WDFW Tucannon River Endemic Stock Spring Chinook Supplementation and Captive Broodstock Programs

HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

Hatchery Program:	**Tucannon River Spring Chinook Supplementation and Captive Broodstock Program: Lyons Ferry Complex – Lyons Ferry Hatchery and Tucannon Hatchery**
Species or Hatchery Stock:	Tucannon River Spring Chinook *Oncorhynchus tshawytscha*
Agency/Operator:	Washington Department of Fish and Wildlife
Watershed and Region:	Tucannon River / Snake River Basin, Washington State
Date Submitted:	Sept. 30, 2002
Date Last Updated:	August 18, 2005

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program.

Hatchery: Lyons Ferry Complex –
Consists of both Lyons Ferry Hatchery (LFH) and Tucannon Hatchery (TFH)

Program: Tucannon River Spring Chinook Supplementation and Captive Broodstock Program

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

Species: Spring Chinook *(O. tshawytscha*),
Stock: Tucannon River (Snake River Spring/Summer Chinook ESU)
ESA Status: Threatened

1.3) Responsible organization and individuals

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

1. U.S. Fish and Wildlife Service – Lower Snake River Compensation Plan (LSRCP) – Program funding/oversight.
2. Confederated Tribes of the Umatilla Indian Reservation (CTUIR) – Co-manager.
3. Nez Perce Tribe (NPT) – Co-manager.

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

The Lower Snake River Compensation Plan (LSRCP – U.S. Fish and Wildlife Service) presently provides funds for mitigation production (supplementation program) of Tucannon River stock spring chinook as a result of hydroelectric projects in the Snake River. Mitigation fish provided by the supplementation program are released in the Tucannon River as smolts (production goal of 132,000 annually). In addition, LSRCP and Bonneville Power Administration (BPA) provide funds for the short-term captive broodstock program for Tucannon River spring chinook. LSRCP contributed to the captive broodstock program during the initial phases of development, and provides the basic hatchery grounds where the captive program occurs.

Current staffing level at LFC consists of the Hatchery Complex Manager, 15 permanent employees, and additional seasonal employees. The evaluation staff currently has 9 biologists and technicians. Many staff members are involved in the spring chinook program, but also have other responsibilities pertaining to the full species program at LFC. Operational and Evaluation costs for the spring chinook program at LFC from the LSRCP have been roughly estimated at $145,000 annually. Operation and monitoring costs (BPA funded) for the captive broodstock program will vary over the program period between $85,000-$126,500 annually.

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

<u>Adult Collection</u>
Tucannon Hatchery Adult Trap – RKM 59 on the Tucannon River, Columbia County, Washington

<u>Holding, Spawning, Incubation, Rearing and Marking</u>
Lyons Ferry Hatchery – along Snake River in Franklin County, Washington (RKM 90)

<u>Final Rearing</u>
Tucannon Hatchery – RKM 58 on the Tucannon River, Columbia County, Washington

<u>Smolt Acclimation and Release</u>
Curl Lake Acclimation Pond – RKM 66 on the Tucannon River, Columbia County, Washington

1.6) Type of program.

Integrated Recovery Program (Supplementation).

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

1. **Mitigation:** Continue to provide mitigation as specified under the LSRCP program (USACE 1975) while meeting conservation and recovery criteria established for the Tucannon River population and Snake River spring/summer chinook ESU. The goal of this program is the restoration and enhancement of spring chinook salmon in the Tucannon River using supplementation with the indigenous stock.

2. **Preservation/Conservation:** Conserve genetic resources of naturally reproducing Tucannon River spring chinook due to low population abundance using captive broodstock propagation methods.

1.8) Justification for the program.

The natural population of spring chinook in the Tucannon River has been decreasing and depressed since 1984. The spring chinook population was listed as "endangered" under the ESA as part of the Snake River spring/summer chinook ESU (April 22, 1992; FR 57 No. 78: 14653). The listing status was changed to "threatened" in 1995 (April 17, 1995; FR 60 No. 73: 19342). The LSRCP spring chinook supplementation program has been operated since 1985 to provide mitigation for adult spring chinook lost because of construction and operation of the lower Snake River dams. The current hatchery supplementation program has used Tucannon River stock since the program's inception. The Tucannon River stock was derived from fish captured at the TFH adult trap, thereby representing individuals that were endemic to the Tucannon River. The May 10, 1999, Biological Opinion issued by NMFS on the Tucannon River spring chinook program (captive broodstock) considered the supplementation and captive broodstock programs to be the best chance to maintain the existence and chance for recovery of natural spring chinook within the Tucannon River.

Actions described within this HGMP represent the continued programs of Tucannon River spring chinook salmon. These two programs will attempt to maintain or increase numbers of naturally reproducing Tucannon River spring chinook salmon and meet mitigation goals of the LSRCP.

1.9) List of program "Performance Standards".

(From NMFS *Artificial Propagation 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,* January 17, 2001: numbers specific to that document)

3.1 Legal Mandates

3.1.1 Standard: Program contributes to fulfilling tribal trust responsibility mandates and treaty rights

Indicator 3.1.1c - *Tribal acknowledgement regarding fulfillment of tribal treaty rights.*

3.1.2 Standard: Program contributes to mitigation requirements.

Indicator 3.1.2a - *Number of fish released and returning by program as applicable to mitigation requirements.*

3.1.3 Standard: Program addresses ESA responsibilities.

Indicator 3.1.3a – *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 Harvest

3.2.1 Standard: Fish produced for harvest are produced and released in a manner enabling effective harvest, as described in applicable fisheries management plans, while avoiding over harvest of non-target species.

Indicator 3.2.1a - *Annual number of fish produced by this program caught in all fisheries, including estimates of fish released and associated incidental mortalities, by fishery.*

3.2.2 Standard: Release groups are sufficiently marked in a manner consistent with information needs and protocols to enable determination of impacts to natural- and hatchery-origin fish in fisheries.

Indicator 3.2.2a - *Marking rate by mark type for each release group.*

Indicator 3.2.2c - *Number of marks of this program observed in fishery samples, and estimated total contribution of this population to fisheries, by fishery.*

3.3 Conservation of Wild/Naturally Spawning Populations

3.3.2 Standard: Releases are sufficiently marked to allow statistically significant evaluation of program contribution to natural production, and to evaluate effects of the program on the local natural population.

Indicator 3.3.2a - *Marking rates and type of mark.*

Indicator 3.3.2b - *Number of marks and estimated total proportion of this population in juvenile dispersal and in adults on natural spawning grounds.*

3.4 Life History Characteristics

3.4.1 Standard: 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.

Indicator 3.4.1a - *Temporal distribution of broodstock collection, and of naturally produced population at point of collection.*

Indicator 3.4.1b - *Age composition of broodstock collected, and of naturally produced population at point of collection.*

3.4.4 Standard: 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.

Indicator 3.4.4b - *Annual release numbers from all programs in basin and subbasin, including size and life-stage at release, and length of acclimation, by program.*

Indicator 3.4.4c - *Location of releases and natural rearing areas.*

Indicator 3.4.4d - *Timing of hatchery releases, compared to natural populations.*

Indicator 3.4.4e – *Annual estimates of naturally produced juveniles present.*

Indicator 3.4.4g - *Migration behavior of releases from this program.*

3.5 Genetic Characteristics

3.5.1 Standard: Patterns of genetic variation within and among natural populations do not change significantly as a result of artificial production.

Indicator 3.5.1b - *Genetic composition of naturally produced adults and co-occurring adults of this program, measured annually.*

3.5.2 Standard: Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.

Indicator 3.5.2c - *Timing of collection compared to overall run timing.*

3.5.4 Standard: Juveniles are released on-station, or after sufficient acclimation to maximize homing ability at intended return locations.

Indicator 3.5.4a - *Location of juvenile releases.*

Indicator 3.5.4b - *Length of acclimation period.*

Indicator 3.5.4c – *Release type, whether forced, volitional or direct.*

Indicator 3.5.4d - *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 Standard: Juveniles are released at fully smolted stage.

Indicator 3.5.5a - *Level of smoltification at release, compared to a regional smoltification (when developed). Release type, whether forced, volitional, or direct stream release.*

3.6 Research Activities

3.6.1 Standard: The artificial production program uses standard scientific procedures to evaluate various aspects of artificial propagation.
Indicator 3.6.1a – Scientifically based experimental design, with measurable objectives and hypothesis.

3.6.2 Standard: 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.
Indicator 3.6.2a – Monitoring and evaluation framework including detailed time line.
Indicator 3.6.2b – Annual and final reports.

3.8 Socio-Economic Effectiveness

3.8.1 Standard: Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population.
Indicator 3.8.1a - *Total cost of program operation.*

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

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

WDFW will use the above information and other information deemed appropriate (such as adult returns, population size and natural spawning) to determine whether the program has provided expected benefits. The ability to estimate such indicators will be determined by implementation plans, budgets, and assessment priorities.

1.10.2) "Performance Indicators" addressing risks.

(From NMFS *Artificial Propagation Performance Standards and Indicators*, January 17, 2001: numbers specific to that document)

3.2 Harvest

3.2.1 Standard: 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.
Indicator 3.2.1d – *Annual escapements of natural populations that are affected by fisheries targeting program fish.*

3.3 Conservation of Wild/Naturally Spawning Populations

3.3.1 Standard: Artificial propagation program contributes to an increasing number spawners returning to natural spawning areas.

Indicator 3.3.1a – *Annual number of spawners on spawning grounds by age.*

Indicator 3.3.1b – *Spawner-recruit ratios.*

Indicator 3.3.1c – *Annual number of redds in selected natural production Index areas.*

3.4 Life History Characteristics

3.4.2 Standard: Broodstock collection does not significantly reduce potential juvenile production in natural rearing areas.

Indicator 3.4.2a – *Number of spawners of natural origin removed for broodstock.*

Indicator 3.4.2b – *Number and origin of spawners migrating to natural spawning areas.*

3.4.3 Standard: Life history characteristics of the natural population do not change as a result of this artificial production program.

Indicator 3.4.3a – *Specific life history characteristics to be measured in the artificially produced population include: juvenile migration timing; size at outmigration; adult return age and sex composition; juvenile growth rate, condition factors, and survivals at several growth stages prior to release; adult physical characteristics; fecundity and egg size.*

3.5 Genetic Characteristics

3.5.2 Standard: Collection of broodstock does not adversely impact the genetic diversity of the naturally spawning population.

Indicator 3.5.2a – *Total number of natural spawners reaching the collection facility.*

Indicator 3.5.2d – *Total actual escapement to each natural spawning area above collection facility*.

3.5.3 Standard: Artificially produced origin adults in natural production areas do not exceed appropriate proportion of the total natural spawning population.

Indicator 3.5.3a – *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.*

3.7 Operation of Artificial Production Facilities

3.7.1 Standard: 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.
Indicator 3.7.1a - *Annual reports indicating level of compliance with applicable standards and criteria.*
Indicator 3.7.1b - *Periodic audits indicating level of compliance with applicable standards and criteria.*

3.7.2 Standard: Effluent from artificial production facility will not detrimentally affect natural populations.
Indicator 3.7.2a - *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 Standard: 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.
Indicator 3.7.3a - *Water withdrawals compared to applicable passage criteria.*
Indicator 3.7.3b - *Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria.*
Indicator 3.7.3c - *Number of adult fish aggregating and/or spawning immediately below water intake point.*
Indicator 3.7.3d - *Number of adult fish passing water intake point.*
Indicator 3.7.3e - *Proportion of diversion of total stream flow between intake and outfall.*

3.7.4 Standard: Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens.
Indicator 3.7.4a - *Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.*

3.7.5 Standard: 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.
Indicator 3.7.5a - *Number and location(s) of carcasses or other products distributed for nutrient enrichment.*

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

3.7.7 Standard: Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.
Indicator 3.7.7a - *Mortality rates in trap.*
Indicator 3.7.7b – *Pre-spawning mortality rates of trapped fish in*

hatchery or after release.

3.7.8 Standard: Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish.

Indicator 3.7.8a - *Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.*

WDFW will use the above and other indicators to determine whether the program has, or is, causing unacceptable risks to the listed natural populations within the Snake River Basin.

1.11) Expected size of program.

