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

TAKE PRIDE IN AMERICA

December 21, 2010

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

Dear ~~Mr. Jones~~ Rob:

Attached is the final Hatchery and Genetic Management Plan (HGMP) for the U.S. Fish and Wildlife Service's, Lower Snake River Compensation Plan (LSRCP), Dworshak NFH spring Chinook salmon program, as required for compliance under the Endangered Species Act (ESA). The LSRCP Office is submitting this HGMP and requesting initiation of Section 7 consultation under the ESA for the program.

The Dworshak NFH spring Chinook salmon HGMP was completed by the Idaho Fishery Resource Office, reviewed by co-managers, and the proposed production is consistent with the 2008-2017 *US v OR* Management Agreement. The LSRCP Office has concluded that while the Dworshak NFH spring Chinook salmon program may affect listed salmonid species, the effects will not threaten the survival and recovery of any listed salmonid species.

If you have any questions regarding the Dworshak NFH spring Chinook salmon HGMP please contact Joe Krakker or me at the LSRCP Office.

Sincerely,

Scott Marshall
LSRCP Program Manager

Enclosures (1)

cc: Rich Johnson (FWS, Portland, OR)
Howard Burge (FWS, IFRO)
Larry Peltz (FWS, DNFH)
Becky Johnson (NPT)
Pete Hassemer (IDFG)
Ron Costello (BPA)

# HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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| **Hatchery Program:** | Dworshak National Fish Hatchery |
| **Species or Hatchery Stock:** | Spring Chinook Salmon |
| **Agency/Operator:** | U.S. Fish and Wildlife Service |
| **Watershed and Region:** | Clearwater Subbasin, Idaho |
| **Date Submitted:** | |
| **Date Last Updated:** | December 20, 2010 |

# SECTION 1. GENERAL PROGRAM DESCRIPTION

**1.1) Name of hatchery or program.**

Dworshak National Fish Hatchery

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

Spring Chinook Salmon (*Oncorhynchus tshawytscha*)

**1.3) Responsible organization and individuals**

Hatchery Operations Lead Contact

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Hatchery Evaluations Lead Contact

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Nez Perce Tribe Coordinator Contact

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

Lower Snake River Compensation Plan - Provides Chinook program funding
Nez Perce Tribe - Co-managers
Idaho Department of Fish and Game - Co-managers
US Army Corps of Engineers, Walla Walla District – owners of Dworshak NFH

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

The Dworshak Spring Chinook Program is 100% funded by the Lower Snake River Compensation Program (LSRCP). The LSRCP program has a direct funding agreement with BPA. Personnel are shared with the Dworshak steelhead program, however the

LSRCP covers the cost of 1.25 biologists, 3 animal caretakers, 0.5 administrative staff, and 0.25 maintenance workers.

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

Dworshak National Fish Hatchery is located at the confluence of the North Fork and the Mainstem Clearwater River at river kilometer 65 in the Snake River Basin, Idaho.
The Hydrologic Unit Code (EPA Reach Code) is 1706030602600.10.

**1.6) Type of program.**

On-site releases - Isolated harvest program.

**1.7) Purpose (Goal) of program.**

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

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

Specific mitigation goals for the LSRCP were established in a three step process. First the adult escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in adult escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement and habitat loss. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area. Other than recognizing that the escapements back to the project area would be used for hatchery broodstock, no other specific priorities or goals were established in the enabling legislation or supporting documents regarding how these fish might be used.
For spring Chinook salmon the escapement above Lower Granite Dam prior to construction of these dams was estimated at 122,200 adults. Based on a 15% mortality rate for smolts transiting each of the four dams (48% total mortality) the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 58,700. This number established the LSRCP escapement mitigation goal. This reduction in natural spawning escapement was estimated to result in a reduction in the coast wide commercial/tribal harvest of 176,100 adults, and a reduction in the recreational fishery harvest of 58,700 adults below the project area. In summary the expected total number of adults that would be produced as part of the LSRCP mitigation program was 293,500.

| Component | Number of Adults |
|---|---|
| Escapement above Lower | 58,700 |

| | |
|---|---|
| Granite Dam | |
| Commercial Harvest | 176,100 |
| Recreational Harvest | 58,700 |
| Total | 293,500 |

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

- The survival rate required to deliver a 4:1 catch to escapement ratio has been less than expected and this has resulted in fewer adults being produced.
- The listing of Snake River Fall Chinook and Snake River Steelhead under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the mainstem Columbia River. This has resulted in a higher percentage of the annual run returning to the project area than was expected.
- The U.S. v. Oregon court stipulated Fishery Management Plan has established specific hatchery production agreements between the states, tribes and federal government. This agreement has substantially diversified the spring Chinook hatchery program by adding new off station releases sites and stocks designed to meet short term conservation objectives.

The Dworshak Spring Chinook Salmon Program was designed to escape 9,135 adults back to the project area after a harvest of 36,540. While recognizing the overarching purpose and goals established for the LSRCP, and realities' regarding changes since the program was authorized, the following objectives for the beneficial uses of adult returns have been established for the period through 2017:

1. To contribute to the recreational, commercial and/or tribal fisheries in the mainstem Columbia River consistent with agreed abundance based harvest rate schedules established in the 2008 – 2017 U.S. vs. Oregon Management Agreement.
2. To trap 1,000 broodstock to perpetuate this program.
3. The goal for state and tribal fisheries is 7,022 adult fish, assuming 90% survival from Lower Granite Dam to the local fisheries and the hatchery.
4. This program is to mitigate for lost fisheries and has no identified conservation goals.
5. To maximize the beneficial uses of fish that return to the project area that are not used for broodstock or harvest, specific priorities are: broodstock for other facilities in the basin (if needed), tribal subsistence, adult outplanting, or if untreated and unsuitable for human consumption; nutrient enhancement and local University's bear and eagle re-habilitation programs.

**1.8) Justification for the program.**

"The Lower Snake River Compensation Plan is a congressionally mandated program pursuant to PL 99-662."

### Isolated Harvest Program

Smolt releases of yearling spring Chinook are made directly into the mainstem Clearwater River so adults returning from those releases can provide sport and tribal fishery harvest opportunities. There is no primary intent for adults returning to the Clearwater River from these hatchery releases to be used other than for harvest and for broodstock to continue the program.

The HRT identified the two issues regarding the harvest program:
First, recovery of coded-wire tags (CWT) from harvested fish in terminal fishery areas in the Clearwater River basin is inadequate (Issue DW40). Harvest benefits associated with the spring Chinook program at Dworshak NFH cannot be accurately distinguished from those for Kooskia NFH and Clearwater Fish Hatchery. This latter deficiency is true also for the spring Chinook programs at Kooskia NFH and Clearwater Fish Hatchery, A coast-wide CWT goal of 20% recovery of all CWTs from returning adult fish has been advocated by the LSRCP Coordinator. The HRT recommended that the Service continue to work with cooperators to assess the mark sampling program, improve CWT recovery rates, and quantify the harvest benefits separately for the spring Chinook programs at Dworshak NFH, Kooskia NFH, and Clearwater Fish Hatchery (Recommendation DW40). [See Appendix B for estimated cost to implement DW40] Managers concur with this recommendation and will work with co-managers to improve the M&E program.

Second, the HRT identified that data obtained from recovery of coded-wire tags by the Service and LSRCP cooperators are not reported within the required time frames, inhibiting adaptive management based on the most current information (Issue DW41). The Pacific Salmon Commission's Data Standards Work Group Report states, under Specifications and Definitions for the Exchange of Coded-Wire Tag Data for the North American Pacific Coast, state that "Preliminary (Recovery) data for the current calendar year should be reported no later than JANUARY 31 of the following year." The HRT recommended that the Service should develop a data management plan that incorporates tagging goals and objectives, data management, and reporting requirements of coded-wire tag data at both the program and regional levels. This could be incorporated into the cooperative agreements between the LSRCP office and cooperators (i.e. IDFG and tribes) (Recommendation DW41). Managers concur with this recommendation and as previously stated will work with all involved to maintain a high quality M&E program.

**1.9) List of program Performance Standards.**

*Performance Standards are designed to achieve the program goal/purpose, and are generally measurable, realistic, and time specific. The NPPC Artificial Production Review document attached with the instructions for completing the HGMP presents a list of draft Performance Standards as examples of standards that could be applied for a hatchery program. If an ESU-wide hatchery plan including your hatchery program is available, use the performance standard list already compiled.*

Upon review of the NPCC "Artificial Production Review" document (2001) the co-managers have determined that this document represents the common knowledge up to 2001 and that the utilization of more recent reviews on the standardized methods for evaluation of hatcheries and supplementation at a basin wide ESU scale was warranted.

The NPCC "Artificial Production Review" document (2001) provides categories of standards for evaluating the effectiveness of hatchery programs and the risks they pose to associated natural populations. The categories are as follows: 1) legal mandates, 2) harvest, 3) conservation of wild/naturally produced spawning populations, 4) life history characteristics, 5) genetic characteristics, 6) quality of research activities, 7) artificial production facilities operations, and 8) socio-economic effectiveness. The NPCC standards represent the common knowledge up to 2001.

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

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

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

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

| Category | Standards | Indicators |
|---|---|---|
| 1. LEGAL MANDATES | 1.1. Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. OR and U.S. v. Washington. | 1.1.1. Total number of fish harvested in Tribal fisheries targeting this program.<br>1.1.2. Total fisher days or proportion of harvestable returns taken in Tribal resident fisheries, by fishery.<br>1.1.3. Tribal acknowledgement regarding fulfillment of tribal treaty rights. |
| | 1.2. Program contributes to mitigation requirements. | 1.2.1. Number of fish released by program, returning, or caught, as applicable to given mitigation requirements. |
| | 1.3. Program addresses ESA responsibilities. | 1.3.1. Section 7, Section 10, 4d rule and annual consultation |
| 2. IMPLEMENTATION AND COMPLIANCE | 2.1. Program contributes to mitigation requirements. | 2.1.1. Hatchery is operated as a segregated program.<br>2.1.2. Hatchery is operated as an integrated program<br>2.1.3. Hatchery is operated as a conservation program |
| | 2.2. Program addresses ESA responsibilities. | 2.2.1. Hatchery fish can be distinguished from natural fish in the hatchery broodstock and among spawners in supplemented or hatchery influenced population(s) |
| | 2.3. Restore and maintain treaty-reserved tribal and non-treaty fisheries. | 2.3.1. Hatchery and natural-origin adult returns can be adequately forecasted to guide harvest opportunities.<br>2.3.2. Hatchery adult returns are produced at a level of abundance adequate to support fisheries in most years with an acceptably limited impact to natural-spawner escapement. |
| | 2.4. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species. | 2.4.1. Number of fish released by location estimated and in compliance with AOPs and US vs. OR Management Agreement.<br>2.4.2. Number of adult returns by release group harvested<br>2.4.3. Number of non-target species encountered in fisheries for targeted release group. |
| | 2.5. Hatchery incubation, rearing, and release practices are consistent with current best management practices for the program type. | 2.5.1. Juvenile rearing densities and growth rates are monitored. and reported.<br>2.5.2. Numbers of fish per release group are known and reported.<br>2.5.3. Average size, weight and condition of fish per release group are known and reported.<br>2.5.4. Date, acclimation period, and release location of each release group are known and reported. |
| | 2.6. Hatchery production, harvest management, and monitoring and evaluation of hatchery production are coordinated among affected co-managers. | 2.6.1. Production adheres to plan documents developed by regional co-managers (e.g. US vs. OR Management agreement, AOPs etc.).<br>2.6.2. Harvest management, harvest sharing agreements, broodstock collection schedules, and disposition of fish trapped at hatcheries in excess of broodstock needs are coordinated among co-management agencies.<br>2.6.3. Co-managers react adaptively by consensus to monitoring and evaluation results.<br>2.6.4. Monitoring and evaluation results are reported to co-managers and regionally in a timely fashion. |

| Category | Standards | Indicators |
| --- | --- | --- |
| 3. HATCHERY EFFECTIVENESS MONITORING REGIONAL FOR AUGMENTATION AND SUPPLEMENTATION PROGRAMS | 3.1. Release groups are marked in a manner consistent with information needs and protocols for monitoring impacts to natural- and hatchery-origin fish at the targeted life stage(s)(e.g. in juvenile migration corridor, in fisheries, etc.). | 3.1.1. All hatchery origin fish recognizable by mark or tag and representative known fraction of each release group marked or tagged uniquely.<br>3.1.2. Number of unique marks recovered per monitoring stratum sufficient to estimate number of unmarked fish from each release group with desired accuracy and precision. |
| | 3.2. The current status and trends of natural origin populations likely to be impacted by hatchery production are monitored. | 3.2.1. Abundance of fish by life stage is monitored annually.<br>3.2.2. Adult to adult or juvenile to adult survivals are estimated.<br>3.2.3. Temporal and spatial distribution of adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored.<br>3.2.4. Timing of juvenile outmigration from rearing areas and adult returns to spawning areas are monitored.<br>3.2.5. Ne and patterns of genetic variability are frequently enough to detect changes across generations. |
| | 3.3. Fish for harvest are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over-harvest of non-target species. | 3.3.1. Number of fish released by location estimated and in compliance with AOPs and US vs. OR Management Agreement.<br>3.3.2. Number of adult returns by release group harvested<br>3.3.3. Number of non-target species encountered in fisheries for targeted release group. |
| | 3.4. Effects of strays from hatchery programs on non-target (unsupplemented and same species) populations remain within acceptable limits. | 3.4.1. Strays from a hatchery program (alone, or aggregated with strays from other hatcheries) do not comprise more than 10% of the naturally spawning fish in non-target populations.<br>3.4.2. Hatchery strays in non-target populations are predominately from in-subbasin releases.<br>3.4.3. Hatchery strays do not exceed 10% of the abundance of any out-of-basin natural population. |
| | 3.5. Habitat is not a limiting factor for the affected supplemented population at the targeted level of supplementation. | 3.5.1. Temporal and spatial trends in habitat capacity relative to spawning and rearing for target population.<br>3.5.2. Spatial and temporal trends among adult spawners and rearing juvenile fish in the available habitat. |
| | 3.6. Supplementation of natural population with hatchery origin production does not negatively impact the viability of the target population. | 3.6.1. Pre- and post-supplementation trends in abundance of fish by life stage is monitored annually.<br>3.6.2. Pre- and post-supplementation trends in adult to adult or juvenile to adult survivals are estimated.<br>3.6.3. Temporal and spatial distribution of natural origin and hatchery origin adult spawners and rearing juveniles in the freshwater spawning and rearing areas are monitored.<br>3.6.4. Timing of juvenile outmigrations from rearing area and adult returns to spawning areas are monitored. |
| | 3.7. Natural production of target population is maintained or enhanced by supplementation. | 3.7.1. Adult progeny per parent (P:P) ratios for hatchery-produced fish significantly exceed those of natural-origin fish.<br>3.7.2. Natural spawning success of hatchery-origin fish must be similar to that of natural-origin fish.<br>3.7.3. Temporal and spatial distribution of hatchery-origin spawners in nature is similar to that of natural-origin fish.<br>3.7.4. Productivity of a supplemented population is similar to the natural productivity of the population had it not been supplemented (adjusted for density dependence).<br>3.7.5. Post-release life stage-specific survival is similar between hatchery and natural-origin population components. |
| | 3.8. Life history characteristics and patterns of genetic diversity and variation within and among natural populations are similar and do not change significantly as a result of hatchery augmentation or supplementation programs. | 3.8.1. Adult life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics observed in the natural population prior to hatchery influence.<br>3.8.2. Juvenile life history characteristics in supplemented or hatchery influenced populations remain similar to characteristics in the natural population those prior to hatchery influence.<br>3.8.3. Genetic characteristics of the supplemented population remain similar (or improved) to the unsupplemented populations. |

| Category | Standards | Indicators |
| --- | --- | --- |
| | 3.9. Operate hatchery programs so that life history characteristics and genetic diversity of hatchery fish mimic natural fish. | 3.9.1. Genetic characteristics of hatchery-origin fish are indistinguishable from natural-origin fish.<br>3.9.2. Life history characteristics of hatchery-origin adult fish are indistinguishable from natural-origin fish.<br>3.9.3. Juvenile emigration timing and survival differences between hatchery and natural-origin fish must be minimal. |
| | 3.10. The distribution and incidence of diseases, parasites and pathogens in natural populations and hatchery populations are known and releases of hatchery fish are designed to minimize potential spread or amplification of diseases, parasites, or pathogens among natural populations. | 3.10. Detectable changes in rate of occurrence and spatial distribution of disease, parasite or pathogen among the affected hatchery and natural populations. |
| 4. OPERATION OF ARTIFICIAL PRODUCTION FACILITIES | 4.1. Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols such as those described by IHOT, PNFHPC, the Co-Managers of Washington Fish Health Policy, INAD, and MDFWP. | 4.1.1. Annual reports indicating level of compliance with applicable standards and criteria.<br>4.1.2. Periodic audits indicating level of compliance with applicable standards and criteria. |
| | 4.2. Effluent from artificial production facility will not detrimentally affect natural populations. | 4.2.1. Discharge water quality compared to applicable water quality standards and guidelines, such as those described or required by NPDES, IHOT, PNFHPC, and Co-Managers of Washington Fish Health Policy tribal water quality plans, including those relating to temperature, nutrient loading, chemicals, etc. |
| | 4.3. Water withdrawals and instream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning behavior of natural populations, or impact juvenile rearing environment. | 4.3.1. Water withdrawals compared to applicable passage criteria.<br>4.3.2. Water withdrawals compared to NMFS, USFWS, and WDFW juvenile screening criteria.<br>4.3.3. Number of adult fish aggregating and/or spawning immediately below water intake point.<br>4.3.4. Number of adult fish passing water intake point.<br>4.3.5. Proportion of diversion of total stream flow between intake and outfall. |
| | 4.4. Releases do not introduce pathogens not already existing in the local populations, and do not significantly increase the levels of existing pathogens. | 4.4.1. Certification of juvenile fish health immediately prior to release, including pathogens present and their virulence.<br>4.4.2. Juvenile densities during artificial rearing.<br>4.4.3. Samples of natural populations for disease occurrence before and after artificial production releases. |
| | 4.5. Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines, including state, tribal, and federal carcass distribution guidelines. | 4.5.1. Number and location(s) of carcasses or other products distributed for nutrient enrichment.<br>4.5.2. Statement of compliance with applicable regulations and guidelines. |
| | 4.6. Adult broodstock collection operation does not significantly alter spatial and temporal distribution of any naturally produced population. | 4.6.1. Spatial and temporal spawning distribution of natural population above and below weir/trap, currently and compared to historic distribution. |
| | 4.7. Weir/trap operations do not result in significant stress, injury, or mortality in natural populations. | 4.7.1. Mortality rates in trap.<br>4.7.2. Prespawning mortality rates of trapped fish in hatchery or after release. |
| | 4.8. Predation by artificially produced fish on naturally produced fish does not significantly reduce numbers of natural fish. | 4.8.1. Size at, and time of, release of juvenile fish, compared to size and timing of natural fish present.<br>4.8.2. Number of fish in stomachs of sampled artificially produced fish, with estimate of natural fish composition. |
| N O MI C EF FE | 5.1. Cost of program operation does not exceed the net economic value of fisheries in dollars per fish for all fisheries targeting this population. | 5.1.1. Total cost of program operation.<br>5.1.2. Sum of ex-vessel value of commercial catch adjusted appropriately, appropriate monetary value of recreational effort, and other fishery related financial benefits. |

| Category | Standards | Indicators |
|---|---|---|
| | 5.2. Juvenile production costs are comparable to or less than other regional programs designed for similar objectives. | 5.2.1. Total cost of program operation.<br>5.2.2. Average total cost of activities with similar objectives. |
| | 5.3. Non-monetary societal benefits for which the program is designed are achieved. | 5.3.1. Number of adult fish available for tribal ceremonial use.<br>5.3.2. Recreational fishery angler days, length of seasons, and number of licenses purchased. |

The suite of performance measures developed by the CSMEP represents a crosswalk mechanism that is needed to quantitatively monitor and evaluate the standards and indicators listed in Table 1. The CSMEP measures have been adopted by the AHSWG (Beasley et. al. 2008), and where applicable, are consistent with those evaluated for the Dworshak Chinook program. The adoption of this regionally-applied means of assessment will facilitate coordinated analysis of findings from basin-wide M&E efforts and will provide the scientifically-based foundation to address the management questions and critical uncertainties associated with supplementation and ESA listed stock status/recovery.

