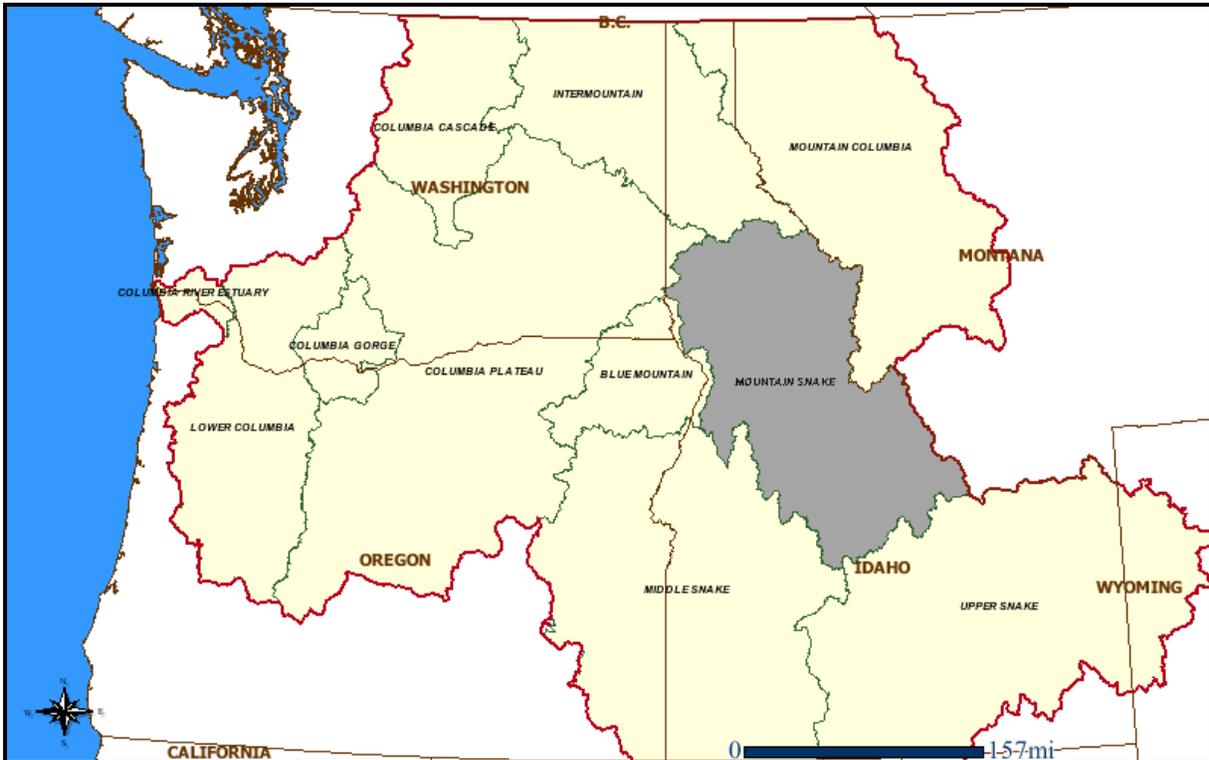




**U.S. Fish and Wildlife Service - Pacific Region
Columbia River Basin Hatchery Review Team**

**Columbia River Basin, Lower Snake Province
*Clearwater and Salmon River Watersheds***



**Kooskia, Dworshak, and Hagerman National Fish
Hatcheries
Assessments and Recommendations**

**Final Report, Appendix B:
Briefing Document; Summary of Background Information**

June 2009

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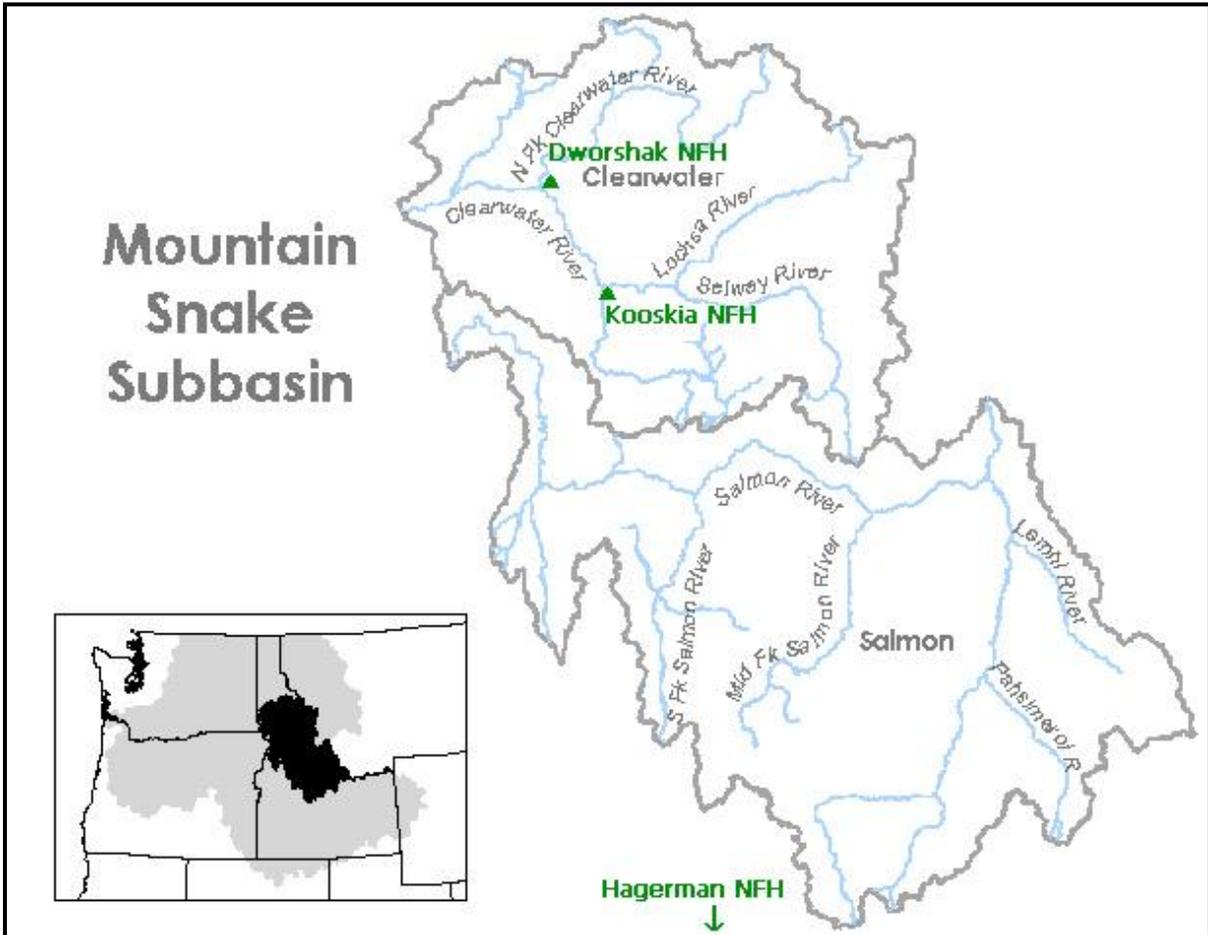


Figure 1. Clearwater and Salmon Subbasin Fisheries Facilities¹

¹ Modified figure from: NWPPC. 2004. Mountain Snake Province Artificial Production Review and Evaluation (APRE) Report. p.1.

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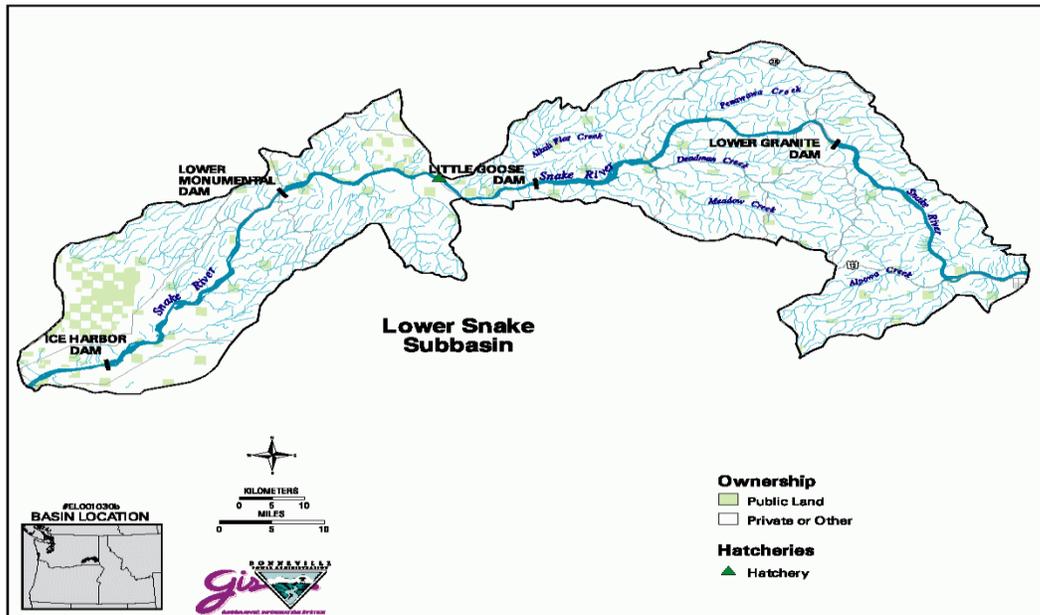
I. Introduction to the Lower Snake Region

A. Watersheds and geographic description

The **Lower Snake** Subbasin encompasses 1,059,935 acres (1,656 square miles) within portions Adams, Franklin, Walla Walla, Columbia, Whitman, Garfield and Asotin Counties in the southeastern corner of Washington State (Figure 1). This subbasin includes a portion of the Snake River Mainstem and a number of its tributaries, including Deadman Creek, Almota Creek, Alpowa Creek, and Penawawa Creek. Approximately 5 percent of the Snake River’s total watershed is located downstream of the Clearwater River at Lewiston, Idaho, and this region is relatively arid compared to the Snake River’s upstream drainage areas. As such, only a small portion of the Snake River mainstem flow is derived from tributaries located within the Lower Snake Subbasin. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p. 1-2)

The Lower Mainstem Snake Subbasin includes 137 miles of mainstem Snake River habitat as well as numerous smaller tributaries. The majority of the Snake River mainstem section of the subbasin is composed of four reservoirs backed up by dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite dams) that are operated for various purposes, including hydropower production and navigation. The lower six miles of the mainstem Snake River are part of the reservoir backed up by McNary Dam on the mainstem Columbia. (NWPPC Lower Snake River Subbasin Plan, May 2004, p.3)

Figure 1: Lower Snake River Subbasin (NWPPC Lower Snake River Subbasin Plan, May 2004)



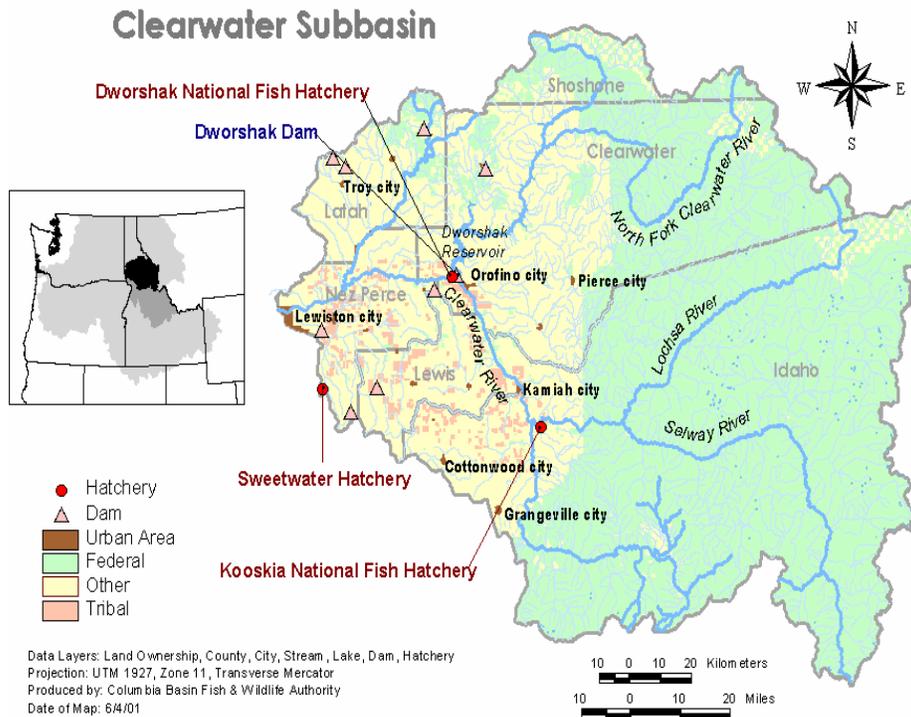
The **Clearwater River** subbasin is located in northcentral Idaho between the 46th and 47th latitudes in the northwestern portion of the continental United States (Figure 2). It is a region of mountains, plateaus, and deep canyons within the Northern Rocky Mountain geographic province. The

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subbasin is bracketed by the Salmon River subbasin to the south and St. Joe River subbasin to the north. The Clearwater River drains approximately a 9,645 square mile (24,980 km²) area. The subbasin extends approximately 100 miles (161 km) north to south and 120 miles (193 km) east to west (Maughan 1972). Four major tributaries drain into the mainstem Clearwater River: the Lochsa, Selway, South Fork Clearwater, and North Fork Clearwater rivers. The Idaho–Montana border follows the upper watershed boundaries of the Lochsa, Selway, and eastern portion of the North Fork Clearwater rivers in the Bitterroot Mountains. The North Fork Clearwater then drains the Clearwater Mountains to the north, while the South Fork Clearwater River drains the divide along the Selway and Salmon Rivers. Dworshak Dam, located two miles above the mouth of the North Fork Clearwater River, is the only major water regulating facility in the subbasin. Dworshak Dam was constructed in 1972 and eliminated access to one of the most productive systems for anadromous fish in the subbasin. The mouth of the Clearwater is located on the Washington–Idaho border at the town of Lewiston, Idaho where it enters the Snake River 139 river miles (224 km) upstream of the Columbia River. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p.28)

Figure 2: Map of the Clearwater River Subbasin and NFH Facilities (NWPPC Mountain Snake APRE Report, 2004, p.5)

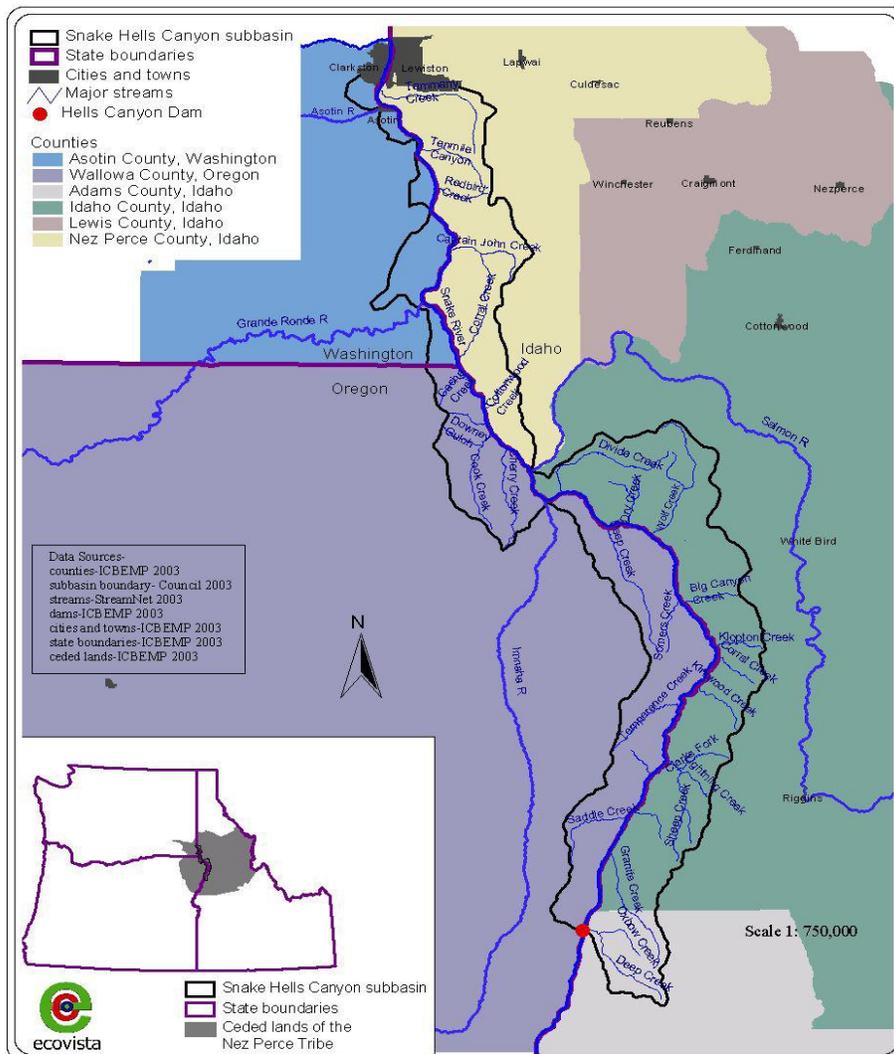


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The **Snake Hells Canyon** subbasin includes the mainstem of the Snake River and the small tributaries that flow into it as the Snake River flows from Hells Canyon Dam to the mouth of the Clearwater River at Lewiston, a length of 109 miles (Figure 3). The Snake River forms the border between Oregon and Idaho for the upper 71 miles of the subbasin and the border between Washington and Idaho for the lower 38 miles. The subbasin contains 862 square miles, or 551,792 acres. About 62% of this area falls in Idaho, 31% is in Oregon and the remaining 7% is in Washington. The subbasin contains part of five counties: Adams, Idaho, and Nez Perce in Idaho; Asotin in Washington; and Wallowa in Oregon. The lower portion of the subbasin contains the town of Asotin and portions of Clarkston and Lewiston. The remainder of the subbasin is either rural or undeveloped. The Salmon, Imnaha, Grande Ronde, and Clearwater rivers, as well as Asotin Creek, are major tributaries that join the Snake River in the Snake Hells Canyon subbasin. These rivers drain a combined area of 19,280 square miles (12,339,200 acres) and dramatically influence the water quality and hydrologic conditions in the Snake River. (NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.4)

Figure 3: Snake Hells Canyon Subbasin (NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.4)

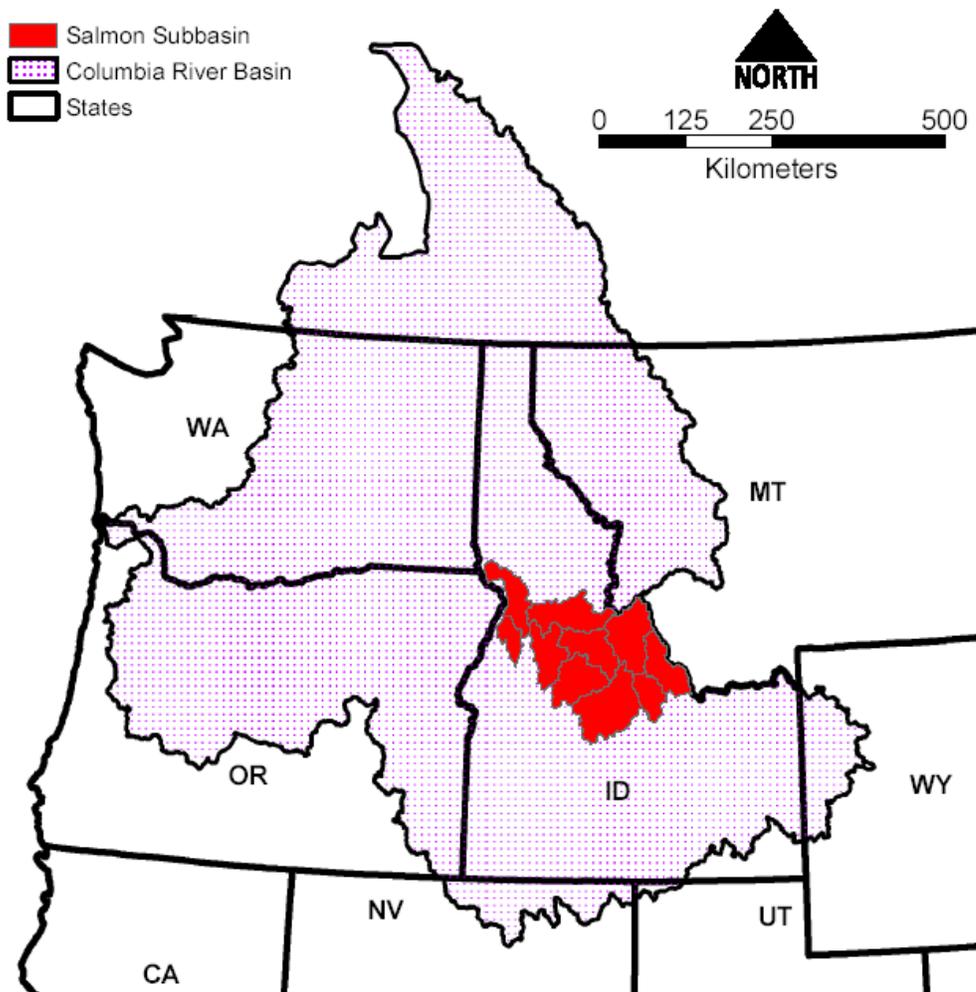


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The **Salmon River** subbasin covers approximately 36,217 square km (13,984 square miles), or 16.7% of the land area of Idaho and 6% of the land area of the Columbia River basin (Figure 4). Ten major hydrologic units (watersheds) occur within the subbasin: the Upper Salmon, Pahsimeroi, Middle Salmon–Panther, Lemhi, Upper Middle Fork Salmon, Lower Middle Fork Salmon, Middle Salmon–Chamberlain, South Fork Salmon, Lower Salmon, and Little Salmon watersheds. The Salmon subbasin has over 1,900 named streams with a combined length of 15,695 stream kilometers (9,752 miles). These streams flow from headwaters in the Beaverhead, Salmon River, Lemhi, Lost River, Sawtooth, and smaller mountain ranges to the mouth of the Salmon River at its confluence with the Snake River in lower Hells Canyon. The largest of the major watersheds is the Upper Salmon; the smallest, the Little Salmon. (NWPPC Salmon Subbasin Plan, May 2004, p1-7-1-8)

Figure 4: Map of the Salmon River Basin (NWPPC Salmon River Subbasin Plan May 2004 p 1-8)



B. Historical distribution of salmon and steelhead throughout region

1. Lower Snake River Subbasin

The Lower Snake River Subbasin is home to 18 native and 17 introduced fish species including white sturgeon, rainbow trout, kokanee, mountain whitefish, brown trout, bull trout, chiselmouth, common carp, peamouth, northern pikeminnow, longnose dace, speckled dace, redbside shiner, bridgelip sucker, largescale sucker, yellow bullhead, brown bullhead, channel catfish, tadpole madtom, flathead catfish, mosquitofish, three-spine stickleback, sandroller, pumpkinseed, warmouth, bluegill, smallmouth bass, largemouth bass, white crappie, black crappie, yellow perch, walleye, prickly sculpin, mottled sculpin, Paiute sculpin, banded killfish, and American shad.

Spring Chinook salmon (threatened, Snake River ESU, 6/05)

Spring and summer Chinook migrate through the mainstem Snake River, but no spawning or rearing is known to occur there or in any of the minor tributaries in this subbasin, except the Tucannon River where an endemic stock persists.

Fall Chinook salmon (threatened, Snake River ESU, 6/05)

Historically, the majority of Snake River fall Chinook salmon spawned in the mainstem near Marsing, Idaho. Construction of the Hells Canyon complex (1958-1967) and the Lower Snake River Dams (1961-1975) eliminated or severely degraded 530 miles of spawning and rearing habitat for fall Chinook in the Snake River. Historically, fall Chinook salmon runs averaged 72,000 fish between 1938-1949, with highs of up to 120,000. By the 1950s these runs had decreased to an average of 29,000. Fall Chinook continued to decline, and by the late 1960s and 1970s the average run was only 5,100 fish at Ice Harbor Dam. The average annual runs have remained at 4,700-5,500 fish in the 1980s and the 1990's.

Coho Salmon (extripated)

Wild coho are extinct in the Snake River basin since the early to mid 1980s. Hatchery coho are being reintroduced in the Clearwater River by the NPT. Also, there may be stray coho from the Umatilla, and possibly the Yakima reintroduction efforts in the Snake River. Some of these fish are recovered at Lyons Ferry Hatchery or in the Tucannon River since about 1997.

Steelhead (threatened, Snake River ESU, 1/06)

Some natural production of steelhead occurs in minor tributaries such as Alpowa Creek, Alkali Flat Creek, Almota Creek, Steptoe Creek., Deadman and Meadow creeks, etc. Steelhead are also produced from the Tucannon River. Spawning and rearing by steelhead is limited in the mainstem because of the Snake River Dams and reservoirs. Most tributaries that maintain summer water flows and do not have barriers are suspected of being used by steelhead.

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(NWPPC Lower Snake River Subbasin Plan, May 2004, p.20-22)

2. Clearwater River Subbasin

Currently more than 30 species of fish inhabit the Clearwater subbasin, including bridgelip sucker, bull trout, chiselmouth, largescale sucker, longnose dace, mottled sculpin, mountain whitefish, northern pikeminnow, Pacific lamprey, Paiute sculpin, peamouth, redbelt shiner, sandroller, shorthead sculpin, speckled dace, steelhead, torrent sculpin, westslope cutthroat, fall Chinook, spring Chinook, coho, arctic grayling, black bullhead, black crappie, bluegill, brook trout, brown bullhead, carp, channel catfish, golden trout, kokanee salmon, largemouth bass, pumpkinseed, smallmouth bass, tiger muskie, yellow perch.

Spring, summer, and fall Chinook were likely present within the mainstem Clearwater River prior to 1900. Historical numbers of Chinook salmon entering the Clearwater River subbasin are assumed to be substantial, but no documentation on actual numbers is available. Estimates range up to 1.8 million smolts produced resulting in 94,169 adults returning to the mouth of the Columbia River annually. Of those fish, 63,617 originated from tributaries and 30,552 were from the mainstem. The majority of historical Chinook salmon production was thought to occur in major tributary systems of the Clearwater River (North, South, and Middle Forks), with less than 10% of total production in the mainstem reach. Within the mainstem portion of the Clearwater River, the most substantial production of spring Chinook salmon probably occurred in the Lolo and Potlatch Creek drainages.

Indigenous Chinook salmon in the Clearwater River subbasin were eliminated by Lewiston Dam. However, naturalized populations of spring Chinook salmon have been reestablished in some portions of the subbasin as a result of reintroduction efforts. Reintroduction efforts for fall Chinook salmon were considered unsuccessful, and the existing fall Chinook runs in the lower Clearwater subbasin may likely represent a combination of recent hatchery supplementation efforts and recolonization by Snake River stock(s). Fall Chinook salmon upstream of Lower Granite Dam (including the Clearwater River) are considered part of a single genetically similar aggregate and represent one evolutionarily significant unit.

(NWPPC Clearwater Subbasin Plan, Nov. 2003, p.291-292)

Spring Chinook salmon (threatened, Snake River ESU, 6/05)

Spring Chinook salmon within the Clearwater subbasin are excluded from the ESU encompassing other spring/summer stocks throughout the Snake River basin, but represent an important effort aimed at restoring an indigenous fish population to an area from which they had been extirpated. Efforts to reestablish spring Chinook salmon in the subbasin were extensive. Currently, hatchery spring Chinook are released for harvest mitigation and to supplement natural production. Reintroduction of spring Chinook salmon following removal of the Lewiston Dam has resulted in naturally reproducing runs in Lolo Creek and mainstem/tributary reaches of the Lochsa, Selway, and South Fork Clearwater Rivers. Founding hatchery stocks used for spring Chinook salmon reintroductions were primarily obtained from the Rapid River Hatchery. Initially however, spring Chinook stocks imported for restoration came from Carson, Big White, Little White or other spring Chinook captured at Bonneville Dam. Genetic analyses confirm that existing natural spring Chinook salmon in the

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Clearwater River subbasin are derived from reintroduced Snake River stocks. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p.291-292)

Fall Chinook salmon (threatened, Snake River ESU, 6/05)

Snake River fall Chinook are believed to have occupied the mainstem Snake River up to Shoshone Falls. In particular, the area downstream of Upper Salmon Falls, at rkm 930, was identified by Evermann (1896) as the "... largest and most important salmon spawning ground of which we know in Snake River." After loss of these upstream reaches with construction of Swan Falls Dam in 1920, the reach between Marsing, Idaho, and Swan Falls Dam (rkm 565 to 682) is believed to have been the primary spawning and rearing areas for Snake River fall Chinook. However, construction of the Hells Canyon Dam complex (1958–1967) cut off anadromous fish access to historical fall Chinook habitat upstream of river km 398.6. Additional fall Chinook habitat was lost through inundation as a result of the construction of the lower mainstem Snake River dams. Historical use of the Clearwater River is more ambiguous. If ocean-type fish used the lower Clearwater, they were extirpated after construction of the Lewiston Dam in 1929. However, Tiffan et al. (2001) concluded that there is "no conclusive evidence" as to whether the lower Clearwater River supported the basic subyearling migrant life-history pattern associated with Snake River fall Chinook. (Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.51)

Fall Chinook salmon reintroduction efforts in the Clearwater subbasin began in 1960. Fall Chinook were reintroduced by the IDFG into the upper Clearwater subbasin from 1960-1967, mainly through eyed-egg plants in artificial spawning channels along the Selway River near the Fenn Ranger Station. Counts of fall Chinook at the Lewiston Dam increased from three in 1962 to a high of 122 in 1966, and back down to 90 in 1969. Due to insignificant returns of fall Chinook, the original reintroduction program was terminated in 1968. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p.302)

Between 1988 and 1997 fall Chinook redds counted in the Clearwater River accounted for 25% of all fall Chinook redds observed above Lower Granite Dam. The proportion of fall Chinook redds above Lower Granite Dam observed in the Clearwater River has increased since 1993. As a consequence of cold winter water temperatures, the early life history timing of fall Chinook salmon in the Clearwater River occurs on the latest schedule of all present-day Snake River stocks. Many young Clearwater River fall Chinook salmon do not reach smolt size or migrate seaward during the first year of life because growth is out of synchronization with environmental cues such as photoperiod. In some years, releasing cool water from Dworshak Reservoir for summer flow augmentation could cause juvenile fall Chinook salmon to hold over an extra year in freshwater by markedly reducing water temperatures and disrupting water temperature cues that prompt outmigration. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p.304)

Two satellite facilities of the Nez Perce Tribal Hatchery on the lower South Fork Clearwater River and the lower Selway River (near Fenn Ranger Station) will initiate the restoration of early- fall Chinook salmon to the Clearwater subbasin. The stock will be developed by selecting early spawners from Snake River fall Chinook broodstock at Lyons Ferry Hatchery and capture of fish spawning in the Clearwater River. (MWPPC Clearwater Subbasin Plan, Nov. 2003, p.306)

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Steelhead (threatened, Snake River ESU, 1/06)

It was estimated that 55% of all Columbia River steelhead trout historically originated from the Snake River basin, of which Clearwater steelhead made up a substantial component. Over 43,000 steelhead were counted at Lewiston Dam near the mouth of the Clearwater River during the 1962-63 run year and historic runs may have ranged as high as 40,000 - 60,000 steelhead annually. Wild steelhead trout historically occupied all major drainages and a majority of the tributaries within the Clearwater subbasin. However, no documentation of historic distributions specific to the Lochsa or Selway River systems could be located.

The upper half of the South Fork Clearwater watershed maintained a historically strong population of steelhead trout. Spawning habitat in the South Fork Clearwater occurred primarily in the lower canyon portions of mainstem tributaries such as Newsome Creek, American River, Red River, Crooked River, and low gradient reaches along the mainstem South Fork Clearwater River. Historic spawning distributions of steelhead trout also likely included Tenmile, Johns, Meadow, and Mill creeks. Low order streams and accessible headwater portions of high order streams provided early rearing habitat.

The North Fork Clearwater provided substantial amounts of spawning and rearing habitat for steelhead trout prior to the construction of Dworshak Dam in 1969, which blocked 26% of Clearwater subbasin habitat from anadromous fish. An estimated 50 to 60 percent of the steelhead entering the Clearwater River spawned in the North Fork Clearwater River and its tributaries. Similar to the South Fork, the mouths of the larger North Fork tributaries were likely the primary spawning areas, while the accessible headwater sections of the tributaries provided habitat for rearing and resident rainbow/redband trout populations. In addition to spawning and rearing, mainstem habitat was used for migration and overwintering. Historical spawning and rearing habitat in the Selway River occurred throughout the subbasin. Lower portions of mainstem tributaries hosted overwintering habitat for juveniles, while the upper portions provided rearing habitat.

Steelhead trout status is present–depressed throughout the majority of their range in the Clearwater subbasin. Designations of present–strong for steelhead trout are only noted in Fish and Hungry Creeks (Lochsa), the lower portions of Meadow Creek (Lower Selway) , and portions of Moose and Bear Creeks (Upper Selway). The Lochsa and Selway River systems have been identified as refugia areas for steelhead trout based on location, accessibility, habitat quality, and number of roadless tributaries.

(NWPPC Clearwater Subbasin Plan, Nov. 2003, p.306-309)

Coho Salmon (extirpated)

Coho salmon are believed to have historically migrated to and spawned in the Clearwater subbasin. The NPT documented the historical presence of ‘cuhlii or kallay’ (coho) in their language and records this species as having been present throughout several streams in the Clearwater subbasin. However, coho runs throughout the Snake River basin were officially declared extinct in 1986. In the Clearwater subbasin, poor passage facilities at the Lewiston Dam (constructed in 1927) are generally accepted as having caused extirpation of coho salmon runs. Efforts were made by the Idaho Department of Fish and Game to reintroduce coho salmon to the Clearwater subbasin between 1962 and 1968, but were curtailed due to lack of success.

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The Nez Perce Tribe currently has a reintroduction program underway for coho salmon in the Clearwater subbasin. Three primary factors may constrain success of coho production in the Clearwater during reintroduction: stock selection, habitat availability, and outof-subbasin mortality related to dams and fisheries.

(NWPPC Clearwater Subbasin Plan, Nov. 2004, p.313)

Pacific lamprey

Pacific lamprey are considered an endangered species by the state of Idaho. Throughout their range in the Columbia River Basin, Pacific lampreys have declined to only a remnant of their pre-1940s populations. Lower Snake dam counts numbered over 30,000 in the late 1960s, but have declined to less than 500 fish in recent years. Currently, an estimated 3% of the lamprey that pass Bonneville Dam are counted at Lower Granite Dam. Based on adult lamprey observations at Lower Granite Dam the current status in the Clearwater subbasin is thought to be extremely depressed. (NWPPC Clearwater Subbasin Plan, Nov. 2004, p.313)

Westslope cutthroat trout (candidate species)

Westslope cutthroat trout were historically the dominant salmonid in streams of northern and central-Idaho, although documentation of status and distribution is limited. In the Lower Clearwater and Lolo/Middle Fork, westslope cutthroat trout were likely abundant throughout the headwaters of mainstem tributaries, with limited use of the mainstem Clearwater River. The upper reaches of both the Potlatch River and Lolo Creek historically maintained healthy populations of westslope cutthroat trout although Potlatch River did not historically support the subspecies. The majority of the South Fork was identified as a historic stronghold for westslope cutthroat. Past distribution and status of the subspecies within the Upper and Lower Selway is thought to have been similar to current conditions, although large fluvial forms may have been more abundant historically. In the Upper and Lower North Fork, westslope cutthroat trout populations are thought to have been historically strong. No information was found on the historic status of westslope cutthroat trout populations in the Lochsa River drainage, although they were thought to exist throughout. (NWPPC Clearwater Subbasin Plan, Nov. 2004, p.319)

Bull trout (threatened, 1998)

The entire Clearwater subbasin lies within the native range of bull trout. However, historic abundance and trend data are scarce because bull trout were considered a nuisance species, and few records of their status were maintained. Historic distribution of fishes in the South Fork Clearwater were probably similar to current distributions, although the status of existing stocks (including bull trout) has declined significantly. Migratory (fluvial) bull trout were likely found throughout the South Fork Clearwater subbasin, with concentrations in mainstem tributaries. Historic abundance and distribution information for bull trout in other areas of the Clearwater subbasin is rare or nonexistent, and existing records do not allow for interpretation of historical distribution or abundance at the subbasin scale. In addition, the connectivity of bull trout populations between assessment units is not known. (NWPPC Clearwater Subbasin Plan, Nov. 2004, p.322-323)

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3. Snake Hells Canyon Subbasin²

The Snake River within the Hells Canyon Snake subbasin is currently inhabited by at least 30 species/races of fish, 23 of which are endemic to the region, bull trout, spring/summer Chinook, fall Chinook, steelhead, sockeye, redband trout, westslope cutthroat trout, white sturgeon, mountain whitefish, Pacific lamprey, peamouth, northern pikeminnow, bridgelip sucker, largescale sucker, chiselmouth, longnose dace speckled dace leopard dace, redband shiner, torrent sculpin, Paiute sculpin, shorthead sculpin, mottled sculpin, common carp, brown bullhead, channel catfish, smallmouth bass, largemouth bass, white crappie, and American shad. A variety of key fish species use the Snake Hells Canyon subbasin during various stages of their lives. Currently, the mainstem Snake River provides upstream and downstream passage (a migration corridor) for all anadromous and many resident salmonids. It is used by fall Chinook and white sturgeon to support all of their life history stages. Subadult bull trout also use the mainstem for rearing and overwintering, whereas use by spring Chinook is less common. Sockeye salmon, use the mainstem Snake River (below the confluence with the Salmon River) during downstream and upstream migration.

Until recently increased returns in 2001 and 2002, the number of natural spawning spring/summer Chinook in the Snake River basin had been at all-time lows with an overall downward trend. Spring Chinook salmon abundance within the Snake Hells Canyon subbasin has likely followed similar long-term trends, although recent increases in overall returns to the Snake River may have been less pronounced within the subbasin due to limited habitat availability. Most Chinook salmon stocks in the remaining accessible habitat are severely depressed and at risk.

Spring Chinook salmon (threatened, Snake River ESU, 6/05)

Historically, Snake River spring and summer Chinook spawned in virtually all accessible and suitable habitat in the Snake River system. A substantial proportion of Columbia Basin spring/summer Chinook were estimated to have originated in the Snake River basin in the late 1800's, with total production probably exceeding 1.5 million in some years. By the mid-1900's, however, the abundance of spring/summer Chinook had declined considerably. Fulton (1968), estimated that an average of 125,000 adults per year entered the Snake River tributaries from 1950 through 1960. Adult counts at the dams show that this value has continued to decline since the 1960's. Chinook habitat in the Snake Hells Canyon subbasin consists of the mainstem Snake River primarily used for migration, and its associated tributaries, some of which support limited spawning and rearing. In addition to a migration route, the mainstem Snake River provides rearing and staging habitat for spring Chinook produced in tributary subbasins. The amount of rearing is unknown.

Fall Chinook salmon (threatened, Snake River ESU, 6/05)

Snake River fall Chinook were historically distributed from the mouth of the Snake River to a natural barrier at Shoshone Falls, Idaho. Swan Falls Dam was the first impoundment to inundate spawning and rearing habitat in 1901, eliminating 385 miles of habitat within the upper river. Following construction of Swan Falls Dam, most production occurred in the 30-mile reach from the dam to Marsing, Idaho. From the late 1950s through the mid-1970s, development and completion of the Snake River hydropower system further reduced available

² Section text from NWPPC Snake Hells Canyon Subbasin Plan, May 2004

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fall Chinook spawning and rearing areas in the free-flowing river reach to approximately 100 miles between the backwaters of Lower Granite Reservoir and Hells Canyon Dam. Although the remaining free-flowing section represents about 17 percent of the historically available river miles, the Hells Canyon reach has never been considered to be the best spawning and rearing habitat. The historically most important spawning and rearing areas were located upstream of Hells Canyon where the river temperatures are regulated by the Thousand Springs inflow and the river is spread in broad gravel riffles compared to the relatively narrow and rocky river section remaining. However, the remaining habitat in Hells Canyon and in the lower reaches of the larger tributaries of this section are now the only areas that this ESU persists. Fall Chinook populations in the Snake Hells Canyon subbasin are depressed but showing considerable improvement following restoration efforts.

Steelhead (threatened, Snake River ESU, 1/06)

Steelhead trout are the most widespread of the selected aquatic focal species in the Snake Hells Canyon subbasin. In Idaho, some of the larger tributaries above the Salmon River confluence with known spawning and rearing populations of summer steelhead include Divide, Wolf, Getta, Kirkwood, Sheep, and Granite creeks, while Granite Creek and Sheep Creek are considered to be priority watersheds. Larger tributaries utilized for spawning and rearing in Oregon include Somers, Temperance and Saddle creeks. Other Idaho and Oregon tributaries used by steelhead include Dry, Highrange, Big Canyon, West, Kurry, Klopton, Corral, Kirby, Kirkwood, Sheep, Bernard, Three, Granite, Deep creeks (all in Idaho), Deep, Cougar, Salt, Sand, Rush, Sluice, Battle, Stud, and Hells Canyon creeks (all in Oregon). No subbasin-specific information is available regarding abundance or trends for steelhead in the Snake Hells Canyon subbasin. Although steelhead stocks are still considered depressed, recent trends in Snake River steelcounts have shown substantially increased numbers since 1999 for both natural and composit (hatchery and natural) runs. Recent run sizes, although much improved relative the past 20 years, are still considered far depressed from historical numbers, and much of the available habitat in the Snake River system remains underseeded.

Coho Salmon (extirpated)

Snake River Sockeye (endangered, Snake River ESU, 6/05)

Snake River sockeye salmon use the lower reaches of the Snake River within the Snake Hells Canyon subbasin as a migration corridor for accessing the Salmon River drainage en route to spawning grounds in the Stanley Basin.

Pacific lamprey

Similar to other anadromous fishes, the distribution and abundance of Pacific lamprey has been reduced due to construction of dams and water diversions, as well as by degradation of spawning and rearing habitats. Historical runs of Pacific lamprey were large, with as many as 400,000 individuals migrating past Bonneville Dam on the lower Columbia River. Counts of lamprey passing Ice Harbor Dam on the Snake River were 40 and 399 in 1993 and 1994, respectively, in contrast to the 1960s when roughly 50,000 were counted annually at the same location. Currently, an estimated 3% of the lamprey that pass Bonneville Dam are counted at Lower Granite Dam. Although Pacific lamprey are found in the Snake River drainage, distribution data specific to the Snake Hells Canyon subbasin are unavailable. Most likely,

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potential use is limited to the mainstem Snake River for migration and larger accessible tributaries for spawning and rearing. There is no evidence that Pacific lamprey used or use the mainstem Snake River for spawning or rearing. No tributaries between Captain John Creek and the mouth of the Salmon River are known to be used by Pacific lamprey for spawning and rearing.

Westslope cutthroat trout (candidate species)

Bull trout (threatened, 1998)

The Snake Hells Canyon subbasin lies within the historic native range of bull trout, although no clear documentation of the historical distribution of bull trout within the subbasin exists. Surveys for bull trout have been conducted throughout the subbasin, with current distribution of bull trout defined in the mainstem Snake River and portions of Granite and Sheep creeks.

4. Salmon River Subbasin³

The Salmon subbasin is known to support 37 species/races of fish (arctic grayling, bluegill, bridgelip sucker, brook trout, bull trout, carp, channel catfish, chiselmouth, fall Chinook, golden trout, kokanee salmon, lake trout, largescale sucker, leopard dace, longnose dace, mottled sculpin, mountain sucker, mountain whitefish, northern pikeminnow, Pacific lamprey, Paiute sculpin, peamouth, rainbow trout, rainbow x cutthroat trout hybrid, redband trout, redband shiner, shorthead sculpin, slimy sculpin, smallmouth bass, sockeye, speckled dace, spring/summer Chinook, summer steelhead, torrent sculpin, westslope cutthroat, and white sturgeon), 26 of which are native and 11 nonnative. Of the 26 native fish species present in the subbasin, 4 are federally listed under the Endangered Species Act (ESA) as threatened (bull trout, spring/summer Chinook salmon, fall Chinook salmon, and steelhead trout) and 1 is listed as endangered (sockeye salmon). A recent broad-scale assessment of the entire Interior Columbia River Basin ecosystem found that the Salmon subbasin provides a core of remaining connected habitat for 5 species of salmonids; bull trout, westslope cutthroat trout, redband trout (sympatric with steelhead trout), Chinook salmon, and summer steelhead trout. The subbasin contains designated critical habitat for the listed Snake River spring/summer Chinook and sockeye salmon, as well as large connected habitats for Pacific anadromous lamprey, white sturgeon, and other native nongame fishes. Critical habitat for bull trout is proposed in the Salmon subbasin.

Fall Chinook (threatened, Snake River ESU, 6/05)

Although there is no historical record of large-scale spawning by fall Chinook in the Salmon River, it is assumed that some spawning occurred when adult escapement was high and environmental conditions were favorable. Fall Chinook salmon returns began steadily declining in the 1970s, reaching low points in the mid-1990s before rebounding slightly in 2000. Fall Chinook are currently found only in the lower mainstem Salmon River.

³ Section text from NWPPC Salmon Subbasin Plan, May 2004.

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Spring/summer Chinook (threatened, Snake River ESU, 6/05)

Spring/summer Chinook are widely distributed throughout the subbasin. In the mid-1900s, the Salmon subbasin produced an estimated 39% of the spring and 45% of the summer Chinook salmon that returned as adults to the mouth of the Columbia River. Spring/summer Chinook salmon returns began steadily declining in the 1970s, reaching low points in the mid-1990s before rebounding slightly in 2000. Portions of the Upper Salmon, Pahsimeroi, Lemhi, Middle Salmon Panther, South Fork Salmon and Little Salmon watersheds are inaccessible to Chinook Salmon due to physical blockage, dewatering or severe water quality limitation. The total number of spring/summer Chinook salmon redds counted in these area surveys ranged from a high of 11,704 in 1957 to a low of 166 in 1995. Land management activities have affected habitat quality for the species in many areas of the subbasin, but spawner abundance declines have been common to populations in both high-quality and degraded spawning and rearing habitats. All the Chinook populations in the Salmon subbasin are in significant decline, at low levels of abundance, and at high risk of localized extinction.

Only one Chinook salmon population was identified in the **Little Salmon River** rainage. Spring Chinook salmon were brought to the Little Salmon River in 1964, as mitigation for the lost run and fishery in the Snake River when the Hells Canyon complex of dams (Brownlee, Oxbow, and Hells Canyon) was constructed. Rapid River (large tributary to the Little Salmon) has a run of wild summer Chinook. The most consistent sport and tribal harvests in the Salmon subbasin in the past two decades have occurred on the hatchery-produced spring Chinook salmon in the Little Salmon River. No redd count or distribution information is available for this population.

Steelhead (threatened, Snake River ESU, 1/06)

Historically, steelhead were widespread in the Salmon subbasin. Spawning occurred in the mainstem rivers and smaller tributaries. Wild B-run steelhead occur in the Middle and South Forks of the Salmon River, which are managed as wild fish sanctuaries (no direct hatchery influence). Wild A-run fish spawn throughout the remainder of the subbasin. Spawner surveys, which have been conducted generally, have been useful for identifying principal spawning areas. Limited spawner escapement information is available from hatchery weirs. Lack of tributary specific adult abundance and distribution information for both A- and B-run steelhead severely limits the ability to manage ESA-listed steelhead in the Salmon subbasin.

Two populations of steelhead were identified in the **Lower Salmon and Little Salmon** watersheds. The Little Salmon River and Lower Salmon River (SRLSR) population includes the Little Salmon watershed and the Lower Salmon River drainage downstream. The Salmon River Chamberlain Creek population extends into the Lower Salmon watershed. Steelhead returning to the Rapid River drainage are counted at the Rapid River Fish Hatchery weir. This population is the only source of population-specific adult abundance data for which a significant portion of the adults in a population were sampled. Abundance has ranged from a high of 221 adults in 1972 to a low of 11 adults in 1999. Density of age 1 parr in the Little Salmon River has been stable over the last 17 years despite the steady decline in adult abundance over the same period.

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Bull trout (threatened, 1998)

Bull trout are well distributed throughout most of the Salmon subbasin in 125 identified local populations located within 10 core areas. Seasonal barriers isolate many small populations of bull trout, and some bull trout populations in the subbasin are locally depressed. Population information is extremely limited.

The Little Salmon River provides for foraging/adult rearing habitat and connectivity between local populations in the core area. Hard, Lake, and Boulder creeks and Rapid River contain spawning and rearing bull trout. Annual runs of fluvial bull trout in the Rapid River drainage have been monitored since 1973, and bull trout abundance data have been collected since 1992. The number of redds located in the headwaters of Rapid River were the greatest, at 33, in 1994, while the lowest numbers (13) were found in 1993. The number of adults passing upstream of a trap near the mouth of Rapid River were the greatest, at 359 adults, in 2001, but lowest, at 112 adults, in 1998.

Sockeye salmon (endangered, Snake River ESU, 6/05)

Historically, Snake River sockeye salmon were found in headwater lakes along tributaries of the Snake River, including five lakes in the upper Salmon River drainage, Payette Lake on the North Fork Payette River, and Wallowa Lake on the Grand Ronde River. Sockeye salmon may have used Warm Lake (South Fork Salmon River). Within the upper Salmon subbasin, sockeye salmon were found in Redfish, Alturas, Pettit, Stanley, and possibly Yellowbelly lakes. Sockeye salmon were blocked from returning to Stanley, Yellowbelly, and Pettit lakes after barriers were installed following chemical treatments with piscicides. The Alturas Lake population was extirpated due to dewatering of Alturas Lake Creek during juvenile and adult migration.

Snake River sockeye salmon populations declined dramatically after 1956. By the 1980s, only Redfish Lake supported a remnant anadromous run. These fish are found seasonally along the migratory corridor between the lake and the mouth of the Salmon River.

Pacific lamprey

The Salmon subbasin supports a remnant population of native anadromous Pacific lamprey. Their historical distribution within the subbasin and elsewhere in Idaho is similar to that of salmon and steelhead. The earliest documented occurrences of anadromous lamprey in Idaho were in the Snake River near Lower Salmon Falls and downstream near Lewiston. In the Salmon subbasin, observations of Pacific lamprey have occurred for the past 50 years. In the late 1950s to early 1960s, thousands of larval lamprey (ammocoetes) were observed in the Lemhi River and common in irrigation canals off the Salmon River near Challis. From 1970 through 2000, small numbers of lamprey were observed or collected at several locations in the Salmon subbasin. Aside from this anecdotal information, little is known about the current status and distribution of Pacific lamprey.

Westslope cutthroat (candidate species)

The native westslope cutthroat subspecies occurs in watersheds throughout the Salmon subbasin. Although the subspecies is still widely distributed and estimated to occur in 85% of its historical range. Most strong populations are associated with roadless and wilderness areas. In Idaho, populations considered strong remain in 11% of the historical range, and it has been

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suggested that genetically pure populations inhabit only 4% of this range, although genetic inventories that would support such a low figure have not been conducted. Many populations have been isolated due to habitat fragmentation from barriers such as dams, diversions, roads, and culverts.

C. Historical anthropogenic impacts to salmonid populations in the region

1. Early 1800's to 1930 (e.g., logging, agricultural development, commercial fishing, canneries).

Although the historical size of the Snake River Chinook salmon population is difficult to estimate, Chapman (1986) estimated that between 2.3 and 3.0 million adult spring/summer Chinook salmon returned to the Columbia River between 1881 and 1895. Declines in Columbia River salmon populations began at the end of the 1800s as a result of overfishing. By the early 1900s, however, environmental degradation from mining, grazing, logging, and agriculture had caused substantial declines. (NWPPC Salmon Subbasin Plan, May 2004, p.2-32)

1. Hydropower development: 1930-1975

- Access to spawning arrears above Hells Canyon Dam was blocked starting in 1955 by a three-dam complex. Although other anadromous species formerly used the area above Hells Canyon Dam, fall Chinook may have been most impacted by impoundment. After construction of the dams, the areas available for spawning included 104 miles of free-flowing Snake River downstream of Hells Canyon Dam and associated tributaries, including the Imnaha, Salmon, Grande Ronde, and Clearwater rivers. An estimated 80% of the Snake River drainage formerly used by fall Chinook salmon for spawning and rearing has been eliminated due to habitat changes or lack of access (NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.136).
- In 1910, Grangeville Electric Light and Power Company built a hydroelectric dam on the South Fork of the Clearwater River at RM 20. Limited steelhead migration was possible over the dam from 1935 to 1949. In 1937, Washington Water Power Company acquired the dam. High flows destroyed the fishway in 1949 and adult salmonid passage was impossible until the removal of the dam in 1963. In 1927, Island Power and Light Company built a hydroelectric dam on the Clearwater River at RM 4 near Lewiston, Idaho. Inadequate adult fish passage at the dam's one fishway virtually eliminated Chinook runs into the basin. Steelhead were able to negotiate the ladder, but the population greatly declined. In 1939, the Island Power and Light Company dam's ownership transferred to Washington Water Power Company, which constructed two additional fishways. Improvements were made to the three fishways in the mid-1960's. In 1973, as part of the Lower Granite Lock and Dam Project, the dam was removed to make Lewiston an inland seaport. Another partial barrier for anadromous fish, a low-head hydroelectric diversion dam on the North Fork Moose Creek (Selway drainage) was removed in the mid-1960's. Dowshak dam was constructed in the late-1960's at RM 2 on

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the North Fork Clearwater river, and completely blocked all anadromous fish migration. (NWPPC Clearwater River Subbasin Salmon and Steelhead Production Plan, 1990, p.5)

- Dworshak Dam is the largest straight axis concrete dam in the United States. The project was authorized primarily for flood control (Mehrhoff and Sather-Blair 1985), with other purposes including power generation, commercial navigation and recreation (USACE 1974). Planning for the dam and reservoir was initiated by the USACE in the 1950s. Authority for construction was contained in Public Law 87-874, Section 201 of the Flood Control Act of 1962 in accordance with House Document 403, 87th Congress, 2nd Session (USACE 1975). On September 27, 1971, the river diversion tunnel was sealed and Dworshak Reservoir was formed (Hanson and Martin 1989). Filling of the reservoir was started in 1972 and power generation began in 1973 (USACE 1974). Located two miles (3 km) above the mouth of the North Fork Clearwater River, the dam blocked fish passage for anadromous fish to spawning habitat that could accommodate 109,000 steelhead trout redds and 74,000 Chinook salmon redds (USFWS 1962). The dam also inundated 16,970 acres (69 km²) of terrestrial and riverine habitats at full pool (USACE 1975). The reservoir provides 13,343 acres (5,400 ha) of kokanee habitat (defined as the area over 49 ft. deep) at full pool. (NWPPC Clearwater Subbasin Plan, Nov. 2003, p.111)
- Three power-generating dams were constructed on rivers in the Salmon subbasin in the early 1900s but have since been removed: Sunbeam Dam on the mainstem Salmon River immediately upstream from the Yankee Fork confluence, a dam across Big Boulder Creek in the East Fork drainage, and a dam on the lower Lemhi River. Constructed in 1910 by the Golden Sunbeam Mining Company, Sunbeam Dam remained intact until 1934. It completely blocked adult anadromous fish for most of the period between 1911 and 1934. The original fish ladder, operating in 1911, proved to be completely ineffective. In 1919, a redesigned fish ladder was installed. Completed in 1920, it reportedly passed adult sockeye salmon during its first year of operation. But between 1921 and 1934, fish passage with the redesigned ladder was reported as doubtful. In 1931, Chinook salmon reportedly began negotiating the abandoned power supply tunnel. In 1934, the rock abutment on the south side of the dam was breached with explosives. (NWPPC Salmon River Subbasin Plan, May 2004, p1-29)
- The Big Boulder Creek dam in the East Fork Salmon drainage was built in 1925. This dam powered the Livingston mine. The dam was removed by the Shoshone-Bannock tribes in 1991, and they are still working to restore the site. In 1907, the first hydro dam was constructed on the Lemhi River about 1 mile above the mouth. In 1909, another dam was constructed just below the first dam. These dams isolated the Lemhi River basin except during high water periods. Both structures operated until 1926 when generating operations were consolidated at a newer plant. Hydropower generation ceased in 1950, and the dams were removed sometime between 1953 and 1956. Before the dams were removed, fish were trapped for commercial and hatchery use. Although hatchery personnel attempted to minimize impacts on the run by restocking a portion of the hatchery fish, the combination of the dams, hatchery, and commercial take contributed to the collapse of the fishery. By the late 1930s, the run had dwindled to about 200 fish. After the dams were removed, the fish runs began to increase. From 1960 to 1965, redd counts by the Idaho Department of Fish and Game averaged 1,200 redds. (NWPPC Salmon River Subbasin Plan, May 2004, p1-30)

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2. *Recent developments: 1975-present*

- Anadromous fish production in the Clearwater subbasin is currently limited by three primary factors: 1) adult escapement of salmon and steelhead is currently limited by out-of-subbasin factors (e.g. dams and ocean conditions) and is insufficient to fully seed available habitat; 2) habitat carrying capacity and fish survival have been reduced within the subbasin by land management activities which impact hydrology, sedimentation, habitat distribution and complexity, and water quality; and 3) Dworshak Dam blocks access to habitat that once produced up to 60% of steelhead and provided excellent spawning and rearing habitat for spring Chinook salmon, and is a limiting factor at the subbasin scale.
- Adult escapement of anadromous species remains low even given significant hatchery production/reintroduction efforts. Low adult abundance in Idaho Supplementation Study streams has resulted in stocking at variable rates between years, depending on the availability of brood fish. Smolt-to-adult return rates (SAR), from smolts at the uppermost dam to adults returning to the Columbia River mouth, averaged 5.2% in the 1960s before hydrosystem completion and only 1.2% from 1977-1994 (Figure 3). This is below the 2%-6% needed for recovery.
- Harvest rates were drastically reduced in the early 1970s in response to declines in upriver stream-type Chinook abundance. Given that changes in smolts per spawner cannot explain the decreases in SAR or overall survival rates for Snake River stocks, it appears the altered migration corridor has had a strong influence on the mortality that causes these differences in stock performance.

(NWPPC Clearwater Subbasin Plan, Nov. 2003, p.342-345)

3. *History of hatcheries in the region*

a) *Clearwater River Subbasin*⁴

- **Dworshak National Fish Hatchery** (NFH) is located at the confluence of the North Fork and the mainstem of the Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead trout caused by the dam and reservoir. The hatchery was designed and constructed by the U.S. Army Corps of Engineers (USACE) and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. At that time, the hatchery had 25 ponds on a single reuse system and 59 other ponds on single-pass water. In 1972, a second phase of construction placed all ponds on three reuse systems with the option of operating on either reuse or single-pass. The hatchery began using only singlepass for the oldest system (25 ponds) in 1986. Present production is 2.3 million smolts at an average size of 200mm in length.

To mitigate for the lost resident sports fishery in the North Fork Clearwater River, the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service agreed that

⁴ Section text from NWPPC Clearwater Subbasin Plan, Nov. 2003, p.330-340.

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100,000 pounds of rainbow trout would be reared at Dworshak NFH for stocking in Dworshak Reservoir annually. During the early years rainbow were produced at Dworshak NFH and stocked directly into the reservoir. Numbers and pounds of fish stocked has varied over the years, but 100,000 pounds per year has never been stocked. The rainbow trout are from sources outside of Idaho and concerns exist about hatchery rainbow trout from Dworshak Reservoir ascending into the North Fork of the Clearwater River to hybridize with native cutthroat trout. Currently, some rainbow are raised at Hagerman NFH and released into reservoirs in southern Idaho. In replacement, the Idaho Department of Fish and Game releases a quantity of rainbow trout into Dworshak Reservoir from a disease free hatchery, and in recent years the trout have been sterile. In addition to rainbow, the USFWS has stocked other species such as small mouth bass and kokanee salmon into Dworshak. Kokanee are now the primary sport fish in the reservoir and are primarily self-sustaining.

- **Kooskia NFH** was authorized by Congress (75 Statute 255) in August 1961 and was built by U.S. Fish and Wildlife Service (USFWS) to raise spring Chinook salmon. The program called for releases of spring Chinook salmon smolts into the Clearwater subbasin to mitigate for fish losses from federal water development projects in the Columbia River Basin. Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and Middle Fork of the Clearwater River and is funded by the USFWS. The Kooskia NFH Spring Chinook Salmon Program was started using a variety of stocks from the Lower Columbia River and Rapid River State Fish Hatchery. However, from 1973 through 1980, smolt releases had a very strong Carson stock influence. Egg transfers of Carson type stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 of a mixed stock, referred to as Clearwater stock (Table 60). Since the Kooskia NFH program already had stock made up primarily of Carson derivatives, the resultant program (1989 and later) is still considered a Carson type stock, and is referred to as Kooskia stock. Length frequency data, ocean age class at return time information, and allele frequencies all support a distinction between Dworshak and Kooskia stocks.

