchery origin fish (LFH – which rears Snake River stock fall chinook). Lyons Ferry fall chinook hatchery releases occur throughout the Snake River Basin from LFH and Idaho Power facilities, acclimation facilities operated by the Nez Perce Tribe, in the Clearwater Basin from an acclimation facility operated by the Nez Perce Tribe, and in the Grande Ronde River as a direct release.

Spring/summer Chinook – Natural origin spring/summer chinook in the Grande Ronde Basin are listed as "threatened" under the ESA as part of the Snake River spring/summer chinook ESU. Local populations of spring/summer chinook in the Washington portion of the Grande Ronde exist in a few isolated tributaries (N.F. Wenaha, Butte Creek). Remoteness and inaccessible areas in both of these tributaries have limited the ability of WDFW to assess population status. Substantial use occurs in tributaries and the mainstem of the Wenaha River in Oregon. The mainstem Grande Ronde River in Washington does not likely contain a spring chinook population due to limited rearing capabilities for juveniles (high summer water temperatures).

Summer Steelhead – Natural origin summer steelhead in the Snake River and Grande Ronde basins are listed as "threatened" under the ESA as part of the Snake River ESU. The status of local stocks in small tributaries within the Washington portion of the Grande Ronde is classified as either depressed (due to their relatively small size), or unknown. Remoteness and inaccessible areas have limited the ability of WDFW to assess stock status as well as distribution of small tributaries that produce steelhead.

Bull Trout – Natural origin fluvial and ad fluvial bull trout in the Snake River are listed as "threatened" under the ESA as part of the Columbia basin bull trout distinct population segment (DPS). In the Washington portion of the Snake River, sub-populations of bull trout exist only in tributaries of the Snake River because of habitat requirements for spawning and rearing.

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

Data is not available at this time. Since Snake River fall chinook are mainstem spawners, it is difficult to determine productivity or survival data by life stage. There is a smolt trap operated by the IDFG on the Snake River just above the confluence with the Clearwater River. The smolt trap only monitors fish using the Snake River corridor between Hells Canyon Dam and Lewiston and does not function for fall chinook. There are also smolt traps in the lower Tucannon, Clearwater, and Grand Ronde rivers.

The measure of productivity for Snake River Basin fall chinook is currently estimated by looking at trends in redd counts for several basins including the Clearwater, Grande Ronde, Imnaha, and Salmon rivers. Also, redd counts have fluctuated over the years and often are underestimated due to water clarity and weather conditions on the day the river is surveyed. Unfortunately natural fish productivity cannot be determined (separated) from the mixed natural/hatchery population. However, the WDFW has received funding to conduct an experimental DNA based reproductive success study on Snake River fall chinook to address this question. Currently, broodstock trapping at LGR Dam provides some indication of the abundance of natural and hatchery spawners returning to the Snake River and spawning grounds above LGR Dam.

Table 6. Natural and hatchery origin (includes all hatcheries) adult fall chinook passed above LGR Dam to continue migration to spawning areas. Data compiled using LSRCP annual reports.

Year	Natural adults	Hatchery adults	Snake River redds	Asotin Creek redds	Clearwater River basin redds	Grande Ronde River basin redds	Imnaha River basin redds	Salmon River basin redds
1988	368	259	64	0	21	1	1	0
1989	295	411	58	0	10	0	1	0
1990	78	258	37	0	4	1	3	0
1991	316	274	46	0	4	0	4	0
1992	549	119	47	-	26	5	3	1
1993	742	210	127	-	36	49	4	3
1994	406	201	67	-	37	15	0	1
1995	350	285	71	-	20	18	4	2
1996	639	280	113	-	69	20	3	1
1997	796	211	58	-	72	55	3	1
1998	304	658	185	-	78	24	13	3
1999	905	957	373	-	184	13	9	0
2000	1171	1497	346	-	173	8	9	0
2001	5216	5291	709	-	336	197	38	22
2002	2235	8155	1113	-	527	111	72	31
2003	3856	9649	1512	3	572	93	43	18
2004	4756	9870	1709	4	631	161	35	17

- Provide the most recent 12 year (e.g. 1988-2004) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

See Table 6 and explanation under section 2.2.2.

- Provide the most recent 12 year (e.g. 1988-2004) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

Data is not available at this time. See Table 6 and explanation under section 2.2.2. We are unable to tell if or how many of the natural fall chinook that passed LGR Dam spawned.

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.

Trapping activities: ESA listed Snake River spring/summer chinook and Snake River steelhead (Snake River ESU) are incidentally trapped at LFH and LGR Dam, while fall chinook are being targeted. Duration of trapping at LGR Dam is generally August 18-November 27. Trapping may end earlier if we have attained our full production needs. Take at LGR Dam will be addressed in a Section 10 Permit which is anticipated to be in place August 2005. Occasionally, spring/summer chinook are misidentified and shipped to LFH. It isn't until the fish dies or is seen at spawning that the fish is identified as a spring/summer chinook. Unfortunately, by then the fish is in too poor of condition to be returned to the spawning grounds and thus is kept from spawning in the wild. Similarly, the LFH adult trap does not open until September 1 to avoid trapping spring/summer chinook. At that time it is possible that listed Snake River spring/summer chinook may be captured. When the fish are being trapped it is difficult to differentiate spring/summer chinook from fall chinook when they are coming down the sorting chute. Early in the season when fish are trapped, the fish are immediately shunted into a raceway and not sorted again until the last week of September. Spring/summer chinook are confirmed at the traps through CWT recoveries. The average number of CWT spring/summer chinook incidentally caught over the last five years (2004-2000) during fall chinook trapping was five fish from LFH and three fish from LGR Dam. Over the last five years, approximately 6,300 fish annually have been trapped for the fall chinook program and associated management needs.

Listed summer steelhead adults (Snake River ESU) will be incidentally trapped from August 18 through November at the LGR adult trap (Take Table 1). Under a new fall chinook trapping protocol for the LGR Dam adult trap, approximately 10-15% of fish passing the dam will be handled. As a result, 10-15% of wild steelhead passing the dam at that time will be incidentally handled, and up to 3% of the total sample may be directly sampled for steelhead run composition information by Idaho Fish and Game Personnel. Those fish will be released back to the fishway to continue upstream to spawning areas. At LFH, all steelhead incidentally trapped will be placed in a holding pond with the fall chinook. It is possible for these fish to be held up to 24 days before they are initially sorted. After sorting, they will be moved to the steelhead raceways, held an additional 21 days (chemical withdrawal period), then released into the Snake River. For estimated take, see Snake River Steelhead HGMP.

Spawning, Rearing and Releases: Once spawning begins, fish will be checked weekly, but fish to be released will still require a 21 day holding period because of chemical withdrawal requirements. Rearing/release of fall chinook from LFH has a potential for indirect take of listed fall chinook that may be present in the mainstem of the Snake River. The release of Snake River Stock fall chinook may incidentally affect (take) other listed salmonids (spring/summer chinook, steelhead, bull trout) in the Snake River by displacement or competition. In addition, smolts that might residualize or over-winter will also compete for food and space, though

we believe this is minimized because released fish are generally fully smolted to maximize emigration. An estimate of the annual take level to each of these species is not possible.

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

Operation of the adult trap at LFH, during early fall, to collect hatchery broodstock will indirectly take spring/summer chinook, and summer steelhead and will directly take listed Snake River ESU fall chinook (both natural and hatchery origin). Current trap operations may prevent or delay upstream migration of a small number of summer steelhead and spring/summer chinook that enter LFH. Fish entering the trap are processed daily, allowing non-targeted fish to be passed within 24 hours of trapping. In years of large numbers of returning fish, the trap at LFH will be operated intermittently, which may encourage the fish to swim upstream on the days we are not trapping. This will help decrease the stress associated with running the trap and shunting the fish back to the river.

Fall chinook at LGR Dam are trapped by NMFS personnel, transferred to WDFW, transported to LFH, and subsequently used for broodstock at LFH. Beginning in 2004, the NPT began hauling fish from LGR Dam to Nez Perce Tribal Hatchery (NPTH). Listed Snake River fall chinook will be collected and transported to LFH and NPTH in proportion to their presence in the ladder at the dam. This action is being taken as a consensus management action of the Managers to minimize the genetic difference between hatchery and wild components of the Snake River fall chinook population

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

See Table 6 Above.

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

See "Take" Table 1 at back of document.

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

At the LGR Dam Adult Trap, most (85-90%) fish pass unhindered above the trap to spawn naturally. Fish collected as part of the systematic sample are hauled to LFH or NPTH and held until spawning when scale samples from unmarked/untagged fish are collected and their origin (H/W) is eventually determined. Managers have identified a goal of including

at least 10% wild origin adults in the broodstock at LFH, however discussions are ongoing as part of the Snake River Fall Chinook Hatchery Management Plan to increase that percentage. Since NOAA's final determination to include Snake River Origin hatchery fish as threatened, we could exceed take levels and have to return fish to the river. Trapping at LFH would cease immediately, but trapping at LGR Dam would have to continue to sample CWTs from hatchery fish for run reconstruction purposes. Untagged fish at Lower Granite Dam in excess of broodstock needs will be scale sampled and released above LGR Dam. Also, Fish are sorted on a daily basis by trap operators, or during the hatchery broodstock spawning operations at LFH that would allow excess listed fish to be returned to the river immediately.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

3.1) Describe alignment of the hatchery program with any ESU-wide hatchery or other regionally accepted policies. Explain any proposed deviations from the plan or policies.