Listed below are the suite of Performance Measures (modified from the management objectives listed in Beasley et al. (2008)) used by the Dworshak Chinook project, and the assumptions that need to be tested for each standard.

**Table 2. Standardized performance measures and definitions for status and trends and hatchery effectiveness monitoring and the associated performance indicator that it addresses.**

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| Abundance | Adult Escapement to Tributary | Number of adults (including jacks) that have escaped to a certain point (i.e. - mouth of stream). Population based measure. Calculated with mark recapture methods from weir data adjusted for redds located downstream of weirs and in tributaries, and maximum net upstream approach for DIDSON and underwater video monitoring. Provides total escapement and wild only escapement. [Assumes tributary harvest is accounted for]. Uses TRT population definition where available | 2.3.2, 3.1.2, 3.2.2, 3.2.4, 5.3.1 |
| Abundance | Fish per Redd | Number of fish divided by the total number of redds. Applied by: The population estimate at a weir site, minus broodstock and mortalities and harvest, divided by the total number of redds located upstream of the weir. | N/A |
| Abundance | Female Spawner per Redd | Number of female spawners divided by the total number of redds above weir. Applied in 2 ways: 1) The population estimate at a weir site multiplied by the weir derived proportion of females, minus the number of female prespawn mortalities, divided by the total number of redds located upstream of the weir, and 2) DIDSON application calculated as in 1 above but with proportion females from carcass recoveries. Correct for mis-sexed fish at weir for 1 above. | N/A |
| Abundance | Index of Spawner Abundance - redd counts | Counts of redds in spawning areas in index area(s) (trend), extensive areas, and supplemental areas. Reported as redds and/or redds/km. | N/A |

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| | Spawner Abundance | In-river: Estimated number of total spawners on the spawning ground. Calculated as the number of fish that return to an adult monitoring site, minus broodstock removals and weir mortalities and harvest if any, subtracts the number of female prespawning mortalities and expanded for redds located below weirs. Calculated in two ways: 1) total spawner abundance, and 2) wild spawner abundance which multiplies by the proportion of natural origin (wild) fish. Calculations include jack salmon.<br>In-hatchery: Total number of fish actually used in hatchery production. Partitioned by gender and origin. | N/A |
| | Hatchery Fraction | Percent of fish on the spawning ground that originated from a hatchery. Applied in two ways: 1) Number of hatchery carcasses divided by the total number of known origin carcasses sampled. Uses carcasses above and below weirs, 2) Uses weir data to determine number of fish released above weir and calculate as in 1 above, and 3) Use 2 above and carcasses above and below weir. | N/A |
| | Ocean/Mainstem Harvest | Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin. | 1.1.1, 1.1.2, 2.3.1, 2.4.2, 2.6.2, 3.3.2, |
| | Harvest Abundance in Tributary | Number of fish caught in ocean and mainstem (tribal, sport, or commercial) by hatchery and natural origin. | 1.1.1, 1.1.2, 2.3.1, 2.4.2, 2.6.2, 3.3.2, |
| | Index of Juvenile Abundance (Density) | Parr abundance estimates using underwater survey methodology are made at pre-established transects. Densities (number per 100 m2) are recorded using protocol described in Thurow (1994). Hanken & Reeves estimator. | N/A |
| | Juvenile Emigrant Abundance | Gauss software is (Aptech Systems, Maple Valley, Washington) isused to estimate emigration estimates. Estimates are given for parr pre-smolts, smolts and the entire migration year. Calculations are completed using the Bailey Method and bootstrapping for 95% CIs. Gauss program developed by the University of Idaho (Steinhorst 2000). | N/A |
| | Smolts | Smolt estimates, which result from juvenile emigrant trapping and PIT tagging, are derived by estimating the proportion of the total juvenile abundance estimate at the tributary comprised of each juvenile life stage (parr, presmolt, smolt) that survive to first mainstem dam. It is calculated by multiplying the life stage specific abundance estimate (with standard error) by the life stage specific survival estimate to first mainstem dam (with standard error). The standard error around the smolt equivalent estimate is calculated using the following formula; where X = life stage specific juvenile abundance estimate and Y = life stage specific juvenile survival estimate:<br>$Var(X \cdot Y)$<br>$= E(X)^2 \cdot Var(Y) + E(Y)^2 \cdot Var(X) + Var(X) \cdot Var(Y)$ | N/A |
| | Run Prediction | This will not be in the raw or summarized performance database. | 2.3.1, |

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| Survival – Productivity | Smolt-to-Adult Return Rate | The number of adult returns from a given brood year returning to a point (stream mouth, weir) divided by the number of smolts that left this point 1-5 years prior. Calculated for wild and hatchery origin conventional and captive brood fish separately. Adult data applied in two ways: 1) SAR estimate to stream using population estimate to stream, 2) adult PIT tag SAR estimate to escapement monitoring site (weirs, LGR), and 3) SAR estimate with harvest. Accounts for all harvest below stream.<br><br>*Smolt-to-adult return rates* are generated for four performance periods; tributary to tributary, tributary to tributary, tributary to first mainstem dam, first mainstem dam to first mainstem dam, and first mainstem dam to tributary.<br><br>*First mainstem dam to first mainstem dam S*AR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the estimated number of PIT tagged juveniles at first mainstem dam. Variances around the point estimates are calculated as described above.<br><br>*Tributary to tributary SAR* estimates for natural and hatchery origin fish are calculated using PIT tag technology as well as direct counts of fish returning to the drainage. PIT tag SAR estimates are calculated by dividing the number of PIT tag adults returning to the tributary (by life stage and origin type) by the number of PIT tagged juvenile fish migrating from the tributary (by life stage and origin type). Overall PIT tag SAR estimates for natural fish are then calculated by averaging the individual life stage specific SAR's. Direct counts are calculated by dividing the estimated number of natural and hatchery-origin adults returning to the tributary (by length break-out for natural fish) by the estimated number of natural-origin fish and the known number of hatchery-origin fish leaving the tributary.<br><br>*Tributary to* first mainstem dam SAR estimates are calculated by dividing the number of PIT tagged adults returning to first mainstem dam by the number of PIT tagged juveniles tagged in the tributary. There is no associated variance around this estimate. The adult detection probabilities at first mainstem dam are near 100 percent.<br><br>First mainstem dam *to tributary* SAR estimates are calculated by dividing the number of PIT tagged adults returning to the tributary by the estimated number of PIT tagged juveniles at first mainstem dam . The estimated number of PIT tagged juveniles at first mainstem dam is calculated by multiplying lifestage specific survival estimates (with standard errors) by the number of juveniles PIT tagged in the tributary. The variance for the estimated number of PIT tagged juveniles at first mainstem dam is calculated as follows, where X = the number of PIT tagged fish in the tributary and Y = the variance of the lifestage specific survival estimate:<br>$Var(X \cdot Y) = X^2 \cdot Var(Y)$<br>The variance around the SAR estimate is calculated as follows, where X = the number of adult PIT tagged fish returning to the tributary and Y = the estimated number of juvenile PIT tagged fish at first mainstem dam :<br>$$Var\left(\frac{X}{Y}\right) = \left(\frac{EX}{EY}\right)^2 \cdot \left(\frac{Var(Y)}{(EY)^2}\right)$$ | 3.2.2 |
| | Progeny-per- Parent Ratio | Adult to adult calculated for naturally spawning fish and hatchery fish separately as the brood year ratio of return adult to parent spawner abundance using data above weir. Two variants calculated: 1) escapement, and 2) spawners. | 3.2.2 |
| | Recruit/spawner (R/S)(Smolt Equivalents per Redd or female) | Juvenile production to some life stage divided by adult spawner abundance. Derive adult escapement above juvenile trap multiplied by the prespawning mortality estimate. Adjusted for redds above juv. Trap.<br>*Recruit per spawner* estimates, or *juvenile abundance (can be various life stages or locations) per redd/female*, is used to index population productivity, since it represents the quantity of juvenile fish resulting from an average redd (total smolts divided by total redds) or female. Several forms of juvenile life stages are applicable. We utilize two measures: 1) juvenile abundance (parr, presmolt, smolt, total abundance) at the tributary mouth, and 2) smolt abundance at first mainstem dam . | 3.2.2 |

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| | Pre-spawn Mortality | Percent of female adults that die after reaching the spawning grounds but before spawning. Calculated as the proportion of "25% spawned" females among the total number of female carcasses sampled. ("25% spawned" = a female that contains 75% of her egg compliment]. | N/A |
| | Juvenile Survival to first mainstem dam | Life stage survival (parr, presmolt, smolt, subyearling) calculated by CJS Estimate (SURPH) produced by PITPRO 4.8+ (recapture file included), CI estimated as 1.96*SE. Apply survival by life stage to first mainstem dam to estimate of abundance by life stage at the tributary and the sum of those is total smolt abundance surviving to first mainstem dam . Juvenile survival to first mainstem dam = total estimated smolts surviving to first mainstem dam divided by the total estimated juveniles leaving tributary. | 3.2.2 |
| | Juvenile Survival to all Mainstem Dams | *Juvenile survival to first mainstem dam and subsequent Mainstem Dam(s)*, which is estimated using PIT tag technology. Survival by life stage to and through the hydrosystem is possible if enough PIT tags are available from the stream. Using tags from all life stages combined we will calculate (SURPH) the survival to all mainstem dams. | 3.2.2 |
| | Post-release Survival | Post-release survival of natural and hatchery-origin fish are calculated as described above in the performance measure "Survival to first mainstem dam and Mainstem Dams". No additional points of detection (i.e screwtraps) are used to calculate survival estimates. | 3.2.2 |
| Distribution | Adult Spawner Spatial Distribution | Extensive area tributary spawner distribution. Target GPS red locations or reach specific summaries, with information from carcass recoveries to identify hatchery-origin vs. natural-origin spawners across spawning areas within populations. | N/A |
| | Stray Rate (percentage) | Estimate of the number and percent of hatchery origin fish on the spawning grounds, as the percent within MPG, and percent out of ESU. Calculated from 1) total known origin carcasses, and 2) uses fish released above weir. Data adjusted for unmarked carcasses above and below weir. | 3.4.2 |
| | Juvenile Rearing Distribution | Chinook rearing distribution observations are recorded using multiple divers who follow protocol described in Thurow (1994). | N/A |
| | Disease Frequency | Natural fish mortalities are provided to certified fish health lab for routine disease testing protocols. Hatcheries routinely samples fish for disease and will defer to then for sampling numbers and periodicity | N/A<br>4.4.1 |
| Genetic | Genetic Diversity | Indices of genetic diversity – measured within a tributary) heterozygosity – allozymes, microsatellites), or among tributaries across population aggregates (e.g., FST). | N/A |
| | Reproductive Success (Nb/N) | Derived measure: determining hatchery:wild proportions, effective population size is modeled. | N/A |
| | Relative Reproductive Success (Parentage) | Derived measure: the relative production of offspring by a particular genotype. Parentage analyses using multilocus genotypes are used to assess reproductive success, mating patterns, kinship, and fitness in natural populations and are gaining widespread use of with the development of highly polymorphic molecular markers. | N/A |
| | Effective Population Size (Ne) | Derived measure: the number of breeding individuals in an idealized population that would show the same amount of dispersion of allele frequencies under random genetic drift or the same amount of inbreeding as the population under consideration. | N/A |
| Life History | Age Structure | Proportion of escapement composed of adult individuals of different brood years. Calculated for wild and hatchery origin conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated. | N/A |
| | Age–at–Return | Age distribution of spawners on spawning ground. Calculated for wild and hatchery conventional and captive brood adult returns. Accessed via scale method, dorsal fin ray ageing, or mark recoveries. | N/A |

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| | Age–at-Emigration | Juvenile Age is determined by brood year (year when eggs are placed in the gravel) Then Age is determined by life stage of that year. Methods to age Chinook captured in screwtrap are by dates; fry – prior to July 1; parr – July 1-August 31; presmolt – September 1 – December 31; smolt – January 1 – June 30; yearlings – July 1 – with no migration until following spring. The age class structure of juveniles is determined using length frequency breakouts for natural-origin fish. Scales have been collected from natural-origin juveniles, however, analysis of the scales have never been completed. The age of hatchery-origin fish is determined through a VIE marking program which identifies fish by brood year. For steelhead we attempt to use length frequency but typically age of juvenile steelhead is not calculated. | N/A |
| | Size-at-Return | Size distribution of spawners using fork length and mid-eye hypural length. Raw database measure only. | N/A |
| | Size-at-Emigration | Fork length (mm) and weight (g) are representatively collected weekly from natural juveniles captured in emigration traps. Mean fork length and variance for all samples within a lifestage-specific emigration period are generated (mean length by week then averaged by lifestage). For entire juvenile abundance leaving a weighted mean (by lifestage) is calculated. Size-at-emigration for hatchery production is generated from pre release sampling of juveniles at the hatchery. | N/A |
| | Condition of Juveniles at Emigration | Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992). | N/A |
| | Percent Females (adults) | The percentage of females in the spawning population. Calculated using 1) weir data, 2) total known origin carcass recoveries, and 3) weir data and unmarked carcasses above and below weir. Calculated for wild, hatchery, and total fish. | N/A |
| | Adult Run-timing | Arrival timing of adults at adult monitoring sites (weir, DIDSON, video) calculated as range, 10%, median, 90% percentiles. Calculated for wild and hatchery origin fish separately, and total. | N/A |
| | Spawn-timing | This will be a raw database measure only. | N/A |
| | Juvenile Emigration Timing | Juvenile emigration timing is characterized by individual life stages at the rotary screw trap and Lower Granite Dam. Emigration timing at the rotary screw trap is expressed as the percent of total abundance over time while the median, 0%, 10, 50%, 90% and 100% detection dates are calculated for fish at first mainstem dam . | N/A |
| | Mainstem Arrival Timing (Lower Granite) | Unique detections of juvenile PIT-tagged fish at first mainstem dam are used to estimate migration timing for natural and hatchery origin tag groups by lifestage. The actual Median, 0, 10%, 50%, 90% and 100% detection dates are reported for each tag group. Weighted detection dates are also calculated by multiplying unique PIT tag detection by a life stage specific correction factor (number fish PIT tagged by lifestage divided by tributary abundance estimate by lifestage). Daily products are added and rounded to the nearest integer to determine weighted median, 0%, 50%, 90% and 100% detection dates. | N/A |
| Habitat | Physical Habitat | TBD | N/A |
| | Stream Network | TBD | N/A |
| | Passage Barriers/Diversions | TBD | N/A |
| | Instream Flow | USGS gauges and also staff gauges | N/A |
| | Water Temperature | Various, mainly Hobo and other temp loggers at screw trap sights and spread out throughout the streams | N/A |
| | Chemical Water Quality | TBD | N/A |
| | Macroinvertebrate Assemblage | TBD | N/A |
| | Fish and Amphibian Assemblage | Observations through rotary screwtrap catch and while conducting snorkel surveys. | N/A |
| In-Hatchery Measures | Hatchery Production Abundance | The number of hatchery juveniles of one cohort released into the receiving stream per year. Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Method dependent upon marking program (census obtained when 100% are marked). | 2.5.2, 2.5.3, 2.6.1, 4.4.2 |