During years with surplus adult hatchery returns, outplanting of adult steelhead or spring Chinook salmon is conducted in areas of agreement between subbasin salmon managers. Streams receiving outplants have past stocking histories, and wild steelhead areas are not stocked. Fish outplanted have originally returned to Dworshak and Kooskia National Fish Hatcheries, Clearwater Hatchery satellites or, in some cases, Rapid River Hatchery (Chinook). These are not part of any program and only occur when there is a surplus.

- **Clearwater Fish Hatchery** was authorized and constructed under the Lower Snake River Compensation Program (LSRCP), and is the newest LSRCP hatchery program in the Snake River basin (The overall Snake River basin LSRCP program is described in USFWS 2001b). The hatchery was completed and became operational in 1990. Clearwater Fish Hatchery serves only incubation and early rearing functions for steelhead and Chinook salmon. All juvenile production is released off site. Dworshak National Fish Hatchery supplies fertilized B-run steelhead eggs for the Clearwater Fish Hatchery steelhead program. Adult spring Chinook salmon trapping and spawning, and juvenile fish final rearing and release are conducted at the hatchery's three satellite facilities. The Powell satellite, located on the Lochsa River was completed in 1989. Red River (completed in 1986) and Crooked River (completed in

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1990) satellites are located in the South Fork Clearwater subbasin. Juvenile fish pond capacities at the satellite facilities are 334,000 at Powell, 334,000 at Red River, and 700,000 at Crooked River. The Chinook salmon total juvenile release target of 1.3695 million fish was intended to return about 12,000 adult spring Chinook salmon back to the LSRCF project area (above Lower Granite Dam). The steelhead total juvenile release target of 2.8 million smolts (8 fish per pound) was intended to return about 14,000 adult steelhead to the LSRCF project area above Lower Granite Dam.

- The **Nez Perce Tribal Hatchery** mitigates for the loss of naturally-reproducing salmon in the Clearwater River subbasin. The overall goal is to produce and release fish that will survive to adulthood, spawn in the Clearwater River subbasin and produce viable offspring that will support future natural production and genetic integrity.
- Initial design and funding for the **Big Canyon Fall Chinook Acclimation Project** occurred under a 1995 Congressional grant organized by Senator Hatfield wherein the U.S. Oregon process provided oversight and direction to the U.S. Army Corps of Engineers to construct facilities. This program designed and constructed three acclimation facilities above Lower Granite Dam to aid in restoring natural spawning Snake River fall Chinook. The Nez Perce Tribe operates and maintains three satellite facilities developed since 1996, 2 on the Snake River and 1 at Big Canyon Creek/Clearwater River confluence. Each satellite acclimates and releases smolts reared at Lyons Ferry Hatchery. Up to 150,000 yearling smolts are acclimated and released each year. Up to 1.8 million subyearling have also been acclimated and released by dividing them between the 3 satellite facilities. All fish are marked for identification as emigrants, and as adult returns they are allowed to ascend above Lower Granite Dam to spawn naturally.
- The Nez Perce Tribe's **Clearwater Coho Restoration Project** started because State and Federal agencies in U.S. v. Oregon PAC (Production Advisory Committee) identified surplus coho eggs not being used for production. A portion of the project is linked to the NMFS Mitchell Act Program calling for restoration of coho stocks for the Tribes upriver of Bonneville Dam. Initial funding was created from BIA 638 budget at the Nez Perce Tribe. Mitchell Act funding occurred in 1999 and 2000. BPA as authorized by NPPC, has provided planning funds in 1998 to present. Additional BIA funds have maintained supplies and transport costs for the past 3 years. Joint in-kind support by USFWS, IDFG and NPT has provided personnel and allowed on-the-job training for NPTH staff during construction. In 1994, PAC, which had 10-14 million surplus eggs; received a request from the Nez Perce Tribe for 800,000 eyed-eggs to be imported annually. This project has expanded to provide annually up to 450,000 coho parr produced at Clearwater Hatchery and 280,000 coho smolts reared at Dworshak with acclimation and release at Kooskia Hatchery. In addition, 570,000 Mitchell Act/USFWS smolts are imported and directly released each year at Lapwai Creek and Potlatch River, approximately half per stream.

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b) Lower Snake River Subbasin⁵

- The **Lyons Fish Hatchery** Complex under the Lower Snake River Compensation Plan is comprised of Lyons Ferry and Tucannon hatcheries, operated by WDFW, and a system of acclimation ponds throughout Southeastern Washington. The Nez Perce Tribe operate three acclimation facilities above Lower Granite Dam for fall Chinook from Lyons Ferry Hatchery, two in the Snake River and one in the Clearwater River. These hatchery and acclimation facilities rear and release fish to compensate for 18,300 Snake River fall Chinook, 1,152 Tucannon River spring Chinook, 4,656 Snake River summer steelhead, and 67,500 angler days of recreation on resident fish. An egg bank program for fall Chinook was initiated in 1976 to preserve genetic material for compensation of 18,300 adults. Production releases from LFH began in the mid-1980s with fish from the egg bank program. Recent releases and returns have increased while the genetic integrity of the stock has been maintained.
- Current management objectives under an interim *US v Oregon* agreement calls for production to support releases of up to 4,250,000 yearlings and subyearlings for LSRCP, IPC, and NPTH programs.
- In 1996, Congress instructed the U.S. Army Corps of Engineers (USCOE) to construct, under the Lower Snake River Compensation Plan (LSRCP), final rearing and acclimation facilities for Chinook in the Snake River basin to complement their activities and efforts in compensating for fish lost due to construction of the lower Snake River Dams. Fisheries co-managers of *U.S. v Oregon* supported and directed the construction and operation of acclimation and release facilities for Snake River fall Chinook from Lyons Ferry Hatchery at three sites above Lower Granite Dam. The Nez Perce Tribe (NPT) played a key role in securing funding and selecting acclimation sites, then assumed responsibility for operation and maintenance of the Fall Chinook Acclimation Facility (FCAP). In 1997, Bonneville Power Administrative (BPA) was directed to fund operations and maintenance (O&M) for FCAP satellites. Two acclimation facilities **Captain John Rapids** and **Pittsburg Landing**, are located on the Snake River between Asotin, WA and Hells Canyon Dam.
- The Capt. John Rapids facility is a single pond while the Pittsburg Landing site consists of portable fish rearing tanks assembled and disassembled each year. Acclimation of 450,000 yearling smolts (150,000 each facility) begins in March and ends 6 weeks later. When available, an additional 2,400,000 fall Chinook sub-yearlings may be acclimated for 6-weeks and released as subyearling smolts.
- Pittsburg Landing satellite is located in the Hells Canyon National Recreation Area near Whitebird, Idaho. The site is located on the Idaho side of the Snake River at River Mile (RM) 215, about 31 miles downstream of Hells Canyon Dam. Captain John Rapids satellite is located on the Snake River between Asotin, Washington and the mouth of the Grand Ronde River at RM 164. The site is on the Washington side of the river, 20 miles upstream of Asotin, with vehicle access provided by the Snake River Road.

⁵ Section text from NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.114-117

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c) Snake Hells Canyon Subbasin

- **Idaho Power Company** is obligated to provide mitigation for lost fish and fishing opportunity resulting from construction of the Hells Canyon Hydroelectric Complex. Under a 1980 FERC settlement agreement, IPC is obligated to produce 400,000 pounds (about 1.8 million fish at 4.5 fish per pound) of steelhead smolts, 4 million spring/summer Chinook smolts and 1 million fall Chinook smolts. Because of poor access and limited remaining habitat in the Snake Hells Canyon subbasin, most of the mitigation releases have been relocated to the Salmon River subbasin. Annually IPC releases about 300,000 spring Chinook smolts and 500,000 steelhead smolts at Hells Canyon Dam. Starting with broodyear 2000, IPC has produced and released a few hundred thousand fall Chinook smolts at Hells Canyon Dam. The fall Chinook smolt release is expected to reach 1 million smolts within the next few years, pending development of facilities and adequate broodstock, and an ongoing negotiation among the management entities for a longterm fall Chinook management plan. (NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.117)

d) Salmon River Subbasin⁶

- The Upper Salmon **Sawtooth Fish Hatchery** spring Chinook program is part of the Lower Snake River Compensation Plan, a goal of which is to return approximately 19,445 adult spring Chinook salmon to the project area above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. Initial facility plans identified production targets of 1.3 million smolts released in the Salmon River at the Sawtooth Fish Hatchery; 700,000 smolts in the East Fork Salmon River; and 300,000 smolts in Valley Creek, a tributary to the Salmon River. Adult return targets were 11,310 adults to the Sawtooth Fish Hatchery, 6,090 adults to the East Fork Salmon River, and 2,045 adults to Valley Creek (all based on a smolt-to-adult return rate of 0.87%). The Valley Creek component of the program has never been implemented. The East Fork Salmon River component was terminated in 1998.
- The Lemhi, East Fork Salmon, and West Fork/Yankee Fork Salmon river programs collectively make up the **Captive Rearing Project for Salmon River Chinook salmon**. The IDFG initiated the captive rearing project to investigate a strategy of preventing cohort collapse by providing captively reared adult spawners to the natural environment. The objectives of this program are to 1) develop and implement culture practices and facility modifications necessary to rear Chinook salmon to adulthood so that they possess morphological, physiological, and behavioral characteristics similar to wild fish and 2) evaluate the spawning behavior and success of these fish under natural conditions in their natal streams. The success of the program depends on developing culture techniques to produce adult Chinook salmon possessing the desired characteristics (defined above) to successfully interact and breed with wild conspecifics or other captively reared individuals.
- Idaho Power Company owns and funds the operation of **Rapid River Fish Hatchery**, located in the Little Salmon River watershed. This facility was constructed in 1964 as part of Idaho Power's mitigation for spring Chinook salmon lost to construction and

⁶ Section text from NWPPC Salmon River Subbasin Plan, May 2004, p.2-89

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operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract. Spring Chinook salmon from the middle Snake River were transplanted as the broodstock source for this program. The goal of this program is to produce 3 million smolts annually for release. Recent Chinook returns from Rapid River Fish Hatchery have produced fish for sport and tribal harvest.

- The Salmon River summer Chinook program at **McCall Fish Hatchery** is part of the Lower Snake River Compensation Plan, a goal of which is to return 8,000 summer Chinook salmon above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. (NWPPC Salmon River Subbasin Plan, May 2004, p.2-86)
- The **Johnson Creek summer Chinook program** is operated by the Nez Perce Tribe. The goal of this project is to prevent the extinction of the Johnson Creek summer Chinook population and begin its rebuilding through supplementation. To achieve this goal, 100,000 Chinook salmon smolts are reared in a Nature's concept hatchery program for releases back into Johnson Creek. Supplementation under this project is planned for a minimum of five full salmon generations or 25 years.
- Idaho Power Company owns and funds the operation of **Pahsimeroi Fish Hatchery**, located in the Pahsimeroi River watershed. This facility was constructed in the mid-1960s as part of Idaho Power's mitigation for spring Chinook salmon lost to construction and operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract and produces steelhead. No spring Chinook salmon were raised or released from this facility after 1987. The goal of this program is to produce one million summer Chinook smolts annually for release.
- The Lower Snake River Compensation Plan has three steelhead programs in the Salmon River basin, the Salmon River A-run steelhead program (Sawtooth Hatchery Steelhead A-run), the East Fork Integrated Steelhead Program, and the Salmon River Basin B-run program (Dworshak Hatchery Steelhead B-run). The goal of the Lower Snake River Compensation Plan is to return approximately 25,000 adult steelhead to the project area above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. The LSRCP A-run steelhead programs (**Sawtooth Fish Hatchery, Magic Valley Fish Hatchery, and Hagerman National Fish Hatchery**) in the Salmon River subbasin are managed and integrated with Idaho Power Company steelhead hatchery programs (**Pahsimeroi Fish Hatchery and Oxbow Fish Hatchery**). The Salmon River A-run steelhead program was designed as an Isolated Harvest Program. However, some broodstock management, eyed-egg production, and smolt production may occur to support ongoing **Shoshone-Bannock Tribes streamside and in stream incubation programs and smolt release programs** for natural production augmentation.
- The **East Fork Salmon natural steelhead program** is an integrated recovery program. The goal of this program is to determine whether hatchery propagation can be used to increase natural fish abundance (e.g., supplementation). It was designed as a small-scale supplementation experiment to spawn a portion of locally returning,

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naturally produced steelhead. Sufficient broodstock are collected (when adult return numbers are adequate) to produce up to 50,000 smolts. Ideally, no more than 50% of unmarked steelhead adults are retained at the East Fork Salmon River satellite for broodstock purposes. Spawning takes place at the East Fork Salmon River satellite facility operated by the Sawtooth Fish Hatchery. Egg incubation through the eyed stage of development occurs at the Sawtooth Fish Hatchery. Eyed-eggs are then shipped to the Magic Valley Fish Hatchery.

- The **Salmon River B-run steelhead program** was developed specifically for fishery enhancement and was not intended to address supplementation objectives. The original management intent was for it to stand alone without the continual infusion of B-run steelhead juveniles produced in the Clearwater River basin. However, this objective has not been met. The B-run steelhead smolts from this program are released in the Little Salmon River, the East Fork Salmon River, Squaw Creek (tributary to the Salmon River), and Squaw Creek.
- Pond. Hatchery-produced, B-run adult steelhead that return to the East Fork Salmon River trap and to Squaw Creek Pond are spawned at the East Fork Salmon River trap. Sawtooth Fish Hatchery, located in the Upper Salmon watershed, is the only facility in the Salmon subbasin that participates in the B-run steelhead program. The out-of-subbasin facilities that are associated with this program are the Magic Valley Fish Hatchery, Clearwater Fish Hatchery, and Dworshak National Fish Hatchery.
- Idaho Power Company owns and funds the operation of **Pahsimeroi Fish Hatchery**, located in the Pahsimeroi River watershed. The facility was constructed in the mid-1960s as part of the Idaho Power's mitigation for anadromous fish production lost to construction and operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract and produces summer Chinook salmon and steelhead. The goals for the Pahsimeroi steelhead program are to release approximately 200,000 pounds of steelhead smolts annually in the Salmon subbasin.
- Due to precipitous declines in the numbers of returning adults, the **captive broodstock program for Snake River sockeye salmon** was started in 1991. The near-term goals for the program are to conserve the genetic resources of the population using captive broodstock technology, prevent extinction, and address demographic and ecological risks associated with extremely low population abundance.
- The Lower Snake River Compensation Plan **rainbow trout program** is mitigation for the loss of angler days brought about because the four lower Snake River dams inundated about 140 miles of spawning habitat. The mitigation goal for this program is to produce approximately 50,000 fingerling rainbow trout (approximately 3,333 pounds or 1,512 kg) for planting in the lower 100 miles (161 km) of the Salmon River and the lower 70 miles (113 km) of the Clearwater River in Idaho.

D. ESUs identified by NMFS and current ESA status

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- **Snake River Spring/Summer Chinook** - threatened, 6/05 (not listed in the Clearwater subbasin).
- **Snake River Fall Chinook** - threatened, 6/05
- **Snake River Steelhead** - threatened, 1/06
- **Snake River Sockeye** – endangered, 6/05

E. Salmonid stocks in the region

1. Stocks identified by state and tribal comanagers

- Dworshak NFH spring Chinook.
- Kooskia spring Chinook.
- South Fork Clearwater spring Chinook.
- Powell spring Chinook.
- Upper Salmon spring Chinook.
- Rapid River spring Chinook.
- Pahsimeroi summer Chinook.
- South Fork Salmon summer Chinook.
- Johnson Creek summer Chinook.
- Dworshak “B” steelhead.
- Upper Salmon River “B” steelhead.
- Sawtooth “A” steelhead.
- East Fork natural “A” steelhead.
- Pahsimeroi “A” steelhead.
- Oxbow “A” steelhead.
- Eagle Creek coho.
- Snake River fall Chinook.

2. “Independent populations” and “major population groups identified by NMFS

a) Snake River Steelhead

The Snake River Steelhead ESU includes both resident and anadromous *Oncorhynchus mykiss* that spawn in the Snake River and its tributaries. These fish are genetically

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differentiated from other interior Columbia steelhead populations; they spawn at higher altitudes (up to 2,000 m) and after longer freshwater migrations (up to 1,500 km). Like other ESUs in the Snake River basin, these populations have been affected by a wide variety of impacts, from the development of the hydropower corridor to habitat degradation and loss to inadvertent negative effects of hatchery practices. Although total abundance is relatively high, the large majority of these fish are of hatchery origin. In addition, the ESU has suffered dramatic declines in at least the last 20 years. As a result of these factors, this ESU was listed as threatened in 1999.

Like steelhead in other areas, fish in this ESU exhibit a wide range of life-history strategies, including varying times of freshwater rearing or ocean residence, or elimination of an ocean residence altogether. Traditionally, two prominent life-history strategies have been recognized in this area. A-run fish are smaller, on average have a shorter freshwater and ocean residence, and apparently begin their up-river migration earlier in the year. B-run fish are larger, spend more time rearing in both fresh and salt water, and appear to begin their up-river migration later in the year. The TRT identified 24 populations in 5 major groupings in this ESU.

(ICTRT, July 2003, p.56-63)

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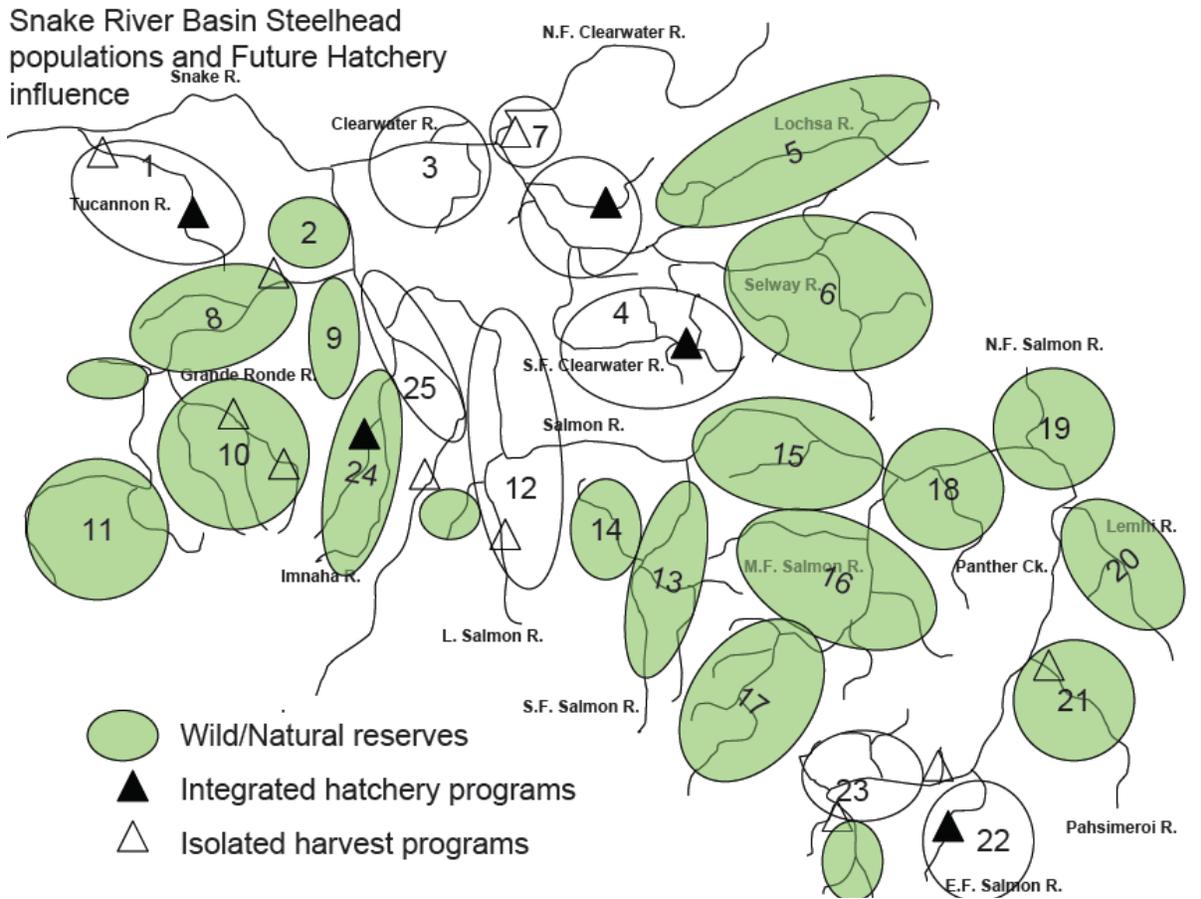


Figure X: Snake River Basin Steelhead Populations and Hatchery Influence (Pollard 2003)

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Snake River Steelhead Major Population Groups (MPG)⁷

Grande Ronde MPG

Lower Grande Ronde. This population includes the mainstem Grande Ronde River and all tributaries (including the outlier Mudd Creek) upstream to the confluence of the Wallowa River, except the Joseph Creek drainage.

Joseph Creek. Spawning areas in Joseph Creek are well separated (67 km) from other spawning aggregations. In addition, samples from the tributaries to Joseph Creek (Chesnimnus and Elk Creeks) form a distinct group in a cluster analysis.

Wallowa River. The Wallowa River population, includes the Minam River, the Lostine River and several smaller tributaries as an independent population. This population includes the outlier Prairie Creek.

Upper Grande Ronde. The remainder of the Grande Ronde drainage, including the mainstem upper Grande Ronde and tributaries Lookingglass Creek, Catherine Creek, and Indian Creek we designate as an independent population.

Imnaha MPG

Imnaha River. This population includes steelhead spawning in the mainstem Imnaha River and all its tributaries.

Hells Canyon MPG

Hells Canyon tributaries. This dependent area includes tributaries to the mainstem Snake in the Hell's Canyon reach, including Granite Creek, Sheep Creek, Deep Creek and others designated as supporting steelhead spawning or rearing.

Lower Snake MPG

Tucannon River. This population includes the Tucannon River, and nearby streams Alkali, Almohta, Penawawa, and Alpowa Creeks. Genetic samples from the upper and lower Tucannon were extremely similar.

Asotin Creek. Fish spawning in this waterway are separated from the genetically similar Tucannon River fish on the basis of distance. The 135 km separating spawning areas in the Tucannon River and Asotin Creek is well over the threshold of 30 km.

Clearwater MPG

Lower Clearwater River (A-run). This population includes the lower portions of the Middle and South Fork Clearwater River and their tributaries. Fish in these areas are all

⁷ Section text from *Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.56-63*

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A-run and are distinguished from the rest of the basin on the basis of this life-history pattern.

South Fork Clearwater River (B-run). The South Fork Clearwater River and its tributaries from Mill Creek upstream are identified as an historically independent population supporting B-run fish.

Lolo Creek (B-run). Few data were available for Lolo Creek: this area was identified as an independent population on the basis of geographic isolation from all but the lower mainstem population and basin size. The lower main stem supports A-run fish, whereas this area currently supports B-run steelhead, supporting this division.

Selway River (B-run). Genetic samples from the Lochsa and Selway Rivers are cluster most closely. Although these areas are not well-separated, each basin covers an enormous area. Given the very few genetic samples from the Selway and Lochsa, the ICTRT designated each as an independent population. This population includes fish spawning in the main stem and all tributaries to the Selway. There is likely to be substantial substructure within this population.

Lochsa River (B-run). The Lochsa population includes the Lochsa River and all tributaries. The ICTRT separated it from the Selway River largely on the basis of basin topography and apparent population size. Like the Selway, there is likely to be substantial substructure within this population.

In addition, the Clearwater River includes one historical population from which the anadromous component has been extirpated.

North Fork Clearwater River (B-run). The anadromous component of this population was extirpated in the wild, but is represented by the Dworshak Hatchery stock, which was derived from fish returning to the passage-blocking Dworshak Dam. The population also includes resident rainbows above Dworshak Dam. These fish are the most consistently genetically divergent samples from the Clearwater basin, supporting designation of this area as an (historical) independent population.

Salmon River MPG

Little Salmon and Lower Salmon tributaries. This population of A-run fish includes the Little Salmon River and its tributaries, as well as steelhead-supporting tributaries to the lower Salmon River, downstream from the mouth of the Little Salmon (Whitebird Creek, Skookumchuck Creek, Slate Creek, and several smaller tributaries).

South Fork Salmon River. This B-run population was defined on the basis of geographic and genetic characteristics. The population includes the South Fork Salmon River and all its tributaries except the Secesh River.

Secesh River. This population, including the mainstem Secesh and its tributaries, was defined primarily on the basis of genetic information. Microsatellite samples from the Secesh were highly differentiated from other South Fork Salmon River.

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Chamberlain Creek. This population, which includes fish spawning in French, Sheep Crooked, Bargamin, and Sabe Creeks, the Wind River and Chamberlain Creek was delineated on the basis of life history and basin topography. All streams in this population are classified as A-run, whereas the populations immediately downstream (South Fork Salmon River) and upstream (lower Middle Fork Salmon River) are classified as B-run.

Lower Middle Fork Salmon River. The lower Middle Fork Salmon River and tributaries, up to and including Loon Creek, were identified as an independent steelhead population.

Upper Middle Fork Salmon River. Geographically separated from other spawning areas, this population delineation was also supported by genetic distance from lower Middle Fork Salmon River samples and a significant habitat break between the two populations. The population includes fish spawning in the Middle Fork main stem and tributaries upstream from Loon Creek.

Panther Creek. This population includes both the Panther and Owl Creek drainages. Anadromous *O. mykiss* in Panther Creek were likely extirpated due to mining impacts by the 1950s. However, Owl Creek was not affected by these activities (and may in recent times have received strays from other Salmon River populations such as the North Fork).

North Fork Salmon River. Few data were available for this population. Designation of this population, which includes Indian Creek, was based primarily on geographic distance of the primary spawning areas from other spawning aggregates and basin topography.

Lemhi River. Lemhi River steelhead were virtually eliminated by a water diversion dam used for hydroelectric power generation at the mouth of the Lemhi, although it is possible that some steelhead gained access to the river during high flows. Steelhead currently found in the Lemhi River drainage are presumably primarily derived from several hatchery stocking efforts. This population includes all tributaries to the Salmon from the mouth of the North Fork Salmon River to the mouth of the Lemhi, as well as the Lemhi River drainage.

Pahsimeroi River. This population includes the Pahsimeroi River and its tributaries, as well as all tributaries to the Salmon River from the mouth of the Lemhi upstream to the Pahsimeroi.

East Fork Salmon River. Spawners in the East Fork Salmon River population, including Herd Creek are geographically close to those in the upper main stem of the Salmon River (7 km). However, there is a significant habitat break at the confluence of the East Fork and mainstem Salmon that was the basis of defining this population.

Upper Mainstem Salmon River. As above, this population, is separated from its nearest neighbor, the East Fork Salmon River population, based on a significant break in habitat type. This population is separated from all other steelhead spawning aggregates by a minimum of 75 km.

Current status of Snake River Steelhead

- The primary concern regarding Snake River steelhead identified in the 1998 status review was a sharp decline in natural stock returns beginning in the mid-1980s. Of 13

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trend indicators at that time, 9 were in decline and 4 were increasing. In addition, Idaho Department of Fish and Game parr survey data indicated declines for both A-run and B-run steelhead in wild and natural stock areas. The high proportion of hatchery fish in the run was also identified as a concern, particularly because of the lack of information on the actual contribution of hatchery fish to natural spawning. The review recognized that some wild spawning areas have relatively little hatchery spawning influence (Selway, lower Clearwater, Middle and South Fork Salmon, and lower Salmon rivers). In other areas, such as the upper Salmon River, there is likely little or no natural production of locally native steelhead. The review identified threats to genetic integrity from past and present hatchery practices as a concern. A concern for the North Fork Clearwater stock was also identified: the stock is currently maintained through the Dworshak Hatchery program but cut off from access to its native tributary by Dworshak Dam. The 1998 review also highlighted concerns for widespread habitat degradation and flow impairment throughout the Snake River basin and for substantial modification of the seaward migration corridor by hydroelectric power development on the Snake and mainstem Columbia rivers. The previous BRT status review noted that the aggregate trend in abundance as measured by ladder counts at the uppermost Snake River dam (Lower Granite Dam, since 1972) has been upward since the mid-1970s, while the aggregate return of naturally produced steelhead was downward for the same period. The decline in natural production was especially pronounced in the later years.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.176)

- Snake River Steelhead *Oncorhynchus mykiss* were listed as threatened under the Endangered Species Act (ESA) on August 18, 1997. In the Snake River Basin, two life history variations, commonly referred to as A-run and B-run are recognized (Busby et al 1996).

Both A-run and B-run steelhead trout exist in the Clearwater subbasin and are included in the Snake River ESU of steelhead trout (Busby et al. 1996). A-run steelhead occupy the lower Clearwater, including the Middle Fork Clearwater and Lower South Fork Clearwater rivers and tributaries (Kiefer et al. 1992). B-run steelhead occupy the Lochsa, Selway, and upper South Fork Clearwater rivers, and were extirpated by Dworshak Dam on the North Fork Clearwater River (Kiefer et al. 1992). B-run steelhead have been documented from only two subbasins in the Columbia River system, the Clearwater and Salmon (Nez Perce Tribe and Idaho Department of Fish and Game 1990).

The only remaining steelhead trout runs in the Clearwater subbasin with limited or no hatchery influence occur in the Lochsa and Selway River systems (B-run) and lower Clearwater River tributaries (A-run; Busby et al. 1996; Idaho Department of Fish and Game 2001). Steelhead trout in other portions of the subbasin have been heavily influenced by hatchery stocking, with the majority originating from Dworshak National Fish Hatchery (Nez Perce Tribe and Idaho Department of Fish and Game 1990).

Wild A-run steelhead trout within the Clearwater subbasin occur only in the lower main stem tributaries (Rich et al. 1992), South Fork Clearwater tributaries up to

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Butcher Creek, and Maggie Creek in the Middle Fork Clearwater (Nez Perce Tribe and Idaho Department of Fish and Game 1990). The Potlatch River and East Fork Potlatch River are considered important streams for production of wild A-run steelhead trout because of their accessibility in relation to the main stem Clearwater (A. Espinosa, personal communication 1999). Wild A-run steelhead trout also occur in Big Canyon, Cottonwood, Lapwai, Mission, Bedrock, and Jacks Creeks (Clearwater National Forest 1997; U.S. Fish and Wildlife Service and Nez Perce Tribe 1995; Kucera and Johnson 1986), with Big Canyon and Cottonwood creeks as the primary aggregates based on available habitat and observed juvenile densities (U.S. Fish and Wildlife Service and Nez Perce Tribe 1997). No hatchery outplanting of A-run steelhead trout has occurred within the Clearwater subbasin, and interbreeding of A-run and hatchery produced B-run steelhead trout is thought to be minimal due to differences in spawn timing (U.S. Fish and Wildlife Service and Nez Perce Tribe 1997).

For reference, year 1990 through 2001 steelhead passage information for Lower Granite Dam is provided below for wild/natural and hatchery-origin B-run steelhead. These data were developed primarily by the Pacific States Marine Fisheries Commission (PSMFC).

(Salmon R. B Steelhead HGMP, Sept. 2002)

Table X. Lower Granite Dam B-run steelhead count data (From IDFG Salmon River B Steelhead HGMP, September 2002)

Lower Granite Dam B-run steelhead count data (1990 – 2001)		
Year	Wild/Natural-Origin	Hatchery-Origin
1990	4,483	22,018
1991	3,180	11,881
1992	5,772	25,566
1993	1,440	16,904
1994	2,444	7,375
1995	1,290	7,573
1996	1,644	12,209
1997	1,327	10,898
1998	2,300	17,446
1999	909	8,827
2000	2,849	17,044
2001	3,050	30,145

Abundance and Productivity of Snake River Steelhead

Estimates of annual returns to specific production areas are not available for most of the Snake River Basin steelhead ESU. Estimates are available for two tributaries below Lower Granite Dam (Tucannon and Asotin creeks). Annual ladder counts at the dam, and associated sampling information, allow for an estimate of aggregate returns to the Snake River basin.

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In addition, area-specific estimates are available for the Imnaha River and two major sections of the Grande Ronde River system. Returns to Lower Granite Dam remained at relatively low levels through the 1990s; the 2001 run size at Lower Granite Dam was substantially higher relative to the 1990s. The recent geometric mean abundance was down for the Tucannon River relative to the last BRT status review. Returns to the Imnaha and Grande Ronde river survey areas were generally higher relative to the early 1990s.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.177-182)

Spatial Structure and Diversity of Snake River Steelhead

In order to determine the distance between spawning aggregates, the ICTRT used spawning areas as identified in Streamnet (2003), modified in a few cases by local data. Real data on the current spatial and temporal distribution of steelhead spawners is sorely lacking, and is fundamental to determining population structure.

Very little life-history information has been collected that would allow comparison of fish from different streams or basins. Of particular interest is information distinguishing A-run and B-run streams; however, all life-history characteristics, from age structure to juvenile migration patterns, are of interest.

(ICTRT, July 2003, p.69)

Habitat of Snake River Steelhead

Tributary habitat conditions vary widely among the various drainages of the Snake River basin. Habitat is degraded in many areas of the basin, reflecting the impacts of forest, grazing, and mining practices. Impacts relative to anadromous fish include lack of pools, higher water temperatures, low water flows, poor overwintering conditions, and high sediment loads. Substantial portions of the Salmon River drainage, particularly in the middle fork, are protected in wilderness areas. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

Hatchery Production of Snake River Steelhead⁸

Almost all artificial production of steelhead in the Snake River Basin ESU has been associated with two major mitigation initiatives—the Lower Snake River Compensation Program (LSRCP) and the mitigation program for Dworshak Dam on the North Fork Clearwater River. LSRCP is administered by the USFWS and was established as compensation for losses incurred as a result of the construction and operation of the four lower Snake River hydroelectric dams. Production under this initiative generally began in the mid-1980s. The Dworshak mitigation program provides for artificial production as compensation for the loss of access to the North Fork Clearwater, a major historical production area. Dworshak Hatchery, completed in 1969, is the focus for that production.

⁸ Section text from *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.187-191.*

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The broodstock for Tucannon River releases was primarily the Lyons Ferry Hatchery stock, which was originally derived from Wells Hatchery and Wallowa Hatchery stocks. ODFW originally derived the Wallowa Hatchery stock by trapping returning adults in the lower Snake River. Pahsimeroi Hatchery stock was used in the program in one year when full production was lost at Lyons Ferry Hatchery due to disease outbreaks, primarily infectious hematopoietic necrosis virus (IHNV). Return rates to the Tucannon River from the hatchery program have been relatively low. Beginning in 1998, the release location for hatchery steelhead was moved downriver in response to studies indicating improved survivals from lower river releases and to minimize the opportunity for interbreeding between hatchery and natural returns (which included listed spring-run Chinook) to the basin. Beginning with the 1999/2000-cycle year, the Tucannon River hatchery steelhead program began evaluating the feasibility of using local broodstock for the program. A full switchover to an endemic broodstock may occur in the future, depending on the success of the pilot program. Problems associated with trapping and rearing of the new broodstock, as well as genetic questions, still need to be addressed.

There are LSRCP steelhead hatchery mitigation releases in the Grande Ronde and Imnaha river systems. The LSRCP compensation objective for Grande Ronde steelhead returns is 9,200. Trapping facilities for adult broodstock are located at Big Canyon Creek acclimation site. The original program used outside broodstock (including Skamania Hatchery stock) from 1979 to 1982 before switching to the Wallowa broodstock. Smolts are acclimated and released at two sites—one within the Wallowa drainage, the other at Big Canyon Creek. Oregon manages the Minam River, Joseph Creek, and Wenaha River drainages for natural production. Other sections of the Grande Ronde River have been outplanted to supplement natural production.

LSRCP program releases into the Imnaha River come from a satellite facility on Little Sheep Creek after primary rearing at Wallowa Hatchery. Additional releases are targeted in Horse Creek and the upper Imnaha River basin.

Steelhead hatchery releases into the Clearwater River basin are managed under two programs—LSRCP and Dworshak Dam mitigation. The Lower Snake Compensation Plan program in the Clearwater River drainage uses the Clearwater hatchery as a central rearing facility and has an overall production objective of 14,000 adult steelhead returns to the Snake River. Program release sites include acclimation ponds on the Powell River (Lochsa River drainage), the Red River, and Crooked River sites in the South Fork Clearwater River. The Dworshak mitigation program has an adult return objective of 20,000 adult steelhead as compensation for losses due to Dworshak Dam, an anadromous block that cuts off the North Fork Clearwater River. Genetics studies have indicated that the hatchery stock used in the Dworshak program may be representative of the original North Fork run.

Steelhead hatchery releases into the Salmon River drainage are under the auspices of two major steelhead hatchery programs—LSRCP and IDFG programs funded by Idaho Power Company. In addition, there are state and tribal experimental supplementation programs in the drainage. The LSRCP program goal for the Salmon River basin is to produce an annual return of 25,000 adult steelhead above Lower Granite Dam. Juvenile steelhead produced at Magic Valley Hatchery and Hagerman National Fish Hatchery are released into the Salmon River drainage. The Idaho Power Company–funded program for steelhead has an objective of releasing 400,000 pounds of steelhead smolts. The Middle Fork

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Salmon River drainages have had minimal or no hatchery releases. The upper Salmon River drainages—the Pahsimeroi, Lemhi, Little Salmon, and Lower Salmon river areas—have received releases in recent years.

b) Snake River Spring/Summer Chinook⁹

The Snake River Spring/Summer Chinook Salmon Evolutionarily Significant Unit (ESU) includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. These stream-type fish rear in freshwater for slightly more than a year before smoltification and seaward migration. Since the late 1800s, the ESU has suffered dramatic declines as a result of heavy harvest pressures, habitat modification and loss, and likely inadvertent negative effects of hatchery practices. More recent declines, since the 1950s, have occurred with the construction of the hydropower system on the Snake and Columbia Rivers. As a result of these declines in abundance, this ESU was listed as threatened under the Endangered Species Act in 1992. Based on genetic and geographic considerations, we established five major groupings in this ESU.

Lower Snake River Tributaries MPG

Tucannon River. Data indicating that Chinook from the Tucannon River are genetically distinct from other upriver stocks are compelling.

Asotin Creek. The ICTRT considered Asotin Creek as an independent population. Spawning habitat in this tributary to the Snake River appears to be sufficient to sustain a viable population (similar to that available in the Tucannon River). In addition, it is substantially isolated from other potential spawning areas, both upstream and downstream.

Grande Ronde Imnaha Rivers MPG

Wenaha River. The Wenaha River fish are genetically and geographically distinct from all other Grande Ronde samples, and are also highly differentiated from other potential northeastern Oregon populations based on timing of smolt migrations.

Wallowa–Lostine River. This population includes the Wallowa River, the Lostine River, Bear Creek and Hurricane Creek.

Minam River. This group is well-separated from most northeastern Oregon tributaries, both genetically and spatially. It is genetically closest to Catherine Creek, but the two areas are isolated by distance.

Catherine Creek. This population includes Catherine and Indian Creeks. Samples from Catherine Creek are well differentiated genetically from other within-basin populations, except for the Minam River, from which it is distinguished by distance (165 km) and timing of juveniles through the main stem.

⁹ Section text from *Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, July 2003, Interior Columbia Basin Technical Recovery Team, p.11-25*

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Upper Grande Ronde. This population includes the upper Grande Ronde River and Sheep Creek. Genetic analysis indicates that fish spawning in this area were likely influenced by earlier outplantings of Rapid River stock (which have been discontinued).

Imnaha main stem. Hatchery and wild collections from the mainstem Imnaha River were genetically indistinguishable. These samples fell within the cluster containing most of the Grande Ronde collections, and were distinct from all but the most closely aligned Lostine River samples.

Big Sheep Creek. This grouping is based on the distance between Big Sheep Creek and Imnaha River primary spawning areas (48 km) and the historically poor demographic correlation between these groups.

The Grande Ronde-Imnaha grouping also includes an historically extirpated population.

Lookingglass Creek. The endemic Chinook in Lookingglass Creek are considered extinct as a result of adult collection of natural fish during the early years of Lookingglass Hatchery operations and extensive and continued natural spawning of Rapid River Hatchery stock in Lookingglass Creek. However, this creek is geographically separated from other spawning areas, and likely had the capacity to support an independent population historically.

South Fork Salmon MPG

South Fork Main Stem. This population includes the South Fork main stem, Poverty Flat and Stolle Meadows. Extending the full length of the South Fork Salmon River and to contiguous minor downstream tributaries to the Little Salmon River.

Secesh River. The Secesh River, including Lake and Lick Creeks is genetically distinguished within the South Fork Salmon River basin at two loci.

East Fork South Fork. This population includes both Johnson Creek and the extirpated upper East Fork South Fork Salmon River.

Middle Fork Salmon MPG

Big Creek. Identified as an independent population based on drainage size and historical escapement, the drainage is only moderately isolated from spawning habitat in the lower main stem of the Middle Fork Salmon River, although primary spawning areas are better separated. Data were insufficient to distinguish between upper, spring-run, and lower, summer-run portions of the drainage.

Lower Middle Fork main stem. Summer Chinook spawning in the Middle Fork Salmon River between Indian Creek and Big Creek were classified as an independent population based on isolation from spawning areas in tributaries.

Camas Creek. Camas Creek and its tributaries are considered an independent population.

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Loon Creek. Loon Creek was identified as an independent population based on high geographic isolation from other potential Middle Fork Salmon River populations.

Pistol Creek. Pistol Creek and adjacent small tributaries (Marble Creek, Indian Creek, and Rapid River) were identified as an aggregate independent population based on low geographic distances within this grouping and large distances to other Middle Fork Salmon River spawning areas.

Sulphur Creek. Little data existed to characterize fish spawning in Sulphur Creek. The ICTRT considered grouping this creek with the Upper Middle Fork main stem. However, the vast majority of spawning in Sulphur Creek occurs in higher elevation meadows, well-separated from other spawning areas. In addition, historical records indicate that spawners were abundant (>500) in this tributary. Due to this isolation and size, we defined Sulphur Creek as an independent population.

Bear Valley Creek. High genetic distances from Middle Fork Salmon River tributaries Marsh Creek and Camas Creek identified Bear Valley Creek (and its tributary Elk Creek) as an independent population.

Marsh Creek. As with Bear Valley and Camas Creeks, multiple sample years indicated that spawners in Marsh Creek were genetically differentiated from nearby spawning aggregates.

Upper Middle Fork main stem. Qualitative habitat differences (hydrology, temperature, elevation, and substrate) from adjacent tributaries led to provisional designation of the Upper Middle Fork main stem as an independent population. Geographic distances from these groups were low (9 km).

Upper Mainstem Salmon River MPG

North Fork Salmon River. The North Fork Salmon River was identified as an independent population based on genetic differentiation from other upper mainstem Salmon River samples. In addition, spawning aggregates in the North Fork are separated from other spawning areas by 63 km.

Lemhi River. An independent population designation for the Lemhi River and Hayden Creek spring Chinook was based largely on geographic distance (102 km).

Pahsimeroi River. Geographic distance and isolation (96 km), coupled with moderate to high genetic differentiation, distinguished Pahsimeroi River summer-run Chinook salmon from other populations. This status was supported by a substantial drainage area and high (2,500) historical estimates of adult abundance.

Upper Salmon lower main stem. This population includes fish spawning in the main stem of the upper Salmon River from the mouth of the Lemhi River to Redfish Lake Creek, as well as tributaries including Thompson and Squaw Creeks. These areas include nearly contiguous spawning aggregates of fish with both summer and spring adult run-timing.

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East Fork Salmon River. The East Fork Salmon River, including Herd Creek, was designated as a single independent population based largely on distance from other spawning aggregates and genetic differentiation from other upper Salmon River samples.

Yankee Fork. Yankee Fork and West Fork Yankee Fork Salmon River spring Chinook salmon

were designated as one independent population based on geographic distance (minimum 49 km) from all other upper Salmon spawning aggregations (except the summer-run lower mainstem spawners) and habitat capacity.

Valley Creek. Valley Creek and its tributaries support both spring and summer-run fish. Although genetic samples from Valley Creek cluster closely with those from the upper Salmon River, this is likely due to the influence of extensive outplanting from the Sawtooth Hatchery (which also clusters with these populations). The bulk of spawning in this population occurs upstream, sufficiently separated from upper Salmon River spawning areas to warrant independent population status. Substantial estimated historical run size (2,500) supports this designation.

Upper Salmon River main stem. This designated independent population includes spawners in the mainstem Salmon River above Redfish Lake Creek and all tributaries to the main stem including Alturas Lake Creek.

The Salmon River also includes one extirpated population.

Panther Creek. Beginning in the 1940s, mining operations in Panther Creek seriously impaired water quality in this tributary to the Salmon River. By the 1970s, the endemic fish had been extirpated. Panther Creek has been stocked several times with hatchery fish from a variety of stocks.

Current Status¹⁰

- The 1991 ESA status review of the Snake River spring/summer-run Chinook salmon ESU concluded that the ESU was at risk. Aggregate abundance of naturally produced Snake River spring and summer Chinook salmon runs had dropped to a small fraction of historical levels. Short-term projections (including jack counts and habitat/flow conditions in the broodyears producing the next generation of returns) were for a continued downward trend in abundance. Risk modeling indicated that if the historical trend in abundance continued, the ESU as a whole was at risk of extinction within 100 years. The review identified related concerns at the population level within the ESU. Given the large number of potential production areas in the Snake River basin and the low levels of annual abundance, risks to individual subpopulations may be greater than the extinction risk for the ESU as a whole. The 1998 Chinook salmon status review summarized and updated these concerns. Both short- and long-term abundance trends had continued downward. The report identified continuing disruption due to the impact of mainstem hydroelectric development, including altered flow regimes and impacts on estuarine habitats. The 1998 review also identified regional habitat

¹⁰ Section text from *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005*, p.36-38.

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degradation and risks associated with the use of outside hatchery stocks in particular areas—specifically including major sections of the Grande Ronde River basin.

Direct estimates of annual runs of historical spring/summer-run Chinook salmon to the Snake River are not available. It was estimated that the Columbia River produced 2.5 million to 3.0 million spring/summer-run Chinook salmon per year in the late 1800s. Total spring/summer-run Chinook salmon production from the Snake River basin contributed a substantial proportion of those returns; the total annual production of Snake River spring/summer-run Chinook salmon may have been in excess of 1.5 million adult returns per year. Returns to Snake River tributaries had dropped to roughly 100,000 adults per year by the late 1960s. Increasing hatchery production contributed to subsequent years' returns, masking a continued decline in natural production.

The Snake River spring/summer-run Chinook salmon ESU includes current runs to the Tucannon River, the Grande Ronde River system, the Imnaha River, and the Salmon River.

The Salmon River system contains a range of habitats used by spring- and summer-run Chinook salmon. The South Fork and Middle Fork Salmon River currently support the bulk of natural production in the drainage. Two large tributaries entering above the confluence of the Middle Fork Salmon River, the Lemhi and Pahsimeroi rivers, drain broad alluvial valleys and are believed to have historically supported substantial, relatively productive anadromous fish runs. Returns into the upper Salmon River tributaries were reestablished following the opening of passage around Sunbeam Dam on the mainstem Salmon River downstream of Stanley, Idaho. Sunbeam Dam in the upper Salmon River was a serious impediment to migration of anadromous fish and may have been a complete block in at least some years before its partial removal in 1934.

Current runs returning to the Clearwater River drainages were not included in the Snake River spring/summer-run Chinook salmon ESU. Lewiston Dam in the lower main stem of the Clearwater River was constructed in 1927 and functioned as an anadromous block until the early 1940s. Spring and summer Chinook salmon runs were reintroduced into the Clearwater system via hatchery outplants beginning in the late 1940s.

- Re-introduction of spring Chinook salmon following removal of the Lewiston Dam has resulted in naturally reproducing runs in Lolo Creek, and mainstems and tributaries of the Lochsa, Selway, and South Fork Clearwater Rivers (Larson and Mobrand 1992). Genetic analyses confirm that existing natural spring Chinook salmon in the Clearwater River subbasin are derived from reintroduced Snake River stocks (Matthews and Waples 1991).

Aerial surveys of spring Chinook salmon redds in the Clearwater subbasin have been conducted since 1966. Number of redds counted from 1966 to 2000 has ranged from 18 to 407 in index areas (see Table 44 of 2003 NPPC subbasin plan on our public site). The subbasin plan identifies the current condition as 1,832 spring Chinook salmon as the natural spawning component for the years 1994-2002, based on redd count data.

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Abundance and Productivity

Aggregate returns of spring-run Chinook salmon (as measured at Lower Granite Dam) showed a large increase over recent year abundances. The 1997–2001 geometric mean return of natural-origin Chinook salmon exceeded 3,700. The increase was largely driven by the 2001 return—estimated to have exceeded 17,000 naturally produced spring-run Chinook salmon—however, a large proportion of the run in 2001 was estimated to be of hatchery origin (88%). The summer run over Lower Granite Dam has increased as well. The 1997–2001 geometric mean total return was slightly more than 6,000. The geometric mean return for the broodyears for recent returns (1987–1996) was 3,076. (Note: This figure does not address hatchery versus wild breakdowns of the aggregate run.). The lowest 5-year geometric mean returns for almost all individual Snake River spring/summer run Chinook salmon production areas were in the 1990s. Sulphur Creek and Poverty Flat production areas had low 5-year geometric mean returns in the early 1980s. Many, but not all, production areas had large increases in return year 2001. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.39-41)

Spatial Structure and Diversity

Dispersal and stray rate information. Since dispersal rates and distance underlie true population boundaries, more data about wild Chinook homing behavior would be extremely useful. In particular, dispersal information collected at relatively small distances (e.g., 10–50 km) would fill a critical data gap.

Spawn-timing data. Spring and summer Chinook are distinguished on the basis of their adult run-timing. However, few data exist to determine whether these fish represent distinct spawning units based on spawn timing or spawn over a continuous and overlapping time period. This information would help refine the boundaries of populations in areas that include both spring and summer runs.

(ICTRT, July 2003, p.72)

Habitat

Tributary habitat conditions vary widely among the various drainages of the Snake River basin. Habitat is degraded in many areas of the basin, reflecting the impacts of forest, grazing, and mining practices. Impacts relative to anadromous fish include lack of pools, higher water temperatures, low water flows, poor overwintering conditions, and high sediment loads. Substantial portions of the Salmon River drainage, particularly in the middle fork, are protected in wilderness areas. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

Hatchery Production and Releases

Spring/summer-run Chinook salmon are produced from a number of artificial production facilities in the Snake River basin. Much of the production was initiated under the Lower Snake River Compensation Plan. Lyons Ferry Hatchery serves as a rearing station for Tucannon River spring-run Chinook salmon broodstock. Rapid River Hatchery and

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McCall Hatchery provide rearing support for a regionally derived summer-run Chinook salmon broodstock released into lower Salmon River areas.

Two major hatchery programs have operated in the upper Salmon Basin—the Pahsimeroi and Sawtooth facilities. Since the mid-1990s, small-scale natural stock supplementation studies and captive breeding efforts have been initiated in the Snake River basin. Historically, releases from broodstock originating outside the basin constituted a relatively small fraction of the total release into the basin. The 1998 Chinook salmon status review identified concerns regarding the use of the Rapid River Hatchery stock reared at Lookingglass Hatchery in the Grande Ronde River basin. The Rapid River Hatchery stock was originally developed from broodstock collected from the spring-run Chinook salmon returns to historical production areas above the Hells Canyon Dam complex.

Use of the Rapid River Hatchery stock in Grande Ronde drainage hatchery programs has been actively phased out since the late 1990s. In addition, a substantial proportion of marked returns of Rapid River Hatchery stock released in the Grande Ronde River have been intercepted and removed at the Lower Granite Dam ladder and at some tributary-level weirs. Carcass survey data indicate significant declines in hatchery contributions to natural spawning in areas previously subject to Rapid River Hatchery stock strays.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

Harvest

Harvest impacts on Snake River spring-run Chinook salmon are generally low. Ocean harvest rates are also low. Historical harvest estimates reflect the impact of mainstem and tributary in-river fisheries. In response to initial declines in returns, in-river harvests of both spring- and summer-run Chinook salmon were restricted beginning in the early 1970s. Fishery impacts were further reduced following ESA listing in 1991, with lower harvest rates from 1991 to 1999. In response to the large increase in returns of spring-run Chinook salmon, additional impacts were allowed beginning in 2000. The management agreement providing for increased impacts as a function of abundance also calls for additional reductions if and when runs drop below prescribed thresholds.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.44)

c) Snake River Fall Chinook MPG¹¹

This ESU includes fish spawning in the lower main stem of the Snake River, and lower reaches of the Clearwater, Imnaha, Grande Ronde, Salmon, and Tucannon Rivers. The Lyons Ferry Hatchery stock, originally derived from returns to the lower Snake River, was included in the ESU. Unlike the other listed Chinook ESUs in the interior Columbia River basin, Snake River fall Chinook exhibit a subyearling, ocean-type life history. These fish return to the Snake River basin in September and October and spawn shortly thereafter. In contrast with stream-type fish, juveniles outmigrate the next summer, rather than rearing in freshwater for 13–14 months before outmigrating. Fish with this life history are well-

¹¹ Section text from ICTRT, July 2003, p.50-51.

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distinguished genetically from stream-type fish. Primarily on the basis of current spawning distribution and abundance, we identified a single population in this ESU.

Snake River Main Stem and Lower Tributaries. A majority (58%) of fish in this population spawn in the mainstem Snake River between the top of Lower Granite Reservoir and Hells Canyon Dam, with the remaining fish distributed among lower sections of the major tributaries. Fish in the mainstem Snake are apparently primarily distributed in a series of aggregates from the Asotin Creek confluence to river km 353, although small numbers have been reported to spawn in the tailraces of the Lower Snake dams. Due to their geographic proximity, and the likelihood that individual tributaries could not support a sufficiently large population, we considered these aggregates and associated reaches in the lower major tributaries to the Snake to be a single population.

The Snake River also includes two extirpated populations above the Hells Canyon Dam complex.

Marsing Reach. This population extends from Swan Falls to Hells Canyon. Hells Canyon was noted as an area of lesser quality for fall Chinook and serves as the break between this population and the Lower Snake population. The Marsing Reach is noted as an area of particularly high production historically. Salmon Falls. This population extends from Swan Falls to Shoshone Falls. The area below American Falls has been noted as an area of high production historically. Shoshone Falls was an impassable barrier to anadromous fishes, and thus is the upper boundary of this population. There is an area of less suitable habitat above Swan Falls that serves as a break between this population and the Marsing Reach population.

Current status

Previous Chinook salmon status reviews identified several concerns regarding Snake River fall-run Chinook salmon: steady and severe decline in abundance since the early 1970s, loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex, increase in nonlocal hatchery contribution to adult escapement over Lower Granite Dam, and relatively high aggregate harvest impacts by ocean and in-river fisheries.

The Lyons Ferry Hatchery Snake River fall-run Chinook salmon broodstock has been used to supply a major natural spawning supplementation effort in recent years. Facilities adjacent to major natural spawning areas have been used to acclimate release groups of yearling smolts. Additional releases of subyearlings have been made in the vicinity of the acclimation sites. The level of subyearling releases depends on the availability of sufficient broodstock to maintain the on-station program and the off-station yearling releases. Returns in 2000 and 2001 reflect increases in the level of off-station plants and relatively high marine survival rates.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.30)

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Abundance and Productivity

The 1999 NMFS status review update noted increases in the Lower Granite Dam counts in the mid-1990s, and the upward trend in returns has continued. The 2001 count over Lower Granite Dam exceeded 8,700 adult fall-run Chinook salmon. The 1997 through 2001 escapements were the highest on record since the count of 1,000 in 1975. Returns of naturally produced Chinook salmon and increased hatchery returns from the Lyons Ferry Hatchery (onstation releases and supplementation program) account for the increase in escapements over Lower Granite Dam. Returns classified as natural origin exceeded 2,600 in 2001. The 1997–2001 geometric mean natural-origin count over Lower Granite Dam was 871 fish, approximately 35% of the delisting abundance criteria proposed for this run (2,500 natural-origin spawners averaged over an 8-year period).

The largest increase in fall-run Chinook salmon returns to the Snake River spawning area was from the Lyons Ferry Hatchery–Snake River stock component. Returns increased from under 200 per year prior to 1998 to over 1,200 and 5,300 adults in 2000 and 2001, respectively. The increase includes returns from the on-station release program as well as returns from large supplementation releases above Lower Granite Dam. Smolt releases from the acclimation sites above Lower Granite Dam were marked. In recent years, large numbers of unmarked subyearling Lyons Ferry Hatchery fall-run Chinook have been released from the acclimation sites. These fish will contribute to adult returns over Lower Granite Dam, complicating the estimation of natural production rates. Escapement over Lower Granite Dam represents the majority of Snake River fall-run Chinook salmon returns. In addition, Snake River fall-run Chinook salmon returns to the Tucannon River system (≤ 100 spawners per year based on redd counts) and to Lyons Ferry Hatchery (recent average returns to the facility have been approximately 1,100 fish per year). Small numbers of fall-run Chinook salmon redds have also been reported in tailrace areas below the mainstem Snake River dams.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.30-33)

Spatial Structure and Diversity

Since the early 1980s, the run has consisted of three major components; unmarked returns of natural origin, marked returns from the Lyons Ferry Hatchery program, and strays from hatchery programs outside of the mainstem Snake River. Although all three components of the fall run have increased in recent years, returns of Snake River–origin Chinook salmon have increased disproportionately to outside hatchery strays. Prior to the 1998–1999 status reviews, the 5-year average contribution of outside stocks to the escapement over Lower Granite Dam exceeded 26.2%. The most recent 5-year average (1997–2001) was 12.4%, with the contribution in 2001 being just over 8%. The drop in relative contribution by outside stocks reflects the disproportionate increase in returns of the Lyons Ferry Hatchery component, the systematic removal of marked hatchery fish at the Lower Granite Dam trap, and modifications to the Umatilla program to increase homing of fall-run Chinook salmon release groups intended to return to the Umatilla River.

One of the concerns leading to the listing of Snake River fall-run Chinook salmon under the ESA was the possibility of significant introgression due to increased straying by outside stocks into the natural spawning areas above Lower Granite Dam. Removal of all

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outside-origin stock at Lower Granite Dam is not feasible—the trapping operation does not handle 100% of the run at the dam, and outside stocks are generally not 100% marked. A genetic analysis of outmigrant smolts produced from spawning above Lower Granite Dam was conducted to evaluate the potential for introgression of outside stocks. Marshall et al. (2000) concluded that distinctive patterns of allelic diversity persisted in the stock, indicating that the natural Snake River Chinook salmon fall run remains a distinct resource.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.30-36)

Major Spawning areas

Historically, the primary fall-run Chinook salmon spawning areas were located on the upper mainstem Snake River. Currently, natural spawning is limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon Dam, the lower reaches of the Imnaha, Grande Ronde, Clearwater, and Tucannon rivers, and small mainstem sections in the tailraces of the lower Snake River hydroelectric dams. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.29)

Hatchery Production and Releases

The Lyons Ferry Hatchery Snake River fall-run Chinook salmon broodstock has been used to supply a major natural spawning supplementation effort in recent years. Facilities adjacent to major natural spawning areas have been used to acclimate release groups of yearling smolts. Additional releases of subyearlings have been made in the vicinity of the acclimation sites. The level of subyearling releases depends on the availability of sufficient broodstock to maintain the on-station program and the off-station yearling releases. Returns in 2000 and 2001 reflect increases in the level of off-station plants and relatively high marine survival rates. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.30)

Harvest

Due to their patterns of ocean distribution and the timing of their spawning run up the Columbia River, Snake River fall-run Chinook salmon are subject to harvest in a wide range of fisheries. Coded-wire tag studies using Lyons Ferry Hatchery fish of Snake River origin indicate that Snake River fall-run Chinook salmon have a broad distribution. Coastal fisheries in California, Oregon, Washington, British Columbia, and southeast Alaska have reported recoveries of tagged fish from the Snake River. The timing of the return and upriver spawning migration of Snake River fall-run Chinook salmon overlaps the Hanford Reach upriver bright Chinook salmon returns, as well as several large hatchery runs returning to lower river release areas or to the major hatcheries adjacent to the lower mainstem Columbia River.

Harvest impacts on Snake River fall-run Chinook salmon declined after listing and have remained relatively constant at approximately 35–40% in recent years. The decline and subsequent listing of Snake River fall-run Chinook salmon prompted major restrictions on U.S. fisheries impacting this stock. In-river gillnet and sport fisheries are “shaped” in time and space to maximize the catch of harvestable hatchery and natural (Hanford Reach)

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stocks while minimizing impacts on the intermingled Snake River fall-run Chinook salmon. Reductions in ocean fishery impacts on Snake River fall-run Chinook salmon resulted from management measures designed to protect weakened or declining stocks specific to each set of fisheries.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.34)

d) Snake River Sockeye MPG

The Snake River Sockeye Salmon ESU had the dubious distinction of being the first Pacific Northwest salmon species to be listed under the Endangered Species Act. Once abundant in a variety of lakes in the Snake River drainage, beginning in the late nineteenth century anadromous sockeye salmon (*Oncorhynchus nerka*) were affected by heavy harvest pressures, unscreened irrigation diversions, and dam construction. In addition, in the 1950s and 1960s, the Idaho Department of Fish and Game actively eradicated sockeye salmon from some locations. As a result of these varied impacts; and the consequent drop in abundance, Snake River sockeye salmon were listed as endangered in November 1991.