LFH and the resulting production of fall chinook is part of legally required mitigation provided to Washington under the LSRCP Program. According to the Artificial Production Review (APR-1999), the Council stated "Management objectives such as for harvest opportunities, or for in-kind, in-place mitigation, or for protection of specific natural populations are all equally important." As such, managers will have to identify their legal mandates, and do their best to provide fish for harvest, while protecting naturally spawning populations. WDFW believes they have taken such actions with the proposed program outlined in this HGMP to be consistent with the Policy Recommendations in the APR. The Columbia River Fish Management Plan (CRFMP) and annual agreements dictate production of fall chinook. Co-managers negotiate release numbers annually. In addition, WDFW plans to operate within guidelines listed in the upcoming Snake River Fall Chinook Hatchery Management Plan (SRFCHMP). Currently this document is being drafted by several entities.

After CWT analysis was completed on the adult fall chinook processed at LFH in 1989, NMFS was concerned with the large number of stray fish found in the LFH broodstock. It was decided that the progeny from the 1989 return of fall chinook would not be used in future broodstocks. Also, it was decided by NMFS that Snake River Stock reared at LFH, because of their genetic similarity to natural fish, would be considered essential for recovery of the Snake River natural population. The NMFS wanted as many strays as possible to be removed from the population at LGR Dam. The goal NMFS set for strays escaping past LGR Dam to spawn was to not exceed 5% of the total run. Operation of the trapping program at LGR Dam through 2002 therefore was instrumental in maintaining stock integrity of Snake River fall chinook. The protocol changed in 2003 when an 11% random sample of fall chinook at LGR occurred. Significantly fewer strays were removed from the population at the dam, resulting in an estimated 8% strays above LGR dam.

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

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

- *Lower Snake River Compensation Plan* – LSRCP goals as authorized by Congress direct actions to mitigate for losses that resulted from construction of the four Lower Snake River hydropower projects. The program is not consistent with smolt production levels as outlined in original LSRCP. The proposed program will continue to support a substantial tribal and sport harvest level. WDFW is still attempting to reach adult

return goals to support harvest.

– *US v Oregon* - The hatchery program outlined within this HGMP is consistent with the now out-dated Appendix B hatchery smolt production agreements of the *US v 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.
- *Fisheries Management and Evaluation Plan (FMEP).* – FMEPs for Snake River fisheries are currently being drafted by WDFW, which will describe in detail the current fisheries management within the Snake River Basin (including the Grande Ronde). Fishery management objectives within the FMEP and this HGMP are consistent.
- *Snake River Fall Chinook Hatchery Management Plan –* The SRFCHMP is currently being drafted by NPT and co-managers in the Snake River Basin. This plan focuses on fall chinook management in the Snake River basin and will have a comprehensive production, monitoring, and evaluation plan for Snake River fall chinook. Fishery management and monitoring and evaluation objectives within the SRBFCCMP and this HGMP are consistent.

3.3) Relationship to harvest objectives.

As an Integrated Recovery Program, and Mitigation program, the use of Snake River Stock at LFH is intended to fulfill mitigation goals as outlined under the LSRCP, which called for in-place and in-kind replacement. Harvest would occur on this stock as part of the mitigation goal.

3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for six broodyears (1988-97).

Multiple fisheries benefit from the fall chinook mitigation program in the ocean and the Columbia River. Fall chinook from LFH releases have been documented in Columbia River fisheries at higher rates than in all ocean harvest combined (See Table 7, Section 3.1). The majority of recoveries have been in the Snake River at adult traps, LFH, and spawning grounds. WDFW intends to have Snake River fisheries directed at harvest of marked hatchery fish within a few years.

Table 7. Preliminary data associated with terminal recoveries/returns of Coded-Wire tagged fish from LFH onstation and barged releases into the Snake River and survival to recovery area (percent), 1989-1998 release years combined. Numbers have been compiled from RMIS Database, LSRCP Annual Reports, and run reconstruction estimates at LGR Dam. Table consists of fish aged 3 years or older.

Recovery Area	Yearling onstation	Yearling barged	Subyearling onstation	Subyearling barged
Snake River [a]	21,259 (0.461)	435 (0.031)	1,458 (0.223)	280 (0.061)
Columbia River	7,334 (0.159)	121 (0.009)	593 (0.091)	140 (0.030)
Total Freshwater	28593 (0.620)	556 (0.040)	2051 (0.314)	420 (0.091)
Alaska	570 (0.012)	5 (0.000)	145 (0.022)	61 (0.013)
British Columbia	3,159 (0.068)	169 (0.012)	174 (0.027)	166 (0.036)
California	268 (0.006)	0 (0.000)	3 (0.000)	3 (0.001)
Oregon	3,507 (0.076)	32 (0.002)	227 (0.035)	0 (0.000)
Washington	3,227 (0.070)	12 (0.001)	227 (0.035)	31 (0.007)
High Seas	3,375 (0.073)	0 (0.000)	6 (0.001)	4 (0.001)
Total Ocean	14,106 (0.306)	218 (0.016)	782 (0.120)	265 (0.058)
Grand total	42,699 (0.925)	774 (0.055)	2,833 (0.434)	685 (0.149)

[a] All freshwater recoveries/returns in the Snake River are from rack or hatchery returns.

All of these fisheries are not necessarily consistent with LSRCP goals (returning fish to the Snake River), although they are consistent with *US v Oregon* management plans and principles for tribal and sport fisheries. All sport fisheries within the region are selective for hatchery-reared fish and require release of natural-origin fall chinook (See WDFW and ODFW Snake River FMEP – in progress). The last fishery in the Snake River was in 1988. WDFW intends to have Snake River fisheries directed at harvest of marked hatchery fish within a few years.

A cooperative review of SARs and recoveries for broodyears 1995-2000 is currently being completed and will be available through *US v Oregon* forums in the near future.

3.4) Relationship to habitat protection and recovery strategies.

Human development and land management impacts, consistent with those identified across the Columbia and Snake River basins, affect natural fall chinook production in the Snake River. Loss of channel diversity, increased sedimentation, reduced stream flows, habitat constriction due to effects of irrigation withdrawn, water temperature, and inundation and loss of spawning/rearing habitat through dam construction, and fragmentation of habitat all affect productivity of natural fall chinook populations within the watershed. No comprehensive review of the ecological health of the Snake River in Washington in relation to salmonid population status and recovery has been completed at this time. Limiting factors such as water temperature, channel stability, sediment load, and instream

habitat (in tributaries to the mainstem) are known to exist in the basin, but the extent of these problems are un-quantified to date. State programs in place provide standards for activities on private land that might otherwise contribute to the problems listed above. Activities on public lands or federally funded actions must additionally meet Endangered Species Act listed species protection criteria developed through consultation with US Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Policy Act (NEPA) review.

3.5) Ecological interactions.

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

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

Predation by hatchery fish on natural-origin smolts is less likely to occur than predation on fry (NMFS 1995). Salmonid predators are generally thought to prey on fish 1/3 or less their length (CBFWA 1996). However, Witty et al. (1995) concluded that predation by hatchery production on wild salmonids does not significantly impact naturally produced fish survival in the Columbia River migration corridor.

Relative size of proposed hatchery fall chinook smolts released as subyearling smolts (75-95 mm) and yearling smolts (130-180 mm) are unlikely to prey on wild fall chinook (35-95mm). Also, spring chinook smolts (90-110 mm) and wild steelhead smolts (130-200 mm) should preclude any substantial predator/prey interaction among the migrating fish.

Timing and location of hatchery fall chinook smolt releases at LFH and the distribution of listed species fry limit potential interaction. Yearling releases from LFH occur before most natural fall chinook out-migration begins, while subyearling releases substantially overlay natural migration and similarity in size likely precludes any predation. In addition, spring/summer chinook and summer steelhead spawn in upper reaches of tributaries which would limit potential interaction at the fry stage. Bull trout fry tend to maintain themselves in headwater spawning areas and thus avoid interaction with hatchery fall chinook smolts.

A varying percentage of hatchery fall chinook releases do not migrate from the system and some have been documented as reservoir rearing (personal communication, John Sneva, WDFW 2002). These fish, by remaining in the lower Snake River have an increased opportunity to interact with juvenile listed fish. At this time, it is not known at what level this is occurring in the Snake River.

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

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

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

Disease - Hatchery operations potentially amplify and concentrate fish pathogens that could affect listed chinook, steelhead, and bull trout growth and survival. LFH is supplied with constant temperature well water; as a result disease occurrence and the presence of pathogens and parasites is infrequent, although BKD and bacterial gill disease are common. When infestations or infections have occurred, they have been treated. Further evidence for the relative disease-free status of this stock at Lyons Ferry is the low mortality during rearing following typical early life stage losses. Documentation of disease in these stocks is accomplished through monthly, and pre-liberation, fish health examinations.

Returning adult fall chinook held for spawning at the LFH potentially create a concentrated source of pathogens and parasites that they carry. The increase in risk posed to natural chinook, steelhead and bull trout by these fish is considered minimal for several reasons. First, it is unlikely that the hatchery fall chinook adults that return to the production facilities harbor any agents that naturally spawning steelhead and salmon do not also carry. Second, cold water temperatures during the winter for fall chinook adults are not conducive to infectious disease processes. This reduces the potential for transmission between adults in holding ponds and from fish-to-fish in the natural habitat. Documentation of the disease status of the adult fall chinook stocks is accomplished through annual fish health examinations of spawning adults. Results of these examinations over the past years indicate a low prevalence and incidence of serious fish pathogens and parasites in this stock. For the Snake River Stock program described here, bacterial kidney disease (BKD) has been most prevalent. Procedures described later (See Section 8 and Section 9) reduce the possibility of outbreaks in the hatchery.