| Performance Measure | | Definition | Related Indicator |
|---|---|---|---|
| | In-hatchery Life Stage Survival | In-hatchery survival is calculated during early life history stages of hatchery-origin juvenile Chinook. Enumeration of individual female's live and dead eggs occurs when the eggs are picked. These numbers create the inventory with subsequent mortality subtracted. This inventory can be changed to the physical count of fish obtained during CWT or VIE tagging. These physical fish counts are the most accurate inventory method available. The inventory is checked throughout the year using 'fish-per-pound' counts.<br>Estimated survival of various in-hatchery juvenile stages (green egg to eyed egg, eyed egg to ponded fry, fry to parr, parr to smolt and overall green egg to release) Derived from census count minus prerelease mortalities or from sample fish- per-pound calculations minus mortalities. Life stage at release varies (smolt, premolt, parr, etc.). | 2.5.1, 2.5.2, 2.5.3, 2.5.4 |
| | Size-at-Release | Mean fork length measured in millimeters and mean weight measured in grams of a hatchery release group. Measured during prerelease sampling. Sample size determined by individual facility and M&E staff. Life stage at release varies (smolt, premolt, parr, etc.). | 2.5.1, 2.5.3 |
| | Juvenile Condition Factor | Condition Factor (K) relating length to weight expressed as a ratio. Condition factor by life stage of juveniles is generated using the formula: $K = (w/l^3)(10^4)$ where K is the condition factor, w is the weight in grams (g), and l is the length in millimeters (Everhart and Youngs 1992). | 2.5.3 |
| | Fecundity by Age | The reproductive potential of an individual female. Estimated as the number of eggs in the ovaries of the individual female. Measured as the number of eggs per female calculated by weight or enumerated by egg counter. | 3.8.1 |
| | Spawn Timing | Spawn date of broodstock spawners by age, sex and origin, Also reported as cumulative timing and median dates. | 3.2.4 |
| | Hatchery Broodstock Fraction | Percent of hatchery broodstock actually used to spawn the next generation of hatchery F1s. Does not include prespawn mortality. | 2.2.1 |
| | Hatchery Broodstock Prespawn Mortality | Percent of adults that die while retained in the hatchery, but before spawning. | 4.7.2 |
| | Female Spawner ELISA Values | Screening procedure for diagnosis and detection of BKD in adult female ovarian fluids. The enzyme linked immunosorbent assay (ELISA) detects antigen of *R. salmoninarum.* | 4.4.1 |
| | In-Hatchery Juvenile Disease Monitoring | Screening procedure for bacterial, viral and other diseases common to juvenile salmonids. Gill/skin/ kidney /spleen/skin/blood culture smears conducted monthly on 10 mortalities per stock | 4.4.1 |
| | Length of Broodstock Spawner | Mean fork length by age measured in millimeters of male and female broodstock spawners. Measured at spawning and/or at weir collection. Is used in conjunction with scale reading for aging. | 3.9.2 Partial |
| | Prerelease Mark Retention | Percentage of a hatchery group that have retained a mark up until release from the hatchery. Estimated from a sample of fish visually calculated as either "present" or "absent" | 3.1.1, 3.1.2 |
| | Prerelease Tag Retention | Percentage of a hatchery group that have retained a tag up until release from the hatchery - estimated from a sample of fish passed as either "present" or "absent". ("Marks" refer to adipose fin clips or VIE batch marks). | 3.1.1, 3.1.2 |
| | Hatchery Release Timing | Date and time of volitional or forced departure from the hatchery. Normally determined through PIT tag detections at facility exit (not all programs monitor volitional releases). | 2.5.4, 4.8.1 |
| | Chemical Water Quality | Hatchery operational measures included: dissolved oxygen (DO) - measured with DO meters, continuously at the hatchery, and manually 3 times daily at acclimation facilities; ammonia ($NH_3$) nitrite ($NO_2$), -measured weekly only at reuse facilities (Dworshak Fish Hatchery). | 4.1.1 |
| | Water Temperature | Hatchery operational measure (Celsius) - measured continuously at the hatchery with thermographs and 3 times daily at acclimation facilities with hand-held devices. | 2.5.1, 4.2.1 Partial |

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

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

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

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

Performance indicators that we use to evaluate the performance standards listed in section 1.9 are presented in Table 2. These performance measures are taken from Beasley et al. (2008) and are consistent with the Dworshak Chinook M&E program. The performance indicators are broken into the categories of abundance, survival-productivity, distribution, genetic, life history, habitat, and in-hatchery groups. Within each of these groups are the specific indicator(s) and brief description of the definition/method(s).

**1.10.1) "Performance Indicators" addressing benefits**.
(e.g. "*Evaluate smolt-to-adult return rates for program fish to harvest, hatchery broodstock, and natural spawning.*").

Evaluation of the Dworshak Chinook program utilizes the performance standards and associated performance indicators in sections 1.9 and 1.10 (respectively). will be utilized for addressing the project benefits and risks.

The HRT was concerned that the current conditions affecting the survival of salmon and steelhead in the Snake and Columbia rivers (operation of the hydropower system, habitat, harvest, and ESA listings) downstream from Dworshak NFH differ from the assumptions that were used to establish LSRCP mitigation goals. These different conditions inhibit consistent achievement of Dworshak NFH"s contribution (9,135 adult spring Chinook) towards meeting the LSRCP mitigation goal of 58,700 adult spring/summer Chinook returning annually upstream of Lower Granite Dam, as developed initially by the Army Corps of Engineers in the mid-1970"s. They recommended (DW32) that we continue to work through various regional processes such as (a) implementation of the mainstem *Federal Columbia River Power System* Biological Opinion to improve migration survival, (b) *US vs. OR* discussions to address harvest issues, (c) NOAA Fisheries to complete ESA consultations on hatchery mitigation programs, and (d) local watershed groups to continue improving habitat, to allow the Service and cooperators meet Army Corps of Engineers and LSRCP mitigation goals on a consistent basis. Reexamine current approaches for contributing 9,135 adult spring Chinook to the LSRCP mitigation goal of

58,700 adult spring/summer Chinook (upstream of Lower Granite Dam) to determine whether the current hatchery program should be modified to account for existing conditions and capabilities at Dworshak NFH.

The Regional Office of the Service contributes dedicated representatives to the meetings involving the activities listed above and we, primarily through IFRO, are in regular contact with those representatives when discussing goals for DNFH spring Chinook. We also regularly cooperate with research projects developed to evaluate passage and survival conditions for DNFH spring Chinook, such as those funded through the Fish Passage Center and BPA Biop-related programs. We will continue to participate at a high level in these discussions. To date, we have not observed evidence for significant changes in survival, escapement or natural production of spring Chinook that would cause alteration of overall stated goals for DNFH. However, there are gaps in our knowledge of the numbers of spring Chinook salmon returning to the Columbia and Clearwater rivers. Filling those gaps is a necessary step prior to any substantive discussions on evaluation of current production goals or other means to meet mitigation objectives.

The HRT also raised the issue that program goals for Dworshak NFH spring Chinook are not fully expressed in terms of numeric outcomes that quantify intended benefits. This hatchery program lacks specific numeric goals for harvest although providing fish for harvest is a primary purpose of the program. The proportional Snake River spring Chinook mitigation goal for adult returns from Dworshak NFH upstream of Lower Granite Dam is 9,135 fish, but no numeric harvest goals within the Clearwater basin, or for on-station releases from Dworshak NFH, have been identified. They recommended (DW31) that we restate program goals to identify the number of harvestable adult spring Chinook from Dworshak NFH for the Clearwater River basin.

The responsibility of Dworshak NFH is to return 9,135 adult spring Chinook salmon to Lower Granite Dam. To have the opportunity to meet that goal, the current program has identified a need to collect 1,000 adults for broodstock (500 females and 500 males). Allocation and distribution of the surplus (up to 8,135 adults) is the responsibility of the fisheries managers, the Idaho Department of Fish and Game and the Nez Perce Tribe, whether that allocation is for harvest, supplementation, or other purposes. The Service does need to work cooperatively with the co-managers to insure that there is a statistically valid tagging program in place that will provide the Service, the Tribe, and the IDFG the ability to estimate adult returns for the Dworshak NFH spring Chinook salmon program. These efforts are currently pursued through the Annual Operations Plan process for the Clearwater River.

### 1.10.2) "Performance Indicators" addressing risks.

(*e.g. "Evaluate predation effects on listed fish resulting from hatchery fish releases."*).

Evaluation of the Dworshak Chinook program utilizes the performance standards and associated performance indicators in sections 1.9 and 1.10 (respectively). will be utilized for addressing the project benefits and risks.

### 1.11) Expected size of program.

*In responding to the two elements below, take into account the potential for increased fish production that may result from increased fish survival rates effected by improvements in hatchery rearing methods, or in the productivity of fish habitat.*

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

Our target for broodstock is to collect 1000 adults. We have about a 1:1 male to female ratio that allows about 500 females for spawning.

**1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.** (*Use standardized life stage definitions by species presented in* Attachment 2).

| Life Stage | Release Location | Annual Release Level |
|---|---|---|
| **Eyed Eggs** | | |
| **Unfed Fry** | | |
| **Fry** | | |
| **Fingerling** | | |
| **Yearling** | *On Site | 1,050,000 |
| **Adult** | See Table 3 below for locations | Chinook adults excess to broodstock needs for all Clearwater River hatcheries |

*On Site releases are made directly from Dworshak NFH into the North Fork Clearwater River.

Table 3. Sites, release numbers, and marks for adult Spring Chinook Salmon, when all Clearwater basin production programs are above broodstock needs.*

| Release Location | Hatchery Source | Number Limit |
|---|---|---|
| **Selway Basin** | | |
| McGruder | RR, NPTH, Clear, DNFH, KNFH | 800 - 1,000 |
| O'Hara Creek | RR, NPTH, Clear, DNFH | 200 |
| Lower Selway | RR, NPTH, Clear, DNFH, KNFH | 0 - 2,000 |
| **SF Clearwater R.** | | |
| Mill Creek | RR, NPTH, Clear, DNFH | 150 |
| Meadow Creek | RR, NPTH, Clear, DNFH | 150 - 300 |
| SF Clearwater R. | RR, NPTH, Clear, DNFH | 0 - 500 |
| **Lochsa River** | | |
| Main Lochsa Badger Cr. Boulder Cr. | RR, NPTH, Clear, DNFH | 500 |
| | **Subtotal** | **1,800 - 4,650** |

*Release Locations are not prioritized

**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 table below lists, by year, the number of yearling spring Chinook released from Dworshak NFH for Brood years 1995 to 2006. Also listed is the total number of adults that returned to the hatchery from those releases. Data summarized from Idaho FRO databases and annual reports.

| Brood Year | Smolts Released | Total Rack Return | Smolt to Hatchery Return (%) |
|---|---|---|---|
| 1995 | 53,078 | 193 | 0.3636 |
| 1996 | 973,400 | 4,244 | 0.4360 |
| 1997 | 1,044,511 | 4,071 | 0.3900 |
| 1998 | 1,017,873 | 3,880 | 0.3812 |
| 1999 | 333,120 | 677 | 0.2044 |
| 2000 | 1,000,561 | 2,696 | 0.2694 |
| 2001 | 1,033,982 | 390 | 0.0377 |
| 2002 | 1,078,923 | 830 | 0.0769 |
| 2003 | 1,072,359 | 1,208 | 0.1126 |
| 2004 | 1,007,738 | 2,148 | 0.2132 |
| 2005 | 963,211 | 1,519 | Incomplete* |
| 2006 | 939,000 | 726 | Incomplete** |

* Incomplete, only I and II-salt fish
** Incomplete, only I-salt fish

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

The first smolt releases were made in 1983. The first adults began to arrive back at the hatchery in 1984.

**1.14) Expected duration of program.**

At a minimum the Dworshak spring Chinook salmon program is expected to run as long as the four Lower Snake River dams are in place.

**1.15) Watersheds targeted by program.**

The program is designed to return adults to the Clearwater River in Idaho so harvest is expected downstream in the Snake and Columbia rivers also.

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

The program is designed to mitigate for lost spring Chinook salmon production due to the four Lower Snake River lock and dam projects: Lower Granite Dam, Little Goose Dam, Lower Monumental Dam, and Ice Harbor Dam. Alternative actions to the mitigation program will not be considered unless breaching at these dams is proposed.

The HSRG recommended that the managers coordinate the programming of all salmon populations reared in the Clearwater basin to maximize the benefits of available water supply, appropriate water temperature, and rearing containers. Operating the four major hatcheries in basin as a coordinated system would facilitate the movement of programs/population between and among the different hatcheries. This would maximize survival by producing fish in good condition for release at the appropriate life stage. The managers currently coordinate salmon production in the Clearwater basin through an Annual Operating Plan and are moving towards a fully integrated program, but this is part of a congressionally mandated program and changing production numbers and other goals requires more than a field levels manager's willingness to do it.

The HSRG also recommended that managers continue to implement their apparently successful BKD risk management strategies, which include culling. The managers concur with this and plan to continue the program.

Specifically for Dworshak NFH the HSRG recommended that the managers develop an improved water supply at the facility to address disease and temperature problems. The managers concur with this recommendation and are working with all pertinent entities to develop a better water supply.

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

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

1) The NMFS 1999 Biological Opinion on Artificial Propagation in the Columbia River Basin: Incidental take of Listed Salmon and Steelhead from Federal and Non-Federal hatchery programs that collect, rear, and release unlisted fish species, prepared pursuant to section 7(a)(2) of the Endangered Species Act of 1973

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

There has never been any fall Chinook salmon and only one suspected wild steelhead (see Section 2.2.3) collected during the trapping of spring Chinook salmon broodstock. If any were collected they would be immediately released back to the river after data were recorded. Bull trout have been collected during spring Chinook trapping, (see Section 15 for an analysis of this impact).

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

*Include information describing: adult age class structure, sex ratio, size range, migration timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release locations and weir sites*

The Dworshak spring Chinook salmon program may affect listed Snake River Steelhead and Snake River Fall Chinook Salmon. The release of spring Chinook salmon smolts from Dworshak NFH occurs in spring, usually the last of March or the first week in

April.  Our releases do occur at about the same time as wild/natural steelhead are emigrating. While they are emigrating together, there may be some interaction, but we have no data on the exact nature or extent of the interaction. As far as effects of our spring Chinook salmon releases on fall Chinook salmon, we do not expect any interaction, since fall Chinook juveniles occupy a completely different habitat type than spring Chinook salmon during this time period.

- **Identify the ESA-listed population(s) that will be <u>directly</u> affected by the program.** *(Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).*

None

**- Identify the ESA-listed population(s) that may be <u>incidentally</u> affected by the program.**
*(Includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas).*

Snake River Steelhead and Snake River Fall Chinook Salmon.

**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** (*see definitions in Attachment 1").*

Fall Chinook – The Hatchery Effects Report for Protected Salmon & Steelhead of the Interior Columbia Basin working paper of the FCRPS Remand Hatcheries and Harvest working Group (2006) states that there is good reason to believe that the Snake River fall Chinook programs have increased spatial structure, genetic resources and probably abundance.  Hatchery programs have helped jumpstart the ESU, and natural-origin fall Chinook returns have increased from <100 in 1990 to between 2,000 and 5, 000 from 2001-2004.  Spatial distribution has expanded into the Clearwater and lower Grande Ronde River sub-basins and changes of the Umatilla hatchery program has reduced straying from outside the basin and threats to fall Chinook diversity.  It was documented in the NOAA Fisheries USBR Upper Snake Actions (2008) that under the current conditions the available area below Hells Canyon Dam has demonstrated the capacity to support at least 5,000 spawners.  The ICTRT has set a recovery abundance threshold of 3,000 spawners to meet viability goals for abundance at <5% risk of extinction (ICTRT 2007).

The Biological Review Team (Good et al.2005) characterizes the risk of the distribution VSP factor as "moderately high" because approximately 85% of historical habitat is inaccessible and the distribution of the extant population makes it relatively vulnerable to variable environmental conditions and large disturbances.  In addition, the BRT characterizes the risk for diversity VSP factor as "moderately high" because of the loss of diversity associated with extinct populations and the significant hatchery influence on the extant population.  A draft ICTRT Current Status Summary (ICTRT 2007) characterizes the long-term (100 year) extinction risk, calculated from productivity and natural origin abundance estimates of SR fall Chinook during the 1977-1999 broodyear "base period" for recruit/spawner productivity estimates, as "High" (>25% 100 year extinction risk).  In these analyses, the ICTRT defines the quasi-extinction threshold (QET) for 100-year extinction risk as fewer than 50 spawners in four consecutive years (QET=50). The ICTRT also calculated the extinction risk based on the 1990-1999 time period and determined that it was "moderate" (6-25% 100-year extinction risk). The ICTRT indicates that the extinction risk is likely between these estimates ("moderate" to "high"). The ICTRT assessments are framed in terms of long-term viability and do not directly incorporate short-term (24-year) extinction risk or specify a particular QET for use in analyzing short-term risk. If hatchery supplementation is assumed to continue at current levels for Snake River fall Chinook, the short-term extinction risk is 0% at all QETs (Hinrichsen 2008). Designated critical habitat for Snake River fall Chinook includes all Columbia River estuarine areas and river reaches proceeding upstream to the confluence of the Columbia and Snake Rivers,; all Snake River reaches from the confluence of the Columbia River upstream to Hells Canyon Dam; the Palouse River upstream to Palouse falls; the Clearwater River upstream to its confluence with Lolo Creek; and the North Fork Clearwater river upstream to Dworshak Dam. Critical habitat also includes river reaches presently or historically accessible in the following subbasins: Clearwater, Hells Canyon Imnaha, Lower Grande Ronde, Lower North Fork Clearwater, Lower Salmon, Lower Snake, Lower Snake-Asotin, Lower Snake-Tucannon, and Palouse.

Natural and hatchery origin fall Chinook in the Snake River are listed as "threatened" under the ESA as part of the Snake River ESU. While no fall Chinook salmon have been captured at Kooskia there is the potential since the NPT has counted redds in the SF Clearwater and Selway rivers. The spawning populations in the lower Grande Ronde, Clearwater, Imnaha, and Salmon rivers are considered part of the larger composite population for the entire Snake River Basin. Spawners consist of natural and hatchery origin fish (LFH – which rears Snake River stock fall Chinook). Lyons Ferry fall Chinook hatchery releases occur throughout the Snake River Basin from Lyons Ferry Hatchery and Idaho Power facilities, acclimation facilities operated by the Nez Perce Tribe, in the Clearwater Basin from an acclimation facility operated by the Nez Perce Tribe, and in the Grande Ronde River as a direct release.

Spring/summer Chinook – Natural origin spring/summer Chinook in the Clearwater Basin are not listed under the ESA.

Summer Steelhead – Natural origin summer steelhead in the Snake River, Clearwater Basin is listed as "threatened" under the ESA as part of the Snake River ESU. The Clearwater River steelhead population is part of the Snake River Steelhead Distinct Population Segment (DPS). The DPS contains both A- and B-run steelhead. This population is considered to have both A- and B-run components and is listed as threatened under the ESA. The HSRG assigned this population as Stabilizing. The ICTRT classified the population as "intermediate" based on historical habitat potential. An "intermediate" population is one that requires a minimum abundance of 1,000 natural spawners and an intrinsic productivity greater than 1.30 recruits per spawner to meet the 5% extinction risk criteria established by the ICTRT. The Lolo Creek component was classified by the ICTRT as a "basic" population, which is defined as one that requires a minimum abundance of 500 natural spawners and an intrinsic productivity greater than 1.15 recruits per spawner.