Redfish Lake Sockeye. This population includes all the fish in this ESU. Returns to this population have been extremely low for many years, and a captive broodstock program was begun in 1992 to aid in recovery efforts. This program took all 16 anadromous fish that returned to Redfish Lake between 1992 and 1998 into its broodstock program, and maintained progeny throughout their life cycle. In addition, this program has produced outplants of eggs, fry, and adults for Redfish Lake.

(ICTRT, July 2003 p.106)

Current Status

NMFS conducted the first formal ESA status review for salmon in the Pacific Northwest in response to a 1990 petition to list sockeye salmon from Redfish Lake in Idaho as an endangered species. The distinctiveness of this population became apparent early in the process; it spawns at a higher elevation (2,000 m) and has a longer freshwater migration (1,500 km) than any other sockeye salmon population in the world (Waples et al. 1991a). Nor was the precarious nature of the anadromous run in doubt: in the fall of 1990, during the course of the status review, no adults were observed at Lower Granite Dam or entering the lake, and only one fish was observed in each of the 2 previous years. However, a population of kokanee also existed in Redfish Lake, and the relationship between the sockeye and kokanee was not well understood. This issue was complicated by uncertainty regarding the effects of Sunbeam Dam, which stood for over 2 decades about 32 km downstream from Redfish Lake. By all accounts, the dam was a serious impediment to anadromous fish, but opinions differed as to whether it was an absolute barrier. Some argued that the original sockeye population in Redfish Lake was extirpated as a result of Sunbeam Dam and that adult returns in recent decades were simply the result of sporadic seaward drift of kokanee. According to this hypothesis, the original sockeye gene pool was extinct and the remaining kokanee population was not at risk because of its reasonably large size (approximately 5,000 to 10,000 spawners per year). An alternative hypothesis held that the original sockeye salmon population managed to persist in spite of Sunbeam Dam, either by intermittent passage of adults or recolonization from holding

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areas downstream of the dam. The fact that the kokanee population spawns in the inlet stream (Fishhook Creek) in August and September and that all the recent observations of sockeye spawning have been on the lake shore in October and November was cited as evidence that the sockeye and kokanee represent separate populations. According to this hypothesis, the sockeye population was critically endangered and perhaps on the brink of extinction.

Based on results of the status review, NMFS proposed a listing of Redfish Lake sockeye as endangered in April 1991. When finalized in late 1991, this decision represented the first ESA listing of a Pacific salmon population in the Pacific Northwest. At the time of the listing, the only population that the BRT and NMFS were confident belonged in this ESU was the beach-spawning population of sockeye from Redfish Lake. Historical records indicated that sockeye once occurred in several other lakes in the Stanley Basin, but no adults were observed in these lakes for many decades and their relationship to the Redfish Lake ESU was uncertain.

(Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.410-411)

Abundance and Productivity¹²

Four adult sockeye salmon returned to Redfish Lake in 1991; they were taken into captivity to join several hundred smolts collected in spring 1991 as they outmigrated from Redfish Lake. The adults were spawned and their progeny reared to adulthood along with the outmigrants as part of a captive broodstock program, whose major goal was to perpetuate the gene pool for a short period of time (one or two generations) to give managers a chance to identify and address the most pressing threats to the population. As a result of this program and related research, a great deal of new information was gained about the biology of Redfish Lake *O. nerka* and limnology of the lakes in the Stanley Basin. Genetic data collected from the returning adults and the outmigrants showed that they were genetically similar but distinct from the Fishhook Creek kokanee. However, otolith microchemistry data indicated that many of the outmigrants had a resident female parent. These results inspired a search of the lake for another population of resident fish that was genetically similar to the sockeye. These efforts led to discovery of a relatively small number (perhaps a few hundred) kokanee-sized fish that spawn at approximately the same time and place as the sockeye. These fish, termed residual sockeye salmon, are considered to be part of the listed ESU. Subsequent genetic analysis established the following relationships between extant populations of *O. nerka* from the Stanley Basin and other populations in the Pacific Northwest;

- Native populations of *O. nerka* from the Stanley Basin (including Redfish Lake sockeye salmon and kokanee and Alturas Lake kokanee) are genetically quite divergent from all other North American *O. nerka* populations that have been examined.
- Within this group, Redfish Lake sockeye and kokanee are genetically distinct, and Alturas Lake kokanee are most similar to Redfish Lake kokanee.

¹² Section text from *Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005*, p.411-412

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- Two gene pools of *O. nerka* were identified in Stanley Lake—one may be the remnant of a native gene pool that survived rotenone treatments in the lake, while the other can be traced to introductions from Wizard Falls Hatchery in Oregon.
- No trace of the original gene pool of *O. nerka* has been found in Pettit Lake.

The population that spawned in Pettit Lake in recent decades can be traced to introductions of kokanee from northern Idaho; those populations in turn can be traced to stock transfers of Lake Whatcom (Washington) kokanee early in the last century. Between 1991 and 1998, 16 naturally produced adult sockeye salmon returned to the weir at Redfish Lake and were incorporated into the captive broodstock program. This program, overseen by the Stanley Basin Sockeye Technical Oversight Committee, produced groundbreaking research in captive broodstock technology and limnology. The program used three different rearing sites to minimize chances of catastrophic failure and produced several hundred thousand eggs and juveniles, as well as several hundred adults, for release into the wild. The program reached a milestone in 2000, when more than 200 adults from the program returned to Redfish Lake. Currently, the captive broodstock program is being maintained as a short-term safety net, pending decisions about longer-term approaches to recovery of the ESU.

Spatial Structure and Diversity

The Snake River Salmon Recovery Team suggested that to be considered recovered under ESA, the Snake River sockeye salmon ESU should have viable populations in three different lakes, with at least 1,000 naturally produced spawners per year in Redfish Lake and at least 500 in each of two other Stanley Basin lakes. As a step toward addressing this recommendation, progeny from the Redfish Lake captive broodstock program were released in Pettit and Alturas lakes as well. In 1991, about 100 outmigrants from Alturas Lake were collected at the same time as the Redfish Lake outmigrants and reared to maturity as a separate population in captivity. However, because of funding and space limitations and uncertainties about priorities for propagating this population, the resulting adults were released into the lake rather than being kept for spawning and another generation of captive rearing. Because the Alturas Lake kokanee spawn earlier than Redfish Lake sockeye salmon, and the kokanee spawn in the inlet stream, it is hoped that the introduction of Redfish Lake sockeye into Alturas Lake will not adversely affect this native gene pool. (Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, June 2005, p.413-414)

F. Current regional management objectives for salmonid resources

1. Clearwater Subbasin¹³

Table 3. Anadromous adult return objectives for the Clearwater subbasin¹.

Species	Goals	Long-term Return ²	Natural Spawning Component ³	Hatchery Component ⁴		Harvest Component
				Broodstock Need	Rack Return	
Spring Chinook	Future	60,000 ⁵	∞10,000	5,000	Undefined	45,000 ⁶
	Existing Condition	≈11,802	1,832 ⁷	4,800 ⁸	4,311 ⁹	5,170 ¹⁰
Fall Chinook	Future	50,000	Up to 10,000	5,000	Undefined	Up to 35,000
	Existing Condition	477 ¹¹	1,019 ¹²	1,300 ¹³	0	0
Coho ¹⁴	Future	14,000	Undefined	1,650	Undefined	Undefined
	Existing Condition	512 ¹⁵	52 ¹⁶	Undefined	339 ¹⁷	0
B-run Steelhead ¹⁸	Future	42,000-91,000	∞12,000	5,000	Undefined	25,000-74,000
	Existing Condition	≈16,642	Unknown	4,000 ¹⁹	5,520 ²⁰	12,642 ²¹
A-run Steelhead	Future	5,900-10,000 ²²	4,900 ²³	0	0	1,000
	Existing Condition	Unknown	Unknown	0	0	0
Lamprey ²⁴	Future	10,000-20,000	Unknown	Undefined	Undefined	Undefined
	Existing Condition	Unknown	Unknown	0	0	0
Sturgeon ²⁵	Future	Undefined	Undefined	Undefined	Undefined	Undefined
	Existing Condition	Unknown	Unknown	0	0	0

¹ Goals are derived from various management plans as described in Appendix A, Table 8 of this plan and do not imply consensus by all management agencies. This table merely gives direction to managers who must work out the restoration and recovery of each specie and population over time through implementation of the plan.

² Clearwater River Subbasin Production Plan 1990. Appendix A, Table 8 of this plan provides the opinions of various management documents as to what the long-term return goal should be. Most values displayed here were derived from the Tribal Recovery Plan, CRITFC (1996).

³ Intensive chinook spawning grounds redd count data from 24 streams from 1994-2002.

⁴ Total rack returns for hatchery broodstock and adult outplants to selected streams.

⁵ Adult return objectives are 9,135 for Dworshak National Fish Hatchery and 11,915 for Clearwater Fish Hatchery (Lower Snake River Compensation Plan), 3,000 Kooskia National Fish Hatchery (U.S. Fish and Wildlife Service), and 1,500 Nez Perce Tribal Hatchery for a total 25,550 hatchery adult chinook. While these are numerical goals, actual recovery levels may vary.

⁶ The harvest component was derived from utilization objectives developed for the 1990 Clearwater River Subbasin Production Plan wherein planners worked with a Public Advisory Committee to derive long-term objectives for non-tribal utilization with an equal share subsequently added for tribal utilization.

⁷ Intensive spawning ground redd count data from 24 streams from 1994-2002 (comparable years from 3 different sources); using a 2.31 fish/redd expansion rate from PATH (Beamesderfer, et al. 1998); total adults were summed for all streams by individual year and then an average taken for 1994-2002.

⁸ Broodstock estimated for Dworshak (1200), Kooskia (700), Clearwater (1,800) and Nez Perce Tribal (528) hatcheries to meet both on station and satellite releases within the subbasin; total estimate 4,756 adults at 1:1 male to female ratio.

⁹ Average hatchery return, all Clearwater drainage weirs and hatchery racks, 1994-2002.

¹⁰ Idaho Department of Fish and Game Harvest reports 1994-2002 for sport harvest of hatchery chinook and Nez Perce Tribe unpublished creel census data for tribal harvest. Total sport and tribal harvest was summed by individual year in which seasons were held between 1994-2002, and then an average taken. Value is a minimum as not all Clearwater drainage tribal harvest is recorded.

¹¹ Redd count data expansion 1999-2002 (NPT - unpublished data).

¹³ Section text from NWPPC Clearwater Subbasin Plan 2003

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- ¹² Intensive spawning ground redd count data from the NPT Clearwater river from 1994-2002 (comparable to spring chinook time series); uses a 6.13 fish/redd average number from the Snake River calculated over a 10-year period (Arnsberg – unpublished data); total adults were estimated by year and then averaged for 1994-2002.
- ¹³ Broodstock estimated to provide NPTH production of 1.4 million Age-0 smolts and FCAP production of 150,000 Age-1 and 500,000 Age-0 smolts within the subbasin. Survival/mortality factors can be found in the AOP production documents. Current broodstock comes from Lyons Ferry Hatchery and Lower Granite Dam. Future broodstock sources could include capture at NPTH sites in addition to captures at the dam and Lyons Ferry.
- ¹⁴ Nez Perce Tribe's Clearwater Coho Restoration Management Plan is currently being developed and will scope ranges to allow management of this population.
- ¹⁵ Average number of coho recognized at Lower Granite Dam from 1997 through October 24, 2003 (NPT unpublished data).
- ¹⁶ Redd count expansion for 2001-2002 from coho M&E by NPT – unpublished data.
- ¹⁷ A 4-year average for coho broodstock collected in the subbasin from 1999-2002; rack returns have ranged from 45 to 635 fish, a composite of females, males and jacks.
- ¹⁸ There is agency concern regarding the accuracy of this future management and harvest goal; the current artificial adult goal is 34,000 for Dworshak and Clearwater hatcheries combined; TAC (1985) estimated wild B-run escapement at 10,000 with 80% designated for the Clearwater River; therefore the future B-run escapement goal for both hatchery and wild may range from 42,000 upwards to 91,000. Harvest goal estimates differ similarly ranging from 25,000-74,000. Infinite detail as to how this difference will be achieved is not explained in this plan but must be worked out after implementation of the plan.
- ¹⁹ Steelhead broodstock estimate for Clearwater and Dworshak Hatchery releases in the Clearwater basin.
- ²⁰ Average hatchery return, all Clearwater drainage weirs and hatchery racks, 1987-2003.
- ²¹ Idaho Department of Fish and Game Harvest reports 1987-2002 for sport harvest of hatchery steelhead and Nez Perce Tribe unpublished creel census data for tribal harvest. Total sport and tribal harvest was summed by individual year and then an average taken for 1987-2002.
- ²² Managers do not agree on the future population size; they do agree on a range estimate of 5,900 to 10,000 until better information is obtained on actual population size potentials. NPT Fisheries staff estimate is higher based on professional opinion after inventories from streams in 1980's.
- ²³ NOAA Interim abundance goal; dependent on which tributaries are included in the estimate; Tom Cooney for further discussion.
- ²⁴ Lamprey populations are not yet determined; future research to establish a program to restore and monitor a recovered population is needed; some historical counts at Snake River dams documented up to 30,000 adults; Appendix A, Table 8 identifies an Interim abundance goal of 10,000 based on 1960's counts of 30,000 at Snake River dams.
- ²⁵ Some managers believe sturgeon once played a role in the anadromous system of the Clearwater but no history exists; research has been ongoing since 1996 and a Benefit Risk Assessment Team will be convened in 2003 to assess and recommend management actions from the current population research program that studied sturgeon upstream of Lower Granite Dam since 1996.

Idaho Department of Fish and Game

The Idaho Department of Fish and Game operates the Clearwater Fish Hatchery, located at the mouth of the North Fork Clearwater River. Clearwater Fish Hatchery was authorized and constructed under the Lower Snake River Compensation Program (LSRCP), and is the newest LSRCP hatchery program in the Snake River basin. The hatchery was completed and became operational in 1990. The implementation of the Clearwater Fish Hatchery program was guided by the following management objectives: 1) restore and maintain natural spawning populations, 2) reestablish historic recreational and tribal fisheries, 3) establish total adult returns that meet LSRCP goals, 4) operate the hatchery programs so that genetic and life history characteristics of hatchery fish mimic wild fish, and 5) minimize impacts on resident stocks of game fish. The IDFG strongly emphasizes maintaining selective fisheries with the steelhead and Chinook salmon programs. Clearwater Fish Hatchery also produces steelhead and Chinook salmon juveniles for release as part of the Idaho Supplementation Studies (Chinook salmon) and Steelhead Supplementation Studies projects occurring in the subbasin. The Clearwater Fish Hatchery salmon and steelhead artificial production programs conform to statewide fisheries policies and management goals identified in the 2001-2006 Fisheries Management Plan.

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Nez Perce Tribe

The Nez Perce Tribal Hatchery mitigates for the loss of naturally-reproducing salmon in the Clearwater River subbasin. The overall goal is to produce and release fish that will survive to adulthood, spawn in the Clearwater River subbasin and produce viable offspring that will support future natural production and genetic integrity. Several underlying purposes of fisheries management will be maintained through this program:

- Protect, mitigate, and enhance Columbia River subbasin anadromous fish resources
- Develop, reintroduce, and increase natural spawning populations of salmon within the Clearwater River subbasin
- Provide long-term harvest opportunities for Tribal and non-Tribal anglers within Nez Perce treaty lands within four generations (20 years) following project completion
- Sustain long-term fitness and genetic integrity of targeted fish populations
- Keep ecological and genetic impacts to nontarget populations within acceptable limits
- Promote Nez Perce Tribal management of Nez Perce Tribal hatchery facilities and production areas within Nez Perce treaty lands.

In the Nez Perce Tribal Hatchery Master Plan, propose the restoration of spring, summer and fall Chinook as the principle management strategy. The Nez Perce Tribe Office of Legal Counsel has released documents which are part of the Snake River Basin Adjudication instream flow claims in which Tribal members and others substantiate the fishery resources used historically and presently by the Nez Perce Tribe. These documents, substantiate the presence of anadromous and resident species that historically occurred in the Clearwater subbasin prior to dams, irrigation, and other commercial practices that lead to their demise. Based on these documents, species which would constitute an all species, stock and population approach to recovery and restoration for the Clearwater River subbasin would include; Spring Chinook Salmon, Summer Chinook Salmon, Fall Chinook Salmon, to include an “early”-type, A-type (run) Steelhead Salmon, B-type (run) Steelhead Salmon, Coho Salmon, Sturgeon, Pacific Lamprey, and resident species including bull trout, westslope cutthroat trout, suckers, etc.

Initial design and funding of the Fall Chinook Acclimation Project, Big Canyon Acclimation Site occurred under a 1995 Congressional grant organized by Senator Hatfield wherein the U.S. Oregon process provided oversight and direction to the U.S. Army Corps of Engineers to construct facilities. This program designed and constructed three acclimation facilities above Lower Granite Dam to aid in restoring natural spawning Snake River fall Chinook. The Nez Perce Tribe operates and maintains three satellite facilities developed since 1996, two on the Snake River and one at Big Canyon Creek/Clearwater River confluence. Each satellite acclimates and releases smolts reared at Lyons Ferry Hatchery. Up to 150,000 yearling smolts are acclimated and released each year. Up to 1.8 million subyearling have also been acclimated and released by dividing them between the 3 satellite facilities. All fish are marked for identification as emigrants, and as adult returns they are allowed to ascend above Lower Granite Dam to spawn naturally. Present adult response indicates a major increase in redd

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counts and smolt emigration counts. The goals and objectives of this program are identical to those shown under the Nez Perce Tribal Hatchery project.

The Nez Perce Clearwater Coho Restoration Project started because State and Federal agencies in *U.S. v. Oregon PAC* (Production Advisory Committee) identified surplus coho eggs not being used for production. A portion of the project is linked to the NMFS Mitchell Act Program calling for restoration of coho stocks for the Tribes upriver of Bonneville Dam. Initial funding was created from BIA 638 budget at the Nez Perce Tribe. Mitchell Act funding occurred in 1999 and 2000. BPA as authorized by NPPC, has provided planning funds in 1998 to present. Additional BIA funds have maintained supplies and transport costs for the past 3 years. Joint in-kind support by USFWS, IDFG and NPT has provided personnel and allowed on-the-job training for NPTH staff during construction. In 1994, PAC, which had 10-14 million surplus eggs; received a request from the Nez Perce Tribe for 800,000 eyed-eggs to be imported annually. This project has expanded to provide annually up to 450,000 coho parr produced at Clearwater Hatchery and 280,000 coho smolts reared at Dworshak with acclimation and release at Kooskia Hatchery. In addition, 570,000 Mitchell Act/USFWS smolts are imported and directly released each year at Lapwai Creek and Potlatch River, approximately half per stream. A multiphased approach is proposed to enhance the recovery of this species in a Master Plan being rewritten at this time. Adult returns from this program have occurred in 1997, 1998, 1999, and 2000. Broodstock from returning adults has been incorporated to replace the out-of-basin eggs take in 1999 and 2000 and has provided 3/8ths and 5/8ths of the eggs needed in 1999 and 2000, respectively. The 2001 adult returns are anticipated to meet all egg import needs and perhaps to partially replace the need to import smolt broodstock. Completion of the Clearwater Coho Master Plan is anticipated to occur in conjunction with the Provincial Review and Subbasin Assessment process being conducted by the NPPC. The goals and objectives of this program are identical to those shown under Nez Perce Tribal Hatchery project above.

U.S. Fish and Wildlife Service

Dworshak National Fish Hatchery (NFH) is located at the confluence of the North Fork and the mainstem of the Clearwater River near Ahsahka, Idaho. Construction of the hatchery was included in the authorization for Dworshak Dam and Reservoir (Public Law 87-847, October 23, 1962) to mitigate for losses of steelhead trout caused by the dam and reservoir. The hatchery was designed and constructed by the U.S. Army Corps of Engineers (USACE) and has been administered and operated by the U.S. Fish and Wildlife Service since the first phase of construction was completed in 1969. At that time, the hatchery had 25 ponds on a single reuse system and 59 other ponds on single-pass water. In 1972, a second phase of construction placed all ponds on three reuse systems with the option of operating on either reuse or single-pass. The hatchery began using only single pass for the oldest system (25 ponds) in 1986. Present production is 2.3 million smolts at an average size of 200mm in length.

Kooskia NFH was authorized by Congress (75 Statute 255) in August 1961 and was built by U.S. Fish and Wildlife Service (USFWS) to raise spring Chinook salmon. The program called for releases of spring Chinook salmon smolts into the Clearwater subbasin to mitigate for fish losses from federal water development projects in the Columbia River Basin. Kooskia NFH is located about 1.5 miles southeast of Kooskia, Idaho, near the confluence of Clear Creek and Middle Fork of the Clearwater River and is funded by the USFWS.

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In June 1982, under the Lower Snake River Compensation Plan (LSRCP), Dworshak NFH was expanded from its primary function as a steelhead mitigation facility to include spring Chinook salmon (*Oncorhynchus tshawytscha*). The COE was authorized by Congress in 1976 to implement the LSRCP in accordance with the Water Resources Development Act of 1976 (Public Law 94-587) to offset losses of anadromous fish in the Snake River basin caused by the four dam and navigation lock projects in the Lower Snake River. The spring Chinook salmon program at Dworshak was intended to replace lost sport and Tribal fisheries in the Clearwater River [DNFH CHMP, p. 12].

2. Lower Snake River Subbasin¹⁴

The **Lyons Fish Hatchery** Complex under the Lower Snake River Compensation Plan is comprised of Lyons Ferry and Tucannon hatcheries, operated by WDFW, and a system of acclimation ponds throughout Southeastern Washington. The Nez Perce Tribe operate three acclimation facilities above Lower Granite Dam for fall Chinook from Lyons Ferry Hatchery, two in the Snake River and one in the Clearwater River. These hatchery and acclimation facilities rear and release fish to compensate for 18,300 Snake River fall Chinook, 1,152 Tucannon River spring Chinook, 4,656 Snake River summer steelhead, and 67,500 angler days of recreation on resident fish. An egg bank program for fall Chinook was initiated in 1976 to preserve genetic material for compensation of 18,300 adults. Production releases from LFH began in the mid-1980s with fish from the egg bank program. Recent releases and returns have increased while the genetic integrity of the stock has been maintained

Current management objectives under an interim *US v Oregon* agreement calls for production to support releases of up to 4,250,000 yearlings and subyearlings for LSRCP, IPC, and NPTH programs.

In 1996, Congress instructed the U.S. Army Corps of Engineers (USCOE) to construct, under the Lower Snake River Compensation Plan (LSRCP), final rearing and acclimation facilities for Chinook in the Snake River basin to complement their activities and efforts in compensating for fish lost due to construction of the lower Snake River Dams. Fisheries co-managers of *U.S. v Oregon* supported and directed the construction and operation of acclimation and release facilities for Snake River fall Chinook from Lyons Ferry Hatchery at three sites above Lower Granite Dam. The Nez Perce Tribe (NPT) played a key role in securing funding and selecting acclimation sites, then assumed responsibility for operation and maintenance of the Fall Chinook Acclimation Facility (FCAP). In 1997, Bonneville Power Administrative (BPA) was directed to fund operations and maintenance (O&M) for FCAP satellites. Two acclimation facilities, **Captain John Rapids** and **Pittsburg Landing**, are located on the Snake River between Asotin, WA and Hells Canyon Dam.

The Capt. John Rapids facility is a single pond while the Pittsburg Landing site consists of portable fish rearing tanks assembled and disassembled each year. Acclimation of 450,000 yearling smolts (150,000 each facility) begins in March and ends 6 weeks later. When available, an additional 2,400,000 fall Chinook sub-yearlings may be acclimated for 6-weeks and released as subyearling smolts.

¹⁴ Section text from NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.114-117.

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Pittsburg Landing satellite is located in the Hells Canyon National Recreation Area near Whitebird, Idaho. The site is located on the Idaho side of the Snake River at River Mile (RM) 215, about 31 miles downstream of Hells Canyon Dam. Captain John Rapids satellite is located on the Snake River between Asotin, Washington and the mouth of the Grand Ronde River at RM 164. The site is on the Washington side of the river, 20 miles upstream of Asotin, with vehicle access provided by the Snake River Road.

3. Snake Hells Canyon Subbasin

Idaho Power Company is obligated to provide mitigation for lost fish and fishing opportunity resulting from construction of the Hells Canyon Hydroelectric Complex. Under a 1980 FERC settlement agreement, IPC is obligated to produce 400,000 pounds (about 1.8 million fish at 4.5 fish per pound) of steelhead smolts, 4 million spring/summer Chinook smolts and 1 million fall Chinook smolts. Because of poor access and limited remaining habitat in the Snake Hells Canyon subbasin, most of the mitigation releases have been relocated to the Salmon River subbasin. Annually IPC releases about 300,000 spring Chinook smolts and 500,000 steelhead smolts at Hells Canyon Dam. Starting with broodyear 2000, IPC has produced and released a few hundred thousand fall Chinook smolts at Hells Canyon Dam. The fall Chinook smolt release is expected to reach 1 million smolts within the next few years, pending development of facilities and adequate broodstock, and an ongoing negotiation among the management entities for a longterm fall Chinook management plan. (NWPPC Snake Hells Canyon Subbasin Plan, May 2004, p.117)

4. Salmon River Subbasin¹⁵

Chinook

The Upper Salmon **Sawtooth Fish Hatchery** spring Chinook program is part of the Lower Snake River Compensation Plan, a goal of which is to return approximately 19,445 adult spring Chinook salmon to the project area above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. Initial facility plans identified production targets of 1.3 million smolts released in the Salmon River at the Sawtooth Fish Hatchery; 700,000 smolts in the East Fork Salmon River; and 300,000 smolts in Valley Creek, a tributary to the Salmon River. Adult return targets were 11,310 adults to the Sawtooth Fish Hatchery, 6,090 adults to the East Fork Salmon River, and 2,045 adults to Valley Creek (all based on a smolt-to-adult return rate of 0.87%). The Valley Creek component of the program has never been implemented. The East Fork Salmon River component was terminated in 1998.

The Lemhi, East Fork Salmon, and West Fork/Yankee Fork Salmon river programs collectively make up the **Captive Rearing Project for Salmon River Chinook salmon**. The IDFG initiated the captive rearing project to investigate a strategy of preventing cohort collapse by providing captively reared adult spawners to the natural environment. The objectives of this program are to 1) develop and implement culture practices and facility modifications necessary to rear Chinook salmon to adulthood so that they possess morphological, physiological, and behavioral characteristics similar to wild fish and 2)

¹⁵ Section text from NWPPC Salmon River Subbasin Plan, May 2004, p.2-89.

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evaluate the spawning behavior and success of these fish under natural conditions in their natal streams. The success of the program depends on developing culture techniques to produce adult Chinook salmon possessing the desired characteristics (defined above) to successfully interact and breed with wild conspecifics or other captively reared individuals.

Idaho Power Company owns and funds the operation of **Rapid River Fish Hatchery**, located in the Little Salmon River watershed. This facility was constructed in 1964 as part of Idaho Power's mitigation for spring Chinook salmon lost to construction and operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract. Spring Chinook salmon from the middle Snake River were transplanted as the broodstock source for this program. The goal of this program is to produce 3 million smolts annually for release. Recent Chinook returns from Rapid River Fish Hatchery have produced fish for sport and tribal harvest.

The Salmon River summer Chinook program at **McCall Fish Hatchery** is part of the Lower Snake River Compensation Plan, a goal of which is to return 8,000 summer Chinook salmon above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams.

The **Johnson Creek summer Chinook program** is operated by the Nez Perce Tribe. The goal of this project is to prevent the extinction of the Johnson Creek summer Chinook population and begin its rebuilding through supplementation. To achieve this goal, 100,000 Chinook salmon smolts are reared in a Nature's concept hatchery program for releases back into Johnson Creek. Supplementation under this project is planned for a minimum of five full salmon generations or 25 years.

Idaho Power Company owns and funds the operation of **Pahsimeroi Fish Hatchery**, located in the Pahsimeroi River watershed. This facility was constructed in the mid-1960s as part of Idaho Power's mitigation for spring Chinook salmon lost to construction and operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract and produces steelhead. No spring Chinook salmon were raised or released from this facility after 1987. The goal of this program is to produce one million summer Chinook smolts annually for release.

Steelhead

The Lower Snake River Compensation Plan has three steelhead programs in the Salmon River basin, the Salmon River A-run steelhead program (Sawtooth Hatchery Steelhead A-run), the East Fork Integrated Steelhead Program, and the Salmon River Basin B-run program (Dworshak Hatchery Steelhead B-run). The goal of the Lower Snake River Compensation Plan is to return approximately 25,000 adult steelhead to the project area above Lower Granite Dam to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams. The LSRCP A-run steelhead programs (**Sawtooth Fish Hatchery, Magic Valley Fish Hatchery, and Hagerman National Fish Hatchery**) in the Salmon River subbasin are managed and integrated with Idaho Power Company steelhead hatchery programs (**Pahsimeroi Fish Hatchery and Oxbow Fish Hatchery**). The Salmon River A-run steelhead program was designed as an Isolated Harvest Program. However, some broodstock management, eyed-egg production, and smolt production may occur to support ongoing **Shoshone-Bannock Tribes streamside and in stream incubation programs and smolt release programs** for natural production augmentation.

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The **East Fork Salmon natural steelhead program** is an integrated recovery program. The goal of this program is to determine whether hatchery propagation can be used to increase natural fish abundance (e.g., supplementation). It was designed as a small-scale supplementation experiment to spawn a portion of locally returning, naturally produced steelhead. Sufficient broodstock are collected (when adult return numbers are adequate) to produce up to 50,000 smolts. Ideally, no more than 50% of unmarked steelhead adults are retained at the East Fork Salmon River satellite for broodstock purposes. Spawning takes place at the East Fork Salmon River satellite facility operated by the Sawtooth Fish Hatchery. Egg incubation through the eyed stage of development occurs at the Sawtooth Fish Hatchery. Eyed-eggs are then shipped to the Magic Valley Fish Hatchery.

The **Salmon River B-run steelhead program** was developed specifically for fishery enhancement and was not intended to address supplementation objectives. The original management intent was for it to stand alone without the continual infusion of B-run steelhead juveniles produced in the Clearwater River basin. However, this objective has not been met. The B-run steelhead smolts from this program are released in the Little Salmon River, the East Fork Salmon River, Squaw Creek (tributary to the Salmon River), and Squaw Creek Pond. Hatchery-produced, B-run adult steelhead that return to the East Fork Salmon River trap and to Squaw Creek Pond are spawned at the East Fork Salmon River trap. Sawtooth Fish Hatchery, located in the Upper Salmon watershed, is the only facility in the Salmon subbasin that participates in the B-run steelhead program. The out-of-subbasin facilities that are associated with this program are the Magic Valley Fish Hatchery, Clearwater Fish Hatchery, and Dworshak National Fish Hatchery.

Idaho Power Company owns and funds the operation of **Pahsimeroi Fish Hatchery**, located in the Pahsimeroi River watershed. The facility was constructed in the mid-1960s as part of the Idaho Power's mitigation for anadromous fish production lost to construction and operation of Brownlee, Oxbow, and Hells Canyon dams on the Snake River. The IDFG operates the facility under contract and produces summer Chinook salmon and steelhead. The goals for the Pahsimeroi steelhead program are to release approximately 200,000 pounds of steelhead smolts annually in the Salmon subbasin.

Sockeye

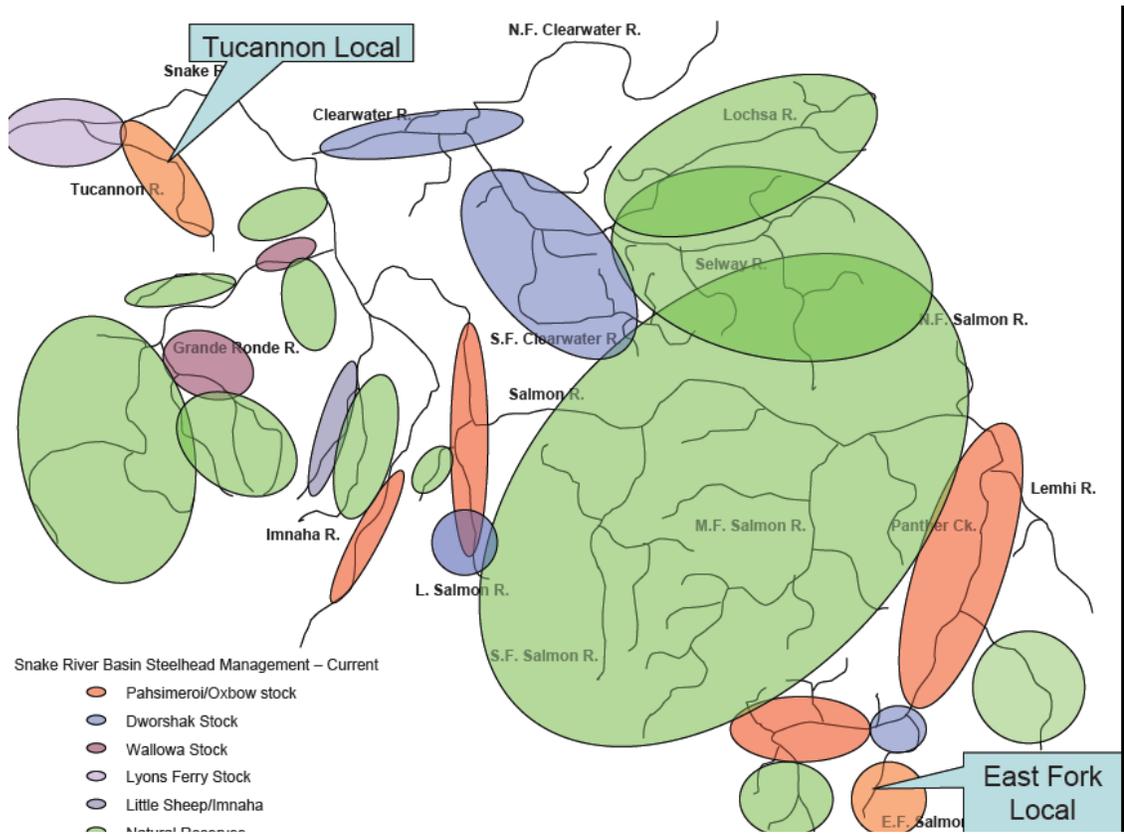
Due to precipitous declines in the numbers of returning adults, the **captive broodstock program for Snake River sockeye salmon** was started in 1991. The near-term goals for the program are to conserve the genetic resources of the population using captive broodstock technology, prevent extinction, and address demographic and ecological risks associated with extremely low population abundance.

Rainbow Trout

The Lower Snake River Compensation Plan **rainbow trout program** is mitigation for the loss of angler days brought about because the four lower Snake River dams inundated about 140 miles of spawning habitat. The mitigation goal for this program is to produce approximately 50,000 fingerling rainbow trout (approximately 3,333 pounds or 1,512 kg) for planting in the lower 100 miles (161 km) of the Salmon River and the lower 70 miles (113 km) of the Clearwater River in Idaho.

G. Examples of management and recovery options for salmonid resources in the region¹⁶

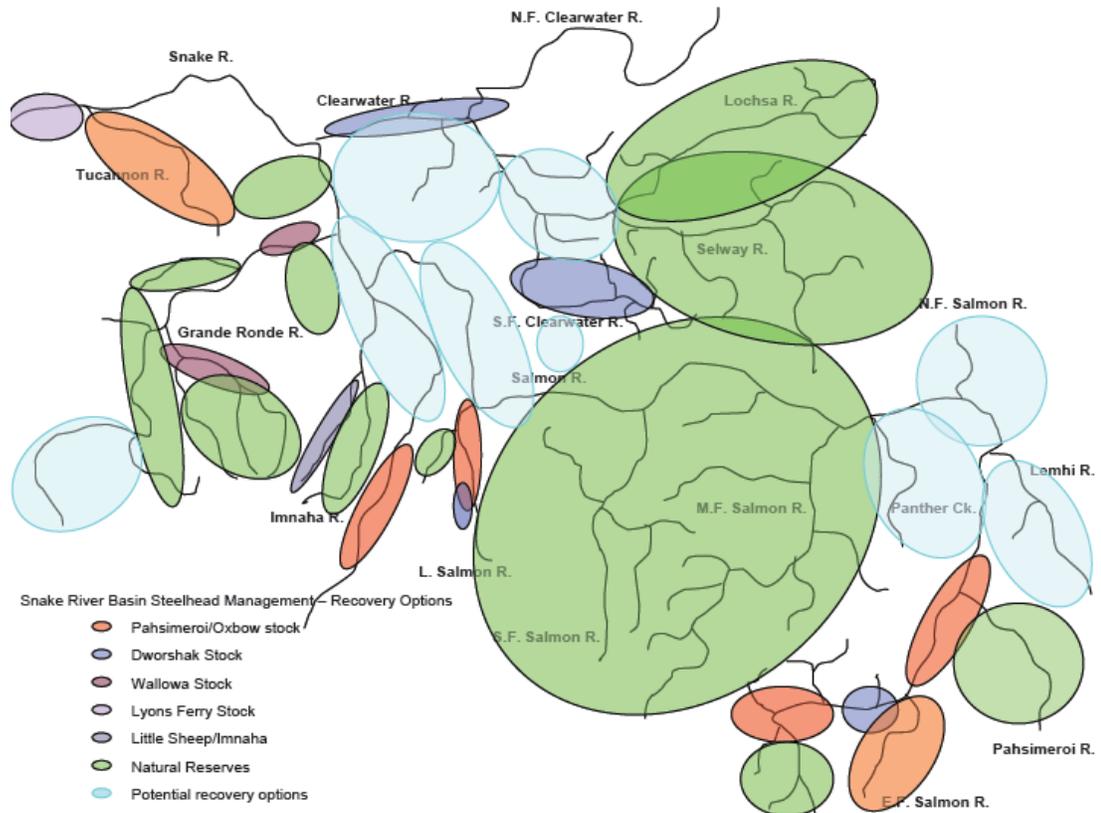
1. Snake River Basin Steelhead



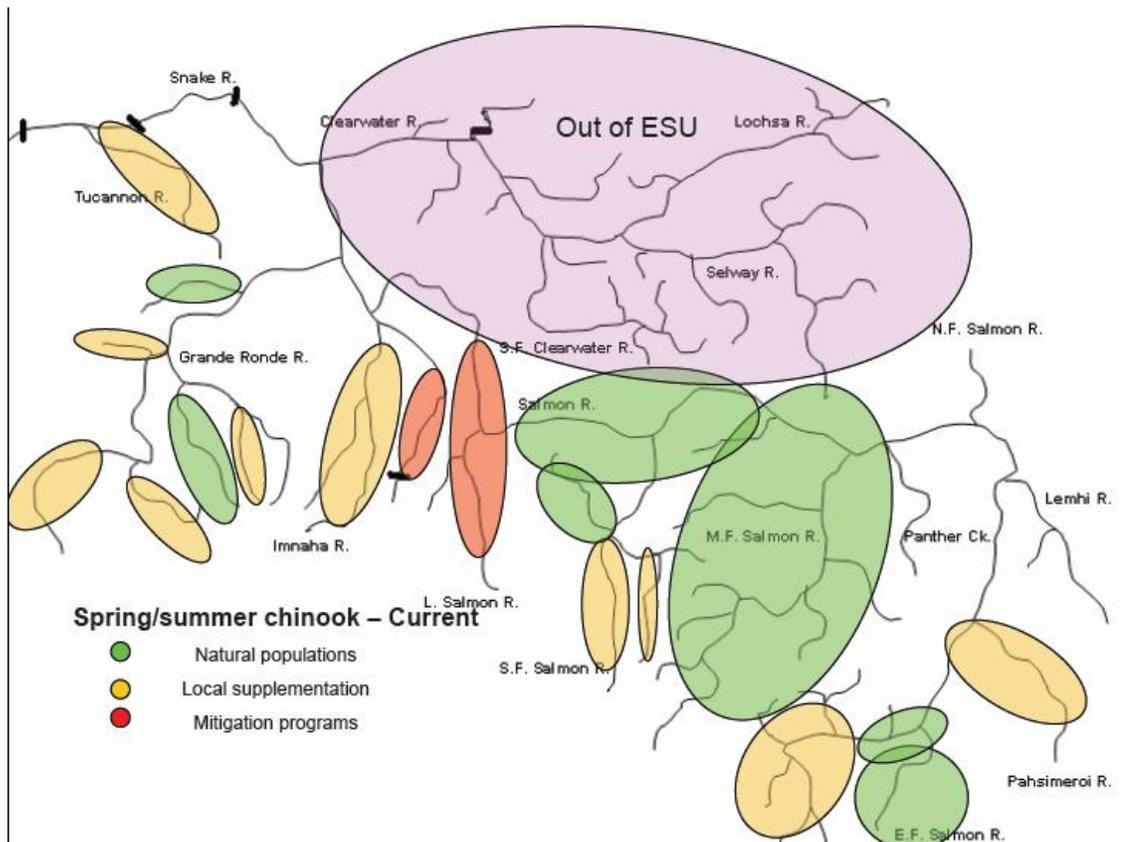
¹⁶ Figures in section from Pollard, December 2003.

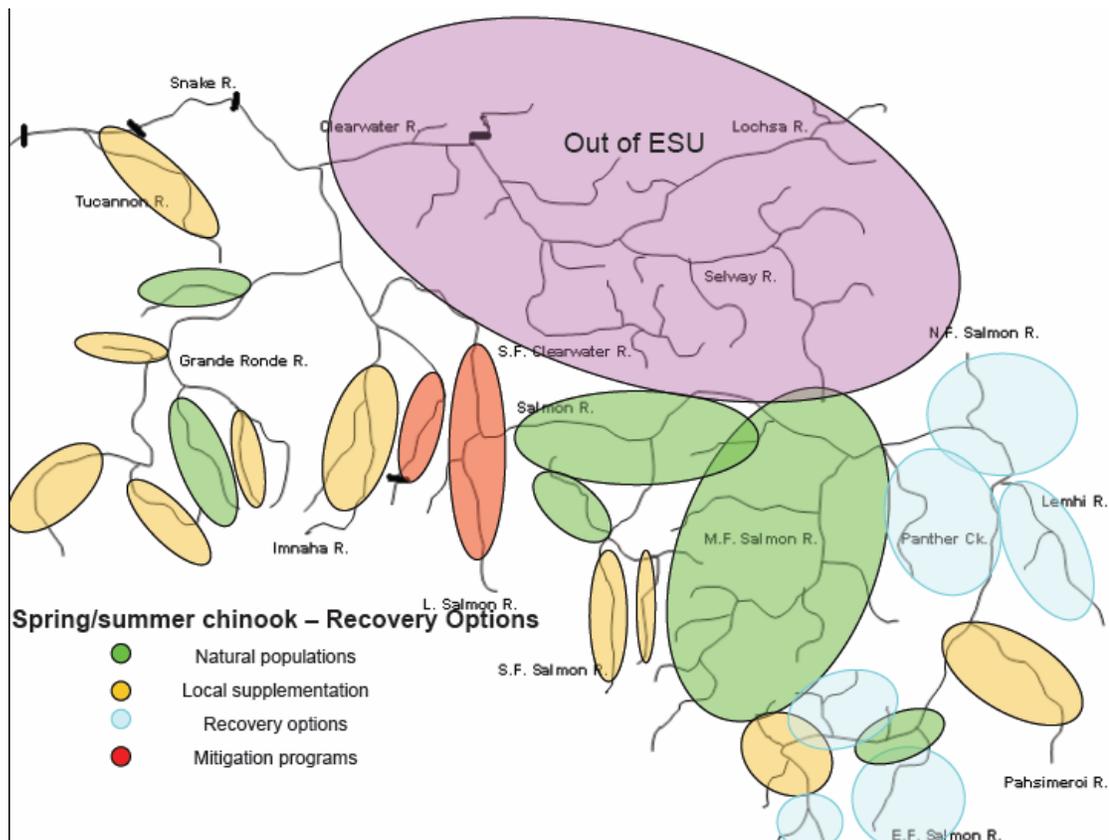
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2. Snake River Basin Spring/Summer Chinook





H. Current state, federal, and tribal hatchery programs/facilities in the region

1. Federal

a) Kooskia NFH

A salmon hatchery was first proposed in the Snake River drainage early in the 1950's as one phase of the Middle Snake River Feasibility Study Program. The objective was to enhance and mitigate losses to anadromous fish runs affected by water development proposals in the river basin. The Clearwater River drainage was selected as the most suitable site and Kooskia NFH was authorized on August 31, 1961, by 75 Statute 255 to rear spring Chinook salmon for release into the Clearwater River basin.

The purposes for which Kooskia NFH was originally authorized and constructed have been amended over the years by subsequent legally binding agreements and federal mandates, such as the Endangered Species Act (ESA), U.S. v. Oregon, and the Snake River Basin Adjudication agreement (SRBA). Those purposes can be accomplished by

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three major goals; 1) produce and release up to 600,000 healthy spring Chinook salmon smolts annually in order to provide opportunities for sport and Tribal harvest of returning adults in subsequent years, 2) assure that all the requirements of legal orders and federally mandated legislation are met, and 3) provide accurate information and educational opportunities associated with the Kooskia NFH production program.

(KNFH CHMP, p 11)

b) Dworshak NFH

Construction of Dworshak National Fish Hatchery (NFH) was included in the authorization for Dworshak Dam and Reservoir to mitigate for the loss of the wild run of the North Fork Clearwater River “B-Run” summer steelhead (*Oncorhynchus mykiss*) caused by the construction and operation of the Dam and Reservoir. Dworshak Dam, constructed by the U.S. Army Corps of Engineers (COE), was authorized under the “Rivers and Harbor Act of 1962 - Flood Control Act of 1962” (Public Law 87-847, October 23, 1962). The construction of Dworshak Dam completely blocked access to all but the lower 1½ miles of the North Fork Clearwater River below the Dam. The intent of the steelhead mitigation program at Dworshak NFH was calculated by the Service to return 20,000 adult steelhead to the mouth of the Clearwater River annually while perpetuating and maintaining the unique genetics of the North Fork B-Run summer steelhead population.

In June 1982, under the Lower Snake River Compensation Plan (LSRCP), Dworshak NFH was expanded from its primary function as a steelhead mitigation facility to include spring Chinook salmon (*Oncorhynchus tshawytscha*). The COE was authorized by Congress in 1976 to implement the LSRCP in accordance with the Water Resources Development Act of 1976 (Public Law 94-587) to offset losses of anadromous fish in the Snake River basin caused by the four dam and navigation lock projects in the Lower Snake River. The spring Chinook salmon program at Dworshak was intended to replace lost sport and Tribal fisheries in the Clearwater River.

(DNFH CHMP, p. 12)

c) Hagerman NFH

The Hagerman NFH (Hatchery) was authorized by 46 Stat, 371 on May 21, 1930, and was established in 1932. Construction of the physical facilities commenced in 1932, and fish production began in 1933. The primary goal of the hatchery, at that time, was the production of rainbow trout for stocking in Idaho, eastern Oregon, and northern Nevada. In the late 1970's the Hatchery became part of the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP), which was authorized by the Water Resources Development Act of 1976, Public Law 94-587. The LSRCP is designed to mitigate for fish and wildlife losses caused by the construction of four dams on the lower Snake River. The Hatchery's primary production was changed from resident rainbow trout to steelhead trout as part of the LSRCP.

The purposes for Hagerman NFH can be met by accomplishing five goals, adapted from the federal authorizing legislation cited above, the Endangered Species Act (ESA)

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Biological Opinions, and U.S. v. Oregon; meet the Lower Snake River Compensation Plan mitigation goal of returning 13,600 adult summer steelhead to the project area above Lower Granite Dam annually, use the additional 12 raceways to help meet U.S Fish and Wildlife Service obligations and needs, assure that all the requirements of legal orders and federally mandated legislation are met, develop outreach to enhance public understanding, participation and support of the Service and Hagerman NFH programs, and ensure that all hatchery activities are conducted safely and that all hatchery facilities and equipment are properly maintained.

(HNFH CHMP, p.xii-xiv)

2. Federally Owned, State Operated

a) Clearwater Fish Hatchery (IDFG)¹⁷

- Clearwater FH was authorized under Lower Snake River Compensation Plan through the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the construction and operation of the four Lower Snake River dam and navigation lock projects. The mitigation goal for the hatchery is to provide for lost harvest opportunities and return 11,915 adult spring Chinook and 14,000 steelhead to the project area (above Lower Granite Dam). Clearwater FH is located on the North Fork Clearwater River just above its confluence with the Clearwater river. There are three satellite facilities associated with Clearwater FH; Crooked River, Red River, and Powell all located on tributaries to the Clearwater River. Clearwater FH and satellites are operated by Idaho Department of Fish and Game through a cooperative agreement with the Service. The success of the program must be measured by the sum of returns to the various fisheries, to the hatchery of origin, and to the natural spawning areas. (USFWS May 1990, p.1-33)

¹⁷ Unless cited otherwise, section text from USFWS May 1990, p.1-33.

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Table: Fish Release Data

Steelhead Yearling Release Location from Clearwater Hatchery	Crooked River	250,000
	Red River	250,000
	South Fork Clearwater River	190,000
	Clear Creek	100,000
	Lolo Creek	50,000
	Newsome Creek	100,000
	American River	100,000
	TOTAL	1,040,000
Spring Chinook		
Life Stage	Release Location	Annual Release Level
Fingerling	Boulder Creek (Lochsa River Tributary) NPT supplementation.	84,000 100% CWT, no clip
	Warm Springs Creek (Lochsa River Tributary) NPT supplementation.	20,000 100% CWT, no clip
	Colt Killed Creek (Lochsa River Tributary) ISS.	300,000 100% RV-clip
	Pete King Creek (Lochsa River Tributary) ISS.	13,000 100% CWT, no clip, 1,000 PIT
	Squaw Creek (Lochsa River Tributary) ISS.	12,000 100% CWT, no clip, 700 PIT
	Crooked River Pond (South Fork Clearwater River Tributary) ISS.	158,000 100% RV-clip, 600 PIT
	Red River Pond (South Fork Clearwater River Tributary) ISS.	80,000 100% LV-clip, 600 PIT
	Powell Pond (Lochsa River) LSRCP.	335,000 100% AD-clip, 700 PIT

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Yearling	Papoose Creek (Lochsa River Tributary) ISS.	50,000 100% CWT, no clip
	Meadow Creek (Selway River Tributary) NPTH.	300,000 100% CWT, no clip
	Lolo Creek (Clearwater River Tributary) NPTH.	150,000 100% CWT, no clip
	Newsome Creek (South Fork Clearwater River Tributary) NPTH.	75,000 100% CWT, no clip
	Mill Creek (South Fork Clearwater River Tributary) NPTH.	40,000 100% CWT, no clip
	Boulder Creek (Lochsa River Tributary) NPTH.	84,000 100% CWT, no clip
	Warm Springs Creek (Lochsa River Tributary) NPTH.	20,000 100% CWT no clip
	Crooked River Pond (South Fork Clearwater River Tributary) LSRCP.	700,000 100% AD-clip, 300 PIT
	Red River Pond (South Fork Clearwater River Tributary) LSRCP.	335,000 100% AD-clip, 300 PIT
	Powell Pond (Lochsa River) LSRCP.	335,000 100% AD-clip, 300 PIT

Table: Spring Chinook Releases

POWELL SATELLITE

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
1984	348,420	Spr. 1986	-	-	16	16	0.005
1985	344,900	Spr. 1987		111	20	131	0.038
1986	200,100	Spr. 1988	27	157	10	194	0.097
1987	200,639	Spr. 1989	2	16	15	33	0.016
1988	314,500	Fall 1989	7	249	288	544	0.173
1989	307,100 180,764	Fall 1990 Spr. 1991	6	204	57	267	0.054
1990	358,400 204,300	Fall 1991 Spr. 1992	8	28	1	37	0.007
1991	500	Fall 1992	1	1	0	2	0.400
1992	261,628	Spr. 1994	12	141	129	268	0.102
1993	311,690 290,417	Fall 1994 Spr. 1995	45	587	310	942	0.156
1994	232,731	Spr. 1996	2	177	53	232	0.099
1995	3,549	Spr. 1996	1	8	8	17	0.479
1996	244,847	Spr. 1998	119	1,038	60	1,217	0.497
1997	330,555 334,482	Fall 1998 Spr. 1999	369	2,140	186	2,695	0.405

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Table: Spring Chinook Releases

RED RIVER SATELLITE

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
1982	260,000 40,000	Fall 1983 Spr. 1984	2	-	107	109	0.036
1983	80,000	Spr. 1985		377	259	636	0.795
1984	136,800	Spr. 1986	35	132	74	214	0.176
1985	96,400 96,800	Fall 1986 Spr. 1987	3	25	13	41	0.021
1986	233,100	Fall 1987	5	38	8	51	0.022
1987	291,200	Fall 1988	2	9	3	14	0.005
1988	240,500	Fall 1989	1	31	39	71	0.029
1989	273,800 187,000	Fall 1990 Spr. 1991	5	99	13	117	0.025
1990	354,700 207,500	Fall 1991 Spr. 1992	1	18	1	20	0.004
1991	6,000	Fall 1992	0	0	0	0	0.000
1992	22,246	Fall 1993	3	4	45	52	0.234
1993	320,755	Fall 1994	5	191	42	238	0.074
1994	24,002	Spr. 1996	2	25	2	29	0.121
1995	2,983	Spr. 1997	1	6	22	29	0.972
1996	51,208	Spr. 1998	15	81	66	162	0.316
1997	66,114 360,983	Fall 1998 Spr. 1999	179	1,244	-	-	-

Table: Spring Chinook Releases

CROOKED RIVER SATELLITE

Brood Year	Number Released	Year Released	Return Age From BY			Total	SAR (%)
			1-ocean	2-ocean	3-ocean		
1987	199,700	Spr. 1989	2	13	7	22	0.011
1988	300,407	Spr. 1990	2	208	276	486	0.162
1989	339,087	Fall 1990	13	119	10	142	0.042
1990	320,400	Fall 1991	7	15	0	22	0.002
1991	-	-	1	0	1	1	0.000
1992	273,766	Spr. 1994	6	241	59	306	0.112
1993	415,535 537,908	Fall 1994 Spr. 1995	94	935	213	1,274	0.134
1994	37,071	Spr. 1996	2	22	3	27	0.073
1995	0	Spr. 1997	0	0	0	0	0.000
1996	205,906	Spr. 1998	122	637	101	860	0.417
1997	162,119 600,981	Fall 1998 Spr. 1999	454	1,878	-	-	-

(USFWS May 1990, p.1-33)

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Table: Harvest data are not available specifically for Clearwater Fish Hatchery-produced fish. General Clearwater River Basin harvest data for the past 12 years is presented in the following table. Information presented is for adipose fin-clipped Chinook only.(IDFG, Clearwater River Spring Chinook HGMP)

Harvest Year	Adult Chinook Passing Lower Granite Dam	Jack Chinook Passing Lower Granite Dam	Estimated Chinook Harvest in Clearwater Basin
1990	17,315	244	369
1991	6,623	980	No Season
1992	21,391	533	< 50
1993	21,025	183	No Season
1994	3,120	43	No Season
1995	1,105	373	No Season
1996	4,207	1,639	No Season
1997	33,854	84	738
1998	9,881	106	99
1999	3,296	2,507	No Season
2000	33,822	10,318	4,396
2001	147,168	3,136	21,883

Table: Clearwater hatchery estimates for B-Run Steelhead release, harvest, escapement and retron figures. (IDFG,Clearwater River B-Run Steelhead HGMP)

Release Year	Estimated No. of Juveniles Released	Estimated No. of Adults Harvested	Rack and In-river Escapement	Total Adult Returns	Estimated SAR (%)
1994	772,968	133	140	273	0.03
1995	637,743	415	213	628	0.10
1996	829,561	600	703	1,303	0.16

¹ Idaho sport fishery only.

b) Lyons Ferry Fish Hatchery Complex (WDFW)

Lyons Ferry FH was authorized under Lower Snake River Compensation Plan through the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the construction and operation of the four Lower Snake River dam and navigation lock projects. The mitigation goal for the hatchery is to provide for lost harvest opportunities and return 18,300 fall Chinook, 1,148 spring Chinook, and 4,656 steelhead to the project area (above Ice Harbor Dam for fall Chinook and Lower Granite Dam for spring Chinook and steelhead). Lyons Ferry also produces 233,000 rainbow trout to compensate for the loss of 67,500 angler-days of fishing in Washington and Idaho waters. Lyons Ferry FH is located on the Columbia River near just below the mouth of the Palouse River. There are four satellite facilities associated with Lyons Ferry FH; Tucannon FH, Dayton Pond, Cottonwood Pond, and Curl Lake located on the Tucannon R., Touchet R., Grande Rond R. Lyons Ferry FH and satellites are operated by Washington Department of Fish and Wildlife though a cooperative agreement with the Service. The success of the program must be measured by the sum of returns to the various fisheries, to the hatchery of origin, and to the natural spawning areas.

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c) Sawtooth Fish Hatchery (IDFG)

Sawtooth FH was authorized under Lower Snake River Compensation Plan through the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the construction and operation of the four Lower Snake River dam and navigation lock projects. The mitigation goal for the hatchery is to provide for lost harvest opportunities and return 19,445 adult spring Chinook to the project area (above Lower Granite Dam). Sawtooth FH is located on the upper Salmon River near Stanley, Idaho. There are two satellite facilities associated with Sawtooth FH; East Fork Salmon River and Squaw Creek pond located on tributaries in the upper Salmon River. Sawtooth FH and satellites are operated by Idaho Department of Fish and Game through a cooperative agreement with the Service. The success of the program must be measured by the sum of returns to the various fisheries, to the hatchery of origin, and to the natural spawning areas.

d) McCall Fish Hatchery (IDFG)

Sawtooth FH was authorized under Lower Snake River Compensation Plan through the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the construction and operation of the four Lower Snake River dam and navigation lock projects. The mitigation goal for the hatchery is to provide for lost harvest opportunities and return 8,000 adult summer Chinook to the project area (above Lower Granite Dam). McCall FH is located on the North Fork Payette River in McCall, Idaho. There is one satellite facility associated with McCall FH; South Fork Salmon located on the South Fork Salmon River. McCall FH and satellite are operated by Idaho Department of Fish and Game through a cooperative agreement with the Service. The success of the program must be measured by the sum of returns to the various fisheries, to the hatchery of origin, and to the natural spawning areas.

e) Magic Valley Fish Hatchery (IDFG)

Magic Valley FH was authorized under Lower Snake River Compensation Plan through the Water Resources Development Act of 1976, Public Law 94-587, to offset losses caused by the construction and operation of the four Lower Snake River dam and navigation lock projects. The mitigation goal for the hatchery is to provide for lost harvest opportunities and return 11,600 adult steelhead to the project area (above Lower Granite Dam). Magic Valley FH is located in the Hagerman Valley near Buhl, Idaho. Magic Valley FH is operated by Idaho Department of Fish and Game through a cooperative agreement with the Service. The success of the program must be measured by the sum of returns to the various fisheries, to the hatchery of origin, and to the natural spawning areas.

3. Tribal

a) Nez Perce Tribal Hatchery

The Nez Perce Tribal Hatchery mitigates for the loss of naturally-reproducing salmon in the Clearwater River subbasin. The overall goal is to produce and release fish that will survive to adulthood, spawn in the Clearwater River subbasin and produce viable

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offspring that will support future natural production and genetic integrity. Several underlying purposes of fisheries management will be maintained through this program:

- protect, mitigate, and enhance Columbia River subbasin anadromous fish resources
- develop, reintroduce, and increase natural spawning populations of salmon within the Clearwater River subbasin
- Provide long-term harvest opportunities for Tribal and non-Tribal anglers within Nez Perce treaty lands within four generations (20 years) following project completion
- Sustain long-term fitness and genetic integrity of targeted fish populations
- Keep ecological and genetic impacts to nontarget populations within acceptable limits
- Promote Nez Perce Tribal management of Nez Perce Tribal hatchery facilities and production areas within Nez Perce treaty lands (Bonneville Power Administration et al. 1997).