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

<u>Supplementation Program:</u> The current supplementation program level is to collect 100 adult fish annually (proposed 50 natural and 50 hatchery origin) of either hatchery or natural origin. Additional jacks (above the 100 adult fish collected) may also be collected for broodstock purposes, but will not exceed proportion of jacks captured at the Tucannon Adult Trap. **Note:** The co-managers want to increase the number of smolts released. The final numbers are still being negotiated, but if the WDFW proposed level of 225,000 smolts were the target we would have to collect 170 adults at the trap starting in 2006. The proportion of wild and hatchery fish collected would be based on the run with no fewer than 25% of the broodstock of wild origin.

<u>Captive Broodstock Program:</u> For the captive broodstock program, no adults are collected. Instead, the program has been built by collecting eggs/fry from the hatchery supplementation program. This was done to lessen the effects of the program on the natural population. The number of spawned fish will vary based on the maturity by age of the captive broodstock.

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

Table 1. Tucannon River spring chinook production from Lyons Ferry Complex into the Tucannon River.

Life Stage	Release Location (release method)	Stock	Production Goal	Maximum Annual Release Level
Eyed Eggs			0	0
Unfed Fry			0	0
Fry			0	0
Fingerling			0	0
Yearling	Curl Lake Acclimation Pond (volitional)	Tucannon Supplementation	132,000	150,000
Yearling	Curl Lake Acclimation Pond (volitional)	Tucannon Captive Broodstock	150,000	150,000

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

The Tucannon River spring chinook supplementation program has been operating since 1985. Survivals within the hatchery for the supplementation program have generally been above program expectations by returning adults to the program above the replacement level. However, the program has never met the hatchery mitigation goal (1,152 adults), as specified under the LSRCP, due to poor smolt-to-adults return rates (SAR). Mean SAR for the supplementation program has averaged 0.2%. Expected SAR under the LSRCP was 0.87%.

The WDFW evaluation program has documented natural and hatchery origin smolt-to-adult return rates and parent-to-progeny ratios (Table 2), and escapement levels (Table 3) since 1985 (Bumgarner et al. 2000, Gallinat et al. 2001). Smolt-to-adult return rates of natural smolts have consistently outperformed the hatchery smolts. However, the natural population is below replacement (0.5 returns/spawner), whereas the hatchery population is not (2.0 returns/spawner). Therefore, the current hatchery supplementation population is critical to maintaining natural production in the river.

Table 2. Smolt-to-adult and parent-to-progeny (R/S) ratios for natural and hatchery reared Tucannon River spring chinook salmon (1985-1999 brood years).

	Natural Origin		Hatchery Origin	
Brood Year	**SAR**	**R/S**	**SAR**	**R/S**
1985	0.93	0.69	0.35	5.00
1986	0.80	0.90	0.22	3.73
1987	0.54	0.49	0.12	2.29
1988	1.41	1.73	0.31	5.14
1989	0.53	0.57	0.25	1.99
1990	0.19	0.15	0.03	0.36
1991	0.02	0.02	0.03	0.35
1992	0.38	0.34	0.09	0.98
1993	0.41	0.47	0.15	2.27
1994	0.20	0.17	0.03	0.49
1995	8.00	0.55	0.29	4.62
1996	4.28	0.51	0.34	3.51
1997	3.79	5.47	0.75	2.03
1998	6.81	7.35	0.65	9.76
1999	1.73	1.32	0.03	0.24

Table 3. Estimated total returns of natural and hatchery-origin spring chinook to the Tucannon River, 1985-2004.

Return Year	**Natural Origin**	**Hatchery Origin**	**% Natural**
1985	591	0	100.0
1986	636	0	100.0
1987	582	0	100.0
1988	410	19	95.6
1989	336	109	75.5
1990	494	260	65.5
1991	260	268	49.2
1992	418	335	55.5
1993	317	272	53.8
1994	98	42	70.0
1995	21	33	38.9
1996	147	85	63.4
1997	134	154	46.5
1998	85	59	59.0
1999	3	242	1.2
2000	82	257	24.2
2001	718	294	70.9
2002	350	655	34.8
2003	248	196	55.9
2004	400	173	69.8

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

The supplementation program started in 1985, and has been under continuous operation since then. The captive broodstock program began operation in 1997.

1.14) Expected duration of program.

The supplementation program is part of the LSRCP mitigation program, and will continue as long as mitigation is required under the LSRCP. Conservation and recovery actions described for the Tucannon River play a vital role in the overall duration of the spring chinook programs. It is anticipated that spring chinook survival must be improved to a level where the population can be determined to be at or above the replacement level most years (presumably a requirement which must be met for NMFS to de-list the population).

As described in the Tucannon River Captive Broodstock Master Plan (1999), WDFW collected fish from the 1997-2001 brood years. Fish from the 1997-2001 brood year will be raised to adults and spawned. Fish were also collected from the 2002 brood year in order to have males on hand to spawn with the captive brood females at the end of the program. It is anticipated that the last adult will spawn in 2006 at Age 5, and the final progeny will be released into the Tucannon River in 2008. Hatchery operations for the captive broodstock program will cease following the last release. Monitoring and final evaluation of the captive broodstock program will continue until 2011, when the last captive brood adult should return to the Tucannon River.

1.15) Watersheds targeted by program.

Both supplementation and captive broodstock program target natural and hatchery spring chinook within the Tucannon River. Should production levels (survival) be greater than anticipated, WDFW has also expressed interest in re-introduction of spring chinook into Asotin Creek using Tucannon River stock (captive brood or supplementation fish).

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

Straying of adults from other sources (broodstocks or river systems) into the Tucannon River, primarily from the Umatilla River, on this small, depressed endemic population is a serious concern. Although the LSRCP program has annually released 132,000 smolts into the river, it has never achieved the 1,132 adult hatchery fish return goal. Increasing production to meet the adult goal is an issue for discussion, but managers need to establish an escapement goal for the Tucannon before considering increased hatchery production and how it will relate to that goal. Further is the potential need to re-negotiate increased mitigation (and potentially increased hatchery production) for natural production which was assumed to continue under the original LSRCP document. The current depressed population doesn't support this assumption. Moreover, the level and type of marking for such increases, as well as how they relate to future harvest opportunities and ESA restrictions in the system need to be addressed.

Despite the hatchery effort, Tucannon spring chinook experienced a significant bottleneck in the late 1990s that could have affected the genetics of the population. Total returns to the basin have since increased substantially, however numbers of naturally reared adults have lagged behind hatchery reared adults. Because of this unbalanced return, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) has expressed concern about using equal numbers of hatchery and wild origin adults in the broodstock. CTUIR staff believes the more naturally reared adults should be allowed to escape and spawn in the upper Tucannon River when hatchery-origin returns are large. The captive broodstock program in the Tucannon was begun with BY1997 fish to increase population abundance and reduce the potential for another very low adult escapement following the bottleneck in the late 1990s. The captive brood program is scheduled to terminate in 2008. Harvest opportunity while the captive brood program is underway is an area of disagreement between the State and Tribal managers. Continuing a reduced captive brood program as a safety net has been proposed, but poses several potential genetic problems.

Curl Lake is essential for release of all spring chinook smolts into the Tucannon River. During an inspection by Washington State Ecology engineers, the safety of Curl Lake Dam was raised as an issue if regular maintenance and repairs were not completed. Maintenance and investment in reinforcing the dam may be required to meet State safety standards for dams (Note: Maintenance of dam completed in Spring 2005).

1.16.2) Potential Alternatives to the Current Program

Alternative 1: <u>Institute broodstock trapping in the lower Tucannon to allow removal of stray chinook from the naturally spawning population throughout the basin.</u>
Trapping in the lower river would allow removal of stray fish and maintain stock integrity throughout the entire spawning area in the river. Presently about one-third of spawning occurs below the Tucannon Hatchery Trap, allowing substantial opportunity for stray introgression. Lower river trapping could also collect broodstock earlier in the year, assuring program continuity. However, any type of trap could inhibit upstream migration and force adults to over-summer in poor holding habitat, resulting in higher pre-spawning mortality. Unless marking protocols ensured that strays were externally identifiable, trapping would ineffectively remove strays. Construction and O&M of a trap could be very expensive.

Alternative 2: <u>Use natural-origin fish as broodstock in proportion to their presence in the run (not to exceed 50%).</u>
During years when hatchery-origin fish far outnumber natural-origin fish in the run it may be beneficial to just take known hatchery-origin (endemic Tucannon

Stock) fish for broodstock and allow the natural-origin fish to spawn naturally in the river. This action would increase the proportion of natural fish in the annual spawning population. Further, broodstock collection would be almost assured each year. However, just taking hatchery-origin fish as broodstock could cause more pronounced domestication of the stock and reduce overall stock fitness. All hatchery fish are not marked (especially strays) and their passage for natural production could compromise stock integrity.

Alternative 3: <u>Continue the captive brood program at a reduced level to ensure adequate broodstock during low run years.</u>
During low run years, having captive brood fish on hand as a safety net program would help to meet egg-take goals. However, the captive brood program was specifically kept short in duration to limit potential adverse genetic effects on the endemic population. The program was originally initiated only as a “stop-gap” measure to halt the population decline due to a period of low run sizes. Captive brood survivals and their success have yet to be deemed a success or failure.

Alternative 4: LSRCP mitigation was for 48% of the loss at the dams, natural production was to account for 52%. Neither goal was achieved. Increase supplementation production of Tucannon spring chinook to achieve LSRCP returns of 1,132 hatchery adults to the river, as well as increase mitigation to compensate for lack of sustainable natural production.
Increased abundance of adults will: decrease concerns about small spawning population size, increase marine nutrient flow into the system which may increase basin productivity, provide for Tribal and sport harvest opportunities, and achieve full promised mitigation levels. However, increased production will require greater hatchery and natural broodstock removal from the river that could mine the natural population and cause further genetic damage. Greater hatchery production could overwhelm natural production on the spawning grounds. Greater hatchery space and additional well water will likely be needed to accomplish this task.

Alternative 5: If adequate numbers exist, the Tucannon spring chinook should be explored as the founding brood stock for Asotin Creek.
Habitat improvement projects that have been conducted on Asotin Creek may lead to increased survival. The historic spring chinook population in Asotin Creek has been extirpated which would open it up for a possible reintroduction effort. Expanding into the Asotin Creek basin would provide another source of spring chinook should problems occur in the Tucannon, and could increase the overall abundance of this unique Snake River population. This may be the most appropriate stock for Asotin Creek reintroduction. However, a management plan is currently not in place for Asotin Creek and agreement has not been reached on which stock to use for the founding population. Tucannon River spring chinook is a listed species and the population currently is not consistently large enough to be used as a founding population for a different watershed.

1.16.3) Potential Reforms and Investments

Reform/Investment 1: If the program were expanded, additional rearing, incubation, acclimation sites, and captive brood space along with increased well water may be needed. Modifications to Lyons Ferry Hatchery Complex could easily exceed $$$$$.

Reform/Investment 2: An acclimation and release facility on Asotin Creek may be needed if Tucannon River spring chinook were used as its founding population. Investment cost for the construction of a new acclimation pond could reach $$$. Direct releases are an alternative $.

Reform/Investment 3: Intensively evaluate the amount of straying to measure the potential for effects on the local population. Carcasses are sampled during spawning ground surveys on an annual basis and genetic samples are taken as part of those surveys. These samples can be used for DNA analysis to determine if strays represent significant introgressions into this endemic ESA listed stock.

Umatilla fish were marked with ventral fin clips in the past and going back to this mark would permit hatchery staff to exclude these fish from going above the hatchery dam to spawn.   However, genetic analysis is costly and Umatilla origin fish were not marked for a number of years. Moreover the strays could not be removed from the Tucannon below the Hatchery trap and therefore may affect the endemic population anyway. $

Reform/Investment 4: Construct a lower Tucannon River trap to manage straying into the Tucannon, collect broodstock from a greater proportion of the total river population, and provide better estimates of total escapement for management. $$$ to $$$$

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 Tucannon River spring chinook supplementation and captive broodstock program, WDFW currently has submitted an updated application to replace Section 10 Permits #1126 (research activities on the Tucannon and Asotin Creek), and #1129 (hatchery supplementation and captive broodstock propagation for Tucannon River spring chinook). WDFW also has USFWS Consultation with NMFS for LSRCP actions and the NMFS Biological Opinion, and a statewide Section 6 Consultation with the USFWS for interactions with Bull Trout. Further, WDFW has written HGMPs to cover all stocks/programs produced at LFC.

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.

