HATCHERY AND GENETIC MANAGEMENT PLAN (HGMP)

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:	September 16, 2002

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

Lower Snake River Compensation Plan – Provides program funding
Nez Perce Tribe – Co-managers
Idaho Department of Fish and Game – Co-managers

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. The Lower Snake River Compensation Plan program has a direct funding agreement with BPA.

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.

The purpose of this program is to mitigate for tribal and sport fishing opportunities in the Clearwater River that were lost because of the construction of the four Lower Snake River dams. The mitigation goal calls for the return of 9,135 adults above Lower Granite Dam.

1.8) Justification for the program.

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.

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.

See Section 1.10

Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
1) Maintain life history characteristics of wild spring Chinook salmon.	Age composition, body size, sex ratio, juvenile emigration timing, adult run timing, and spawn timing of wild and hatchery fish are similar.	Evaluate age composition, body size, sex ratio, and adult return timing. A subsample of hatchery fish will be biosampled in order to collect length, age, sex, and coded-wire tag information for adult fish returning to the hatchery.
2) Broodstock collection covers the entire spectrum of the run.	Adults collected for broodstock are collected proportionately throughout the run of adults returning to the Dworshak NFH ladder.	Annual run timing of hatchery spring Chinook salmon will be monitored at the hatchery ladder.
3) Produce spring Chinook salmon for harvest in sport and tribal fisheries.	Use established relationships between jacks and 2-ocean returns to predict harvestable surpluses of program fish. Contribution of Dworshak spring Chinook salmon to fisheries in the Clearwater River.	Evaluate adult returns over Lower Granite Dam, Tribal and Sport harvest, and returns to the hatchery. Creel surveys conducted by the Idaho Dept. of Fish and Game and the Nez Perce Tribe, coded-wire tag recoveries, and hatchery returns will be used to estimate the contribution

Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
		of Dworshak NFH spring Chinook salmon to various fisheries.
4) Surplus hatchery spring Chinook salmon are available for outplanting in underseeded habitat in the Clearwater basin.	An average of 1200 adult Dworshak NFH origin spring Chinook salmon are needed to meet broodstock annually. Any additional fish will be outplanted in underseeded habitat.	Adults will be selected for outplanting in Clearwater basin at time of collection at the hatchery. Redd surveys and juvenile monitoring will evaluate the contribution of Dworshak NFH spring Chinook salmon to natural production in the Clearwater basin.
5) Maximize survival of hatchery spring Chinook at all life stages using disease control and disease prevention techniques.	Hatchery operations comply with USFWS Fish Health Policy and Implementation Guidelines as well as the Integrated Hatchery Operation Team's fish policy.	Juvenile fish health will be monitored on at least a monthly basis in order to detect potential disease problems. A fish health specialist will examine affected fish and make recommendations on remedial or preventative measures.
6) Release healthy, functional smolts from Dworshak NFH.	Annually release up to 1,050,000 marked smolts from Dworshak NFH.	Three to six weeks prior to release or transfer, 60 fish from each lot will be given a health exam by fish health specialists. All juvenile fish at the hatchery will be externally marked with an adipose fin clip and a group marked with coded-wire tagged. Juvenile fish will be sampled by the USFWS for mark quality and tag retention prior to release. The tag retention goal is a minimum of 95%.
7) Juvenile releases from Dworshak NFH survive and return to the hatchery in sufficient numbers to sustain the hatchery program.	The adult production goal from the 1,050,000 smolts released from Dworshak NFH should provide for a harvest in the Clearwater River and a broodstock collection goal of 1200 hatchery adults at Dworshak NFH.	Smolt to adult survival rates will be estimated for each brood year. Creel surveys conducted by IDFG and the Nez Perce Tribe will sample fish caught in fisheries in the Clearwater River. A subsample of hatchery spring Chinook salmon returning to the hatchery will be biosampled. Coded-wire tag recoveries will be used to estimate the age structure of returning fish.