(NWPPC Nov. 2003, p.332-333)

Approximately 750 spring Chinook salmon adults are needed for broodstock for the Nez Perce Tribal Hatchery spring Chinook program. This number includes jacks and accounts for pre-spawning mortality. This brood level will provide for a target release of 75,000 presmolts from Newsome Creek (South Fork Clearwater River) acclimation facility, 150,000 presmolts from Yoosa/Camp (Lolo Creek) acclimation facility and 400,000 parr into Meadow Creek (Selway River). (IDFG, Mar. 8, 2007, p. 15)

b) Fall Chinook Acclimation Project, Big Canyon Acclimation Site

The Big Canyon Acclimation facility is a portable acclimation setup designed and operated for acclimation and release of Snake River fall Chinook salmon that are reared at Lyons Ferry Hatchery. Big Canyon facility is operated by the Nez Perce Tribe as part of the Fall Chinook Acclimation Project (FCAP) funded by BPA. The facility has capacity to acclimate 150,000 yearlings and 500,000 subyearlings. The facility is operated in conjunction with two other acclimation facilities on the Snake River in an effort to restore ESA listed Snake River fall Chinook salmon and achieve the LSRCP mitigation goal of 18,300 adults to the project area. (IDFG, Mar. 8, 2007, p. 21)

c) Fall Chinook Acclimation Project, Captain Johns Rapids Acclimation Site

In 1996, Congress instructed the U.S. Army Corps of Engineers (USCOE) to construct, under the Lower Snake River Compensation Plan (LSRCP), final rearing and acclimation facilities for Chinook in the Snake River basin to complement their activities and efforts in compensating for fish lost due to construction of the lower Snake River Dams. Fisheries co-managers of *U.S. vOregon* supported and directed the construction and operation of acclimation and release facilities for Snake River fall Chinook from Lyons Ferry Hatchery at three sites above Lower Granite Dam. The Nez Perce Tribe (NPT) played a key role in securing funding and selecting acclimation sites, then assumed responsibility for operation

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and maintenance of the Fall Chinook Acclimation Facility (FCAP). In 1997, Bonneville Power Administrative (BPA) was directed to fund operations and maintenance (O&M) for FCAP satellites. Two acclimation facilities, Captain John Rapids and Pittsburg Landing, are located on the Snake River between Asotin, WA and Hells Canyon Dam. The Capt. John Rapids facility is a single pond while the Pittsburg Landing and Big Canyon sites consist of portable fish rearing tanks assembled and disassembled each year. Acclimation of 450,000 yearling smolts (150,000 each facility) begins in March and ends 6 weeks later. When available, an additional 2,400,000 fall Chinook sub-yearlings may be acclimated for 6-weeks and released as subyearling smolts. Captain John Rapids satellite is located on the Snake River between Asotin, Washington anmouth of the Grand Ronde River at RM 164. The site is on the Washington side of the river, 20 miles upstream of Asotin, with vehicle access provided by the Snake River Road. (NWPPC May 2004, p.116-117)

d) Fall Chinook Acclimation Project, Pittsburg Landing Acclimation Site

In 1996, Congress instructed the U.S. Army Corps of Engineers (USCOE) to construct, under the Lower Snake River Compensation Plan (LSRCP), final rearing and acclimation facilities for Chinook in the Snake River basin to complement their activities and efforts in compensating for fish lost due to construction of the lower Snake River Dams. Fisheries co-managers of *U.S. vOregon* supported and directed the construction and operation of acclimation and release facilities for Snake River fall Chinook from Lyons Ferry Hatchery at three sites above Lower Granite Dam. The Nez Perce Tribe (NPT) played a key role in securing funding and selecting acclimation sites, then assumed responsibility for operation and maintenance of the Fall Chinook Acclimation Facility (FCAP). In 1997, Bonneville Power Administrative (BPA) was directed to fund operations and maintenance (O&M) for FCAP satellites. Two acclimation facilities, Captain John Rapids and Pittsburg Landing, are located on the Snake River between Asotin, WA and Hells Canyon Dam. The Capt. John Rapids facility is a single pond while the Pittsburg Landing and Big Canyon sites consist of portable fish rearing tanks assembled and disassembled each year. Acclimation of 450,000 yearling smolts (150,000 each facility) begins in March and ends 6 weeks later. When available, an additional 2,400,000 fall Chinook sub-yearlings may be acclimated for 6-weeks and released as subyearling smolts. Pittsburg Landing satellite is located in the Hells Canyon National Recreation Area (HCN near Whitebird, Idaho. The site is located on the Idaho side of the Snake River at River Mile (RM) 215, about 31 miles downstream of Hells Canyon Dam. (NWPPC May 2004, p. 116-117)

e) Johnson Creek

The goal of the Johnson Creek Artificial Propagation Enhancement (JCAPE) project is to reduce the demographic risk of extirpation of the ESA listed Johnson Creek summer Chinook salmon and begin its recovery through supplementation. A secondary goal is to maintain genetic diversity of the artificially propagated summer Chinook salmon population and the natural population. The intent is to increase adult returns through increased juvenile survival and improved homing in order to preserve and recover the Johnson Creek salmon population.

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Supplementation (O&M) Goal: Conduct necessary operations to produce 100,000 smolts annually for release back into Johnson Creek. In order to meet this supplementation goal, up to 40 pairs of natural origin adults are needed to produce 100,000 smolts annually.

(IDFG, Mar. 12, 2007, p. 32)

f) Shoshone Bannock Tribe Egg Box Program

The SBT developed supplementation activities aimed at improving the viability of natural steelhead populations. Steelhead supplementation may be necessary to maintain high populations to support harvest and improve abundance, productivity, special structure, and genetic diversity. Annually, one million eyed steelhead eggs (Table 12) from Sawtooth and Pahsimeroi Fish Hatcheries are transferred to remote upwellers where they are incubated on river water in to mimic natural hatch timing in the system. (IDFG, Mar. 12, 2007, p. 17)

To maintain, rehabilitate, and enhance salmon population viability, the SBT initiated an in-stream incubation program in Dollar Creek, a tributary of the South Fork Salmon River. Eyed summer Chinook eggs are placed into hatch-boxes in late fall, incubated in stream water, and allowed to volitionally emigrate at approximately the same time as fry in the natural system. This supplementation activity is designed to mimic natural production to develop a naturally spawning tributary component of the SFSR in order to increase abundance, genetic diversity, and productivity of summer Chinook salmon as well as increase knowledge of fishery management and hatchery supplementation. (IDFG, Mar. 12, 2007, p. 59-60)

4. Idaho Power Owned, IDFG Operated

Idaho Power Company (IPC) is obligated to provide mitigation for lost fish and fishing opportunity resulting from construction of the Hells Canyon Hydroelectric Complex. Under a 1980 FERC settlement agreement, IPC is obligated to produce 400,000 pounds (about 1.8 million fish at 4.5 fish per pound) of steelhead smolts, 4 million spring/summer Chinook smolts and 1 million fall Chinook smolts. Because of poor access and limited remaining habitat in the Snake Hells Canyon subbasin, most of the mitigation releases have been relocated to the Salmon River subbasin. Annually IPC releases about 300,000 spring Chinook smolts and 500,000 steelhead smolts at Hells Canyon Dam. Starting with broodyear 2000, IPC has produced and released a few hundred thousand fall Chinook smolts at Hells Canyon Dam. The fall Chinook smolt release is expected to reach 1 million smolts within the next few years, pending development of facilities and adequate broodstock, and an ongoing negotiation among the management entities for a longterm fall Chinook management plan. (NWPPC May 2004, p. 117)

a) Niagra Springs Fish Hatchery

IPC's mitigation goal at Niagra Springs FH is to annually produce 400,000 pounds of healthy steelhead smolts. This equates to approximately 1.8 million smolts at a mean size of 4.5 fpp. Eggs for the program are obtained from adult returns spawned at Pahsimeroi FH and Oxbow FH. The fish are reared from eyed eggs and swimup fry to smolts at Niagra Springs FH and released into the Pahsimeroi River below the Pahsimeroi FH

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weir, into the Snake River below Hells Canyon Dam, and into the Little Salmon River at Stinky Springs or Hazard Creek. (IDFG, Mar. 12, p.7-8)

b) Pahsimeroi Fish Hatchery

IPC's mitigation goal for steelhead production at Pahsimeroi FH is to take up to 1,450,000 green eggs for distribution to Niagara Springs FH. Approximately 332 pairs of adult steelhead broodstock are needed to meet the egg take goal. Pahsimeroi FH also traps and spawns additional adult steelhead to provide eggs for the following programs: eyed eggs for the SBT egg box program and green eggs for the LSRCF programs at Magic Valley FH and Hagerman NFH. These additional eggs require the spawning of another 442 pairs of adult steelhead to accomplish this task.

The mitigation goal for Pahsimeroi FH is to release up to 1,000,000 Summer Chinook smolts annually into the Pahsimeroi River. Approximately 300 pair of adult Summer Chinook are required to meet this mitigation when considering prespawning mortality and culling of disease positive adults.

(IDFG, Mar. 12, 2007)

c) Oxbow Fish Hatchery

Idaho Power Company's current mitigation goal for steelhead production at Oxbow FH is to trap and spawn a sufficient number of adult steelhead to allow for the production of 200,000 lbs of steelhead smolts at Niagara Springs FH. To produce the minimum 1.2 million eyed-eggs/ fry necessary to reach that goal, approximately 550 adult steelhead are trapped in the fall and held over winter. An additional 50 females or 10% of the broodstock are trapped the following spring. This provides for pre-spawning mortality, culling for disease management and manipulation of run timing. It will also provides a small surplus for use at Pahsimeroi FH and Sawtooth FH in the event that returns to their weirs do not meet production goals Steelhead spawning occurs in the spring and the resulting eggs and swimup fry are transferred to Niagara Springs FH beginning in June. (IDFG, Mar. 12, 2007, p. 24)

d) Rapid River Fish Hatchery

Approximately, 2,500 Chinook are needed annually for broodstock for the Rapid River FH spring Chinook salmon program. This number includes jacks and accounts for pre-spawning mortality at the 20-year average as well as average female culling required by disease management constraints and average fecundity. This brood level will provide 3.4 million green eggs and 3.0 million smolts at an average of 88% eyed egg-to-smolt survival to meet the smolt release goals. As of February 7, 2007 release sites and numbers have yet to be determined. That determination will depend upon agreement among the participants in US v Oregon. (IDFG, Mar 12, 2007, p. 35)

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5. State

a) Eagle Fish Hatchery (IDFG)

Approximately 400 – 500 eyed-eggs are needed to meet and maintain genetic diversity for broodstock replacement goals for the Eagle Hatchery Sockeye salmon captive broodstock program. A replicate group of eyed-eggs is transferred to Burley Creek FH (NOAA Fisheries Manchester Marine Lab in Washington State) as a spread the risk strategy. Spawn crosses made from each broodyear will also meet production goals in the Salmon River Basin. Production goals may be adjusted annually based on recommendations provided by the Stanley Basin Sockeye Technical Oversight Committee (SBSTOC) to agency policy staff. Current production goals for the Salmon River Basin are: 50,000 eyed-eggs to Pettit Lake released in November/December; 120,000 pre-smolts released in October (85,000 Redfish Lake, 15,000 Pettit Lake and 20,000 Alturas Lake); and 300 captive reared adults released in September. (IDFG, Mary 12, 2007, p. 62)

I. Overview of Hatchery Production in the Clearwater and Salmon River Basins¹⁸

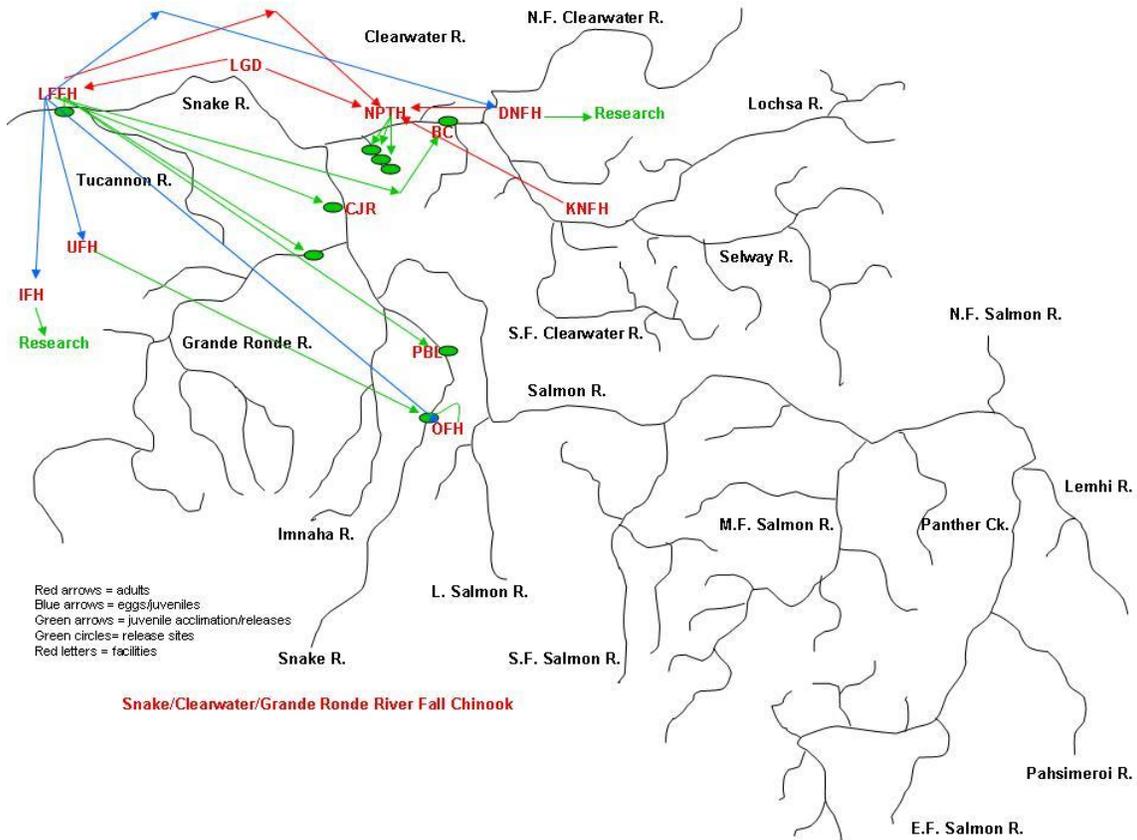
Black print = LSRCP Programs

Red Print = non-LSRCP Programs

							Release Year 2007	
Fall Chinook (Clearwater River Basin Releases)								
Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release
(Snake R. stock) Lyons Ferry FH Lower Granite Dam	Lyons Ferry FH	Lyons Ferry FH	Lyons Ferry FH	Lyons Ferry FH	Big Canyon Big Canyon	Snake R. @ LFFH Clearwater R. @ BC Clearwater R. @ BC	450,000 150,000 500,000	Yearl. Yearl. Subyearl.
Lyons Ferry FH Lower Granite Dam Dworshak NFH Kooskia NFH Nez Perce Tribal FH	Nez Perce Tribal FH		Snake R. @ NPTH Lapwai R. @ 3 sites Total Subyearl.	500,000 900,000 1,400,000	Subyearl. Subyearl.			

¹⁸ Unless otherwise cited, tables and maps in this section were created by J. Kraker, USFWS Hatchery Review Team

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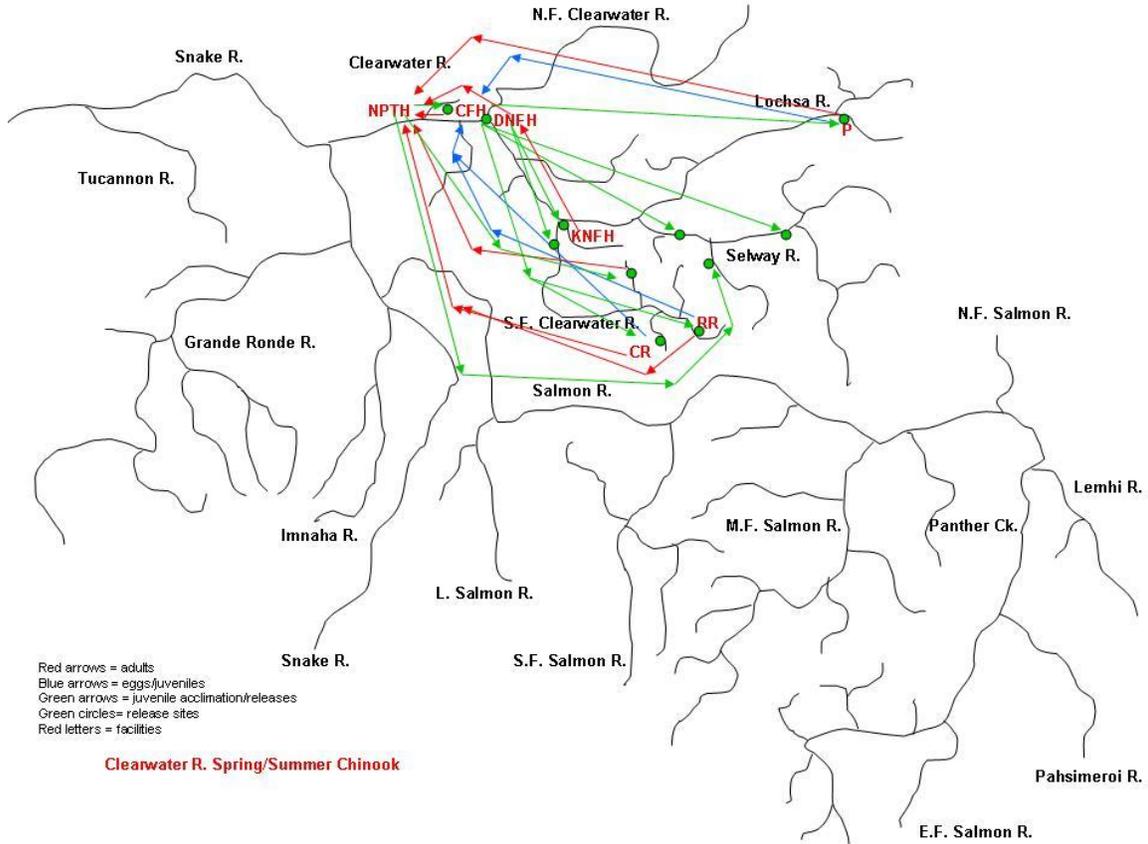
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Black print = LSRCP Programs

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							Release Year 2007	
Spring/summer Chinook (Clearwater River Basin Releases)								
Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release
(Powell/ RR stock)								
Powell (Red R./Crooked R./RR stock) Red River Crooked River	Powell/Red R./Clearwater FH	Powell/Red River/Clearwater FH	Clearwater FH	Clearwater FH	Powell	Lochsa R. @ Powell	400,000	Smolt
					Red River Crooked River Powell	S.F. Clearwater @ Red R. S.F. Clearwater @ Crooked R. Lochsa R. @ Powell upper Selway R. lower Selway R.	400,000 700,000 335,000 300,000 300,000	Smolt Smolt pre-smolt parr Smolt
(Dworshak/RR stock)								
Dworshak NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH		Clearwater R. @ Dworshak NFH	1,050,000	Smolt
(Kooskia/RR stock)								
Kooskia NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH	Kooskia NFH		Clear Ck @ Kooskia NFH	600,000	Smolt
Nez Perce Tribal Hatchery Crooked R./Red R./Powell/DNFH	NPTH	NPTH	NPTH	NPTH		Meadow Ck. - Selway R.	400,000	Smolt
Newsome Ck.	Newsome Ck.	Newsome Ck.	NPTH	NPTH/Sweatwater Spgs.	Newsome Ck.	Newsome Ck.	75,000	pre-smolt
Lolo Ck	Yosa Camp	Yosa camp	NPTH	NPTH	Yosa camp	Lolo Ck.	150,000	pre-smolt
Total							4,710,000	

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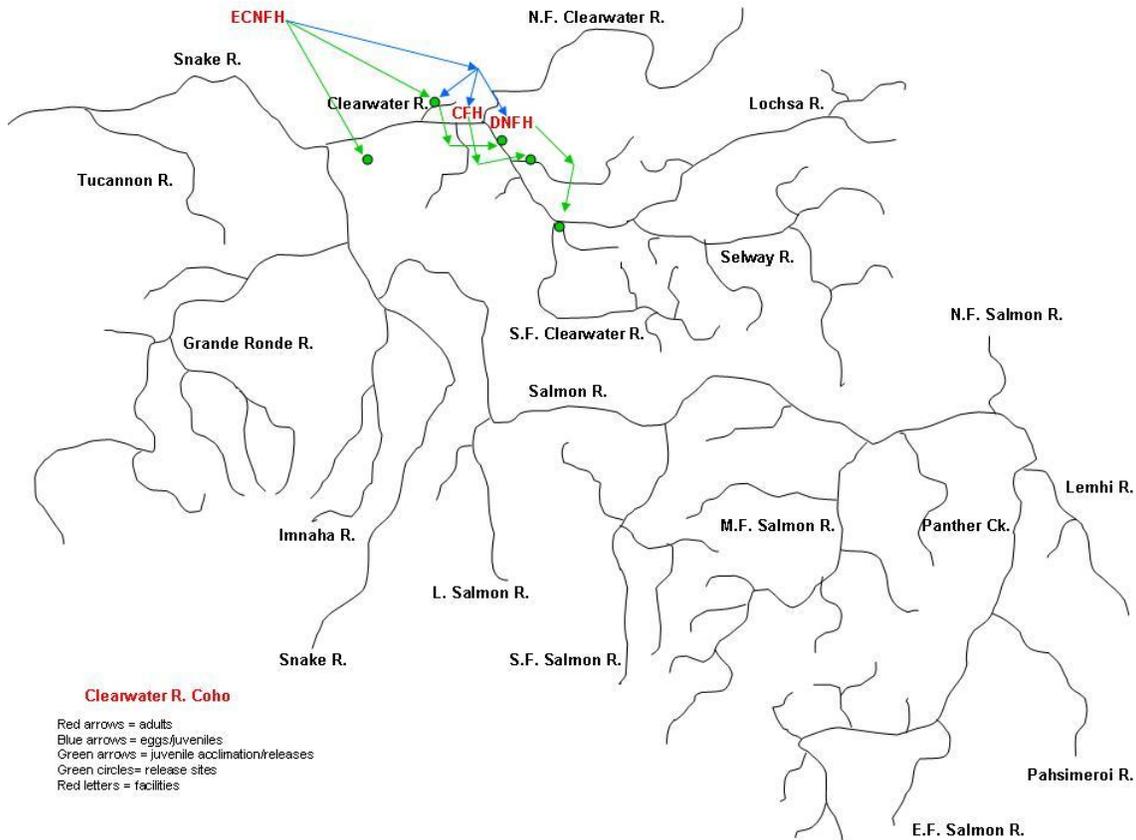


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								Release Year 2007	
Coho (Clearwater River Basin Releases)									
Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release	
Eagle Creek NFH	ECNFH	ECNFH	ECNFH	ECNFH		Lapwai Ck. Potlatch Ck.	275,000 275,000	Smolt Smolt	
LFFH, NPTH, DNFH, KNFH, Lapwai and Potlatch Ck's (back-fill with eggs from ECNFH)			Dworshak NFH Potlatch Clearwater FH	Dworshak NFH Potlatch Clearwater FH		Clear Ck. Orifino Ck. Lolo/Eldorado Ck.	280,000 30,000 270,000	Smolt fry pre-smolt	
Total							1,130,000		



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							Release Year 2007	
Steelhead (Clearwater River Basin Releases)								
Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release
(N.F. Clearwater B stock) Dworshak NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH		N.F. Clearwater R. @ DNFH Clear Ck. S.F. Clearwater @ Red House Newsome Ck. American R.	1,200,000 300,000 400,000 100,000 100,000	Smolt (AD) Smolt (AD) Smolt (AD) Smolt Smolt
			DNFH/Clearwater er FH	Clearwater FH		Crooked R. Crooked R. Red R. Red R. S.F. Clearwater @ Red House Meadow Ck. Mill Ck. Lolo Ck.	150,000 83,000 100,000 150,000 260,000 25,000 25,000 50,000	Smolt (AD) Smolt Smolt (AD) Smolt Smolt (AD) Smolt Smolt Smolt
Total							2,943,000	

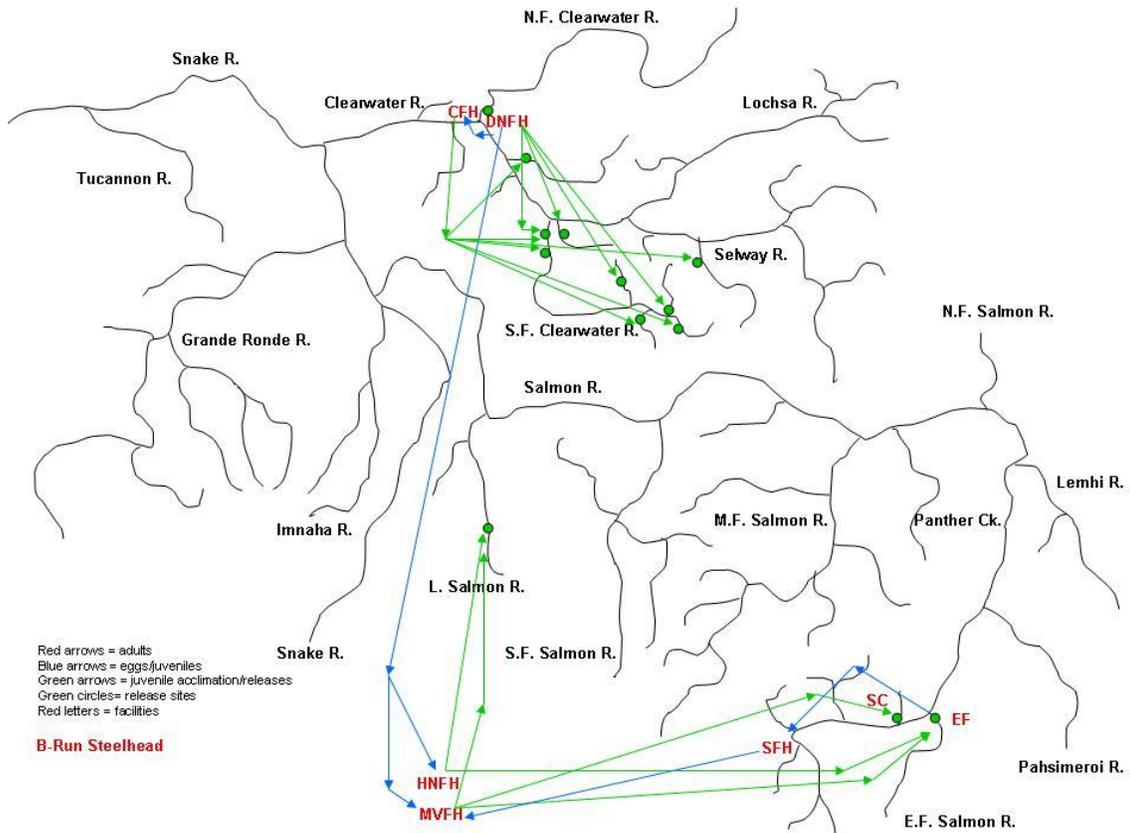
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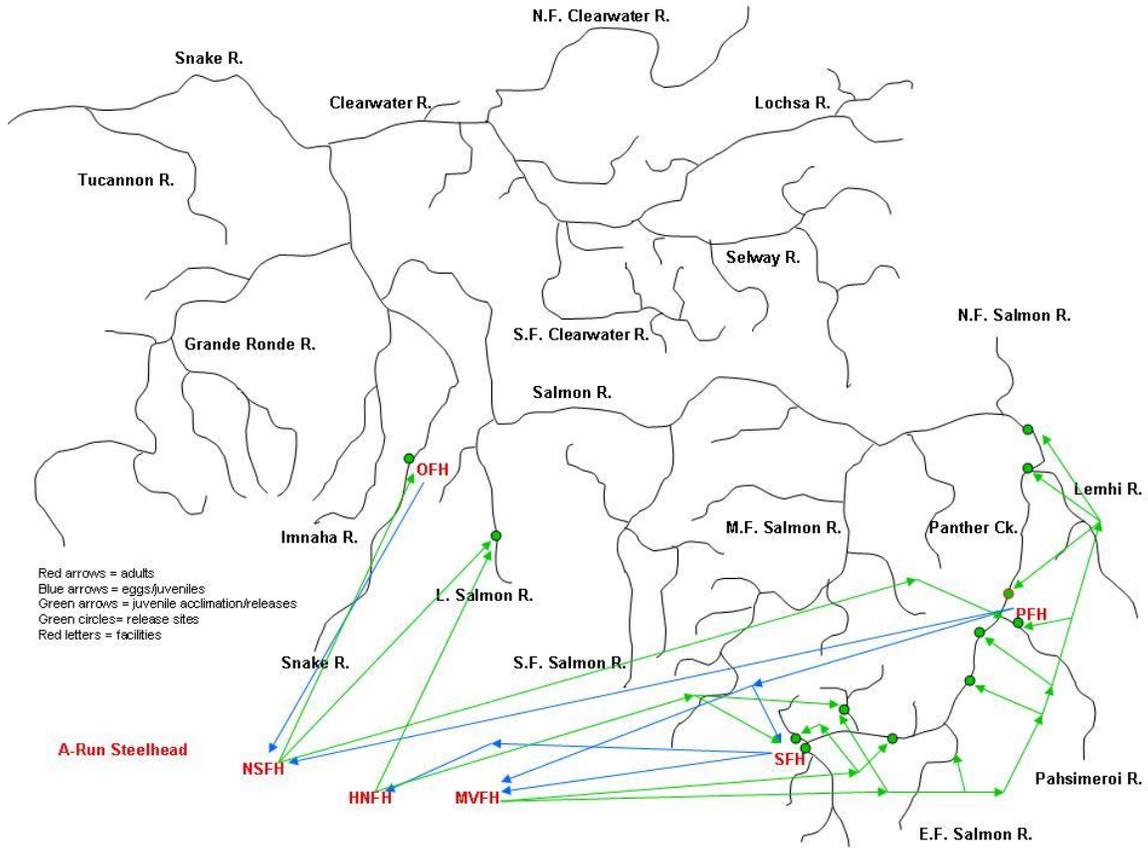
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							Release Year 2007	
Steelhead (Salmon River Basin Releases)								
Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release
(Dworshak B stock) Dworshak NFH		Dworshak NFH	Dworshak NFH	Magic Valley FH		L. Salmon R. (Stinky Spgs.)	215,000	Smolt (AD)
						Squaw Ck.	130,000	Smolt (AD)
						Squaw Ck.	60,000	Smolt (AD)
						lower E.F. Salmon R.	225,000	Smolt (AD)
E.F. Salmon R.	E.F. Salmon R.	E.F. Salmon R.	Sawtooth FH	Magic Valley FH	Squaw Ck. Pd.	Squaw Ck.	60,000	Smolt (AD)
						Squaw Ck. Pd.	60,000	Smolt (AD)
(E.F. Salmon R. stock)				Magic Valley FH		E.F. Salmon R. @ weir	50,000	Smolt
(Pahsimeroi/Sawtooth A stock) Pahsimeroi/Sawtooth FH	Pahsimeroi/Sawtooth FH	Pahsimeroi/Sawtooth FH	Sawtooth FH	Magic Valley FH		Slate Ck.	40,000	Smolt (AD)
						Salmon R. @ Red Rock	130,000	Smolt (AD)
						Slate Ck.	60,000	Smolt
						Salmon R. @ Lemhi Hole	80,000	Smolt (AD)
						Yankee Fk.	60,000	Smolt (AD)
						Yankee Fk.	30,000	Smolt
						Salmon R. @ Colston Corner	140,000	Smolt (AD)
						Salmon R. @ Tunnel Rock	60,000	Smolt (AD)
						Salmon R. @ McNabb Pt.	120,000	Smolt (AD)
						Pahsimeroi R. @ trap	30,000	Smolt (AD)
						Magic Valley FH	50,000	Smolt
(Oxbow stock)				Niagra Springs FH		Snake R. @ Hells Canyon Dam	525,000	Smolt (AD)
Hells Canyon Dam	?	?	?	Niagra Springs FH		L.Salmon R. @ Stinky Spgs.	275,000	Smolt (AD)
(Pahsimeroi stock)				Niagra Springs FH		Pahsimeroi R. @ trap	830,000	Smolt (AD)
Pahsimeroi FH	?	?	?	Niagra Springs FH		L.Salmon R. @ Stinky Spgs.	170,000	Smolt (AD)
	?	?	?					
(Sawtooth/Pahsimeroi stock) Sawtooth FH	Sawtooth FH	Sawtooth FH	Sawtooth FH	Hagerman NFH		Salmon R. @ Sawtooth FH	750,000	Smolt (AD)
				Hagerman NFH		Yankee Fk.	140,000	Smolt
				Hagerman NFH		Yankee Fk.	100,000	Smolt (AD)
				Hagerman NFH		L. Salmon R. @ Stinky Spgs.	160,000	Smolt
				Hagerman NFH		L. Salmon R. @ Hazard Ck.	40,000	Smolt
(Dworshak B stock) Dworshak NFH	Dworshak NFH	Dworshak NFH	Dworshak NFH	Hagerman NFH		L. Salmon R. @ Stinky Spgs.	100,000	Smolt (AD)
				Hagerman NFH		lower E.F. Salmon R.	100,000	Smolt (AD)
Total							4,790,000	

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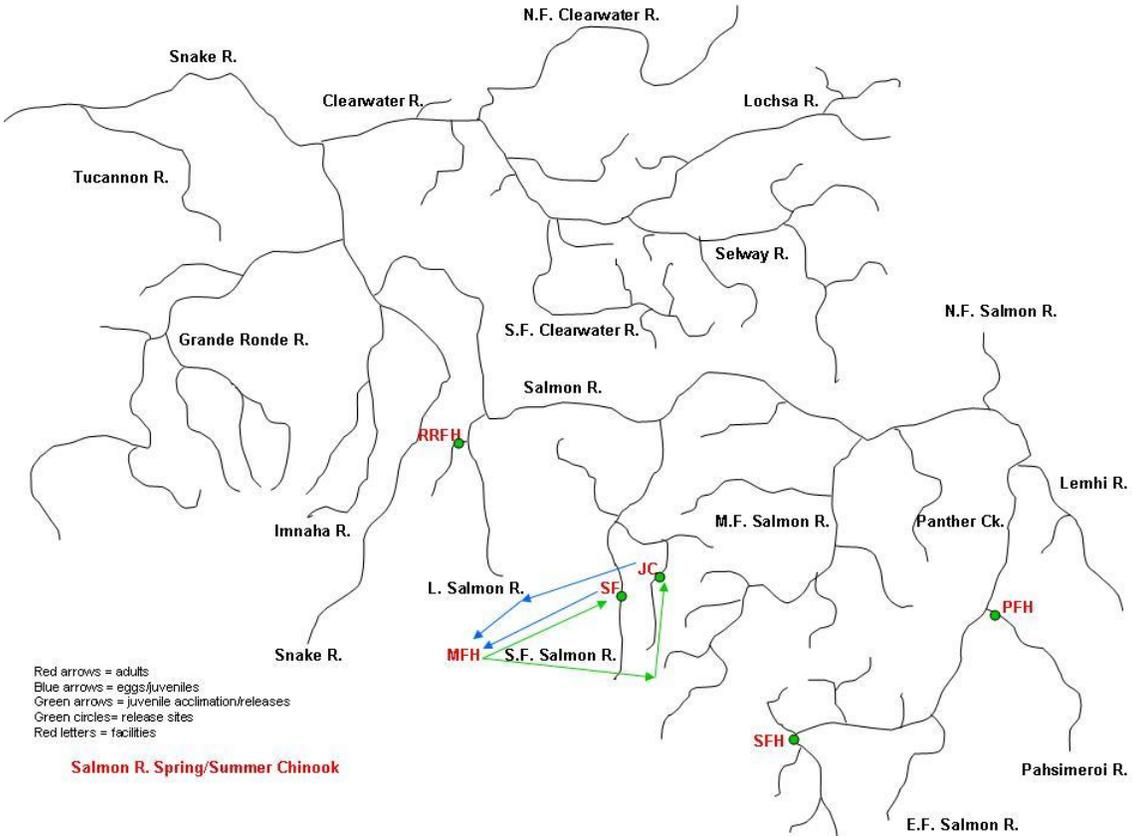
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Release Year 2007

Spring/summer chinook (Salmon River Basin Releases)

Adult collection	Adult holding	Adult spawning	Incubation	Rearing	Acclimation	Release Site	Release numbers	Size at release
(S.F. Salmon R. stock) S.F. Salmon	S.F. Salmon	S.F. Salmon	McCall FH	McCall FH		S.F. Salmon	1,050,000	Smolt
(Johnson Ck. Stock) Johnson Ck.	Johnson Ck.	Johnson Ck.	McCall FH	McCall FH	Johnson Ck.	Johnson Ck.	100,000	Smolt
(upper Salmon R. stock) Sawtooth FH	Sawtooth FH	Sawtooth FH	Sawtooth FH	Sawtooth FH		upper Salmon R.	1,500,000	Smolt
(Pahsimeroi R. stock) Pahsimeroi FH	Pahsimeroi FH	Pahsimeroi FH	Pahsimeroi FH	Pahsimeroi FH		Pahsimeroi R.	1,100,000	Smolt



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J. Special considerations in region (e.g., ESA listings, Habitat Conservation Plans, Fishery Management Plans, FERC relicensing, etc.)

- Snake River Spring/Summer Chinook - threatened, 6/05 (not listed in the Clearwater subbasin).
- Snake River Fall Chinook - threatened, 6/05
- Snake River Steelhead - threatened, 1/06
- Snake River Sockeye – endangered, 6/05

II. Dworshak National Fish Hatchery¹⁹

A. Description of hatchery

- Construction of Dworshak National Fish Hatchery (NFH) was included in the authorization for Dworshak Dam and Reservoir to mitigate for the loss of the wild run of the North Fork Clearwater River “B-Run” summer steelhead (*Oncorhynchus mykiss*) caused by the construction and operation of the Dam and Reservoir. Dworshak Dam, constructed by the U.S. Army Corps of Engineers (COE), was authorized under the “Rivers and Harbor Act of 1962 - Flood Control Act of 1962” (Public Law 87-847, October 23, 1962). The construction of Dworshak Dam completely blocked access to all but the lower 1½ miles of the North Fork Clearwater River below the Dam. The intent of the steelhead mitigation program at Dworshak NFH was calculated by the Service to return 20,000 adult steelhead to the mouth of the Clearwater River annually while perpetuating and maintaining the unique genetics of the North Fork B-Run summer steelhead population (Miller 1987).
- In June 1982, under the Lower Snake River Compensation Plan (LSRCP), Dworshak NFH was expanded from its primary function as a steelhead mitigation facility to include spring Chinook salmon (*Oncorhynchus tshawytscha*). The COE was authorized by Congress in 1976 to implement the LSRCP in accordance with the Water Resources Development Act of 1976 (Public Law 94-587) to offset losses of anadromous fish in the Snake River basin caused by the four dam and navigation lock projects in the Lower Snake River. The spring Chinook salmon program at Dworshak was intended to replace lost sport and Tribal fisheries in the Clearwater River.
- Dworshak National Fish Hatchery is located approximately 40 miles east of Lewiston near the community of Ahsahka in Clearwater County, Idaho and lies within Nez Perce Indian Reservation boundaries. The hatchery is situated 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.
- Currently, Dworshak NFH operates with a staff of 26; seven in administration, nine in maintenance, and 10 in production. A summer youth program is conducted every summer to provide opportunities for youth to become acquainted with fishery resource conservation programs. Volunteers are used to assist with outreach activities and station operations whenever possible.
- Dworshak NFH has 26 buildings altogether; four administrative type buildings, four residences, 11 buildings used in production and maintenance, and six storage buildings. There are currently no plans for any additional construction although improvements, maintenance and rehabilitation is performed on a regularly scheduled basis.

¹⁹ Section text and figures from DNFH CHMP, 2004.

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Table: Hatchery buildings, primary use, type of construction, and improvements.

Building	Construction Type
Main PumpHouse 3204 ft ²	89 ft. x36 ft. Concrete Building constructed in 1968. Contains 6 main pumps, standby generator, 3 traveling water screens and coarse trash rack.
Aeration Chamber 10329 ft ²	114 ft. x 91 ft. Concrete structure built in 1968. Aerates and degases river water.
F&M Pump House 345 ft ²	15 ft. x 23 ft. Concrete Building constructed in 1968 contains 3 pumps.
Visitors Restroom 704 ft ²	32 ft. x 22 ft. Concrete building used for restrooms for the visitors.
Residence # 1 3591 ft ²	Residences at Dworshak NFH consist of 4 wood frame houses constructed in 1969. Houses are 3 bedroom with unfinished basements.
Residence # 2 3591 ft ²	
Residence # 3 3591 ft ²	
Residence #4 3591 ft ²	
Flammable Storage 800 ft ²	32 ft. x 25 ft. Concrete Building constructed in 1968.
Shop 4361 ft ²	49 ft. x 89 ft. Concrete Building constructed in 1968.
System I Pump house 504 ft ²	21 ft. x 24 ft. Concrete Building constructed in 1968.
System I Digester Area 304 ft ²	16 ft. x 19 ft. Concrete Building constructed in 1968.
Mechanical Building I 6624 ft ²	69 ft. x 96 ft. Concrete Building constructed in 1968.
Mechanical Building I add on 768 ft ²	96 ft. x 8 ft. Concrete Building
Cart Shed 520 ft ²	40 ft. x 13 ft. Concrete metal building constructed in 1968
Generator Building 729 ft ²	27 ft. x 27 ft. Concrete Building constructed in 1968.
Mechanical Building II 5468 ft ²	81 ft. x 685 ft. Concrete Building constructed in 1968.
Fish Food Facility 5508 ft ²	Concrete Building constructed in 1968.
Warehouse West 1720 ft ²	20 ft. x 86 ft. Wood/Metal Building.
Vehicle Storage 3780 ft ²	30 ft. x 126 ft. Metal Building constructed in 1968.
Electric Shop 1200 ft ²	20 ft. x 60 ft. Metal Building constructed in 1968.
Main Hatchery Bldg Upstairs 5472 ft ²	Concrete Building constructed in 1968.

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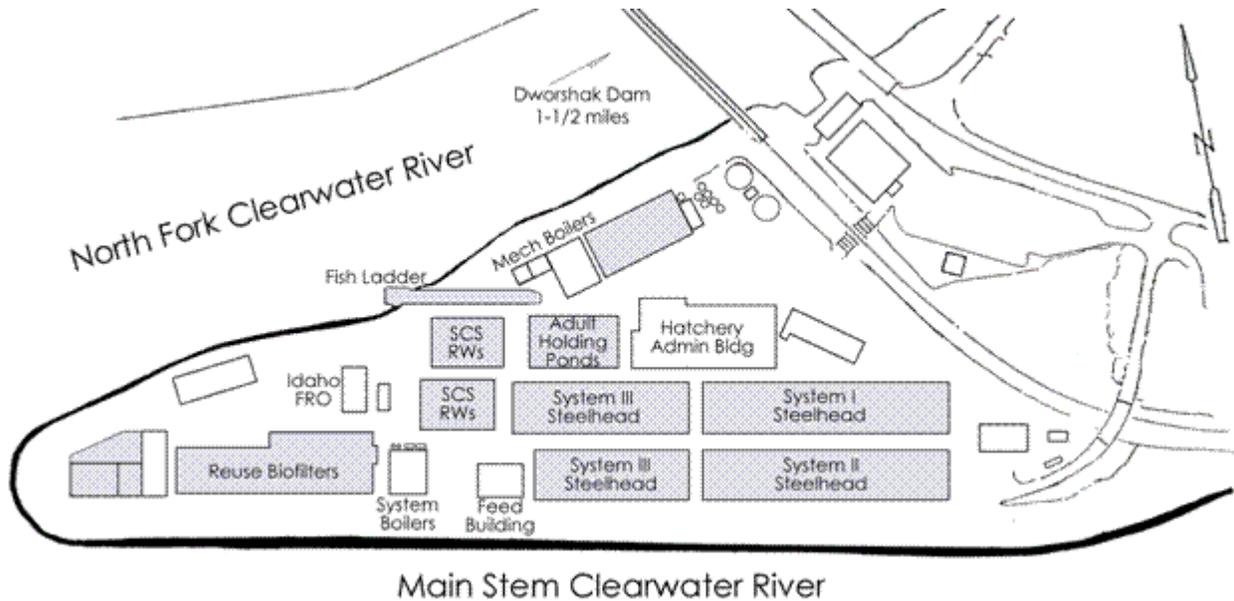
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Main Hatchery Bldg Downstairs 9120 ft ²	Concrete Building constructed in 1968.
Nursery Building 19200 ft ²	160 ft. x 120 ft. Concrete Block Building constructed in 1968.
Chemical Buildings II & III 256 ft ²	Wood/Metal Buildings constructed in 1968.
Chemical Storage Buildings 73 ft ²	Two Metal Buildings purchased for storing formalin.

Table: Description of Dworshak NFH rearing units.

Unit	Length ft	Width ft	Depth ft	Volume ft ³	Volume Gallons	#	Material	Year Installe d/ Constru cted
Adult Holding Pond	75	15	7.5	8,438	63,117	4	Concrete	1970
Burrows Pond	75	16.5	2.4	2,933	21,939	84	Concrete	1970
Circular Tank	-	6' Dia	2.5	71	528	4	Fiberglass	2000
Heath Incubator Stacks- 16Tray	-	-	-	0.35/tray	2.63/tray	58	Fiberglass	1992- 2002
Nursery Tank	16	3	1.9	91	682	64	Concrete	1970
Nursery Tank	16	3	1.8	86	646	64	Fiberglass	1979
Raceway	80	8	2.0	1,280	9,575	30	Concrete	1982
Raceway	63	8	2.0	1,008	7,540	10	Concrete	1978

Figure: Physical layout of Dworshak NFH.



B. Hatchery water sources

Dworshak NFH consists of a mechanical and electrical water reuse and reconditioning system employing filtration, biological nitrification, pollution control and monitoring facilities, alarm system, water chillers, heaters, and numerous pumps. Initial construction at DNFH included 84 BP's, 64 nursery tanks, and 9 adult holding ponds (Figure 2). Twenty-five BP's (System I) were operated on a heated recycle water flow, for rearing steelhead smolts to the initial target size of 180 mm in only one year. In 1973, System II (25 ponds) and System III (34 ponds) were converted from a single-pass, 2-year rearing cycle, to water reuse and heating for accelerated production growth. This second phase of construction, with added mechanical systems (biological filters, electric grid, sand filters, U.V. lamps, chillers, and boilers), increased production capacity and allowed all three water systems to be environmentally controlled.

Further construction in the late 1970's and early 1980's added 18,000 square feet of nursery building, doubling the number of inside rearing tanks to 128. In FY2001 there were 58 incubator stacks available (870 trays).

Also in the 1980's, five of the nine adult steelhead holding ponds were converted to raceways in order to rear rainbow trout as part of the resident fish mitigation program for Dworshak Reservoir. In 1997 these were converted into coho rearing ponds for the NPT.

Current reservoir supply needs for Dworshak NFH include separate warm and cold reservoir supply lines into the hatchery. Because of the two species—steelhead and spring Chinook

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salmon—both warm and cold water is needed at the same time for various rearing and incubation needs. Two temperature options (54°F and 43°F) are available for egg development in half of the incubators and for fry development in a limited number of the tanks in the nursery.

In all the outside steelhead rearing systems, water reuse and heating is used during the colder months of November through March, enabling the hatchery to obtain programmed fish growth. During reuse, 10 percent makeup water enters the operation to make up for various water losses in each system. Each of the three outside ponding systems is independent of the others for temperatures when reuse and heated water are available.

Screening. Three large traveling water screens are installed in the main pump house. These screens are installed behind trash racks. The traveling water screens remove small debris that could cause damage to the six main pumps that supply river water to the hatchery. The screen is stainless steel wire mesh with a 3/8-inch square opening. The trash rack has a 2-foot by 3-inch opening. The screens are backwashed daily using high-pressure water. This is normally done manually but can be done by a timer and/or a pressure regulator.

The maintenance crew takes care of the screens Monday through Friday. The production crew takes care of the screens on weekends and holidays. The screens operate all year depending upon water requirements and pumping needs for fish production. Normally, there are at least two main pumps in use at all times. Routine maintenance includes lubricating various components on a scheduled time and daily inspections. All three screens were completely rebuilt in 1999 and 2000.

Conveyance System to Hatchery and Ponds. River water is pumped to the outside steelhead ponds, providing single-pass water from May through November. When desired, changes in temperature can sometimes be obtained through selector gates at Dworshak Dam. A pump station on the North Fork of the Clearwater River, one mile down river from the Dam, is capable of providing 92,500 gpm of water for the hatchery. With all systems up and running, the intake for Dworshak is 136 million gallons of water/day.

Beginning in November of 1991, the hatchery was supplied with an additional 6,400 gpm of water directly from Dworshak Reservoir by a pipeline coming out of the face of the dam. This disease free water supplies egg incubators and nursery rearing tanks and has afforded disease protection from IHNV in the early production stages.

Supply lines from the dam come to a distribution box (42-inch diameter warm water and 24-inch diameter cold water). From the distribution box to Dworshak NFH, there is a 24-inch diameter warm water supply line and a 14-inch diameter cold water supply line. The two reservoir supply lines enter Dworshak NFH at a valve pit where they join and continue into a 30-inch diameter supply line. This supply line was an existing line from the main aeration chamber and supplies water to the Nursery building and Mechanical buildings I and II. The water can be heated in Mechanical building I and II or chilled in the incubation room.

During 1998, a water line was completed between Mechanical Building I and the main water line from the large boilers in Mechanical Building II. This line now enables Dworshak to heat all the nursery reservoir water (5,100gpm) to 54°F for better steelhead production. Chilled water is less than 100 gpm at 44–45°F and is limited to half of the incubation room.

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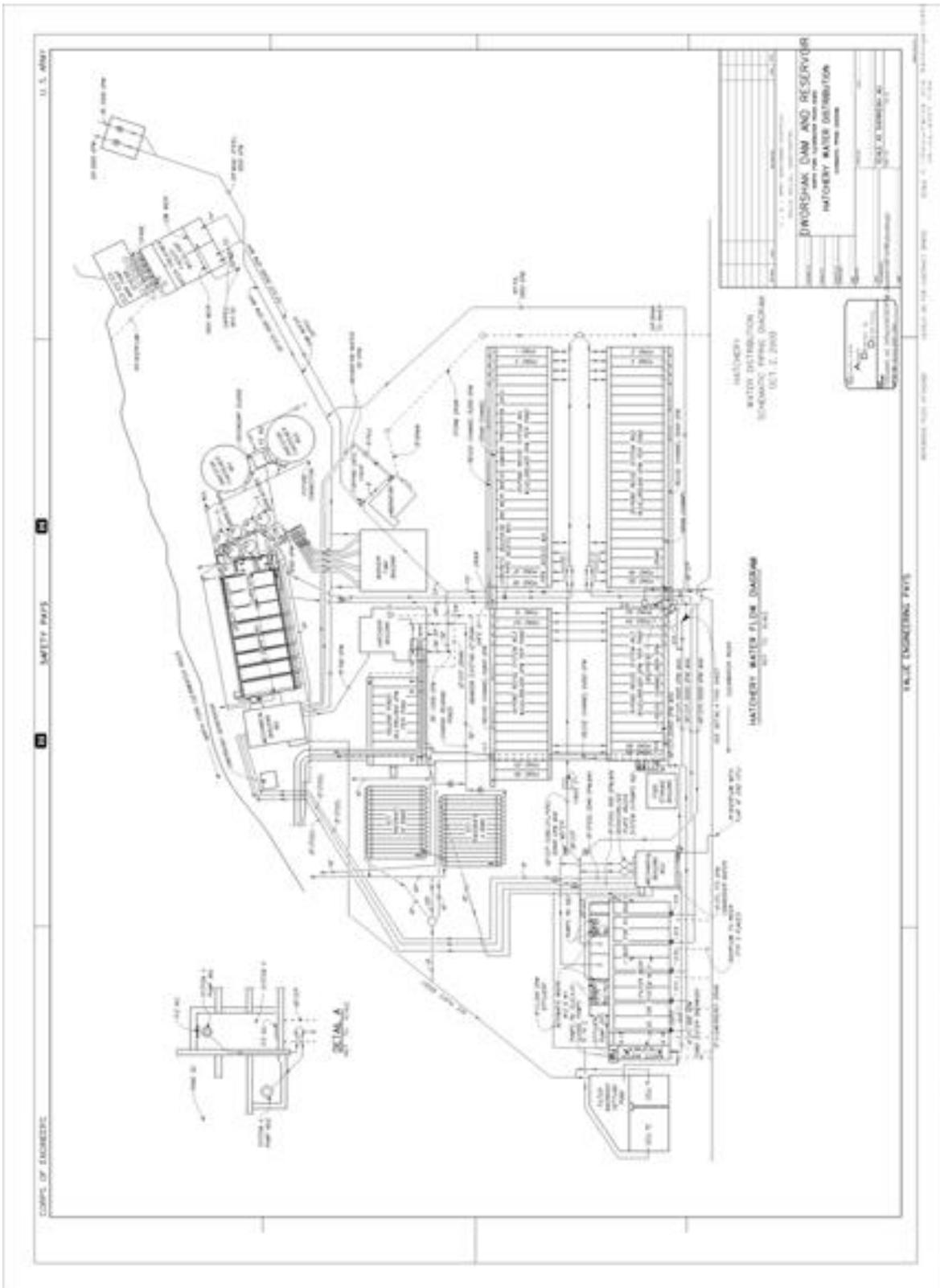


Figure: Dworshak Dam and Reservoir.

C. Adult broodstock collection facilities

Dworshak NFH has a step-pool fish ladder in the North Fork of Clearwater River that allows adult summer steelhead and spring Chinook salmon to return to the hatchery. The ladder is operated during from June through mid-September to collect spring Chinook salmon. Summer steelhead are collected twice during the year; from October to November to collect the early return portion of the run and from late January to early May to collect the late portion of the run.

D. Broodstock holding and spawning facilities

The following performance measures for spring Chinook salmon have been established at Dworshak NFH.

Performance Measure	Hatchery Goal	5-Year Average	Range
Spawning Population	1,200	2,218	800–4,018
Fish release (millions)	1.00–1.05	873,893	333,120–1,044,511
Smolt size at release (fish/lb)	20–22	21	19.7–24.0

- Dworshak operates a fish ladder at its facility to capture returning adult spring Chinook. The ladder is usually opened for spring Chinook collection from late May through mid-September.
- Mortalities are removed daily and formalin treatments are administered from 1-3 times per week to control fungus. All adult females are injected with Erythromycin (20mg/kg) approximately 21 days prior to spawning. The spring Chinook carcasses are unfit for human consumption and can be used for Washington or Idaho State bear research/capture programs, university research, raptor recovery and rehabilitation programs, or stream nutrient enhancement programs. The remainder of the carcasses are taken to an area waste-transfer station.
- Because the run of spring Chinook salmon to Dworshak NFH is relatively short most years, especially compared to the steelhead return, the ladder is generally opened in June and operated all summer until closing in September. In most years, running the trap continually is necessary in order to ensure that broodstock is collected over the full spectrum of the run. In those years when returns are sufficient to provide sport and tribal harvest opportunities, the ladder may be closed for brief periods during the summer.
- **Surplus Adult Returns.** Surplus adults entering the hatchery are usually outplanted to various locations in the Clearwater basin.
- **Spawning Protocol.** As Chinook are spawned throughout a 3–5 week spawning season, fish which are ripe when examined are used for the production program. Ripe adult spring Chinook of any and all ages are used, including two-year-old males and females. The majority of fish spawned are 4 years old, with some 3 and 5 year old fish being utilized.

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The spawning procedures are similar in recent years. Tricaine methanesulfonate (MS-222) is used for spawning purposes for the easiest handling of the fish. Adults are crowded from the holding ponds into a crowding channel, moved into a channel basket, and placed into an anesthetic bin. Pro-Polyaqua is added (250 ml per bin) to reduce stress and susceptibility to infection. Oxygen is provided at a rate of 1.5 L/minute.

Spinal columns of ripe females are severed using a pneumatic knife. The females are then placed on a table for approximately 3–10 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 added to assist in milt motility. The milt solution is poured onto the eggs and swirled for more complete fertilization. After sufficient time had elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter.

Green males and females are returned to holding ponds for examination the following week.

- **Other Acceptable Stocks.** If brood stock numbers are insufficient to meet hatchery production objectives, the hatchery will accept surplus eggs or fish from either Kooskia NFH or another LSRCF facility that has Rapid River stock.

E. Incubation facilities

- After fertilization, eggs from one female are placed in Heath incubator trays. 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 disease transmission. The trays are then pushed into the incubator with a water-flow rate of approximately three gallons/minute. Eggs in banks A/B are chilled to approximately 40°F. Since the chiller has the capacity to only chill two incubator stacks, eggs in C/D bank incubators are held at approximately 45°F.
- Eye-up of eggs on 45°F water takes place approximately 43 days after spawning. Eye-up of eggs on chilled water (40°F) takes place approximately 70 days after spawning. Upon eye-up, eggs are shocked and enumerated using an electronic egg picker and counter (Van Gaalen Model N-100).

F. Indoor rearing facilities

- From 1996 through 2002, all Dworshak stock spring Chinook eggs were shipped to Kooskia NFH. This was done after the eggs were eyed-up and enumerated at Dworshak NFH. Eyed eggs were then transferred to Kooskia NFH in lots of 5,000 a few days after enumeration, usually in October/November. Eggs are transferred inside of Vexar tubes packed inside of ice chests. From 2002-2005, approximately ½ of Dworshak stock eggs were shipped to Dworshak for incubation. After a new chiller was installed in 2005, Dworshak stock spring Chinook eggs for Dworshak production remain on station. All Kooskia stock spring Chinook eggs are still shipped to Kooskia in the fall for incubation over the winter.

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- The use of 38°F chilled water at Kooskia NFH all winter allows for slowing the rate of development in the eggs so that smolts will be a target size of 20–22 fpp at release in the spring of 2004. This delay in egg development is undertaken to reduce the length of the Chinook feeding program from 17 months to 14 months. With this shortened feeding program, Chinook require fasting for a shorter period of time than if the incubation water were not chilled.

G. Outdoor rearing facilities

- Before 2005, Chinook eggs which were shipped to Kooskia NFH in the fall return as fry to Dworshak NFH in March and April of the following year. These fry are shipped just before going on feed and are usually transferred inside of incubation trays submerged in a fish-hauling tank.
- Since 2005, fry are loaded at approximately 100,000 fry/raceway straight from the incubation trays and later split to a final rearing density of 30–35,000/raceway. Splitting of the Chinook occurs when fish are adipose-fin clipped and coded wire tagged in the summer.

H. Release locations and facilities

Chinook are reared until reaching about 20 fish per pound in size and are released during spring run-off. Release of spring Chinook at Dworshak NFH usually occurs at the end of March each year. The fingerlings are direct-released into the North Fork of the Clearwater River, approximately 1½ miles downstream of Dworshak Dam.

I. Outmigrant monitoring facilities

Dworshak NFH releases about 1.05 million spring Chinook salmon smolts each year. Starting with 1993 releases all of the spring Chinook salmon smolts at Dworshak NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least two groups of 60,000 fish receive a CWT to represent the two separate banks of LSRCP raceways. Since 1996, the spring Chinook salmon program at Dworshak NFH has cooperated with the Fish Passage Center in the Comparative Survival Study by providing in excess of 50,000 smolts per year for PIT-tagging. The smolts are released at Dworshak NFH and provide information on survival during emigration to the ocean as well as Transported vs. Non-Transported adult survival back to the river from the ocean. For the past several years, the adult PIT tag information has been used by the fishery management agencies and the hatchery to construct in-season estimates of harvestable surpluses of Chinook salmon not needed for broodstock.

J. Additional or special facilities

- **Effluent Treatment and monitoring.** The incubation room has single-pass reservoir water with three temperatures available: heated, chilled, and ambient. Water from the incubation

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room drains into the outside raw water channel that supplies the holding ponds and the storm drain that discharges into the North Fork below the ladder. Except for screening for eggs in the spawning area, there is no treatment for the water leaving the incubation/spawning area.

- There are 30 8'x80' concrete raceways for the spring Chinook salmon program, 15 in A-Bank and 15 in B-Bank. Raceways are operated on single-pass river water. Cleaning wastes go to a settling pond on the point at the confluence of the rivers prior to being discharged into the North Fork.
- There are 10 raceways in the adult holding pond area that were built for rearing rainbow trout. These raceways can be operated on single-pass river water. Cleaning wastes and the raw water are discharged into the North Fork.
- There are four adult holding ponds. These ponds and the ladder are operated on single-pass river water. Raw water is discharged to the North Fork. No cleaning wastewater treatment is conducted for this system.

K. Outreach and public education facilities/programs

Dworshak Fisheries Complex Information and Education (I&E) Office services Dworshak and Kooskia NFH's and the Idaho FRO. The Office shares/distributes its time and staffing between these stations. The I&E program is mainly funded by Dworshak NFH with assistance from Kooskia NFH and the Idaho FRO.

The goal of Dworshak Fisheries Complex outreach program is to increase the visibility of the Fish and Wildlife Service facilities in the Clearwater River Basin, and to provide information about Service programs to internal and external audiences. Staff and volunteers show how Service programs benefit the public and the environment in keeping with the Service's mission, *Working with others to conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people.*

Recognizing that it is increasingly important for all staff to be involved in gaining or retaining public support for our programs, the I&E program will strive to ensure that staff are well-informed about policies, procedures, and issues; and they are willing and able to interact with our various publics. Program efforts will include providing information to staff, partners, and volunteers; through them, to members of the community and other publics. Outreach will be used as a management tool, providing support to the Service, the public, and our hatchery programs.