WDFW has estimated natural and hatchery-origin spring chinook escapement into the Tucannon River since 1985 (Table 3). The largest escapement was seen in 2001 when an estimated 1,012 fish returned (Gallinat et al. 2002), of which 718 were natural-origin. The lowest return on record was in 1995, when an estimated total of 54 fish were believed to escape into the system, 21 of which were natural-origin. Tag recoveries from fish spawned at the hatchery, and recovered from the spawning grounds on the Tucannon River, show the population to be made up of 3-5 year old individuals (all 1-year freshwater age and 2-4 year ocean age). Rarely have 6-year old individuals been identified in the population. The dominant age of return for both natural and hatchery origin is four years (65-75%). Three-year old fish occur more in the hatchery population (mean 1985-1995 broods = 15%), with natural-origin fish from the same period at 2%. It is believed that hatchery fish return at a younger age due to the greater smolt size at release compared to natural reared fish. Sex ratio’s vary between years but generally average 1:1 for most years.

Fish enter the Tucannon River as early as late April and as late as September. Redds have been observed as high as Rkm 84 (Bugert et al. 1990), and as low as Rkm 13 (Bumgarner et al. 1997). Juveniles have been documented as low as Rkm 22 (WDFW Unpublished data). Spawning begins in late August and can continue into the first week of October. Hatchery and natural fish appear to enter and spawn in the river at the same time. About 70% of the run is captured at the Tucannon adult trap each year.

Generally, juvenile spring chinook rear successfully in the Tucannon above Rkm 39 (Marengo). Though they can be found in lower sections of the Tucannon River, their survival is likely limited by potentially lethal summer rearing temperatures. Between Rkm 39 and 55, rearing conditions are generally good and should improve due to conservation and stream rehabilitation efforts in recent years. The majority of juveniles spend one year in the Tucannon River before out-migrating as smolts. A small percentage of fish (<5%) will spend an additional year in the river. Sampling of these fish indicate they are all males that mature in the second year (WDFW Unpublished Data), and represent a variant life pattern for species survival.

The majority of smolts leave the Tucannon River between early March and late May; however, an early fall migration has also been documented (Mendel et al. 1993). Natural smolt size varies (85-135mm), and appears to vary annually in relation to total fish production in the river. Natural production of smolts has varied between 75 and 58,200 fish based on smolt trapping estimates.

Hatchery smolt size has also varied over the years, but is currently programmed for release at 15 fish/lb or 30.0 g/fish. Hatchery spring chinook smolts have been released at a variety of locations over the years (Rkm 58-78) to determine optimum release location (Bumgarner et al. 1996). Currently, all hatchery smolts are released from Curl Lake Acclimation Pond (Rkm 66).

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

Tucannon River natural and hatchery origin spring chinook are part of the listed Snake River Spring/Summer Chinook ESU. Each is currently used in both the supplementation and captive broodstock programs. Tucannon River natural and hatchery origin fish will be directly affected by broodstock collection activities. However, this action is deemed necessary at this time for continuation of the stock in the river.

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

The supplementation and captive broodstock program will incidentally affect Tucannon River bull trout, summer steelhead and fall chinook. Juvenile hatchery and natural origin spring chinook may compete for food and space with naturally rearing bull trout and summer steelhead of the same size. However, as a positive benefit to bull trout and summer steelhead, any hatchery reared smolts released into the system, or additional natural production of juvenile spring chinook in the Tucannon River from the hatchery program, may serve as prey for bull trout. Bull trout and summer steelhead are also captured in the adult trap at TFH during the same period when spring chinook are captured. All bull trout and summer steelhead captured will be immediately released after sampling. Trapping/sampling/handling of bull trout has been authorized by USFWS under a Section 6 Cooperative Agreement with WDFW. Trapping/sampling/handling of summer steelhead has been authorized by NMFS under an HGMP for Tucannon River Endemic summer steelhead. Strict protocols will be followed to ensure healthy fish upon release.

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

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

Tucannon River spring chinook were classified as "depressed" by WDFW (SASSI 1993) because of chronically low escapement levels. In 1992, NMFS listed Snake River spring/summer chinook salmon as "endangered", and then re-classified them as "threatened" in 1995. Tucannon River spring chinook were part of the Snake River spring/summer ESU. The status of the natural population is currently below replacement level. As such, stochastic events pose significant genetic risk to the population because of low absolute population numbers. Currently, there is no recognized escapement goal for wild Tucannon River spring chinook salmon. WDFW has proposed a goal of 600 natural spawners, and 300 hatchery spawners. Average natural escapement has been 316 spawners/year since 1985, with an estimated range of 3-718 fish. Average hatchery escapement has been about 206 spawners/year since 1988, with an estimated range of 19-655 fish (Table 3).

Bull Trout

Spawning ground surveys conducted within the basin have suggested a stable to slightly increasing population of bull trout since 1991 (WDFW District 3 Fish Management Files-Dayton, Washington). Resident, fluvial and ad-fluvial segments of the population are all believed to be present (Martin et al. 1992). Based upon the population status of the species, and risk factors affecting the likelihood for its continued existence, the USFWS determined that Columbia River basin bull trout warrant protection under the ESA as a distinct population segment (DPS). Individual basin status (including the Tucannon River) is currently under review and may be exempted, however, no such determination for the Tucannon River is likely to occur in the near future. A draft lower Snake River bull trout recovery plan has been prepared.

Summer Steelhead

Tucannon River steelhead are part of the Snake River ESU. Recent estimated escapements of wild fish in the Tucannon River have ranged from a low of 71 in 1996, to a high of 525 in 1988. The population was relatively stable prior to 1990. Following that, the population has rapidly decreased and NMFS, WDFW, NPT, and CTUIR consider the Tucannon River steelhead a candidate for supplementation to help rebuild the run. There has been a clear failure of the natural stock to replace itself in recent years due to the same limiting factors that caused the decline of the spring chinook population. Also, a WDFW weir located at TFH prior to 1996 is believed to have substantially deterred steelhead escapement into the upper river.

Fall Chinook

Since 1988, the WDFW has documented 16-61 fall chinook salmon redds per year in the lower 21 rkm of the Tucannon River. Many of the carcasses recovered have been unmarked, and therefore are of unknown origin. Fall chinook from outside the Snake River Basin (i.e., Umatilla Hatchery fall chinook) are known to stray into the Snake River Basin in relatively large numbers (Mendel et al. 1996). Many of these stray fall chinook are unmarked, and could represent a large proportion of the fish spawning in the Tucannon River. WDFW has also recovered a few spawned out fish in the Tucannon River that originated from LFH. WDFW is unsure whether spawning fall chinook in the lower Tucannon River represents a self-sustaining population, or is a conglomeration of many stocks from other basins and hatcheries. However, once these fish spawn in the river, progeny that survive become listed as "threatened" under the ESA, unless the progeny can be genetically determined to be from non-Snake River origin fish. By mandate of the Act, the managers are therefore obligated to protect this listed species and improve their critical habitat to the fullest extent possible.

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

Parent-to-progeny ratios (R/S), and survival by various life stages have been calculated for natural and hatchery-origin Tucannon River spring chinook salmon as part of the LSRCP evaluation program (Table 4). Naturally reared spring chinook are currently below the replacement level with average Return/Spawner ratio of 0.6. Hatchery reared fish are currently above replacement with average R/S ratio of 1.8 (Gallinat et al. 2002).

Table 4. Survival of natural and hatchery origin spring chinook salmon from the Tucannon River (2000 incomplete).								
	Natural Origin				**Hatchery Origin**			
Brood Year	**R/S**	**% Egg-fry survival**	**% fry-smolt survival**	**% Egg-smolt survival**	**R/S**	**% Egg-fry survival**	**% fry-smolt survival**	**% Egg-smolt survival**
1985	0.69	10.6	46.6	4.9	5.00	90.3	96.4	87.1
1986	0.90	13.1	56.7	7.4	3.73	94.3	86.7	81.8
1987	0.49	10.4	55.6	5.8	2.29	83.8	92.4	77.4
1988	1.73	15.2	54.3	8.3	5.14	82.6	97.0	80.1
1989	0.57	14.4	51.2	7.4	1.99	77.5	95.8	74.2
1990	0.15	13.2	57.4	7.6	0.36	70.9	95.8	67.9
1991	0.02	19.0	54.7	10.4	0.35	84.6	95.9	81.1
1992	0.34	14.2	49.2	7.0	0.98	97.0	57.8	56.1
1993	0.47	12.9	57.1	7.4	2.27	86.3	95.6	82.5
1994	0.17	7.1	55.0	3.9	0.49	82.2	97.9	80.4
1995	0.55	0.0	0.0	0.3	4.62	74.5	97.4	72.6
1996	0.51	1.2	56.7	0.7	3.51	68.5	94.9	65.0
1997	5.47	13.2	64.0	8.4	2.03	20.6	81.6	16.8
1998	7.35	8.7	65.2	5.6	9.76	84.5	94.1	79.5
1999	1.32	12.3	51.2	6.3	0.24	94.1	91.3	86.0
2000	1.65	13.8	44.9	6.2	2.40	95.6	82.8	79.2
2001		6.1	60.1	3.6		95.0	84.0	79.8
2002		6.7	83.8	5.7		89.5	81.6	73.0
2003		9.1				89.9	56.3	50.6
2004						91.8		
Geometric Mean	0.63	10.6	53.5	5.9	1.79	82.7	88.2	72.2

- Provide the most recent 12-year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.

Estimated natural and hatchery-origin spawning spring chinook salmon in the Tucannon River from 1985-2002 has been calculated (Table 5) based on weekly spawning ground surveys, carcass collection and adult trap information. The data are compiled from the LSRCP annual report for Tucannon River Spring Chinook Hatchery Evaluations (1986-2004).

Table 5. Estimates of natural and hatchery reared Tucannon River spring chinook salmon on the spawning grounds from the Tucannon River, 1985-2004.

Run Year	Natural Origin	Hatchery Origin	Percent Natural	Percent Hatchery
1985	569	0	100	0
1986	520	0	100	0
1987	481	0	100	0
1988	294	10	96.7	3.3
1989	269	7	97.5	2.5
1990	433	178	70.9	29.1
1991	219	171	56.2	43.8
1992	336	228	59.6	40.4
1993	254	182	58.3	41.7
1994	62	8	88.6	11.4
1995	11	0	100	0
1996	104	32	76.5	23.5
1997	78	68	53.4	46.6
1998	37	14	72.5	27.5
1999	2	105	1.9	98.1
2000	70	169	29.3	70.7
2001	658	236	73.6	26.4
2002	308	589	34.3	65.7
2003	205	161	56.0	44.0
2004	349	131	72.7	27.3

- Provide the most recent 12-year (e.g. 1988-2000) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

See Table 5 above.

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

Broodstock Trapping: Listed spring chinook adults (Tucannon River natural and hatchery-origin) will be trapped and collected for broodstock from April through October, which constitutes a direct take of listed fish (Take Table A). Natural and hatchery-origin adults will be trapped, handled, and passed upstream during trapping operations which may lead to injury and/or mortality of listed fish. The trap is entirely fenced to prevent unauthorized access.

Bull trout and summer steelhead are indigenous to Tucannon River, and indirect takes of bull trout and summer steelhead are anticipated through the broodstock collection program. Any bull trout or summer steelhead encountered at the adult trap will be sampled (length, DNA, scales) and then passed immediately upstream, with minimal delay. Trapping and sampling of bull trout has been authorized by USFWS in accordance with a Section 6 Cooperative Agreement for the Endangered and Threatened Fish and Wildlife Program – Washington. Trapping and sampling of summer steelhead has been authorized by NMFS in accordance with the Tucannon River summer steelhead HGMP (2001)

Spawning, Rearing and Releases: Spawning of the adults, egg incubation, and rearing/release of spring chinook for 18 months from September through the second week of April has a potential for lethal take of these listed spring chinook. Mortality can occur in association with fish culture activities and conditions which affect fish health and development, from handling procedures, fertilization procedures, water temperature, water quality, water flow, feeding success, and transport. Further, the release of hatchery-origin Tucannon River spring chinook may incidentally affect (take) other listed salmonids in the Tucannon River by displacement or competition.

Monitoring and Evaluation: Contact with listed summer steelhead during spawning ground surveys (August-October), summer parr population monitoring (snorkeling), smolt trapping, and PIT tagging programs may take listed spring chinook. Each of these activities is described in more detail below.