Sockeye – Natural origin sockeye from the Snake River are listed as "endangered" under the ESA as part of the Snake River ESU. No sockeye have ever been captured in Clear Creek.

Bull Trout – Natural origin fluvial and ad fluvial bull trout in the Snake River are listed as "threatened" under the ESA as part of the Columbia basin bull trout distinct population segment (DPS). Clear Creek is not included in the critical habitat designation. See Section 15 for a full analysis of bull trout impacts.

**- 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.**

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

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

**Table 5. Natural and hatchery origin (includes all hatcheries) adult fall chinook passed above LGR Dam to continue migration to spawning areas. Data compiled using LSRCP annual reports.**

| Year | Natural adults | Hatchery adults | Snake River redds | Asotin Creek redds | Clearwater River basin redds | Grande Ronde River basin redds | Imnaha River basin redds | Salmon River basin redds |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1988** | 368 | 259 | 64 | 0 | 21 | 1 | 1 | 0 |
| **1989** | 295 | 411 | 58 | 0 | 10 | 0 | 1 | 0 |
| **1990** | 78 | 258 | 37 | 0 | 4 | 1 | 3 | 0 |
| **1991** | 316 | 274 | 46 | 0 | 4 | 0 | 4 | 0 |
| **1992** | 549 | 119 | 47 | - | 26 | 5 | 3 | 1 |
| **1993** | 742 | 210 | 127 | - | 36 | 49 | 4 | 3 |
| **1994** | 406 | 201 | 67 | - | 37 | 15 | 0 | 1 |
| **1995** | 350 | 285 | 65 | - | 20 | 18 | 4 | 2 |
| **1996** | 639 | 280 | 104 | - | 69 | 20 | 3 | 1 |
| **1997** | 796 | 211 | 58 | - | 72 | 55 | 3 | 1 |
| **1998** | 304 | 658 | 185 | - | 78 | 24 | 13 | 3 |
| **1999** | 905 | 957 | 373 | - | 191 | 13 | 9 | 0 |
| **2000** | 1171 | 1497 | 346 | - | 173 | 8 | 9 | 0 |
| **2001** | 5216 | 5291 | 709 | - | 336 | 197 | 38 | 22 |
| **2002** | 2235 | 8155 | 1113 | - | 527 | 111 | 72 | 31 |
| **2003** | 3856 | 9649 | 1512 | 3 | 572 | 93 | 43 | 18 |
| **2004** | 4756 | 9870 | 1709 | 4 | 631 | 162 | 35 | 21 |
| **2005** | 2704 | 7421 | 1442 | 6 | 487 | 129 | 36 | 27 |
| **2006** | 2433 | 5351 | 1025 | 1 | 514* | 42 | 36 | 9 |
| **2007** | 1762 | 8565 | 1117 | 0 | 718 | 81 | 17 | 18 |
| **2008** | 1853 | 15413 | 1819 | 3 | 965 | 186 | 68 | 14 |

* Not a full count after not a complete count, no surveys after 11/21 in 1995, and 10/30 in 2006 due to rains and turbid water conditions

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

See Table 5 and explanation under section 2.2.2.

**- 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.** *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

See Table 5 and explanation under section 2.2.2. We are unable to tell if or how many of the natural fall Chinook that passed LGR Dam spawned

Wild/natural steelhead counts at the Crooked River weir. Data obtained from Idaho Fish and Game.

| 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|
| 7 | 8 | 6 | 15 | 60 | 29 | 85 | 17 | 4 |

**2.2.3) <u>Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take</u>** *(see Attachment 1" for definition of take)***.**
**- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take**.

The Dworshak Fisheries Complex spring Chinook program has the potential to affect listed B-run steelhead and Snake River Fall Chinook Salmon in several ways: 1) competition; 2) adverse behavioral interactions; 3) disease transmission; 4) facility operation and maintenance.

Competition - Studies to date indicate that yearling spring Chinook do feed as they emigrate through the Columbia River system (Giorgi 1991). This could have some effect on wild/natural steelhead. Dworshak NFH spring Chinook are released as smolts (155 mm target size at release). Competition between hatchery released smolts and wild salmonids is minimized due to the rapid emigration time in free flowing river sections, although these fish could directly compete with natural steelhead for food.

Behavior - There are limited data describing adverse behavioral effects of hatchery spring Chinook releases on wild/natural salmonid populations. Hillman and Mullan (1989) reported that larger, hatchery-released fingerling Chinook salmon apparently "pulled" smaller wild/natural Chinook salmon with them as they drifted downstream, resulting in predation on the smaller fish by other salmonids.

Disease - Spring Chinook salmon reared at Dworshak NFH have had Bacterial Kidney Disease (BKD) problems prior to 1996. Since then BKD has come under better control with culling of high BKD eggs and segregation of high BKD fish in the hatchery. Additionally we strictly adhere to all Integrated Hatchery Operations Team guidelines concerning the release of fish undergoing a disease epizootic. The potential still exists for horizontal transmission of BKD and other diseases from Chinook salmon released from Dworshak NFH to wild fish. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest that horizontal transmission of disease from hatchery to wild fish is widespread, although little research has been done in this area. The authors concluded that the full impact of disease on wild fish from hatchery fish is probably underestimated. It is common knowledge that pathogens and diseases occur in natural fish populations and that stresses can cause them to exhibit themselves. As mentioned, hatchery fish could potentially induce stresses on natural populations through competition, or adverse interactions.

Harvest - Idaho Department of Fish and Game administers the sport harvest within the State, and the Nez Perce Tribe administers the Tribal fishery for returning Dworshak NFH spring Chinook salmon. All hatchery Chinook are externally marked with an adipose fin clip and it is a requirement for sport fishermen to release all unmarked fish unharmed. Additionally, there are no other listed anadromous salmonids returning at the same time as spring Chinook. Therefore, we believe there are minimal negative impacts to listed fish.

Facility operation and maintenance - Operation and maintenance includes operation of the ladder for trapping returning adult spring Chinook salmon, water intake and discharge, in hatchery incubation and rearing phases, and general maintenance and construction.

The operation of the ladder for returning adult hatchery spring Chinook salmon has minimal potential for capturing adult wild steelhead. Only one suspected natural adult steelhead has ever captured during spring Chinook broodstock collection at Dworshak. Any suspected natural adult steelhead captured in the ladder will be immediately released back into the river unharmed, upstream of the trap.

Water for Dworshak NFH is pumped from the North Fork Clearwater River. The HRT identified an issue with the water intake screen in that it doesn't comply with current NOAA Fisheries ESA screening criteria (Issue DW18). The screen mesh is 3/8"; and NOAA requires 3/32" mesh. NOAA criteria also include parameters for water approach velocity, sweeping velocity, and screen angle. The HRT recommends replacing the water intake screen for the hatchery so that it complies with NOAA Fisheries criteria.

The water intake does not adversely affect the water level in the river since the North Fork is regulated by Dworshak Dam located one mile upstream of the hatchery.

Discharge from the hatchery is permitted by the EPA, Non-Point Discharge Effluent Standards (NPDES) but does not fully meet the requirements of the permit, as identified by the HRT (Issue DW13). Untreated water from the nursery building, Burrows ponds, and cleaning water from the Burrows ponds is discharged directly into the Clearwater River. Direct discharge of unsettled effluent poses ecological and water quality risks to aquatic species in the Clearwater River. The HRT recommended the construction of a pollution abatement system or settling pond to remove dissolved solids from the hatchery effluent water prior to discharge into the Clearwater River. As required in the NPDES permit, a Quality Assurance Plan and a Best Management Plan are written to address NPDES operations. The COE has contracted with CH2MHill to design a pollution abatement system for Dworshak Fish Hatchery. Alternatives are currently in development.

In-hatchery incubation and rearing phases have no additional impacts on listed steelhead or fall Chinook salmon.

All other maintenance or construction activities that could have an impact on water quality or quantity or could possibly impact steelhead or fall Chinook salmon will be consulted on as they arise. All required state and Federal permits would be obtained prior to any work being initiated. None are currently planned at this time.

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

- **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).**
*Complete the appended take table (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or worst case scenarios.*

Quantifiable take levels on Snake River steelhead and fall Chinook salmon are only available for the broodstock collection activities associated with the program.

Since the steelhead listing in 1997, there has only been one unclipped/unmarked adult steelhead documented (August 2001) during spring Chinook broodstock collection operations at Dworshak NFH. Prior to 1997, data on unmarked steelhead was not collected. Additionally, there has never been any fall Chinook collected, and as a result, we anticipate no take on either species.

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

During spring Chinook salmon broodstock collection, general procedure is for the trap to be emptied and inventoried weekly. In years of large returns the trap counter is closely monitored to prevent overcrowding the holding pond, it the pond becomes full prior to inventory the trap is closed to keep additional Chinook from entering. Since any natural steelhead trapped would be at the end of the Chinook run, the trap would be closed if excessive numbers of natural steelhead were encountered.

# SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

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

There is currently no ESU-wide hatchery plan for Spring Chinook Salmon. The Dworshak Spring Chinook Salmon production program is consistent with the following policy excerpts from the NPPC Artificial Production Review:

10 The manner and use of artificial production is considered in the context of the environment in which it is used.

20 Artificial production is implemented within an adaptive management design that includes evaluation programs to determine benefits and address scientific uncertainties.

30 The hatchery is operated in a manner that recognizes that it exists within an ecological system whose behavior is constrained by larger-scale basin, regional and global factors.

40 The hatchery is authorized and managed as a mitigation facility for lost Spring Chinook Salmon production resulting from the Lower Snake River dams.

50 Risk management strategies are implemented to reduce adverse effects on wild steelhead and fall Chinook salmon.

60 Legal mandates and obligations for fish protection, mitigation and enhancement are addressed.

Deviations from APR policies:

10 A diversity of life history types and species needs to be maintained in order to sustain a system of populations in the face of environmental variation.

Because of limited facilities, rearing space, and water supply, spring Chinook salmon must be reared under a 18-month program. Smolts are released at 1.5-year of age. This deviates from wild/natural populations which produce smolts from 1-3 years of age.

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

The spring Chinook salmon production program at Dworshak NFH is part of the Lower Snake River Compensation Plan (LSRCP) program. The LSRCP was authorized by the Water Resources Development Act of 1976, Public Law (P.L.) 94-587, to offset losses caused by the four Lower Snake River dam and navigation lock projects.

The spring Chinook salmon production program at Dworshak NFH comes under the jurisdiction of U.S. v Oregon court order. The 2008-2017 U.S. vs. Oregon Management Agreement is an agreement between state, tribal, and federal fishery agencies on harvest and production issues in the basin.

The Dworshak spring Chinook salmon program is also under a Memorandum of Agreement between the United States Fish and Wildlife Service and the Nez Perce Tribe for the Joint Management of the Dworshak National Fish Hatchery. Under this agreement the spring Chinook salmon program will continue as outlined in U.S. vs. Oregon, but the Nez Perce Tribe will have a more active role in the management of Dworshak as well as staff working in the production division of Dworshak NFH.

**3.3) Relationship to harvest objectives.**

The responsibility of the U.S. Fish and Wildlife Service is to provide mitigation by returning adults to the target area and does not exercise harvest management jurisdiction. Information on harvest or harvest management planning is deferred to the Idaho Department of Fish and Game and the Nez Perce Tribe.

Although the hatchery does not have any direct regulatory authority for fishery management of spring Chinook salmon in the Clearwater or Snake rivers, the hatchery maintains a close working relationship with the State and Tribe. Bi-annual coordination meetings and weekly in-season conference calls are held to insure that each office and agency is kept appraised of planned and on-going activities and current status during the return.

**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.**

Number of Dworshak NFH spring Chinook salmon adults (jack excluded) harvested or collected in various fisheries in the Columbia and Snake rivers, below and above Lower Granite Dam, for Brood Years 1995 to 2002. Data summarized from RMIS and Idaho FRO data files and reports.

| | Columbia and Snake River Below Lower Granite Dam | | | | | | Above Lower Granite Dam | | | | | ***Combined Total*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brood Year | Ocean Harvest | Sport Harvest | Commercial Harvest | Tribal Harvest | Other | **Total Harvest** | Sport Harvest | Tribal Harvest | Hatchery Rack | Other | **Total** | |
| 95 | 0 | 0 | 0 | 2 | 0 | **2** | 107 | 39 | 182 | 17 | **345** | ***347*** |
| 96 | 0 | 98 | 273 | 592 | 107 | **963** | 5,381 | 1,157 | 3,574 | 227 | **10,339** | ***11,409*** |
| 97 | 31 | 2,284 | 608 | 1,747 | 242 | **4,670** | 7,301 | 647 | 3,850 | 44 | **11,842** | ***16,754*** |
| 98 | 24 | 2,529 | 715 | 1,351 | 112 | **4,619** | 4,933 | 1,545 | 3,844 | 40 | **10,362** | ***15,093*** |
| 99 | 0 | 16 | 39 | 26 | 3 | **81** | 319 | 227 | 615 | 2 | **1,163** | ***1,247*** |
| 00 | 47 | 75 | 499 | 454 | 9 | **1,075** | 4,854 | 383 | 2,199 | 110 | **7,546** | ***8,630*** |
| 01 | 0 | 323 | 100 | 0 | 24 | **423** | 494 | 123 | 842 | 16 | **1,475** | ***1,922*** |
| 02 | 0 | 217 | 187 | 250 | 167 | **654** | 693 | 384 | 1735 | 0 | **2,812** | ***3,633*** |

Smolt-to-Adult Survival (SAS) and Smolt-to-Adult Return (SAR) rates for Dworshak NFH spring Chinook salmon adults (jacks excluded) collected in the Columbia and Snake rivers, above and below Lower Granite Dam, for Brood Years 1995-2002. Data summarized from RMIS and Idaho FRO data files and reports (see above table for details).

| Brood Year | Smolts Released | Combined Total | SAS | Above Granite Total | SAR |
|---|---|---|---|---|---|
| 95 | 53,078 | 347 | 0.6538% | 345 | 0.6501% |
| 96 | 973,400 | 11,409 | 1.1720% | 10,339 | 1.0622% |
| 97 | 1,044,511 | 16,754 | 1.6040% | 11,842 | 1.1337% |
| 98 | 1,017,873 | 15,093 | 1.4828% | 10,362 | 1.0180% |
| 99 | 333,120 | 1,247 | 0.3743% | 1,163 | 0.3491% |
| 00 | 1,000,561 | 8,630 | 0.8625% | 7,546 | 0.7542% |
| 01 | 1,033,982 | 1,922 | 0.1859% | 1,475 | 0.1427% |
| 02 | 1,078,923 | 3,633 | 0.3216% | 2,812 | 0.2606% |

### 3.4) Relationship to habitat protection and recovery strategies.

The purpose of this production program is mitigation for lost habitat resulting from the construction of the four Lower Snake River dam and navigation projects. The duration of this program is permanent for the foreseeable future.

### 3.5) Ecological interactions.

*Describe salmonid and non-salmonid fishes or other species that could:*
(1) *negatively impact program;*

There are several species in the Clearwater and Lower Snake rivers that could negatively impact program fish. These effects are primarily in the form of predation on juveniles, and less so on returning adults. The most prominent predatory fish species in the area include smallmouth bass and northern pikeminnow. Although they are not in high abundance, bull trout are sometimes observed in North Fork Clearwater River below Dworshak Dam. Program fish likely provide some forage for bull trout in the area. Avian predators commonly observed include gulls, bald eagle, osprey, great blue heron and kingfisher. River otters and mink also occur in the Clearwater River and have the potential to prey on program fish.

(2) *be negatively impacted by program;*

Species that could be negatively impacted by the program include ESA listed Snake River Steelhead and Snake River Fall Chinook Salmon. Program fish may interact with these species by competing for food and space and preying on subyearlings.

(3) *positively impact program;*

None

(4) *be positively impacted by program. Give most attention to interactions between listed and candidate salmonids and program fish.*

The program could positively impact all species listed in item 1 above, by providing forage.

The HRT identified the following issue: Stray rates for Dworshak NFH spring Chinook into tributaries downstream of the hatchery in the Columbia basin are high compared to other hatchery stocks of spring Chinook, thus posing a genetic risk to natural populations in other watersheds (Issue DW35). The HRT example was broodyears (BY) 1986-1993, when 15% of all coded-wire tag recoveries for Dworshak NFH spring Chinook occurred in the Deschutes River. However, the HRT was using old data and for BY 1998 and later, straying rates were far less than those observed for BY 1986-1993.

The HRT recommended that the Idaho Fisheries Resource Office should quantify homing and straying of spring Chinook released from Dworshak NFH (Recommendation DW35). [See Appendix B for an estimated cost to implement DW35] Attempts should be made to correlate variable stray rates with factors that may contribute to straying including variable fish culture practices (e.g., level of backfilling, mean size at release, etc.), water management practices, and barging vs. volitional transport of smolt through the hydropower system. Straying risks to other populations in the Clearwater, Snake and Columbia rivers should be assessed.

In response, the Idaho FRO examined current coded-wire tag data for Dworshak NFH spring Chinook salmon. For BYs released from 1998 through 2006, data analysis show straying to average 2.31%, whereas for release years 1994-1997 the straying was 13.79%. In release year 1998 two changes in the production program occurred; 1) size of fish released decreased from 12-15 fish per pound to 20 fish per pound (see Section 10.3) and 2) Chinook were released 2 weeks earlier than previous years (see Section 10.4, this change was based on the results of a time of release study). We believe these two changes had a major influence in reducing straying of Dworshak spring Chinook salmon. Based on these current data the managers disagree with the HRT assertion that stray rates of Dworshak NFH spring Chinook salmon present a genetic risk to natural populations in other watersheds.

## SECTION 4. WATER SOURCE

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

The main supply for the hatchery is river water pumped from the North Fork of the Clearwater River. There are six pumps rated at 15,500 GPM each for a total flow of 93,000 GPM or 207 CFS. There is also a reservoir supply source for the hatchery. It consists of a 24 inch warm water supply line and an 18 inch cold water supply line from the distribution box for the Clearwater Hatchery. The supply was designed for 6,400 GPM or 14 cfs for incubation and early rearing.