On Station. On station activities include an average of 85 guided tours annually to local schools. Some special interest groups schedule more in-depth tours of specific hatchery operations. On site educational efforts include Jr. High Science Day each May introducing Orofino 7th and 8th graders to various elements of the hatchery and general stewardship of the outdoors. Various Natural Resource Conservation Service (NRCS) – county agency Environmental Days are held May – July for 6th grade students over 3 day periods. Students from 4 – 5 area schools raise spring Chinook salmon or steelhead trout in their classrooms and visit the hatchery annually to release their fish and tour the facility. Annual events include an Open House/Kids Fishing Day in June. Additional coverage by I&E staff is provided on weekends during peak visitation (May -

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September) to give tours, answer questions, staff the Dworshak Spawn Shop, and disseminate general information.

Off station. Outreach efforts include an array of activities that occur throughout the Pacific Region, with an emphasis on Idaho events. Examples include natural resource career fairs, festivals, classroom activities at local schools, stream and water quality surveys, participation in other NFH events, and county fairs (Clearwater, Idaho and Lewis counties).

The hatchery houses a traveling fisheries exhibit complete with photo panels, video player, and steelhead diorama. This exhibit is displayed at several outdoor venues each year. The Service chooses events reaching a broad audience, and rotates staffed offsite events yearly due to minimal staffing levels.

Virtual visitors can tour Dworshak NFH through the World Wide Web at <http://dworshak.fws.gov>. Web statistics show 524 hits per month average use of the web site. We are negotiating as a beta test site for a web-camera offering 360 degree views of the facility.

Partnerships/Cooperators/Stakeholders. A bulleted list of events and partnerships follows:

- Clearwater, Idaho, Latah and Lewis county public schools – Dworshak/Kooskia NFH provides spring Chinook salmon or steelhead trout eyed eggs for Hatchery-In-The- Classroom activities in February; classes tour the hatchery, conduct ‘Fin Bin’ activities, then release their fish in May.
- Orofino Jr. and Senior High Schools – provide staffed Career Day station annually on fisheries and FWS careers, with hands-on tools and employment information.
- Clearwater Basin Advisory Council – actively participate on this team for regional and local outdoor or public use projects.
- Columbia Basin Environmental Education Capacity Building Initiative (CBI) – I&E staff actively participate on the Lower Snake River Advisory team for this group, meeting throughout the year to identify all environmental/natural resource education in region, correlate with 10 sub-basin groups to develop a region-wide plan for Environmental Education (EE).
- Earth Week Educators – Attend and plan event with multi-agency committee Jan – May; annual April presentation over 3 days to 300 area 4th graders, at Big Eddy Rec area, Dworshak Reservoir. Present interactive fisheries lessons, participate in daily group summary activity.
- Friends of Northwest Hatcheries - continue to strengthen and expand this partnership; operate the Dworshak Spawn Shop sales area at the hatchery. Dworshak NFH Complex signed an official MOU with the Friends Group and the Regional Director in January, 2002. I&E Coordinator acts as Idaho contact/shop manager for FNWH.
- Latah County Environmental Awareness Days – annual participation at 2 day event at Spring Valley Reservoir conducting interactive lessons for 300 6th students.
- Nez Perce County Outdoor Education Days – Hells Gate State Park, annual participation at 2 day event for 250+ students, conducting interactive fisheries lessons.

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- Idaho County Sports Show - May, Grangeville, ID; staff outdoor booth on FWS fishery programs, local NFH, and advertise for June Open House events.
- Orofino, Kamiah, Kooskia, Nez Perce schools – I&E staff lead fish dissections to reinforce internal and external anatomy, pre or post-hatchery tour.
- Upper Clearwater Arts Council - cooperative effort with various activities and events annually primarily at Kooskia NFH. MOU in place for their use of vacant residence trailer as office/meeting/storage space on hatchery grounds.
- U.S. Army Corps of Engineers, Dworshak Dam - cooperative effort with outreach activities including booth at annual Kids' Fishing Day, joint county fair booth, Clearwater County 6th grade Forestry Tour.
- U.S. Forest Service - cooperative effort with outreach activities including Kids' Fishing days, day camps and cultural resources events.
- Idaho Salmon and Steelhead Days, Boise – on the planning committee for this annual event, Gyotaku activity chairperson for over 3,000 4th grade students.
- Salmonfest – host Gyotaku activity at annual Leavenworth NFH event for over 10,000 people in 4 days.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.)

No information provided

IIA. Dworshak NFH B-Run Steelhead²⁰

A. General information

Construction of Dworshak National Fish Hatchery (NFH) was included in the authorization for Dworshak Dam and Reservoir to mitigate for the loss of the wild run of the North Fork Clearwater River “B-Run” summer steelhead (*Oncorhynchus mykiss*) caused by the construction and operation of the Dam and Reservoir. Dworshak Dam, constructed by the U.S. Army Corps of Engineers (COE), was authorized under the “Rivers and Harbor Act of 1962 - Flood Control Act of 1962” (Public Law 87-847, October 23, 1962). The construction of Dworshak Dam completely blocked access to all but the lower 1½ miles of the North Fork Clearwater River below the Dam. The Service calculation of the steelhead mitigation program at Dworshak NFH is to return 20,000 adult steelhead to the mouth of the Clearwater River annually while perpetuating and maintaining the unique genetics of the North Fork B-Run summer steelhead population.

A. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

The purposes for Dworshak NFH can be met by accomplishing three Goals, adapted from the federal authorizing legislation cited above, the Endangered Species Act (ESA) Biological Opinions, and U.S. v. Oregon.

- Goal 1: Conserve and perpetuate the unique North Fork Clearwater River “B-Run” summer steelhead population.
- Goal 2: Assure that all the requirements of legal orders and federally mandated legislation are met.
- Goal 3: Provide accurate information and educational (I/E) opportunities for the public, media, schools, Tribal, State, and Federal agencies, and elected officials to enhance participation in understanding and stewardship of Dworshak NFH and United States Fish & Wildlife Service (USFWS) programs.

1. Goals of program

Goal 1: Conserve and perpetuate the unique North Fork Clearwater River “B-Run” summer steelhead population.

Objective 1.1: Return 30,000 adult summer steelhead to the Columbia River and 20,000 adult summer steelhead to the Clearwater River annually.

²⁰ Unless cited otherwise, section figures, tables and text from DNFH CHMP, 2004.

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- Task 1.1.1: Annually collect 3000 adults to provide between 1,200 and 1,500 fish for broodstock.
- Task 1.1.2: Rear and release 2.3 million smolts into the Clearwater River annually.
- Objective 1.2: Maintain the genetic integrity and diversity of the North Fork Clearwater River “B-Run” summer steelhead population through proper broodstock collection, spawning procedures, and fish culture techniques.
 - Task 1.2.1: Ensure that broodstock includes at least 500 adults collected from the early return (fall) component of the run.
 - Task 1.2.2: Collect broodstock to represent the full spectrum of the run.
 - Task 1.2.3: Spawn and rear the early return component of the run separately from the remaining run.
 - Task 1.2.4: Maintain as close to a 1:1 male to female spawning ratio as possible.
 - Task 1.2.5: Spawn adults to represent the entire range of timing of reproductive maturity.
 - Task 1.2.6: Spawn adults so that all age classes are represented.
 - Task 1.2.7: Work with the regional genetics lab to insure that the genetic diversity of the Dworshak summer steelhead population is maintained.
- Objective 1.3: Produce the healthiest, highest quality fish possible at every stage of production.
 - Task 1.3.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.
 - Task 1.3.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
 - Task 1.3.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, broodstock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.
- Objective 1.4: Conduct monitoring and evaluation activities that will provide information on the progress of the hatchery in meeting its return objectives for summer steelhead.
 - Task 1.4.1: Conduct regularly scheduled HET meetings.
 - Task 1.4.2: Biosample returning adults.
 - Task 1.4.3: Use coded-wire tags(CWT) to mark and track representative production groups in the ocean and Columbia River basin.
 - Task 1.4.4: Cooperate with the State and Tribe to obtain estimates of sport and Tribal harvest in the North Fork and Lower Clearwater River.
- Objective 1.5: Cooperate and Coordinate with the IDFG and the NPT to develop opportunities for sport and tribal harvest.
 - Task 1.5.1: Collect and spawn broodstock for IDFG projects in the LSRCF program.
 - Task 1.5.2: Conduct semi-annual coordination meetings.

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Task 1.5.3: Monitor health and disease status of fish, following the Service Fish Health Policy and IHOT Guidelines.

Goal 2: Assure that all the requirements of legal orders and federally mandated legislation are met.

Objective 3.1: Conduct hatchery operations consistently with requirements and obligations called for under the ESA.

Task 3.1.1: Develop and implement plans to release adult fall Chinook that enter the ladder immediately back into the Clearwater River.

Task 3.1.2: Mass mark all production fish to identify them from naturally produced fish.

Task 3.1.3: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).

Task 3.1.4: Implement measures to minimize interactions between production and natural fish.

Task 3.1.5: Draft and implement a Hatchery and Genetic Management Plan.

Objective 3.2: Operate the hatchery so that all requirements and obligations called for under the Clean Water Act are satisfied.

Task 3.2.1: Collect and store on site, fish waste from clarifiers and biofilters.

Task 3.2.2: Collect and analyze water samples monthly in accordance with the NPDES permit.

Objective 3.3: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) production and harvest objectives.

Task 3.3.1: Provide pertinent data and information to Service representatives on U.S. v Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 3.3.2: Meet tribal trust responsibilities.

Goal 3: Provide accurate information and educational (I/E) opportunities for the public, media, schools, Tribal, State, and Federal agencies, and elected officials to enhance participation in understanding and stewardship of Dworshak NFH and FWS programs.

Objective 4.1: Provide production and evaluation information in various reporting formats as necessary or required.

Task 4.1.1: Continue existing and develop new partnerships with public and private groups by being available for guest speaking at their meetings, workshops and other routine or special events.

Task 4.1.2: Develop and maintain strong relationships with area media (Orofino, Kamiah, Grangeville, Lewiston, Spokane) and provide regular news releases, feature stories, photos, data, public service announcements regarding agency issues and station activities.

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- Task 4.1.3: Maintain information flyers on station for after-hours visitors.
- Task 4.1.4: Coordinate with other Outreach or Public Affairs offices to incorporate hatchery information in their programs.
- Task 4.1.5: Maintain hatchery website with accurate and frequently updated information and graphics.
- Objective 4.2: Develop new and maintain existing levels of public contact and education programs, both on- and off-site.
 - Task 4.2.1: Facilitate interagency cooperation with existing and new programs in the Clearwater/Snake River region.
 - Task 4.2.2: Evaluate use and exposure of outreach materials and exhibits as they support goals for the I/E hatchery program.
 - Task 4.2.3: Distribute and follow up with teacher evaluations post-program to ensure goals are met.
- Objective 4.3: Develop site keynote events to promote awareness and stewardship of regional fishery resources in support of National Fishing Week activities.
 - Task 4.3.1: Continue hosting annual Kids' Fishing Day/Open House event each June.
 - Task 4.3.2: Interact with other state and federal agencies to host or partner present special events such as National Wildlife Refuge Week, Earth Day, Lewis and Clark Bicentennial activities, regional and local events.
 - Task 4.3.4: Develop more hands-on interactive education for current special events on-site.
- Objective 4.4: Develop external partnerships with new and existing private, non-profit and special interest groups and local, regional and national organizations, institutions and agencies, to promote public awareness and stewardship of fishery resources in the Columbia River Basin.
 - Task 4.4.1: Promote special interest group's use of hatchery by inviting to tour.
 - Task 4.4.2: Interact with Regional Office, Idaho Fish Health Center (FHC), Idaho Fishery Resource Office (FRO), IDFG, Clearwater National Forest (NF), National Oceanic and Atmospheric Administration (NOAA), COE and National Marine Fisheries Service (NMFS) to integrate Lower Snake, Clearwater and Columbia Basin fisheries outreach activities with FWS regional and national strategies.
 - Task 4.4.3: Participate in local advisory or community outreach forums and groups.
 - Task 4.4.4: Hold bi-annual public informational meetings to discuss hatchery practices, projects and program issues, concerns and plans.
 - Task 4.4.5: Provide annual legislative briefing packet distribution to Idaho elected officials; invite them to visit the hatchery during peak spawning seasons.

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2. Objectives of program

Table: The following performance measures have been established at the hatchery:

Performance Measure	Hatchery Goal	5-Year Average	Range
Spawning Population	3,500	5,222	2,882–7,797
Fish release (millions)	2.1–2.3	2.16	2.11–2.21
Egg transfers (millions)	2.30	2.93	2.65–3.65
Smolt size at release (mm)	200	198	192–205

3. Type of program (Integrated or Segregated)

Segregated harvest

4. Alignment of program with ESU-wide plans

Of special concern in the lower Clearwater River is the potential for ecological interactions between wild (listed) A-run summer steelhead and the B-run hatchery steelhead released from Dworshak NFH. From 1994–1997, the Idaho FRO conducted research on the interactions of hatchery and wild steelhead in the Clearwater River of Idaho. From 1999–present, the Idaho FRO continued the investigation with Bonneville Power Administration (BPA) funding, focusing primarily on factors related to residualization of steelhead in the Clearwater River.

5. Habitat description and status where fish are released.

Prior to blockage by Dworshak Dam, habitat in the North Fork Clearwater provided excellent steelhead spawning and rearing habitat that supported 60% of the spawning activity in the Clearwater subbasin (USFWS 1962). Of the remaining habitat in the subbasin, excellent steelhead habitat characterizes the vast majority of the available habitat in the Upper Selway AU, and the majority of tributary habitats within the Lower Selway and Lochsa AUs. The mainstem Lochsa River and mainstem Selway River above the wilderness boundary provide ‘good’ steelhead habitat, as do most of the tributary systems within the South Fork AU. Within the South Fork AU, ‘excellent’ steelhead trout habitat is associated with drainages originating within the Gospel Hump Wilderness Area: Johns Creek, Tenmile Creek, and the uppermost reaches of Crooked River. The Lower Clearwater and Lolo/Middle Fork AUs are most typically characterized by fair to poor steelhead habitat throughout. Notable exceptions are Big Canyon Creek and portions of Lolo Creek which are characterized as “good” steelhead habitat. (NWPPC Clearwater Subbasin Plan, November 2003, p.279)

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6. Size of program and production goals (No. of spawners and smolt release goals)

Table: Proposed annual fish release levels by life stage and location (DNFH B Steelhead HGMP, Oct. 2002, sec.1.11.2).

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	*On Site / **Off Site	1.2 mil on Site/ 1.1 mil off Site
Adult	S.F. Clearwater Tributaries	Variable

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

** Off site releases are made into the South Fork Clearwater River and Clear Creek.

B. Description of program and operations

1. Broodstock goal and source

- Since its construction the hatchery has served primarily as a mitigation hatchery for steelhead (*Oncorhynchus mykiss*), a unique run of the North Fork Clearwater River "B" strain summer steelhead. The construction of Dworshak Dam and Reservoir completely blocked access to all but the lower 1 ½ miles of the river below the dam. Since that time, the FWS has endeavored to meet the mitigation goal of providing 20,000 adult Summer Steelhead to the Clearwater River and to conserving the unique genetics of the stock.
- The North Fork Clearwater River steelhead stock maintained by Dworshak NFH is unique. At maturity, males and females of this particular stock of "B" run steelhead average about 91 cm (36 inches) and 82 cm (33 inches) in length, respectively. Spawning stock is comprised of three age classes; I-, II-, and III-"salt" fish, referring to the number of complete years fish have spent in salt water.
- Most "B" run steelhead enter the Columbia River in August through September, usually later than the smaller "A" run fish. The Clearwater "B" run steelhead may reach the Snake and Clearwater rivers in the fall, then over winter until their final run into the hatchery. Some of the fish actually arrive at Dworshak NFH in the fall. The Dworshak NFH trap is operated during the fall to ensure inclusion of sufficient early arriving steelhead (~500 adults) into the hatchery gene pool. The trap is then reopened from February through April to capture broodstock from the middle and late portions of the run.

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- Broodstock need for Dworshak mitigation is ~2,300 fish, this number of steelhead is needed to provide enough males to allow a 1:1 spawning ratio for the 630 females needed for egg collection. (An additional 2,000 fish are needed to provide eggs for Clearwater and Magic Valley Hatchery steelhead programs.) Male to female return ratio for two ocean steelhead at Dworshak is typically 1:2.3, so to collect enough males, more females than needed are collected and then excess steelhead are typically outplanted for natural spawning. This number includes jacks, accounts for pre-spawning mortality, and the 500 steelhead that are collected in the fall to cover the early returning, early spawning component of the run. This brood level provides ~2.1 million smolts at an average of 80% eyed egg-to-smolt survival to meet the adult return goal of 20,000 to the Clearwater River. The total adult return goal for Dworshak NFH and Clearwater Hatchery is 34,000 steelhead to the project area. Broodstock for all facilities are collected at Dworshak and total 4,300 adults. (USFWS Clearwater AOP, Mar. 2007, p.1)

2. *Adult collection procedures and holding*

- Dworshak NFH operates a fish ladder at its facility to capture returning Clearwater River "B" run steelhead. No summer steelhead are trapped and transferred to Dworshak NFH from outside of the basin. Dworshak operates the adult fish trap to capture summer steelhead from the entire spectrum of the run. This includes the adult returns to Dworshak in fall of the year (October–December), and the winter and spring (February–May). Collecting adults from the time they begin to appear at Dworshak until the run is over insures that genetic differences attributable to run timing are included in the broodstock.
- Dworshak operates the adult fish trap each fall to capture summer steelhead which enter the hatchery area several months before spawning begins. The ladder is usually opened near October 1 each year, and remains open until either 500 summer steelhead are captured or cold weather interferes with steelhead entering the ladder. In years past, the time the ladder was opened to collect the target number ranged from a few days to three months, depending upon the size of the run and various other factors.
- After 500 adults are trapped in the fall, the ladder used to remain closed until February. For the past several years the ladder has been opened in the fall after the 500 summer steelhead were captured for the trapping of coho for the NPT. Last year 1,941 additional summer steelhead were trapped, anesthetized with carbon dioxide, then handled and transported back to Lewiston, Idaho. The ladder closure results in more fish available to the sport and tribal fishery in the Clearwater River Basin. Steelhead which are trapped in the fall of the year are held in a separate adult holding pond. These fish are also spawned separately from the middle and late returning summer steelhead. Normally, these early-return fish are spawned the last week in January and the first week of February each year. The eggs from each take are kept separate from each other. As the eggs hatch, each take is kept separate from the other throughout both nursery and outside rearing until release. Approximately 400,000 smolts, or about 20 percent of the smolts released at Dworshak, will be progeny from these early return adults.
- Surplus adults entering the hatchery in the spring are usually outplanted to various locations in the Clearwater basin. Excess adults may also be donated to the NPT or Coeur d'Alene Tribe for subsistence use. Adult carcasses are used primarily for the food bank program and inmate rations in the Federal Prison System. Carcasses which are unfit for

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human consumption are used for Washington or Idaho State bear research/capture programs, university research, raptor recovery and rehabilitation programs, or stream nutrient enhancement programs.

3. *Adult spawning*

a) Spawning protocols

- Spawning usually begins the last week of January and ends the first week of May. Adult summer steelhead are pushed by mechanical crowders from holding pond (HP) 9 into a channel, moved into a channel basket, and placed into an anesthetic bin. Ripe fish are spawned for either Dworshak NFH or IDFG hatcheries. Excess ripe fish will be transferred to another HP for outplanting. Green fish will either be outplanted or transferred to another HP for later spawning. Whenever possible, fish just coming up the ladder and trapped in HP 9 will be spawned exclusively. Fish that have CWT's will be either spawned or killed for tag recovery.
- Female summer steelhead returning to Dworshak usually outnumber males 2.3:1 in return-ratio. Ideally, 3,500 adult steelhead returning to Dworshak are needed to come close to a 1:1 male:female spawning ratio and fulfill the entire egg production needs for Dworshak NFH and IDFG programs. Although Dworshak can usually take a full program of eggs with less than 3,500 adults returning, the spawning ratio of males:females drifts away from the ideal 1:1 as fewer fish return. Maintaining as close to a 1:1 male:female spawning ratio will be continued at Dworshak during upcoming spawning seasons.
- As steelhead are spawned throughout the 12-week spawning season at Dworshak NFH, the first fish which are ripe when examined will be used until the target egg numbers are reached for any given week. Ripe adult summer steelhead of any and all ages are used, including two-year-old males and females. The majority of fish spawned are 3–4 years old, with some 5 years old fish being utilized.
- If brood stock numbers are insufficient to meet hatchery production objectives, the hatchery will use the hatchery summer steelhead trapped at Kooskia NFH, since these fish are Dworshak stock from Dworshak NFH.

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Table: Dworshak adult return-rack summary, BY2006 summer steelhead. (USFWS Spawning Report BY06 Steelhead)

Date Fish Examined	Males	Females	Week Total	Cumulative Numbers	Cumulative % of Run
10/11/05	122	123	245	245	7.6
10/18/05	109	98	207	452	13.9
10/25/05	95	49	144	596	18.4
02/28/06	69	217	286	882	27.2
03/07/06	96	155	251	1,133	34.9
03/14/06	129	255	384	1,517	46.8
03/21/06	163	334	497	2,014	62.1
03/28/06	117	240	357	2,371	73.1
04/04/06	63	171	234	2,605	80.3
04/11/06	32	79	111	2,716	83.7
04/18/06	88	189	277	2,993	92.3
04/25/06	40	62	102	3,095	95.4
05/02/06	58	90	148	3,243	100.0
Total	1,181	2,062	3,243	3,243	

b) No. of males and females spawned each year over past 10 years (Table)

Table: Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available: (DNFH B Steelhead HGMP, Oct 1, 2002, sec.7.4)

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1988	801*	459*	73*	3,832,200	1,391,999
1989	858*	452*	72*	3,166,750	2,663,550
1990	719*	366*	29*	2,279,500	2,655,998
1991	939*	630*	47*	3,285,415	2,309,052
1992	980*	660*	110*	4,012,449	2,388,993
1993	534*	356*	15*	3,279,683	1,823,877
1994	653*	246*	8*	3,389,400	2,387,182
1995	584*	243*	18*	2,989,909	2,480,639
1996	634*	759*	2*	2,882,040	2,488,174
1997	658*	417*	25*	2,940,000	2,156,732
1998	630	377*	11*	2,709,580	2,107,471
1999	562	455*	10*	2,522,310	2,145,707
2000	546	403	87*	2,720,961	2,196,000
2001	552	369	40*	2,700,715	2,215,553

**Estimated because numbers were recorded for all steelhead spawned at Dworshak (DNFH, IDFG, USGS, etc.) not just those eggs going into the Dworshak program. Number of jacks included in Total Males Spawned number.*

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4. Fertilization

a) Protocols

- The fish are anesthetized with carbon dioxide at a rate of 400 to 1000 mg/l solution buffered with 8 to 10 pounds of sodium bicarbonate. Although carbon dioxide (CO₂) as an anesthetic appears more stressful on the fish than MS-222, carcasses anesthetized with CO₂ can be used for human consumption. Oxygen is provided at a rate of one l/minute. Spinal columns of ripe females are severed using a pneumatic knife. The females are placed on a table for 5–15 minutes for blood drainage. The ventral side is 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 to aid in more complete fertilization. After sufficient time has elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter.

b) Number of eggs collected and fertilized each year over past 10 years (Table)

Table: Number of eggs taken and survival rates to eye-up and/or ponding. (DNFH B Steelhead HGMP, Oct 1, 2002, sec.9.1)

Brood Year	# Eggs Taken	% Survival Green to Eyed	% Survival Eyed to Nursery Tanking
2007	2,808,000	95.7	93.8
2006	2,896,000	94.9	95.5
2005	2,867,200	91.6	89.1
2004	2,704,000	93.2	93.4
2003	2,724,480	92.5	91.2
2002	2,721,836	92.5	93.4
2001	2,700,715	87.6	91.2
2000	2,720,961	90.7	90.0
1999	2,523,010	91.9	94.9
1998	2,737,400	87.5	90.0
1997	2,877,552	88.6	91.7
1996	2,882,040	88.5	91.1
1995	2,989,909	90.7	89.5
1994	3,389,400	91.5	89.5
1993	3,279,638	90.6	92.6
1992	4,012,449	81.0	90.9
1991	3,285,415	80.3	87.5
1990	2,279,500	84.1	97.0
1989	3,166,750	86.7	97.9
1988	3,832,200	88.7	94.2

% Eye-up is enumerated eye-up (after green culls).

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5. Incubation

- After rinsing, eggs are placed in Heath incubator trays at approximately 6,750 eggs per tray (one female). In each tray is a 75 mg/l iodophor solution buffered with sodium bicarbonate. Eggs are maintained in this solution for approximately 30 minutes. This is done as a precaution against disease transmission. The egg trays are then pushed into the incubator stack, flushing the iodine.
- Water flow rate is approximately three-four gallons/minute and temperature will average approximately 54°F. Formalin treatments are administered five days per week to control fungus on the eggs.
- Approximately 2.7 million eyed eggs are put into Dworshak's summer steelhead program. Upon eye-up (approximately 15 days after fertilization at 54°F), the eggs will be shocked. The next day the eggs will be enumerated and sorted using an electronic egg picker and counter (Van Gaalen Model -100). Eggs are then placed into hatching jars in the nursery. Due to space constraints in the nursery, eggs from Takes 10–12 are enumerated and returned to Heath trays (4,000–6,000 per tray) and hatched in the trays. Once Takes 1 and 2 are moved from the nursery to outside ponds, fry from Takes 10–12 are moved into these vacated nursery tanks. The water flow is maintained at approximately 3-4 gpm in both the trays and jars. The hatching jars drain into 680-gallon rectangular nursery tanks. As the fry swim up in the jars, they flow into these tanks for initial rearing.

6. Ponding

a) Protocols

- The nursery at Dworshak NFH contains 128 tanks with a volume of 680 gallons/tank. Steelhead are stocked at an initial density of approximately 17,000 fry/tank. The fry are reared in these tanks for approximately 3½ months, until they reach a size of about 85 fish per pound. At this time, the 3-inch fingerlings are transferred to outside BP's for final rearing until release.
- Dworshak has 84 BP's, which have a volume of 22,000 gallons/pond. Steelhead fingerlings are stocked at a rate of 25,000–33,000 fish/pond. The fingerlings receive an adipose fin clip as they are moved outside the nursery to mark them as hatchery fish. Approximately 2.2–2.3 million summer steelhead fingerlings are moved from the nursery to outside ponds each summer. The summer steelhead are reared part of the year on reuse water, heated to approximately 52°F in the winter. Although fish health can deteriorate while the fish are on reuse, the heated water is necessary to obtain a 200mm smolt by release time.

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b) Number of fry ponded each year, including % hatch each year

Table: Number of eggs taken and survival rates to eye-up and/or ponding. [DNFH B Steelhead HGMP, Oct 1, 2002, sec.9.1]

Brood Year	# Eggs Taken	% Survival Green to Eyed	% Survival Eyed to Nursery Tanking
2007	2,808,000	95.7	93.8
2006	2,896,000	94.9	95.5
2005	2,867,200	91.6	89.1
2004	2,704,000	93.2	93.4
2003	2,724,480	92.5	91.2
2002	2,721,836	92.5	93.4
2001	2,700,715	87.6	91.2
2000	2,720,961	90.7	90.0
1999	2,523,010	91.9	94.9
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1997	2,877,552	88.6	91.7
1996	2,882,040	88.5	91.1
1995	2,989,909	90.7	89.5
1994	3,389,400	91.5	89.5
1993	3,279,638	90.6	92.6
1992	4,012,449	81.0	90.9
1991	3,285,415	80.3	87.5
1990	2,279,500	84.1	97.0
1989	3,166,750	86.7	97.9
1988	3,832,200	88.7	94.2

% Eye-up is enumerated eye-up (after green culls).

- Steelhead eggs are initially loaded at 1 female/tray = approximately 6,500 green eggs. After enumeration, eggs are put into incubation jars at 16,500 eggs/jar. Water flow for both incubation trays and jars is approximately 5 gallons/minute.
- Temperature for steelhead incubation is 54 degrees F.
- Temperature is monitored at least once/day.
- Minimum dissolved oxygen is 6-7ppm in the bottom tray

(DNFH Steelhead HGMP, Oct 1, 2002, sec.9.1.3-9.1.4)

7. Rearing/feeding protocols

- Currently, tanking for steelhead occurs as fry volitionally swim-up and out of egg jars. The fry have approximately 550 TU's at hatching & subsequent swim-up. Average length is 1.05 inches. The fish are approximately 2,500 fish per pound. Steelhead are tanked from mid February until June.

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- 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.
- Eggs are incubated and initially reared at Dworshak using only reservoir water, not river water. This virtually eliminates health problems in early-rearing of the fingerlings.

Table: Survival of Dworshak Steelhead fry/fingerlings reared at Dworshak

Brood Year	% Survival fry to fingerling	% Survival fingerling to smolt
2006	92.6	83.6
2005	88.6	87.1
2004	91.7	82.1
2003	90.6	91.8
2002	92.8	97.0
2001	92.8	96.8
1999	93.2	N/A
1998	96.6	89.5
1997	92.3	87.4
1996	86.3	97.2
1995	95.4	90.1
1994	87.4	87.4
1993	87.2	68.9
1992	82.2	81.2
1991	58.5	92.0
1990	71.1	89.1
1989	21.9	92.3
1988	29.5	79.2
Ave	75.1	86.8

Table: Density and loading criteria (goals and actual levels).

Steelhead density index goal is less than 0.5
Actual = Nursery - 0.5 to 0.75
Burrows Ponds - 0.2 to 0.25

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

Fish rearing conditions

- Water temperatures are taken at least once/day. Thermographs monitor temperatures throughout the rearing cycle, including egg incubation.
- Minimum dissolved oxygen level is 6 ppm. Oxygen is monitored when fish are given a chemical treatment for disease. Oxygen is spot-checked throughout the rearing cycle.

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Carbon dioxide is not tested. Nitrogen gas is tested if gas bubble disease is suspected in the nursery. This usually occurs less than once/year.

(DNFH B Steelhead HGMP, Oct 1, 2002, sec.9.1.5-9.2)

8. Fish growth profiles

Table: Approximate average growth of Dworshak steelhead in Burrows ponds.

Month	No/lb	Length in	Length mm
July 1	88	3.2	81
August 1	75	3.4	85
Sept 1	48	3.9	99
Oct 1	29	4.6	117
Nov 1	21	5.1	131
Dec 1	16	5.6	143
Jan 1	12	6.2	157
Feb 1	9.9	6.6	168
March 1	8.3	7.0	178
April 1	7	7.4	188
April 15	6.3	7.7	195

- Steelhead in the nursery grow about 0.8 of an inch (20mm) a month at 54° F.
- Fish from the nursery are being loaded into the Burrows ponds June-August and will reduce the average number/lb during these months.
- From November until April approximately 2/3 of the steelhead at Dworshak are on a heated water re-use system.
- Nursery: Bio-Oregon (For BY2000 steelhead, Dworshak is changing to Moore-Clark). For FY07, the summer steelhead are fed Bio Vita Starter/Fry until 25 fpp. Then they are changed to Nelson Silver Cup until release. Feeding = 8 times/day and approximately 3.3 % body weight fed/day initially. Both frequency and % body weight fed are reduced as fish grow. By final rearing size (approximately 90 fpp) in the nursery, % body weight fed/day is approximately 2% and frequency is 3-4 times/day. Conversion is approximately 1.3 using Bio-Oregon feed.

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Outside rearing ponds: Initially fish are hand-fed then demand feeders are used for most of the rearing cycle. Conversion is approximately 1.3 throughout the rearing cycle. By final rearing size (200mm or 5.8 fpp) the % body weight fed/day is approximately 0.4 to 0.7%.

(DNFH B Steelhead HGMP, Oct 1, 2002, sec.9.2.4-9.2.6)

9. Fish health protocols and issues

- The Idaho FHC conducts several types of fish health exams. Examinations of both summer steelhead and spring Chinook salmon are conducted at Dworshak NFH by a pathologist from the Idaho FHC once per month. From each stock and broodyear of
- Juvenile, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) are checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections. Additional tests for virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.
- Diagnostic examinations are performed on an as-needed basis as determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.
- Pre-release examinations are conducted two to four weeks prior to a release or transfer from the hatchery. Routinely, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW (Fish and Wildlife Service Manual) include IHNV, infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.
- Adult certification examinations are performed during spawning. Tissues from adult fish are collected to ascertain viral, bacterial, and parasite infections and to provide a brood health profile for the progeny. The Idaho FHC tests for all of the listed pathogens, including *Myxobolus cerebralis* and *Ceratomyxa shasta*. The minimum number of samples collected is defined by 713 FW. A random sample of 60 adult steelhead is also tested for BKD by ELISA.

10. Chemotherapeutant use

- Adult steelhead held for brood stock are treated with formalin up to three times per week to control external pathogens prior to spawning.
- GNRHa is used to insure a number of males are ripe for spawning for the first two takes.

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- Salmonid egg hardening and disinfection treatment with a polyvinylpyrrolidone iodine compound (approximately 1% iodine) is required by 713 FW policy to minimize/prevent transmittance of viral and bacterial pathogens. The eggs are disinfected in 75 ppm iodine in water buffered by sodium bicarbonate (at 0.01%) for 30 minutes during the water-hardening process. Eggs received at the hatchery must be disinfected before they are allowed to come in contact with the station's water, rearing units or equipment. Specifics are provided in 713 FW policy.

Other Fish Health Precautions.

- Drugs and chemicals for treating fish are used on an “as needed” basis. Formalin treatments for adult brood stock are given to control external parasites and as a fungicide on eggs.
- Tank trucks and tagging trailers are disinfected before being brought onto the station and after use at the hatchery.
- Abernathy Fish Technology Center provides quarterly feed quality analysis to prevent disease and meet nutritional requirements of fish.

11. Tagging and marking of juveniles

Dworshak NFH releases nearly 2.2 million summer steelhead smolts each year. From 1983 to 2000, all the summer steelhead smolts released from Dworshak NFH were adipose fin clipped to identify them as hatchery fish. In 2000, the Service entered into an agreement through U.S. v Oregon to release 100,000 unclipped steelhead smolts marked with blank CWT's. Depending on future management decisions by the U.S. v Oregon parties, unclipped steelhead smolts may or may not continue to be released from Dworshak NFH. Of the remaining steelhead smolts released annually, six groups of 20,000 fish each or 120,000 are coded-wire tagged and receive a left ventral fin clip. These marked groups provide the opportunity to evaluate various aspects of the production program such as the various rearing systems, release sites, size at release, and return timing of adults. In addition, about 1,500 are PIT-tagged to monitor emigration. All marking and tagging is in compliance with ESA requirements.

12. Fish Release

a) Protocols

Steelhead at Dworshak are typically released during high flows in April. About 1.1 million smolts are released directly from Dworshak NFH into the mainstem of the Clearwater River. There are also about 1.0 million summer steelhead smolts that are trucked upstream approximately 35 miles for release in Clear Creek and the South Fork of the Clearwater River.

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b) Number of fish released each year (subyearlings?; yearlings?; other?)

The III-salt returns in 2006 complete the returns from the 1,365,823 smolts released at Dworshak NFH in 2002. Total rack returns to Dworshak NFH from the 2002 release were 678 I-salt, 3,876 II-salt, and 34 III-salt fish for a hatchery return survival rate of 0.3359 percent. The mean hatchery rack return rate for the last 10 years is 0.3653 percent.

Table: Rack return vs. release numbers for summer steelhead at Dworshak NFH, release years 1980-2004. (Burge, January 2007, Adult Steelhead Returns, p.7)

Release Year	Smolts Released	Returns I-Salt Total	II-Salt	III-Salt		Rack Return %
1980	2,666,085	400	6,613	652	7,665	0.2875
1981	1,930,047	124	1,538	1,219	2,881	0.1493
1982	2,108,319	1,094	12,679	403	14,176	0.6724
1983	1,259,110	120	3,359	239	3,718	0.2953
1984	1,208,319	700	8,318	119	9,137	0.7562
1985	1,035,573	431	3,487	317	4,235	0.4090
1986	1,239,541	168	5,296	215	5,679	0.4582
1987	1,206,580	428	9,896	314	10,638	0.8817
1988	1,432,125	487	7,339	250	8,076	0.5639
1989	1,073,900	218	3,132	162	3,512	0.3270
1990	1,466,664	313	7,349	153	7,815	0.6699
1991	1,192,503	389	3,543	76	4,008	0.3361
1992	1,224,101	61	1,270	71	1,331	0.1087
1993	1,217,990	48	4,005 ¹	83	4,136	0.3396
1994	1,153,417	384	2,537	38	2,959	0.2565
1995	1,213,577	349	3,308	87	3,744	0.3085
1996	1,377,435	253	4,976	69	5,298	0.3846
1997	1,361,034	356	2,225	96	2,677	0.1967
1998	1,228,944	588	5,745	177	6,510	0.5297
1999	1,249,237	570	6,226	129 ²	6,925	0.5543
2000	1,311,447	1,330	4,555 ²	101 ²	5,986	0.4564
2001	1,247,550	560 ²	2,988 ²	78 ²	3,626	0.2906
2002	1,365,823	678 ²	3,876 ²	34 ²	4,588	0.3359
2003	1,210,919	408 ²	2,837 ²			
2004	1,202,055	372 ²				

¹Does not include twenty unmeasured fish.

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C. Program benefits and performance

Table: List of program “Performance Indicators”, designated by “benefits” and “risks”. (DNFH B steelhead HGMP, Oct 1, 2002, sec.1.10)

Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
1) Maintain life history characteristics and genetic diversity of Dworshak “B” run steelhead.	Age composition, body size, sex ratio, juvenile emigration timing, adult run timing, spawn timing and genetic diversity of hatchery fish are maintained over generations.	Evaluate age composition, body size, sex ratio, adult return timing and genetics. A subsample of hatchery fish will be biosampled in order to collect length, age, sex, and coded-wire tag information, and genetics samples 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 B-run steelhead will be monitored at the hatchery ladder.
3) Produce steelhead 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 steelhead 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 of Dworshak NFH steelhead to various fisheries.
4) Surplus hatchery steelhead available for outplanting in underseeded habitat in the Clearwater basin.	An average of 550 female steelhead are needed to meet Dworshak’s broodstock and another 650 females to meet other programs needs. 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. Juvenile monitoring will evaluate the contribution of Dworshak NFH steelhead to natural production in the Clearwater basin.
5) Maximize survival of hatchery steelhead 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	Annually release up to	Three to six weeks prior to

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Benefits		
Performance Standards	Performance Indicators	Monitoring and Evaluation
smolts from Dworshak NFH.	2,100,000 marked smolts from Dworshak NFH.	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 2,100,000 smolts released from Dworshak NFH should provide for a harvest in the Clearwater River and a broodstock collection goal of 550 females 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 steelhead returning to the hatchery will be biosampled. Coded-wire tag recoveries will be used to estimate the age structure of returning fish
8) Fulfill legal/policy obligations of mandated mitigation program and fall harvest/production agreements.	Release of 2,000,000 smolts and 100,000 un-clipped steelhead from Dworshak and off-site locations.	.Monitor emigration of PIT tagged smolts. Assess mark/tag and dorsal fin quality of smolts prior to release to evaluate adult returns of clipped and un-clipped hatchery 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.	Approval from NMFS on HGMP and other operating permits.
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 released back into the	Incidental captures are monitored to insure that only minimal numbers of wild

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	Clearwater River upstream of the hatchery.	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 steelhead is below 5% of the receiving population.	Monitor stray rate of hatchery population through the recovery of tagged Dworshak origin steelhead.
6) Juvenile hatchery releases minimize interactions with wild fish species.	Steelhead 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.	Environmental parameters will be monitored to establish release date. PIT-tagged fish will be detected at downstream dams to monitor travel rate and survival. Evaluate rate of residualism and predation on listed stocks by hatchery residuals.

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Table: Number of steelhead returning to Dworshak NFH, estimates of hatchery fish harvested, and total hatchery returns to the Clearwater River, Idaho, 1972-2006 (1972-73 to 1983-84 data based on report from Pettit, 1985, IDFG Federal Aid Report, Project F-73-6, January, 1985). (Burge, January 2007, Adult Steelhead Returns, p.4-5)

Return ¹	Number Back to Dworshak NFH	Estimated Clearwater Sport Harvest ²	Estimated North Fork Tribal Harvest ³	Unharvested Dworshak Hatchery Fish ⁴	Total Dworshak Fish Returning to Clearwater River
1972-73	9,938	2,068	-	0	12,006
1973-74	7,910	2,320	-	0	10,230
1974-75	1,698	N.S. ⁵	290	0	1,988
1975-76	1,858	N.S. ⁵	430	0	2,288
1976-77	3,100	N.S. ⁵	410	0	3,510
1977-78	12,272	14,000	(1,000) ⁶	0	27,272
1978-79	4,939	4,610	(500) ⁶	0	10,049

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1979-80	2,519	N.S. ⁵	1,250	300	4,069
1980-81	1,968	4,510	(1,000) ⁶	500	7,978
1981-82	3,054	1,665	(1,000) ⁶	0	5,719
1982-83	7,672	13,967 ⁷	(1,500) ⁶	0	23,139
1983-84	3,284	6,500	(500) ⁶	100	11,384
1984-85	14,018	19,410	(1,500) ⁶	2,700	37,628
1985-86	4,462	7,240	1,471	1,800	15,002
1986-87	5,286 ⁸	15,679	4,210	3,000	28,175
1987-88	3,764	8,766	1,478	2,000	16,008
1988-89	6,041	11,332	1,242	3,700	22,315
1989-90	10,630	27,953	1,710	3,650	43,944 ⁹
1990-91	7,876	12,974	1,211	2,250	24,311
1991-92	3,700	10,415	1,326	1,650	17,091
1992-93	7,900	19,351	1,184	3,368	31,803
1993-94	3,757	11,538	675	1,457	17,427
1994-95	1,394	5,954	730	1,307	9,385
1995-96	4,480	2,319	992	1,315	9,106
1996-97	2,980	4,926	513	779	9,198
1997-98	3,601	7,611	145	479	11,836
1998-99	5,419	8,774	1,007	1,137	16,337
1999-00	2,882	7,177	1,000	720	11,779
2000-01	6,411	12,230	(1,000) ⁶	513	20,154
2001-02	7,733	25,196	(1,000) ⁶	774	34,703
2002-03	5,244 ⁸	30,168	1,118	830	37,360
2003-04	3,767 ⁸	22,106	(1,336) ⁶	855	28,064
2004-05	4,362 ⁸	20,608	1,331	280	26,581
2005-06	3,243 ⁸	17,849	1,470	457	23,019

Table 1. Footnotes.

¹Return year is from October through May.

²Estimates of sport harvest in the Clearwater River provided by Idaho Department of Fish and Game.

³Estimates of tribal harvest in the Clearwater River provided by Nez Perce Tribe Department of Fishery, except as noted by Footnote 6.

⁴Based on the return percentage to Kooskia NFH to estimate returning II-salts from offsite releases.

⁵N.S. = no sport fishing season.

⁶() guesstimate on tribal harvest by authors.

⁷Pettit, IDFG, Lewiston, Idaho (personal communication) included an additional 2,000 fish in harvest from Snake River for a total of 15,967.

⁸Ladder was operated intermittently for broodstock management.

⁹We believe the sport estimate of 27,953 is about 8,000 too high and the total number of Dworshak steelhead to the Clearwater River was in the range of 32,000 to 35,000.

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b) Return timing and age-class structure of adults

Table: Rack returns and age class structure for hatchery steelhead and naturals captured at Kooskia NFH, 1995-2006. (Burge, January 2007, Adult Steelhead Returns, p.8)

Return year	I-Salt	II-Salt	III-Salt	Total Hatchery	Naturals
1995	20	381	20	421	48
1996	72	307	6	385	24
1997	26	420	4	450	61
1998	18	217	0	235	18
1999	36	685	1	722	53
2000	83	232	5	320	17
2001	12	253	1	266	10
2002	75	367	2	444	8
2003	40	350	4	394	16
2004	14	361	5	380	22
2005	2	100	2	104	4
2006	13	131	1	145	7

Age class of adult steelhead is determined by fork length measurements and based on data from previous coded-wire tag returns from Dworshak NFH. The steelhead I-salt returns were 86.3 percent male, and the II & III salt return was comprised of 70.1 percent females and 29.9 percent males.

Table: Adult steelhead broodstock returns by sex, age, and return time at Dworshak NFH rack, 2005-2006. (Burge, January 2007, Adult Steelhead Returns, p.6)

Ocean Age Class by Run Time	Males	Females	Total
Fall Run (10/11 to 10/25)			
I-Salt	122	24	146
II-Salt	198	245	443
III-Salt	6	1	7
Spring Run (2/28 to 5/02)*			
I-Salt	198	28	226
II-Salt	635	1,759	2,394
III-Salt	21	6	27
Combined Total*			
I-Salt	320	52	372
II-Salt	833	2,004	2,837
III-Salt	27	7	34
Total Measured Rack Return*	1,180	2,063	3,243

* Intermittent ladder operation during Spring Run for broodstock management.

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c) Smolt-to-adult return rates

Table: Rack return vs. release numbers for summer steelhead at Dworshak NFH, release years 1980-2004. (Burge, January 2007, Adult Steelhead Returns, p.7)

Release Year	Smolts Released	Returns I-Salt	II-Salt	III-Salt	Total	Rack Return %
1980	2,666,085	400	6,613	652	7,665	0.2875
1981	1,930,047	124	1,538	1,219	2,881	0.1493
1982	2,108,319	1,094	12,679	403	14,176	0.6724
1983	1,259,110	120	3,359	239	3,718	0.2953
1984	1,208,319	700	8,318	119	9,137	0.7562
1985	1,035,573	431	3,487	317	4,235	0.4090
1986	1,239,541	168	5,296	215	5,679	0.4582
1987	1,206,580	428	9,896	314	10,638	0.8817
1988	1,432,125	487	7,339	250	8,076	0.5639
1989	1,073,900	218	3,132	162	3,512	0.3270
1990	1,466,664	313	7,349	153	7,815	0.6699
1991	1,192,503	389	3,543	76	4,008	0.3361
1992	1,224,101	61	1,270	71	1,331	0.1087
1993	1,217,990	48	4,005 ¹	83	4,136	0.3396
1994	1,153,417	384	2,537	38	2,959	0.2565
1995	1,213,577	349	3,308	87	3,744	0.3085
1996	1,377,435	253	4,976	69	5,298	0.3846
1997	1,361,034	356	2,225	96	2,677	0.1967
1998	1,228,944	588	5,745	177	6,510	0.5297
1999	1,249,237	570	6,226	129 ²	6,925	0.5543
2000	1,311,447	1,330	4,555 ²	101 ²	5,986	0.4564
2001	1,247,550	560 ²	2,988 ²	78 ²	3,626	0.2906
2002	1,365,823	678 ²	3,876 ²	34 ²	4,588	0.3359
2003	1,210,919	408 ²	2,837 ²			
2004	1,202,055	372 ²				

¹Does not include twenty unmeasured fish.

² Intermittent ladder operation for broodstock management.

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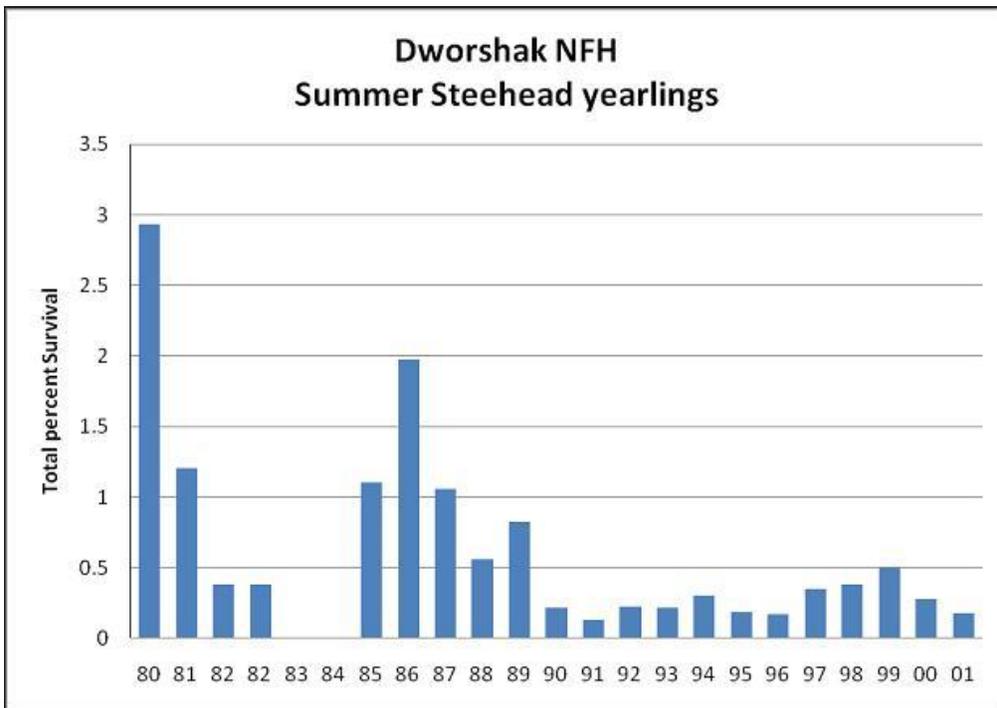


Figure: Smolt to adult survival (harvest, hatchery, and escapement) based up coded-wire tag data for Dworshak NFH B-run steelhead by brood year 1980-2001 (Pastor 2009)

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Table: Releases and returns (harvest, hatchery, and escapement) based up coded-wire tag data for Dworshak NFH B-run steelhead 1990-2001 (Pastor 2009)

Dworshak NFH summer Steelhead yearling Releases and Returns

Brood Year	Number Released	Hatchery	Columbia		Spawning Ground Recoveries	Total	Smolt
			River Harvest	Ocean Harvest			to Adult Survival
90	1,192,593	1,014	1,567	28	0	2,609	0.2188
91	1,224,101	486	1,096	25	0	1,607	0.1313
92	1,217,990	1,946	806	0	0	2,752	0.2259
93	1,410,283	2,432	643	0	0	3,075	0.2180
94	1,213,577	2,771	900	0	0	3,671	0.3025
95	1,377,435	2,007	615	0	0	2,622	0.1904
96	1,361,034	1,320	1,037	0	0	2,357	0.1732
97	1,228,944	2,821	1,451	0	0	4,272	0.3476
98	1,479,940	4,273	1,311	0	0	5,584	0.3773
99	1,427,083	4,344	2,712	0	0	7,056	0.4944
00	1,247,550	1,768	1,678	0	0	3,446	0.2762
01	1,365,623	1,828	582	0	0	2,410	0.1765

d) Stock productivity (e.g. recruits per spawner)

No information provided.

1. Contributions to harvest and utilization (e.g. food banks)

Table: Clearwater River estimated harvest by program for 2001/02 through 2006/07 (IDFG draft Steelhead Harvest Reports)

Run Year	Dworshak NFH Harv. Est.	Clearwater FH Harv. Est.	Total Clear. R. Harv. Est.
2006/2007	13,301	7,600	20,901
2005/2006	14,916	2,933	17,849
2004/2005	19,252	1,354	20,606

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2003/2004	20,806	1,265	22,071
2002/2003	25,030	5,081	30,111
2001/2002	22,774	2,422	25,196

Table: Summary of IDFG steelhead fishery interview data (unexpanded) for Snake, Clearwater, and Salmon rivers for run years 2001-2006 (IDFG Steelhead Harvest Reports)

Year	River	No. Anglers	Total Hours Fished
2006-2007	Snake	1,242	6,940
	Clearwater	8,342	37,071
	Salmon	16,088	106,449
2005-2006	Snake	608	3,817
	Clearwater	6,480	25,787
	Salmon	14,683	109,569
2004-2005	Snake	894	5,162
	Clearwater	7,074	28,180
	Salmon	15,643	118,799
2003-2004	Snake	939	6,352
	Clearwater	6,629	28,512
	Salmon	16,923	114,942
2002-2003	Snake	1,653	9,963
	Clearwater	6,013	28,151
	Salmon	15,623	114,778
2001-2002	Snake	1,375	7,774
	Clearwater	9,500	37,667
	Salmon	21,114	159,490

Table: Number of steelhead returning to Dworshak NFH, estimates of hatchery fish harvested, and total hatchery returns to the Clearwater River, Idaho, 1972-2006 (1972-73 to 1983-84 data based on report from Pettit, 1985, IDFG Federal Aid Report, Project F-73-6, January, 1985).

Return ¹	Number Back to Dworshak NFH	Estimated Clearwater Sport Harvest ²	Estimated North Fork Tribal Harvest ³	Unharvested Dworshak Hatchery Fish ⁴	Total Dworshak Fish Returning to Clearwater River
1972-73	9,938	2,068	-	0	12,006
1973-74	7,910	2,320	-	0	10,230
1974-75	1,698	N.S. ⁵	290	0	1,988
1975-76	1,858	N.S. ⁵	430	0	2,288
1976-77	3,100	N.S. ⁵	410	0	3,510
1977-78	12,272	14,000	(1,000) ⁶	0	27,272

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1978-79	4,939	4,610	(500) ⁶	0	10,049
1979-80	2,519	N.S. ⁵	1,250	300	4,069
1980-81	1,968	4,510	(1,000) ⁶	500	7,978
1981-82	3,054	1,665	(1,000) ⁶	0	5,719
1982-83	7,672	13,967 ⁷	(1,500) ⁶	0	23,139
1983-84	3,284	6,500	(500) ⁶	100	11,384
1984-85	14,018	19,410	(1,500) ⁶	2,700	37,628
1985-86	4,462	7,240	1,471	1,800	15,002
1986-87	5,286 ⁸	15,679	4,210	3,000	28,175
1987-88	3,764	8,766	1,478	2,000	16,008
1988-89	6,041	11,332	1,242	3,700	22,315
1989-90	10,630	27,953	1,710	3,650	43,944 ⁹
1990-91	7,876	12,974	1,211	2,250	24,311
1991-92	3,700	10,415	1,326	1,650	17,091
1992-93	7,900	19,351	1,184	3,368	31,803
1993-94	3,757	11,538	675	1,457	17,427
1994-95	1,394	5,954	730	1,307	9,385
1995-96	4,480	2,319	992	1,315	9,106
1996-97	2,980	4,926	513	779	9,198
1997-98	3,601	7,611	145	479	11,836
1998-99	5,419	8,774	1,007	1,137	16,337
1999-00	2,882	7,177	1,000	720	11,779
2000-01	6,411	12,230	(1,000) ⁶	513	20,154
2001-02	7,733	25,196	(1,000) ⁶	774	34,703
2002-03	5,244 ⁸	30,168	1,118	830	37,360
2003-04	3,767 ⁸	22,106	(1,336) ⁶	855	28,064
2004-05	4,362 ⁸	20,608	1,331	280	26,581
2005-06	3,243 ⁸	17,849	1,470	457	23,019

Footnotes.

¹Return year is from October through May.

²Estimates of sport harvest in the Clearwater River provided by Idaho Department of Fish and Game.

³Estimates of tribal harvest in the Clearwater River provided by Nez Perce Tribe Department of Fishery, except as noted by Footnote 6.

⁴Based on the return percentage to Kooskia NFH to estimate returning II-salts from offsite releases.

⁵N.S. = no sport fishing season.

⁶() guesstimate on tribal harvest by authors.

⁷Pettit, IDFG, Lewiston, Idaho (personal communication) included an additional 2,000 fish in harvest from Snake River for a total of 15,967.

⁸Ladder was operated intermittently for broodstock management.

⁹We believe the sport estimate of 27,953 is about 8,000 too high and the total number of Dworshak steelhead to the Clearwater River was in the range of 32,000 to 35,000.

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Table: Contribution and recovery of coded-wire tagged summer steelhead from Dworshak NFH from CRiS and PSMFC TSI stock reference summary (Steve Pastor pers. Com.)

Recovery Area	Expanded Recoveries by Area and Broodyear (BY)					5-Year Ave.
	BY 1996	BY 1997	BY 1998	BY 1999	BY 2000	
Ocean Troll	0	0	0	0	0	0
Estuary Sport	0	16	0	0	0	3
Treaty Cermonial-Subsistence	0	2	0	0	0	0
Columbia River Gillnet	168	438	490	1,088	773	591
Columbia River Sport	81	74	33	0	35	45
Freshwater Sport	763	950	777	1,585	394	894
Hatchery	1,301	2,845	4,273	4,344	352	2,623
Miscl Trap	0	0	11	39	0	10
Spawning Ground	0	0	0	0	0	0
Total Expanded Recoveries	2,313	4,325	5,584	7,056	1,554	4,166
Total # Released	1,361,034	1,228,944	1,479,940	1,427,083	1,138,617	1,327,124
SAR %	0.17	0.35	0.38	0.49	0.14	0.31

Broodyear (BY) refers to the year that the fish was spawned and its resulting progeny. For example, BY 2000 fish were spawned in 2000 and returned as three, four, and five year old fish in 2003, 2004, and 2005

(Burge, January 2007, Adult Steelhead Returns, p.4-5)

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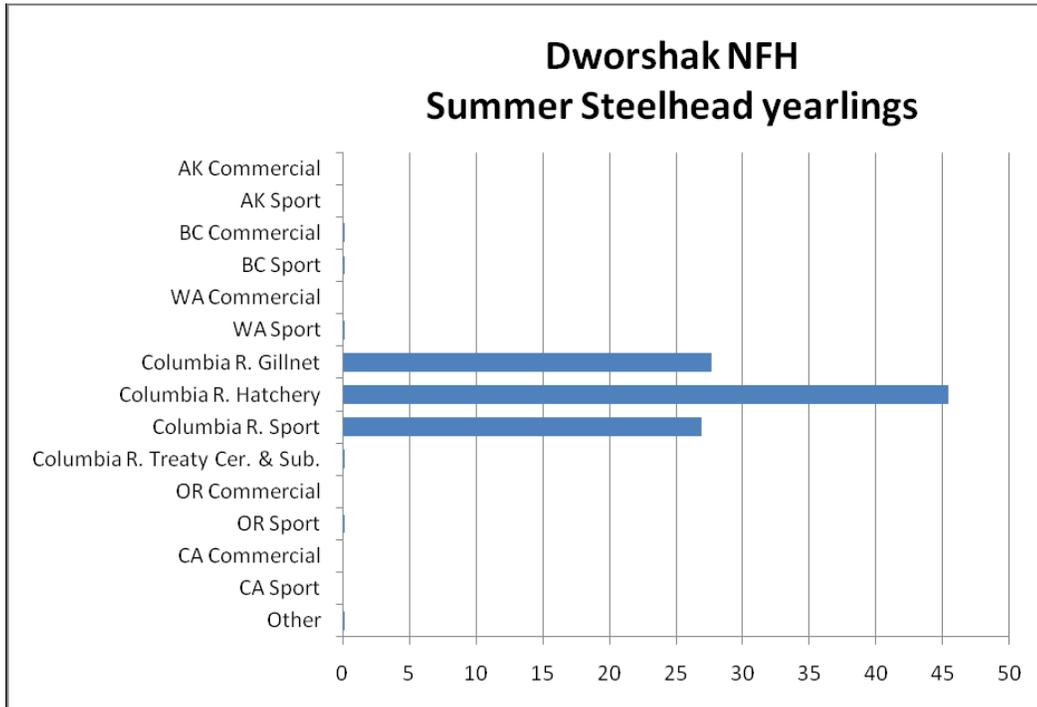


Figure: Mean % of Recoveries of Dworshak NFH summer Steelhead yearlings since 1980 based on coded-wire tag data (Pastor 2009)

2. Contributions to conservation

Of special concern in the lower Clearwater River is the potential for ecological interactions between wild (listed) A-run summer steelhead and the B-run hatchery steelhead released from Dworshak NFH. From 1994–1997, the Idaho FRO conducted research on the interactions of hatchery and wild steelhead in the Clearwater River of Idaho. From 1999–present, the Idaho FRO continued the investigation with Bonneville Power Administration (BPA) funding, focusing primarily on factors related to residualization of steelhead in the Clearwater River.

3. Other benefits

Historic. Fishing in the Clearwater River has been a primary activity of indigenous peoples for thousands of years. The Nez Perce people have fished seasonally from these waters for centuries. Their history and culture revolve around the natural world, and they have deep reverence for all living things. Salmon and steelhead have played a significant role in tribal culture, both pre-historic and in the modern era.

The description of steelhead by the Lewis and Clark expedition was the first recorded documentation of this species in the Clearwater basin. Commercial and sport fishing began in the late 19th century as the area was settled and developed. Mining, and later logging, were primary economic activities in these early communities, along with agriculture and ranching practices on early homesteads.

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The communities of Orofino and Ahsahka have been economically supported by the natural resource industry since the 1860's - logging, mining, fish & wildlife recreation, farming, ranching, non-consumptive recreation and hydro-electric power generation (Dworshak Dam).