Spawning Ground Surveys: Takes associated with spawning ground surveys (Take Table B) will occur in the form of "observe/harass" and from occasional carcass recovery of spawned adults. Spawning surveys for spring chinook are conducted from late August through early October. Surveys are conducted once or twice a week, with the intent to estimate spawning escapement into the Tucannon River. Surveys cover the entire range of spring chinook spawning (King Grade rkm 34.1 to Sheep Creek rkm 84.2). Additional surveys are sometimes conducted below King Grade but have seldom indicated any spawning activity. Each survey section is about 3-4 miles in length. During each survey, surveyors generally walk down the bank and not in the water when possible. Surveyors look for redds, record and mark their location, and look for live and dead fish. During the peak of the spawning activity (around mid-September) additional surveys are walked to collect spawned-out carcasses. Carcasses provide additional data for run and age composition, study group analysis, and DNA samples. Properly conducted surveys are not expected to result in any direct or indirect mortality.

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

Electrofishing: Incidental takes of listed spring chinook in the Tucannon River will occur during electrofishing surveys for listed summer steelhead (Take Table B). Electrofishing surveys occur from July through August, and are conducted to monitor distribution and abundance of natural-origin steelhead. Spring chinook captured during electrofishing surveys will be used to provide a secondary estimate to compare with the snorkel estimates. Electrofishing surveys will also allow limited data on fish length, weight, and condition factor during the summer months.

Electrofishing surveys are conducted using a modified Smith-Root backpack electroshocker with upgraded, state of the art electronic components. Use of this programmable output waveform electroshocker has decreased the incidence of injury to small fish. Guidelines established by NMFS and WDFW will be followed when conducting surveys. Pertinent environmental information during surveys (conductivity and temperature for each site) will be recorded, as previously specified in Section 10 Permit #1126 (research activities on the Tucannon River).

PIT Tagging: Takes of listed natural and hatchery-origin spring chinook will occur during PIT tag studies (Take Table B). Tagging will occur at the Tucannon Hatchery prior to transfer to Curl Lake, or at Curl Lake when fish are actively migrating. Tagging will also occur at the Tucannon River Smolt trap (described in the next section). Tagging of listed hatchery-reared fish with PIT tags will provide information on downstream migration performance (relative survival, migration speed, and timing) from release points in the Tucannon River. Tagging procedures follow established protocols used throughout the Columbia and Snake River basins by WDFW and other agencies when PIT tags are utilized. Mortality of PIT tagged fish is expected to be 1% or less.

Smolt Trapping: Takes of out-migrating listed spring chinook (natural and hatchery-origin) will occur at WDFW's smolt trap (Take Table B) located on the mainstem Tucannon River (RKM 3). The trap will be operated from October to early July each year to capture natural and hatchery-origin spring chinook, natural fall chinook, and natural and hatchery-origin summer steelhead. Smolt trapping enables WDFW staff to estimate natural smolt production from the basin, and evaluate performance of hatchery releases. Some of the natural and hatchery fish captured will be measured, weighed and released. Small groups of captured fish (natural or hatchery-origin) will receive a partial caudal fin clip for identification and transported back upstream about one kilometer and released to calculate trap efficiency. Other groups of fish (about 100/group) may be PIT tagged from the smolt trap to determine migration speed and relative survival from the smolt trap. Most fish will be counted and released immediately back to the stream to continue their out-migration. During peak out-migration, fish may be held in live boxes for two to three hours before release (mark/recapture trial, or PIT tagged). At other times of year the trap may be checked only once a day. Delayed migration will result for fish captured in the trap, and delayed mortality as a result of injury may also result. Mortality of natural spring chinook is expected to remain below 0.5% (based on previous records of smolt trapping in the Tucannon River from 1997-present).

- 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 to capture spring chinook from April to October will result in the direct take of listed spring chinook salmon, though mortalities due to trapping are expected to be low (Table 6). Operation of the adult trap during that time will also indirectly take listed bull trout and summer steelhead. Trap operations have the potential to prevent or delay upstream migration of a small number of bull trout or summer steelhead that approach. The adult trap may also cause indirect mortalities as a result of handling fish to remove them from the trap. Mortalities are expected to be less than 5% of the total spring chinook, bull trout, or summer steelhead trapped. Previous trap operations have not documented any direct delay of bull trout or steelhead.

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

WDFW has operated the adult trap site (~RKM 59) continually from May to October since 1990 (Table 6). Prior to 1990, the trap was operated from late April to early July to collect broodstock for the hatchery. Direct mortalities associated with trapping have been very low.

Table 6. Number of trapped natural and hatchery-origin adult spring chinook captured at the Tucannon River adult trap (RKM 58 or 59) from 1986-2004.						
Run Year	**Natural Origin**	**Natural Mortalities**	**Hatchery Origin**	**Hatchery Mortalities**	**Total Trapped**	**Total Mortalities**
1986	247	0	0	0	247	0
1987	209	0	0	0	209	0
1988	267	0	9	0	276	0
1989	156	0	102	0	258	0
1990	252	0	216	1	468	1
1991	109	0	202	0	311	0
1992	242	8	305	3	547	11
1993	191	0	257	0	448	0
1994	36	0	34	0	70	0
1995	10	0	33	0	43	0
1996	76	1	59	4	135	5
1997	99	0	160	0	259	0
1998	50	0	43	0	93	0
1999	1	0	139	1	140	1
2000	28	0	177	17	205	17*
2001	405	0	276	0	681	0
2002	168	0	610	0	778	0
2003	84	0	151	0	235	0
2004	311	0	155	0	466	0

- * Stray hatchery fish that were killed outright.

-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" Tables A and B 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.

While WDFW has tried to foresee all possible mortalities for hatchery and evaluation activities described within this HGMP, it is possible that certain situations may arise either in broodstock trapping, or evaluation projects that take levels may be exceeded. In the event WDFW can foresee that a particular take level will be exceeded, it will contact NMFS immediately to apprise them of the problem. NMFS and WDFW will formulate a plan that will minimize any further takes. Should a take level be unexpectedly exceeded, WDFW will immediately halt the operation (i.e., broodstock trapping, smolt trapping, etc.) that caused the mortalities. Consultations will begin immediately with NMFS to see if an agreed upon solution to the mortalities can be utilized so activities may continue.

SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

Lyons Ferry Complex is part of the LSRCP Program and the production of spring chinook is part of legally required mitigation provided to the state of Washington under the LSRCP Program. Spring chinook production is recognized under the U.S. vs. Oregon annual production plan as part of the fall fishing agreement.

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

This HGMP would be 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.

- *U.S. v. Oregon* Management plan for the Columbia River (currently under negotiation).
- Lower Snake River Compensation Plan goals as authorized by Congress direct actions to mitigate for losses that resulted from construction and operation of the four Lower Snake River hydropower projects.
- WDFW Wild Salmonid Policy. Fish and Wildlife is directed by State and Departmental management guidelines to conserve and protect fish populations within Washington, and use of an endemic broodstock to minimize staying of hatchery fish is preferred. No other comprehensive management agreements are in effect.
- Fisheries Management and Evaluation Plan (FMEP). Developing FMEP's for Snake River fisheries are currently being drafted by WDFW that will describe in detail the current fisheries management within the Snake River Basin within Washington, including the Tucannon River spring chinook. Fishery management objectives within the draft FMEP and this HGMP are consistent.

3.3) Relationship to harvest objectives.

The LSRCP, as a mitigation program, defined replacement of adults "in place" and "in kind" for appropriate state management purposes. In addition, WDFW has identified the maintenance of abundant naturally spawning populations and harvest as valuable management goals (WDFW Wild Salmonid Policy, 1999).

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

Based on 1985-1999 brood year Coded-Wire-Tag (CWT) recoveries from the Regional Mark Information System (RMIS) database, harvest has accounted for approximately 7.9% of the hatchery adult fish recovered annually. All sport fisheries within the Snake River are selective for hatchery-reared fish (denoted by lack of the adipose fin) and require release of natural-origin spring chinook (intact adipose fin). The adipose fin clip was abandoned for Tucannon River spring chinook starting with the 2000 brood year to decrease fishing mortality on this ESA listed population. Limited hooking mortality may occur as a result of sport fisheries on adults.

3.4) Relationship to habitat protection and recovery strategies.

Limited comprehensive review of the ecological health of the Tucannon River watershed in relation to salmonid population status and recovery has been completed. Limiting factors such as water temperature, channel stability, sediment, and instream habitat are known to exist in the basin (WDFW unpublished data), but the extent of these problems is un-quantified. State programs 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 U.S. Fish and Wildlife Service and National Marine Fisheries Service as well as National Environmental Protection Act (NEPA) review.

Most watershed restoration/improvement projects are funded through the Columbia Conservation District Tucannon Model Watershed Management Plan (1996). Efforts include fencing to ensure riparian vegetative recovery, improved fish passage at road crossings and diversions, reduced sediment production from roads and cropland, and screening of irrigation diversions. Taken together, habitat protection and improvement measures have, and will continue to improve habitat for and productivity of the basin’s spring chinook population.

3.5) Ecological interactions.

Summer steelhead and natural predators such as bull trout live sympatrically with Tucannon River natural-origin spring chinook, and may incidentally prey upon released hatchery-reared smolts of small size, or naturally produced spring chinook. Additionally, kingfishers, mergansers and other avian and mammal predators will prey on hatchery-reared juveniles/smolts as they migrate down the Tucannon River.

The release, and subsequent return as adults, of spring chinook will likely affect (positive and negative) the existence of ESA-listed populations of bull trout and summer steelhead. However, temporal and spatial overlap that could give rise to competitive or aggressive interactions for food and space will be minimized by the volitional release of smolts into the river. Smolts are expected to quickly emigrate from the system, thus interactions among the species will be minimized. Returning hatchery adults (supplementation and captive brood) are expected to spawn concurrently with natural spring chinook throughout their entire range in the Tucannon River. This will likely increase the abundance of juvenile spring chinook throughout the basin and fill available habitat, a positive benefit for bull trout that may use them as a food source.

SECTION 4. WATER SOURCE

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

Presently, LFH will be where adults are held and spawned, eggs hatched and juveniles reared through the fingerling stage. Lyons Ferry has eight deep wells that produce nearly constant 52^0 F, fish pathogen-free water. The hatchery is permitted to pump up to 53,000 gpm (118.1 cfs). High concentrations of dissolved Manganese (variable among the eight wells), and particulate Manganese Oxide, is strongly suspected of limiting the density at which chinook can be reared in raceways at LFH. 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 and enters the Snake River and will not affect Tucannon River water quality.

Fingerlings are transported to TFH in October each year. Once the fish reach TFH, they are reared on a combination of well, spring, and river water. Maximum capacity of well, spring and river water at TFH is 1.76 cfs, 1.41 cfs, and 7.42 cfs, respectively. River water is used as the main mixture, which allows for a more natural winter temperature profile. However, well and spring water is mixed to keep temperatures above 4.4 ^{0}C (40 ^{0}F), to prevent Erythrocytic Inclusion Body Syndrome (EIBS), which has been documented as a problem in the past. Fish remain at TFH until they are pre-smolts.

Pre-smolts are transported to Curl Lake Acclimation Pond in mid-February for acclimation and volitional release. Water is removed from the Tucannon River under a permit for non-consumptive fish propagation purposes, with maximum withdrawal of 6 cfs. Spring chinook taken to Curl Lake are acclimated for a minimum of three weeks before the outlet of the pond is opened to allow for volitional migration. Water temperatures while fish are acclimating range between 4.4-12.8 ^{0}C (40- 55 ^{0}F).

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

Water intake screens at Curl Lake Acclimation Pond meet current NMFS screening guidelines, and effluent discharge is monitored, reported, and currently complies with NPDES standards. Water intake screens at TFH and Curl Lake meet current NMFS screening guidelines, and effluent discharge is monitored, reported and currently complies with NPDES screening. Water withdrawal at LFH is through wells, and effluent is discharged to the Snake River, complying with NPDES standards.

SECTION 5. FACILITIES

5.1) Broodstock collection facilities (or methods).

Supplementation Program: Broodstock for the supplementation program will be collected at the TFH adult trap (RKM 59) on the mainstem Tucannon River. The TFH adult trap was constructed in 1998 after floods in 1996 destroyed the previous trap. The new trap is a ladder system around the TFH water intake building. The ladder can be opened to allow unrestricted passage if necessary. WDFW believes that trap to be about 90-95% efficient at capturing adults and jacks, but is highly dependant on springtime flows.