SECTION 4. WATER SOURCE

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

Lyons Ferry has eight deep wells that produce nearly constant 52^0 F, fish pathogen-free water. The hatchery is permitted to pump up to 53,000 gpm (118.1 cfs). Presently, LFH is the main rearing site for Snake River stock fall chinook. Adult fall chinook are collected at the LFH adult trap and the LGR adult trap, and transported to LFH. Eggs are fertilized, incubated and hatched, and juveniles reared to the pre-smolt and smolt stages on well water. High concentrations of dissolved Manganese (variable among the eight wells), and particulate Manganese Oxide, is strongly suspected of limiting the density at which fall chinook can be reared in raceways at LFH. While the water also has higher concentrations of other minerals (common in deep wells), no negative impacts on eggs or fish from these are known. Discharge from LFH complies with all NPDES standards where it enters the Snake River.

By Mid December, some eyed eggs are transported to the IDFG for incubation, rearing at Oxbow Hatchery facility, and release at Pittsburg Landing Acclimation facility or just below HC Dam (Contact the IDFG for a quantitative and narrative description of the water source, water quality profile, and natural limitations to production at Oxbow Hatchery). Likewise, eyed eggs are transported to the ODFW for incubation, rearing at Umatilla Hatchery facility, and release below HC Dam and at Pittsburg Landing Acclimation facility (Contact ODFW for a quantitative and narrative description of the water source, water quality profile, and natural limitations to production at Umatilla Hatchery).

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

Water withdrawal at LFH is through wells, and effluent is discharged to the Snake River, in compliance with NPDES standards.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Adult Salmonids enter a ladder at LFH that terminates in a trap. The trap will be checked daily, possibly more often, depending upon expected return. Fish are directed by an automated crowder to a chute where they are identified by species and directed to the appropriate pond where they are to be held until spawning, or returned to the river.

NMFS personnel obtain additional broodstock for LFH through the operation of LGR Dam adult trap. Ten to fifteen percent of the run passing LGR Dam is trapped daily starting in late August and continuing through November. Fall chinook are anesthetized and some retained in holding ponds on site. Regular transportation of fish from the Dam to LFH is coordinated between NMFS/LFH staffs. For more details on operational criteria and takes associated with the LGR trap, a separate Section 10 permit is being considered by NMFS and should be issued by late August 2005.

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

Captured fall chinook are hauled From LGR Dam to LFH by WDFW personnel in a 5,578 L aerated, un-refrigerated tank truck, filled with water from LFH.

5.3) Broodstock holding and spawning facilities.

Fall chinook collected at LGR Dam are held separately from those that voluntarily enter the hatchery. All fish are held in concrete raceways 18 ft wide x 150 ft long x 4.3 ft deep. Each of the four pond holds 1,475 cu ft of water. One pond holds the new arrival fish trapped at LFH. The second pond is used for Volunteers after they have been sorted through the spawning room and inoculated. The third pond holds fish hauled from LGR Dam. After those fish are sorted through the spawning building the first time, they are placed in the fourth pond.

During weekly spawning activities, fish are crowded into a channel, enter an elevator, are hoisted into the building and submerged in anesthetic, and then placed on the sorting table. Ripe Snake River origin fish (H&W) are killed and spawned.

5.4) Incubation facilities.

The incubation room at LFH is designed to accept and incubate eggs from individual females through the eyed stage. The south side incubation room holds four banks of 28 stacks, which hold 1,568 usable Heath trays. Each stack has its own water source. Water is single use flow through. Each female will be kept separate until eye-up. After eyeing is complete and ELISA and virus sample results are received, eggs will be combined, according to sample results, and placed in trays with substrate. Each tray will hold 5,000 eggs. Eggs with positive ELISA results will be kept separate or destroyed, according to fish health/production protocol. Eggs will hatch in the incubation trays and fry will be ponded in raceways at LFH.

5.5) Rearing facilities.

Initial rearing will occur in outside raceways, 10ft wide x 100 ft long x 2.8 ft deep, which run 600 gpm of well water. There are 37 outdoor raceways available for rearing at LFH. All fish will be feed a commercial dry or semi moist salmon diet by hand.

After fish reach fingerling size, the on-station yearling production group will be marked and placed into one of three 2.1-acre rearing lakes at LFH. Each lake is supplied with up to 4,200 gpm of well water. Fish rearing density at this point is very low. A pneumatic feeder mounted on a truck is used to present feed.

Beginning in 2003, large raceways 18 ft wide x 150 ft long x 4.3 ft deep are used to rear subyearling fish destined for transfer to the NPT. These raceways are supplied with well water at 3,000 gpm. Fish rearing densities will be very low ($\leq$0.10 lbs/ft^3).

a. Acclimation/release facilities.

Subyearling production at LFH will be reared in raceways until release. At release, these fish will be pumped from the raceway using a four or six inch Magic Valley® pump. The fish will be directed through an irrigation pipe to the Snake River. Yearling production at LFH will be reared in raceways until marking. At that time they will be transferred to one of the lakes. The fish will remain in the lake until release. Screens and stop logs will be pulled around April 1 to allow fish to volitionally move to the outlet structure. The outlet structure is a concrete raceway approximately 11 ft wide x 59 ft long x 4 ft deep (total depth without water). Fish move out of this channel to the Snake River.

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

In 2000 the estimated loss due to bird predation was 25% for the 1998 broodyear fall chinook juveniles. These fish were being reared in one of the lakes at LFH for yearling production. Wires over the pond and limited hazing were insufficient to deter birds.

In 2001 there was a power outage that led to dewatering of the holding area at the adult trap at LFH. Twenty-three fall chinook died that were unmarked/untagged and could have been Snake River origin, naturally produced fish. An additional 172 Snake River origin, hatchery produced fall chinook also died. At that time an automatic pump restart system was not in place. The system has been updated and a similar occurrence is not anticipated.

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.

Staff is available to respond to critical operational problems at all times. Water flow and low water alarm systems, and emergency generator power supply systems to provide incubation and rearing water to the facilities are installed at LFH. All pumps are now fitted with automatic restart systems in case of power outages. Fish health monitoring occurs monthly, or more often, as required in cases of disease epizootics. All rearing lakes at LFH

were covered with netting in 2003-2004 to prevent excessive bird predation. Fish health practices follow PNWFHPC (1989) protocol.

An emergency plan was developed by LFH and will be implemented in case of emergency. The following is a list of vessels used to hold/rear fish at LFH with their respective emergency release protocols:

North raceways-Fish will be released by removing the discharge screens, pulling the wooden stoplogs, and forcing the fish over the short concrete stoplog wall. The fish will then be flushed with the discharge water to the river.

South raceways- Fish will be released by removing the discharge screens and lowering the adjustable sump pipe into the discharge channel. The fish will then be flushed with the discharge water to the river.

Rearing lakes-Fish will be released by lifting the flush gate and pulling the discharge stoplogs. The fish will then be flushed with the discharge water to the river.

Adult salmon/fingerling ponds- Fish will be released by lifting the flush gate and pulling the discharge stoplogs. The fish will then be flushed with the discharge water to the river.

Adult trap holding pond-The adult exclusion bar/screen located at the base of the fish ladder will be removed to prevent injury to fish during an emergency release. In addition, the water supply pump, which supplies ladder water to the adult trap, will be turned off to avoid pulling released fish into the pump and causing mortality. After these measures are taken, fish will be released by pulling the discharge stoplogs. The fish will then be flushed with the discharge water to the river.

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.

Currently, Snake River origin, hatchery (stock essential for recovery) and naturally produced fall chinook are used for broodstock. Fish are trapped at LFH and LGR Dam.

6.2) Supporting information.

6.2.1) History.

The Snake River fall chinook ESU consists of fall chinook which spawn in the Snake, Clearwater, Salmon, Imnaha, and Grande Ronde river basins.

After adaptation of the LSRCP program in 1976, WDFW initiated a fall chinook egg bank development program for the Snake River. WDFW initiated adult trapping at IHR Dam between 1977 and 1993. In addition, fish have been trapped on-site at LFH since 1984. Over time the program has changed to a supplementation program to enhance fall chinook production in the Snake River using Snake River stock. The incidence of stray fish in the broodstock at Lyons Ferry began increasing until 1989 when it was determined after spawning that 41% of fish used for broodstock were strays. It was decided that maintaining the genetic integrity of Snake River fall chinook was paramount. More over, the management agencies were concerned that strays were spawning in the wild with natural Snake River stock and the integrity of the natural population was being compromised. The 1989 brood year were not used as broodstock. In 1990, trapping also began at LGR Dam to monitor and remove strays from the Snake River and to supplement broodstock for LFH. As of 1990 WDFW began reading coded wire tags to determine origin of fish prior to spawning. Until 2003, any fish of unknown origin were removed at LGR Dam and excluded from the broodstock used for supplementation to maintain the integrity of the natural population. Genetic sampling and characterization has been done and results indicate that Snake River stock reared at Lyons Ferry Hatchery are indeed closer to the original natural spawning population in the Snake River, than the Columbia River stocks or the Snake River population during high stray rate years. In 1993 trapping ceased at Ice Harbor dam because of the high number of strays from the Columbia River that were detected during a three year radio telemetry project. We plan to continue trapping at LFH and supplementing the broodstock with fish trapped at LGR Dam. In 2003 the program began including unmarked/untagged Snake River origin hatchery females trapped at LFH in production. In 2004 unmarked/untagged Snake River hatchery females and natural Snake River origin females from both trapping locations were used for broodstock. Based on scale analysis of unmarked/untagged fish, only Snake River hatchery or natural origin fish are used. Managers desire to include at least 10% naturally produced Snake River stock fall chinook in LFH broodstock annually. Any Snake River origin hatchery fish not needed for production are returned to the Snake River to "supplement" the natural population. The majority of unmarked fish are allowed to spawn

naturally in the Snake River each year.

6.2.2) Annual size.