The HRT identified the following issue: Exposure of anadromous fish to the water supply (N.F. Clearwater River) for Dworshak NFH increases disease risks for spring Chinook reared on station. Reliance on pumped water for rearing spring Chinook increases demographic risks of fish losses (Issue DW37).

To address the issue, the HRT recommended that the agencies responsible investigate options to increase the amount of gravity-feed water available from Dworshak Reservoir (Recommendation DW37). [See Appendix B for estimated cost to implement DW37] The long term benefit of developing an adequate water supply from Dworshak reservoir may significantly reduce current power costs required to pump water to the facility, increase operational efficiencies, increase fish health, produce a higher quality smolt, more efficiently meet appropriate fish size at release, and increase survival. Managers concur with this recommendation and will work with all pertinent entities to develop a better water supply.

**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.**

The HRT identified an issue with the water intake screen in that it doesn't comply with current NOAA Fisheries ESA screening criteria (Issue DW18). The screen mesh is 3/8"; however, NOAA requires 3/32" mesh. NOAA criteria also include parameters for water approach velocity, sweeping velocity, and screen angle. The HRT recommends replacing the water intake screen for the hatchery so that it complies with NOAA Fisheries criteria. The screen size will be changed as funding becomes available.

Discharge from the hatchery is permitted by the EPA, Non-Point Discharge Effluent Standards (NPDES) but does not fully meet the requirements of the permit, as identified by the HRT (Issue DW13). Untreated water from the nursery building, Burrows ponds, and cleaning water from the Burrows ponds is discharged directly into the Clearwater River. Direct discharge of unsettled effluent poses ecological and water quality risks to aquatic species in the Clearwater River. The HRT recommended the construction of a pollution abatement system or settling pond to remove dissolved solids from the hatchery effluent water prior to discharge into the Clearwater River. As required in the NPDES permit, ensure a Quality Assurance Plan and a Best Management Plan are written to address NPDES operations. The COE has contracted with CH2MHill to design a pollution abatement system for Dworshak Fish Hatchery. Alternatives are currently being developed

## SECTION 5. FACILITIES

*Provide descriptions of the hatchery facilities that are to be included in this plan (see* A *Guidelines for Providing Responses@ Item E), including dimensions of trapping, holding incubation, and rearing facilities. Indicate the fish life stage held or reared in each. Also describe any instance where operation of the hatchery facilities, or new construction, results in destruction or adverse modification of critical habitat designated for listed salmonid species.*

**5.1) Broodstock collection facilities (or methods)**.

A fish ladder from the North Fork of the Clearwater River traps returning adults at the hatchery. The holding pond at the top of the ladder is 15=x 75=x 8

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

Spring Chinook salmon smolts are released directly from the hatchery, usually into the North Fork Clearwater River. There are no smolts transported for release into other areas of the basin.

**5.3) Broodstock holding and spawning facilities.**

Broodstock are held in three 15= x 75= x 8= concrete ponds. Adults in these ponds are crowded into a 370 gallon anesthetic tank. From here they lifted to an examining table and are checked for ripeness and either spawned or returned to the holding pond for later examination.

**5.4) Incubation facilities**.

Dworshak has 58 Heath incubator stacks containing 435 trays. Each stack has $54^{o}$F water available for Chinook incubation. Ten stacks also have chilled water ($42^{o}$ F) available for incubation of Chinook.

**5.5) Rearing facilities.**

-Outside there are 30 raceways which are 8= x 80= x 2.5= used for Chinook rearing.

There are 84 which are 17= x 35= x 3, 76 are used to rear summer steelhead. Two have been modified into mixed-cell rearing units that are currently being evaluated for steelhead rearing. Five Burrows ponds are being used for rearing coho salmon. There is one Burrows pond 17= x 35= x 3 used for rainbow trout rearing.

There are 10 raceways which are 8= x 63= x 2.5 which are not used because of discharge location.

-Inside there are 128 nursery tanks, 64 concrete, 64 fiberglass. These are 3' x 16' x 2', these are presently used for steelhead and coho early rearing, not spring Chinook salmon.

**5.6) Acclimation/release facilities.**

Chinook are released directly from outside raceways into the North Fork Clearwater River.

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

None known.

**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.**
*(e.g. The hatchery will be staffed full-time, and equipped with a low-water alarm system to help prevent catastrophic fish loss resulting from water system failure.)*

At Dworshak, if we did have any listed fish captured via the fish ladder (located on the North Fork of the Clearwater River) it would be sorted out during spawning, placed in a transport tank, driven to the Ahsahka access boat ramp (~1/2 mile), and released into the main stem Clearwater River. To reduce much of this handling stress on the fish and to expedite their release, Dworshak would require an adult release pipe directly into the main stem Clearwater River, which would not be a short route.

## 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**.

Genetic background of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-present. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon).

| Release Year | Genetic Background |
|---|---|
| 1983 | 75% LW, 12% RR, 13% LE |
| 1984 | 100% LE |
| 1985 | 68% LW, 32% LE |
| 1986 | 100% LE |
| 1987 - 1988 | 100% RR |
| 1989 - 1994 | 100% DW |
| 1995 | 66% DW, 34% KK |

| | |
|---|---|
| 1996 - present | 100% DW |

Regarding the source of broodstock, the HRT identified the following issue: In the past, Rapid River stock was used to "backfill" for broodstock shortages. Backfilling is inconsistent with the principles of local adaptation and managing hatchery stocks for maximum viability (Issue DW34). Additionally, backfilling of egg shortages substantially increases straying risks because juvenile fish are released into watersheds different from the source population and watershed to which parental fish homed and returned

The HRT recommended that the hatchery eliminate backfilling of the spring Chinook broodstock at Dworshak NFH to maintain a locally-adapted stock at Dworshak NFH and minimize straying risks to natural populations in the Columbia and Snake rivers (Recommendation DW34). If other stocks are used to meet harvest or mitigation agreements in the Clearwater River, then (a) the imported fish should be differentially marked or tagged, (b) released on station (i.e., not outplanted) to maximize recapture rates as returning adults, and (c) excluded from the Dworshak NFH broodstock. In response, the Co-managers re-iterate that no backfilling has occurred since 1995 (15 years ago). Managers do not anticipate any future broodstock shortages even during poor return years. In the case where that might happen, the managers agree that backfilling with other Clearwater River basin stocks would not be inconsistent with the principals of maintaining a locally adapted stock. The priority for backfilling would be from Kooskia NFH first, then from other Clearwater River basin spring Chinook stocks (IDFG or NPT), and then finally Rapid River stock from the Little Salmon River. It should be noted that the Dworshak NFH spring Chinook program was founded using the stock from Rapid River State Fish Hatchery and should not be considered to be genetically incompatible. As to the issue of using out of basin stocks contributing to increased stray rates, the HRT is referred to information provided in Issue DW35.

### 6.2) Supporting information.

#### 6.2.1) History.

The Dworshak NFH spring Chinook salmon program was initially started using Chinook salmon stock from the Leavenworth and Little White Salmon NFH programs. Eggs were transferred from these facilities and made up the smolt releases from 1983 to 1986. Since these stocks were very strongly influenced by transfers to their programs from Carson NFH, the early Dworshak Chinook stock was considered a Lower Columbia River Carson derivative. The Chinook programs for brood years 1985 and 1986 consisted entirely of eggs that had been transferred from Rapid River State Fish Hatchery, which used Chinook returning to the Snake River at Hells Canyon Dam. Thus, smolts released in 1987 and 1988 were entirely Rapid River stock, shifting the program away from using the Lower Columbia River Carson Chinook stock. Since then, Dworshak NFH has maintained its program from returns to its own rack. In 1995, when returns were too low to meet broodstock needs, Dworshak NFH back filled its program using excess eggs from Kooskia NFH. The recent returns to Dworshak NFH (1989 and later) are referred to as

Dworshak stock, since they are progeny of returns to Dworshak NFH, rather than direct products of transfers of Rapid River stock.

**6.2.2) Annual size.**

The production release target is 1,050,000 spring Chinook salmon smolts.

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

Natural populations were never intended to be used for broodstock, nor are they actively sought out and collected for incorporation into the broodstock at Dworshak National Fish Hatchery. However, natural (or unmarked) spring Chinook salmon adults do occasionally enter the hatchery at times during broodstock collection. These adults are considered strays and are incorporated into the broodstock rather than being returned to the river.

**6.2.4) Genetic or ecological differences**.

Differences from the historic wild stock is unknown due to the loss of the indigenous spring Chinook salmon stock caused by blocked adult passage at Lewiston Dam 1927-1972.

**6.2.5) Reasons for choosing.**

Indigenous spring Chinook salmon populations in the Clearwater basin were eliminated by the construction and operation of Lewiston Dam from 1927 to 1972. Other efforts to restore spring Chinook salmon runs in the basin consisted of massive outplants of juveniles from several hatcheries in the Columbia River basin, and any naturally producing population now present in the Clearwater are likely influenced by fish of local origin.

Since natural populations in the basin were extinct, or at extremely low levels, initiation of the spring Chinook program at Dworshak NFH for the LSRCP program had to rely on introduction of stocks from out of the basin.

**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.**

We do not use listed natural fish in our broodstock selection.

## SECTION 7. BROODSTOCK COLLECTION

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

Adults only

### 7.2) Collection or sampling design.

Broodstock is collected passively using a fish ladder that enters the hatchery from the North Fork Clearwater River. The ladder is opened in May and adults are collected during May, June, July, and August. During years when runs are low and expectations of meeting broodstock needs are in question, the ladder is usually opened and adults are collected continuously during the season. During those years when runs are higher and expectations of meeting broodstock needs are not in question, the ladder may or may not be run continuously depending the need for Dworshak NFH to assist other spring Chinook salmon artificial production programs in the Clearwater basin.

### 7.3) Identity.

Occasionally, unmarked adults (identified by the presence of an adipose fin) enter the hatchery. Since wild fish were extirpated from the Clearwater basin these unmarked fish are generally incorporated into the broodstock. Fish released from Dworshak NFH are 100% adipose fin clipped, as are the majority of spring Chinook salmon released into the Clearwater basin.

### 7.4) Proposed number to be collected:

We require about 500 females in order to get all the eggs we need for a full program. Therefore, in order to fill the program, we need to collect about 1,000 adults total.

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

The Dworshak spring Chinook salmon program usually observes a 1:1 sex ratio in adult returns. We require about 500 females in order to get all the eggs we need for a full program. Therefore, in order to fill the program, we need to collect about 1,000 adults total.

The HRT identified the following issue: The number of spring Chinook collected for broodstock is above the number necessary to meet the 1.4 million egg-take goal (Issue DW33). Currently, 1000 adults is the collection goal for a 1.05 million yearling smolt release. Assuming a 5% pre-spawning mortality of fish held for broodstock, a maximum 8% loss of fertilized eggs due to culling of high risk females for bacterial kidney disease (BKD), an average fecundity is 3,500 eggs per female, and an 85% eyed egg to smolt survival, approximately 406 females total would need to be retained for broodstock to produce 1.05 M smolts (1.42M eggs at 3,500 egg/female).

The HRT recommended that the adult collection goal be reduced to approximately 812 adults, consistent with obtaining approximately 406 females to provide a minimum of 1.4 million eggs sufficient to produce 1.05 million smolts (Recommendation DW33). The most recent co-manager goal to retain 1,000 spring Chinook adults during 2008 is more consistent with the Team's recommendations.

Overall given the many uncertainties in meeting production goals, the Co-managers plan to maintain the broodstock goal of 1,000 fish.

### 7.4.2) Broodstock collection levels for the last nineteen years (e.g. 1990-08), or for most recent years available:

We are reporting the total number of spring Chinook salmon returning to the hatchery. Because spring Chinook salmon are immature at the time of initial inventory, it is almost impossible to distinguish males from females. Therefore, we are reporting the total number of II- and III- ocean adults (including the unmeasured fish in the return) and the number of Jacks (I-ocean adults).

| **Year** | Adults | Jacks |
|---|---|---|
| **1990** | 2,035 | 7 |
| **1991** | 149 | 16 |
| **1992** | 347 | 23 |
| **1993** | 814 | 9 |
| **1994** | 71 | 3 |
| **1995** | 42 | 83 |
| **1996** | 688 | 275 |
| **1997** | 3,138 | 12 |
| **1998** | 904 | 11 |
| **1999** | 130 | 670 |
| **2000** | 2,931 | 221 |
| **2001** | 3,982 | 36 |
| **2002** | 2,095 | 62 |
| **2003** | 2,842 | 580 |
| **2004** | 2,214 | 142 |
| **2005** | 808 | 74 |
| **2006** | 1,292 | 62 |
| **2007** | 1,408 | 702 |
| **2008** | 1,538 | 319 |

Data source: Appendix Table 2, in: Adult spring Chinook salmon returns to Dworshak and Kooskia National Fish Hatcheries in 2007 and predictions for 2008, Idaho FRO Annual Report, 2008.

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

If the adult return is above broodstock needs the plan and agreement of co-managers is to utilize fish for tribal subsistence early in the return when they are in better condition, rather than later when they are unfit for human consumption. Snouts would be removed from CWT tagged Chinook prior to subsistence distribution. Excess adults may also be utilized at other Clearwater production facilities that are below brood needs. Beyond that Table 3 (pg17-18) lists the prearranged streams to receive adult spring Chinook salmon after all brood and subsistence needs are met. All adults outplanted from Dworshak will receive a left opercle v-notch.

### 7.6) Fish transportation and holding methods.

Any wild or listed fish, such as steehead or bull trout, that are incidentally captured during broodstock collection are typically held in pick-up truck transportation tanks with running water and aeration until time permits moving those fish back to the main stem Clearwater River for release. The fish may be held up to an hour before transport to the release site.

### 7.7) Describe fish health maintenance and sanitation procedures applied.

Formalin treatment is applied, as needed, for fungus.

### 7.8) Disposition of carcasses.

Almost all carcasses are taken to the landfill after being spawned because of using MS-222 as an anesthesia for spawning. However, there are rare occasions where we do not use MS-222 so that carcasses can be given to the Nez Perce Tribe or the local food bank. For 2007, 2008, and 2009, spawned out carcasses were stored frozen for use in a research project conducted by Washington State University for stream nutrient enhancement. Female Chinook that are injected with Erythromycin were not used in this program, but taken to the landfill.

### 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.

Listed fish are not collected for broodstock use.

## SECTION 8. MATING

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

### 8.1) Selection method.

Random, from ripe fish on spawning day, all collected adults are sorted and examined, typically on a weekly spawning schedule.

**8.2) Males.**

No backup males used, fish are spawned randomly on a certain day. Jacks are used as they are randomly taken on the spawning rack at a rate of 5 to 10%. There are no plans to use repeat spawners unless the number of males is extremely low.

**8.3) Fertilization.**

Adults are crowded from a fish trap at the end of the fish ladder into a crowding channel, moved into a channel basket, and placed into an anesthetic bin. Spring Chinook salmon adults are anesthetized with MS-222. Spinal columns of ripe females are severed using a pneumatic knife. The females are then placed on a table for 1-20 minutes for blood drainage. The ventral side is then cut open using a spawning knife and eggs are collected in disinfected colanders. After ovarian fluid is drained, the eggs are poured into a clean bucket

Milt from ripe males is stripped into Styrofoam cups and a one-percent saline solution is added to assist in milt motility. The milt solution is poured onto the eggs and swirled for more complete fertilization. Chinook spawning involves a male:female ratio of 1:1. After sufficient time is elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter.

After rinsing, eggs are placed in Heath incubator trays at approximately 3,500 eggs per tray (1 female). In the tray is a 75 mg/l iodophor solution buffered with sodium bicarbonate. Eggs are maintained in this solution for approximately 30 minutes as a precaution against horizontal disease transmission. The egg trays are then pushed into the incubator, flushing the iodine. Water flow rate is approximately five gallons/minute and incubation temperature averages $43^{o}$ F.

The HRT identified that MS-222 is currently used to anesthetize spring Chinook during spawning. This precludes the use of carcasses for nutrient enhancement of streams and other beneficial uses that could result in immediate consumption by humans or game animals (Issue DW36). The U.S. Food and Drug Administration has not approved MS-222 for use on animals that could be consumed by humans or other animals within 30 days of use.

The HRT recommended that the agencies consider an alternative method of anesthetizing broodstock at the time of spawning (Recommendation DW36). [See Appendix B for estimated cost to implement DW36] Alternatives include, but are not limited to, electro-anesthesia and carbon dioxide. Currently CO2 (FDA-approved) is used by the hatchery for select groups of fish destined for ourplanting and bear/eagle rehabilitation programs: however, Dworshak should research the feasibility of electro-anesthesia as an alternative for MS-222 and CO2. Electro-anesthesia is successfully used for large broodstock programs at other hatcheries to reduce chemical use, alleviate safety concerns and to increase the number of carcasses suitable for other uses. Managers are not opposed to considering alternative methods of anesthetizing broodstock. Electro-anesthesia will require funding to purchase equipment and make facility modifications. This is not a high priority for the hatchery so this recommendation is not likely to happen anytime soon. At the same time , a Sedative work group composed of FWS, NOAA, CRITFC, NPT, ODFW, IDFG, ODFG, WDFW, NWIFC, COE and others met in 2009 and began investigating two chemicals as a "near-zero, release-time sedative for FDA clearance. They are Benzocaine and/or Eugenol for adult anadromous salmonids. The workgroup hopes to have one of these two chemicals FDA cleared within 2-3 years to resolve this issue whether fish are sedated at dams or hatcheries and where release needs to occur legally and safely immediately thereafter.

**8.4) Cryopreserved gametes**.

We do not cryopreserve spring Chinook salmon milt.

**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.**

Listed fish are not used in the mating scheme.