Spring chinook will generally not arrive at the trap before 1 May, but the trap will already be in operation for documentation of natural-origin summer steelhead. While in operation, TFH personnel will check the trap daily for fish. The trap may be checked more than once a day if a large number of fish are expected to be captured. Captured fish are netted from the trap box, and either placed in a V-shaped trough or inside a dark bag which holds water in the lower one-third of the bag. The V-shaped trough has a calming effect on the fish so they can be easily sampled prior to being collected or passed upstream. Collected samples may include lengths, scales, or DNA tissue samples (fin or opercle punch), with sex and origin (natural, hatchery supplementation, hatchery captive broodstock) determined as well. Fish placed in the bag (broodstock collected) are then lifted out of the trap and placed immediately into the transport truck. All broodstock collected are transported to LFH for holding and spawning. Holding of broodstock at LFH has proven to be beneficial in decreasing the number of pre-spawning mortalities each year. Pre-spawning mortality is generally 0-10% each year (Gallinat et al. 2001).

Captive Broodstock Program: Captive broodstock are held at LFH in 6.1 m circular fiberglass tanks.

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

Adult Salmon: All adult and jack salmon captured and hauled for broodstock from TFH are transported in a stainless steel, 500 gal tank on the back of a flatbed truck. The tank is equipped with supplemental oxygen and aerators. Transportation time to LFH is about 50 minutes. Up to 15 adults can be transported in the tank at one time.

Captive Brood Adults: Captive brood adults are briefly moved when mature fish are sorted from immature fish prior to spawning. During the sorting process all mature fish are removed from the 6.1 m circular tanks and loaded into a 500 gal transport tank. Oxygen and aerators are operating at that time. Mature fish are then hauled to adult holding facilities where they will eventually be spawned. Transport time to adult ponds is about 1 minute. Mature adults may spend up to a half hour in the tank before it is unloaded.

Juvenile Salmon: Juvenile spring chinook are immediately ponded to the outside raceways directly from the incubation stacks. They will remain in the raceways until marking time. After marking in September, the fish are loaded into 2,000 gal transport trucks with oxygen and aerators and transferred back to TFH in October. Transport time is about 50 minutes to TFH from LFH. During February, fish are loaded into transport vehicles and moved to Curl Lake Acclimation Pond. Transport time is about 15 minutes.

5.3) Broodstock holding and spawning facilities.

Broodstock captured at the TFH adult trap are hauled to LFH where they are placed in an adult holding raceway (3.1x 1.8x 24.4 m) that receives constant temperature well water. WDFW documented that holding fish at LFH significantly reduced pre-spawning mortality. Maturing captive broodstock adults are placed in the same adult holding raceway, but are screened from the supplementation fish.

The adult holding raceways are enclosed over the middle one-third of the raceway length by the spawning building, where spawning occurs. Within the spawning building, the gametes are collected from both the supplementation and captive broodstock. After origin has been confirmed for the supplementation fish, and after “family” has been determined for the captive fish, crosses occur, and the fertilized eggs are then taken up to the incubation building.

5.4) Incubation facilities.

The chinook salmon incubation rooms at LFH are designed to accept and incubate eggs from individual females through the eyed stage. The incubation rooms receive constant 11^{o} C well water. One incubation room utilizes heath incubation stacks; the other utilizes colanders nested in PVC buckets that receive water via individual plastic tubes. Isolated incubation vessels allow for controlling disease and for documenting fecundities and fertilization success of the different groups. Incubating eggs are treated with formalin every other day at 1,667 ppm (37% formalin) for 15 minutes to control fungus. After development to the eyed-egg stage, the eggs are shocked and Evaluation Staff remove the dead eggs. Substrate (layered plastic screening material) is added to the trays, and eggs from each female are placed back in its original tray. Eggs are allowed to hatch and sac fry rear in the trays, or troughs until yolk absorption is complete.

5.5) Rearing facilities.

LFH: When the incubating fry (supplementation and captive progeny) have completely absorbed their yolk sac, they are ponded in standard raceways at LFH (3.1 x 1.1 x 30.5 m). Each raceway is supplied with 500-1,000 gal/min of well water at constant temperature. Raceways are cleaned weekly by brushing screens and vacuuming pond floors. Fry are initially fed 8 or more times per day. Feeding frequency, percent BWD and feed size are adjusted as fish increase in size in accordance with good fish husbandry and program goals. In the future, some aspects of natural rearing techniques may be utilized (in-pond structures, covers for shading, in-water feeders, etc) for rearing fish at LFH. However, LFH is a production hatchery, and as such, the raceways were not designed for small group rearing, or for easily placing/removing natural structures in raceways.

TFH: TFH is designed similarly, but holds more promise for Natures rearing modifications. Depending on the number of fish transferred to TFH, fish will be placed in a 4.6 x 35.1 m raceway, two 3.1 x 24.4 m raceways and in circular ponds (~12.2 m diameter). Modifications to each of these existing facilities to use natural rearing techniques may be cost limited.

a. Acclimation/release facilities.

Curl Lake Acclimation Pond is a 0.85 hectare natural bottom lake, with a mean depth of 2.7 m (pond volume estimated at 22,203.3 m^3), and is supplied with a maximum of 0.17 cms (m^3/sec) (6 cfs or ~2,690 gal/min) river water. At maximum program level, up to 300,000 smolts (150,000 supplementation and 150,000 captive broodstock progeny) may be volitionally released from Curl Lake. Fish are put in Curl Lake during mid-February each year, and allowed 3-4 weeks of acclimation before the outlet of the pond is opened, allowing for volitional migration. Once the pond outlet screens are pulled, fish have about 4-5 weeks when they can leave the pond at any time. Generally, most of the fish don't exit the pond until April. During the final week of release, dam boards in the pond outlet are slowly removed to lower the pond. This generally encourages all remaining fish to leave.

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

Since the program inception in 1985, WDFW has documented significant mortality to fish in two areas of the hatchery practices, 1) broodstock holding, and 2) incubation of eggs. Both of these have been addressed (explained below) throughout the program and mortality is no longer an issue in these areas.

Broodstock pre-spawning mortality: Prior to 1992, collected broodstock for the supplementation program were held and spawned at TFH. Pre-spawning mortality averaged 25% for natural fish and 63% for hatchery-origin fish. Since 1992, broodstock have been held at LFH, with pre-spawning losses averaging only 5% for natural fish and 4% for hatchery-origin fish. Holding broodstock at LFH is the preferred action and will continue for the duration of the program.

Egg loss during incubation: The water chiller at LFH was installed and operated between 1991 and 1999. Mechanical problems plagued the water chiller from its initial operation, with constant repairs needed to keep it operating effectively. As such, many times during any given incubation year, eggs could experience large, sudden changes in water temperature that likely influenced overall survival. In particular, in 1997, the water chiller was fixed just prior to putting eggs in the incubation stacks. The maintenance made the chiller perform better than ever documented, and as such produced much colder water than expected. This was unknown and unchecked by all hatchery and evaluation staff prior to putting eggs in the stacks. The result was an 80% loss to eye-up on the entire 1997 brood year. However, even prior to that year, egg loss was elevated. Since use of the chiller ceased, egg loss to eye-up in the last two years was only 1.5%. The use of the water chiller at LFH in the future is not planned at this time. Costs to keep it operating and the dangers associated with the egg loss do not warrant its use at this time. However, should we need to explore the use of Remote Site Incubators to handle excess eggs in the program, use of the water chiller will be considered for that program.

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

Strict operational procedures as laid out by Integrated Hatchery Operation Team (IHOT 1993) are followed at LFH. Where possible, remedial actions identified in a 1996 IHOT compliance audit are implemented. Staff is available to respond to critical operational problems at all times. 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 and TFH. Fish health monitoring occurs monthly, or more often, as required in cases of disease epizootics. Fish health practices follow PNWFHPC (1989) protocol.

SECTION 6. BROODSTOCK ORIGIN AND IDENTITY

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

6.1) Source.

ESA listed natural and hatchery-origin adults and jacks captured at the Tucannon River adult trap will be used for the supplementation broodstock on an annual basis. No adults will be collected for the captive broodstock program. The captive broodstock program will be started from emergent fry from the supplementation program. No adults that return from the captive broodstock program will be used in the supplementation program unless future run sizes get critically low.

Supporting information.

6.2.1) History.

Prior to 1985, artificial production of spring chinook in the Tucannon River was nearly nonexistent, with only two fry releases in the 1960's (WDFW et al. 1990). In August 1962 and June 1964, 16,000 Klickitat (2.3 g fish or 197 fish/lb) and 10,500 Willamette (2.6g fish or 175 fish/lb) spring chinook stock, respectively, were released by the Washington Department of Fisheries into the Tucannon River. The out-planting program was discontinued after a major flood destroyed the rearing ponds in 1965. Neither of these releases is believed to have returned any significant number of adults. Hatchery mitigation (supplementation) smolt releases into the Tucannon River under the LSRCP began in 1987. The hatchery broodstock originated from natural origin adults and jacks beginning in 1985, with no hatchery fish used in the broodstock until 1989. Since 1989, the broodstock has consisted of natural and hatchery-origin fish. All hatchery fish used in the broodstock were of Tucannon River origin.

For the captive broodstock program, fry were collected from the 1997-2001 supplementation brood years. Fry have represented both natural and hatchery origin (confirmed by Coded-Wire-Tag) parents from the Tucannon River.

6.2.2) Annual size.

The current supplementation program requires the collection of 100 adults (natural or hatchery origin) to produce 132,000 smolts (LSRCP goal). This number takes into account pre-spawning loss, and losses anticipated in the hatchery to the smolt stage. **Note:** The co-managers would like to see an increase in the number of smolts released. The final numbers are still being negotiated, but if the WDFW proposed level of 225,000 smolts were the target we would have to collect 170 adults at the trap starting in 2006. The proportion of wild and hatchery fish collected would be based on the run with no fewer than 25% of the broodstock of wild origin.

The captive broodstock program goals require that 450 fish be held for adult spawners at

Age 1. However, as insurance against high mortality prior to Age 1, 1,200 fry are initially collected from the 15 families to rear to Age 1. At Age 1, the family sizes are reduced to 30 fish/family or 450 fish.

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

Supplementation Program:

In the beginning years of the spring chinook supplementation program, between 8 (1985) and 127 (1988) natural origin adults were collected to create the hatchery mitigation broodstock. High pre-spawning mortality forced managers to collect more fish to reach program goals. Beginning in 1992, broodstock were held at LFH in the cooler, pathogen free well water, which significantly reduced pre-spawning mortality, and the need for broodstock was reduced. Since 1992, WDFW has attempted to collect 100 fish annually (equal numbers of natural and hatchery-origin fish) for the broodstock.

However, since 1994, shortage of fish in the run, and shortage of natural fish in some years forced WDFW to collect all fish (natural or hatchery-origin) that returned to the TFH adult trap. For example, in 1995 this amounted to 43 total fish, of which only 10 were natural origin.

For the future supplementation program, WDFW proposes to continue with the goal to collect 100 fish (adults and jacks combined). WDFW will attempt to collect 50 natural and 50 hatchery-origin fish each year, but realize in some years that may not be possible, especially for natural-origin fish. In addition, WDFW proposes that adults originating from the captive broodstock program not be collected for hatchery broodstock. However, should the run collapse to levels experienced in 1994 and 1995, and we are broodstock limited, captive brood origin adults may be trapped to continue the supplementation program. Should that happen, WDFW will consult with NMFS, and tribal co-managers for an agreed upon collection level.

Captive Broodstock Program:

As described in the Captive Broodstock Master Plan, progeny selected for the captive broodstock program were selected based on three criteria: 1) parent origin, 2) ELISA (BKD test) results, and 3) crosses in the hatchery. Natural origin parents were generally chosen, unless disease-screening (BKD) results suggested otherwise.

During spawning of the mature captive broodstock females, WDFW will continue to incorporate as many natural origin males in their crosses as possible. However, differential spawn timing may limit this practice. Also, WDFW will be careful to not overuse natural origin males within the captive broodstock spawning crosses, thereby reducing the overall effective population size.

6.2.4) Genetic or ecological differences.

To date, WDFW has no evidence that the hatchery supplementation fish, natural-origin fish, or captive broodstock fish are genetically or ecologically different from one another. The spring chinook program in the Tucannon River has been in operation for only 3.5 generations, and it is unlikely that much genetic change has occurred. Further, the captive broodstock program has just begun, and given the short-term nature (one generation - five brood years) of the program, will not likely cause any genetic or ecological changes in the natural population.