An estimated 3,600 Snake River origin fall chinook adults will need to be collected to meet production goals through Tier 1. Of the 1,449 females collected, we anticipate 145 females being natural origin and the remaining 1,304 would be hatchery origin. The estimated collection number takes into account a 9% prespawning mortality, which should leave 1,320 females (132 wild and 1,188 hatchery) available for production. This target number has been calculated from the following information. Average eggs/female is about 3,500 eggs. Survival has been 78.6% from green egg to yearling release (BY 2000-2003 data), 90.2% survival from green egg to subyearling release (BY 2000-2004 data), and 96.5% survival from green egg to eyed egg. Total eggtake of Snake River hatchery or natural origin fish therefore needs to be 4,620,332 to cover priorities 1-12 (Tier 1) as listed in the 2005-2007 Interim Management Agreement.

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

The Snake River Stock was likely derived from a genetically distinct population of fall chinook in the Snake River Basin. Between 1990-2002, unmarked/untagged fish were not included in broodstock because of the possibility of encountering unmarked strays. In 2003 the program began including unmarked/untagged Snake River origin hatchery females trapped at LFH for production. Based on scale analysis of unmarked/untagged fish, only Snake River hatchery or natural origin fish are used. In 2003 we included 2 natural origin Snake River fall chinook (incidentally trapped at LFH) in broodstock. In 2004 unmarked/untagged Snake River hatchery females and natural Snake River origin females from both trapping locations were used in broodstock. In 2004 we included 130 natural origin Snake River fall chinook in the LFH broodstock (4.9% of all the fish spawned). In 2005, we anticipate collecting 303 natural origin Snake River fall chinook (145 females, 138 males, and 20 jacks), of which 264 should survive to be included in broodstock. As stated above, managers have identified the goal of having 10% or more of the LFH broodstock consist of naturally produced salmon.

6.2.4) Genetic or ecological differences.

Genetic relationship between Snake River origin, hatchery produced fall chinook and natural spawners above LGR Dam is unanswerable at present (Marshall and Blankenship et al 2000). The ecological differences are also unknown at present. Phase 1 of a Reproductive Success Study began in 2004 to examine the applicability of new technology (ad-mixture stock analysis procedure using DNA samples) in understanding hatchery/wild relative reproductive success in a large river system where traditional intensive DNA pedigree sampling is not practical.

6.2.5) Reasons for choosing.

The Snake River Stock fall chinook is an endemic population and has been shown to be genetically different from the Columbia River stocks. An egg bank program was initiated

in 1976 to save this stock. Since LFH fall chinook program is an integrated recovery program, using an endemic stock was mandated. The LSRCP also required "in-place" and "in-kind" mitigation.

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.

The exclusion of non-Snake River fall chinook from our broodstock has kept the LFH fall chinook production genetically intact. WDFW will continue to exclude non-Snake River origin fall chinook from its broodstock based on CWT information and scale analysis. Unmarked/untagged fish will be included in broodstock, at a level of 10% or greater, if they can positively be determined to be of natural Snake River origin. It is suggested that unmarked/untagged fish from LGR Dam be used preferentially over unmarked fish at LFH as they are more likely to be of Snake River origin. This action will be examined on an annual basis. Further, unmarked/untagged fish will be mated with known hatchery Snake River origin adults to minimize the potential effects of stray unmarked fish on population genetics. Broodstock (i.e. eggs) for the LFH Snake River fall chinook program will be collected over the entire run timing. Spawning will occur weekly to cover the run and spawn timing.

SECTION 7. BROODSTOCK COLLECTION

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

Adults

7.2) Collection or sampling design.

Primary broodstock source is LFH. Additional broodstock will be collected at LGR Dam as we are required to process NMFS trapped fish for run reconstruction, natural fish collection for infusion into the LFH broodstock, and stray elimination.

Broodstock will be collected at the adult trap at LFH starting on September 1 to limit the number of spring/summer chinook encountered. The trap will be checked daily, possibly more, depending upon expected return. Fish are directed to a chute where they are identified by species and directed to the appropriate pond where they are to be held until spawning. Trapping will continue through the run or until about 1 December. Hauling of fish from the LGR adult trap begins after August 18 and continues through November.

7.3) Identity.

Adult fall chinook will be 100% electronically sampled before spawning. Origin of fish used for spawning will be determined by CWT, BWT, fin-clip, and visual implant elastomer tag detections prior to spawning. Unmarked/untagged fish that are spawned will be scale sampled to determine origin (in-basin or stray) before the eggs are included with production.

7.4) Proposed number to be collected:

7.4.1) Program adult broodstock goal :

The goal changes yearly based on run size and negotiations for the fall agreement for *U.S. v Oregon*. Total number collected is also dictated by NMFS request for removal of stray fish at LGR Dam and run reconstruction needs.

Short Term: An estimated 3,600 adult fall chinook of Snake River origin would need to be collected to meet production goals through Tier 1 as listed in the 2005-2007 Interim Management Agreement.

Long Term: Unknown, will depend on future run sizes, fall agreements, and completion of the Comprehensive Snake River Fall Chinook Hatchery Management Plan.

7.4.2) Broodstock collection levels for the last ten years (e.g. 1992-2003): See Table 8.

Table 8. Collected, spawned, and eggs collected from fall chinook, Snake River Stock, trapping in 1991-2001. Based on CWT and elastomer recoveries processed at LFH. Jacks measure <53 cm to be consistent with current run reconstruction and window counts.

Brood Year	Collected Adults			Spawned Adults			Eggs Collected
	Female	Male	Jack	Female	Male	Jack	
1991	269	238	148	260	183	118	906,411
1992	293	185	154	276	161	1	901,232
1993	126	125	140	115	102	24	400,490
1994	168	243	510	164	164	47	583,871
1995	349	505	1,884	333	371	81	1,056,700
1996	499	609	501	464	465	60	1,433,862
1997	485	381	769	375	255	206	1,184,141
1998	815	1,274	1,201	663	518	228	2,085,155
1999	1,448	1,371	934	1,305	874	528	3,980,455
2000	1,112	1,757	1,332	1,037	729	369	3,576,956
2001	1,519	2,200	455	1,338	1150	188	4,734,234
2002	1,856	1,858	811	1,322	1,089	171	4,910,467
2003	1,164	1,428	1,596	794	619	234	2,812,751
2004	1,681	2,298	710	1,331	1,178	156	4,625,638

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

Fish in excess of broodstock needs will either be returned to the river or will be spawned and resulting progeny distributed according to the fall agreement and/or decisions made by co-managers based upon rearing space and release location. All non-Snake River origin hatchery fall chinook will be killed unless an identified need, outside of the Snake River Basin, is found for the gametes. WDFW proposes collecting tissues for DNA analysis by collecting scales (age and rearing information) from unmarked/untagged fall chinook and returning them to the river, pending NMFS agreement.

7.6) Fish transportation and holding methods.

See items 5.2 and 5.3.

7.7) Describe fish health maintenance and sanitation procedures applied.

Broodstock collected at LGR adult trap: All fall chinook collected are injected at capture with Erythromycin 200 (20mg/kg of fish) to reduce infection levels of *Renibacterium salmonarum* [causative agent of Bacterial Kidney Disease (BKD)]. While at LFH, salmon are treated with a formalin flush (167ppm) every other day as prophylaxis for *Saprolegnia sp*. (Fungus).

Broodstock collected at LFH: Females will have their first injection of Erythromycin 200 (20mg/kg of fish), at sorting which is up to 25 days after collection. Once spawning begins, newly trapped fish will be injected at the next spawn day (up to seven days after trapping) to reduce infection levels of *Renibacterium salmonarum* (causative agent of Bacterial Kidney Disease [BKD]). While at LFH, salmon are treated with formalin flush (167ppm) every other day as prophylaxis for *Saprolegnia sp*. (Fungus).

Prior to spawning, all personnel will disinfect raingear and boots prior to entering the spawning building.

All females contributing to yearling production will be examined for BKD using the enzyme linked immunosorbent assay (ELISA) technique. In addition, all eggs destined for Nez Perce Tribal Hatchery will be examined for BKD. Fish will be sampled across the run.

A sample of 60 females used for broodstock will be sampled annually to detect viral pathogens.

Eggs will be initially disinfected and water hardened for one hour in iodophor (1:100 or 10,000 ppm). During incubation, formalin (1:600/1,667 ppm) will be added every other day for 15 minutes to control fungus on the eggs.

Flow monitors will sound an alarm if flow through the incubation troughs is interrupted. IHOT incubation protocols will be followed where practical.

Footbaths will be present in the incubation room at each door. Staff will disinfect boots each time they enter or exit the area.

Dead eggs will be picked and removed at the eyed stage

All sampling equipment for fish evaluations will be disinfected with iodophor if equipment was used in any other location prior to coming onsite. Disinfections will occur between sampling of ponds, and after completion of tasks.

After fish are ponded, a WDFW fish health specialist visits the hatchery monthly or more often as requested by hatchery personnel. On monthly visits, fish are examined for abnormal behavior and characteristics. In cases of sickness and/or mortality, fish are sacrificed to determine the cause of the problem.

7.8) Disposition of carcasses.

All carcasses will be buried onsite due to fish health, permitting, and storage constraints.

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.

Natural fish are systematically sub-sampled at the trap at LGR Dam (10-15% rate depending on year) along with hatchery origin fish. The remaining fish are allowed to continue upstream to their spawning grounds un-delayed, which provides substantial numbers of natural and hatchery Snake River stock fish for the up-river spawning grounds. Currently, all fish caught at LFH are retained for potential inclusion as broodstock. LFH and LGR trapped fish that are determined to be stray based on scale analysis will be excluded from the broodstock. Otherwise, natural Snake River fall chinook will be included into the broodstock at LFH to minimize digression of the hatchery origin fish from the genetic make up of the naturally spawning population.