## 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.**

*Provide data for the most recent twelve years (1997-2008) or for years dependable data are available.*

*Survival of Dworshak Spring **Chinook** eggs to smolt by stage, reared at Dworshak 1997-2008.*

| *Brood Year* | *# Eggs Taken* | *% Survival Green to Eyed* | *% Survival Eyed to Nursery Tanking (fry)* | *% Survival Fry to Smolt* |
|---|---|---|---|---|
| 2008 | 1,216,845 | 98.1 | 98.2 | 98.2 |
| 2007 | 1,455,383 | 96.0 | 98.2 | 92.1 |
| 2006 | 1,155,892 | 96.5 | 98.9 | 86.3 |
| 2005 | 1,460,348 | 96.4 | 98.3 | 93.2 |
| 2004* | 1,376,360 | 88.8* | 91.0 | 95.1 |
| 2003 | 1,264,462 | 95.9 | 90.1 | 97.9 |
| 2002 | 1,182,945 | 97.4 | 97.0 | 96.6 |
| 2001 | 1,195,486 | 97.4 | 97.1 | 92.8 |
| 2000 | 1,172,404 | 95.1 | 94.6 | 99.2 |
| 1999 | 249,726 | 93.3 | 94.4 | 96.2 |

| | | | | |
|---|---|---|---|---|
| 1998 | 1,665,474 | 91.1 | 90.4 | 93.4 |
| 1997 | 1,728,534 | 90.9 | 98.2 | 91.2 |
| **Average** | **1,260,322** | **94.7** | **95.5** | **94.4** |

*% Eye-up is enumerated eye-up (after green culls, disease culls, etc).*
**bad formalin treatment*

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

Typically no extra eggs are taken, except to make up for average losses from one life stage to the next. Occasionally eggs are taken for other Clearwater programs, but more likely, additional brood are collected and provided to any program that is short.

**9.1.3) Loading densities applied during incubation.**
*Provide egg size data, standard incubator flows, standard loading per Heath tray (or other incubation density parameters).*

Spring Chinook eggs are initially loaded at 1 female/tray ~ 3,500 eggs/tray green eggs. After enumeration, eggs are returned to the tray at 5,000 eggs/tray.

-Currently approximately 1/2 of Dworshak stock eyed eggs are incubated at Dwoshak and 1/2 are shipped to Kooskia NFH for incubation and initial rearing. Water flow in incubation trays range from 3-5 gallons/minute.

**9.1.4) Incubation conditions.**

Temperature for SCS incubation is 40-43$^{o}$ F.
Temperature is monitored at least once/day.
Minimum dissolved oxygen is 6-7ppm in the bottom tray

***9.1.5) Ponding*.**

The Dworshak eggs incubated at Kooskia are returned to Dworshak during the spring as fry. These fish are approximately 500 fish per pound at time of transfer. There are approximately 110,000 fry transferred per raceway. There are also approx 110,000 swim-up fry transferred from Dworshak incubators into individual raceways. There are approximately 1,100,000 to 1,200,000 fry initially ponded in ten raceways. These are then tagged and split into a total of 30 raceways in August.

**9.1.6) Fish health maintenance and monitoring.**

Eggs are treated 3-5 days/week with formalin to control fungus. Yolk-sac malformation is very low. Dead eggs are removed either with an electronic egg sorter or by hand.

**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.**

We do not incubate or rear listed fish.

**9.2) Rearing:**

**9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1997-2008), or for years dependable data are available.**

See Table in Section 9.1.1 above for survival data by life stage for Dworshak spring Chinook eggs to smolt by stage, reared at Dworshak 1997-2008.

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

*Include density targets (lbs fish/gpm, lbs fish/ft$^3$ rearing volume, etc).*

Chinook density index goal is less than 0.4
Actual = Raceways - 0.2 to 0.3

***The limiting factor in rearing at Dworshak is space, not water flow. Density indexes are therefore used to determine loading capacities.

**9.2.3) Fish rearing conditions**

Water temperatures are monitored with thermographs throughout the rearing cycle, including egg incubation and in outside rearing ponds. Minimum dissolved oxygen level is 6 ppm. Oxygen is monitored when fish are given a chemical treatment for disease, at points of transfer, and spot-checked throughout the rearing cycle. Total gas saturation is continuously monitored in the outside rearing ponds.

**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.**

The Chinook that are incubated and initially reared at Kooskia NFH arrive back at Dworshak when they are approximately 500 fish per pound or 2 inches (50 mm).

The following table illustrates average growth of Chinook at Dworshak NFH.

Approximate average growth of Dworshak Chinook in raceways.

| Month | No/lb | Length in | Length mm |
|---|---|---|---|
| June 1 | 300 | 2.2 | 57 |
| July 1 | 178 | 2.7 | 67 |
| August 1 | 105 | 3.2 | 80 |
| Sept 1 | 85 | 3.4 | 86 |
| Oct 1 | 65 | 3.7 | 94 |

| | | | |
|---|---|---|---|
| Nov 1 | 54 | 4.0 | 100 |
| Dec 1 | 45 | 4.2 | 107 |
| Jan 1 | 41 | 4.3 | 110 |
| Feb 1 | 35 | 4.6 | 116 |
| March 1 | 28 | 4.9 | 125 |
| April 1 | 22 | 5.3 | 135 |

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

Reference 9.2.4 above.

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

Chinook are fed Bio-Vita Starter #0, #1 & #2. Frequency of 8 times a day every hour at approximately 3% body weight initially. Both frequency and % body weight fed/day are adjusted as fish grow. Conversion is around 1 throughout early rearing. For Chinook initially reared at Kooskia they are fed at a frequency of 6 times a day at approximately 4% body weight initially until fish are 500 fpp when they are tranfered back to Dworshak. They are changed over to Bio-Vita Fry 1.5mm and then Bio-Olympic 2.0mm for final rearing size (135 mm or 20 fpp) the % body weight fed/day is approximately 0.5% and frequency is 3-4 times/day.

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

Production fish are monitored monthly for health status. Diagnostic work is done as needed. Recently there has been little or no disease treatments on the SCS during the rearing cycle. If needed, treatments are done under direction of the Service Idaho Fish Health Center. Formalin treatments are used to control parasites and medicated feed can be used for bacterial control. Individual mort nets are used in each raceway. Ponds are cleaned 1 or 2 times per week and separate brushes and nets are used for each pond.

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

We have used several smolt development indices for research purposes in the past. We have measured gill ATPase, skin reflectance, or used condition factors. However, we do not use any established smolt development index to help determine the readiness of smolts for release.

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

We do not use any natural rearing methods or techniques. All of our production rearing is standard hatchery practices and methods.

**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.**

Listed fish are not propagated in the Dworshak spring Chinook program.

## SECTION 10. RELEASE

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

**10.1) Proposed fish release levels.** *(Use standardized life stage definitions by species presented in* ***Attachment 2****. Location is watershed planted (e.g. Elwha River).)*

| Age Class | Maximum Number | Size (fpp) | Release Date | Location |
|---|---|---|---|---|
| **Eggs** | | | | |
| **Unfed Fry** | | | | |
| **Fry** | | | | |
| **Fingerling** | | | | |
| **Yearling** | 1.05 million | 18.0 | Late March | NF Clearwater River |

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

**Stream, river, or watercourse:** Clearwater River – Hydrologic Unit Code (EPA Reach Code) is 1706030602600.10.

**Release point:** River kilometer 64

**Major watershed:** Clearwater River

**Basin or Region:** Snake River basin

We release smolts in the Clearwater River directly from the hatchery. The hatchery releases are made at about river kilometer 64. The Clearwater River is a tributary of the Snake River in the Columbia River Basin.

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

*For existing programs, provide fish release number and size data for the past three fish generations, or approximately the past 12 years, if available. Use standardized life stage definitions by species presented in* ***Attachment 2****. Cite the data source for this information.*

| Release year | Yearling | Avg size (fpp) |
|---|---|---|

| Release year | Yearling | Avg size (fpp) |
|---|---|---|
| 1990 | 1,252,247 | 25.6-20.2 |
| 1991 | 1,094,884 | 17.5-22.6 |
| 1992 | 959,369 | 14-17 |
| 1993 | 467,222 | 12-20 |
| 1994 | 1,278,273 | 13.7-19 |
| 1995 | 1,311,445 | 12.5-16.4 |
| 1996 | 102,903 | 8-15 |
| 1997 | 53,078 | 8.3-16.4 |
| 1998 | 973,400 | 20.9 |
| 1999 | 1,044,511 | 21.0 |
| 2000 | 1,017,873 | 24.0 |
| 2001 | 333,120 | 20.0 |
| 2002 | 1,000,561 | 20.0 |
| 2003 | 1,033,982 | 21.0 |
| 2004 | 1,078,923 | 20.0 |
| 2005 | 1,072,359 | 19.0 |
| 2006 | 1,007,738 | 18.0 |
| 2007 | 963,211 | 18.0 |
| 2008 | 939,000 | 23.0 |
| 2009 | 1,014,748 | 21.0 |

Data source: Monthly Inventory Statements, Dworshak NFH production data files.

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

*Provide the recent five year release date ranges by life stage produced (mo/day/yr). Also indicate the rationale for choosing release dates, how fish are released (volitionally, forced, volitionally then forced) and any culling procedures applied for non-migrants.*

Release Dates:

All releases are 1+ year old smolts

1995 – April 13 &14
1996 – April 11
1997 – April 11
1998 - March 25 & 26
1999 - March 29 & April 7 & 8
2000 - March 29 & April 5 & 6
2001 - March 28
2002 – March 27 & 28
2003 – March 19 & 20
2004 – March 31 & April 1
2005 – April 4 & 6

2006 – March 27 & 29
2007 – March 28 & 29
2008 – April 2 & 3
2009 – March 25 & 26

Release dates are selected within a 4-week window, actual days chosen are based on the fish readiness to smolt and size, hatchery logistics, environmental conditions (turbid water, increasing hydrograph, and availability of water releases from Dworshak Dam). Fish are forced out of the hatchery in the early evening to allow initial emigration to occur under the cover of darkness. No procedures are in place for culling non-migrants.

**10.5) Fish transportation procedures, if applicable.**

All fish are released on station.

**10.6) Acclimation procedures.**

Spring Chinook are reared in ambient water, so they are already acclimated to the river conditions for release.

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

All spring Chinook salmon smolts released from Dworshak NFH are marked by the removal of the adipose fin in order to identify it as a hatchery fish. For monitoring and evaluation purposes, we also tag certain groups with coded-wire and PIT tags.

The HRT identified two issues relative to the marking program for Chinook at Dworshak NFH: First, coded-wire tagged fish may not accurately represent all progeny groups released from Dworshak NFH *Issue DW38).* Currently, 120,000 fish in four of the thirty raceways of spring Chinook are coded-wire tagged. Because fish in different raceways can differ (e.g., mean age and size) and the pond environments can differ slightly (e.g., flow index and flow pattern), the practice of tagging fish in just a few raceways may not accurately represent the entire brood year of fish that will be released. In most NFH salmon and steelhead programs, fish are spawned from throughout the entire adult return to ensure that most segments of the run are represented in the resulting progeny. This procedure usually results in many different spawn "takes". The fish are ponded by take/hatch date into a series of raceways that, when fully populated, can differ in mean age and size between raceways. Post-release monitoring of each release group using coded-wire tags requires that the tags represent the entire population. The HRT recommends that the hatchery consult with the Idaho Fishery Resource Office and the Columbia River Fisheries Program Office coded-wire tagging team to insure that the tagging strategy accurately represents the entire population of progeny from all spawn groups for a particular brood year. For example, all spawn groups should be proportionately represented among tag groups and raceways *(*Recommendation DW38). [See Appendix B for estimated cost to implement DW38]

In contrast to the steelhead program, generally there are only four or five spawning takes for spring Chinook. Each spawning take is composed of a cross section of the entire broodstock population, in contrast to steelhead where fresh broodstock are collected for spawning each week. At the time of ponding into raceways, unlike steelhead, there is considerable mixing of progeny across spawning takes so that by the time ponding is completed, the likely hood that any one particular raceway is unrepresentative of the entire population is very minimal. Thus, the managers disagrees with the HRT that there may be significant differences in the age and size of fish between raceways. Managers will develop a written M&E program for Dworshak spring run Chinook salmon in the Clearwater Drainage.

Second the PIT tag program for spring Chinook **(greater than 50,000/year)** currently depends on funding from the Comparative Survival Study (CSS) which compares smolt-to-adult return rates (SARs) of fish transported downstream in barges versus SARs for juvenile fish negotiating the passage systems at each dam on the Columbia and Snake Rivers. Once the CSS study is complete, funding for the PIT tag program will cease. PIT tagging and monitoring are required to continue evaluating post-release migration and survival of spring Chinook released from Dworshak NFH (Issue DW39). The HRT recommended that the agencies establish a PIT tag program independent of the CSS to monitor migration and survival of spring Chinook, and to assist with in-season harvest management of returning fish (Recommendation DW39). [See Appendix B for estimated cost to implement DW39] The PIT tagging program should be consistent with regional goals and objectives and concurrent goals and objectives for the hatchery program. Managers will develop a written M&E program that includes a PIT tagging program for Dworshak spring Chinook salmon in the Clearwater Drainage.

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

All fish reared at the hatchery are released as part of the program.

**10.9) Fish health certification procedures applied pre-release.**

A sample of 60 fish (30 from A Bank and 30 from B Bank) is collected for pre-release assessments. Fish are randomly collected from 2 or more raceways from each bank of raceways. Viral, bacterial, and parasite assays are completed on these fish. General health and smolt quality is observed and recorded.

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

In case of an emergency, fish can be released directly into the river from the hatchery.

**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.**
(*e.g. All yearling coho salmon will be released in early June in the lower mainstem of the Green River to minimize the likelihood for interaction, and adverse ecological effects, to listed natural*

*Chinook salmon juveniles, which rear in up-river areas and migrate seaward as sub-yearling smolts predominately in May).*

Actions taken to minimize adverse effects on listed fish include:

1. Continuing fish health practices to minimize the incidence of infectious disease agents. Follow IHOT, AFS, and PNFHPC guidelines.
2. Continue with BKD culling program to reduce incidence of the disease.

2. Marking hatchery-produced spring Chinook salmon for harvest management in downstream fisheries.
3. Continuing to release fish that are fully smolted to promote rapid emigration to reduce interactions with natural fish.
4. Continue with current time and size of release to minimize adult straying.

## SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

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

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

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

Refer to Section 1.10 for a discussion of how each "Performance Indicator" will be monitored and evaluated.

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

The LSRCP provides funding to the Idaho FRO for monitoring and evaluation programs associated with the Dworshak NFH spring Chinook salmon program.

### 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.

Potential take associated with monitoring and evaluation activities is discussed in Section 2.2.3. All monitoring and evaluation activities will employ measures to minimize adverse effects to listed species.

## SECTION 12. RESEARCH

*Provide the following information for any research programs conducted in **direct association with the hatchery program described in this HGMP. Provide sufficient detail to allow for the***

***independent assessment of the effects of the research program on listed fish***. *If applicable, correlate with research indicated as needed in any ESU hatchery plan approved by the co-managers and NMFS. Attach a copy of any formal research proposal addressing activities covered in this section. Include estimated take levels for the research program with take levels provided for the associated hatchery program in* ***Table 1***.

The only research project being conducted with the spring Chinook salmon program at Dworshak NFH is the contribution to the Comparative Survival Study (CSS). Approximately 50,000 spring Chinook are PIT tagged annually at Dworshak for CSS analysis.

**12.1) Objective or purpose.** Comparison of smolt-to-adult survival for transported vs. non-transported Chinook salmon.

**12.2) Cooperating and funding agencies**. Fish Passage Study is the lead agency with funding provided by BPA. The CSS is a collaborative study of Washington Department of Fish and Wildlife, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Columbia River Intertribal Fish Commission, and the US Fish and Wildlife Service.

**12.3) Principle investigator or project supervisor and staff.** Michele DeHart, Fish Passage Center staff, also OR, WA, ID, and FWS staff.

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

**12.5) Techniques: include capture methods, drugs, samples collected, tags applied**. Fish are tagged at the hatchery and data is passively collected at several PIT tag detector locations.

**12.5) Dates or time period in which research activity occurs.**
Project is ongoing since 1996

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

**12.8) Expected type and effects of take and potential for injury or mortality.** N/A

**12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached ″take table" (Table 1).** N/A

**12.10) Alternative methods to achieve project objectives.** N/A

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

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

**proposed research activities.** N/A

## SECTION 13. ATTACHMENTS AND CITATIONS

**References**

Hatchery databases used to provide data are maintained by the Idaho Fishery Resource Office and Dworshak NFH, both are located at Dworshak NFH, P.O. Box 18, Ahsahka, ID 83544.


Beasley, C.A., B.A. Berejikian, R. W. Carmichael, D.E. Fast, P.F. Galbreath, M.J. Ford, J.A. Hesse, L.L. McDonald, A.R. Murdoch, C.M. Peven, and D.A. Venditti. 2008. Recommendations for broad scale monitoring to evaluate the effects of hatchery supplementation on the fitness of natural salmon and steelhead populations. Final report of the Ad Hoc Supplementation Monitoring and Evaluation Workgroup (AHSWG).

BRWG (Biological Requirements Work Group). 1994 Analytical methods for determining requirements of listed Snake River salmon relative to survival and recovery. Progress Report, October 13, 1994. Available from: NMFS, Environmental and Technical Services Division, 525 N.E. Oregon St. Portland OR 97232.

Burge, H., M. Faler, R. Roseberg, and R. Jones. 1999. Annual Report of the Idaho Fishery Resource Office, Fiscal Year 1999. USFWS. Dworshak Fisheries Complex. P.O. Box 18, Ahsahka, ID 83520.

Connor, W.P. 1994. Letter from W. Connor, U.S. Fish and Wildlife Service, to C. Toole, National Marine Fisheries Service, Re: Biological Parameter Work Groups Program Report, Dec. 7, 1994. Available from: NMFS, Environmental and Technical Services Division, 525 N.E. Oregon St. Portland OR 97232.

IHOT (Integrated Hatchery Operations Team) 1996. Hatchery Evaluation Report, Dworshak NFH B Summer Steelhead. Prepared for: USDOE, Bonneville Power Administration, Project Number 95-2, September, 1996.

ISRP and ISAB (Independent Scientific Review Panel and Independent Scientific Advisory Board). 2005. Monitoring and Evaluation of Supplementation Projects. ISRP & ISAB Report 2005-15. Northwest Power and Conservation Council, Portland, Oregon. (http://www.nwcouncil.org/library/isrp/isrpisab2005-15.pdf)

NMFS, 1999. Biological Opinion on Artificial Propagation in the Columbia River Basin: Incidental take of Listed Salmon and Steelhead from Federal and Non-Federal hatchery programs that collect, rear, and release unlisted fish species, prepared pursuant to section 7(a)(2) of the Endangered Species Act of 1973. Available from: NMFS, Sustainable Fisheries Division, 525 N.E. Oregon St. Portland OR 97232.