6.2.5) Reasons for choosing.

Natural origin spring chinook are optimally adapted for survival in the Tucannon River. Washington Department of Fish and Wildlife and the co-managers believe they will be most capable of surviving, returning to, and effectively spawning in the Tucannon River. Also, all ESA concerns will be satisfied because they are of Tucannon River origin.

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.

Continued use of natural-origin adults from the Tucannon River for broodstock, in conjunction with the supplementation adults will provide the greatest protection of the population’s genetic structure. This should remain true if spawning protocols are followed. With the exception of the first five program years, hatchery broodstock have been, and will continue to be collected over the entire run timing to the best of our abilities. Further, given the short-term length of the captive broodstock program, genetic and ecological risks to the natural population should be minimized.

SECTION 7. BROODSTOCK COLLECTION

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

Supplementation Program: Only adults (100 total) and jacks of natural or hatchery-origin (Tucannon) will be collected for the hatchery supplementation program. **Note**: The co-managers would like to see an increase in the number of smolts released. The final numbers are still being negotiated, but if the WDFW proposed level of 225,000 smolts were the target than we would have to collect 170 adults at the trap starting in 2006.

Captive Broodstock Program: Only emergent fry will be collected. Emergent fry will be collected out of the spring chinook supplementation program from the incubation stacks at LFH. This was chosen for disease reasons, family origin and history, and less impacts to the natural fish and redds in the river.

7.2) Collection or sampling design.

Trapping operations occur at the Tucannon River adult trap (rkm 59). The goals of broodstock trapping include fulfilling broodstock needs to meet supplementation program goals (160,000 eggs, or 132,000 smolts released at 15/lb). Incorporate wild-origin fish into the hatchery broodstock while eliminating unmarked strays from the population. Pass all Tucannon River wild and hatchery origin fish not needed for broodstock above the TFH adult trap for natural spawning. Document the number of all unmarked, presumably wild-origin fish, at the trap and determine the percent that are actually hatchery origin. Determine TFH adult trap efficiency and fall back rate.

The goal is to collect 100 adult salmon (either origin but try for 50 wild, 50 hatchery). Additional jacks of either origin (above the 100 adults) can be collected, but may not exceed the proportion of jacks in the run. Approximately 70% of the run is captured at the TFH adult trap annually. Broodstock are collected at a rate of 1:1 to 1:3 (collected: passed) during the early part of the run depending upon predicted run size. Collection rates during the run may change to ensure fish are collected for the duration of the run. Scale samples are collected from all unmarked fish (to determine origin) and all passed fish are opercle punched to determine trap efficiency and fallback rate. Spring chinook will generally not arrive at the trap before 1 May, but the trap will already be in operation for documentation of natural-origin summer steelhead. Trapping will continue throughout the spawning period (through September).

Note: If the proposed WDFW level of 225,000 smolts were the target we would have to collect 170 adults at the trap starting in 2006. The proportion of wild and hatchery fish collected would be based on the run with no fewer than 25% of the broodstock of wild origin.

7.3) Identity.

During previous years, spring chinook smolts were identified by lack of the adipose fin and having CWT in the snout. The adipose fin clip was abandoned starting with the 2000 BY to help prevent potential harvest of this listed species in down river sport fisheries. Presently and in the future, supplementation fish will be marked with an elastomer mark behind the eye and tagged with CWT in the snout. Captive brood progeny are marked with CWT or agency-only wire. The elastomer mark will allow hatchery personnel operating the adult trap to distinguish between supplementation and captive brood origin fish.

7.4) Proposed number to be collected:

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

The annual supplementation collection goal is for 50 natural and 50 hatchery adults collected throughout the duration of the run. Additional jack salmon may be collected if necessary. **Note:** if the WDFW proposed level of 225,000 smolts were the target we would have to collect 170 adults at the trap starting in 2006. The proportion of wild and hatchery fish collected would be based on the run with no fewer than 25% of the broodstock of wild origin.

Adults from the captive broodstock are sorted for maturity during late June-early July. Number of mature fish collected each year will vary due to growth and maturity rates. Mature fish from the captive brood program in excess of broodstock needs will be outplanted as adults into suitable habitat in the Tucannon River. Females from the 2002 BY (this BY was originally collected for extra males) will be spawned or outplanted as they become mature.

7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: See Table 7.

Table 7. Number of natural and hatchery-origin spring chinook collected from the Tucannon River for the supplementation program, 1986-2004.

Year	Natural Origin	Hatchery Origin
1986	116	0
1987	101	0
1988	116	9
1989	67	102
1990	60	75
1991	41	89
1992	47	50
1993	50	47
1994	36	34
1995	10	33
1996	35	45
1997	43	54
1998	48	41
1999	1	135
2000	12	69
2001	52	54
2002	42	65
2003	42	35
2004	51	41

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

All fish captured in the adult trap and not collected for broodstock are given an opercle punch and passed upstream. Spawned adults used as broodstock for the program will be returned to the Tucannon River for nutrient enhancement. Carcass distribution will require the approval of WDFW's pathologist to ensure proper disease control measures.

Mature captive brood fish in excess of eggtake goals may be outplanted into the Tucannon River for natural spawning.

7.6) Fish transportation and holding methods.

Adults are transported in tank trucks with re-circulation aeration and/or oxygenation. Hauling time from the Tucannon trap site to LFH is approximately 60 minutes, depending on road conditions.

7.7) Describe fish health maintenance and sanitation procedures applied.

Monthly fish health inspections occur at LFH and TFH. Because of very low numbers of adults held in broodstock raceways, raceway cleaning is unnecessary. Fish may be treated with a suite of approved chemicals to control fungus, parasites and bacterial diseases, as prescribed by WDFW fish health specialists. Treatments for fungal infections are applied as chemical flushes through the raceways.

7.8) Disposition of carcasses.

All Tucannon River broodstock carcasses will be returned to the Tucannon River for nutrient enhancement after approval by WDFW fish health specialist if such release of carcasses is determined not to pose a significant fish health risk for the natural population.

7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.

Broodstock will be collected from throughout the natural run period to provide for random selection of adults from the entire adult population, prevent run timing divergence of the hatchery-reared population from the natural population, and provide for natural fish escapement into the habitat to spawn. Returning adults from captive brood smolt releases will be allowed to enter the spawning population without being collected for broodstock.

During broodstock trapping, measures will be taken to ensure the trap holding area is free of sharp objects that may cause injury to fish. Steps will also be taken to adjust attraction water entering the trap to discourage jumping of the fish captured. The trap is located behind a secure fenced area. All fish handled (either to be passed or collected) are first placed in a V-shaped box containing water, with the head area covered with a rubber strip. This produces a calming effect on the fish that can then be sampled (scales, fork length, sex, external condition, identifying marks, etc.) without the use of anesthetic.

In 2005, an automated brail system was installed in the TFH trap. This brail allows hatchery staff to raise the trap holding-area floor from above. As the floor rises and effective water depth reduced, fish move to submerged rubber-lined holding troughs, located in the floor itself. Staff is then able to quickly secure and place fish in the above-mentioned V-shaped box for sampling. This modification has dramatically reduced stress to trapped fish, as staff no longer must “chase” adults, but rather quickly place them in the sampling box from the holding troughs. This system works well for all trapped adults, including summer steelhead and bull trout.

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

SECTION 8. MATING

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

8.1) Selection method.

All males and females that have been collected for broodstock will be examined weekly during the spawning season to determine ripeness, and all fish will be spawned when ripe. Fish are anesthetized using MS-222 to determine degree of ripeness.

8.2) Matings.

Mating occurs in a 2x2 factorial cross to increase the number of crosses and ensure the highest likelihood of fertilization.

8.3) Fertilization.

Maintaining an equal sex ratio in the spawning population is the goal of the program. A 2x2 factorial spawning occurs to increase the number of crosses. At times the small number of fish ripe on individual days usually limits spawning options. Males are usually limited to primary status on one half the eggs from two females. Where insufficient males are available to meet these criteria, males can be used as primary more than twice. In those circumstances, males will be used no more than four times as primary spawners (egg equivalent = 2 females). After fertilization, eggs are rinsed in a buffered iodine solution (100 ppm) to control viral and bacterial disease, and allowed to water harden for one hour in the same solution.

8.4) Cryo-preserved gametes.

Semen has been cryo-preserved in past years and may be used in future brood years to increase diversity during low run years.

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

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

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.

Table 8 includes the egg survival information at LFH since broodstock collection began in 1985.

Table 8. History of egg loss for Tucannon River stock spring chinook, 1985-2004.

Brood Year	Eggs Taken	% Loss to eye-up
1985	14,843	8.2
1986	187,958	2.0
1987	196,573	14.4
1988	182,438	16.3
1989	133,521	19.9
1990	126,334	33.7
1991	91,275	12.8
1992	156,359	1.8
1993	168,366	9.2
1994	161,707	6.0
1995	85,772	23.5
1996	117,287	17.3
1997	144,237	76.3
1998	161,019	11.5
1999	113,544	2.0
2000	128,980	2.0
2001	184,127	1.2
2002	169,364	3.6
2003	140,658	5.3
2004	140,459	4.5

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

Number of eggs collected from adults trapped in the supplementation program or from mature captive broodstock could exceed program needs. Eggs in excess of program needs will be retained to ensure the goal is met in case of unexpected loss from BKD or other unexpected circumstances. LFH staff will work with the WDFW fish health specialist to ensure appropriate measures are taken to disinfect eggs and proper prophylactic treatments are conducted to prevent disease outbreaks. Excess fingerlings above the smolt production goal could be released within the Tucannon River basin in areas of under-seeded habitat. Broodstock collection and number of mature captive broodstock retained will be monitored closely to try to stay within program eggtake goals.

9.1.3) Loading densities applied during incubation.

Tucannon natural and hatchery spring chinook fecundities vary by age and origin. Natural-origin females average 3,597 and 4,337 for Age 4 and Age 5 females, respectively. Hatchery-origin females average 3,166 and 3,474 for Age 4 and Age 5 females, respectively. Fecundity of Age 3, 4, and 5 captive broodstock is 1,092, 1,650 and 1,803 eggs/female, respectively. The evaluation program has identified fecundity as an important biological component to measure for the spring chinook program. Therefore, each female's eggs are incubated individually to document fecundity.

Since both incubation rooms will likely be used to incubate spring chinook eggs (supplementation and captive broodstock), loading densities during incubation must match each incubation room. With the Heath incubation stacks, up to 5,000-6,000 eggs can be put in each tray. Since fecundity is generally less than that, individual incubation is not a problem. In the colanders in the PVC buckets, 5,000 eggs could be put in so egg capacity on a female basis may be limited. Since lower fecundities are expected from the captive broodstock females, WDFW will incubate eggs from captive females in colanders until eye-up.

9.1.4) Incubation conditions.

Incubation, as with rearing, occurs with 11^0C well water. The incubation buildings are fitted with back-up pumps to maintain flow through the troughs and Heath stacks in emergency situations. Flow monitors will sound an alarm if flow through is interrupted. Incubation (IHOT) protocols will be followed where practical.

9.1.5) Ponding.

Currently, after eggs have hatched and the fry have buttoned-up, fish are taken out of the incubation stacks and placed in outside rearing raceways. Fish are immediately begun on a starter diet, with all mortalities removed each day from the pond. Fish remain in the outside raceways the entire time they are at LFH. Splitting into other raceways may occur, but will depend on densities. Low density rearing (LFH guidelines are for early rearing densities generally not to exceed 0.2 $lbs/ft^{3)}$ to reduce BKD is being initiated at LFH. Limited pond space at TFH does not allow low density rearing there.

However, six new intermediate rearing raceways will be installed at LFH in 2005-2006. This will allow hatchery staff to move fry from incubation vessels to these small rearing containers before being moved to full-sized raceways. This should help culturists get all fish groups to the same size at release, and improve CV's, hopefully increasing SARs. Exactly how these new rearing vessels will be utilized for spring chinook will be determined once installation is complete. After intermediate rearing in the new ponds, they will be moved to the traditional larger raceways for final rearing before transfer to TFH.

9.1.6) Fish health maintenance and monitoring.

Eggs are examined daily by hatchery personnel. Prophylactic treatment of eggs for the control of fungus is prescribed by a WDFW fish health specialist, and may include treatment with formalin or other accepted fungicides. Non-viable eggs are removed after shocking, and dead sac-fry are removed during ponding procedures. A fish health specialist makes at least monthly visits to each hatchery, and more if required to diagnose and recommend treatments for disease.