Risks Performance Standards	Performance Indicators	Monitoring and Evaluation
1) Hatchery operations comply with ESA responsibilities.	Hatchery conducts Section 7 consultations and completes an HGMP.	Refer to M&E Section in this document.
2) Hatchery operations comply with water quality standards.	Hatchery meets the requirements of the National Pollution Discharge Elimination Permit.	Environmental monitoring of total suspended solids, settleable solids, in-hatchery water temperatures, in hatchery dissolved oxygen, nitrogen,

		ammonia, and pH will be conducted annually at the hatchery.
3) Handling of wild adult steelhead and bull trout is minimized.	Fish are gone through weekly and wild adult steelhead or bull trout are passed upstream of the weir and trap.	Incidental captures are monitored to insure that only minimal numbers of wild steelhead and bull trout are annually.
4) Avoid disease transfer from hatchery to wild fish and vice versa.	Hatchery operations comply with USFWS Fish Health Policy and Implementation Guidelines as well as the Integrated Hatchery Operation Team's fish policy.	Juvenile fish health will be monitored on at least a monthly basis in order to detect potential disease problems. A fish health specialist will examine affected fish and make recommendations on remedial or preventative measures.
5) Minimize straying of hatchery fish to areas outside of the basin.	Stray rate of Dworshak origin chinook is below 5% of the receiving population.	Monitor stray rate of hatchery population through the recovery of tagged Dworshak origin Chinook.
6) Juvenile hatchery releases minimize interactions with wild fish species.	Spring Chinook smolts will be released in the evening, on an increasing hydrograph, at the correct date to increase emigration rate and survival. Juveniles will be fully smolted at release to also increase emigration rate.	Fish will be given a smolt quality assessment by fish health specialists to determine smolt quality. Environmental pararmeters will be monitored to establish release date. PIT-tagged fish will be detected at downstream dams to monitor travel rate and survival.

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

1.10.1) "Performance Indicators" addressing benefits.

See Section 1.10

1.10.2) "Performance Indicators" addressing risks.

See Section 1.10

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 1200 adults. We have about a 1:1 male to female ratio, that allows about 600 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**

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	*On Site	1,050,000
Adult		

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

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 from 1983 to 2002. Also listed is the number of adults that returned to the hatchery from releases, through 1998.

Release Year	Smolts Released	Adult Returns	Smolt to Adult Survival (%)
1983	520,903	386	0.0741
1984	259,589	735	0.2831
1985	1,137,139	2,922	0.2570
1986	506,320	815	0.1610
1987	1,710,710	1,678	0.0981
1988	1,547,219	2,937	0.1898
1989	1,651,472	127	0.0077
1990	1,251,427	661	0.0528
1991	1,094,884	516	0.0471
1992	959,396	45	0.0047
1993	467,222	64	0.0137
1994	1,278,273	1,856	0.1452
1995	1,311,445	4,798	0.3659
1996	102,903	300	0.2915
1997	53,078	436	0.8214

1998	973,400	9,807	1.0075
1999	1,044,511	N/A	N/A
2000	1,017,873	N/A	N/A
2001	333,120	N/A	N/A
2002	1,000,561	N/A	N/A

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.

Expected to run indefinitely.

1.15) Watersheds targeted by program.

The program is designed to return adults to the Clearwater River in Idaho

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.

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 have been no wild steelhead or fall Chinook salmon 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.

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,migrational 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 directly 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 incidentally 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) Status of ESA-listed salmonid population(s) affected by the program.

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

Snake River Fall Chinook Salmon

The Proposed Recovery Plan for Snake River Salmon (NMFS 1995) does not specifically suggest critical or viable population thresholds for fall Chinook salmon. For the purposes of this HGMP, we are assuming a critical threshhold of 300 to 400 spawners, which is referred to as a threshold escapement level in BRWG (1994) and Connor (1994). In addition, we are assuming a viable population threshold of 2500 spawners as indicated at 35% of the spawner capacity estimate.