Present Day. The NPT continues intermittent use of a private in-holding on Dworshak hatchery property for cultural purposes (church and cemetery), as well as accessing fishing areas.

Dworshak NFH has been open to the visiting public since its completion and dedication in August, 1969. The hatchery was designed primarily for steelhead production to mitigate for the loss of habitat by the construction and operation of Dworshak Dam and reservoir. Over the years a public tour route was developed to provide visitors an easy self-guided walking tour of the main buildings and grounds. Interpretive signs were designed and placed along this walking route in the 1980's and early 1990's. The signs explain the detailed operations of the state-of-the-art hatchery. Brochures and a welcome audio/visual program greet visitors in the main hatchery lobby, and a large viewing balcony overlooks the spawning room; displays and exhibits provide information on the hatchery life cycle of fish.

In 1990, an Open House and Kids' Fishing Day at the hatchery was begun to coincide with National Fishing Week activities. Participation has increased steadily over the years, with as many as 800 – 900 children (12 yr and under) catching trout out of our kid's fishing pond every year.

New in 2002, is a small non-profit sales area in the main hatchery building, called the Dworshak Spawn Shop, operated by the FNWH out of Leavenworth, WA. The shop offers visitors unique gift items reflecting the natural resources of the region, with an emphasis on fish. Proceeds aid in funding outreach and educational projects at national fish hatcheries in the Northwest.

The hatchery lies within the Northwest Passage Scenic Byway corridor, with Highway 12 paralleling the compound on the South side of the Clearwater River. The Clearwater River canyon is a major travel corridor from East to West, connecting Montana to Idaho, and summer seasonal traffic is greatly increased. The river is an attraction to many seasonal visitors for recreational opportunities including fishing, hunting, rafting, berry picking, swimming and sightseeing.

Plans are currently underway for updated interpretive information and a new kiosk highlighting the Lewis/Clark era, tribal influences on fishery resources, and what the future holds for hatchery management. Picnic tables and a remodeled visitor's lobby are also being planned to accommodate the 20,000+ annual visitors.

With the addition of a permanent outreach specialist and assistant, more public programs are being offered on and off hatchery grounds. School groups make up one of the largest groups of visitors in the spring and fall when spawning is scheduled. Summer visitors are increasing yearly. Guided group tours are also increasing, as well as requests for more specialized educational programs revolving around specific fishery resource issues, or broader aquatic ecosystem themes.

Fishery Benefits. It must be recognized that there are environmental conditions outside the hatchery that are beyond the control of hatchery managers, whenever an estimate of the

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benefits of an anadromous fish hatchery are made. This variability can affect post-release survival of juveniles and numbers of returning adults. During times of good ocean and river conditions resulting in healthy adult returns, significant economic activity is generated through harvest of Dworshak NFH summer steelhead and spring Chinook.

Additionally, the role of a Federal mitigation hatchery is to compensate for natural habitat lost to Federal hydro-projects. Therefore, it can be surmised that the economic benefit of the mitigation hatchery is interwoven into the economic benefit of the hydro-power projects being mitigated for, and that the hatchery can be characterized as an operating expense of the hydro-power project, both of which provide significant benefits to the American public.

The benefits of anadromous fish in the Clearwater River relate to providing a harvestable product on a seasonal basis. Sport, Tribal and commercial fisherman annually take a significant number of the returning hatchery adult population.

Steelhead and salmon play an important role in the overall aquatic ecosystem, and mean many different things to many different people. They can indicate the health of a watershed, and are a vital link on the natural food chain; they are caught for pleasure or sport; they are used for food and cultural ceremonies. The majority of people, no matter their background, like the idea of fish being in the river.

D. Research, monitoring, and evaluation programs

The Idaho FRO provides monitoring, evaluation, and coordination services for the Dworshak Fisheries Complex. The Idaho FRO staff monitors hatchery returns, measures biological characteristics of the hatchery stock, coordinates fish marking, performs tag recovery, and assists with other aspects of the hatchery program. They maintain databases that store this information and provide data to databases maintained by other entities. The Idaho FRO also provides leadership for the Dworshak HET, which ensures close cooperation and coordination between Dworshak NFH, Idaho FHC, the Idaho FRO and our co-managers, to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally. These activities are described in the following section:

Database Management. All national fish hatcheries submit distribution data to the fisheries information system (FIS) which is the Service's national database. Dworshak NFH submits distribution, lot history, and adult return information to the Idaho FRO. After review, these files are sent to the Columbia River Fisheries Program Office (CRFPO) for incorporation into the Columbia River information System (CRiS). Marked release and recovery information is sent to the Fisheries Division of the Western Washington Fish and Wildlife Office for conversion to the Pacific States Commission / Pacific States Marine Fisheries Commission format. In addition, the Idaho FRO maintains complete databases of all hatchery information within the office to provide summary data to other State, Federal, and Tribal agencies.

Marking/Tagging Program. Dworshak NFH releases nearly 2.2 million summer steelhead smolts each year. From 1983 to 2000, all the summer steelhead smolts released from Dworshak NFH were adipose fin clipped to identify them as hatchery fish. In 2000, the Service entered into an agreement through *U.S. v Oregon* to release 200,000 unclipped steelhead smolts into Newsome Creek and American River. Of the remaining steelhead smolts released annually, six groups of 20,000 fish each or 120,000 are coded-wire tagged and receive a left ventral fin clip. These

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marked groups provide the opportunity to evaluate various aspects of the production program such as the various rearing systems, release sites, size at release, and return timing of adults. In addition, about 1,500 are PIT-tagged to monitor emigration. All marking and tagging is in compliance with ESA requirements.

Bio-sampling and reporting. The Idaho FRO is responsible for sampling all adult summer steelhead that return to Dworshak NFH. Fish are measured for fork length, checked for CWT's, PIT tags, fin clips and other distinguishing marks, and when possible identified as either male or female. Mark recovery information is used to report success of that production year in terms of smolt to adult return rates. Where groups of smolts were marked to represent various treatment groups of an evaluation study, the data are used to draw conclusions and make recommendations. Final reports are made available to other Service offices, other agencies, and the general public as requested. In addition, marked adults have been used to help separate different runs at the dams in order to adjust harvest.

Hatchery Evaluation Studies. The Hatchery Evaluation Vision Action Plan, developed in 1993 for Region 1 Fisheries, describes hatchery evaluation in greater detail (USFWS 1993). The purpose of hatchery evaluation studies are to simply determine what works and what doesn't work through planning, implementing, documenting, monitoring, analyzing, and reporting.

A number of evaluation studies have been conducted at Dworshak NFH in past 20 years. Recent studies include: 1) An evaluation of the effects of various fish cultural methods on the size variability of summer steelhead; 2) An evaluation of various methods of marking and tagging adult spring Chinook salmon and steelhead for broodstock management; 3) A comparison of three dry starter feeds on the growth of juvenile summer steelhead; and, 4) Manipulation of growth rate and use of enhanced diets to stimulate smoltification in summer steelhead. Results from these and other studies have been used to refine hatchery management and fish culture at Dworshak NFH

Stock Assessment and Contribution to Fisheries. Dworshak NFH began production releases of summer steelhead in 1970. CWT groups of summer steelhead have been released every year since 1977, with the exception of 1985. Numerous marked groups have been released to monitor the program, including many evaluation studies.

A summary of the CWT release groups is provided in **Table 1**. Note: Although tag group size is targeted for 20,000 fish per group, mortality prior to release reduces the number significantly in some years. CWT's have been used to monitor adult returns and contribution to fisheries as well as to test differences in experimental treatment groups for various special studies. Summer steelhead from Dworshak NFH contribute primarily to sport and Tribal fisheries in Clearwater River although they are also harvested in various fisheries in the lower Columbia and Snake Rivers.

All release information, including marked to unmarked ratios, is reported to the Pacific States Marine Fisheries Commission (PSMFC). Mark and tag information from sampled fish recovered in the various fisheries and at the hatchery, are also reported.

E. Program conflicts

4. *Biological conflicts (e.g. propagated stock maladapted to hatchery water source)*

- Operation and maintenance includes operation of the adult collection facilities for trapping returning adult steelhead, water intake and discharge, in hatchery incubation and rearing phases, and general maintenance and construction. The operation of the adult collection facilities at both hatcheries has the potential for capturing adult wild steelhead. Since 1989, 1.7% to 0.4% of the adult steelhead captured at Dworshak NFH have adipose fins, although very few would be considered truly natural by fishery biologists. Based on other distinguishing characteristics, such as deformed fins, only a handful (<10) natural steelhead have been documented in the last 10 years; three of these fish were trapped in the fall of 1999. Any suspected natural adult steelhead captured in the ladder is immediately released back into the river upstream of the trap. Adult fall Chinook salmon are also occasionally trapped and these are immediately transferred to the Nez Perce Tribe for transport.
- About 200 cfs of water is pumped from the North Fork Clearwater River for use by Dworshak NFH. Water intakes at Dworshak are screened to prevent fish from being drawn into pumps. Water intake does not adversely affect the water level in the contributing stream. 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. 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 planned during FY2001.

5. *Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)*

IDF&G administers the sport harvest within the State, and the NPT administers the Tribal fishery. Because only hatchery spring Chinook salmon that are externally marked with an adipose fin clip can be harvested and it is a requirement for sport fishermen to release all unmarked fish unharmed, we believe there is minimal negative impacts to wild/threatened steelhead. [KNFH CHMP,p36]

6. *Conservation conflicts and risks*

- We are not aware of established critical or viable population thresholds for Snake River Steelhead. Wild/natural steelhead in the S.F. Clearwater River have been at extremely low levels in the past 10 years (see tables below). We believe these populations are currently below a critical population threshold and are functionally extinct.

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a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

Genetics - Beginning in 1973, and consistently since 1981, juvenile B-run summer steelhead have been outplanted in various locations in the South Fork Clearwater and Middle Fork Clearwater rivers. The intention of outplanting these fish is to spread returning fish out over a larger area for the sport fishery. Steelhead outplanted into Clear Creek on the Middle Fork Clearwater River are released at the Kooskia NFH adult fish trap approximately half a mile from the mouth of the creek and are allowed to move out of the creek on their own. Steelhead that return to Kooskia NFH are captured in the adult trap. Natural steelhead trapped at Kooskia NFH are released above the weir to continue their migration. Currently, hatchery steelhead that enter the Kooskia trap are either taken to Dworshak NFH for spawning or released in the South Fork for utilization in the sport fishery.

Steelhead that are not harvested could potentially spawn in one of the many tributaries to the South or Middle Fork Clearwater rivers. Spawning of hatchery fish with natural fish could potentially dilute the gene pool of natural steelhead. In FY2001, the Service collected genetic samples for comparison of natural and hatchery steelhead populations. Adult steelhead that are above broodstock needs at Dworshak are often taken to the South Fork Clearwater River for release to allow fishermen an additional opportunity to harvest these fish. These steelhead could also potentially spawn in tributaries to the South Fork Clearwater River.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

Hatchery steelhead may affect listed Snake River steelhead in the mainstem and South Forks of the Clearwater River and in the lower portion of the Snake River. The program may also affect listed Snake River fall Chinook salmon in the lower portion of the Clearwater River. The steelhead program has the potential to affect listed steelhead and Snake River fall Chinook salmon in several ways: 1) predation; 2) competition; 3) adverse behavioral interactions; 4) disease transmission; 5) alteration of the gene pool; (6) harvest and/or (7) facility operation and maintenance.

Predation - The level of predation by hatchery released steelhead smolts on wild/natural salmonids is unknown. However, several factors suggest that predation by hatchery steelhead smolts on wild/natural salmonid fry and smolts is probably non-existent or not significant.

First, the emigration time of Passive Integrated Transponder (PIT) tagged Dworshak hatchery smolts in 1991 and 1992 to the Idaho Department of Fish & Game (IDFG) smolt trap at the head of Lower Granite Reservoir averaged about 1.5 days (37 km/day) (Idaho FRO datafiles). Based on the rapid emigration time through the lower Clearwater River, predation on listed salmonids by hatchery smolts should be minimal in the free-flowing river sections.

Second, according to the literature, steelhead smolts released by the complex are generally below the size that actively preys on fish. Though small steelhead may feed on fish

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(Horner 1978; Hillman and Mullan 1989), 250mm TL appears to be the lower threshold size that has the greatest propensity to be piscivorous (Beauchamp 1990; IDFG 1992). The mean size at release for steelhead smolts at Dworshak NFH is 200 mm.

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

Dworshak NFH steelhead are released as smolts (200 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 (see section on predation above). Steelhead that are not ready to smolt and residualize in Lower Clearwater River tributaries present potential for conflict. These fish could directly compete with wild/natural salmonids for food, rearing space, and/or preferred habitats. Bigelow (1997) found that smaller fish (<180 mm FL) were much more likely to residualize than medium (180-200 mm) or larger fish (>200 mm). While we don't know if competition from residuals is a threat, we do know that these smaller fish do not emigrate at the same rate as the medium and large size groups. Bigelow also saw a decrease in the number of hatchery fish found in streams as the summer progressed. We are actively evaluating various fish culture practices to reduce the tendency toward residualism for hatchery steelhead smolts.

Behavior - There are limited data describing adverse behavioral effects of hatchery steelhead 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. As mentioned above, several steps have been taken 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 steelhead smolts before release, have all been modified over the last several years to prepare juvenile steelhead for smoltification. Reducing the time a smolt spends in the river and mainstem migration corridor will also reduce the potential for adverse interactions with listed salmonids.

Disease - Steelhead reared by the Complex have had outbreaks of IHNV in past years causing significant mortality. IHNV has come under better control over the past 10 years because of improved fish culture and modifications to the nursery water supply. Additionally, all Integrated Hatchery Operations Team (IHOT) guidelines concerning the release of fish undergoing a disease epizootic are strictly practiced. The potential still exists for horizontal transmission of IHNV and other diseases from hatchery steelhead to wild/natural fish. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest that horizontal transmission of disease from hatchery to wild/natural fish is widespread, although little research has been done in this area. The authors concluded that the full impact of disease on wild/natural fish from hatchery fish is probably underestimated. It is common knowledge that pathogens and diseases occur in wild/natural fish populations and that stresses can cause them to exhibit themselves. As mentioned, hatchery fish could potentially induce stresses on wild/natural populations through predation, competition, or adverse interactions.

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7. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

IIB. Dworshak NFH Spring Chinook²¹

A. General information

In June 1982, Dworshak National Fish Hatchery (NFH) was expanded from its function as a steelhead mitigation facility to include spring Chinook salmon trapping, spawning, and rearing under the Lower Snake River Compensation Plan. The new facilities were designed to rear 70,000 pounds of spring Chinook salmon to 20 fish per pound for a total of 1.4 million smolts. The adult return goal for Dworshak NFH is 9,135 spring Chinook salmon (calculated using the 15 fish per pound size, total rearing capacity, and 0.87 percent return rate). At 20 fish per pound the smolt-to-adult return rate must be 0.65 percent to reach the adult return goal.

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

In June 1982, under the Lower Snake River Compensation Plan (LSRCP), Dworshak NFH was expanded from its primary function as a steelhead mitigation facility to include spring Chinook salmon (*Oncorhynchus tshawytscha*). The COE was authorized by Congress in 1976 to implement the LSRCP in accordance with the Water Resources Development Act of 1976 (Public Law 94-587) to offset losses of anadromous fish in the Snake River basin caused by the four dam and navigation lock projects in the Lower Snake River. The spring Chinook salmon program at Dworshak was intended to replace lost sport and Tribal fisheries in the Clearwater River.

2. Goals 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. [DNFH Spring Chinook HGMP, sec. 1.7]

Goal 1: Return 9,135 adult spring Chinook salmon to Lower Granite Dam annually.

Objective 2.1: Release 1.05 million spring Chinook salmon smolts from the hatchery each year.

Task 2.1.1: Collect between 1,200 adults annually for broodstock.

Task 2.1.2: Collect broodstock to represent the full spectrum of the run.

Task 2.1.3: Maintain as close to a 1:1 male to female spawning ratio as possible.

Task 2.1.4: Spawn adults to represent the entire range of timing of reproductive maturity.

²¹ Unless cited otherwise, section figures, tables and text from DNFH CHMP

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- Task 2.1.5: Spawn adults so that all age classes are proportionally represented.
- Objective 2.2: Produce the healthiest, highest quality fish possible at every stage of production.
 - Task 2.2.1: Monitor health and disease status of fish, following the Service Fish Health Policy and IHOT Guidelines.
 - Task 2.2.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
 - Task 2.2.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, broodstock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.
- Objective 2.3 Conduct monitoring and evaluation activities that will provide information on the progress of the hatchery in meeting its return goal for spring Chinook salmon.
 - Task 2.3.1: Conduct regularly scheduled HET meetings.
 - Task 2.3.2: Bio-sample returning adults.
 - Task 2.3.3: Use CWT's to mark and track representative production groups in the ocean and Columbia River basin.
 - Task 2.3.4: Cooperate with the State and Tribe to obtain estimates of sport and Tribal harvest in the North Fork and Lower Clearwater River.
- Objective 2.4: Cooperate and Coordinate with the IDFG and the NPT to develop opportunities for sport and tribal harvest.
 - Task 2.4.1: Conduct semi-annual coordination meetings
 - Task 2.4.2: Provide surplus adult to Tribal programs for out-planting.
 - Task 2.4.3: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.

Goal 2: Assure that all the requirements of legal orders and federally mandated legislation are met.

- Objective 3.1: Conduct hatchery operations consistently with requirements and obligations called for under the ESA.
 - Task 3.1.1: Develop and implement plans to release adult fall Chinook that enter the ladder immediately back into the Clearwater River.
 - Task 3.1.2: Mass mark all production fish to identify them from naturally produced fish.
 - Task 3.1.3: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).

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Task 3.1.4 Implement measures to minimize interactions between production and natural fish.

Task 3.1.5: Draft and implement a Hatchery and Genetic Management Plan.

Objective 3.2: Operate the hatchery so that all requirements and obligations called for under the Clean Water Act are satisfied.

Task 3.2.1: Collect and store on site, fish waste from clarifiers and biofilters.

Task 3.2.2: Collect and analyze water samples monthly in accordance with the NPDES permit.

Objective 3.3: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) production and harvest objectives.

Task 3.3.1: Provide pertinent data and information to Service representatives on U.S. v Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 3.3.2: Meet tribal trust responsibilities.

Goal 3: Provide accurate information and educational (I/E) opportunities for the public, media, schools, Tribal, State, and Federal agencies, and elected officials to enhance participation in understanding and stewardship of Dworshak NFH and FWS programs.

Objective 4.1: Provide production and evaluation information in various reporting formats as necessary or required.

Task 4.1.1: Continue existing and develop new partnerships with public and private groups by being available for guest speaking at their meetings, workshops and other routine or special events.

Task 4.1.2: Develop and maintain strong relationships with area media (Orofino, Kamiah, Grangeville, Lewiston, Spokane) and provide regular news releases, feature stories, photos, data, public service announcements regarding agency issues and station activities.

Task 4.1.3: Maintain information flyers on station for after-hours visitors.

Task 4.1.4: Coordinate with other Outreach or Public Affairs offices to incorporate hatchery information in their programs.

Task 4.1.5: Maintain hatchery website with accurate and frequently updated information and graphics.

Objective 4.2: Develop new and maintain existing levels of public contact and education programs, both on- and off-site.

Task 4.2.1: Facilitate interagency cooperation with existing and new programs in the Clearwater/Snake River region.

Task 4.2.2: Evaluate use and exposure of outreach materials and exhibits as they support goals for the I/E hatchery program.

Task 4.2.3: Distribute and follow up with teacher evaluations post-program to ensure goals are met.

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- Objective 4.3: Develop site keynote events to promote awareness and stewardship of regional fishery resources in support of National Fishing Week activities.
- Task 4.3.1: Continue hosting annual Kids’ Fishing Day/Open House event each June.
 - Task 4.3.2: Interact with other state and federal agencies to host or partner present special events such as National Wildlife Refuge Week, Earth Day, Lewis and Clark Bicentennial activities, regional and local events.
 - Task 4.3.4: Develop more hands-on interactive education for current special events on-site.
- Objective 4.4: Develop external partnerships with new and existing private, non-profit and special interest groups and local, regional and national organizations, institutions and agencies, to promote public awareness and stewardship of fishery resources in the Columbia River Basin.
- Task 4.4.1: Promote special interest group’s use of hatchery by inviting to tour.
 - Task 4.4.2: Interact with Regional Office, Idaho Fish Health Center (FHC), Idaho Fishery Resource Office (FRO), IDFG, Clearwater National Forest (NF), National Oceanic and Atmospheric Administration (NOAA), COE and National Marine Fisheries Service (NMFS) to integrate Lower Snake, Clearwater and Columbia Basin fisheries outreach activities with FWS regional and national strategies.
 - Task 4.4.3: Participate in local advisory or community outreach forums and groups.
 - Task 4.4.4: Hold bi-annual public informational meetings to discuss hatchery practices, projects and program issues, concerns and plans.
 - Task 4.4.5: Provide annual legislative briefing packet distribution to Idaho elected officials; invite them to visit the hatchery during peak spawning seasons.

3. Objectives of program

Table: Performance measures established at the hatchery.

Performance Measure	Hatchery Goal	5-Year Average	Range
Spawning Population	1,200	2,218	800–4,018
Fish release (millions)	1.00–1.05	873,893	333,120–1,044,511
Smolt size at release (fish/lb)	20–22	21	19.7–24.0

4. Type of program (Integrated or Segregated)

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

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Clearwater River from these hatchery releases to be used other than for harvest and for broodstock to continue the program. (DNFH Spring Chinook HGMP, sec.1.8)

5. Alignment of program with ESU-wide plans

There is currently no ESU-wide hatchery plan for Spring Chinook Salmon. Spring Chinook salmon are not listed in the Clearwater River Basin.

6. Habitat description and statu where fish are released.

Very little habitat within the Clearwater subbasin has been defined as excellent for spring Chinook salmon. Excellent habitat is typically limited to the highest elevation headwater streams within the Lochsa and Upper Selway AUs. Good and fair spring Chinook salmon habitat is widely intermixed and found throughout the majority of the usable mainstem and tributary reaches of the Lochsa, South Fork, and Upper and Lower Selway AUs. Poor habitat conditions for spring Chinook are typically associated with lower mainstem reaches of major tributaries (Lolo Creek, Lochsa, Selway and South Fork Clearwater Rivers) and the mainstem Clearwater River [NWPPC Clearwater River Subbasin Plan, November 2003, p.279].

7. Size of program and production goals (No. of spawners and smolt release goals)

The 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. (DNFH Spring Chiook HGMP, sec.1.11.1)

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. (DNFH Spring Chinook HGMP, sec.1.11.2)*

C. Description of program and operations

1. Broodstock goal and source

- 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. (DNFH Spring Chinook HGMP, sec.6.2.1)
- *Genetic background of Dworshak NFH spring Chinook salmon smolts directly released from the hatchery, 1983-2006. (RR = Rapid River, KK = Kooskia, DW = Dworshak, LE = Leavenworth, LW = Little White Salmon). (Burge, January 2007, Spring Chinook, p.3)*

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 – 2000	100% DW
2001	64% DW, 36% RR
2002-2006	100% DW

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2. *Adult collection procedures and holding*

- Dworshak operates a fish ladder at its facility to capture returning adult spring Chinook. The ladder is usually opened for spring Chinook collection from late May through mid-September.
- The spring Chinook carcasses are unfit for human consumption and can be used for Washington or Idaho State bear research/capture programs, university research, raptor recovery and rehabilitation programs, or stream nutrient enhancement programs. The remainder of the carcasses are taken to an area waste-transfer station.
- Because the run of spring Chinook salmon to Dworshak NFH is relatively short most years, especially compared to the steelhead return, the ladder is generally opened in June and operated all summer until closing in September. In most years, running the trap continually is necessary in order to ensure that broodstock is collected over the full spectrum of the run. In those years when returns are sufficient to provide sport and tribal harvest opportunities, the ladder may be closed for brief periods during the summer.
- 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. (DNFH Spring Chinook HGMP, sec.7.3)
- 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. (DNFH Spring Chinook HGMP, sec.7.5)
- 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. Mortalities are removed daily and formalin treatments are administered from 1-3 times per week to control fungus. All adult females are injected with Erythromycin (20mg/kg) approximately 21 days prior to spawning. (DNFH Spring Chinook HGMP, sec.5.1)
- 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. (DNFH Spring Chinook HGMP, sec.5.3)

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3. Adult spawning

a) Spawning protocols

- The Dworshak spring Chinook salmon program usually observes a 1:1 sex ratio in adult returns. In order to fill the program, we need to collect about 1200 adults total to account for sex ratio, pre-spawning mortality, jacks, and BKD culling. (DNFH Spring Chinook HGMP, sec.7.)]
- 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. (DNFH Spring Chinook HGMP, sec.8.2)

b) No. of males and females spawned each year over past 10 years (Table)

Total number of spring Chinook salmon returning to the hatchery are reported below. 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).* (DNFH Spring Chinook HGMP, sec.7.4.2)

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

Table: Number of spring Chinook females spawned for the Dworshak NFH program before culling. (DNFH Spring Chinook HGMP, sec.7.4.2)

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Total SCS Females Spawned 2003-2007 before culling for ELISA, dead trays, etc.				
culling level - 0.25 OD				
	DW	<u>females spawned</u>	<u># culled</u>	% culled
BY	2007	502	10	1.99
	2006	440	4	0.91
	2005	385	1	0.26
	2004	437	11	2.52
	2003	363	30	8.26

4. *Fertilization*

a) **Protocols**

- 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° F.
- Chinook spawning involves a male:female ratio of 1:1. (DNFH Spring Chinook HGMP, sec.8.2)

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b) Number of eggs collected and fertilized each year over past 10 years (Table)

spring Chinook Egg Requirements for Dworshak NFH

# Females	Eggs/Female	Green Eggs	After Culling	
			Dead Eggs, BKD, etc 88% Eyed Eggs *EST*	Eyed Eggs needed for program
380-400	3,500-3,900	1,400,000	1,232,000	1,120,000

* BKD culling is highly variable so extra eggs are taken

Table: Survival of Dworshak Spring **Chinook** eggs reared at Dworshak only. (DNFH Spring Chinook HGMP, sec.9.1)

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.

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Table: Dworshak BY06 spring Chinook Egg Take and Survival. (Burge, January 2007, Spring Chinook, p.4)

Take	Spawn Date 2006	# of Male ¹	# of Female	Female culled BKD ²	Tray Culled Dead	Trays Culled Extra	Dead Eggs Enum	Eyed Eggs Enum	Eggs for Research	Total Eggs	Eggs/Female	Percent Enum Eye-up
1	15-Aug	72	73	5	0	0	10,343	246,522	0	256,865	3,777	96.0
2	16-Aug	35	55	3	1	0	10,316	188,525	0	198,841	3,899	94.8
3	22-Aug	76	138	30	4	0	16,042	390,000	0	406,042	3,904	96.0
4	29-Aug	146	174	71	2	24	4,144	290,000	0	294,144	3,820	98.6
Tot/Ave		329	440	109	7	24	40,845	1,115,047	0	1,155,892	3,853	96.5

1 Includes 24 jacks spawned during the season

2 BKD culling above 0.085 ELISA testing for all Takes

Percent enumerated eye-up does not include eggs/females culled before enumeration

Source: BY06 spring Chinook Egg Enumeration and % Survival of Eggs Summary SC2006 EggEnum.xls IFHC BKD ELISA testing results BY06 spring Chinook

5. Incubation

- Dworshak has 58 Heath incubator stacks containing 435 trays. Each stack has 54°F water available for Chinook incubation. Ten stacks also have chilled water (42°F) available for incubation of Chinook. (DNFH Spring Chinook HGMP, sec.5.4)
- 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 2005, all Dworshak stock spring Chinook remain at Dworshak. All Kooskia spring Chinook stock are shipped to Kooskia after eye-up and enumeration Water flow for the trays is approximately 5 gallons/minute. (DNFH Spring Chinook HGMP, sec.9.1.3)

6. Ponding

a) Protocols

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 are not taken at this time to avoid damage to the fish. Fry are tanked from early-December through mid-December. Fry are moved from the trays to the tanks by hatchery personnel (forced tanking). Fry swim-up, off the bottom and began to feed on their own discretion.

b) Number of fry ponded each year, including % hatch each year

Table: Survival of Dworshak Spring Chinook eggs reared at Dworshak only. (DNFH Spring Chinook HGMP, sec.9.1)

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Brood Year	# Eggs Taken	% Survival Green to Eyed	% Survival Eyed to Nursery
2001	1,195,486	97.4	97.1
2000	1,172,404	95.1	94.6
1999	249726	93.3	94.4
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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 Dworshak and Kooskia eggs to be mixed, not enumerated separately, etc.

7. Rearing/feeding protocols

- 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. Water flow for the trays is approximately 5 gallons/minute. (DNFH Spring Chinook HGMP, sec.9.1.3-9.1.4)
- Temperature for spring Chinook incubation is 37° F.
- Temperature is monitored at least once/day.
- Minimum dissolved oxygen is 6-7ppm in the bottom tray

8. Fish growth profiles

The following table illustrates average growth of Chinook at Dworshak NFH. (DNFH Spring Chinook HGMP, sec.9.2.4)

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

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9. Fish health protocols and issues

- The Idaho FHC conducts several types of fish health exams. Examinations of both summer steelhead and spring Chinook salmon are conducted at Dworshak NFH by a pathologist from the Idaho FHC once per month. From each stock and broodyear of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) are checked for the common bacterial pathogens by culture and by a specific test for bacterial kidney disease (BKD). Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.
- Diagnostic examinations are performed on an as-needed basis as determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.
- Pre-release examinations are conducted two to four weeks prior to a release or transfer from the hatchery. Routinely, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW (Fish and Wildlife Service Manual) include IHNV, infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.
- Adult certification examinations are performed during spawning. Tissues from adult fish are collected to ascertain viral, bacterial, and parasite infections and to provide a brood health profile for the progeny. The Idaho FHC tests for all of the listed pathogens, including *Myxobolus cerebralis* and tests for *Ceratomyxa shasta*. The minimum number of samples collected is defined by 713 FW. At Dworshak NFH, all brood spring Chinook females are tested for *R. salmoninarum* (causative agent of BKD), with an identifying fish health number corresponding to each female's eggs so that selective culling and/or segregation is possible. This is done to reduce/control BKD, a vertically transmitted disease. Progeny from females with high levels of BKD are culled (if not needed to make production goals) or segregated from progeny at lower risk. The Idaho FHC provides results from testing within four weeks to allow management decisions. A random sample of 60 adult steelhead is also tested for BKD by ELISA.

10. Chemotherapeutant use

- Erythromycin injections for spring Chinook brood stock are critical to the control of BKD, which is caused by a vertically transmitted bacterium (*Renibacterium salmoninarum*) that can reside in the ovarian and seminal fluids. In addition, erythromycin injections control the mortality and reduce horizontal transmission of BKD between adults in the holding pond. The injection schedule is set to maximize the number of adults injected, with a goal of one injection 21 days prior to spawning.

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- To reduce bacterial numbers in the reproductive fluids, and to deposit the drug inside the ova, erythromycin must be injected at a dosage of 20 mg drug/kg of fish. At Dworshak NFH, the first injection is scheduled on about July 29th. Except for fish arriving too close to the time of spawning for safe handling and injection, all spring Chinook salmon female adults kept for broodstock are injected.
- Injections are done under a prescription from a veterinarian. The injected drug is Gallimycin 200 (200 mg/ml), of active erythromycin base in a non-aqueous buffered alcohol base; to be injected into the peritoneal cavity at 20 mg drug/kg of body weight.
- Since 1998 (brood year 97 juveniles) prophylactic medicated feedings to control BKD in juveniles has been deemed unnecessary. The reduced levels of BKD in the juveniles is attributed to lowered densities (< 0.25 density index and < 1.0 flow index) during rearing, regular cleaning and maintenance of individual equipment (nets, etc.) for each pond, erythromycin injection of the adults, and culling/segregation of progeny from highly infected females.
- Should prophylactic feeding be necessary juveniles are fed at a daily dosage of 100 mg/kg of fish for a minimum of 21 days, unless contraindicated by drug toxicity or needed feeding rate adjustments. The time and number of treatments will be dictated by circumstances. As of 2001, there is a temporary INAD 4333 that allows feeding of Aquamycin 100 (erythromycin thiocyanate in a wheat flour base).
- GNRHa (under INAD) is used upon occasion when there are no early maturing males or at the end of spawning to insure all females spawn.
- Adult spring Chinook salmon held for brood stock are treated with formalin up to three times per week to control external pathogens prior to spawning.
- Salmonid egg hardening and disinfection treatment with a polyvinylpyrrolidone iodine compound (approximately 1% iodine) is required by 713 FW policy to minimize/prevent transmittance of viral and bacterial pathogens. The eggs are disinfected in 75 ppm iodine in water buffered by sodium bicarbonate (at 0.01%) for 30 minutes during the water-hardening process. Eggs received at the hatchery must be disinfected before they are allowed to come in contact with the station's water, rearing units or equipment. Specifics are provided in 713 FW policy.

Other Fish Health Precautions.

- Unless knowledge regarding vertical transmittance of BKD proves otherwise, eggs from female brood stock with high levels of BKD (a cut-off point selected by the NFH and FHC managers based on results from the Enzyme-Linked Immunosorbent Assay or ELISA) will not be used in production except when egg production is low. If the number of brood females is low, progeny from highly infected females shall be segregated into rearing units apart from the rest of the production and with all equipment being disinfected and/or dedicated to these segregated rearing units. Eggs from high or moderate females are tested to insure antibiotic retention and Quantitative PCR used to determine actual level of bacteria. Eggs that have no antibiotic and have high levels of bacteria are culled, regardless of egg need.

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- Returning spring Chinook that are allowed to remain in the North Fork of the Clearwater River upstream of the hatchery can serve as a reservoir of pathogens for the fish in the hatchery. Returning spring Chinook salmon have a relatively low incidence of IHNV. The risk from BKD in the juveniles is also enhanced, with evidence from this and other hatcheries, that horizontal transmission occurs when infected adults are in the water supply.
- Drugs and chemicals for treating fish are used on an “as needed” basis. Formalin treatments for adult brood stock are given to control external parasites and as a fungicide on eggs. GNRHa is used periodically when more spawning males are needed early (steelhead) or trying to get the last few females (spring Chinook).
- Tank trucks and tagging trailers are disinfected before being brought onto the station and after use at the hatchery.
- Abernathy Fish Technology Center provides quarterly feed quality analysis to prevent disease and meet nutritional requirements of fish.

11. Tagging and marking of juveniles

Dworshak NFH releases about 1.0 million spring Chinook salmon smolts each year. Since 1993 all of the spring Chinook salmon smolts at Dworshak NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least two groups of 60,000 fish receive a CWT to represent the two separate banks of LSRCF raceways. Since 1996, the spring Chinook salmon program at Dworshak NFH has cooperated with the NMFS in the Comparative Survival Study by providing in excess of 50,000 smolts per year for PIT-tagging. The smolts are released at Dworshak NFH and provide information on survival during emigration to the ocean as well as Transported vs. Non-Transported adult survival back to the river from the ocean. For the past several years, the adult PIT tag information has been used by the fishery management agencies and the hatchery to construct in-season estimates of harvestable surpluses of Chinook salmon not needed for broodstock.

12. Fish Release

a) Protocols

- 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. (DNFH Spring Chinook HGMP, sec.10.2)
- Spring Chinook salmon on the hatchery usually begin the smolt transformation process in late January and begin manifesting distinct smolt characteristics by March. An evaluation of release timing conducted by Jones and Burge (2002) in the mid-90's indicated that earlier releases are more successful than later releases in terms of the number of adults returning to the hatchery. Based on those results and practical

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experience, smolt releases are generally scheduled for the period between the last week in March and the first 10 days in April. The precise release days are determined by monitoring flows in the Clearwater and Snake Rivers and scheduling release days during a rising hydrograph. Releases occur over a two-day period and take place in the late afternoon and evening in order to reduce avian predation. Smolts are released into the North Fork of the Clearwater River and arrangements are made with the Corp of Engineers to schedule an increase in flow out of Dworshak Reservoir to facilitate moving the smolts out of the North Fork and into the mainstem Clearwater River (pers. comm. Jones 2007).

b) Number of fish released each year (subyearlings?; yearlings?; other?)

Table: Release year, number of smolts released at Dworshak NFH from 1988 to 2006. [Burge, January 2006, Spring Chinook, p16]

Release Year	Smolts Released ¹
1988	1,547,219
1989	1,651,472
1990	1,251,247
1991	1,094,884
1992	959,369
1993	7,222
1994	1,278,273
1995	1,311,445
1996	102,903
1997	53,078
1998	973,400
1999	1,044,511
2000	1,017,873
2001	333,120 (main stem release)
2002	1,000,561
2003	1,033,982
2004	1,078,923
2005	1,072,359

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2006	1,007,738
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¹ Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

D. Program benefits and performance

Table: List of program “Performance Indicators”, designated by “benefits” and “risks”. (DNFH Spring Chinook HGMP, sec.1.10)

Benefits	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 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 operations comply	Juvenile fish health will be

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Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
hatchery spring Chinook at all life stages using disease control and disease prevention techniques.	with USFWS Fish Health Policy and Implementation Guidelines as well as the Integrated Hatchery Operation Team’s fish policy.	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.

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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 parameters will be monitored to establish release date. PIT-tagged fish will be detected at downstream dams to monitor travel rate and survival.

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1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Table: spring Chinook rack returns to Dworshak/Kooskia 1990-2006 Source: DNFH BY06 spring Chinook Spawning Activity Report – Final IFRO spring Chinook Rack Returns (USFWS, Oct. 30, 2006, p.1-2)

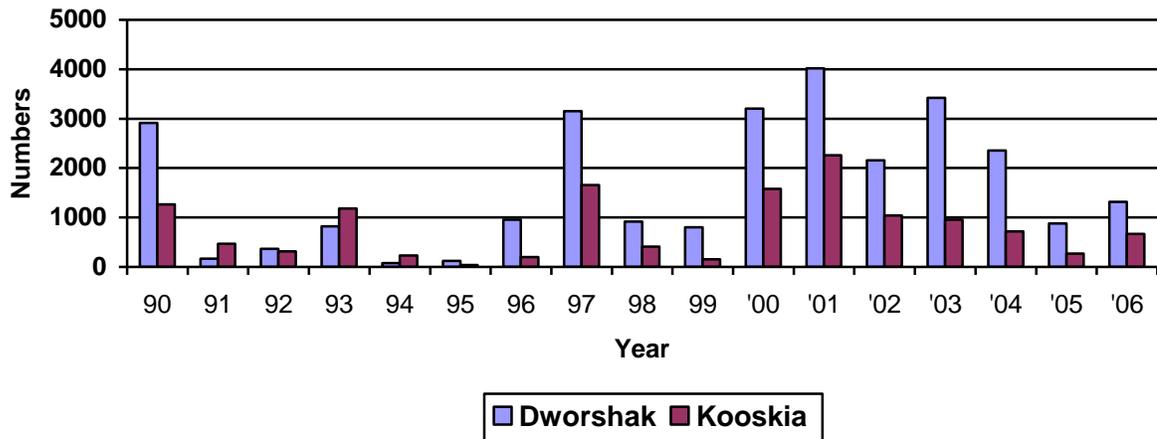


Table: Release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class from 1988 to 2006. Estimates include sport and Tribal harvest or other estimates for 1990, 1997, 1998, 2000-2006. (Burge, January 2007, Spring Chinook,, p.16)

Release Year	Smolts Released ¹	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
1988	1,547,219	156 (0.0101%)	2,709 (0.1751%)	72 (0.0047%)	2,937 (0.1898%)
1989	1,651,472	10 (0.0006%)	77 (0.0047%)	40 (0.0024%)	127 (0.0077%)
1990	1,251,247	16 (0.0013%)	286 (0.0229%)	359 (0.0287%)	661 (0.0528%)
1991	1,094,884	23 (0.0021%)	452 (0.0413%)	41 (0.0037%)	516 (0.0471%)
1992	959,369	9 (0.0009%)	30 (0.0031%)	6 (0.0007%)	45 (0.0047%)
1993	7,222	3 (0.000646%)	36 (0.0077%)	25 (0.0054%)	64 (0.0137%)
1994	1,278,273	83 (0.0065%)	663 (0.0517%)	1,110 (0.0868%)	1,856 (0.1452%)

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1995	1,311,445	275 (0.0210%)	3,571 (0.2723%)	952 (.0726%)	4,798 (0.3659%)
1996	102,903	18 (0.0175%)	230 (0.2235%)	52 (0.0505%)	300 (0.2915%)
1997	53,078	14 (0.0264%)	78 (0.1470%)	344 (0.6481%)	436 (0.8214%)
1998	973,400	670 (0.0688%)	7,443 (0.7646%)	2,452 (0.2519%)	10,565 (1.0854%)
1999	1,044,511	496 (0.0475%)	10,622 (1.0169%)	1851 (0.1722%)	12,969 (1.2416%)
2000	1,017,873	128 (0.0126%)	4,455 (0.4377%)	4,930 (0.4843%)	9,513 (0.9346%)
2001	333,120	187 (0.0561%)	878 (0.2636%)	250 (0.0750%)	1,315 (0.3948%)
2002	1,000,561	847 (0.0847%)	3,936 (0.3934%)	279 (0.0279%)	5,062 (0.5059%)
2003	1,033,982	184 (0.0178%)	1,567 (0.1516%)	238 (0.0230%)	1,989 (0.1924%)
2004	1,078,923	80 (0.0074%)	1,875 (0.1738%)		
2005	1,072,359	64 (0.0060%)			
2006	1,007,738				

¹ Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

b) Return timing and age-class structure of adults

Table: Release year, number of smolts released, and the numbers and percent survival of adult returns to Dworshak NFH by age class from 2001 to 2005. (Burge, January 2007, Spring Chinook., p.7)

Release Year	Smolts Released ¹	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
2001	333,120	187 (0.0561%)	878 (0.2636%)	250 (0.0750%)	1,315 (0.3948%)
2002	1,000,561	847 (0.0847%)	3,936 (0.3934%)	279 (0.0279%)	5,062 (0.5059%)
2003	1,033,982	184 (0.0178%)	1,567 (0.1516%)	238 (0.0230%)	1,989 (0.1924%)
2004	1,078,923	80 (0.0074%)	1,875 (0.1738%)		

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2005	1,072,359	64 (0.0060%)			
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¹ Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

Appendix Table: Age composition of spring Chinook salmon returning to Dworshak NFH, 1984-2006. Percentages do not include unmeasured adults (USFWS 2006).

Year	I-Salt	%	II-Salt	%	III-Salt	%	Unmeasured	Total Return
1984	14	17	52	63	16	20	0	82
1985	13	4	281	85	35	11	5	334
1986	78	15	346	67	91	18	0	516
1987	25	1	1,604	80	376	19	12	2,017
1988	163	8	569	29	1,240	63	0	1,972
1989	156	9	1,322	78	221	13	1	1,700
1990	7	0.3	1,892	93	135	6.7	8	2,042
1991	16	10	77	47	72	43	0	165
1992	23	6	286	82	40	12	21	370
1993	9	1	452	55	359	44	3	823
1994	3	4	30	41	41	55	0	74
1995	83	66	36	29	6	5	0	125
1996	275	28	663	69	25	3	0	963
1997	12	0.4	2,380	76	740	23.6	18	3,150
1998	11	1	176	19	728	80	0	915
1999	670	84	78	10	52	6	0	800
2000	221	7	2,827	90	104	3	0	3,202
2001	36	1	3,235	80	747	19	0	4,018
2002	62	3	1,480	69	615	28	0	2,157
2003	580	17	478	14	2,364	69	0	3,422
2004	142	6	2,077	88	137	6	0	2,356
2005	74	8	686	78	122	14	0	882
2006	62	5	1,136	84	156	11	0	1,354

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c) Smolt-to-adult return rates

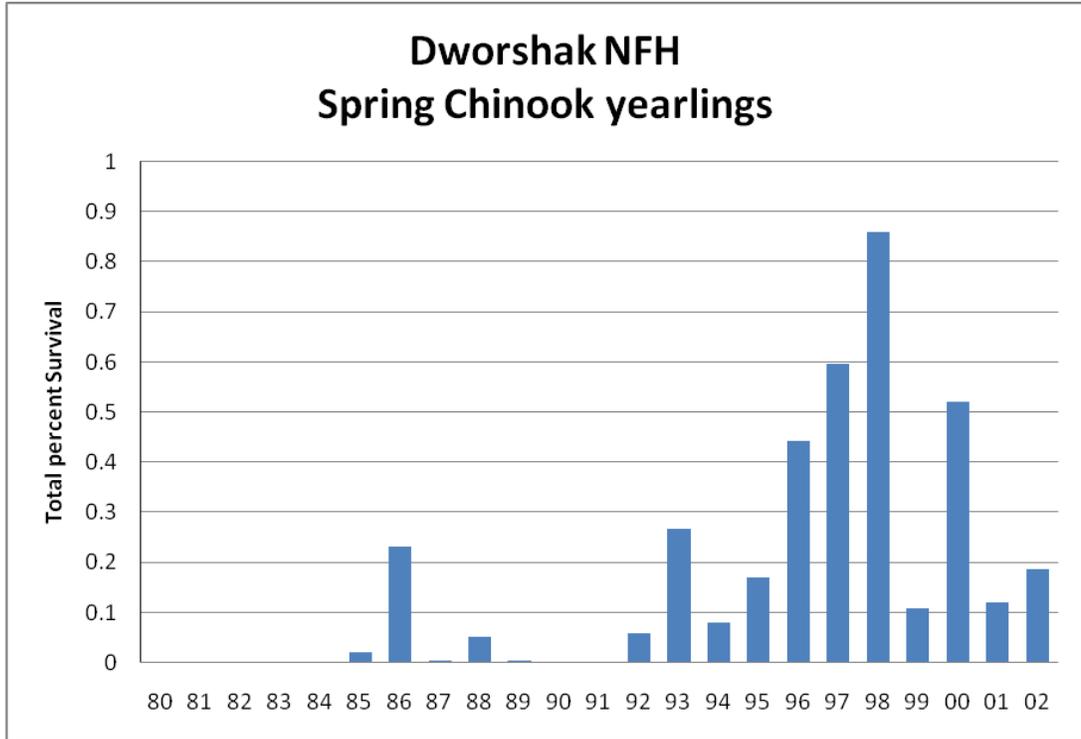


Figure: Dworshak NFH Spring Chinook smolt to adult survival by brood year based on coded-wire tag data. (Pastor 2009)

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Table: Releases and returns (harvest, hatchery, and escapement) based on coded-wire tag data for Dworshak NFH spring Chinook 1990-2001 (Pastor 2009)

Dworshak NFH spring Chinook yearling Releases and Returns

Brood Year	Number Released	Hatchery	Columbia		Spawning Ground	Total Recoveries	Smolt to Adult Survival
			River Harvest	Ocean Harvest			
90	959,369	22	4	0	0	26	0.0027
91	467,222	9	1	0	0	10	0.0021
92	1,278,273	669	78	0	3	750	0.0584
93	1,311,445	2,779	721	8	23	3,531	0.2675
94	102,903	45	35	3	1	84	0.0807
95	53,078	82	8	0	0	90	0.1696
96	973,400	3,365	948	0	2	4,315	0.4431
97	1,044,511	886	2,942	6	0	3,834	0.5949
98	1,017,873	3,338	5,373	24	40	8,775	0.8582
99	333,120	253	111	0	0	364	0.1093
00	1,000,561	2,846	2,313	47	0	5,206	0.5203
01	1,033,982	634	602	0	24	1,260	0.1195
02	1,074,009	1,201	791	0	96	2,088	0.1855

d) Stock productivity (e.g. recruits per spawner)

No information provided.

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2. Contributions to harvest and utilization (e.g. food banks)

Table: Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 1987 to 2006. (Burge, January 2007, Spring Chinook,, p.12)

Year	Dworshak NFH Rack Return	Kooskia NFH Rack Return	Sport Harvest ¹	Tribal Harvest ¹	Estimated Return
1987	2,017	687	0	210	2,914
1988	1,972	595	0	312	2,879
1989	1,700	973	0	404	3,077
1990	2,042	1,141	369	644	4,196
1991	165	467	0	0	632
1992	370	312	54	160	896
1993	823	1,180	0	43	2,046
1994	74	232	0	0	306
1995	125	40	0	0	165
1996	963	202	0	24	1,189
1997	3,150	1,657	741	847	6,395
1998	915	408	99	202	1,624
1999	800	157	0	37	994
2000	3,202	1,581	3,908	1,183	9,874
2001	4,018	2,261	14,752	3,144	24,175
2002	2,157	1,037	5,087	1,259	9,540
2003	3,422	965	2,068	1,609	8,064
2004	2,356	718	1,825	808	5,707
2005	882	270	942	275	2,369
2006	1,354	670	495	457	2,976

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Table: Contribution and recovery of coded-wire tagged spring Chinook salmon from Dworshak NFH from CRiS and PSMFC TSI stock reference summary, (Steve Pastor pers. com.)

Recovery Area	Expanded Recoveries by Area and Broodyear (BY)					5-Year Ave.
	BY 1996	BY 1997	BY 1998	BY 1999	BY 2000	
Ocean Troll	0	6	24	0	47	15
Treaty Ceremonial	228	63	72	0	28	78
Columbia River Gillnet	147	1,155	2,282	65	886	907
Columbia River Sport	84	1,289	2,440	16	870	940
Freshwater Sport	433	413	515	30	511	380
Hatchery	3,412	897	3,338	225	620	1,698
Miscel Trap	7	11	24	0	0	8
Spawning Ground	2	0	40	0	0	8
Total Expanded Recoveries	4,313	3,834	8,735	336	2,962	4,036
Total # Released	973,400	644,511	1,017,873	333,120	1,000,561	793,893
SAR %	0.44	0.59	0.86	0.10	0.30	0.46

*Broodyear (BY) refers to the year that the fish was spawned and its resulting progeny. For example, BY 2000 fish were spawned in 2000, released in 2002 and returned as three, four, and five year old fish in 2003, 2004, and 2005

Table: For Spring Chinook Returning to the Clearwater Basin. General Clearwater River Basin harvest data for the past 12 years is presented in the following table. Information presented is for adipose fin-clipped Chinook only (IDFG Spring Chinook HGMP, Sept. 30 2002)

Harvest Year	Adult Chinook Passing Lower Granite Dam	Jack Chinook Passing Lower Granite Dam	Estimated Chinook Harvest in Clearwater Basin
1990	17,315	244	369
1991	6,623	980	No Season
1992	21,391	533	< 50
1993	21,025	183	No Season
1994	3,120	43	No Season
1995	1,105	373	No Season
1996	4,207	1,639	No Season
1997	33,854	84	738
1998	9,881	106	99
1999	3,296	2,507	No Season
2000	33,822	10,318	4,396
2001	147,168	3,136	21,883

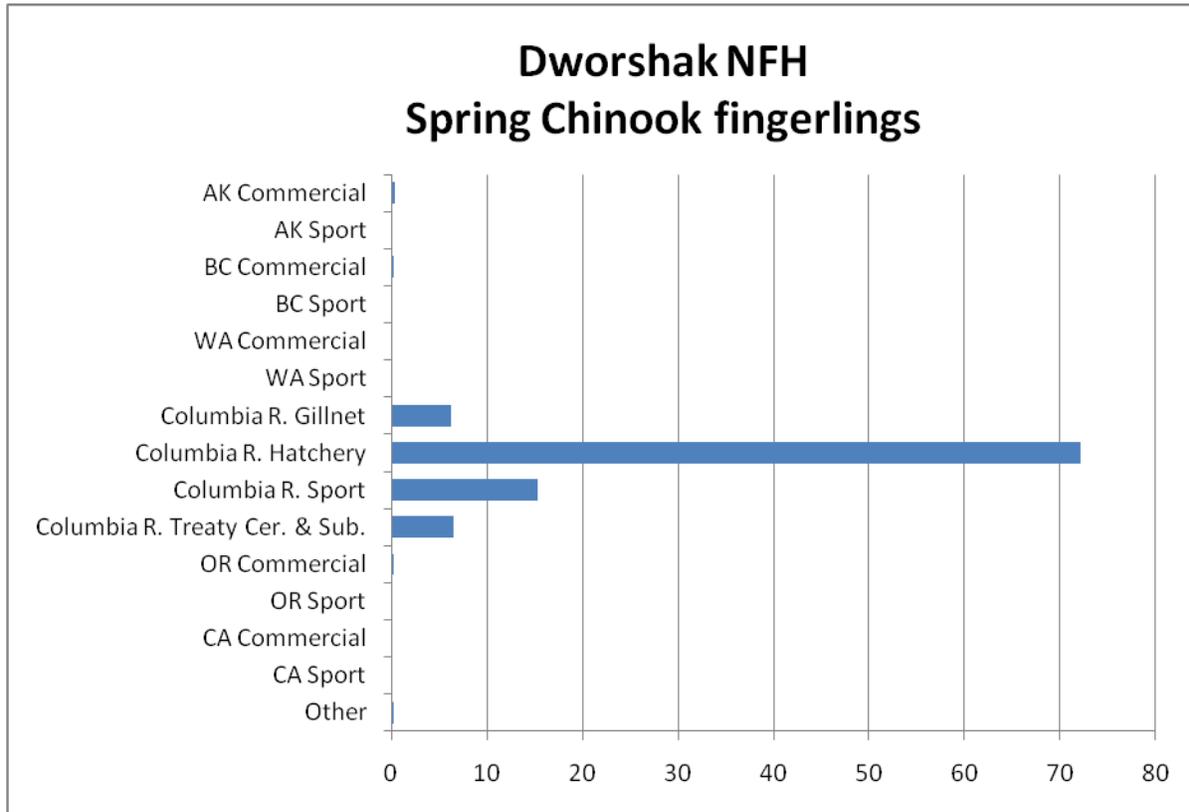


Figure: Mean % of recoveries of Dworshak NFH spring Chinook yearlings since 1980 based on coded-wire tag data (Pastor 2009)

3. Contributions to conservation

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. (DNFH Spring Chinook HGMP, sec.2.2.1)

4. Other benefits

Historic. Fishing in the Clearwater River has been a primary activity of indigenous peoples for thousands of years. The Nez Perce people have fished seasonally from these waters for centuries. Their history and culture revolve around the natural world, and they have deep reverence for all living things. Salmon and steelhead have played a significant role in tribal culture, both pre-historic and in the modern era.

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The description of steelhead trout by the Lewis and Clark expedition was the first recorded documentation of this species in the Clearwater basin. Commercial and sport fishing began in the late 19th century as the area was settled and developed. Mining, and later logging, were primary economic activities in these early communities, along with agriculture and ranching practices on early homesteads.

The communities of Orofino and Ahsahka have been economically supported by the natural resource industry since the 1860's - logging, mining, fish & wildlife recreation, farming, ranching, non-consumptive recreation and hydro-electric power generation (Dworshak Dam).

Present Day. The NPT continues intermittent use of a private in-holding on Dworshak hatchery property for cultural purposes (church and cemetery), as well as accessing fishing areas.

Dworshak NFH has been open to the visiting public since its completion and dedication in August, 1969. The hatchery was designed primarily for steelhead production to mitigate for the loss of habitat by the construction and operation of Dworshak Dam and reservoir. Over the years a public tour route was developed to provide visitors an easy self-guided walking tour of the main buildings and grounds. Interpretive signs were designed and placed along this walking route in the 1980's and early 1990's. The signs explain the detailed operations of the state-of-the-art hatchery. Brochures and a welcome audio/visual program greet visitors in the main hatchery lobby, and a large viewing balcony overlooks the spawning room; displays and exhibits provide information on the hatchery life cycle of fish.

In 1990, an Open House and Kids' Fishing Day at the hatchery was begun to coincide with National Fishing Week activities. Participation has increased steadily over the years, with as many as 800 – 900 children (12 yr and under) catching trout out of our kid's fishing pond every year.

New in 2002, is a small non-profit sales area in the main hatchery building, called the Dworshak Spawn Shop, operated by the FNWH out of Leavenworth, WA. The shop offers visitors unique gift items reflecting the natural resources of the region, with an emphasis on fish. Proceeds aid in funding outreach and educational projects at national fish hatcheries in the Northwest.

The hatchery lies within the Northwest Passage Scenic Byway corridor, with Highway 12 paralleling the compound on the South side of the Clearwater River. The Clearwater River canyon is a major travel corridor from East to West, connecting Montana to Idaho, and summer seasonal traffic is greatly increased. The river is an attraction to many seasonal visitors for recreational opportunities including fishing, hunting, rafting, berry picking, swimming and sightseeing.

Plans are currently underway for updated interpretive information and a new kiosk highlighting the Lewis/Clark era, tribal influences on fishery resources, and what the future holds for hatchery management. Picnic tables and a remodeled visitor's lobby are also being planned to accommodate the 20,000+ annual visitors.

With the addition of a permanent outreach specialist and assistant, more public programs are being offered on and off hatchery grounds. School groups make up one of the largest groups of visitors in the spring and fall when spawning is scheduled. Summer visitors are increasing

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yearly. Guided group tours are also increasing, as well as requests for more specialized educational programs revolving around specific fishery resource issues, or broader aquatic ecosystem themes.

Fishery Benefits. It must be recognized that there are environmental conditions outside the hatchery that are beyond the control of hatchery managers, whenever an estimate of the benefits of an anadromous fish hatchery are made. This variability can affect post-release survival of juveniles and numbers of returning adults. During times of good ocean and river conditions resulting in healthy adult returns, significant economic activity is generated through harvest of Dworshak NFH summer steelhead and spring Chinook.

Additionally, the role of a Federal mitigation hatchery is to compensate for natural habitat lost to Federal hydro-projects. Therefore, it can be surmised that the economic benefit of the mitigation hatchery is interwoven into the economic benefit of the hydro-power projects being mitigated for, and that the hatchery can be characterized as an operating expense of the hydro-power project, both of which provide significant benefits to the American public.

The benefits of anadromous fish in the Clearwater River relate to providing a harvestable product on a seasonal basis. Sport, Tribal and commercial fisherman annually take a significant number of the returning hatchery adult population.

Steelhead and salmon play an important role in the overall aquatic ecosystem, and mean many different things to many different people. They can indicate the health of a watershed, and are a vital link on the natural food chain; they are caught for pleasure or sport; they are used for food and cultural ceremonies. The majority of people, no matter their background, like the idea of fish being in the river.

E. Research, monitoring, and evaluation programs

[DNFH CHMP,p55-58]

The Idaho FRO provides monitoring, evaluation, and coordination services for the Dworshak Fisheries Complex. The Idaho FRO staff monitors hatchery returns, measures biological characteristics of the hatchery stock, coordinates fish marking, performs tag recovery, and assists with other aspects of the hatchery program. They maintain databases that store this information and provide data to databases maintained by other entities. The Idaho FRO also provides leadership for the Dworshak HET, which ensures close cooperation and coordination between Dworshak NFH, Idaho FHC, the Idaho FRO and our co-managers, to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally. These activities are described in the following section:

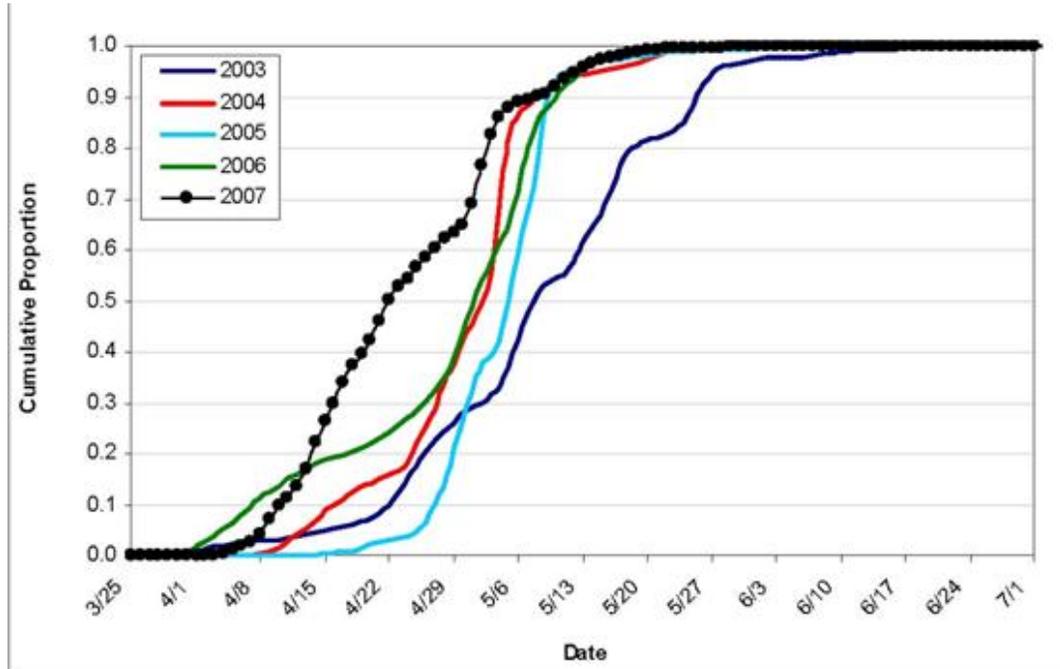
Database Management. All national fish hatcheries submit distribution data to the fisheries information system (FIS) which is the Service's national database. Dworshak NFH submits distribution, lot history, and adult return information to the Idaho FRO. After review, these files are sent to the Columbia River Fisheries Program Office (CRFPO) for incorporation into the Columbia River information System (CRiS). Marked release and recovery information is sent to the Fisheries Division of the Western Washington Fish and Wildlife Office for conversion to the Pacific States Commission / Pacific States Marine Fisheries Commission

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format. In addition, the Idaho FRO maintains complete databases of all hatchery information within the office to provide summary data to other State, Federal, and Tribal agencies.