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.

At LFH, eggs are incubated in well water to ensure maximum egg survival and minimize potential loss from disease. Eggs are also treated with formalin to control fungus. The hatchery incubation room(s) are protected by a separate low water alarm system and an automatic water reuse pumping system, and for the use of wells separate from the hatchery's main well field.

9.2) <u>Rearing</u>:

9.2.1) Provide survival rate data by hatchery life stage for the most recent twelve years (1988-00), or for years where dependable data are available.

Table 9. Survivals for Tucannon River spring chinook reared at LFH and TFH.

BY	Eggs Taken	% Eyed Egg Mortality	Number of Fry	% Egg-Fry Survival	Number of Smolts	% Egg-Smolt Surv.
1985	14,843	8.2	13,401	90.3	12,922	87.1
1986	187,958	2.0	177,277	94.3	153,725	81.8
1987	196,573	14.4	164,630	83.8	152,165	77.4
1988	182,438	16.3	150,677	82.6	146,200	80.1
1989	133,521	19.9	103,420	77.5	99,060	74.2
1990	126,334	33.7	89,519	70.9	85,800	67.9
1991	91,275	12.8	77,232	84.6	74,060	81.1
1992	156,359	1.8	151,727	97.0	87,752	56.1
1993	168,366	9.2	145,303	86.3	138,848	82.5
1994	161,707	6.0	132,870	82.2	130,069	80.4
1995	85,772	23.5	63,935	74.5	62,272	72.6
1996	117,287	17.3	80,325	68.5	76,219	65.0
1997	144,237	76.3	29,650	20.6	24,184	16.8
1998	161,019	11.5	136,027	84.5	127,939	79.5
1999	113,544	2.0	106,880	94.1	97,600	86.0
2000	128,980	2.0	123,313	95.6	102,099	79.2
2001	184,127	1.2	174,934	95.0	146,922	79.8
2002	169,364	3.6	151,531	89.5	123,586	73.0
2003	140,658	5.3	126,400	89.9	71,154	50.6
2004	140,459	4.5	128,877	91.8		

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

LFH raceway rearing density index criteria for spring chinook generally should not exceed 0.15 lbs/ft^3 for fish >100 Fpp to help ensure healthy fish. Early rearing (immediate post ponding) densities can be higher (see **9.1.5**). When the spring chinook are reared in rearing ponds (Curl Lake), densities can be 10% of the raceway maximum.

9.2.3) Fish rearing conditions

At Lyons Ferry, raceways are supplied with pathogen free, oxygenated well water from the hatchery's central degassing building. Approximately 1,000 gpm of water enters the north raceway and 650 gpm enters the south raceway. 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 vacuumed to remove accumulated uneaten feed and fecal material. Feeding is by hand presentation. In 2005, netting was installed on the south raceways at LFH to minimize bird predation and disease transfer by predators. Predation losses in spring chinook reared in these raceways should be reduced, and the potential for disease transfer from other stocks through predator transfer should be completely eliminated as a result of this improvement.

At Tucannon Hatchery**,** raceways are supplied with oxygenated well or river water from the hatchery's central degassing building. Approximately 1,000-gpm (2.2 cfs) water enters raceway A, 400 gpm (0.9 cfs) enters raceways E and W and 200 gpm (0.45 cfs) enters the round ponds. 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. Feeding is by hand presentation.

At Curl Lake Acclimation Pond, water is supplied directly from the Tucannon River. A maximum of 6 cfs can be drawn from the river to the pond, though rarely is 5 cfs used. Based on the river water temperature, oxygen levels range between 11-14 ppm. Density indexes within Curl Lake are very low with a DI of 0.005 lbs/ft^3 assuming a maximum 300,000 fish at 15 fpp. Fish are fed by truck mounted 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.

Growth rate information for the Tucannon River spring chinook stock for last year (e.g. 1999-2001), or for most recent year available (Table 10):

Table 10. Tucannon River Spring Chinook Stock Growth – 1999 and 2000 Brood Years.

	2000 BY	1999 BY
Month	**Fish/Lb**	**Fish/Lb**
November	1600.0	1600.0
December	844.0	800.0
January	264.0	600.0
February	157.0	98.0
March	76.3	71.8
April	59.0	66.8
May	58.0	50.0
June	53.0	37.0
July	48.5	32.3
August	43.0	30.0
September	38.0	27.4
October	33.0	25.6
November	27.1	19.3
December	24.7	18.6
January	22.2	18.0
February	19.2	17.0
March	17.1	13.0
April	15.2	13.0

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

See Table 10.

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

Fry/fingerling will be fed an appropriate commercial dry or moist salmon diet. Fry are started at 2-3% B.W./day and reduced to 0.5-1.1% to slow growth rate when fish are approximately 250 fpp. Feed conversion is expected to fall in a range of 1.1 – 1.4 pounds fed to pounds produced. Due to the possible later spawning time of captive brood fish from supplementation/natural spring chinook, a variety of starter diets and feed schedules may be used to achieve a similar size among the fish. This strategy will reduce the variation (CV's) in size of juveniles within the population when they are released as smolts.

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

A WDFW fish health specialist monitors fish health as least monthly. More frequent care is provided as needed if disease is noted. Treatment for disease is provided by Hatchery Specialists under the direction of the Fish Health Specialist. Sanitation consists of raceway vacuuming to remove uneaten feed and fecal material. Equipment is disinfected between raceways and/or between species at the hatchery.

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

Program goal for both supplementation and captive brood programs will be to release fish between 1 March and 25 April at 15 fish/lb. Pre-liberation samples will visually note smolt development based on degree of silvering, presence/absence of parr marks. No gill ATPase activity or blood chemistry samples to determine degree of smoltification, or to guide fish release timing is anticipated.

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

Camouflage covers the captive broodstock tanks to help maintain a fright response and provide shading. Raceways for rearing are concrete. The walls and bottoms are of nearly natural coloration and texture, and promote natural looking fish. All fish are held at Curl Lake Acclimation Pond (a natural pond) prior to volitional release.

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 and technical personnel trained in fish cultural procedures operate Lyons Ferry Complex 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 gravity systems to prevent catastrophic fish losses.

All smolts will be volitionally released from Curl Lake Acclimation Pond and will occur on river water to provide acclimation/imprinting time and begin the conversion to natural feed sources present in river water.

SECTION 10. RELEASE

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

10.1) Proposed fish release levels

As outlined in the LSRCP planning document (1975), the smolt production goal for Tucannon River spring chinook is 132,000 smolts released as yearlings. However, depending on survival in the hatchery, 150,000 smolts from the supplementation program is possible on a yearling basis, and has been an allowable release level approved by NMFS in Section 10 Permit #1129. The Tucannon River Spring Chinook Captive Broodstock Master Plan (1999) calls for the release of an additional 150,000 yearling smolts produced from the captive broodstock program. Combined, 300,000 smolts could be released into the Tucannon River between 2002-2008, after which the captive broodstock program will no longer produce fish, and smolt production would be reduced to LSRCP mitigation (Table 11).

Note: The co-managers and WDFW are currently in discussions to increase the target smolt level to 225,000 beginning in 2006 as the captive broodstock program ends.

Other proposed fish released include unfed fry (remote site incubators), fry plants (unspecified amounts), smolts released into Asotin Creek as part of a re-introduction effort, and adult outplants (from the captive broodstock program). All of these additional releases have not been agreed to by the co-managers but are potential outlets of excess production should the captive broodstock program be more successful than originally planned.

Table 11. Fish release goals.

Age Class	Maximum Number	Goal	Size (fpp)	Release Date	Location	Stock
Eggs						
Unfed Fry						
Fry						
Fingerling						
Yearling	150,000	132,000	15	15 March – 25 April	Curl Lake Acclimation Pond	Supplementation

Table 11. Fish release goals.

Age Class	Maximum Number	Goal	Size (fpp)	Release Date	Location	Stock
Yearling	150,000	150,000	15	15 March – 25 April	Curl Lake Acclimation Pond	Captive Broodstock

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

As currently described in the Master Plan (1999) and Annual Operation Plan for LFC, all Tucannon River stock spring chinook smolts (supplementation or captive brood progeny) will all be released into the Tucannon River from Curl Lake Acclimation Pond. Curl Lake is located at RKM 66 on the Tucannon River. Other releases of spring chinook (Tucannon stock) may occur into other areas of the watershed, but will have to be decided upon in agreement by the co-managers. Should more production be reached in the hatchery beyond what can be used in the Tucannon River, WDFW proposes using Tucannon River spring chinook stock for re-introduction into Asotin Creek (North Fork). WDFW has documented that the spring chinook population in Asotin Creek was extirpated in the early 1990s (Bumgarner et al. 1998).

Stream, river, or watercourse: Tucannon River
Release point: RKM 66 or RKM 75-84
Major watershed: Tucannon River
Basin or Region: Snake River Basin

Or

Stream, river, or watercourse: North Fork Asotin Creek
Release point: RKM 22
Major watershed: Asotin Creek
Basin or Region: Snake River Basin

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

Hatchery origin spring chinook have been released as yearling smolts annually into the Tucannon River as part of the supplementation program since 1987 (Table 12). The annual smolt production goal is 132,000 smolts at 15 fish/lb (fpp) or 30 g/fish, though release size has varied over the years (Table 12). For example, a portion of the 1992 brood year was released as pre-smolts during the fall of 1993. This release method was not considered again given the poor results documented (Bumgarner et al. 1994). The first captive brood progeny smolts were released in 2002. Captive brood progeny will be released as yearling smolts at approximately 15 fpp.

Table 12. Number and size of spring chinook released from the supplementation program into the Tucannon River since 1987.

Brood Year	Release Year	Release Dates	Release Method	Number of smolts	Pounds of fish	Average Size (fpp)
1985	1987	4/06-4/10	H-Acc	12,922	2,172	6.0
1986	1988	3/07-4/13	H-Acc	152,725	15,173	10.0
1987	1989	4/11-4/13	H-Acc	152,165	16,907	9.0
1988	1990	3/30-4/10	H-Acc	145,146	13,195	11.0
1989	1991	4/01-4/12	H-Acc	99,057	11,007	9.0
1990	1992	3/30-4/10	H-Acc	85,737	7,798	11.0
1991	1993	4/06-4/12	H-Acc	74,064	4,830	15.3
1992	1993	10/22-10/25	Direct	57,316	1,592	36.0
1992	1994	4/11-4/18	H-Acc	83,409	5,957	14.0
1993	1995	3/15-4/15	Mixed	138,848	9,569	14.5
1994	1996	3/16-4/22	Mixed	130,069	8,120	16.0
1995	1997	3/7-4/18	Mixed	62,144	3,541	17.5
1996	1998	3/11-4/18	Mixed	76,219	4,820	15.8
1997	1999	3/11-4/20	Curl Acc	24,186	1,550	15.6
1998	2000	3/20-4/26	Curl Acc	127,939	10,235	12.5
1999	2001	3/19-4/25	Curl Acc	97,600	9,207	10.6
2000	2002	3/15-4/23	Curl Acc	102,099	6,587	15.5
2001	2003	4/01-4/21	Curl Acc	146,922	11,389	12.9
2002	2004	4/01-4/20	Curl Acc	123,586	10,563	11.7
2003	2005	3/28-4/15	Curl Acc	71,154	5,603	12.7

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

Supplementation fish have been generally released as smolts in March and April, with only a portion of a single brood year released in October as pre-smolts (Table 12). Fish have been released by a combination of methods including direct stream releases, acclimated and forced releases, and acclimated and volitional releases (Table 12).

10.5) Fish transportation procedures, if applicable.

During October of each year, progeny produced from both programs will be transported from LFH to TFH. Fish are then reared until the following February, and transported again to Curl Lake Acclimation Pond. Transportation time between LFH and TFH is approximately one hour. Transportation time to Curl Lake Acclimation Pond from TFH is about 15 minutes.

10.6) Acclimation procedures.

Should full program production be reached in the future, all of the fish from both programs will be acclimated at the Curl Lake Acclimation Pond. During the middle of February, all fish will be transported from TFH and acclimated for at least three weeks in Curl Lake. Following acclimation, the outlet to the pond will be opened and fish will be allowed to volitionally leave the pond until about 20-25 April (seven weeks). During the final couple of weeks of release, the pond is gradually lowered which encourages remaining fish to leave the pond. Curl Lake is supplied with Tucannon River water, which will provide acclimation to the chemistry and temperature regime of the Tucannon basin.