Snake River Fall Chinook Salmon have been on an increasing trend in the past few years. Estimated escapement levels for 1999 were 905 adult and 817 jack fall Chinook above Lower Granite Dam. These escapement levels are well above the critical thresholds, but still below the viable population threshold assumed above.

Snake River Steelhead

We are not aware of established critical or viable population thresholds for Snake River Steelhead.

- 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.

Unknown

- 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.

Unknown

- 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).*

Number of fall Chinook salmon redds counted in the Snake River and tributaries between Lower Granite and Hells Canyon dams, 1989-2001. An empty cell indicates no searches were conducted in the corresponding river and year. Some of the data is broken down into method, and river mile (RM) sections.

River (method or RM)	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	
Snake (helicopter)[a]	58	37	41	47	60	53	41	71	49	135	273	255	535	
Snake (underwater video)[b]			5	0	67	14	30	42	9	50	100	91	175	
Clearwater (RM 0-41)	10	4	4	25	36	30	20	66	58	78	179	165	290	
Clearwater (RM 41-74)				1	0	0	0	0	0	0	2	7	16	
M.F. Clearwater (RM 74-98)						0	0	0	0	0	0	0	0	
N. F. Clearwater				0	0	7	0	2	14	0	1	0	1	
S. F. Clearwater				0	0	0	0	1	0	0	2	1	5	
Grande Ronde	0	1	0	5	49	15	18	20	55	24	13	8	197	
Imnaha	1	3	4	3	4	0	4	3	3	13	9	9	38	
Salmon				1	3	1	2	1	1	3	0	0	22	
Selway						0	0	0	0	0	0	0	0	
Potlatch													24	
Totals	69	45	54	82	219	120	115	206	189	303	579	536	1303	

[a] The targeted search area was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.
[b] The targeted search areas were discrete sites composed mainly of 1-6 in. bottom substrates in water over 10 ft. deep. The number of sites searched varied.

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.

(*e.g. "Broodstock collection directed at sockeye salmon has a "high" potential to take listed spring Chinook salmon, through migrational delay, capture, handling, and upstream release, during trap operation at Tumwater Falls Dam between July 1 and October 15. Trapping and handling devices and methods may*

lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation").

The Dworshak Fisheries Complex spring Chinook program has the potential to affect listed A-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 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 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 is 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 intake is screened to prevent fish from being drawn into pumps. Also water intake does not adversely effect 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 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, as the pond becomes full 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 Columbia River Fishery Management Plan, which was mandated by U.S. v Oregon, was an agreement between state, tribal, and federal fishery agencies on harvest and production issues in the basin expired in July, 1999. Since that time interim annual management agreements are prepared, these outline modifications to harvest and production issues for the year. To date there have been no changes proposed to the Dworshak Chinook program in these annual management plans.

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.

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.

Table 3. Total number of Dworshak and Kooskia NFH spring Chinook salmon returning to the Clearwater River annually from 1990 to 2001.

Year	Dworshak NFH Rack Return	Sport Harvest[1]	Tribal Subsistence Harvest[1]	Total Return
1990	2,042	369	644	3,055
1991	165	0	0	165
1992	370	54	160	584
1993	823	0	43	866
1994	74	0	0	74
1995	125	0	0	125
1996	963	0	24	785
1997	3,150	741	847	4,738

1998	915	99	202	1,216
1999	800	0	37	837
2000	3,202	1,581	1,183	9,874
2001	4,018	3,039	830	9,113 (incl. 1,226 unharvested estimate)

[1] Total estimated harvest in the Clearwater River Basin.

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 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.

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 15500 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 a 14 inch cold water supply line from the distribution box for the Clearwater Hatchery. The supply was designed for 6400 GPM or 14 cfs for incubation and early rearing.

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.

Hatchery intake screens conform with NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.

SECTION 5. FACILITIES

Provide descriptions of the hatchery facilities that are to be included in this plan (see "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.

-Inside there are 128 nursery tanks, 64 concrete, 64 fiberglass. These are 3' x 16' x 2' and available for salmonid early rearing.

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

There are 83 Burrows ponds which are 17' x 35' x 3' used for steelhead rearing.