NMFS, 1995. Proposed Recovery Plan for Snake River Salmon. U.S. Department of

Commerce, National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Portland, OR. March 1995.

Piper, R.G., I. McElwain, L. Orme, J. McCraren, L. Fowler, and J. Leonard. 1982. Fish Hatchery Management. U.S. Department of the Interior, Fish and Wildlife Service. Washington, D.C. 1982.

Waples. R. 1998. Letter from R. Waples, National Marine Fisheries Service, to P. Bigelow and R. Roseberg, U.S. Fish and Wildlife Service, Re: Genetic analysis of Idaho steelhead samples, August 25, 1998. Available from: Idaho Fishery Resource Office, P.O. Box 18, Ahsahka, ID 83520.

## 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.

Name, Title, and Signature of Applicant:

Certified by__ ___________________________ Date: 12/20/10_____
Howard L. Burge Project Leader

## ADDENDUM A. <u>PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS.</u> (Anadromous salmonid effects are addressed in Section 2)

*This section will be the cornerstone for any required consultation with the U.S. Fish and Wildlife Service under section 7 of the ESA. Accordingly hatcheries that may affect any federally listed/ proposed* ***aquatic or terrestrial*** *species under USFWS jurisdiction need to complete this section. By fully addressing the topics of this section, the HGMP will provide the information necessary to initiate formal or informal consultation under the ESA for species under USFWS jurisdiction.*

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

Biological Opinion for the operation of the Lower Snake River Compensation Plan Program (File # 1024.0000, 1-4-99-F-2), April 8, 1999.

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

The potential for the Dworshak spring Chinook salmon program to affect USFWS ESA-listed or proposed terrestrial species are minimal. Any impacts to listed birds or mammals are more likely to be beneficial by providing additional food rather than introducing detrimental impacts. We can foresee no negative impacts to any listed plants that may occur in the project area. The only listed aquatic species to occur in the project area are bull trout and they are addressed in the analysis below.

<u>Bull trout</u>
Bull trout were first described as *Salmo spectabilis* by Girard in 1856 from a specimen collected on the lower Columbia River, and subsequently described as *Salmo confluentus* and *Salvelinus malma* (Cavender 1978). Bull trout and Dolly Varden (*Salvelinus malma*) were previously considered a single species (Cavender 1978; Bond 1992). Cavender (1978) presented morphometric, meristic, osteological, and distributional evidence to document specific distinctions between Dolly Varden and bull trout. Bull trout and Dolly Varden were formally recognized as separate species by the American Fisheries Society in 1980 (Robins et al. 1980). Although bull trout and Dolly Varden co-occur in several northwestern Washington river drainages, there is little evidence of introgression (Haas and McPhail 1991) and the two species appear to be maintaining distinct genomes (Leary et al. 1993; Williams et al. 1995; Kanda et al. 1997; Spruell and Allendorf 1997).

Bull trout exhibit resident and migratory life-history strategies through much of the current range (Rieman and McIntyre 1993). Resident bull trout complete their entire life cycle in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial), or in certain coastal areas, to saltwater (anadromous) where maturity is reached (Fraley and Shepard 1989; Goetz 1989). Resident and migratory forms may be found together and it is suspected that individual bull trout give rise to offspring exhibiting either resident or migratory behavior (Rieman and McIntyre 1993).

Bull trout spawn from August through November (McPhail and Murray 1979; Pratt 1992). Hatching may occur in winter or early spring, but alevins may stay in the gravel for an extended period after yolk absorption (McPhail and Murray 1979). Growth, maturation, and longevity vary with environment. First spawning is often noted after age four, with individuals living 10 or more years (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements compared to other salmonids (Rieman and McIntyre 1993). Habitat components that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver 1979; Pratt 1984, 1992; Fraley and Shepard 1989; Goetz 1989; Hoelscher and Bjornn 1989; Sedell and Everest 1991; Howell and Buchanan 1992; Rieman and McIntyre 1993, 1995; Rich 1996; Watson and Hillman 1997).

Substrate composition has repeatedly been correlated with the occurrence and abundance of juvenile bull trout (Dambacher et al. 1992; Rieman and McIntyre 1993) and spawning site selection by adults (Graham et al. 1982; McPhail and Murray 1979). Fine sediments can hinder survival of eggs during incubation, reduce success of fry emergence, and limit access to substrate interstices important as cover during rearing and overwintering (Goetz 1994; Jakober 1995).

In the Clearwater Basin there are known subpopulations of bull trout in South Fork Clearwater River tributaries. While little is known of the status or trends of these subpopulations, we do know that migratory forms do exist. Their use of the main stem Clearwater River is seasonal, as summer water temperatures exceed those preferred by bull trout. As with many subpopulations elsewhere, the suppressing factors impacting these include habitat degradation, loss of prey species, passage barriers, hybridization and competition with exotics, and harvest (Clearwater Basin Bull Trout Technical Advisory Team, 1998).

Dworshak Dam is a factor isolating the North Fork Clearwater River subpopulation from the others in the basin. Bull trout that are entrained from Dworshak Dam or migrate from other Clearwater Basin subpopulations cannot contribute to the North Fork subpopulation. Bull trout are known to occur in the tailrace below Dworshak Dam and in the North Fork near the hatchery water intake and fish ladder. The Service believes most, if not all bull trout residing in the North Fork Clearwater River below Dworshak Dam are the result of entrainment through the dam from Dworshak Reservoir. This is based on: 1) the proximity of the tailrace to known spawning subpopulations (the closest being those in the Selway River, at least 92 rkm upstream from the mouth of the North Fork), 2) documented entrainment of kokanee and other reservoir fishes, and 3) the occurrence of adult migrant sized bull trout in the area during periods when these fish would be expected to be on their spawning grounds. The Service does not believe that the North Fork Clearwater River below Dworshak Dam provides suitable spawning habitat for natural production of bull trout. We also assume that the frequency of bull trout entrainment likely mirrors that of other salmonids such as kokanee. The highest entrainment rates of kokanee at Dworshak Dam occurred in 1996 and 1997, and were associated with the flood releases of those years. These same years are associated with the highest incidental catches of bull trout in the hatchery adult trap (n = 5, 4 of these during ladder operation for spring Chinook salmon) and fish sampling in the tailrace (n = 12) (Roseberg, USFWS, unpublished data, Bigelow, USFWS, personal communication, 2000; Cochnauer and Putnam, 1997; Connor, USFWS, personal communication, 2000).

Water temperature in the North Fork Clearwater River and the main stem Clearwater River below the confluence has been altered by releases from Dworshak Dam and Reservoir. Changes from the historic water temperature regime began in 1972 after Dworshak Dam was closed and the reservoir was impounded. Dworshak Dam is equipped with multilevel selector gates that are adjustable for selective withdrawal between full pool (1600 ft. mean seal level (msl)) to minimum pool (1445 ft. msl) (Corps, 1986). This system is used to provide cool water suitable for fish production at Dworshak NFH located below the dam. These cool water releases moderate seasonal water temperature fluctuations in the river below. When compared to pre-dam conditions, facility operations result in: 1) warmer water in the winter, 2) slower warming in the spring, 3) colder water in the summer, and 4) slower cooling in the fall (Ball and Cannon, 1974; Ball and Pettit, 1974). The effects of these water temperature changes on bull trout distribution and usage in the Lower Clearwater River is unclear, but the Service speculates that both benefits and negative effects may occur.

While the annual range of water temperatures below Dworshak Dam is not as variable as historic temperatures, it does typically follow ambient conditions with one exception - summer flow augmentation. Since 1992, summer flow augmentation from Dworshak Dam under the National Marine Fisheries Service's Biological Opinion's has been provided to cool the Snake River for juvenile fall chinook salmon which emigrate during the summer. The summer augmentation releases have had variable temperatures ranging from 6.2 to 13.9°C since the program's inception in 1992 (Connor et al. 1998). These releases are implemented from early July to late August, and have a major cooling effect on the lower main stem Clearwater River because of the low flows typical in the river at that time of year (Connor et al. 1998). The cool water provided during summer could be both beneficial and detrimental to bull trout found in that section of river. The benefits may be that the cool water could provide relief for, and may reduce temperature related mortalities of bull trout that have been entrained from the dam. It is likely that any bull trout that are in the Clearwater River near the mouth of the North Fork would move into the North Fork to escape the warm water temperatures in the main stem Clearwater during the summer. Daily average water temperatures have been commonly measured at 23 - 25°C during July and August in the main stem above the confluence with the North Fork (Nez Perce Tribe, unpublished data). Because bull trout distribution is believed to be limited by temperatures exceeding 15°C (Fraley and Shepard 1989; Ratliff, 1992) the Service believes Dworshak summer flow augmentation artificially creates a section of river with temperatures that bull trout may seek out. This would entice bull trout to remain in the river longer than they would under natural water temperature regimes, and these fish may never move out to found unoccupied habitat, or become incorporated into other existing subpopulations.

It is unlikely that migratory bull trout from other subpopulations in the Clearwater Basin would be residing in the main stem Clearwater River from late June into July due to increasing water temperatures. The mean daily water temperature recorded at Peck, Idaho from the last week in June to the first week in July increases from 11.3 to 14.2°C. Because researchers have found peak upstream movement to coincide with maximum water temperatures of 10 to 12$^{o}$C (McPhail and Murray, 1979; Elle et al. 1994), the Service believes any overwintering bull trout that use the area from the Lochsa, Selway, or South Fork Clearwater rivers would have already left the main stem on their spawning migrations before the onset of summer flow augmentation. However, those fish entrained from Dworshak would likely be imprinted on the North Fork Clearwater River, and the reduced summer temperatures that are in the North Fork during these cool water releases could cause isolation of these fish from other subpopulations. As a result, they would not contribute to natural production for the population.

**15.3) <u>Analyze effects.</u>**

The Dworshak Fisheries Complex spring Chinook salmon program has the potential to affect listed bull trout in several ways: 1) predation; 2) competition; 3) adverse behavioral interactions; 4) disease transmission; 5) harvest and/or (6) facility operation and maintenance.

<u>Predation</u> - The level of predation by hatchery released spring chinook salmon smolts on bull trout is unknown. However, several factors suggest that predation by Dworshak spring chinook salmon smolts on bull trout juveniles is probably non-existent or not significant. Most bull trout found in the rivers below release points are sub-adults and above the size that would be suitable prey for spring chinook salmon smolts. Also most of the bull trout in the rivers at that time of year would more likely be preying upon spring chinook salmon smolts than the other way around.

<u>Competition</u> - Studies to date indicate that yearling Chinook salmon do feed as they emigrate through the Columbia River system (Giorgi 1991) although the relation between Chinook that reside for extended periods of time and those that actively migrate have not been conducted.

Dworshak NFH spring chinook salmon are released as smolts (145 mm target size at release). Competition between hatchery released smolts and bull trout is minimized due to the rapid emigration time in free flowing river sections. Spring chinook salmon that are not ready to smolt and residualize in Lower Clearwater tributaries present potential for conflict. These fish could directly compete with juvenile bull trout for food, rearing space, and/or preferred habitats. While we don't know if competition from residual spring Chinook is a threat, we are evaluating various fish culture practices in our attempt to produce a more viable smolt. Again, because of the fact that many of the bull trout in the rivers at that time are larger and would likely be preying upon spring chinook salmon smolts, residualization of spring chinook salmon smolts could be beneficial to bull trout.

<u>Behavior</u> - There are no data describing adverse behavioral effects of hatchery chinook salmon releases on bull trout populations and only limited data on effects on natural salmonid population. Hillman and Mullan (1989) reported that larger, hatchery-released fingerling chinook salmon apparently "pulled" smaller wild/natural chinook salmon with them as they drifted downstream, resulting in predation on the smaller fish by other salmonids. As mentioned above, several steps have been taken at Dworshak NFH to produce functional smolts and minimize the time spent emigrating in the river. Time and method of release, size at release, and feeding and handling regimes of Chinook salmon smolts before release have all been modified over the last several years to prepare juvenile Chinook for smoltification. Reducing the time a smolt spends

in the river and main stem migration corridor will also reduce the potential for adverse interactions with listed bull trout, steelhead, and chinook salmon.

Disease - Spring chinook salmon reared at Dworshak NFH have bacterial kidney disease (BKD) problems in past years. BKD has come under better control the last several years with culling of high BKD eggs and segregation of high BKD fish in the hatchery. Additionally we strictly adhere to all Integrated Hatchery Operations Team guidelines concerning the release of fish undergoing a disease epizootic. The potential still exists for horizontal transmission of BKD and other diseases from spring chinook salmon released from Dworshak NFH to wild fish. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest that horizontal transmission of disease from hatchery to wild fish is widespread, although little research has been done in this area. The authors concluded that the full impact of disease on wild fish from hatchery fish is probably underestimated. It is common knowledge that pathogens and diseases occur in natural fish populations and that stresses can cause them to exhibit themselves. As mentioned, hatchery fish could potentially induce stresses on natural populations through predation, competition, or adverse interactions.

Harvest - Idaho Department of Fish and Game administers the sport harvest within the State, and the Nez Perce Tribe administers the Tribal fishery for returning Kooskia NFH spring chinook salmon. Because there is no season on bull trout any captures would be incidental to the targeted spring chinook salmon. Since there is a requirement for only barb less hooks to be used during chinook season and all bull trout captured are required to be released unharmed we believe there is minimal negative impacts to bull trout.

Facility operation and maintenance - Operation and maintenance includes operation of the ladder for trapping returning adult Chinook, water intake and discharge, in hatchery incubation and rearing phases, and general maintenance and construction.

The operation of the ladder for returning adult hatchery Chinook has potential for capturing bull trout. Since 1993 only seven bull trout has been captured in the Dworshak trap, during trapping operation for spring chinook salmon. Prior to 1993 the data on incidental captures is not all-inclusive for species other than spring Chinook salmon.

Water for Dworshak NFH is pumped from the North Fork Clearwater River. The intake is screened to prevent fish from being drawn into pumps. Also water intake does not adversely affect the water level in the river since the North Fork is regulated by Dworshak Dam located one mile upstream of the hatchery. Discharge from the hatchery is permitted by the State of Idaho, Non-Point Discharge Effluent Standards (NPDES) and fully meets the requirements of the permit. In-hatchery incubation and rearing phases have no additional impacts on listed bull trout.

All other maintenance or construction activities that could have an impact on water quality or quantity or could possibly impact bull trout would be consulted on as they arise. All required state and Federal permits would be obtained prior to any work being initiated. None are currently planned at this time.

Overall, we believe that the rearing and release of spring Chinook salmon should not be detrimental to bull trout and that actually there are potential benefits from the release of juvenile Chinook salmon. Juvenile salmon would increase the forage base and should benefit bull trout in areas downstream of release points. The biggest potential for harm would come from possible disease transfer and our strict adherence to IHOT guidelines and not releasing fish undergoing a disease epizootic should minimize those concerns.

### 15.4 Actions taken to minimize potential effects.

Water intake and discharge

Since water levels in the North Fork Clearwater River are regulated by Dworshak Dam and releases occur throughout the year there is no way to de-water the North Fork Clearwater River. The water intake which is located on the North Fork is screened to prevent fish and debris from entering the pumping chamber. Additionally, water effluent from Dworshak NFH must meet State of Idaho, Non-Point Discharge Effluent Standards (NPDES).

Adult collection

The adult holding pond at Dworshak is emptied weekly and in the event a bull trout is captured, data would be recorded and the fish will be immediately released back into the river unharmed.

Juvenile releases

For direct releases of Chinook smolts, Dworshak NFH is located in low elevation mainstem habitat that would typically only be used by bull trout as a migration corridor or possibly winter holding for adults and sub-adults. Various rearing practices are employed to reduce the potential for residulisum. We strive to release viable smolts ready to emigrate as quickly as possible. We also attempt to release on an increasing hydrograph to aid in the emigration. Also to reduce the potential to transmit disease to wild fish we strictly adhere to all Integrated Hatchery Operation Team guidelines for fish releases and do not release fish undergoing an disease epizootic.

Adult releases

Any adults captured that are above broodstock needs are given to the Nez Perce Tribe for release into tributaries in the upper Clearwater basin. This adult supplementation program is administered by the Tribe and is not assessed in this HGMP.

### 15.5 References

Ball, K. and W. Cannon. 1974. Evaluation of game and rough fish populations below Dworshak Dam and relationship to changes in water quality. Job Performance Report to the U.S. Army Corps of Engineers. Contract No. 14-16-0001-4842FS. Idaho Fish and Game.

Ball, K. and S. Pettit. 1974. Evaluation of game and rough fish populations below Dworshak Dam and relationship to changes in water quality. Job Performance Report. Project DSS-29-4. Idaho Fish and Game.

Bigelow, P.E. 2000. Personal communication. U.S. Fish and Wildlife Service, Ahsahka, Idaho.

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Attachment A

Dworshak Steelhead HRT recommendations also referenced in the Chinook HRT report

***Issue DW13: Untreated water from the nursery building, Burrows ponds, and cleaning water from the Burrows ponds is discharged directly into the Clearwater River.*** *Direct discharge of unsettled effluent poses ecological and water quality risks to aquatic species in the Clearwater River.*

**Recommendation DW13:** Construct a pollution abatement system or settling pond to remove dissolved solids from the hatchery effluent water prior to discharge into the Clearwater River.57 As required in the NPDES permit, ensure a Quality Assurance Plan and a Best Management Plan are written to address NPDES operations.

**Response**: The COE has contracted with CH2MHill to design a pollution abatement system for the hatchery. A final design should be completed by January 2011. Construction will depend on available funds.

***Issue DW16: Lack of shade covers over the raceways and Burrows' Ponds increases crowding and the effective density of fish, particularly during the summer months, thus increasing stress and disease risks to juvenile fish.***

**Recommendation DW16:** Construct shade covers over the raceways and Burrows' ponds.

**Response**: Managers concur with this recommendation. Shade structures would need to withstand heavy wind and snow events and not interfere with daily operations. This recommendation will be accomplished once funding becomes available. However, managers believe shade structures to be a lower priority than other funding needs.