SECTION 8. MATING

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

8.1) Selection method.

All males and females that have been collected for broodstock will be examined weekly during the spawning season to determine ripeness. All ripe fish of potentially Snake River origin from LFH will be spawned. Hatchery reared males of Snake River stock will be randomly selected and spawned.

8.2) Matings.

Mating will occur in a 1x1 cross (1 female to 1 male). Because the spawning population is large (>1000), increasing genetic diversity is not presently a concern. An additional step will be taken to minimize the potential affect of stray chinook on the population genetics. Mating will occur as one of the following:
LFH origin x *LFH origin* or *LFH origin* x *unmarked/untagged origin*

8.3) Fertilization.

During fertilization, each female's eggs will be spawned into a plastic bag lining a bucket. Semen from one male will be added and the mixture stirred. See section 7.7 for specific fish health maintenance procedures.

8.4) Cryopreserved gametes.

Semen from hatchery-origin males has been collected in the past but is not currently needed for spawning because of the large spawning population. The cryopreserved semen will be archived for possible future uses including genetic investigations or use if limited males are available for spawning.

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.

A 1x1 cross attempts to simulate natural spawning and increases the chance of high reproductive genetic diversity.

SECTION 9. INCUBATION AND REARING

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

9.1) Incubation:

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

Lyons Ferry Hatchery staff collects Snake River stock eggs, from hatchery produced fall chinook annually. Following are the egg survival information at LFH for the fourteen most recent brood years (Table 9). (**Note:** Bacterial Kidney Disease (BKD) control measures at LFH may require the disposal of eggs from females that test positive for the virus. Years with low returns may leave us broodstock limited. To meet fall agreement requests there may be a need to rear high titer ELISA fish to transfer and release. In other years we may discard these. Discarded eggs are included in percent loss figures. So, figures may not represent true egg survival, but correctly depict survival under existing hatchery management protocol.) Original LSRCP hatchery protocol called for 80% survival from green egg to smolt stage for subyearlings. Since this program was originally designed for subyearling production, yearling protocols were not identified. Data presented in Table 9 would indicate that these goals have generally been met for the Snake River Stock reared at LFH.

Table 9. History of egg loss for the Snake River Stock fall chinook at WDFW's LFH from 1991-2004 brood years.

Brood year	Green eggs	Eyed eggs retained	Fry ponded	Release type	Survival		
					green egg-ponding	ponding-smolt	green egg-smolt
1991	906,411	828,514	807,685	yearling	89.1	94.1	85.1
1992	901,232	855,577	835,171	yearling subyearling	92.7 92.7	96.5 98.4	89.5 91.2
1993	400,4980	363,129	352,574	yearling	88.0	99.0	87.1
1994	583,871	553,189	542,461	yearling	92.7	99.3	92.1
1995	1,056,700	1,022,700	959,773	yearling subyearling	90.8 90.8	94.8 99.0	86.1 89.9
1996	1,433,862	1,377,202	1,361,577	yearling subyearling	95.0 95.0	76.6 89.5	72.8 85.0
1997	1,184,141	1,134,641	1,101,070	yearling subyearling	93.0 93.0	92.5 97.6	86.0 90.8
1998	2,085,155	1,978,704	1,926,605	yearling subyearling	92.4 92.4	94.8 95.1	87.6 87.9

1999	3,980,455	3,605,482	3,869,707	yearling subyearling	92.4 92.4	66.3 95.2	61.3 87.9
2000	3,576,956	3,249,377	3,158,689	yearling subyearling	92.8 92.8	91.3 94.9	84.8 88.1
2001	4,734,234	4,230,432	4,103,521	yearling subyearling	93.6 93.6	79.5 97.7	74.5 95.8
2002	4,910,467	3,540,000	3,481,685	yearling subyearling	95.3 95.3	86.8 94.8	82.8 90.3
2003	2,812,751	2,476,825	2,441,771	Yearling subyearling	95.5 95.5	75.7 95.1	72.3 90.8
2004	4,625,638	3,421,751	3,380,711	Yearling subyearling	96.7 96.7	Pending 90.1	Pending 86.1

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

Causes for surplus eggs include: 1) the unknown extent of Snake River origin hatchery reared fall chinook in the return, 2) additional requests for removal of non-Snake River origin fish, 3) sampling for run-reconstruction needs 4) under estimating the number of females hauled from LGR adult trap because of difficulty in identifying females early in the season before secondary sex characteristic development, 5) greater female fecundity than predicted, and 6) any changes in survival rates of gametes. Often we do not know the origin of fish until they have their CWT read. Unfortunately that can only be done after the fish is killed, at spawning. Surplus eggs of Snake River origin from hatchery releases may be folded into production groups as listed in the fall agreement, if density and flow parameters allow.

9.1.3) Loading densities applied during incubation.

Currently there are no management goals regarding incubation loading densities. Protocol restricts loading of incubation trays after eye-up to no more than 5,000 eggs per tray.

9.1.4) Incubation conditions.

See section 7.7 for specific incubation techniques including fish health maintenance. There are currently no management goals relating to incubation conditions.

9.1.5) Ponding.

An ideal ponding density index (DI) goal for Snake River origin fall chinook produced at LFH is not specified by LSRCP. Management objectives for fall chinook ponding are dependent upon fall chinook agreements and rearing capacity, and can change yearly. Density indices were reduced beginning in 2001, to address bacterial gill problems encountered since 1984. These indices are now evaluated annually to minimize disease outbreaks while targeting maximum production and SAR. However, declining occurrence

of both BKD and Bacterial Gill disease (BGD) since reducing densities warrants a maximum DI of 0.08 lbs/ft^3 at ponding and until fish are larger than 100 FPP (4.5 g/fish). Water turnover rates are also being evaluated. Please see section 5.5 for more information regarding ponding and subsequent rearing.

9.1.6) Fish health maintenance and monitoring.

See section 7.7 for fish health maintenance and monitoring.

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.

See section 8.5 for discussion about mating protocol. Flows to the incubator stacks are checked daily, as is head box water level, by utilizing a simple visual monitoring system installed on each head box. Head boxes are physically checked periodically and cleaned as needed, although typically no cleaning is required. All four head boxes have water level alarms, set to sound well before water would be lost to incubation trays.

9.2) <u>Rearing</u>:

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

See Table 9 Above.

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

When production at LFH began increasing in the late 1990s, disease outbreaks also increased. Density indices were evaluated in 2001-2004 to address bacterial gill problems and the potential effect on BKD outbreaks encountered since 1984. The ideal density indices for Snake River origin fall chinook produced at LFH, by rearing vessel, are not known at this time and likely depend on various within-hatchery factors (water quality, vessel type, feed type, etc) , but trials keeping DIs between 0.08 and 0.14 (depending on fish size), consistently produced fish with lower incidence of both BKD and BGD. Therefore, density for any fall Chinook group reared at the Lyons Ferry Hatchery should generally not exceed 0.14 lbs/ft^3. Fall Chinook densities in any rearing vessel should not exceed 0.08 lbs/ft^3 until fish reach 100 fish per pound. At that point, densities can increase on a sliding scale to 0.14 lbs/ft^3 at yearling size [10-12 FPP (38-45 g/fish)]. Fish destined for transfer to other facilities for final rearing (historically at around 70 FPP) should generally not exceed a density of 0.11 lbs/ft^3. In the past, flow indices rarely exceeded 80% of maximum for any rearing vessel (see below). Water turnover rates are also being evaluated. Please see section 5.5 for more information regarding rearing.

9.2.3) Fish rearing conditions

See section 5.5. Raceways are supplied with oxygenated water from the hatchery's central degassing building. Approximately 1,000 gpm of water enters each raceway through secondary degassing cans. Oxygen levels range between 10-12 ppm entering, to 8-10 ppm leaving the raceway, depending on ambient air temperature and number of fish in the raceway. Flow index (FLI) is monitored monthly at all facilities and rarely exceeds 80% of the allowable loading. Raceways are cleaned by vacuuming weekly to remove accumulated feed and fecal material. Fall chinook in raceways are fed by hand, whereas those held in the lake are fed via feed blower.

9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available. See Table 10 and Table 11.

Table 10. Growth and size of Snake River Stock fall chinook for yearling production at LFH for the 2001-2003 Brood Years released in 2003-2005.

2001 brood year			2002 brood year			2003 brood year		
Month/Year	**Fpp**	**G/fish**	**Month/Year**	**Fpp**	**G/fish**	**Month/Year**	**Fpp**	**G/fish**
½	1200	0.4	**1/03**	1200	0.4	**1/04**	1200	0.4
2/02	1000	0.5	**2/03**	497	0.9	**2/04**	590	0.8
3/02	514	0.9	**3/03**	249	1.8	**3/04**	321	1.4
4/02	303	1.5	**4/03**	166	2.7	**4/04**	159	2.8
5/02	170	2.7	**5/03**	127	3.6	**5/04**	109	4.1
6/02	113	4.0	**6/03**	87	5.2	**6/04**	74	6.0
7/02	70	6.5	**7/03**	75	6.1	**7/04**	51	8.8
8/02	50	9.1	**8/03**	35	13.0	**8/04**	39	11.5
9/02	37	12.3	**9/03**	30	15.1	**9/04**	29	15.4
10/02	28	16.2	**10/03**	27	16.8	**10/04**	25	18.0
11/02	21	21.6	**11/03**	20	22.7	**11/04**	20	22.7
12/03	18	25.2	**12/04**	17	26.7	**12/05**	18	25.2
1/03	15	30.3	**1/04**	14	32.4	**1/05**	15	30.3
2/03	12	37.8	**2/04**	12	37.8	**2/05**	11	41.0
3/03	10	45.4	**3/04**	10.5	43.2	**3/05**	9.5	47.0
4/03			**4/04**			**4/05**		

Table 11. Growth and size of Snake River Stock fall chinook for subyearling production at LFH for the 2002-2004 Brood Years released in 2003-2005.