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' used for NPT salmonid rearing.

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, any listed fish which return via the fish ladder (located on the North Fork of the Clearwater River) is 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.

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	100% RR
1988	100% RR
1989 – 1994	100% DW
1995	66% DW, 34% KK
1996 – present	100% DW

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.

There are currently no wild/natural fish that are used for broodstock.

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

Natural populations were never used for broodstock, nor are they incorporated into the broodstock at any time. Natural (or unmarked) spring Chinook salmon adults enter the hatchery at times during broodstock collection, but are returned to the river to continue their migration and to spawn naturally.

6.2.4) Genetic or ecological differences.

All natural stocks are assumed extirpated.

6.2.5) Reasons for choosing.

Indigenous spring Chinook salmon populations in the Clearwater basin are believed to have been 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 nonnative 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.

7.3) Identity.

Occasionally, unmarked adults (identified by the presence of an adipose fin) enter the hatchery. Most hatchery fish from the Clearwater basin have been marked by the removal of the adipose fin. Since wild fish are believed to be extirpated from

the Clearwater basin these fish are generally used for broodstock if needed or placed with fish for adult outplanting, if not needed.

7.4) Proposed number to be collected:

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 600 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 1200 adults total.

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

We report here 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 and the number of Jacks (I-ocean adults).

Year	Adults	Jacks
1990	2027	7
1991	149	16
1992	347	22
1993	814	9
1994	71	3
1995	42	83
1996	688	275
1997	3138	12
1998	904	11
1999	130	670
2000	2,931	221
2001	3,982	36

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

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

There have only been a few years when there are surplus broodstock. In those cases excess adults are given to the Nez Perce Tribe for release into tributaries in the upper Clearwater basin (this adult program is administered by the Tribe and is not assessed in this HGMP). Excess fish have also been used to backfill other state or tribal production programs. In 1997, some excess broodstock were given to the local food bank program, this must be well supervised due to the typical use of MS-222 as an anesthetic. It is highly unlikely that the food bank program will occur in the future, due to Tribal requests for any excess Chinook.

7.6) Fish transportation and holding methods.

Any wild/natural fish 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. How, 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

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 a certain day

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. 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. 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.

Chinook spawning involves a male:female ratio of 1:1.

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 (1990-01), or for years dependable data are available.

*Survival of Dworshak Spring **Chinook** eggs reared at Dworshak only.*

Brood Year	*# Eggs Taken*	*% Survival Green to Eyed*	*% Survival Eyed to Nursery Tanking*
2001	*1,195,486*	*97.4*	*97.1*
2000	*1,172,404*	*95.1*	*94.6*
1999	*249726*	*93.3*	*94.4*
1998	*1665474*	*91.1*	*90.4*
1997	*1728534*	*90.9*	*98.2*
1996	*1158765*	*87.2*	*98.6*
1995	*76632*	*66.9*	*96.0*

% Eye-up is enumerated eye-up (after green culls, disease culls, etc).
Before 1993 some adults from Kooskia were mixed with Dworshak adults and/or experiments were conducted which caused Dwoshak and Kooskia eggs to be mixed, not enumerated separately, etc.

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

Usually no extra eggs are taken, except to make up for average losses from one life stage to the next. Extra adult returns are currently outplanted for supplementation or fishery recycle.

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. Since 1998, SCS eggs have been shipped to Kooskia NFH for final incubation and initial rearing. Water flow for the trays is approximately 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.

Currently, all spring Chinook undergo final incubated and initial rearing at Kooskia NFH,
1997 was the last year that the Chinook were incubated and completely reared at

Dworshak. The eggs are incubated in Heath incubator trays. The fry are tanked at approximately 83% button up. The fry have approximately 1370 temperature units when moved to the tanks in the nursery. Average lengths and weights were not taken at this time to avoid damage to the fish. These fry were tanked from December 4 through December 17, 1997. Fry were moved from the trays to the tanks by hatchery personnel (forced tanking). Fry swam-up, off the bottom and began to feed on their own discretion (volitional swim-up?). If incubation and rearing of Chinook occurs at Dworshak rather than Kooskia, they are subjected to higher water temperatures and the fish have to be subsequently starved further along in the rearing cycle. This is done to meet the target size at release of 20 fpp.