***Issue DW17: The water management and reuse system at Dworshak NFH is complex, has changed over the years, and institutional knowledge of its structure and function have been lost.***

**Recommendation DW17:** Develop an updated engineering schematic of the water systems and an updated water reuse system *standard operating procedure* (SOP) at Dworshak NFH. 58

**Response**: Managers concur with this recommendation and will try to complete this within the next year. We have recently hired an aquaculture engineer who will aide in developing engineering plans and records.

***Issue DW18: The water intake screen for the hatchery does not comply with current NOAA Fisheries ESA screening criteria. The screen mesh is 3/8"; however, NOAA requires 3/32" mesh. NOAA criteria also include parameters for water approach velocity, sweeping velocity, and screen angle.***

**Recommendation DW18:** Replace the water intake screen for the hatchery so that it complies with NOAA Fisheries criteria.

**Response:** Managers concur with this recommendation and screens will be replaced once funds are made available.

***Issue DW21: The Monitoring and Evaluation (M&E) program for Dworshak NFH is not well documented.***

**Recommendation DW21:** Develop a clearly-defined and well-documented long-term M&E program. Such a long-term program should be established for assessing annual benefits (e.g., contributions to harvest) and short-term and long-term risks of the program (e.g., straying). Proposed or planned M&E activities should be reviewed annually prior to tagging and ponding of each broodyear.

**Response:** Managers, working with IFRO, are in discussions on the potential components of a written M&E program for Dworshak B-run steelhead in the Clearwater Drainage.

### *Chinook Salmon*

*Program goals and objectives*

***Issue DW31: Program goals for Dworshak NFH spring Chinook are not fully expressed in terms of numeric outcomes that quantify intended benefits.*** *This hatchery program lacks specific numeric goals for harvest although providing fish for harvest is a primary purpose of the program. The proportional Snake River spring Chinook mitigation goal for adult returns from Dworshak NFH upstream of Lower Granite Dam is 9,135 fish, but no numeric harvest goals within the Clearwater basin, or for on-station releases from Dworshak NFH, have been identified.*

**Recommendation DW31:** Restate program goals to identify the number of harvestable adult spring Chinook from Dworshak NFH for the Clearwater River basin. For example, based on the mitigation goal (9,135 adults) and broodstock needs, the harvest goal could be as high as 7,022 adult fish, assuming 90% survival from Lower Granite Dams to the fishery and hatchery.

**Response:** The responsibility of Dworshak NFH is to return 9,135 adult spring Chinook salmon to Lower Granite Dam. To have the opportunity to meet that goal, the current program has identified a need to collect 1,000 adults for broodstock (500 females and 500 males). Allocation and distribution of the surplus (up to 8,135 adults) is the responsibility of the fisheries managers, the Idaho Department of Fish and Game and the Nez Perce Tribe, whether that allocation is for harvest, supplementation, or other purposes. The Service does need to work cooperatively with the co-managers to insure that there is a statistically valid tagging program in place that will provide the Service, the Tribe, and the IDFG the ability to estimate adult returns for the Dworshak NFH spring Chinook salmon program. These efforts are currently pursued through the Annual Operations Plan process for the Clearwater River.

***Issue DW32: Current conditions affecting the survival of salmon and steelhead in the Snake and Columbia rivers (operation of the hydropower system, habitat, harvest, and ESA listings)***

***downstream from Dworshak NFH differ from the assumptions that were used to establish LSRCP mitigation goals.*** *These different conditions inhibit consistent achievement of Dworshak NFH ‟s contribution (9,135 adult spring Chinook) towards meeting the LSRCP mitigation goal of 58,700 adult spring/summer Chinook returning annually upstream of Lower Granite Dam, as developed initially by the Army Corps of Engineers in the mid-1970 ‟s.*

**Recommendation DW32:** Continue to work through various regional processes such as (a) implementation of the mainstem *Federal Columbia River Power System* Biological Opinion to improve migration survival, (b) *US vs. OR* discussions to address harvest issues, (c) NOAA Fisheries to complete ESA consultations on hatchery mitigation programs, and (d) local watershed groups to continue improving habitat, to allow the Service and cooperators meet Army Corps of Engineers and LSRCP mitigation goals on a consistent basis. Reexamine current approaches for contributing 9,135 adult spring Chinook to the LSRCP mitigation goal of 58,700 adult spring/summer Chinook (upstream of Lower Granite Dam) to determine whether the current hatchery program should be modified to account for existing conditions and capabilities at Dworshak NFH.

**Response:** The Regional Office of the Service contributes dedicated representatives to the meetings involving the activities listed above and we, primarily through IFRO, are in regular contact with those representatives when discussing goals for DNFH spring Chinook. We also regularly cooperate with research projects developed to evaluate passage and survival conditions for DNFH spring Chinook, such as those funded through the Fish Passage Center and BPA Biop-related programs. We will continue to participate at a high level in these discussions. To date, we have not observed evidence for significant changes in survival, escapement or natural production of spring Chinook that would cause alteration of overall stated goals for DNFH. However, there are gaps in our knowledge of the numbers of spring Chinook salmon returning to the Columbia and Clearwater rivers. Filling those gaps is a necessary step prior to any substantive discussions on evaluation of current production goals or other means to meet mitigation objectives.

### *Broodstock Choice and Collection*

***Issue DW33: The number of spring Chinook collected for broodstock is above the number necessary to meet the 1.4 million egg-take goal.*** *Currently, 1200 adults is the collection goal for a 1.05 million yearling smolt release. Assuming a 5% pre-spawning mortality of fish held for broodstock, a maximum 8% loss of fertilized eggs due to culling of high risk females for bacterial kidney disease (BKD), an average fecundity is 3,500 eggs per female, and an 85% eyed egg to smolt survival, approximately 406 females total would need to be retained for broodstock to produce 1.05 M smolts (1.42M eggs at 3,500 egg/female).*

**Recommendation DW33:** Reduce adult collection goal to approximately 820 adults consistent with obtaining approximately 410 females to provide a minimum of 1.4 million eggs sufficient to produce 1.05 million smolts. The most recent comanager goal to retain 1,000 spring Chinook adults during 2008 is more consistent with the Team‘s recommendation.

**Response:** Managers are comfortable with a broodstock goal of 1,000 spring Chinook adults.

***Issue DW34:*** *In the past, Rapid River stock was used to "backfill" for broodstock shortages. Backfilling is inconsistent with the principles of local adaptation and managing hatchery stocks for maximum viability. Additionally, backfilling of egg shortages substantially increases straying risks because juvenile fish are released into watersheds different from the source population and watershed to which parental fish homed and returned*

**Recommendation DW34:** Eliminate backfilling of the spring Chinook broodstock at Dworshak NFH to maintain a locally-adapted stock at Dworshak NFH and minimize straying risks to natural populations in the Columbia and Snake rivers. If other stocks are used to meet harvest or mitigation agreements in the Clearwater River, then (a) the imported fish should be differentially marked or tagged, (b) released on station (i.e., not outplanted) to maximize recapture rates as returning adults, and (c) excluded from the Dworshak NFH broodstock.

**Response:** No backfilling has occurred since 1995 (15 years ago). Managers do not anticipate any future broodstock shortages even during poor return years. In the case where that might happen, the managers agree that backfilling with other Clearwater River basin stocks would not be inconsistent with the principals of maintaining a locally adapted stock. The priority for backfilling would be from Kooskia NFH first, then from other Clearwater River basin spring Chinook stocks (IDFG or NPT), and then finally Rapid River stock from the Little Salmon River. It should be noted that the Dworshak NFH spring Chinook program was founded using the stock from Rapid River State Fish Hatchery and should not be considered to be genetically incompatible. As to the issue of using out of basin stocks contributing to increased stray rates, the HRT is referred to information provided in Issue DW35.

### *Hatchery and Natural Spawning, Adult Returns*

***Issue DW35: Stray rates for Dworshak NFH spring Chinook into tributaries downstream of the hatchery in the Columbia basin are high compared to other hatchery stocks of spring Chinook, thus posing a genetic risk to natural populations in other watersheds.*** *For example, for broodyears (BY) 1986-1993, 15% of all code-wire tag recoveries for Dworshak NFH spring Chinook occurred in the Deschutes River. However, for BY 1996-2000, straying rates were less than those observed for BY 1986-1993.*

**Recommendation DW35:** The Idaho Fisheries Resource Office should quantify homing and straying of spring Chinook released from Dworshak NFH. Attempts should be made to correlate variable stray rates with factors that may contribute to straying including variable fish culture practices (e.g., level of backfilling, mean size at release, etc.), water management practices, and barging vs. volitional transport of smolts through the hydropower system. Straying risks to other populations in the Clearwater, Snake and Columbia rivers should be assessed.

**Response:** The Idaho FRO is currently examining the most recent coded-wire tag data for Dworshak NFH spring Chinook salmon. For BYs released from 1997 through 2003, the prelimary data analysis indicate straying to be less than 1% for most years and less that 2% for all years except for one group released in 1997 that had a 3.96% stray rate. The managers disagree with the HRT that stray rates of Dworshak NFH spring Chinook salmon present a genetic risk to natural populations in other watersheds.

***Issue DW36: MS-222 is currently used to anesthetize most of the spring Chinook during spawning. This precludes the use of these carcasses for nutrient enhancement of streams and other beneficial uses that could result in immediate consumption by wildlife.*** *The U.S. Food and Drug Administration has not approved MS-222 for use on animals that could be consumed by humans or other animals within 30 days of use.*

**Recommendation DW36**: Consider an alternative method of anesthetizing broodstock at the time of spawning. Alternatives to MS-222 include, but are not limited to, electro-anesthesia and carbon dioxide (CO2), including . CO2 and oxygen used together. Currently, CO2 (FDA-approved) is used by the hatchery for select groups of fish destined for outplanting and bear/eagle rehabilitation programs; however, Dworshak should research the feasibility of electro-anesthesia as a alternative for MS-222 and CO**2**. Electro-anesthesia is successfully used for large broodstock programs at other hatcheries to reduce chemical use, alleviate safety concerns and to increase the number of carcasses suitable for other uses.

**Response:** Managers are not opposed to considering alternative methods of anesthetizing broodstock. Electro-anesthesia will require funding to purchase equipment and make facility modifications. This is not a high priority for the hatchery so this recommendation is not likely to happen anytime soon. At the same time , a Sedative work group composed of FWS, NOAA, CRITFC, NPT, ODFW, IDFG, ODFG, WDFW, NWIFC, COE and others met in 2009 and began investigating two chemicals as a "near-zero, release-time sedative for FDA clearance. They are Benzocaine and/or Eugenol for adult anadromous salmonids. The workgroup hopes to have one of these two chemicals FDA cleared within 2-3 years to resolve this issue whether fish are sedated at dams or hatcheries and where release needs to occur legally and safely immediately thereafter.

### *Incubation and Rearing*

***Issue DW37: Exposure of anadromous fish to the water supply (N.F. Clearwater River) for Dworshak NFH increases disease risks for spring Chinook reared on station. Reliance on pumped water for rearing spring Chinook increases demographic risks of fish losses.***

**Recommendation DW37:** Investigate options to increase the amount of gravity-feed water available from Dworshak Reservoir. The long term benefit of developing an adequate water supply from Dworshak reservoir may significantly reduce current power costs required to pump water to the facility, increase operational efficiencies, increase fish health, produce a higher quality smolt, more efficiently meet appropriate fish size at release, and increase survival.

**Response:** Managers concur with this recommendation and will work with all pertinent entities to develop a better water supply.

### *Research, Monitoring, and Accountability*

***Issue DW38: Dworshak NFH has a well-developed coded-wire tagging program to assess survival of various rearing and release strategies. In addition, coded-wire tagged fish need to accurately represent all progeny groups released from Dworshak NFH. Currently, 120,000 fish in four of the thirty raceways of spring Chinook are coded-wire tagged.*** *Because fish in different raceways can differ (e.g., mean age and size) and the pond environments can differ slightly (e.g., flow index and flow pattern), the practice of tagging fish in four raceways needs to be assessed to ensure that the entire brood year of fish is represented. In most NFH salmon and steelhead programs, fish are spawned from throughout the entire adult return to ensure that most segments of the run are represented in the resulting progeny. This procedure usually results in many different spawn "takes". The fish are ponded by take/hatch date into a series of raceways that, when fully populated, can differ in mean age and size between raceways. Post-release monitoring of each release group using coded-wire tags requires that the tags represent the entire population.*

**Recommendation DW38:** Continue to consult with the Idaho Fishery Resource Office to insure that the tagging strategy accurately represents the entire population of progeny from all spawn groups for a particular brood year.

**Response:** In contrast to the steelhead program, generally there are only four or five spawning takes of spring Chinook. Each spawning take is composed of a cross section of the entire broodstock population, in contrast to steelhead where fresh broodstock is collected for spawning each week. At the time of ponding into raceways, unlike steelhead, there is considerable mixing of progeny across spawning takes so that by the time ponding is completed, the likely hood that any one particular raceway is unrepresentative of the entire population is very minimal. Thus, the managers disagrees with the HRT that there may be significant differences in the age and size of fish between raceways. Managers will develop a written M&E program for Dworshak spring run Chinook salmon in the Clearwater Drainage.

***Issue DW39: The PIT tag program for spring Chinook*** **(greater than 50,000/year)** ***currently depends on funding from the Comparative Survival Study (CSS) which compares smolt-to-adult return rates (SARs) of fish transported downstream in barges versus SARs for juvenile fish negotiating the passage systems at each dam on the Columbia and Snake Rivers. Once the CSS study is complete, funding for the PIT tag program will cease. PIT tagging and monitoring are required to continue evaluating post-release migration and survival of spring Chinook released from Dworshak NFH.***

**Recommendation DW39:** Continue to implement and refine the PIT tag program to monitor migration and survival of spring Chinook, and to assist with in-season harvest management of returning fish. The PIT tagging program should be consistent with (a) regional goals and objectives and (b) concurrent goals and objectives for the hatchery program.

**Response:** Managers will develop a written M&E program that includes PIT tagging for Dworshak spring run Chinook salmon in the Clearwater Drainage.

***Issue DW40: Recovery of coded-wire tags (CWT) from harvested fish in terminal fishery areas in the Clearwater River basin*** *is inadequate. Harvest benefits associated with the spring Chinook program at Dworshak NFH cannot be accurately distinguished from those for Kooskia NFH and Clearwater Anadromous Fish Hatchery. This latter deficiency is true also for the spring Chinook programs at Kooskia NFH and Clearwater Fish Hatchery, A coast-wide CWT goal of 20% recovery of all CWTs from returning adult fish has been advocated by the LSRCP Coordinator.*

**Recommendation DW40:** The Service should continue to work with cooperators to assess the mark sampling program, improve CWT recovery rates, and quantify the harvest benefits separately for the spring Chinook programs at Dworshak NFH, Kooksia NFH, and Clearwater Fish Hatchery.

**Response:** Managers concur with this recommendation and will work with co-managers to improve the M&E program.

***Issue DW41: Data obtained from recovery of coded-wire tags by the Service and LSRCP cooperators are not reported within the required time frames, inhibiting adaptive management based on the most current information.*** *The Pacific Salmon Commission "s Data Standards Work Group Report states, under Specifications and Definitions for the Exchange of Coded-Wire Tag Data for the North American Pacific Coast, state that "Preliminary (Recovery) data for the current calendar year should be reported no later than JANUARY 31 of the following year."*

**Recommendation DW41:** The Service should develop a data management plan that incorporates tagging goals and objectives, data management, and annual reporting requirements of coded-wire tag data at both the program and regional levels. This could be incorporated into the cooperative agreements between the LSRCP office and cooperators (i.e. IDFG and tribes).

**Response:** Managers concur with this recommendation and as previously stated will work with all involved to maintain a high quality M&E program.

*Education and Outreach*

***Issue DW28: Dworshak NFH has a well-developed education and outreach program.*** *This program has been innovative and proactive with respect to providing benefits to the local community and region.*

**Recommendation DW28:** Continue support for existing education and outreach efforts, including evaluation of the effectiveness of those efforts.

**Response**: Managers are no longer able to support all previously existing education and outreach efforts. One of the 2 previously existing I&E positions at the hatchery has been eliminated. These are COE funded positions and after consultation with COE officials it was decided that funding for one of the positions would be better spent on other pressing hatchery needs.

***Issue DW29: Signage providing directions to the hatchery and at the entrance of the facility is inadequate. Additionally, existing signage does not identify U.S. Fish & Wildlife Service and the Nez Perce Tribe as co-operators of the facility.***

**Recommendation DW29:** Establish appropriate signage that identifies all comanagers and cooperators that contribute personnel and/or funding for the facility (e.g., Army Corps of Engineers, U.S. Fish and Wildlife Service, Nez Perce Tribe, Bonneville Power Administration, etc.). Volunteer work or contributions from any hatchery ―friends group could also be acknowledged as an outreach benefit.

**Response:** Most signage around Dworshak Hatchery acknowledges the COE, FWS and NPT as co-managers. The COE, as owner of the facility, have primary responsibility to determine appropriate signage needs.

***Issue DW30: Access to progress reports and publications regarding Dworshak NFH, the Idaho Fisheries Resource Office, and the Idaho Fish Health Center is limited****. The public is provided access to reports and publications for facilities in other regions via regularly updated web sites.*

**Recommendation DW30:** Provide public access to reports and publications accessible to the public via the Dworshak NFH Complex web site and the LSRCP web site.

**Response:** Managers will work to provide greater public access to reports and publications. All annual reports for DNFH have recently been digitally scanned and are available in pdf format. Discussions are underway on the most effective means to make reports available to interested parties.

Attachment B

Estimated Monetary impacts of HRT Recommendations

– Dworshak NFH Spring Chinook Salmon

1. DW36 – Purchase electro-anesthesia equipment - $100,000
2. DW37 – Replace pumped water from the North Fork with gravity line from Dworshak Reservoir - $25 - $50 million
3. DW35 – Monitor straying rates - $250,000
4. DW38 – Improve spring Chinook salmon CWT program - $150,000 annually
5. DW39 - Improve spring Chinook salmon PIT program - $150,000 annually
6. DW40 – Improve spring Chinook salmon CWT recovery program - $150,000 annually