2002 brood year			2003 brood year			2004 brood year		
Month/Year	**Fpp**	**G/fish**	**Month/Year**	**Fpp**	**G/fish**	**Month/Year**	**Fpp**	**G/fish**
1/03	1200	0.4	**1/04**	1200	0.4	**1/05**	1200	0.4
2/03	420	1.1	**2/04**	407	1.1	**2/05**	365	1.2
3/03	168	2.7	**3/04**	195	2.3	**3/05**	154	2.8
4/03	84	5.4	**4/04**	86	5.3	**4/05**	78	5.6
5/03	65	7.3	**5/04**	70	6.5	**5/05**	60	7.5
6/03	50	9.1	**6/04**	51	8.9	**6/05**	56	7.8

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

See above tables.

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

Fry/fingerling will be fed an appropriate commercial dry or semi-moist trout/salmon diet. Fry are initially fed 8 or more times per day. Feeding frequency, percent body weight per day, and feed size are adjusted as fish increase in size in accordance with good fish culture practices and program goals.

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

A WDFW fish health specialist monitors fish health monthly. More frequent care is provided as needed if disease is noted. Treatment for disease is provided by Hatchery Specialists under the direction of the Fish Health Specialist. Sanitation consists of raceway cleaning, and disinfecting equipment between raceways and/or between species on the hatchery site.

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

Program goal for the Snake River Stock program will be to release yearling fall chinook between April 1 and April 15 at 10 fpp. Subyearling releases are targeted for release in June at 50 fish per pound. Pre-liberation samples will note smolt development visually based on degree of silvering, presence/absence of parr marks, fin clarity and banding of the caudal fin. No gill ATPase activity or blood chemistry samples to determine degree of smoltification, or to guide fish release timing, are anticipated.

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

"NATURES" rearing concepts will not directly be applied to the Snake River stock program. However, certain aspects of the "NATURES" techniques are used by default at LFH. For instance, the concrete rearing raceways are old enough that the walls and bottoms are of nearly natural coloration and texture, and promote natural looking fish. Once the yearling program fish are removed from the raceways, they are placed in a large semi-natural rearing pond at LFH, which greatly reduces density, producing more natural looking fish (i.e. less erosion on fins). The large adult holding ponds will also be used for sub-yearling rearing. These ponds allow greater surface space and depth for the fish, and minimize handling during the rearing period.

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

Professional personnel trained in fish cultural procedures operate LFH facilities. Facilities are state-of-the-art to provide a safe and secure rearing environment through the use of alarm systems, backup generators, and water re-use pumping systems to prevent catastrophic fish losses. In 2004, a net to deter bird predation on the fish was installed over the lake in which fall chinook are reared. Netting over the south raceways used for intermediate rearing of these fish will be installed in late 2005.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels

The following (Table 12) shows proposed WDFW Snake River Stock smolt releases into the Snake River from LFH.

Table 12. Snake River Stock fall chinook production releases into the Snake River from LFH.

Age Class	Goal	Size (fpp)	Release Date	Location
Yearling	450,000	10	1 April – 15 April	LFH-onsite
Subyearling	200,000	50	May/June	LFH-onsite

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

Stream, river, or watercourse: Snake River
Release point: RKM 95.1 (LFH)
Major watershed: Snake River
Basin or Region: Snake River Basin

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

The number of Snake River Stock fall chinook released into the Snake River by WDFW has varied since program inception (Table 13).

Table 13. WDFW Releases of Snake River Stock, hatchery reared fall chinook.

Release year	Release date	Number of subyearlings	Fpp	Release date	Number of yearlings	Fpp
1985	6/6	539,392 direct	76.0	4/17	650,300 direct	10
1986	6/10 6/13	1,542,168 direct 247,391 barged	58/70/87 55	4/2-8	663,450 direct	8
1987	6/1 6/2	337,790 direct 336,262 barged	48/76 71/105	4/14 4/16	230,413 direct 156,506 barged	6/9 7
1988	6/1 6/8	2,009,158 direct 2,564,299 barged	53 53/70/99/124	4/14 4/19	286,611 direct 121,229 barged	8 8
1989	6/8 6/14	1,175,618 direct 669,831 barged	90/96/69 75/63/118/90	4/14 4/20	293,202 direct 119,815 barged	10 10
1990	6/6 6/6 6/18	254,136 direct 382,931 direct 793,349 direct	55 77/70 73	4/16 4/17	280,045 direct 156,309 barged	9.0 11.0

	6/25 7/2 7/12 6/8	604,205 direct 1,302,486 direct 2,274,13 direct 247,548 barged	69 71 84 62			
1991	6/2	224,439 barged	49			
1992		0		4/15 4/17	364,022 direct 325,579 barged	8.0 9.0
1993	6/24	206,775 direct	61	4/12 4/19	414,997 direct 345,021 barged	11.0 9/10/11/18
1994		0		4/18 4/19	309,949 direct 293,712 barged	11.0 11.0
1995		0		4/17	349,124 direct	8/7.5
1996	3/1-31	83,183 fry escaped	500	4/9-12	404,270 direct-lake	10.5
1997		0		4/4-26	456,876 direct-lake	9.3
1998		0		4/3-16	418,992 direct-lake	10.1
1999	6/15	204,194 direct	50.1	3/25- 4/13	432,166 direct-lake	8.3
2000	5/26	196,643 direct	45.5	3/24- 4/14	456,401 direct-lake	9.2
2001	6/1 7/3	199,976 barged 3,994 direct	45.7 52.2	4/1-20	338,757 direct-lake	8.7
2002	6/24 10/16 12/2	194,582 direct 29,059 direct (Rkm 210.3) 24,573direct (Rkm 221.3)	52.0 24.6 26	4/1-11	432,511 direct-lake	9.3
2003	3/4 6/6 6/9	33,500 direct (RK 221.3) 200,092 direct 100,019 direct (Rkm 253.7)	1,200 50.0 40.4	4/1-9	518,436 direct-lake	9.7
2004	6/21	201,534 direct	51.1	4/12-14	446,355 direct-lake	9.9
2005	5/27 5/26 5/25 5/24 5/23	200,171 direct [a] 200,191 direct (Rkm 253.7) 200,772 direct (Rkm 320.8) 281,668 direct (Rkm 320.8) 234,030 (Rkm 253.7)	51.0 49.0 56.0 66.0 59.0	3/28-30	453,200 direct-lake[b]	9.4

[a] First year fish were released in the evening.
[b] Lake was netted to inhibit avian predation in 2004.

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

See table 13 for specific release data. Volitional releases will begin 1 April, and can continue through 15 April for yearlings released from LFH. Yearly adjustments may occur based on water conditions, smolt size, and other environmental conditions. Subyearling releases may occur in May and June.

10.5) Fish transportation procedures, if applicable.

Yearling and subyearling smolts are transported to acclimation facilities operated by the NPT in a variety of transport tankers. Each tanker uses re-circulation, aeration, and O2 supplementation to maintain water qualities optimal for fish.

10.6) Acclimation procedures.

Fish released at LFH are not acclimated on river water. The pond exit is screened so that fish cannot escape. See section 4.0 regarding water sources for fish rearing at LFH and section 5.5 for details on rearing. During release, evaluation staff sample fish to document size, weight, condition factor, degree of visual smoltification, and the number of precocial fish present in the release population.

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

Since this program is primarily for Mitigation / Isolated Harvest, a majority of the smolts released onsite are marked so they can easily be identified in fisheries and as returns to LFH. Adipose fins are removed from 100% of the subyearling and 50% of the yearling fish prior to release. All onsite yearling releases also receive a coded-wire tagged and have a red VIE tag behind the left eye. Onsite subyearling releases are 100% CWT, but have no VIE tag. In 2005 protocols identified the need for a representative CWT tag code for each group of fish released. Tagged fish allow for expanded harvest estimates in fisheries, and to document stray rates and locations. (Note: due to size differences, two unassociated releases of subyearling fall chinook occurred in 2005: 1) at Couse Creek, and 2) near Cougar Creek on the Grande Ronde River. Both groups were originally slated to be part of groups of fish that were adipose clipped and coded wire tagged, but at the time of release size differences were too great, and the decision was made to call them unassociated)

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

See item 9.1.2. Snake River Stock, hatchery reared fish would be folded back into production groups as listed in the fall agreement. Any deviations from standard release areas and production will be discussed and agreed upon by co-managers

10.0) Fish health certification procedures applied pre-release.

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

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

Under conditions requiring release of fish, actions will be taken that are suitable for the incident point. At LFH, direct release into the Snake River is the preferred alternative.