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) <u>Rearing</u>:

9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolt) for the most recent twelve years (1988-99), or for years dependable data are available..

Survival of Dworshak Spring Chinook fry/fingerlings reared at Dworshak NFH.

Brood Year	% Survival fry to fingerling	% Survival fingerling to smolt
2001	88.5	Not Released
2000	95.6	99.2
1999	N/A[1]	96.2[2]
1998	84.3	93.4
1997	99.6	91.2
1996	98.1	97.4
1995	96.0	98.3
1994	87.4	98.0
1993	99.4	97.7
1992	96.1	98.0
1991	99.3	96.9
1990	95.6	97.2
Average	93.7	96.4

[1]SCS final incubation and initial tanking at Kooskia NFH. Later transferred to Dworshak at approximately 300-500 fpp.

[2] Survival is from fry to smolt.

9.2.2) Density and loading criteria (goals and actual levels).
Include density targets (lbs fish/gpm, lbs fish/ft3 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

Chinook- Temperature taken at least once/day.
Minimum dissolved oxygen level is 6 ppm. Oxygen is monitored when fish are given a chemical treatment for disease. Oxygen may be spot-checked throughout the rearing cycle. Carbon dioxide is not tested. Chinook are incubated and early reared at Kooskia NFH and later transferred to Dworshak after the fish have been started on feed.

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.

Chinook are final incubated and initially reared at Kooskia NFH. When they arrive back at Dworshak they are approximately 350 fish per pound or 2.1 inches (54 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*).

Frequency of 6 times a day at approximately 4% body weight initially (fish are 300-500 fpp when received from Kooskia). Both frequency and % body weight fed/day are reduced as fish grow. Conversion is approximately 1.4 throughout the rearing cycle. By final rearing size (135 mm or 20 fpp) the % body weight fed/day is approximately 0.5% and frequency is 2-3 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. Fish are fed antibiotic treated feed for coldwater disease and Pseudomonas Disease. Fungus is not usually a problem except after freeze branding- no treatments are typically needed. Ponds are disinfected between production lots. Pond brooms and nets are usually disinfected between ponds, especially during disease outbreak. Formalin treatments routinely needed for parasite control.

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 of the NATURES rearing techniques nor do we try to use any kind of natural rearing methods. 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	1.035 million	18.0	Mid April – Mid May	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	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size (fpp)
1990							1,252,247	25.6-20.2
1991							1,094,884	17.5-22.6

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size (fpp)
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
2000							1,017,873	24
2001							333,120	20

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

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

1998 – March 25 & 26
1999 – April 7 & 8
2000 – April 5 & 6
2001 – March 28
2002 – March 27 & 28

Release dates are selected within a 4-week window, actual days chosen are based on the fishes 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 hatchery fish 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.

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 20 fish sample is randomly selected from each of the three systems. 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").*

With the listing of steelhead, fall Chinook, and bull trout in the Snake River Basin, we are actively re-examining our policies and procedures to avoid obvious risks to listed stocks

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 attempt 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**.*

There 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.

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, funding is provided by BPA

12.3) Principle investigator or project supervisor and staff. Michele DeHart, Fish Passage Center staff

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

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.

12.6) 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.

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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:_____

ADDENDUM A. PROGRAM EFFECTS ON OTHER (AQUATIC OR TERRESTRIAL) ESA-LISTED POPULATIONS. (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) List all ESA permits or authorizations for USFWS ESA-listed, proposed, and candidate salmonid and non-salmonid species associated with the hatchery program.

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

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.

Bull trout

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 the South Fork Clearwater rivers where Dworshak Chinook are released. 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 ocurrance 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 affects 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^{o}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^{o}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^{o}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^{o}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.

Behavior - 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 effect 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

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