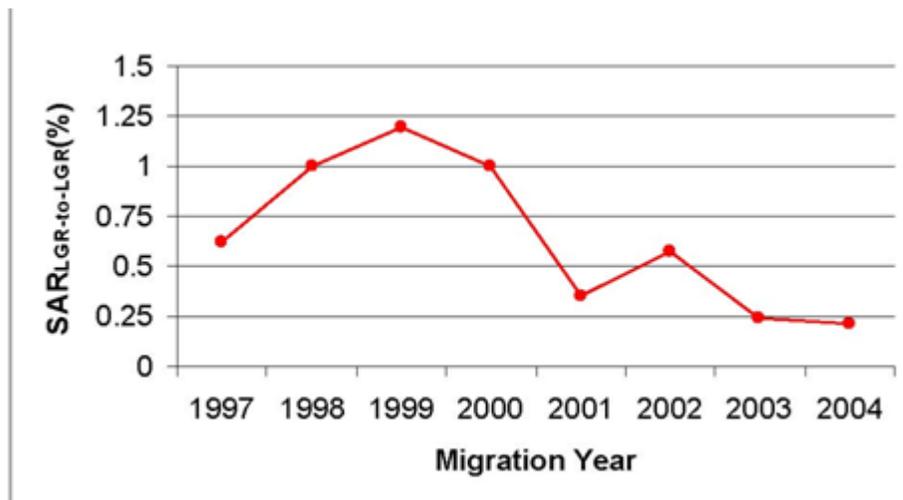
Marking/Tagging Program. Dworshak NFH releases about 1.0 million spring Chinook salmon smolts each year. Since 1993 all of the spring Chinook salmon smolts at Dworshak NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least two groups of 60,000 fish receive a CWT to represent the two separate banks of LSRCP raceways. Since 1996, the spring Chinook salmon program at Dworshak NFH has cooperated with the FPC in the Comparative Survival Study by providing in excess of 50,000 smolts per year for PIT-tagging. The smolts are released at Dworshak NFH and provide information on survival during emigration to the ocean as well as Transported vs. Non-Transported adult survival back to the river from the ocean. For the past several years, the adult PIT tag information has been used by the fishery management agencies and the hatchery to construct in-season estimates of harvestable surpluses of Chinook salmon not needed for broodstock.



- PIT tagged Dworshak NFH spring Chinook salmon passage timing to Lower Granite Dam, 2003-2007 (Fish Passage Center).
- Survival from hatchery release to LGR averaged about 65% (range ~20%-80%) from CSS hatcheries during 1997-2004 (Figure 6.1; Appendix D). Survival from Dworshak NFH was generally higher than other CSS hatcheries (Rapid River FH, Catherine Creek, McCall FH, Imnaha); survival from Catherine Creek was notably lower than the others (BPA, August 31, 2007)

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- PIT tagged Dworshak spring Chinook salmon from CSS. The above graph shows a time series of the Weighted SAR_{LGR-10-LGR} over the eight years of available data (Fish Passage Center)
- Dworshak Hatchery spring Chinook SARs tended to be less than wild aggregate SARs. The geometric mean SAR for Dworshak Hatchery spring Chinook during 1997-2003 was 0.62%, and annual estimated SARs ranged from 0.21% to 1.18% (Figure 5.10; Appendix E). Coefficients of variation on annual estimates ranged from 6% to 18%. (BPA, August 31, 2007)

Bio-sampling and reporting. The Idaho FRO is responsible for sampling all adult spring Chinook that return to Dworshak NFH. Fish are measured for fork length, checked for CWT's, PIT tags, fin clips and other distinguishing marks, and when possible identified as either male or female. Mark recovery information is used to report success of that production year in terms of smolt to adult return rates. Where groups of smolts were marked to represent various treatment groups of an evaluation study, the data are used to draw conclusions and make recommendations. Final reports are made available to other Service offices, other agencies, and the general public as requested. In addition, marked adults have been used to help separate different runs at the dams in order to adjust harvest.

Hatchery Evaluation Studies. The Hatchery Evaluation Vision Action Plan, developed in 1993 for Region 1 Fisheries, describes hatchery evaluation in greater detail (USFWS 1993). The purpose of hatchery evaluation studies are to simply determine what works and what doesn't work through planning, implementing, documenting, monitoring, analyzing, and reporting.

A number of evaluation studies have been conducted at Dworshak NFH in past 20 years. Recent studies include: 1) An evaluation of rearing density of spring Chinook salmon; 2) An evaluation of various methods of marking and tagging adult spring Chinook salmon and steelhead for broodstock management; 3) and 4) A comparison of release time on downstream

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emigration success and adult returns of spring Chinook salmon. Results from these and other studies have been used to refine hatchery management and fish culture at Dworshak NFH

F. Program conflicts

The spring Chinook salmon program may affect listed salmonids. The release of spring Chinook salmon smolts occurs in spring, usually the last of March or the first week in April. Hatchery releases occur at about the same time as wild/natural steelhead are migrating as well. While they are migrating 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.

1. *Biological conflicts (e.g. propagated stock maladapted to hatchery water source)*

- Operation and maintenance includes operation of the adult collection facilities 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 adult collection facilities for returning adult hatchery spring Chinook salmon has the potential for capturing adult wild steelhead. Any suspected natural adult steelhead captured during broodstock collection are immediately released back into the river, upstream of the trap.
- Water intake is screened to prevent fish from being drawn into pumps. Also water intake does not adversely effect the water levels in the contributing stream. Discharge 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 salmonids. All other maintenance or construction activities that could have an impact on water quality or quantity or could possibly impact listed salmonids will be consulted on as they arise. All required state and Federal permits would be obtained prior to any work being initiated. None are planned during FY2001.

2. *Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)*

IDF&G administers the sport harvest within the State, and the NPT administers the Tribal fishery. Because only hatchery spring Chinook salmon that are externally marked with an adipose fin clip can be harvested and it is a requirement for sport fishermen to release all unmarked fish unharmed, we believe there is minimal negative impacts to wild/threatened steelhead. (KNFH CHMP, p.27)

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3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- Spring Chinook salmon are not listed in the Clearwater River.
- In the Clearwater River, there are three ESA-listed species and one species of concern. Summer steelhead, fall Chinook salmon, and bull trout are all listed under the ESA and cutthroat trout is a species of concern. The primary species produced by Dworshak NFH are summer steelhead and spring Chinook salmon. (KNFH CHMP, p.34)

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

The spring Chinook salmon program may affect listed salmonids. The release of spring Chinook salmon smolts occurs in spring, usually the last of March or the first week in April. Hatchery releases occur at about the same time as wild/natural steelhead are migrating as well. While they are migrating 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.

The Dworshak Fisheries Complex spring Chinook salmon program has the potential to affect listed salmonids 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. Hatchery 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. These fish could directly compete with natural steelhead for food. While we don't know if competition from residuals is a threat, we do suspect that the incidence is extremely low.

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 - Hatchery spring Chinook salmon at Dworshak NFH have had Bacterial Kidney Disease (BKD) problems in past years. BKD has been under better control the last several years. Additionally, we strictly adhere to all IHOT guidelines concerning the release of fish undergoing a disease epizootic. The potential still exists for horizontal transmission of BKD and other diseases from hatchery spring Chinook salmon to wild fish. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest that horizontal

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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. There is also strong evidence that fish held on raw water at Dworshak contract pathogens and, at times, disease, from wild fish in the river.

Harvest - IDFG administers the sport harvest within the State, and the Nez Perce Tribe (NPT) administers the Tribal fishery. Because only those hatchery spring Chinook that are externally marked with a adipose fin clip can be harvested and it is a requirement for sport fishermen to release all unmarked fish unharmed, we believe there is minimal negative impacts to wild/threatened steelhead.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

Facility operation and maintenance - Operation and maintenance includes operation of the adult collection facilities 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 adult collection facilities for returning adult hatchery spring Chinook salmon has the potential for capturing adult wild steelhead. Any suspected natural adult steelhead captured during broodstock collection are immediately released back into the river, upstream of the trap.

Water intake is screened to prevent fish from being drawn into pumps. Also water intake does not adversely effect the water levels in the contributing stream. Discharge 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 salmonids. All other maintenance or construction activities that could have an impact on water quality or quantity or could possibly impact listed salmonids will be consulted on as they arise. All required state and Federal permits would be obtained prior to any work being initiated.

IIC. Dworshak NFH Clearwater Fall Chinook

A. General information

Fall Chinook salmon production in the Clearwater River occurs at Dworshak NFH on an as needed basis (pers. comm. Becky Johnson, Nez Perce Tribe, July 2007). Fall Chinook are incidentally trapped when the trap is operated in the fall for collection of steelhead and coho. Any fall Chinook collected are transferred immediately to the Nez Perce Tribe for transport to their facility.

Fall Chinook salmon production in the Clearwater River occurs through two programs – Lower Snake River Compensation Plan/Fall Chinook Acclimation Project and Nez Perce Tribal Hatchery. Both are operated by the Nez Perce Tribe and will be further reviewed when the HRT covers the other LSRCP programs directly associated with fall Chinook.

(IDFG, Mar. 8, 2007, p.21-25)

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IID. Dworshak NFH Resident Rainbow Trout

- Dworshak is rearing Shasta strain rainbow trout from Ennis NFH for the June 15, 2007 Kids' Fishing Day. On December 1, 2006, there were 16,529 rainbows at Dworshak. Approximately 3,800 of these trout will be transported to Kooskia NFH for their Open-House. The rainbow trout are currently being reared in two Burrow's ponds in System III. The Service hopes to achieve 15 inches in length (0.75 per lb.) by Open House. No fish health problems to date in this group of fish.
- Excess outplanting - The plan is to continue what has been done in previous years, with excess fish going to the Nez Perce Tribe ~ 40%; Coeur D' Alene Tribe ~ 20%; and Idaho Dept. of Fish and Game ~ 40%.
- IDFG Nampa Hatchery rainbows experienced an Ich outbreak, so fish were treated seven days/week to help control the infection. Mortalities have subsided to single digits. Treatments are being curtailed and then will cease for 4 weeks. Necropsies will be performed to see if the infection is still present. If the treatments are successful the planned Clearwater basin releases are described below. If the treatments are unsuccessful IDFG will make adjustments to fish disposition. Efforts will be taken to ensure only fish from clean hatcheries are used for redistribution from hatcheries in sensitive areas.
- Nampa Fish Hatchery stocks 50,000 sterile triploid rainbows into Dworshak Reservoir in May- July. Since 1997 Hagerman NFH has raised rainbows for stocking into Southern Idaho reservoirs and IDFG reciprocates by stocking Dworshak Reservoir.
- IDFG stocks approximately 50,000 Kamloops rainbow trout and 160,000 Spokane rainbow trout annually into the Clearwater River system. For 2006, the Kamloops rainbow are raised at Lyons Ferry and Nampa Fish Hatcheries (25,000 each) and stocked into the lower Clearwater River in October, after AD and RV-clipping.
- Spokane rainbow from Lyons Ferry Hatchery will be stocked into lowland lakes within the Clearwater drainage in April and May; these unmarked fish provide additional fishing opportunities. This program is funded by the Lower Snake River Compensation Plan and the Dingle-Johnson Program to compensate for dam related losses.
- The Clearwater Fish Hatchery regional rainbow program redistributes 100,000 Nampa reared trout. A total of 29 plant sites, requiring 110 trips are stocked May to August.

(IDFG, Mar. 8, 2007, p.27)

III. Kooskia National Fish Hatchery²²

A. Description of hatchery

Kooskia NFH was authorized on August 31, 1961, by 75 Statute 255 to rear spring Chinook salmon for release into the Clearwater River basin. Kooskia NFH is directly funded by the U.S. Fish and Wildlife Service and is intended to provide general mitigation for lost fisheries and fish habitat in the Columbia River Basin. As such, the program at Kooskia NFH is somewhat more flexible, although compliance with U.S. vs Oregon and other regional/national directives apply. For example, Kooskia NFH is directly involved with the Idaho Supplementation Studies (ISS) in Clear Creek. Further program modification is planned in the near future with the anticipated finalization of the Snake River Basin Adjudication agreement as early as April or May, 2007.

Kooskia NFH is located approximately 70 miles east of Lewiston near the community of Kooskia in Idaho County, Idaho. The hatchery is situated on Clear Creek, about 3 miles upstream from the confluence of the South and Middle Forks at river kilometer 65 in the Snake River Basin, Idaho.

Construction of the hatchery was started in 1966 with the drilling of five wells and installation of the Clear Creek water intake structure. Fish production, begun in 1969, established runs of adult spring Chinook salmon which returned to Clear Creek. Smolts released from the hatchery return 2-3 years later as 7-20 pound adults.

The hatchery has five buildings involved in fish production and station maintenance, three residences, and a Bio-filter. A description of hatchery buildings, their primary use, and improvements are listed below.

²² Unless cited otherwise section figures, tables and text are from KNFH CHMP.

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Figure x. Hatchery buildings, primary use, type of construction, and improvements.

<u>Building</u>	<u>Construction Type</u>
<p>Hatchery Building 4162 ft³</p>	<p>Masonry brick with metal frame and roof. Used to incubate eggs and fry. Includes Office, Lab, and Locker Room. Constructed 1969.</p>
<p>Shop Building 3744 ft³</p>	<p>Metal frame and roof structure. Constructed in 1969. Includes Emergency generator room, Explosion proof hazardous material room, Carpenter shop, Eight bays, and a Freezer in one of the bays.</p>
<p>Mechanical Building 2636 ft³</p>	<p>Metal frame and roof structure constructed in 1967. Houses two chillers for water reuse system, a back-up generator, and lock up.</p>
<p>Adult Storage Building 3236 ft³</p>	<p>Metal frame and roof structure constructed in 1976. This building used to house four cement ponds for adult Chinook/steelhead. Currently filled in with gravel. Used as equipment storage.</p>
<p>Break Room 300 ft³</p>	<p>Wood frame, constructed in 1978. Used as a break room.</p>
<p>Outside Nursery Building 3750 ft³</p>	<p>Steel beam structure with metal roof. Constructed in 1985. Used to rear fish fry.</p>
<p>Public Restrooms 30.5 ft³</p>	<p>Wooden frame building constructed in (1987).</p>
<p>Residences Quarters #2, 528 ft³ 1975, 3 bedroom. Quarters #3, 500 ft³ 1967, 2 bedroom. Quarters #4, 976 ft³ 1973, 2 bedroom.</p>	<p>Residences at Kooskia NFH consist of two single wide trailers and one double wide trailer</p>
<p>Pole Building 1536 ft³</p>	<p>Wood frame metal roof and sides. Constructed in 2001 & 2002. Used for vehicle storage.</p>
<p>Bio-filter Building 72,462 ft³</p>	<p>Underground concrete walls and floor 67'l x 63'w x 17'h, w/three filter bays, four 10-hp turbine pumps, motors. An aeration chamber w/ above ground cover metal structure 45'l x 15'w x 15'h. Used to treat reuse water.</p>

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The hatchery's outdoor rearing units include six Burrow's ponds (BP's), twelve raceways, and one adult holding trap/pond. Details of the physical dimensions and other characteristics of these rearing units are listed in figure xx. The physical layout of the hatchery grounds is depicted in Figure xxx.

Figure xx. Description of Kooskia NFH rearing units.

Unit	Length ft	Width ft	Depth ft	Volume ft ³	Volume Gallons	Number	Material	Year Installed/ Constructed
Adult Holding Pond ¹	80	12	4	3840	28,727	1	Concrete	1974
Burrows Pond ²	80	17	2.4	3,264	24,415	6	Concrete	1967
Raceway	80	8	2.0	1,280	9,575	12	Concrete	1967
Heath Incubator Stacks-16Tray	-	-	-	0.35/tray	2.63/tray	27	Fiberglass	1992-2002
Outside Nursery Tank	16	3	1.9	91	682	32	Fiberglass	1982
Inside Nursery Tank	16	3	1.8	86	646	24	Fiberglass	1996

¹ A cover, of iron beams and insulated metal roof, was built over the holding pond in 1999.

² A shade cover of metal arches and shade cloth was built spanning every other pond in 2003.

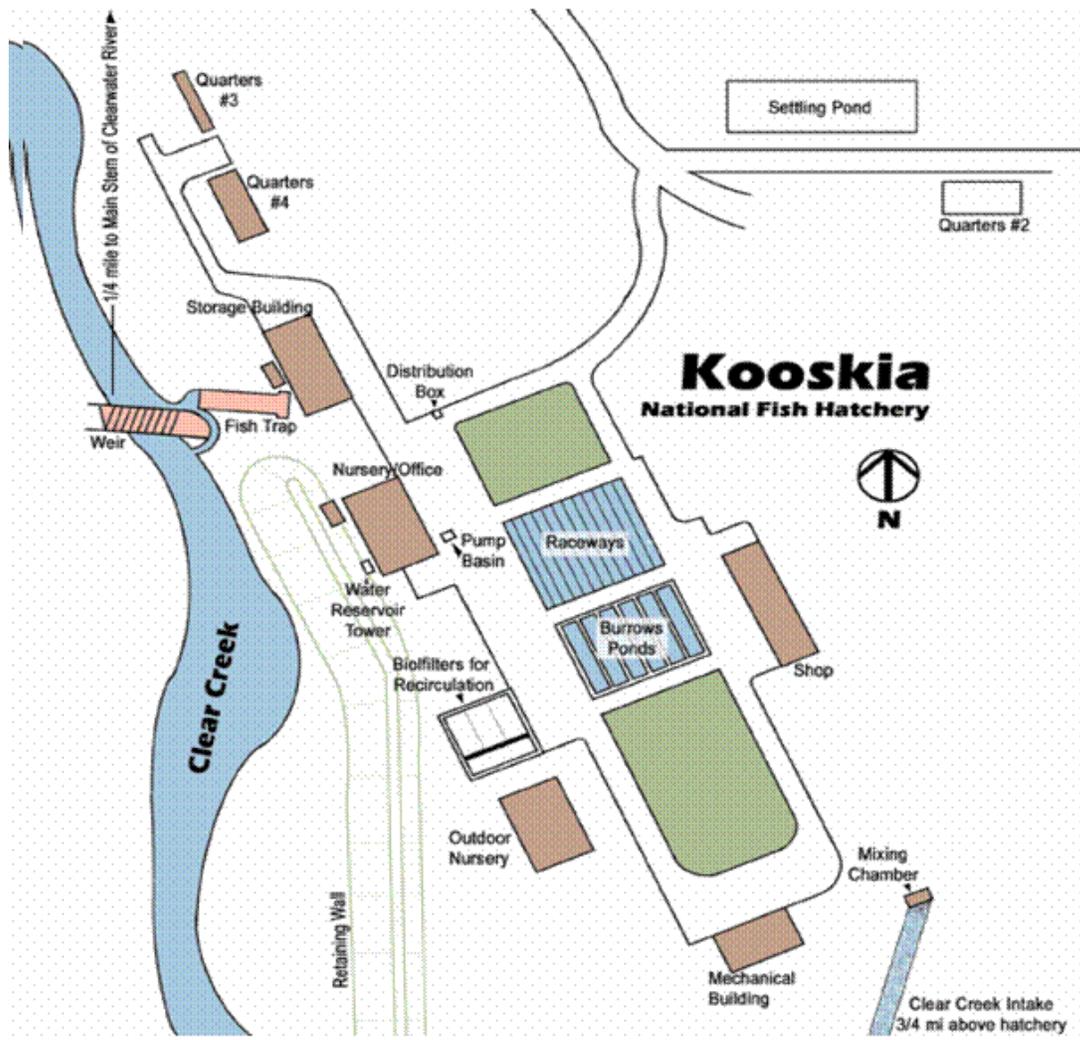


Figure xxx: Diagram - aerial view of Kooskia NFH.

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- Kooskia NFH receives 100% of its operations budget for the spring Chinook program from the USFWS. Additional funding is provided to the Idaho FRO and the Idaho FHC for support services to the hatchery.
- Currently, Kooskia NFH operates with a staff of four, the Manager, two Animal Caretakers, and a Maintenance Mechanic. A summer youth program is conducted every summer to provide opportunities for youth to become acquainted with fishery resource conservation programs. Volunteers are used to assist with outreach activities and station operations whenever possible.

B. Hatchery water sources

The main water source for the hatchery is Clear Creek, while two wells supply ground water for the secondary supply. Single pass gravity flow Clear Creek water is used to incubate eyed eggs November through January. Incubation water is switched to single pass chilled well water before spring run-off. Once the fry absorb their yolk sac, the fish are transferred from incubator stacks to outside nursery tanks. During the period that chilled well water is being used, the reuse Bio-filter system is put into operation. When the fish reach a size of 250 fish per pound (fpp) or greater, they are transferred to the six BP's and remain on chilled well water, using the reuse system with 10% makeup (also well water) throughout the summer months. When Clear Creek temperatures drop below 50°F in the fall, the production is switched from chilled well water back to single pass Clear Creek water, usually near the end of October.

During the summer months Clear Creek water is used to irrigate about 8 acres of hatchery grounds. Domestic well water is pumped to a 3,000 gallon concrete holding tank and flows via gravity to station residences and hatchery buildings on demand.

Screening- The Clear Creek intake structure is located approximately one-half mile upstream of the hatchery. The surface water travels from the intake structure through a 42" underground pipe to the hatchery screen building. Six screens made of stainless steel wire mesh with 1/4-inch openings rest atop of a concrete settling chamber measuring 30' wide x 44' length x 13' height. The creek water flows to the screen building where it drops into the settling chamber before going to the hatchery. The screens filter creek water and prevent debris build-ups that could stop water from reaching the hatchery. The screens also keep resident fish from entering the hatchery water supply. The screens do create a problem during cold spells as they can freeze and ice will block inflow. Hatchery personnel check and clean screens daily when creek water is being used.

Conveyance System to Hatchery and Ponds - Clear Creek water flows by gravity to the hatchery through a 36" pipe from the screen chamber to the mixing chamber. At this point, surface and well water are mixed and directed to the point of use by a series of valves, pumps and dam boards.

The conveyance system allows Clear Creek water to be sent to the BP's and raceways while independently sending well water to the chiller to be cooled and sent to the incubation stacks or nursery tanks. Strict precautions are taken not to use creek water in the reuse system in order to prevent infectious diseases being introduced into the bio-filter and reuse system. Only well water is used in the reuse system.

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Clear Creek water used in the Borrows raceways is diverted through the adult holding/trap back into Clear Creek. Likewise, overflow from the reuse system is diverted to the adult holding/trap and then into the creek.

Kooskia NFH currently holds the following water rights:

<u>Source</u>	<u>Right Number</u>	<u>Date</u>	<u>Flow (ft³/s)</u>	<u>Purpose of Use</u>
Clear Creek	81-2028	10/05/1966	16.0	Fish propagation year-round and lawn irrigation.
Ground	81-2032	09/13/1965	0.160	Domestic and stock water.
Ground round.	81-2034	09/13/1965	1.140	Fish propagation year
<u>Ground round.</u>	81-2035	04/05/1963	1.910	<u>Fish propagation year</u>

Table: Average Monthly Water Temperatures by Year, Clear Creek, Kooskia NFH (Kooskia NFH files)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2007	32.2	35.7	40.5	43.5	51.0	58.4	71.7	66.7	58.5			
2006	37.4	33.2	39.0	41.3	54.7	56.8	68.7	66.9	60.4	47.0	38.9	33.8
2005	34.9	35.1	40.5	44.6	52.9	55.1	65.3	66.5	55.5	47.8	38.1	32.5
2004	34.2	36.8	40.1	43.2	47.8	55.1	66.4	65.0	54.9	47.9	37.2	35.9
2003	37.6	39.8	42.3	46.1	51.0	59.6	67.4	65.6	54.9	46.7	35.1	36.3
2002	37.3	35.7	38.8	42.8	47.9	58.0	66.3	62.7	56.4	46.6	39.7	37.4
2001	35.3	36.6	39.2	41.4	47.8	52.5	64.6	68.3	60.9	47.2	42.3	37.1
2000	33.1	38.4	40.6	44.6	50.2	55.4	61.0	61.6	52.6	46.3	36.7	35.0
1999	36.0	41.7	39.3	40.2	44.7	52.8	63.9	65.5	54.9	44.2	38.5	34.0
1998	34.4	37.8	40.3	44.5	48.6	50.0	61.9	65.8	59.9	46.5	40.9	34.8
10 yr avg:	35.2	37.1	40.1	43.2	49.7	55.4	65.7	65.5	56.9	46.7	38.6	35.2

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Table: Average water temps while on re-use system Kooskia NFH (Kooskia NFH files)

	Jun.	Jul.	Aug	Sep.	
1999	50.18	50.11	49.2	48.2	
1998	47.7	50.35	51.4	52.1	
1997	48.7	50.6	51.3	50.3	
1996	47.7	50.1	55.6	54.4	turned off chiller Aug. 11
1995	56	50.6	46.7	49	chiller on July 11
1994	54.4	51		47.6	no data for Aug.
1993	57.5	53.9	48.9	48.4	big chiller on Jul. 21st. Switched to Cr. Sept. 24th.
1992					
1991	50.43	50.6	50.6	50.4	started reuse Jun. 21.
1990	53.4	51.4	50.6	52.2	started reuse Jun. 23.
1989	51.1	50.6	49	52	chiller on Jun. 21. chiller off Sept. 19
1988	52.5	52.1	51.8	52.8	chiller on Jun. 21.
1987	51.8	49.9	49.3	48.7	chiller on Jun. 22.
1986		48.5	48.8	50.3	chiller off Sept.18.
1985		50.1	48.2	47.4	chiller off Sept.10.
1984					
1983	55.8	50.5			chiller off Jul. 28th.
1982	52.6	53.6	53	55.1	
1981	51.8	50.1	48.6	47.3	
1980					
1979	58.2	57.4	54.6	49.4	New chiller on line Aug. 23th.

C. Adult broodstock collection facilities

- spring Chinook usually begin entering the mouth of Clear Creek in May. The stream is completely blocked by a top-hinged picket weir. As the adults migrate upstream, the weir blocks migration and directs the adults through a one-way finger door and into the adult holding pond. Trap operation usually begins in May and ends in mid-September. Since 1986, Kooskia NFH has been establishing a localized stock with returning adults to the hatchery. Currently, the policy in force is that no other stock of spring Chinook will be used to supplement the existing broodstock in years when returns are low. When adult returns are low and broodstock numbers are insufficient to meet hatchery production objectives, Kooskia NFH will continue the program with the adults that return. However, progeny of other stocks may be used to supplement production at Kooskia NFH in those years when the Kooskia broodstock is insufficient with the intent of only contributing to adult returns for harvest. These progeny would be differentially marked so that adults returning to the hatchery could be identified and not incorporated into the hatchery broodstock program. Other acceptable stocks for this purpose would include progeny from Dworshak NFH and those from IDF&G programs in the Clearwater River and Rapid River.
- In years when returns are more than sufficient for brood stock needs, surplus adults entering the hatchery are usually outplanted to various locations in the Clearwater basin, or used for

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other projects. The disposition of surplus adults is determined and coordinated through the NPT and the IDF&G.

D. Broodstock holding and spawning facilities

Adults are held at the hatchery until water temperatures in Clear Creek begin to increase to about 60°F. At that time, adults are inventoried weekly and transported to Dworshak NFH for holding until they mature for spawning. All the adults are held at Dworshak NFH in large outdoor adult holding ponds. Mortalities are removed daily and formalin treatments are administered from 1-3 times per week to control fungus. All adult females are injected with Erythromycin (20mg/kg) approximately 21 days prior to spawning. Adults begin to mature and are usually ready for spawning in mid-August. Spawning is conducted weekly at Dworshak NFH and usually lasts from three to six weeks, depending on the number of adults that return to the hatchery.

E. Incubation facilities

- Adults are crowded out of the adult holding pond using a large mechanical crowder, forcing the adults into a channel which leads into the spawning room. Adults are crowded into the spawning room, using a smaller mechanical crowder and into basket that leads into an anesthetic bin. Tricaine methanesulfonate (MS-222) is used for fish anesthesia to make handling easier and Pro-Polyaqua is added (250 ml per bin) to reduce stress and susceptibility to infection. Oxygen is provided at a rate of 1.5 L/minute. Once adults are completely anesthetized, they are transferred onto an examination table. Unripe males and females are returned to holding ponds for examination the following week. Ripe males are sent alive to the male handling area where the milt is stripped into styrofoam cups and a one-percent saline solution added to assist in milt motility.
- A pneumatic knife is used to sever the spinal column of ripe females which are then sent to the female handling table where they are kept for approximately 3–10 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 solution is poured onto the eggs and swirled for more complete fertilization. After sufficient time had elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter.
- After fertilization, eggs from one female are placed in Heath incubator trays. 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 disease transmission. The trays are then pushed into the incubator with a water-flow rate of approximately five gallons/minute. Eggs in banks A/B are chilled to approximately 40°F. Since the chiller has the capacity to only chill two incubator stacks, eggs in C/D bank incubators are held at approximately 45°F.
- Carcasses are unfit for human consumption because of the use of tricaine methanesulfonate for anesthesia and erythromycin injections and are used for Washington or Idaho State bear research/capture programs, university research, raptor recovery and rehabilitation programs,

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or stream nutrient enhancement programs. The remaining carcasses are taken to an area waste-transfer station.

F. Indoor rearing facilities

- Eggs are incubated and eyed up at Dworshak NFH. Eye-up of eggs on 45°F water takes place approximately 43 days after spawning. Eye-up of eggs on chilled water (40°F) takes place approximately 70 days after spawning. Upon eye-up, eggs are shocked and enumerated using an electronic egg picker and counter Model N-100) and transferred to Kooskia NFH.
- In the past, warm water temperatures at Kooskia NFH made it difficult to meet the size at release target of 20 fpp (5.5 inches) without reducing growth rate by reducing rations. However, due to the fish health implications of reduced rations, the hatchery implemented a modification to the incubation strategy designed to slow development and delay hatching. Eyed eggs begin incubation using chilled well water of approximately 38°F. The change to this procedure was initiated with Brood Year (BY) 2000. Clear Creek water was used from November to February instead of chilling well water. This served a dual purpose. First, creek water temperatures would mimic natural temperature conditions for the eggs and at times would be cooler than chilled well water. Secondly, switching to creek water allows the hatchery to conserve energy by not running the wells/chiller and would save station funds for other station projects.

G. Outdoor rearing facilities

- Chinook are transferred to outside nursery rearing tanks and started on feed. Kooskia has a limited amount of well water available. Two production wells produce a maximum of 450 g/m, each approximately 57°F. Nursery rearing begins using single-pass well water, but then is replaced by the Bio-filter reuse system after two weeks. Once fry outgrow the tanks (~ 250 fpp) they are inventoried and transferred to six BP's where the fry remain during the summer months. The reuse operation system remains in use along with the chiller which lowers water temperatures down to approximately 50°F. Chilled reuse water is utilized from June-September because Clear Creek water temperatures are generally too high for healthy Chinook rearing. Also, utilizing well water decreases the introduction of the creek water parasite *Ichthyophthirius* (ICH) into the BP reuse system. Chinook are adipose-fin clipped and coded wire tagged during the last week of July.
- As the weather cools in the fall, fingerlings are split into raceways utilizing Clear Creek water. Around October, when Clear Creek temperature lowers, the well water is shut down and either single pass or serial use Clear Creek water is run through the BP's and raceways. Fish remain in BP's and raceways until released as smolts directly into Clear Creek the following April.

H. Release locations and facilities

Chinook are reared until reaching about 20 fpp in size and are released during spring run-off. Release of spring Chinook at Kooskia NFH usually occurs at the end of March each year. The

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fingerlings are direct-released into Clear Creek which flows into the Clearwater River, approximately ½ mile downstream of the hatchery.

I. Outmigrant monitoring facilities

- Kooskia NFH releases about 600,000 spring Chinook smolts each year. Beginning with 1994 releases, all of the spring Chinook salmon smolts at Kooskia NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least one group of 60,000 fish receives a coded-wire tag that represents Kooskia NFH. Coded-wire tags are used to track contributions to ocean and downriver commercial, sport, and Tribal fisheries, as well as to track success of adult returns from evaluation and research studies.
- PIT tags have been used at Kooskia NFH since 1989, to generate data on run timing and smolt survival to various Lower Snake and Lower Columbia River dams. In 2005, the IFRO obtained funding to evaluate adult returns to Lower Granite Dam using PIT tags. That program calls for tagging of about 10,000 smolts annually for monitoring adult returns.

J. Additional or special facilities

- Kooskia's production is below the number of lbs required for NPES permitting
- Monitoring helps identify when changes in hatchery practices are required. The following parameters are currently monitored at this hatchery:
- In-hatchery Water Temperatures—maximum and minimum daily.
- In-hatchery Dissolved Oxygen—as required by stream flow or weather conditions.

K. Outreach and public education facilities/programs

The Information and Education (I&E) staff provides program support for Dworshak NFH and Kooskia NFH, the IFRO, and the IFHC.

The Kooskia NFH outreach program goal is to increase the visibility of the USFWS facilities and programs in the upper Clearwater sub-basin, to internal and external audiences. Staff and volunteers provide information on USFWS programs to benefit the public and the environment, in keeping with the Service's mission "*To conserve, protect, and enhance the Nation's fish and wildlife and their habitats for the continuing benefit of the American people*".

Recognizing that it is increasingly important for all staff to be involved in gaining or retaining public support for our programs, the I&E program strives to ensure that hatchery personnel are well-informed about USFWS policies, procedures, and issues. The I&E program efforts include

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providing information to staff, partners, and volunteers and, through them, to members of the community and other publics. Outreach is a management tool, providing support to the Service, the public, and hatchery programs. All outreach activities are in accordance with the Pacific Region Fisheries Outreach Action Plan, finalized and distributed in August 2006.

On-site programs - Activities include providing guided tours as requested to local schools or public groups. Occasional special interest groups schedule detailed tours of specific hatchery operations. Education includes annual natural resource awareness events which introduce students to hatchery and general environmental stewardship. Students in several area schools raise spring Chinook or steelhead trout in their classrooms and visit the hatchery annually to release their fish and tour the facility. The Open House/Kids Fishing Day in June is the largest annual event, with an average of 400+ children 12 years and under attending (1993 – 2006 stats). Additional on-site coverage by I&E staff is provided during peak visitation (May - September) as requested by resident hatchery staff, who provide routine daily public contact.

Off-site programs - Outreach efforts include an array of activities throughout the Pacific Region, with an emphasis on local or in-state events. Examples include: natural resource career fairs and festivals, school classroom activities, stream and water quality surveys, participation in other National Fish Hatchery events, Project WET or Wild educator workshops, and 3 county fairs (Clearwater, Idaho and Lewis counties).

Virtual visitors can tour Kooskia NFH at <http://kooskia.fws.gov>. Since site launching, statistics show an average 300 individual or unique visits to the site per month.

Established On and Off-site programs - A bulleted list of annual or recurring events and I&E partnerships follows:

- Clearwater, Idaho, Latah and Lewis county public schools –Kooskia NFH provides spring Chinook or steelhead trout eyed eggs for Hatchery-In-The-Classroom (HIC) activities in February; classes tour the hatchery, conduct ‘Fin Bin’ activities. Also provide annual career day station at one or more of these schools annually on fisheries and FWS careers, with hands-on tools and employment information.
- Clearwater Earth Week – On core planning team for multi-agency event; meet Jan. – April; annual April presentation over 2 days to 250 area 4th graders in the Orofino City Park. Provide interactive fisheries lessons, participate in daily group summary activity.
- Friends of Northwest Hatcheries, Inc. - Continue to strengthen and expand this partnership locally; operate the ‘Spawn Shop’ sales area at the hatchery for special events; Kooskia NFH included under January, 2002 Memorandum of Understanding (MOU) with the Friends of Northwest Hatcheries.
- Kamiah, Kooskia, Nez Perce, Cottonwood, Grangeville schools – I&E staff lead fish dissections as part of fishery lessons, pre- or post-hatchery tour.
- U.S. Forest Service - Cooperative effort with outreach activities including Kids Fishing Day, day camps, cultural and natural resource education events.

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- Idaho Salmon and Steelhead Days, Boise, ID – since 1997, I&E Staff participate as Gyotaku activity chairman, and core planning committee for this annual event; approx. 1,500 5th grade students from Boise and surrounding area attend.
- Nez Perce Tribe – Coordinate annual events on and use of historic Mill Pond/Looking Glass interpretive trail.
- Nez Perce National Historical Park, National Park Service (NPS) – Under the MOU, work to maintain historic trail and public use area during summer season; NPS provides weed control, interpretive program input.
- Nez Perce National Historic Trail Foundation (NPNHT)–maintain historic integrity of the Looking Glass village site, historic monument and any public use programming; attend regular meetings, sit on NPNHT grant proposal review team.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.)

Budgetary Needs and Strategies - Funding for unmet needs such as construction, program changes, and quarters maintenance is identified through the Service Asset and Maintenance Management System (SAMMS) and the Fisheries Operational Needs System (FONS). Access to the SAMMS database is online. Access to the FONS system is through the Fisheries Information System (FIS) online database. The FIS database consists of five modules which address out-year budgeting (FONS Module), resource oriented accomplishments that occurred over a fiscal year (Accomplishments Module), Congressionally mandated reporting requirements that describe yearly production at NFH (Fish Distribution and Egg Module), and activities related to endangered species (Imperiled Species Module).

Fisheries Operational Needs System- The FONS was established in 1999 as a planning, budgeting, and communication tool to enhance identification of funding and staffing needs for the fishery program. FONS projects are used in budget requests to the Department of Interior and the Office of Management and Budget. Kooskia NFH uses the FONS system to report accomplishments and to identify projects or operations that need funding. Projects are submitted to FONS as needs arise. Other field offices that support Kooskia NFH include Idaho Fisheries Resource Office and Idaho Fish Health Center.

Service Asset and Maintenance Management System - The Service Asset and Maintenance Management System (SAMMS) is used to document annual operations and maintenance costs by individual asset. The SAMMS database contains deferred maintenance projects, operations costs, preventive maintenance costs, and corrective maintenance costs for all buildings, facilities, and equipment. The materials and labor costs are tracked and entered into the SAMMS database by field station personnel. The database is updated annually then forwarded to the Service's Washington D.C. Office for consolidation and submission into the budgetary process.

Five-year Construction Plan - Fisheries Construction projects are entered into the Refuge Management Information System (RMIS), the same web-based database, developed for Refuges, as is used for the Real Property Inventory (RPI). Scores and Regional priorities are assigned and the information is used in the Service's Washington D.C. Office to develop the Five Construction

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Plan. This plan, after it has been approved by the Department and Office Management and Budget (OMB), is submitted as part of the Service Budget to Congress. The out-years of this plan are subject to revision each year.

Construction funds are similar to Maintenance Management System (MMS) funds but are reserved for new construction and maintenance to existing buildings above \$500,000.

Five-Year Maintenance Plan - Five year deferred maintenance plans come from Deferred Maintenance Five-Year Plan (DMFP) work orders in Service Asset and Maintenance Needs System (SAMMS). Deferred maintenance projects are maintenance projects that do not occur on an annual basis and reflect maintenance deficiencies. Deferred Maintenance projects entered into the database are prioritized by the Washington Office (WO) and Regional Office (RO), based on the priority established by the Field Station and Regional Office. Only Regional or Washington office staff can change or save any DM work order. DM work orders are created using findings from the comprehensive condition assessment which are conducted once every 5 years by Regional or national staff and supplemented by a less detailed annual assessment by field stations. Deferred maintenance projects submitted for consideration can be found in **Attachment 19**.

ESA Compliance and Needs - The 1999 NOAA Fisheries Biological Opinion on Artificial Propagation in the Columbia River Basin lists several measures for Kooskia NFH which either must, in the case of Reasonable and Prudent Alternatives, be complied with or, in the case of Conservation Recommendations, should be implemented (NMFS 1999b). At this time, none of those are currently unfunded. However, during development of the Phase II drafts of the HGMPs, there may be actions identified at that time that may not be funded by either the COE or Lower Snake River Complex Plan (LSRCP) where another source of funding may have to be sought.

IIIA. Kooskia NFH Spring Chinook

A. General information

The purposes for which Kooskia NFH was originally authorized and constructed have been amended over the years by subsequent legally binding agreements and federal mandates, such as the Endangered Species Act (ESA), U.S. v. Oregon, and the Snake River Basin Adjudication agreement (SRBA). Those purposes can be accomplished by three major goals; 1) produce and release up to 600,000 healthy spring Chinook salmon smolts annually in order to provide opportunities for sport and Tribal harvest of returning adults in subsequent years, 2) assure that all the requirements of legal orders and federally mandated legislation are met, and 3) provide accurate information and educational opportunities associated with the Kooskia NFH production program..

B. Stock/Habitat/Harvest Program Goals and Purpose

1. Purpose and justification of program

A salmon hatchery was first proposed in the Snake River drainage early in the 1950's as one phase of the Middle Snake River Feasibility Study Program. The objective was to enhance and mitigate losses to anadromous fish runs affected by water development proposals in the river basin. The Clearwater River drainage was selected as the most suitable site and Kooskia NFH was authorized on August 31, 1961, by 75 Statute 255 to rear spring Chinook salmon for release into the Clearwater River basin. Kooskia NFH is directly funded by the U.S. Fish and Wildlife Service and is intended to provide general mitigation for lost fisheries and fish habitat in the Columbia River Basin. As such, the program at Kooskia NFH is somewhat more flexible, although compliance with U.S. vs Oregon and other regional/national directives apply. For example, Kooskia NFH is directly involved with the Idaho Supplementation Studies(ISS) in Clear Creek. Further program modification is planned in the near future with the anticipated finalization of the Snake River Basin Adjudication agreement as early as April or May, 2007. [KNFH, CHMP, p19].

2. Goals of program

The goal of this program is to mitigate for tribal and sport fishing opportunities in the Clearwater River that were lost because of the construction of water development projects in the Columbia River basin.

Goal 1: Release 600,000 spring Chinook salmon smolts from the hatchery each year.

Objective 1.1 Collect 800 adults annually for broodstock.

Task 1.1.1: Collect broodstock to represent the full spectrum of the run.

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Task 1.1.2: Maintain as close to a 1:1 male to female spawning ratio as possible.

Task 1.1.3: Spawn adults to represent the entire range of timing of reproductive maturity.

Task 1.1.4: Spawn adults so that all age classes are proportionally represented.

Objective 1.2: Produce the healthiest, highest quality fish possible at every stage of production.

Task 1.2.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.

Task 1.2.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 1.2.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, brood stock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.

Objective 1.3: Conduct monitoring and evaluation activities that will provide information on the progress of the hatchery in meeting its return goal for spring Chinook salmon.

Task 1.3.1: Conduct regularly scheduled HET meetings.

Task 1.3.2: Conduct biological sampling on returning adult salmon.

Task 1.3.3: Use coded-wire tags to mark and track representative production groups in the ocean and Columbia River basin.

Task 1.3.4: Cooperate with the State and Tribe to obtain estimates of sport and Tribal harvest in the North Fork and Lower Clearwater River.

Objective 1.4: Cooperate and coordinate with the Idaho Department of Fish and Game and the NPT to develop opportunities for sport and Tribal harvest.

Task 1.4.1: Participate in the semi-annual Clearwater River Annual Operational Plan (AOP) meetings.

Task 1.4.2: Provide surplus adult to Tribal programs for outplanting.

Task 1.4.3: Provide surplus adults for recycling through the Sport and Tribal fisheries.

Goal 2: Assure that all the requirements of legal orders and federally mandated legislation are met.

Objective 2.1: Conduct hatchery operations consistently with requirements and obligations called for under the ESA.

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Task 2.1.1: Develop and implement plans to release adult fall Chinook, bulltrout, summer steelhead that enter the trap immediately back into Clear Creek.

Task 2.1.2: Mass mark all production fish to identify them from naturally produced fish.

Task 2.1.3: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).

Task 2.1.4: Implement measures to minimize interactions between production and natural fish.

Task 2.1.5: Implement the “Hatchery and Genetic Management Plan”.

Objective 2.2: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) production and harvest objectives.

Task 2.2.1: Provide pertinent data and information to Service representatives on U.S. v Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 2.2.2: Meet tribal trust responsibilities.

Objective 2.3: Assure that hatchery operations support the Snake River Basin Adjudication agreement.

Task 2.4.1 Memorandum of Agreement (MOA) regarding Management of Kooskia NFH and joint management of Dworshak NFH.

Task 2.4.2 Exhibit A – MOA regarding Training, Education and Employment opportunities for Tribal Members.

Task 2.4.3 Exhibit C – MOA regarding Transfer and Operation of Fish Production at Kooskia NFH.

Goal 3: Provide accurate information and educational opportunities to enhance participation in, understanding and stewardship of Kooskia National Fish Hatchery and FWS programs.

Objective 3.1: Provide public information in various reporting formats as necessary or required.

Task 3.1.1: Improve existing and develop new partnerships for speaking on USFWS and specific hatchery programs at meetings, workshops and other routine or special events.

Task 3.1.2: Develop new and improve existing media relationships within a 5 county area (Clearwater, Lewis, Idaho, Nez Perce, Latah), providing news releases, feature stories, photos, data, public service announcements regarding USFWS issues and station activities.

Task 3.1.3: Produce seasonally accurate informational materials for non-personal public outreach.

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Task 3.1.4: Coordinate with USFWS and other Outreach or Public Affairs offices in the region and surrounding communities to incorporate hatchery information in their programs.

Task 3.1.5: Maintain hatchery website with accurate and frequently updated information and graphics.

Objective 3.2: Develop new and improve existing levels of public contact and education programs, both on- and off-site.

Task 3.2.1: Facilitate interagency cooperation with existing and new programs in the Clearwater/Snake River region.

Task 3.2.2: Evaluate use and exposure of outreach materials and exhibits as they support goals for hatchery outreach program.

Task 3.2.3: Conduct teacher evaluations post-program to ensure goals are met.

Objective 3.3: Develop or support on- and off-site events to promote awareness and stewardship of regional fishery resources

Task 3.3.1: Host annual Kids' Fishing Day/Open House event each June in support of National Boating and Fishing Week activities.

Task 3.3.2: Support other state and Federal agencies to present special events such as National Wildlife Refuge Week, cultural and natural history activities, regional and local events.

Task 3.3.4: Develop more hands-on interactive education events and programs.

Objective 3.4: Develop external partnerships to promote public awareness and stewardship of fishery resources in the Columbia River Basin.

Task 3.4.1: Promote use of hatchery facilities by outside groups, organizations.

Task 3.4.2: Improve communications with external partner and stakeholder groups to integrate Columbia Basin fisheries outreach activities with USFWS regional and national strategies.

Task 3.4.3: Participate in local advisory or community outreach forums and special interest groups.

Task 3.4.4: Prepare for and host public informational meetings as needed to discuss hatchery practices, projects, issues, concerns and plans.

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Task 3.4.5: Become proactive in establishing communications with Idaho elected officials; prepare and distribute legislative briefing packets annually; invite to visit the hatchery during peak spawning seasons or special events.

3. Objectives of program

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.

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 Kooskia NFH trap.

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 Kooskia spring Chinook salmon to fisheries in the Clearwater River and Clear Creek.

4) Surplus hatchery spring Chinook salmon are available for outplanting in underseeded habitat in the Clearwater basin.

An average of 800 adult Kooskia NFH origin spring Chinook salmon are needed to meet broodstock annually. Any additional fish will be outplanted in underseeded habitat.

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.

6) Release healthy, functional smolts from Kooskia NFH.

Annually release up to 600,000 marked smolts from Kooskia NFH.

7) Juvenile releases from Kooskia NFH survive and return to the hatchery in sufficient numbers to sustain the hatchery program.

The adult production goal from the 600,000 smolts released from Kooskia NFH should provide for a harvest in the Clearwater River and a broodstock collection goal of 800 hatchery adults at Kooskia NFH.

[KNFH HGMP, p.1.10]

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4. Type of program (Integrated or Segregated)

Isolated Harvest Program- Smolt releases of yearling Chinook are made directly into the Clear Creek on the Middle Fork of the Clearwater River so that 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. [KNFH HGMP, p.1.8]

5. Alignment of program with ESU-wide plans

There is currently no ESU-wide hatchery plan for Spring Chinook Salmon. Spring Chinook salmon are not listed in the Clearwater River Basin.

6. Habitat description and status where fish are released.

Very little habitat within the Clearwater subbasin has been defined as excellent for spring Chinook salmon. Excellent habitat is typically limited to the highest elevation headwater streams within the Lochsa and Upper Selway AUs. Good and fair spring Chinook salmon habitat is widely intermixed and found throughout the majority of the usable mainstem and tributary reaches of the Lochsa, South Fork, and Upper and Lower Selway AUs. While poor habitat conditions for spring Chinook are typically associated with lower mainstem reaches of major tributaries (Lolo Creek, Lochsa, Selway and South Fork Clearwater Rivers) and the mainstem Clearwater River, it does provide an excellent migration corridor. (NWPPC Nov. 2003, p.279)

7. Size of program and production goals (No. of spawners and smolt release goals)

Table: Broodstock goal is to collect 400 adults or about 200 females at a 1:1 male to female ratio. (KNFH HGMP, sec.1.11.1-1.112)

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	*On Site	600,000
Adult		

*On Site releases are made directly from Kooskia NFH into Clear Creek on the Middle Fork Clearwater River.

C. Description of program and operations

1. Broodstock goal and source

The Kooskia NFH spring Chinook salmon program was started using a wide variety of stocks from the Lower Columbia River and Rapid River SFH. However, from 1973 through 1980, smolt releases had a very strong Carson stock influence. Egg transfers of Carson type stock from Dworshak NFH in 1985 and 1986 resulted in smolt releases in 1987 and 1988 that were a mixed stock, referred to as Clearwater stock. Since the Kooskia NFH program already had stock made up primarily of Carson derivatives, the resultant program (1989 and later) is still considered a Carson type stock, but is referred to as Kooskia stock. Length frequency data, ocean age class at return time information, and allele frequencies all support a distinction between Dworshak and Kooskia stocks. (KNFH HGMP, sec.6.2)

Table: Genetic background of Kooskia NFH spring Chinook salmon smolts directly released from the hatchery, 1971-2006. (RR = Rapid River, KK = Kooskia, LE = Leavenworth, SS = South Santiam, CL = Clearwater, LW = Little White Salmon, CA = Carson, WR = Wind River). (Burge, January 2007, Spring Chinook, p.4)

Release Year	Genetic Background
1971	86% RR, 14% WR
1972	100% RR
1973 - 1974	100% CA
1975	58% RR, 42% CA
1976	100% SS
1977	84% CA, 11% KK, 5% LW
1978	75% RR, 25% CA
1979	69% KK, 31% CA
1980	31% KK, 69% CA
1981	64% CA, 19% KK, 17% RR
1982	100% CA
1983	65% KK, 35% LE
1984	89% KK, 11% RR
1985 - 1986	100% KK
1987 - 1988	100% CL
1989 - 2006	100% KK

2. Adult collection procedures and holding

- spring Chinook usually begin entering the mouth of Clear Creek in May. The stream is completely blocked by a top-hinged picket weir. As the adults migrate upstream, the weir blocks migration and directs the adults through a one-way finger door and into the adult holding pond. Trap operation usually begins in May and ends in mid-September. Adults are held at the hatchery until water temperatures in Clear Creek begin to increase to about 60°F. At that time, adults are inventoried weekly and transported to Dworshak NFH for holding until they mature for spawning.

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- ***Other Acceptable Stocks*** - Since 1986, Kooskia NFH has been establishing a localized stock with returning adults to the hatchery. Currently, the policy in force is that no other stock of spring Chinook will be used to supplement the existing broodstock in years when returns are low. When adult returns are low and broodstock numbers are insufficient to meet hatchery production objectives, Kooskia NFH will continue the program with the adults that return. However, progeny of other stocks may be used to supplement production at Kooskia NFH in those years when the Kooskia broodstock is insufficient with the intent of only contributing to adult returns for harvest. These progeny would be differentially marked so that adults returning to the hatchery could be identified and not incorporated into the hatchery broodstock program. Other acceptable stocks for this purpose would include progeny from Dworshak NFH and those from IDF&G programs in the Clearwater River and Rapid River.
- 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 the historic run of spring Chinook salmon are believed to be extirpated from the Clearwater basin these fish are generally not used for broodstock, but placed above the weir to continue their migration. [KNFH HGMP,p7.3]
- Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 2002 to 2006. (Burge, January 2007, Spring Chinook, p.5)
- ***Adult Holding*** – All the adults are held at Dworshak NFH in large outdoor adult holding ponds. Mortalities are removed daily and formalin treatments are administered from 1-3 times per week to control fungus. All adult females are injected with Erythromycin (20mg/kg) approximately 21 days prior to spawning.

3. *Adult spawning*

a) *Spawning protocols*

Adults begin to mature and are usually ready for spawning in mid-August. Spawning is conducted weekly at Dworshak NFH and usually lasts from three to six weeks, depending on the number of adults that return to the hatchery. The Kooskia spring Chinook salmon program usually observes a 1:1 sex ratio in adult returns. We require about 800 adults in order to get all the eggs we need for a full program to account for pre-spawning mortality, BKD culling, and uneven sex ratio.(KNFH HGMP, sec.7.4)

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b) No. of males and females spawned each year over past 10 years (Table)

Year	Adults			Eggs	Juveniles
	Females	Males	Jacks		
1993	474	442			
1994	95	75			
1995	7	11	6		
1996	49	32	18		
1997	316	303	4		
1998	130	139			
1999	26	19	4		
2000	278	268	73		
2001	304	212	10		

Data source: Idaho FRO databases and annual reports. (KNFH HGMP, sec.7.4)

Table: Number of spring Chinook females spawned for the Kooskia NFH program before culling

Total SCS Females Spawned 2003-2007 before culling for ELISA, dead trays, etc. culling level - 0.25 OD				
	KK	females spawned	#culled	%culled
BY	2007	136	1	0.74
	2006	252	0	0.00
	2005	128	11	8.59
	2004	260	12	4.62
	2003	257	50	19.46

- 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. (KNFH HGMP, sec.7.5)
- Adults are crowded out of the adult holding pond using a large mechanical crowder, forcing the adults into a channel which leads into the spawning room. Adults are crowded into the spawning room, using a smaller mechanical crowder and into basket that leads into an anesthetic bin. Tricaine methanesulfonate (MS-222) is used for fish

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anesthesia to make handling easier and Pro-Polyaqua is added (250 ml per bin) to reduce stress and susceptibility to infection. Oxygen is provided at a rate of 1.5 L/minute. Once adults are completely anesthetized, they are transferred onto an examination table. Unripe males and females are returned to holding ponds for examination the following week. Ripe males are sent alive to the male handling area where the milt is stripped into styrofoam cups and a one-percent saline solution added to assist in milt motility.

A pneumatic knife is used to sever the spinal column of ripe females which are then sent to the female handling table where they are kept for approximately 3–10 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.

4. Fertilization

Milt solution is poured onto the eggs and swirled for more complete fertilization. After sufficient time had elapsed for fertilization to take place (one to two minutes), the eggs are rinsed of sperm, blood, and other organic matter. After fertilization, eggs from one female are placed in Heath incubator trays. 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 disease transmission. The trays are then pushed into the incubator with a water-flow rate of approximately five gallons/minute. Eggs in banks A/B are chilled to approximately 40°F. Since the chiller has the capacity to only chill two incubator stacks, eggs in C/D bank incubators are held at approximately 45°F.

a) Number of eggs collected and fertilized each year over past 10 years

Summary of Egg Collection and Survival of Kooskia Stock spring Chinook reared at Kooskia NFH – 5/25/2007.

Brood Year	# green eggs taken	eyed eggs enumerated	% Survive green to enumerated Eye-up	# survived to tanking	% Survival Eyed to Tanking	# extra culled	# smolts released	% survival tanked fry to released smolt
2006	733,054	702,181	95.8%	679,652	96.8%	0	NA	NA
2005	462,989	431,984	93.3%	408,408	94.5%	0	390,878	95.7%
2004	829,480	774,195	93.3%	705,564	91.1%	0	637,333	90.3%
2003	915,310	856,702	93.6%	812,319	94.8%	105,000	624,967	88.4%
2002	798,666	769,162	96.3%	756,600	98.4%	0	643,503	85.1%
2001	770,079	765,061	99.3%	734,639	96.0%	0	597,063	81.3%
2000	710,972	668,555	94.0%	611,917	91.5%	0	549,861	89.9%
1999	113,827	104,867	92.1%	99,258	94.7%	0	80,430	81.0%

% Eye-up is enumerated eye-up (after green culls). (KNFH HGMP, sec.9.1)

Percent survival enumerated eye-up does not include eggs/females culled before enumeration

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Table: Kooskia BY06 spring Chinook Egg Take and Survival. (USFWS, Oct. 30, 2006, p.4)

Take	Spawn Date 2005	# of Male ¹	# of Female	Female culled BKD ²	Tray Culled Dead	Trays Culled Extra	Dead Eggs Enum	Eyed Eggs Enum	Eggs for Research	Total Eggs	Eggs/Female	Percent Enum Eye-up
1	15-Aug	56	98	1	0	0	19,190	302,714	0	321,904	3,319	94.0
2	22-Aug	44	82	12	3	0	7,114	206,364	0	213,478	3,186	96.7
3	29-Aug	58	72	12	1	0	4,569	193,103	0	197,672	3,350	97.7
Tot/Ave		158	252	25	4	0	30,873	702,181	0	733,054	3,287	95.8

1 Includes 3 jacks spawned during the season

2 BKD culling above 0.250 ELISA testing for all Takes

Percent enumerated eye-up does not include eggs/females culled before enumeration

Source: BY06 spring Chinook Egg Enumeration and % Survival of Eggs Summary SC2006EggEnum.xls
IFHC BKD ELISA testing results BY06 spring Chinook

5. Incubation

- Eggs are incubated and eyed up at Dworshak NFH. Eye-up of eggs on 45°F water takes place approximately 43 days after spawning. Eye-up of eggs on chilled water (40°F) takes place approximately 70 days after spawning. Upon eye-up, eggs are shocked and enumerated using an electronic egg picker and counter (Van Gaalen Model N-100).
- In the past, warm water temperatures at Kooskia NFH made it difficult to meet the size at release target of 20 fpp (5.5 inches) without reducing growth rate by reducing rations. However, due to the fish health implications of reduced rations, the hatchery implemented a modification to the incubation strategy designed to slow development and delay hatching. Eyed eggs begin incubation using chilled well water of approximately 38°F. The change to this procedure was initiated with Brood Year (BY) 2000. Clear Creek water was used from November to February instead of chilling well water. This served a dual purpose. First, creek water temperatures would mimic natural temperature conditions for the eggs and at times would be cooler than chilled well water. Secondly, switching to creek water allows the hatchery to conserve energy by not running the wells/chiller and would save station funds for other station projects.
- Spring Chinook eggs are initial loaded 1 female/tray = 3,500 eggs/tray green eggs. After enumeration, eggs are returned to the tray at 5,000 eggs/tray. Eggs are then shipped to Kooskia NFH for final incubation and rearing. Water flow for the trays is approximately 5 gallons/minute. (KNFH HGMP, sec.9.1.3)

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6. Ponding

a) Protocols

- Kooskia Chinook are transferred to outside nursery rearing tanks and started on feed. Kooskia has a limited amount of well water available. Two production wells produce a maximum of 450 g/m, each approximately 57°F. Nursery rearing begins using single-pass well water, but then is replaced by the Bio-filter reuse system after two weeks. Once fry outgrow the tanks (~ 250 fpp) they are inventoried and transferred to six BP's where the fry remain during the summer months. The reuse operation system remains in use along with the chiller which lowers water temperatures down to approximately 50°F. Chilled reuse water is utilized from June-September because Clear Creek water temperatures are generally too high for healthy Chinook rearing. Also, utilizing well water decreases the introduction of the creek water parasite *Ichthyophthirius* (ICH) into the BP reuse system. Chinook are adipose-fin clipped and coded wire tagged during the last week of July.

- As the weather cools in the fall, fingerlings are split into raceways utilizing Clear Creek water. Around October, when Clear Creek temperature lowers, the well water is shut down and either single pass or serial use Clear Creek water is run through the BP's and raceways. Fish remain in BP's and raceways until released as smolts directly into Clear Creek the following April.