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

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

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

- Mark a proportion of production releases (adipose fin clip) for harvest as agreed to under *US v Oregon*. In addition, mark a portion with Coded Wire Tags and visual implant elastomer tags and determine mark rate.
  - (*Indicators: 3.1.1a, 3.1.2a, 3.2.1a, 3.2.2a&c, 3.3.2a-b, 3.4.3a, 3.4.4a-d, 3.5.4d, 3.8.1a&b, 3.8.2a&b, 3.8.3a&b)*
- Analyze marked fish recovery data collected by others from Columbia, Snake, and other river fisheries to determine harvest numbers and rate.
  - *(Indicators: 3.1.1a, 3.2.1a, 3.2.2a&c, 3.2.2a-c, 3.3.2a-b, 3.5.4d, 3.8.1a&b, 3.8.2a&b, 3.8.3a&b)*
- Monitor smolt release size, numbers and timing. Monitor smolt passage past Lower Monumental Dam.
  - *(Indicators: 3.4.4a-d, 3.5.4a-c, 3.5.5a, 3.4.3a, 3.7.8a)*
- Monitor adult collection at Lyons Ferry Adult Trap and LGR adult trap, record numbers, status and disposition.
  - *(Indicators: 3.1.2a, 3.1.3a, 3.3.2a-b, 3.4.1a-b, 3.4.2a-b, 3.4.3a, 3.5.2a-c, 3.5.3a-b, 3.5.4d, 3.5.6a, 3.7.6a, 3.7.7a-b, 3.8.3a)*
- Monitor in-hatchery survival, growth and performance of Snake River Stock fish at LFH.
  - *(Indicators: 3.1.2a, 3.4.3a, 3.7.1a-b, 3.7.4a-b)*
- Cooperate with NMFS to determine proportion of natural and hatchery origin adults in the Snake River via observation and/or through inference from adult trapping.
  - *(Indicator: 3.1.2a, 3.3.1a-c, 3.3.2a-b, 3.4.1a-b, 3.4.2a-b, 3.5.2a-c, 3.5.3a-b, 3.5.4d, 3.8.3a,)*
- Determine proportion of natural and hatchery origin adults in Tucannon River via observations during spawning surveys.
  - *(Indicator: 3.1.2a, 3.3.1a-c, 3.3.2a-b, 3.4.1a-b, 3.4.2a-b, 3.5.3a-b, 3.5.4d)*
- Develop genetic profiles for hatchery and natural origin fall chinook populations trapped at Lyons Ferry Hatchery and conduct regular monitoring
  - *(Indicator: 3.1.3a, 3.3.2a-b, 3.5.1a, 3.5.2a-c, 3.5.6a)*
- Develop and implement evaluation plans and report findings consistent with needs of the program for adaptive management
  - *(Indicators: 3.1.3a, 3.3.2a-b, 3.6.1a, 3.6.2a-b, 3.7.5a-b, 3.8.1a-b, 3.8.2a-b, 3.8.3a-b)*
- Monitor discharge water quality and water withdrawals and report annually on compliance with related permits and criteria, i.e., screening and fish passage criteria.
  - *(Indicators: 3.7.1a-b, 3.7.2a, 3.7.3a-e)*
- Monitor health of adult and juvenile fall chinook associated with hatchery production.
  - *(Indicators: 3.7.5a-b, 3.4.3a, 3.7.1a-b, 3.7.4a-b)*

Use the above information to determine whether the population has declined, remained stable, or has been recovered to sustainable levels. The ability to estimate hatchery and natural proportions will be determined by implementation plans, budgets, and assessment priorities.

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

Current monitoring and evaluation funding covers most activities listed above. However, funding to monitor potential hatchery/wild interaction, including ratios of hatchery and wild fish in natural spawning areas, and annual production estimates in the Snake River, 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.

1. Minimize residualism by producing fully smolted fish that quickly emigrate from the system.
2. Adult trapping facilities will be monitored daily, or more often as necessary to prevent injury and unnecessary delay.

SECTION 12. RESEARCH

12.1) Objective or purpose.

The ongoing LSRCP program research is designed to:

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

12.2) Cooperating and funding agencies.

Lower Snake River Compensation Program
Nez Perce Tribe
Confederated Tribes of the Umatilla Indian Reservation
National Marine Fisheries Service

12.3) Principle investigator or project supervisor and staff.

Mark Schuck	Debbie Milks	Michelle Varney	Mike Gallinat
Jeromy Jording	Joe Bumgarner	Jerry Dedloff	Lance Ross

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

Same as described in Section 2.

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

1) *Monitoring hatchery/wild ratios in natural spawning streams* - Adult fall chinook will be captured and enumerated at the existing LGR adult trap. In addition redd counts and carcass surveys will be performed on the Tucannon River and hatchery/wild ratios calculated. Fish that are systematically sampled and collected for broodstock are hauled to LFH for future spawning. Scale samples collected from unmarked/untagged fish will be used to estimate number of hatchery and wild fish passing LGR dam. An annual run reconstruction will be built from this data, and will be used to track H/W ratios at LFH and LGR dam. Similar samples will be collected from carcasses during spawning ground surveys of the Tucannon River, and will be used to monitor the H/W ratio there. See section 2.2.3.

2) *Genetic monitoring* – Wild juvenile fall chinook may be sampled periodically from various natural production areas in the course of genetic monitoring. Samples will be collected using a smolt trap located on the lower Tucannon River. Juvenile chinook sampled will be

captured and anesthetized with MS222, measured, weighed, and have their scales sampled. Non-lethal tissue samples will be removed for genetic analysis and the fish will be allowed to recover before release. Snake River Stock hatchery produced juveniles will also be sampled for comparison to natural fish.

During spawning at LFH and on the spawning grounds in the Tucannon River, unmarked/untagged fall chinook will have scale samples taken, which can be used for DNA analysis. Fish encountered during spawning surveys are likely to be dead when sampled. In addition, Snake River origin, hatchery reared fall chinook will be sampled for comparison to historically sampled natural fish and present-day natural fish. Results of this data should tell us if we are maintaining genetic integrity of the stock reared at LFH or producing a divergent population. Fish sampled in the hatchery will be anesthetized with MS222 prior sampling. As part of a reproductive success study at LGR dam, scales from fish sampled at the trap may be used for DNA profiling.

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

1. August-December
2. April-June, October-December

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

At LFH, all adult fall chinook sorted will be anesthetized with MS222 before they are handled. Regarding juvenile smolt trapping on the Tucannon River, fish will be hauled upstream in buckets to estimate trapping efficiency and population size. In addition, a portion of the naturally spawned fish will be PIT tagged to monitor downstream migration timing. Any juvenile fall chinook handled will be anesthetized with MS222 prior to any handling.

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

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

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

See "Take" Table 2.

12.10) Alternative methods to achieve project objectives.

The nature of our genetic sampling strategy, to monitor genetic integrity of the fish used for broodstock at LFH. One of our goals is recovery and thus the maintenance of the genetic profile seen in the past. We may need to change our spawning protocols if shifts have occurred regarding the genetic integrity of the hatchery produced Snake River stock. Alternate techniques such as adult or smolt trapping on the mainstem Snake River and

recovering fish off of redds for genetic analysis are too labor intensive to consider feasible.

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

Due to our inability to differentiate between listed anadromous and non-listed resident forms of *O. tshawytscha*, take estimates include both. During smolt trapping, we expect to encounter spring/summer/fall chinook juveniles and bull trout during sampling. However the number of encounters and as a result the level of mortality, is expected to be on the order of <50 fish/species for the season.

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

Every effort will be made to insure that adult trapping facilities do not delay movement of listed fish by checking the trap daily or more often as needed. Juvenile fish that are handled and/or tagged are anesthetized to reduce stress and held in recovery buckets before being released. Handling and tagging are dept to the minimum needed to provide valid estimates of abundance or survivals.

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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)

Currently, there are 40 separate listings of Federal Status endangered/threatened species within the State of Washington. In the list below (Table 114), are all non-salmonid listed species and their current status ratings. Of the following species listed, only the bald eagle, and the plant species Spalding's Catchfly are confirmed to be found in the area where the Snake River Stock production program occurs (i.e. Snake River, Grande Ronde River, Lyons Ferry Hatchery). Species such as the Gray Wolf, the Grizzly Bear, the Canadian Lynx, and the northern spotted owl were once likely found in the Grande Ronde River basin, but their current existence is not verified. The geographic distributions of the other listed species were generally limited to the Cascade Mountain Range, the Selkirk Mountains in NE Washington, the Willamette Valley (Oregon), Puget Sound and Coastal areas.

Table 14. List of current ESA listed species (animal and plant) within the State of Washington.

Status Rating	Species
	ANIMALS
Endangered	Albatross, short-tailed (*Phoebastria (=Diomedea) albatrus*)
Threatened	Bear, grizzly (*Ursus arctos horribilis*)
Threatened	Butterfly, Oregon silverspot (*Speyeria zerene hippolyta*)
Endangered	Caribou, woodland (ID, WA, B.C.) (*Rangifer tarandus caribou*)
Endangered	Deer, Columbian white-tailed (*Odocoileus virginianus leucurus*)
Threatened	Eagle, bald (lower 48 States) (*Haliaeetus leucocephalus*)
Threatened	Lynx, Canada (lower 48 States DPS) (*Lynx canadensis*)
Threatened	Murrelet, marbled (CA, OR, WA) (*Brachyramphus marmoratus marmoratus*)
Threatened	Owl, northern spotted (*Strix occidentalis caurina*)
Endangered	Pelican, brown (*Pelecanus occidentalis*)
Threatened	Plover, western snowy (Pacific coastal pop.) (*Charadrius alexandrinus nivosus*)
Threatened	Sea turtle, green (*Chelonia mydas*)
Endangered	Sea turtle, leatherback (*Dermochelys coriacea*)
Threatened	Sea-lion, Steller (eastern pop.) (*Eumetopias jubatus*)
Endangered	Whale, humpback (*Megaptera novaeangliae*)
Endangered	Wolf, gray (*Canis lupus*)
	PLANTS
Endangered	Sandwort, Marsh (*Arenaria paludicola*)
Threatened	Paintbrush, golden (*Castilleja levisecta*)
Endangered	Stickseed, showy (*Hackelia venusta*)
Threatened	Howellia, water (*Howellia aquatilis*)
Endangered	Desert-parsley, Bradshaw's (*Lomatium bradshawii*)
Threatened	Lupine, Kincaid's (*Lupinus sulphureus (=oreganus) ssp. Kincaidii (=var. kincaidii*))
Threatened	Checker-mallow, Nelson's (*Sidalcea nelsoniana*)
Endangered	Checkermallow, Wenatchee Mountains (*Sidalcea oregana var. calva*)
Threatened	Catchfly, Spalding's (*Silene spaldingii*)
Threatened	Ladies'-tresses, Ute (*Spiranthes diluvialis*)

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

Section 10 permits, 4(d) rules, etc. for other programs associated with hatchery program.
Section 7 biological opinions for other programs associated with hatchery program.