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

Since 1985, all (100%) of the hatchery origin smolts have received an adipose fin clip and a coded wire tag. Throughout the years, other tags (VI elastomer and blank wire) have been used for external identification of study groups. The adipose fin clip was abandoned with the 2000 BY. In order to continue the long-term study of the program, 100% of the supplementation fish will be externally marked with an elastomer tag and receive a coded wire tag. The first captive brood progeny were released into the Tucannon River in 2002. These fish have an agency wire tag in the snout, with no other identifiable marks. In future years, all unmarked fish will be electronically scanned at the adult trap, or from the spawning grounds to determine origin. Lengths and scales will also be collected for brood year determination, so accurate evaluation on returns from the captive broodstock program can occur.

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

Monitoring of fish numbers, growth and mortality at the hatcheries will provide reasonably accurate estimates of live fish throughout their rearing life.

Because fish are of Tucannon River origin, all fish will be released into the Tucannon River as smolts or fingerlings. The preferred alternative would be to release fingerling into the Tucannon basin at that time, targeting river reaches that had population densities below carrying capacity, although surplus production is expected to be small. Another alternative would be to use surplus fingerling for reintroduction of spring chinook into Asotin Creek, which is devoid of spring chinook. This alternative would require the concurrence of co-managing Tribes, and Federal managers.

10.9) Fish health certification procedures applied pre-release.

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

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

Under conditions requiring release of fish at TFH or Curl Lake Acclimation Pond, in response to a water system failure, all fish would be immediately released into the Tucannon River. Should an emergency occur at LFH, every attempt would be made to haul fish to the Tucannon River. However, the distance to the river and priority of other fish stocks on hand at LFH may require the immediate release of Tucannon River spring chinook stock fish into the Snake River.

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

The standard release strategy will consist of volitionally releasing smolts. Most will orient to the river for a short time (1-10 days) and then emigrate.

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

The Species Interaction Work Group (SIWG 1984) reported that potential impacts from competition between hatchery and 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. Steward and Bjornn (1990), however, concluded that hatchery fish kept in the hatchery for extended periods before release as smolts (e.g. yearling salmonids) may have different food and habitat preferences than natural fish, and that hatchery fish will be unlikely to out-compete natural fish. Hatchery-produced smolts emigrate seaward soon after liberation, minimizing the potential for competition with natural fish (Steward and Bjornn 1990). Competition between hatchery-origin salmonids with wild salmonids in the mainstem corridor was judged not to be a significant factor (Witty et al. 1995).

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

Indicators: *3.1.2a, 3.2.1a-c, 3.2.2a,c, 3.3.1, 3.3.2a-b, 3.4.4a-d, 3.5.4d, 3.8.*

1. Differentially mark all hatchery-origin spring chinook (both supplementation and captive brood progeny) to allow for distinction from natural-origin fish upon return as adults to the spawning grounds. This will be accomplished by coded and agency-only wire tags and visible implant elastomer tagging or another permanent, effective method.

Indicators: *3.1.2a, 3.3.1, 3.3.2a-b, 3.4.1a-b, 3.4.2a-b, 3.4.3a-d, 3.5.2a-d, 3.5.3a-b, 3.5.4d, 3.7.6a, 3.7.7a-b.*

2. Conduct broodstock trapping at the Tucannon adult trap to collect broodstock for the mitigation program, enumerate overall returns, and to collect information regarding fish origin for the spawning escapement, and age class composition.

Indicators: *3.2.2a-c, 3.3.1a-c, 3.3.2a-b, 3.4.2b, 3.4.4, 3.5.2a-d, 3.7.6a.*

3. Conduct spawning ground surveys to estimate number of spawners, and use in conjunction with trapping data to estimate the proportions of natural, supplementation and captive brood-origin spring chinook in the spawning population.

Indicators: *3.1.2a, 3.2.1d, 3.3.1a-c, 3.3.2a-b, 3.4.2a-b, 3.5.3a-b.*

4. Estimate the number of natural, and naturally spawning hatchery-origin spring chinook contributing to the Tucannon River annual escapement.

Indicators: *3.3.2a-b, 3.4.2b, 3.4.3a,d, 3.4.4a-c,e-f, 3.5.5a, 3.7.8a.*

5. Conduct summer snorkel surveys to estimate densities and the population of Age 0 and Age 1+ spring chinook throughout the Tucannon River basin to compare to historical records.

Indicators: *3.2.2a-c, 3.3.2a-b, 3.4.3a,c, 3.4.4a,e,g, 3.5.5a.*

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

Indicators: *3.1.2a, 3.2.1d, 3.2.2a,c, 3.3.2a-b, 3.4.4a, 3.5.4d, 3.5.5a.*

7. Estimated SARs by brood year to determine if fish are surviving – escapement to hatchery and spawning grounds.

Indicators: *3.5.1a, 3.5.2a-c, 3.5.6a*

8. Collect DNA samples to be used for comparison with past collections to monitor changes in allelic characteristics, and with the intent to assess whether the hatchery program negatively affects the genetic diversity of the natural population in the Tucannon River.

Indicators: *3.1.3a, 3.6.1a, 3.6.2a-b, 3.8*

9. Develop and implement evaluation plans and report findings consistent with the needs
   of the program for adaptive management.

Indicators: *3.7.1a-b, 3.7.2a, 3.7.3a-e*

10. 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: *3.7.4a-b, 3.7.5a-b*

11. Monitor health of adult and juvenile spring chinook associated with hatchery production.

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.

Funding for most of the Monitoring and Evaluation will be provided by the LSRCP program as part of the ongoing mitigation program. BPA funding will be used for captive brood Monitoring and Evaluation.

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

1. Juvenile sampling at hatchery facilities will be conducted with accepted procedures to minimize stress and mortality from sampling. Sample sizes will be the minimum necessary to achieve statistically valid results for growth, tag retention and fish health.
2. Smolt trapping operations will ensure that holding time, stress and potential for injury of captured migrants is minimized. Marked groups for assessing trap efficiency will be the minimum necessary to achieve statistically valid results.
3. Adult trapping facilities will be monitored daily, or more often as necessary to prevent injury and unnecessary delay.
4. Spawning ground surveys will be conducted in such a manner to avoid scaring spawning fish off redds. Also, care will taken when walking in areas with redds so eggs won’t be accidentally crushed.

5. Snorkel surveys will be conducted only at the minimum number of sites necessary to achieve statistically valid results for population estimates. Displacement of fish will be kept to a minimum by snorkeling on days when water clarity and visibility are high.
6. Electrofishing surveys will be conducted only at the minimum number of sites necessary to achieve statistically valid results for population estimates. If possible, surveys will be conducted when water temperatures are below stressful levels to fish. WDFW will follow NMFS and WDFW electrofishing guidelines by: not shocking near redds or spawning adults, use of approved electroshockers, having experienced crew members during all shocking surveys, using DC current (pulsed or direct where appropriate), recording temperature, conductivity and electroshocker settings, and providing a good environment for fish holding/sampling after capture.

SECTION 13. ATTACHMENTS AND CITATIONS

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

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

Name, Title, and Signature of Applicant:

Certified by_____________________________ Date:_____________

<u>SECTION 15. PROGRAM EFFECTS ON OTHER (NON-ANADROMOUS SALMONID) ESA-LISTED POPULATIONS.</u> 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 12), are all non-salmonid listed species and their current status ratings. Of the following species listed, only the bald eagle is confirmed to be found in the area where the Tucannon River Spring Chinook Program occurs. Species such as the Gray Wolf, the Grizzly Bear, the Canadian Lynx, and the northern spotted owl were once likely found in the area, 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 12. List of current ESA listed species (animal and plant) within the State of Washington.

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

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

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

See Section 2.1

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

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

General species description and habitat requirements (citations).

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

Major wintering concentrations are often located along rivers with salmon runs. Primary food sources have been marine or freshwater fish, waterfowl and seabirds, with secondary sources including mammals, mollusks and crustaceans (Retfalvi 1970, Knight and Gutzwiller 1985, Watson et al. 1991, Watson and Pierce 1998).

Local population status and habitat use (citations).

Bald Eagles breed throughout most of the United States and Canada, with the highest concentrations occurring along the marine shorelines of Alaska and Canada. They winter throughout most of the breeding range, primarily south of southern Alaska and Canada (U.S. Fish and Wildlife Service 1986, Stinson et al. 2001). 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 food sources 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 from the Tucannon River near hatchery production activities are unknown. Sightings have been documented in the area. No nesting or nest trees are known to exist in the area affected by the program.

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

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

To the best of our knowledge, the program as described in this HGMP will not directly have any negative effects on the listed species. Providing adults and juveniles to the system, even within the short term, will provide a potential prey item 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).

Disturbance to listed species from people fishing for other species in the area. A take estimate is not possible for this potential disturbance in the past or in the future. Eagle sightings in the area near the fishery are uncommon.

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

Operation of the Tucannon River adult trap or Curl Lake Acclimation pond will not affect (directly or indirectly) the existence of the listed species in the area. 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.

<u>Fish health</u> - pathogen transmission, therapeutics, chemicals.

Not expected to be a problem. The two species have co-existed for thousands of years, the chinook salmon 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) would follow label directions for proper use, eliminating any potential "take".

<u>*Ecological/biological*</u> *- competition, behavioral, etc.*

As stated earlier, behavioral disturbances could occur if fishing pressure (for other species) and eagle abundance overlap.

<u>*Predation*</u> -

A positive benefit (adult or juveniles) for the listed species in this case.

<u>*Monitoring and evaluations*</u> *- surveys (trap, seine, electrofish, snorkel, spawning, carcass, boat, etc.).*

Snorkel and spawning surveys would have little to no negative impact to bald eagles. These surveys require little time in any particular area. Disturbances could occur if an eagle nest is located near a survey site.

<u>*Habitat*</u> *- 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 <u>Actions taken to mitigate for potential effects.</u>

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.

15.5 <u>References</u>

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Table A. Estimated listed salmonid take levels of Tucannon River spring chinook by hatchery activity.

Listed species affected: Spring/Summer Chinook ESU/Population: Snake River/ Tucannon River Activity: Broodstock collection, spawning, rearing, and release.				
Location of hatchery activity: Lyons Ferry Complex Dates of activity: Year Round Hatchery program operator: Lyons Ferry Complex Manager				
	Annual Take of Listed Fish By Life Stage (*Number of Fish*)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	0	0	0
Collect for transport b)	0	0	0	0
Capture, handle, and release c)	0	0	0	0
Capture, handle, tag/mark/tissue sample, and released)	0	0	1,500	0
Removal (e.g. broodstock) e)	0	0	125 (170[i])	0
Intentional lethal take f)	0	0	125 (170[i])	0
Unintentional lethal take g)	0	0	20	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled, and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.
i. WDFW and the co-managers are currently in discussions concerning increasing the broodstock collection to 170 adults in order to reach a new target goal of 225,000 smolts.

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 B. Estimated listed salmonid take levels by Research/Monitoring/Evaluation activity.

Listed species affected: Spring Chinook ESU/Population: Snake River/ Tucannon River Activity: Spawning, Snorkel, smolt trapping, and electrofishing surveys				
Location of hatchery activity: Tucannon River _(Various locations) Dates of activity: Year Round___ Research/ Monitoring / Evaluation program operator: Michael Gallinat_				
	Annual Take of Listed Fish By Life Stage (*Number of Fish*)			
Type of Take	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)	0	4,000	500	0
Collect for transport b)	0	6,000	0	0
Capture, handle, and release c)	0	43,000	0	0
Capture, handle, tag/mark/tissue sample, and release d)	0	4,300	0	0
Removal (e.g. broodstock) e)	0	0	0	0
Intentional lethal take f)	0	325	0	0
Unintentional lethal take g)	0	150	0	0
Other Take (specify) h)	0	0	0	0

a. Contact with listed fish though snorkeling.
b. Take (non-lethal) of juveniles/smolts captured and marked for smolt trap efficiency tests.
c. Take associated with smolt trapping operations, electrofishing, and hook and line methods to estimate residuals, where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to PIT tagging and/or bio-sampling (length/weight and scales) of fish collected through smolt trapping operations or electrofishing surveys prior to release.
e. Listed fish removed from the wild and collected for use as broodstock intentional mortality of listed fish during smolt trapping or electrofishing.
f. Unintentional mortality of listed fish, including loss of fish during transport during smolt trapping or holding after electrofishing.

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.*