See Section 2.1

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

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

General species description and habitat requirements (citations).

Bald eagles are one of the worlds larger predatory birds, ranging from 7-14 pounds, with wingspans up to 8 feet. They mate for life and are believed to live 30 years or longer in the wild. Habitat requirements generally consist of a moderate forested area with large trees that are generally located nears rivers, lakes, marshes, or other wetlands. Bald eagles have few natural enemies, and in general need an environment of quiet isolation, a condition that has changed dramatically over the last 100 years.

Major wintering concentrations are often located along rivers with salmon runs. Primary food sources have been marine or freshwater fish, waterfowl and seabirds, with secondary sources including mammals, mollusks and crustaceans (Retfalvi 1970, Knight et al. 1990, Watson et al. 1991, Watson and Pierce 1998).

Local population status and habitat use (citations).

Bald Eagles breed throughout most of the United States and Canada, with the highest concentrations occurring along the marine shorelines of Alaska and Canada. They winter throughout most of the breeding range, primarily south of Alaska and Canada (U.S. Fish and Wildlife Service 1986, Stinson et al. 2000). Within Washington, bald eagles nest primarily west of the Cascade Mountains, with scattered breeding areas along major rivers in the eastern part of the state. The bald eagle is a State Threatened species in Washington, and a Federally listed species. Early declines in populations in the lower 48 states were caused by habitat destruction and degradation, illegal shooting, and contamination of its' food source from the pesticide DDT. It is currently vulnerable to loss of nesting and winter roost habitat and is sensitive to human disturbance, primarily from development and timber harvest along shorelines. Territories are generally defined by 1) nearness of water and availability of food, 2) the availability of suitable nesting, perching, and roosting trees, and 3) the number of breeding eagles the area (Stalmaster 1987).

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

Site specific inventories (abundance/status) on bald eagles in the Snake River near hatchery production activities is unknown. Sightings have been documented in the area. No nesting or nest trees are known to exist in the area affected by the program.

Spalding's Catchfly

General species description and habitat requirements (citations).

Citation: Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest, Part 2: *Salicaceae to Saxifragaceae*. University of Washington Press, Seattle. 597 pp.

The Spalding's Catchfly is a long-lived, herbaceous perennial, 8-24 inches tall, typically with one stem, but can have several. Each stem bears 4-7 pairs of lance shaped leaves 2 to 3 inches in length. The light green foliage and stem are lightly to more typically densely covered with sticky hairs. The cream-colored flowers are arranged in a spiral at that top of the stem. The outer, green portion of the flower forms a tube, ~1/2 inch long with ten distinct veins running it's length. The flower consists of 5 petals, each with a long narrow "claw" that is largely concealed by the calyx tube and a very short "blade", or flared portion at the summit of the claw. Four (sometimes as many as 6) short petal-like appendages are attached inside and just below each blade.

The species begins to flower in mid- to late July, with some individuals still flowering by early September. Most other forbs within it's habitat have finished flowering when *S. spaldingii* is just hitting its peak. A majority of individuals have developed young fruits by mid- to late August.

S. spaldingii occurs primarily within open grasslands with a minor shrub component and occasionally with in a mosaic of grassland and ponderosa pines. It is most commonly found at elevations of 1900-3050 feet, near the lower tree line, with a preference for northerly-facing aspects. The species is primarily restricted to mesic (not extremely wet nor extremely dry) prairie or steppe vegetation that makes up the Palouse Region in SE Washington.

Local population status and habitat use (citations).

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

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

Site-specific findings in Franklin County not available.

15.3) Analysis of effects.

Bald Eagle
Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects).

To the best of our knowledge, the program as described in this HGMP will not directly have any negative effects on the listed species. Providing adults and juveniles to the system, even within the short term, will provide a potential prey item that would likely benefit the listed species. The surrounding habitat associated with this hatchery mitigation program will not be altered, which would be the only source of negative "take" possible to the listed species.

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

Currently, no fishery occurs for fall chinook on the Snake River. In the future when fisheries are opened, disturbance to listed species may occur from people fishing in the area. A take estimate is not possible for this potential disturbance in the past or in the future. Eagle sightings in the area near the hatchery are uncommon.

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

Operation of Lyons Ferry and LGR adult traps will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at the LGR adult trap or Lyons Ferry hatchery. Activities at Lyons Ferry all take place on existing hatchery grounds. No new construction activities are planned for the program in either location that could impact the listed species. Effluent from the Acclimation Pond meets state water quality standards and is therefore not a concern.

Fish health - pathogen transmission, therapeutics, chemicals.

Not expected to be a problem. The two species have co-existed for thousands of years, the fall chinook being the prey of the eagle. Eagles are likely immune to any potential pathogens that hatchery fish might be carrying. Therapeutics and chemicals when applied (at Lyons Ferry and LGR adult trap) would follow label directions for proper use, eliminating any potential "take".

Ecological/biological - competition, behavioral, etc.

As stated earlier, behavioral disturbances could occur if fishing occurs on fall chinook. Fishing pressure and eagle abundance could overlap. Generally the highest density of

fisherman doesn't exceed 3.4 / river kilometer for steelhead fishermen. Assuming fishing pressure would be similar for fall chinook as is seen for steelhead, fishermen should only minimally disturb the species. Camping is limited within the area where the main fishery would occur, so disturbance from campers will be limited.

Predation - A positive benefit (adult or juveniles) for the listed species in this case, due to increased releases and returns of program fish.

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

When/if electrofishing surveys occur to collect genetic samples, little to no negative impact to bald eagles should be expected as surveys will require little time in any particular area, and occur at a time when eagles have migrated from the area. Disturbances could occur if an eagle nest is nearby a collection site.

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

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

Spalding's Catchfly
Identify potential direct, indirect, and cumulative effects of hatchery program on species and habitat (immediate and future effects).

To the best of our knowledge, the program as described in this HGMP will not have direct, indirect, or cumulative effects on the listed species. The surrounding habitat associated with this hatchery mitigation program will not be altered, which would be the only source of "take" possible to the listed species. Interactions with the fall chinook will not occur.

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

None (past or projected future)

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

Operation of the Adult Trap or incubation/rearing areas at Lyons Ferry will not affect (directly or indirectly) the existence of the listed species in the area. Habitat requirements for the species do not apply at the Lyons Ferry adult trap or hatchery facility. Activities at Lyons Ferry all take place on existing hatchery grounds. No new construction activities are planned for the program that could impact the listed species. Effluent from the hatchery falls below state water quality standards guidelines, and is therefore not a concern.

Fish health - pathogen transmission, therapeutics, chemicals.

Not Applicable – Pathogens would not be transmitted between the species.

Ecological/biological - competition, behavioral, etc.

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

Predation -

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

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

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

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

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

15.4 Actions taken to mitigate for potential effects.

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

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

15.5 References

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

Hitchcock, C.L., A. Cronquist, M. Ownbey, and J.W. Thompson. 1964. Vascular Plants of the Pacific Northwest, Part 2: *Salicaceae to Saxifragaceae*. University of Washington Press, Seattle. 597 pp.

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

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

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

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

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

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

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

Listed species affected: Fall Chinook ESU/Population: Snake River Activity: Broodstock collection				
Location of hatchery activity: Collection at Lyons Ferry hatchery, Hauling of fish from Lower Granite Adult Trap Dates of activity: September-November Hatchery program operator: Steve Rodgers				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Capture, handle, and release b)	0	0	500	0
Capture, handle, tag/mark/tissue sample, and released c)	0	0	600	0
Removal (e.g. broodstock) d)	0	0	3600	0
Intentional lethal take e)	0	0	0	0
Unintentional lethal take f)	0	0	0	0
Other Take (specify) g)	0	0	0	0

a. Contact with listed fish through migration delay at LGR adult trap. Delay is not anticipated.
b. Adult harassment occurring at LGR adult trap before fish are released.
c. Take occurring due to tagging and/or bio-sampling of fish collected through LGR adult trapping operations prior to upstream or downstream release at LGR adult trap are not listed here. Listed are the number of fish handled, sampled, and released.
d. Listed fish removed from the wild and collected for use as broodstock.
e. Intentional mortality, usually as a result of spawning as broodstock. Any loss occurring after fish are collected for broodstock is listed under item d.
f. Unintentional mortality of listed fish from trapping.
g. Other takes not identified above as a category.

Instructions:

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

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

Listed species affected: Fall chinook ESU/Population: Snake River Activity: Genetic Stock profiles, spawning ground surveys				
Location of research/monitoring/evaluation activity: Lyons Ferry Hatchery and the Tucannon River Dates of activity: September-November for adults and February-July for juveniles Research/ Monitoring / Evaluation program operator: Debbie Milks				
Type of Take	**Annual Take of Listed Fish By Life Stage *(Number of Fish)***			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	100	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	26,850	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	2,800	0	100
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	0	0	0
Unintentional lethal take g)	0	250	0	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish though redd counts.
b. Take (non-lethal) of juveniles/smolts captured and marked for smolt trap efficiency tests.
c. Take associated with smolt trapping operations, where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to juvenile bio-sampling (length/weight, scales, DNA) of fish collected through smolt trapping. Adult take is from DNA sampling of dead unmarked/untagged fish during redd counts.
e. Listed fish removed from the wild and collected for use as broodstock
f. Intentional mortality of listed fish during smolt trapping.
g. Unintentional mortality to listed fish from smolt trapping on the Tucannon for juveniles.

Instructions:

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