- Chinook density index goal is less than 0.4. Actual = Raceways – 0.2 to 0.3. (KNFH HGMP, sec.26)

- Chinook- Temperature taken @ 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. (KNFH HGMP, sec. 26)

b) Number of fry ponded each year, including % hatch each year

Table: Survival of Kooskia Spring Chinook fry/fingerlings reared at Kooskia NFH. Blanks indicate lack of data. (KNFH HGMP, sec.9.2)

Brood Year	% Survival fry to fingerling	% Survival fingerling to smolt
2000	92	99
1999	98	80
1998	99	
1997		
1996		
1995		
1994	99	98
Average	97	92.3

**spring Chinook final incubation and initial tanking at Kooskia NFH. Later transferred to Dworshak at approximately 300-500 fpp.*

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7. Rearing/feeding protocols

- Nursery: Chinook raised at Kooskia once transferred to nursery tanks are fed Biomoist starter #2 & #3. Fish are fed to satiation once every hour (eight times daily). Satiation is determined by the amount of feed left on the bottom of the tanks. If excess feed is at a level deemed too much, the food is cut back for that feeding in that particular tank. Fish feeding and growth is dependent upon water temperature which can change from year to year.
- Outside: Frequency of 6 times a day at approximately 4% body weight. 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 (135mm or 20 fpp) the % body weight fed/day is approximately 0.5% and frequency is 2-3 times/day.(KNFH HGMP, sec.9.2.6)

8. Fish growth profiles

Table: Approximate average growth of BY99 Kooskia NFH spring Chinook in raceways during 2000 and 2001. (KNFH HGMP, sec.9.2.4)

Month	Number	Weight	No/lb	Length in	Length mm
June 1	473,138	864	530	1.8	47
July 1	506,013	2530	200	2.5	65
August 1	504,154	4531	110	3.1	79
Sept 1	502,902	7157	70	3.6	92
Oct 1	502,495	9913	49.6	4.0	103
Nov 1	501,699	14,291	32.3	4.7	119
Dec 1	501,303	15,206	31.1	4.7	121
Jan 1	501,033	15,217	31	4.8	121
Feb 1	500,348	15052	34	4.6	117
March 1	499,665	16591	31	4.8	121
April 4	498,532	18592	27	4.9	125

9. Fish health protocols and issues

Production fish are monitored monthly for health status. Diagnostic work is done as needed. Fungus is not usually a problem except after freeze branding- no treatments are typically needed. Formalin treatments routinely needed for parasite control.(KNFH HGMP,sec. 9.2.7)

A pathologist from the IFHC visits once per month to examine fish at the hatchery. From each stock and broodyear of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Kidneys (and other tissues, if necessary) are checked for the common bacterial pathogens by culture and by a specific test for *Renibacterium salmoninarum* (causative agent for Bacterial Kidney Disease)(BKD). Blood is checked for signs of anemia or other infections. Additional tests for

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virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.

Diagnostic Examination: This is done on an as-needed basis as determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. A pathologist will normally check symptomatic fish during a monthly examination.

Pre-release Examination: At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW of the Fish and Wildlife Service Manual (FWM) include *Infectious hematopoietic necrosis virus* (IHNV), *Infectious pancreatic necrosis virus* (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.

Adult Certification Examination: At spawning, tissues from adult fish are collected to ascertain viral, bacterial, and parasite infections and to provide a brood health profile for the progeny. The IFHC tests for all of the listed pathogens, including *Myxobolus cerebralis* and tests for *Ceratomyxa shasta*. The minimum number of samples collected is defined by 713 FWM. At Dworshak NFH, all Kooskia brood spring Chinook females are tested for *R. salmoninarum* (causative agent of BKD), with an identifying fish health number corresponding to each female's eggs so that selective culling and/or segregation is possible. This is done to reduce/control BKD, a vertically transmitted disease. Progeny from females with high and moderate levels of BKD are culled (if not needed to make production goals) or segregated from progeny at lower risk. The IFHC provides results from testing within four weeks to allow management decisions.

Other Fish Health Precautions - Unless knowledge regarding vertical transmittance of BKD proves otherwise, eggs from female brood stock with high and moderate levels of BKD (a cut-off point selected by the NFH and FHC managers based on results from the Enzyme-Linked Immunosorbent Assay or ELISA) will not be used in production except when egg production is low. If the number of brood females is low, progeny from highly infected females shall be segregated into rearing units apart from the rest of the production and absolute fastidiousness maintained as to using equipment that is disinfected and/or dedicated to these rearing units. Eggs from high or moderate females are tested to insure antibiotic retention and Quantitative PCR used to determine actual level of bacteria. Eggs that have no antibiotic and have high levels of bacteria are culled, regardless of egg need.

Returning spring Chinook that are allowed to remain in the North Fork of the Clearwater River upstream of the hatchery can serve as a reservoir of pathogens for the fish in the hatchery. The risk from BKD in the juveniles is also enhanced, with evidence from this and other hatcheries that horizontal transmission occurs when infected adults are in the water supply. Returning spring Chinook have a relatively low incidence of IHNV.

Tank trucks and tagging trailers are disinfected before being brought onto the station and after use at the hatchery.

Abernathy Fish Technology Center provides quarterly feed quality analysis to prevent disease and meet nutritional requirements of fish.

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10. Chemotherapeutant use

Erythromycin injections for spring Chinook brood stock are critical to the control of BKD, which is caused by a vertically transmitted bacterium (*Renibacterium salmoninarum*) that can reside in the ovarian and seminal fluids. In addition, erythromycin injections control the mortality and reduce horizontal transmission of BKD between adults in the brood pond. The injection schedule is set to maximize the number of adults injected, with a goal of one injection 21 days prior to spawning.

To reduce bacterial numbers in the reproductive fluids, and to deposit the drug inside the ova, erythromycin must be injected at a dosage of 20 mg drug/kg of fish. At Dworshak NFH, the first injection is scheduled on about July 29th. Except for fish arriving too close to the time of spawning for safe handling and injection, all female spring Chinook adults kept for broodstock are injected. Injections are done under a prescription from a veterinarian. The injected drug is Gallimycin 200 (200 mg/ml), of active erythromycin base in a non-aqueous buffered alcohol base; to be injected into the peritoneal cavity at 20 mg drug/kg of body weight.

Since 1998 (brood year 97 juveniles), prophylactic medicated feedings to control BKD in juveniles have been deemed unnecessary. The reduced levels of BKD in the juveniles is attributed to lowered densities (< 0.25 density index and < 1.0 flow index) during rearing, regular cleaning and maintenance of individual equipment (nets, etc.) for each pond, erythromycin injection of the adults, and culling/segregation of progeny from highly infected females.

Should prophylactic feeding be necessary, as determined by the IFHC, juveniles are to be fed at a daily dosage of 100 mg/kg of fish for a minimum of 21 days, unless contraindicated by drug toxicity or needed feeding rate adjustments. The time and number of treatments will be dictated by circumstances. As of 2001, there is a temporary INAD 4333 that allows feeding of Aquamycin 100 (erythromycin thiocyanate in a wheat flour base).

Formalin treatments of adults held for brood stock are used to control external pathogens three times per week prior to spawning.

Salmonid egg hardening and disinfection treatment with a polyvinylpyrrolidone iodine compound (approximately 1% iodine) is required by 713 FWM policy to minimize/prevent transmittance of viral and bacterial pathogens. The eggs are disinfected in 75 ppm iodine in water buffered by sodium bicarbonate (at 0.01%) for 30 minutes during the water-hardening process. Eggs received at the hatchery must be disinfected before they are allowed to come in contact with the station's water, rearing units or equipment. Specifics are provided in 713 FWM policy.

11. Tagging and marking of juveniles

Kooskia NFH releases about 600,000 spring Chinook smolts each year. Since 1993 all of the spring Chinook salmon smolts at Kooskia NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least one group of 100,000 fish receives a coded-wire tag that represents Kooskia NFH. Coded-wire tags are

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used to track contributions to ocean and downriver commercial, sport, and Tribal fisheries, as well as to track success of adult returns from evaluation and research studies.

PIT tags have been used at Kooskia NFH since the late 1980's to generate data on run timing and smolt survival to various Lower Snake and Lower Columbia River dams. In 2005, the IFRO obtained funding to evaluate adult returns to Lower Granite Dam using PIT tags. That program calls for tagging of about 10,000 smolts annually for monitoring adult returns.

12. Fish Release

a) Protocols

- Smolts are released into Clear Creek, which flows about ¼ mile before joining the Clearwater River. Clear Creek is a tributary of the main stem Clearwater River a tributary to the Snake River in the Columbia River Basin. (KNFH HGMP, sec.10.2)
- All releases are 18 month old smolts. Release dates are selected within a 4-week window, actual days chosen are based on the fishes readiness to smolt and size, hatchery logistics, and environmental conditions (turbid water, increasing hydrograph. 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.(KNFH HGMP, sec.10.4)

1998 – April 1

1999 – April 6 & 9

2000 – April 6 & 7

2001 – March 27

2002 – April 4

b) Number of fish released each year (subyearlings?; yearlings?; other?)

Release numbers for Kooskia NFH spring Chinook salmon, 1988-2006. (Burge, January 2007, Spring Chinook., p17)

Release Year	Smolts Released ¹
1988	778,407
1989	384,235
1990	403,701
1991	396,619
1992	727,251
1993	343,437
1994	305,813
1995	722,906
1996	333,794
1997	16,598
1998	76,846
1999	684,165
2000	449,454
2001	80,430

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2002	549,861
2003	597,063
2004	643,503
2005	624,967
2006	637,334

¹ *Releases at hatchery only and does not include off-site releases or fry/fingerling releases.*

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D. Program benefits and performance

Table: List of program “Performance Indicators”, designated by “benefits” and “risks”. (KNFH HGMP, sec.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 Kooskia NFH trap.	Annual run timing of hatchery spring Chinook salmon will be monitored at the hatchery fish trap.
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 Kooskia spring Chinook salmon to fisheries in the Clearwater River and Clear Creek.	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 of Kooskia 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 600 adult Kooskia 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 Kooskia 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

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Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
		measures.
6) Release healthy, functional smolts from Kooskia NFH.	Annually release up to 600,000 marked smolts from Kooskia 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 Kooskia NFH survive and return to the hatchery in sufficient numbers to sustain the hatchery program.	The adult production goal from the 600,000 smolts released from Kooskia NFH should provide for a harvest in the Clearwater River and a broodstock collection goal of 600 hatchery adults at Kooskia 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.	Approval from NMFS on HGMP and other operating permits.
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 steelhead and bull trout is minimized.	A passive by-pass channel is available for smaller bull trout to escape the adult holding/trap. Fish are gone through weekly and wild adult steelhead or larger bull trout are passed upstream of	The weir and trap are currently being evaluated to insure that the opening is sufficient to allow passage of as large as possible bull trout while still retaining jack Chinook salmon.

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	the weir and trap.	
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 Kooskia origin Chinook is below 5% of the receiving population.	Monitor stray rate of hatchery population through the recovery of tagged Kooskia 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.	Environmental parameters will be monitored to establish release date. PIT tagged fish will be detected at downstream dams to monitor travel rate and survival.

1. Adult returns

a) Numbers of adult returns (data for the past 17 years)

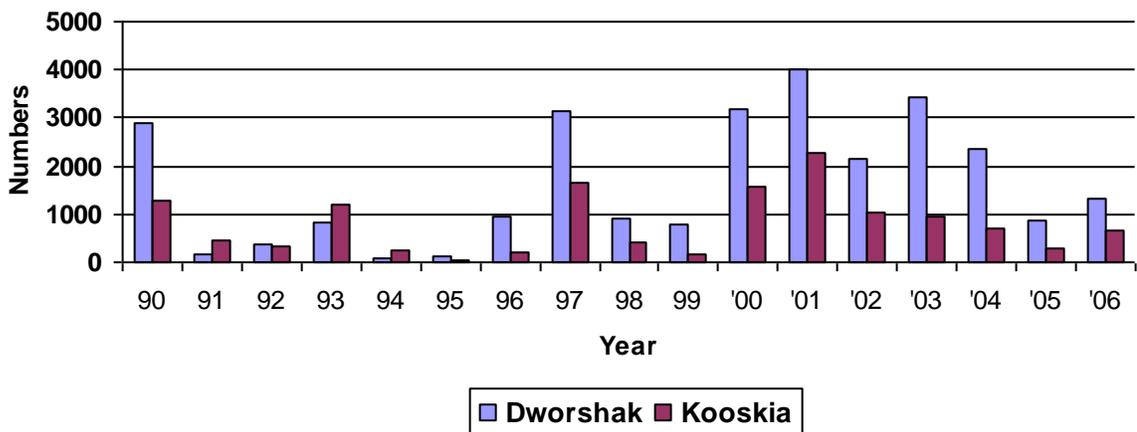


Figure xx. spring Chinook returns to Dworshak/Kooskia 1990-2006. Source: DNFH BY06 spring Chinook Spawning Activity Report – Final IFRO spring Chinook Rack Returns (USFWS, Oct. 30 2006, p.1-2)

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Table: Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 1987 to 2006. (Burge, January 2007, Spring Chinook, p.12)

Year	Dworshak NFH Rack Return	Kooskia NFH Rack Return	Sport Harvest ¹	Tribal Harvest ¹	Estimated Return
1987	2,017	687	0	210	2,914
1988	1,972	595	0	312	2,879
1989	1,700	973	0	404	3,077
1990	2,042	1,141	369	644	4,196
1991	165	467	0	0	632
1992	370	312	54	160	896
1993	823	1,180	0	43	2,046
1994	74	232	0	0	306
1995	125	40	0	0	165
1996	963	202	0	24	1,189
1997	3,150	1,657	741	847	6,395
1998	915	408	99	202	1,624
1999	800	157	0	37	994
2000	3,202	1,581	3,908	1,183	9,874
2001	4,018	2,261	14,752	3,144	24,175
2002	2,157	1,037	5,087	1,259	9,540
2003	3,422	965	2,068	1,609	8,064
2004	2,356	718	1,825	808	5,707
2005	882	270	942	275	2,369
2006	1,354	670	495	457	2,976

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b) Return timing and age-class structure of adults

Table: Age composition and total annual return of spring Chinook salmon returning to Kooskia NFH, 1972-2006. Percentages do not include unmeasured adults. (Burge, January 2007, Spring Chinook, p.14-15)

Year	I-Salt	%	II-Salt	%	III-Salt	%	Unmeasured	Total Return
1972	5	(100)	0	(0)	0	(0)	0	5
1973	5	(10)	45	(90)	0	(0)	0	50
1974	16	(30)	35	(66)	2	(4)	0	53
1975	15	(5)	284	(87)	27	(8)	0	326
1976	409	(51)	286	(36)	106	(13)	0	801
1977	333	(11)	2,539	(84)	154	(5)	0	3,026
1978	23	(1)	1,676	(82)	336	(17)	0	2,035
1979	11	(3)	100	(27)	264	(70)	0	375
1980	9	(13)	55	(82)	3	(5)	0	67
1981	1	(0.4)	168	(68)	78	(31.6)	0	247
1982	3	(1)	116	(45)	139	(54)	0	258
1983	1	(0.3)	231	(61.7)	141	(38)	0	373
1984	55	(16)	80	(23)	206	(61)	0	341
1985	26	(5)	449	(85)	54	(10)	0	529
1986	21	(7)	159	(56)	103	(37)	0	283
1987	16	(2)	607	(88)	64	(10)	0	687
1988	39	(7)	363	(61)	193	(32)	0	595
1989	107	(11)	717	(74)	142	(15)	7	973
1990	11	(1)	921	(81)	209	(18)	0	1,141
1991	10	(2)	98	(21)	350	(77)	9	467
1992	14	(5)	239	(82)	38	(13)	21	312
1993	11	(1)	749	(64)	409	(35)	11	1,180
1994	1	(0.4)	96	(41.6)	135	(58)	0	232

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Year	I-Salt	%	II-Salt	%	III-Salt	%	Unmeasured	Total
1995 ¹	21	(52)	7	(18)	12	(30)	0	40
1996	86	(43)	113	(56)	3	(1)	0	202
1997	7	(0.4)	1,523	(92)	127	(7.6)	0	1,657
1998	1	(0.3)	200	(49)	207	(50.7)	0	408
1999	72	(46)	28	(18)	57	(36)	0	157
2000	966	(61)	604	(38)	11	(1)	0	1,581
2001	28	(1)	2,137	(95)	96	(4)	0	2,261
2002	14	(1)	852	(82)	171	(17)	0	1,037
2003	97	(10)	71	(7)	797	(83)	0	965
2004	15	(2)	682	(95)	21	(3)	0	718
2005	29	(11)	202	(75)	39	(14)	0	270
2006	7	(1)	617	(92)	46	(7)	0	670

c) Smolt-to-adult return rates

Table: Return vs. release numbers for adult Kooskia NFH spring Chinook salmon returns, 1988-2006. Including sport and tribal harvest estimates for 1990, 1999, 2000-2006. (Burge, January 2007, Spring Chinook, p.17)

Release Year	Smolts Released ¹	I-Salt (% Return)	II-Salt (% Return)	III-Salt (% Return)	Total (% Return)
1988	778,407	107 (0.0137%)	921 (0.1183%)	350 (0.0450%)	1,378 (0.1770%)
1989	384,235	11 (0.0029%)	98 (0.0225%)	38 (0.0096%)	147 (0.0077%)
1990	403,701	10 (0.0025%)	239 (0.0590%)	409 (0.1013%)	658 (0.1630%)
1991	396,619	14 (0.0038%)	749 (0.2026%)	135 (0.0365%)	898 (0.2430%)
1992	727,251	11 (0.0015%)	96 (0.0132%)	12 (0.0017%)	119 (0.0164%)
1993	343,437	13 (0.0003%)	7 (0.0020%)	3 (0.0009%)	11 (0.0032%)
1994	305,813	21 (0.0069%)	113 (0.0360%)	127 (0.0415%)	261 (0.0853%)
1995	722,906	86 (0.0119%)	1,523 (0.2107%)	207 (0.0285%)	1,816 (0.2512%)

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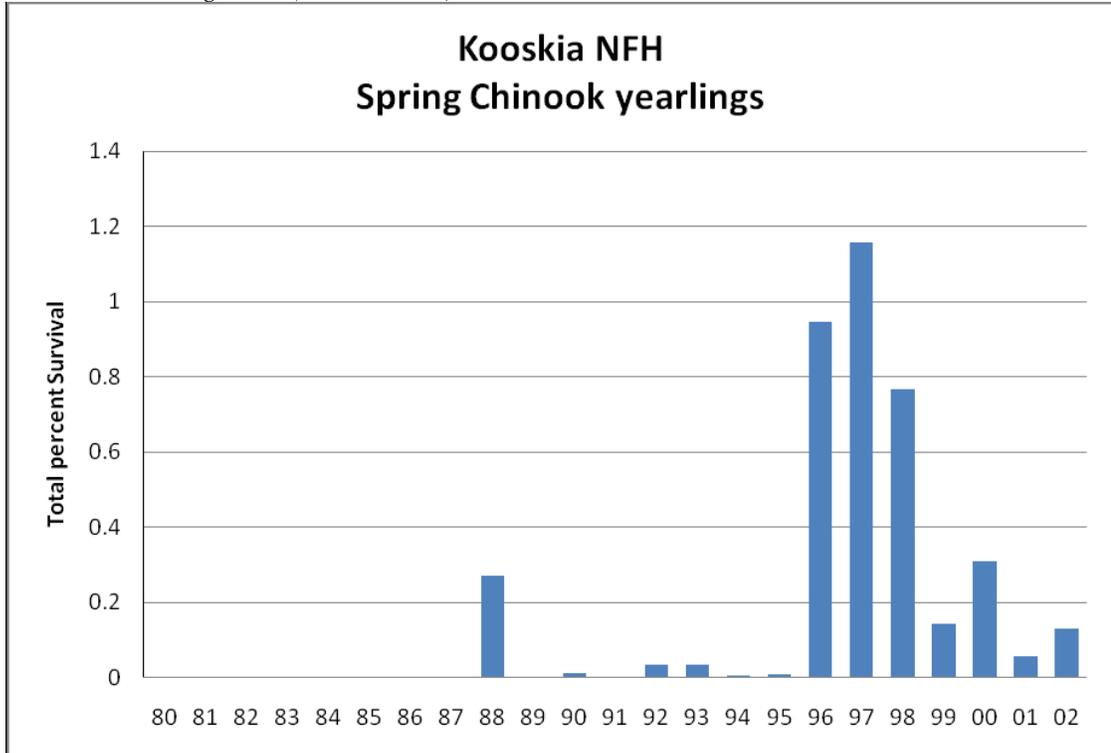
1996	333,794	7 (.0021%)	200 (.0599%)	57 (0.0189%)	264 (0.0790%)
1997	16,598	1 (0.0060%)	28 (0.1687%)	11 (0.0663%)	40 (0.2410%)
1998	76,846	72 (0.0937%)	608 (0.7912%)	465 (0.6050%)	1,145 (1.4900%)
1999	684,165	972 (0.1421%)	10,347 (1.5124%)	502 (0.0734%)	11,821 (1.7278%)
2000	449,454	160 (0.0356%)	2,503 (0.5569%)	1,212 (0.2697%)	3,875 (0.8622%)
2001	80,430	41 (0.0510%)	83 (0.1032%)	39 (0.0485%)	163 (0.2027%)
2002	549,861	113 (0.0206%)	1,275 (0.2319%)	67 (0.0122%)	1,465 (0.2646%)
2003	597,063	15 (0.0025%)	347 (0.0631%)	50 (0.0084%)	412 (0.0690%)
2004	643,503	29 (0.0045%)	741 (0.1152%)		
2005	624,967	8 (0.0013%)			
2006	637,334				

¹ Releases at hatchery only and does not include off-site releases or fry/fingerling releases.

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Table: Kooskia NFH total percent survival of Spring Chinook yearlings by brood year based on coded-wire tag data. (Pastor 2009)



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Table: Releases and returns (harvest, hatchery, and escapement) based up coded-wire tag data for Kooskia NFH spring Chinook broodyear 1990-2002 (Pastor 2009)

Kooskia NFH spring Chinook yearling Releases and Returns

Brood Year	Number Released	Hatchery	Columbia		Spawning Ground	Total Recoveries	Smolt to Adult Survival
			River Harvest	Ocean Harvest			
90	727,251	59	18	0	0	77	0.0106
91	333,437	2	0	0	0	2	0.0006
92	305,813	86	13	0	0	99	0.0324
93	722,906	82	123	15	16	236	0.0327
94	333,794	0	9	0	0	9	0.0027
95	16,598	0	1	0	0	1	0.0060
96	43,165	381	27	0	1	409	0.9452
97	570,290	648	2,053	9	6	2,716	1.1573
98	365,150	852	1,946	0	68	2,866	0.7663
99	82,974	75	42	0	4	121	0.1410
00	549,861	719	952	16	25	1,712	0.3068
01	548,097	194	89	11	0	294	0.0536
02	591,380	444	306	12	6	768	0.1289

d) Stock productivity (e.g. recruits per spawner)

No information provided.

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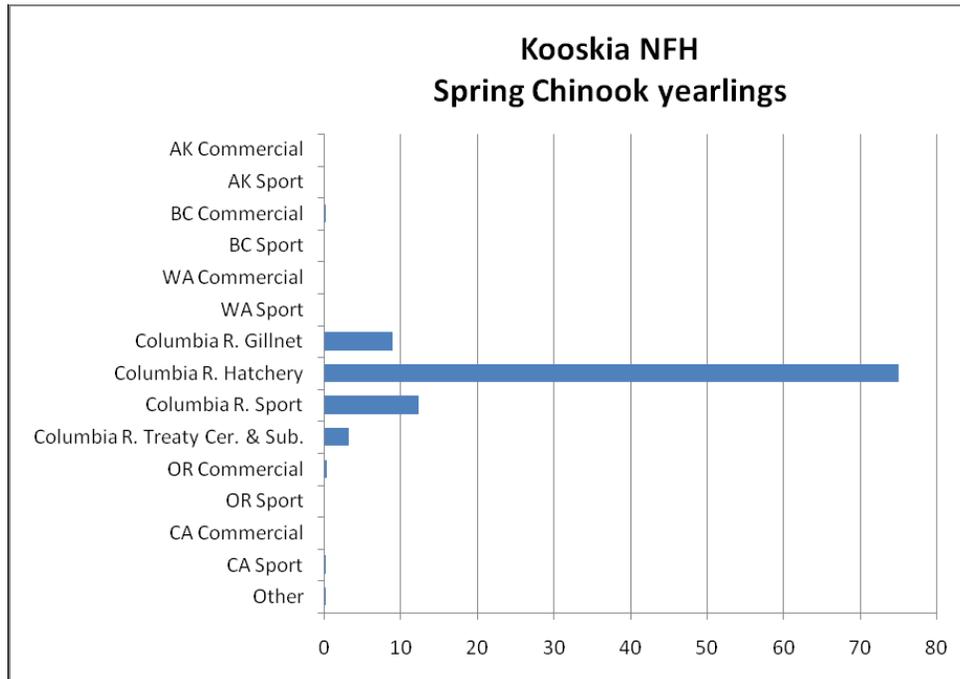
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2. Contributions to harvest and utilization (e.g. food banks)

- Coded wire tags are used to monitor adult returns and contribution to fisheries in the ocean, the lower Columbia River, the lower Snake River, and sport and Tribal fisheries in the Clearwater River. Spring Chinook salmon from Kooskia NFH contributes primarily to sport and Tribal fisheries in Clearwater River although some are harvested in various fisheries in the lower Columbia and Snake Rivers.

All release information, including marked to unmarked ratios, is reported to the Pacific States Marine Fisheries Commission (PSMFC). Mark and tag information from sampled fish recovered in the various fisheries and at the hatchery, are also reported.

Table: Dworshak NFH Mean % of Recoveries of Summer Steelhead yearlings since 1980 based on coded-wire tag data (Pastor 2009)



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Table: Contribution and recovery of coded-wire tagged spring Chinook salmon from Kooskia NFH from CRiS and PSMFC TSI stock reference summary (Steve Pastor pers. com.)

Contribution and recovery of coded-wire tagged spring Chinook salmon from Kooskia NFH

Expanded Recoveries by Area and Broodyear (BY)						
Recovery Area	BY 1996	BY 1997	BY 1998	BY 1999	BY 2000	5-Year Ave.
Ocean Troll	0	9	0	0	16	5
Treaty Ceremonial	8	66	53	1	0	26
Columbia River Gillnet	10	1,000	1,085	22	365	496
Columbia River Sport	7	865	751	7	432	412
Freshwater Sport	1	109	166	7	135	84
Hatchery	381	654	852	56	57	400
Miscl Trap	0	0	9	0	0	2
Spawning Ground	1	7	67	5	0	16
Total Expanded Recoveries	408	2,710	2,983	98	1,005	1,441
Total # Released	43,165	234,165	365,150	82,974	549,861	255,063
SAR %	0.95	1.16	0.82	0.12	0.18	0.64

*Broodyear (BY) refers to the year that the fish was spawned and its resulting progeny. For example, BY 2000 fish were spawned in 2000, released in 2002 and returned as three, four, and five year old fish in 2003, 2004, and 2005

Table: Number of Dworshak and Kooskia NFH spring Chinook salmon returning to the hatcheries and estimates of hatchery fish harvested in the Clearwater River annually from 1987 to 2006. (Pastor, January 2007,p.12)

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1989	1,700	973	0	404	3,077
1990	2,042	1,141	369	644	4,196
1991	165	467	0	0	632
1992	370	312	54	160	896
1993	823	1,180	0	43	2,046
1994	74	232	0	0	306

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1995	125	40	0	0	165
1996	963	202	0	24	1,189
1997	3,150	1,657	741	847	6,395
1998	915	408	99	202	1,624
1999	800	157	0	37	994
2000	3,202	1,581	3,908	1,183	9,874
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2002	2,157	1,037	5,087	1,259	9,540
2003	3,422	965	2,068	1,609	8,064
2004	2,356	718	1,825	808	5,707
2005	882	270	942	275	2,369
2006	1,354	670	495	457	2,976

3. Contributions to conservation

The program is designed to mitigate for lost spring Chinook salmon production due to various water development projects in the Columbia River basin. 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 migrating as well. While they are migrating 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. (KNFH HGMP, sec.2.2.1)

4. Other benefits

Historic - Fishing in the Clearwater River has been a primary activity of indigenous peoples for thousands of years. The Nez Perce people have fished seasonally from these waters for centuries. Their history and culture revolve around the natural world, and they have deep reverence for all living things. Salmon and steelhead have played a significant role in tribal culture, both pre-historic and in the modern era.

The description of steelhead trout by the Lewis and Clark expedition in 1805 was the first scientific documentation of this species in the Clearwater basin. Commercial and sport fishing in the Clearwater began in the late 19th century as the area was settled and developed. Mining, and later logging, were primary economic activities in these early communities, along with agriculture and ranching practices on early homesteads. All had a tremendous impact on the salmon and steelhead fishery.

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The community of Kooskia has been economically supported by the natural resource industry since the 1860's - logging, mining, fish & wildlife recreation, farming, ranching, and non-consumptive recreation.

Present Day - The Nez Perce tribe continues intermittent use of a traditional and historic site on Kooskia hatchery property for cultural purposes, as well as accessing protected fishing grounds from the mouth of Clear Creek up to the hatchery weir.

Kooskia NFH has been open to the visiting public since completion and dedication in August, 1969. The hatchery was designed primarily for Chinook production due to loss of habitat from the construction of down river hydropower projects. In the late 1990's, a public tour route was developed to provide visitors an easy self-guided walking tour of the main buildings and grounds. An interpretive kiosk near the nursery building and main office has brochures and signs available to guide visitors around the hatchery,

In 1993, an annual hatchery Open House and Kids Fishing Day event was begun to coincide with National Boating and Fishing Week activities. Attendance fluctuates yearly, depending on the date and regional economy, but has averaged 413 children aged 12 and under in 14 years.

The hatchery lies within the Northwest Passage Scenic Byway corridor, with Highway 12 paralleling the compound on the South side of the Clearwater River. The Clearwater River canyon is a major travel corridor from East to West, connecting Montana to Idaho, and summer seasonal traffic is greatly increased. The river is an attraction to many seasonal visitors for recreational opportunities including fishing, hunting, rafting, berry picking, swimming and sightseeing.

With the addition of a permanent outreach specialist and assistant, more public programs are being offered on and off hatchery grounds. School groups make up one of the largest groups of visitors in the spring and fall. Summer visitors have increased yearly. Guided group tours have also increased, as well as requests for more specialized educational programs revolving around specific fishery resource issues, or broader aquatic ecosystem themes.

Fishery Benefits - When attempting to estimate the benefits of an anadromous fish hatchery, environmental conditions outside the hatchery are cyclic and beyond the control of hatchery managers. This variability can affect post-release survival of juveniles and numbers of returning adults. During times of good ocean and river conditions resulting in healthy adult returns, significant economic activity is generated through harvest of Dworshak Complex summer steelhead and spring Chinook salmon.

Additionally, the role of a Federal mitigation hatchery is to compensate for natural habitat lost to Federal hydro-projects. Therefore, it can be surmised that the economic benefit of the mitigation hatchery is interwoven into the economic benefit of the hydro-power projects being mitigated for, and that the hatchery can be characterized as an operating expense of the hydro-power project, both of which provide significant benefits to the American public.

The benefits of anadromous fish in the Clearwater River relate to providing a harvestable product on a seasonal basis. Sport, tribal, and commercial fisherman annually take a significant number of the returning hatchery adult fish population.

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Steelhead and Chinook salmon play an important role in the overall aquatic ecosystem, and mean many different things to many different people. They can indicate the health of a watershed, and are a vital link within the natural food chain; they are caught for pleasure or sport; they are used for food, profit, and cultural ceremonies. The majority of people, no matter their background, economic status, education or ability, expect to see or hear of Chinook and steelhead in the Clearwater River and are supportive of the hatchery fish production program.

E. Research, monitoring, and evaluation programs

The IFRO provides monitoring, evaluation, and coordination services for the Dworshak Fisheries Complex. The IFRO staff monitors hatchery returns, measures biological characteristics of the hatchery stock, coordinates fish marking, performs tag recovery, and assists with other aspects of the hatchery program. They maintain databases that store this information and provide data to databases maintained by other entities. The IFRO also provides leadership for the Kooskia HET, which ensures close cooperation and coordination between Kooskia NFH, Dworshak NFH, IFHC, the IFRO and our co-managers, to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally. These activities are described in the following sections:

Database Management - All national fish hatcheries submit distribution data to the fisheries information system (FIS) which is the Service's national database. Kooskia NFH submits distribution, lot history, and adult return information to the Idaho FRO. After review, these files are sent to the Columbia River Fisheries Program Office (CRFPO) for incorporation into the Columbia River Information System (CRIS). Marked release and recovery information is sent to the Fisheries Division of the Western Washington Fish and Wildlife Office for conversion to the Pacific States Commission / Pacific States Marine Fisheries Commission format. The IFRO is responsible for submitting tag, release and recovery files for all PIT-tagging activities conducted on the Complex. Files are submitted to the PIT Tag Information System (PTAGIS), the entity responsible for managing and maintaining all PIT tag data collected for target species in the Columbia River Basin. In addition, the Idaho FRO maintains complete databases of all hatchery information within the office to provide summary data to other State, Federal, and Tribal agencies.

Marking/Tagging Program - Kooskia NFH releases about 600,000 spring Chinook smolts each year. Since 1993 all of the spring Chinook salmon smolts at Kooskia NFH have had the adipose fin removed as a mass mark to identify them as hatchery fish. The mark facilitates selective fisheries and evaluation of wild populations in some areas. In addition to the adipose fin clip, at least one group of 100,000 fish receives a coded-wire tag that represents Kooskia NFH. Coded-wire tags are used to track contributions to ocean and downriver commercial, sport, and Tribal fisheries, as well as to track success of adult returns from evaluation and research studies.

PIT tags have been used at Kooskia NFH since the late 1980's to generate data on run timing and smolt survival to various Lower Snake and Lower Columbia River dams. In 2005, the IFRO obtained funding to evaluate adult returns to Lower Granite Dam using PIT tags. That program calls for tagging of about 10,000 smolts annually for monitoring adult returns.

Bio-sampling and reporting - The Idaho FRO is responsible for sampling all adult summer steelhead and spring Chinook that return to Kooskia NFH. Fish are measured for fork length, checked for coded-wire tags, PIT tags, fin clips and other distinguishing marks, and when

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possible, identified as either male or female. Mark recovery information is used to report success of that production year in terms of smolt to adult return rates. Where groups of smolt were marked to represent various treatment groups of an evaluation study, the data are used to draw conclusions and make recommendations. Final reports are made available to other Service offices, other agencies, and the general public as requested. In addition, marked adults have been used to help separate different runs at the dams in order to adjust harvest.

Hatchery Evaluation Studies - The Hatchery Evaluation Vision Action Plan, developed in 1993 for Region 1 Fisheries, describes hatchery evaluation in greater detail (USFWS 1993). The purpose of hatchery evaluation studies are to evaluate alternative rearing and release strategies designed to improve program efficiency. Data are used to develop recommendations for the Project Leaders and managers. In addition to evaluation of hatchery practices and performance, other studies and evaluations are routinely conducted for associated purposes.

Stock Assessment and Contribution to Fisheries - Coded wire tags are used to monitor adult returns and contribution to fisheries in the ocean, the lower Columbia River, the lower Snake River, and sport and Tribal fisheries in the Clearwater River. Spring Chinook salmon from Kooskia NFH contributes primarily to sport and Tribal fisheries in Clearwater River although some are harvested in various fisheries in the lower Columbia and Snake Rivers.

All release information, including marked to unmarked ratios, is reported to the Pacific States Marine Fisheries Commission (PSMFC). Mark and tag information from sampled fish recovered in the various fisheries and at the hatchery, are also reported.

Juvenile Monitoring - Juvenile fish at Kooskia NFH are monitored monthly by the hatchery staff to determine changes in size and growth rates. Samples are taken monthly for analysis by the IFHC to determine the health condition of fry, fingerling, yearling and smolts prior to release. Sampling of fingerling fish for tag retention and fin mark quality, prior to release, is conducted by Idaho FRO. PIT tagging of spring Chinook was started in 1989. PIT tagging has given us the first indication of success after hatchery releases are made by providing data on travel time and survival to downriver dams.

ESA Assessments, Ecological Interactions, and Natural Production Studies - The Service completes Biological Assessments and Hatchery and Genetic Management Plans to comply with the ESA. These assessments and plans help guide production, considering the potential impacts on the biological community.

To comply with ESA, the Service initiated Biological Assessments for both spring Chinook and bull trout at Kooskia NFH and subsequently completed a draft Hatchery and Genetic Management Plan (HGMP) in 1999. This initial draft HGMP followed an older format and was produced under consultation with NOAA Fisheries to meet ESA Section 7 obligations. The Service and NOAA Fisheries agreed that a more thorough HGMP would be completed once the format was finalized by NOAA Fisheries and the Service. The Idaho FRO completed a more detailed HGMP during the fall of 2002.

This document, considered “phase I draft,” describes current operations at the hatchery and complies with ESA obligations, covering both NOAA Fisheries and Service trust species. It is anticipated that the phase I drafts for all hatcheries, including Kooskia NFH, will be distributed to the co-managers and other interested parties and will serve as the focus for a collaborative, phase II part of the process. Drafts for any proposed new projects/programs will be developed by

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appropriate proponents and also discussed and reconciled during phase II. This process will produce phase II draft plans which will be provided to subbasin planning processes and the appropriate Technical Recovery Team (TRT) for consideration and interaction with those groups.

For HGMP's that involve unreconciled differences, the phase II options could create "scenarios" that can be presented to the TRT for consideration and advice. The phase II draft plans will be completed and set aside (parked) until all HGMPs relevant to an Evolutionarily Significant Unit (ESU) are completed, allowing for ESU-wide considerations and feedback with the TRT/Recovery Planning processes. The HGMP collaborators will incorporate TRT advice as appropriate to ensure consistency with broader recovery objectives. This step culminates in Phase III drafts, which become final and ready to implement after approval by NOAA Fisheries and the Service.

Environmental Monitoring - Environmental monitoring is conducted at Service facilities to ensure these facilities meet the requirements of the National Pollution Discharge Elimination System (NPDES) permit and is also used in managing fish health. Monitoring helps identify when changes in hatchery practices are required. The following parameters are currently monitored at this hatchery:

- Total Suspended Solids (TSS) - Once per month on pollution abatement pond inflow and effluent samples.
- Settleable Solids (SS) - Once per month on pollution abatement pond inflow and effluent samples.
- In-hatchery Water Temperatures—maximum and minimum daily.
- In-hatchery Dissolved Oxygen—as required by stream flow or weather conditions.

Coordination/Communication - Dworshak Complex holds production and planning meetings Annual Operations Plan (AOP) twice annually. Representatives from the Complex, IDF&G, NPT, USACE, and the National Marine Fisheries Service (NMFS) attend regularly. Other agencies and organizations send representatives when topics of discussion are pertinent. The meetings focus primarily on upcoming production plans, reviews of recently completed production activities, interagency production coordination, potential implications of upcoming or ongoing maintenance and construction on production, major fish health issues, and ongoing or planned research.

While long term planning and coordination is handled at coordination meetings, the Kooskia HET is responsible for intracomplex coordination and communication. The Team is composed of representatives from IFHC, Kooskia NFH, the IFRO, and the NPT. The HET does not have a regular meeting schedule but meets as issues and activities require. The Team is responsible for coordinating production activities such as spawning, marking and tagging, smolt releases, fish or egg transfers, or adult outplanting. The HET is responsible for identifying production constraints or opportunities to improve rearing and release strategies. Evaluation or research projects are then designed and conducted to provide the data necessary to make recommendations for implementing change. All research or requests to the hatchery from outside agencies or offices are reviewed by the HET with recommendations for approval/disapproval sent to the Complex Manager for final authorization.

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Fish and Egg Transfers - Fish and egg transfers are coordinated through Kooskia NFH and the IDFG. Researchers working at Kooskia NFH are requested to obtain any pertinent state permits concerning fish and egg transfers to and from Kooskia NFH. Any outside eggs or fish coming on to Kooskia are subject to disinfection protocol established by IHOT and the IFHC.

Ocean Fisheries Management - Spring Chinook salmon produced at Kooskia NFH are not recovered in ocean fisheries in significant numbers and do not influence ocean fishery management decisions.

Freshwater Fisheries Management - Harvestable surpluses of spring Chinook originating from Kooskia NFH are managed by the IDF&G and the NPT. These agencies are responsible for setting regulations for terminal sport and tribal harvests. Fishing regulations are set to provide for adequate escapement for hatchery production and to meet ESA guidelines.

F. Program conflicts

The 1999 NOAA Fisheries Biological Opinion on Artificial Propagation in the Columbia River Basin lists several measures for Kooskia NFH which either must, in the case of Reasonable and Prudent Alternatives, be complied with or, in the case of Conservation Recommendations, should be implemented (NMFS 1999b). At this time, none of those are currently unfunded. However, during development of the Phase II drafts of the HGMPs, there may be actions identified at that time that may not be funded by either the COE or Lower Snake River Complex Plan (LSRCP) where another source of funding may have to be sought.

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

The intake structure poses problems during spring and winter. High flow in the spring result in debris, rocks, sand, and silt potentially blocking the intake entrance and preventing water from going to the hatchery. Personnel manually check the intake structure twice daily to remove any debris that accumulates during spring and summer. Also, in the summer an excavator is contracted out to remove rock, sand, and silt from in front of the intake structure that accumulated there from spring run-off. In the winter ice and slush flows can accumulate on the inclined screens blocking the water flow to the hatchery. In severe winters hatchery personal will man the screen chamber for a 24 hour period (eight hour shifts) to physically remove ice and slush from inclined screens. Inclined screens are lifted to prevent ice formation on the structure and to maintain water flow to the hatchery. (KNFH HGMP, sec.5.7)

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

IDF&G administers the sport harvest within the State, and the NPT administers the Tribal fishery. Because only hatchery spring Chinook salmon that are externally marked with an adipose fin clip can be harvested and it is a requirement for sport fishermen to release all unmarked fish unharmed, we believe there is minimal negative impacts to wild/threatened steelhead.

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3. *Conservation conflicts and risks*

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

- Spring Chinook salmon are not listed in the Clearwater River.
- In the Clearwater River, there are three ESA-listed species and one species of concern. The A-Run summer steelhead, the fall Chinook salmon, and the bull trout are all listed under the ESA and the cutthroat trout is a species of concern. The primary species produced by Kooskia NFH is spring Chinook.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

The release of spring Chinook smolts occurs in spring, usually the last of March or the first week in April. Hatchery releases occur at about the same time as wild/natural steelhead smolts emigrate to the ocean. While they are migrating together, there may be some interaction, but we have no data on the exact nature or extent of the interaction. No effect is expected on fall Chinook salmon from spring Chinook smolt releases at Kooskia NFH since fall Chinook juveniles occupy a completely different habitat type than spring Chinook salmon during this time period.

The Kooskia NFH spring Chinook program has the potential to affect ESA-listed salmonids 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. Hatchery 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. These fish could directly compete with natural steelhead for food. While we don't know if competition from residuals is a threat, we do suspect that the incidence is extremely low.

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 - Hatchery spring Chinook at Kooskia NFH have had Bacterial Kidney Disease (BKD) problems in past years. BKD has been under better control the last several years. Additionally, we strictly adhere to all Integrated Hatchery Operations Team (IHOT) guidelines concerning the release of fish undergoing a disease epizootic. The potential still exists for horizontal transmission of BKD and other diseases from hatchery spring Chinook salmon 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

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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.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

Operation and maintenance includes operation of the adult collection facilities 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 adult collection facilities for returning adult hatchery spring Chinook has the potential for capturing wild adult steelhead. All wild and natural adult steelhead captured during broodstock collection are immediately released back into the river, upstream of the weir/trap. The water intake is screened to prevent fish from being drawn into water destined for the hatchery. Discharge 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 salmonids. All other maintenance or construction activities that could have an impact on water quality or quantity or could possibly impact listed salmonids will be consulted on as they arise. All required state and Federal permits would be obtained prior to any work being initiated.

IV. Hagerman National Fish Hatchery²³

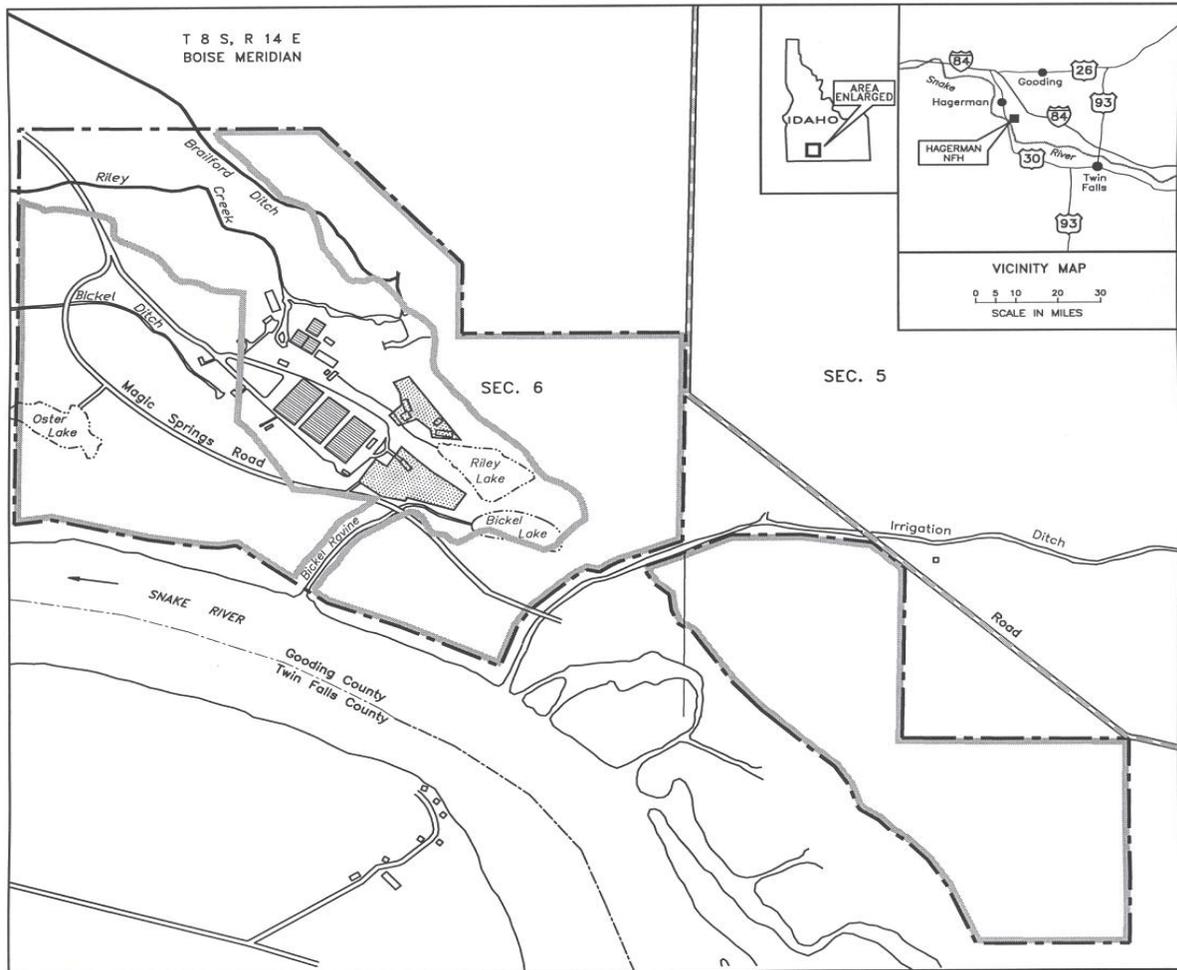
A. Description of hatchery

- The Hagerman NFH (Hatchery) was authorized by 46 Stat, 371 on May 21, 1930, and was established in 1932. Construction of the physical facilities commenced in 1932, and fish production began in 1933. The primary goal of the hatchery, at that time, was the production of rainbow trout for stocking in Idaho, eastern Oregon, and northern Nevada.
- In the late 1970's the Hatchery became part of the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP), which was authorized by the Water Resources Development Act of 1976, Public Law 94-587. The LSRCP is designed to mitigate for fish and wildlife losses caused by the construction of four dams on the lower Snake River. The Hatchery's primary production was changed from resident rainbow trout to steelhead trout as part of the LSRCP.
- The Hatchery is located in Section 6, Township 8S, Range 14E, at a point three miles south and two miles east of Hagerman, Idaho (Figure). The Hatchery consists of 298.57 acres situated on a series of terraces above the Snake River. Of this total acreage, 78.79 are dedicated to the Hatchery administrative site and 219.78 are managed under a Cooperative Agreement with the IDFG as part of the Hagerman Wildlife Management Area.
- Co-located within the Hatchery grounds is the Hagerman Fish Culture Experiment Station (HFCES). Formerly a Service research facility, Congress enacted Public Law 105-346 in 1999 transferring ownership of the facility to the University of Idaho (UI). Due to the close proximity of the HFCES to the Hatchery, the Service and the UI entered into a Cooperative Agreement "to facilitate current and future collaboration between the Service and the UI concerning the management and operation of their contiguous properties." In addition, the Service retained ownership of the water rights for the HFCES.
- The Hatchery has an administration building, two hatchery buildings, a combination shop/garage, a flammable storage building, storage barn, well house, combination maintenance office/apartment, water service building, and four residences. There are 78 outside raceways at the Hatchery. Of these, 66 are devoted to LSRCP steelhead production and 12 are reserved for other fish production programs which the Service deems appropriate. The remaining 24 raceways are not in use at this time. Other major facilities include two hatchery-rearing buildings with a total of 60 rearing tanks, an administration-visitor facility building, a combination shop/four-stall garage, four residences, an oil/paint storage building, and two general storage buildings (see below).

²³ Unless cited otherwise section figures, tables and text from HNFH CHMP.

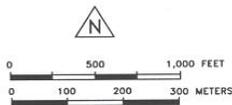
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Figure.: Location map of Hagerman National Fish Hatchery.



Revised: May 2001

HAGERMAN NATIONAL FISH HATCHERY



- LEGEND
- Approved Hatchery Boundary
 - Transferred from USFWS to University of Idaho
 - USFWS lands managed by Idaho Department of Fish and Game

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Figure: Hagerman NFH Hatchery Buildings, Primary Use, and Improvements.

Building	Construction type
Hatchery 1 (new) Tank room 5,106 ft ² Support Area 1,389 ft ²	Pre-engineered metal building with masonry block walls constructed 2002. Includes tank room, crew office, crew locker room, fish pathology lab, cold storage, and feed prep room.
Hatchery 2 Tank Room 2,640ft ² Feed Storage 3,000ft ²	Concrete masonry block constructed in 1983. Includes Tank room, feed storage room and two vehicle garage on south end of building.
Hatchery 1 (old) building is condemned Scheduled for demolition in future (completed in 2006)	Concrete masonry block, wood frame gable roof with transite shingles Holds chiller and its associated plumbing to chill water for fish distribution
Combination Shop, Garage, and Truck Repair 2,566sq.ft ²	Concrete block with wood frame gable roof with transite shingles constructed in 1951. Truck repair shop with asphalt shingles added in 1988.
Residences Q1, Q2, Q3 & Q4	Residences at Hagerman NFH consist of concrete block houses constructed circa 1954.
Administration 2356 ft ²	Concrete Masonry block, constructed 1983. Includes Project leader's office, Assistant Project Leader's office, Program Assistant's office, crew office, combination conference/lunch/break room, storage room, and employees bathrooms.
Storage Building 1,210ft ²	Concrete masonry block covered with rigid insulation and steel siding, wood frame gable roof and asphalt shingles Constructed in 1952 remodeled in 1963.
Oil and Paint Storage 160 ft ²	Cement Block, concrete pad, wood frame, transite shingles. Used to store gas cans, oil, and paint.
Garage 360ft ²	Concrete block, wood frame gable roof cwith transite shingles constructed in 1951.
Storage Building 1,440ft ²	Wood frame covered with steel siding, asphalt shingles, concrete foundation and floor. Constructed 1933.
Pump House 110ft ² old domestic water system	Concrete masonry block, flat composition roof. Contains pump and controls for irrigation and supply to heat pumps at offices and residences. Constructed in 1983
Pump House 192ft ²	Metal building and metal gable roof with concrete pad. Contains domestic water well head, and chlorine treatment system and its controls. Constructed 1996.

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Figure: Hagerman NFH Physical Description of Holding, Incubation, and Rearing Units.

Unit type	Length (ft)	Width (ft)	Depth (ft)	Volume (ft ³) ¹	No	Material	Age (yrs)	Condition
Steelhead raceways	103.0	10.0	3.0	3,000	66	concrete	20	good
Rainbow Trout raceways	70.0	8.0	2.5	1,350	12	concrete	20	good
Incubator jars	n/a	0.75	1	1	64	fiberglass	???	good
Hatchery 1 nursery tanks	15.8	3.2	2.0	90	40	fiberglass	<1	new
Hatchery 2 nursery tanks	15.2	3.1	2.0	85	20	concrete	20	excellent

¹Volumes listed refer to living space.

- Hagerman NFH operates with a staff of 9. This includes the Project Leader, Assistant Project Leader, Staff Fishery Biologist, two Animal Caretakers, two Motor Vehicle Operators, one Maintenance Mechanic, and one Fishery Program Assistant. Volunteers are utilized to assist with outreach activities and station operations when available.
- The Hatchery receives 100% of its operations budget from reimbursable funds; the LSRCF funds the steelhead rearing program and the US Army Corps of Engineers (COE) funds the Dworshak Reservoir Mitigation program through a redistribution of funds from Dworshak NFH for the production of rainbow trout.

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Table: Water Rights at Hagerman National Fish Hatchery

U.S. Fish and Wildlife Service Water Rights at Hagerman National Fish Hatchery				
Spring Name	IDWR No.	Volume	Purpose	Priority Date
Bickel Spring Creek	36-00128	2.00	Fish Propagation	01/18/1889
Riley Creek	36-00130	1.50	Fish Propagation	01/18/1889
Springs 11 & 13*	36-00132	6.00	Fish Propagation 6.0 cfs, Domestic 0.89 cfs, Irrigation 0.22 cfs; Stockwater 0.02 cfs	06/15/1910
Bickel Spring Creek	36-15444	20.30	Fish Propagation	01/01/1933
Riley Creek	36-15446	4.50	Fish Propagation	01/01/1933
Spring (Main) & Springs 12,13, &14	36-15448A	11.43	Fish Propagation	01/01/1933
Spring (Main) & Springs 12, 13, & 14	36-15448B	8.57	Fish Propagation	01/01/1950
Spring 15	36-15449	4.50	Fish Propagation	01/01/1933
Len Lewis Spring 16	36-15450	21.20	21.2 cfs for fish propagation during non-irrigation season and 8.0 cfs for fish propagation during irrigation season.	01/01/1950
Spring 17	36-15451	4.59	Fish Propagation	01/01/1959
Springs 8 & 9*	36-00131	1.0	Fish Propagation	06/15/1910
Springs 8 & 9*	36-15447	0.5	Fish Propagation	01/01/1966
Spring 10*	36-00129	1.00	Fish Propagation	01/18/1899
Spring 10*	36-15445	0.6	Fish Propagation	01/01/1966
Springs 8, 9, & 11*	36-08354	1.5	Fish Propagation	05/06/1988
Groundwater	36-08750	0.04	Domestic (Year-round)	03/13/1996
Bickel Spring & Riley Creek	36-15961	20.55	Fish Propagation (5/6 to 6/19)	11/19/2001

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B. Hatchery water sources

- The Hatchery's water supply is spring-fed at a constant 59 degrees Fahrenheit with a flow rate of approximately 30,000 gallons per minute.
- The intake structures of the Bickel, Riley, Main spring systems have wire mesh screening, while the Brailsford Intake has perforated plate in place to separate debris from the water prior to it entering rearing units. The screens are checked and cleaned daily. Screening to preclude anadromous or listed stocks does not apply since these stocks do not inhabit the springs.
- Because of the number of spring sources spanning several hundred yards of basalt rock escarpment the Hatchery's water delivery system has evolved into a complex system of ponds, concrete catch basins, weirs, collection boxes, various valve and stop log control structures and associated pipelines. All water used for fish rearing is delivered via gravity flow. This system requires 25 individual points of measurement to accurately quantify water use. Water use is measured weekly and reported annually as required by the Idaho Department of Water Resources (IDWR).
- The following describes the Hatchery's various water use points and source water for those points.

Location

New Hatchery 1

Incubation

Rearing Tanks

Hatchery 2

Incubation

Rearing Tanks

Steelhead raceways

Trout Raceways

Source Water

Springs 13&14

Main Spring Diversion system (includes Main Spring and Springs 13,14,15,16)

Brailsford Intake includes Springs 13,14,15,&16

Brailsford Intake includes Springs 13,14,15, & 16

Mixing Chamber (Bickel spr, Riley Creek spr and main Spring Diversion system)

Spring 17 and Main Spring Diversion System

Water Fill Points

Fish Transports (Water Chiller)

(15,000 gal. of water can be chilled and stored)

Portable Fish transport tank

and Fire Truck fill point

Irrigation System, Heat Pumps

and Wash Down Hydrants

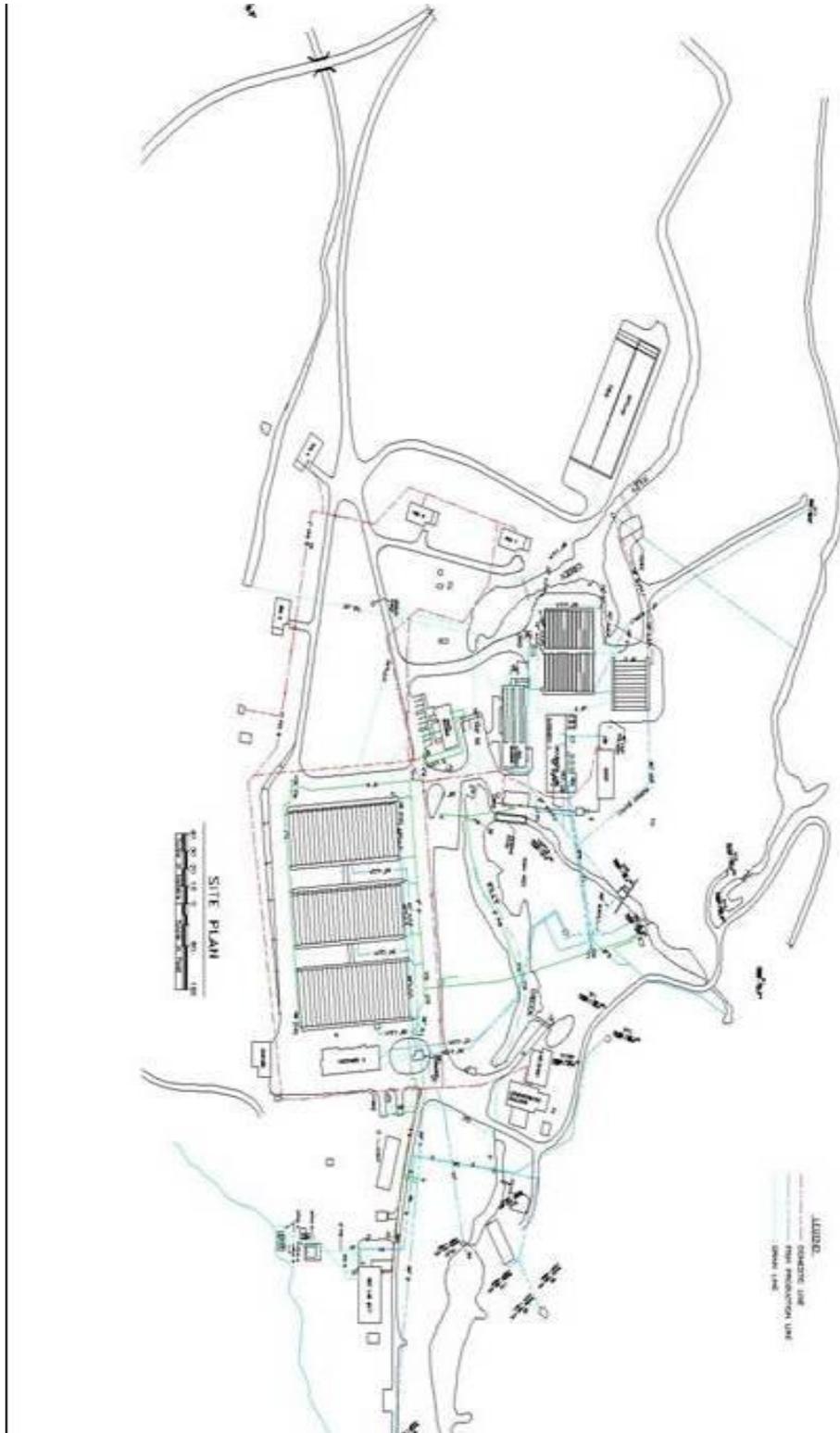
Springs 13&14

Springs 13 & 14

Springs 13, & 14

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Figure.—Layout Diagram of Hagerman National Fish Hatchery water supply system.



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Table: Monthly average waterflow from spring at Hagerman NFH from 1999-2008.

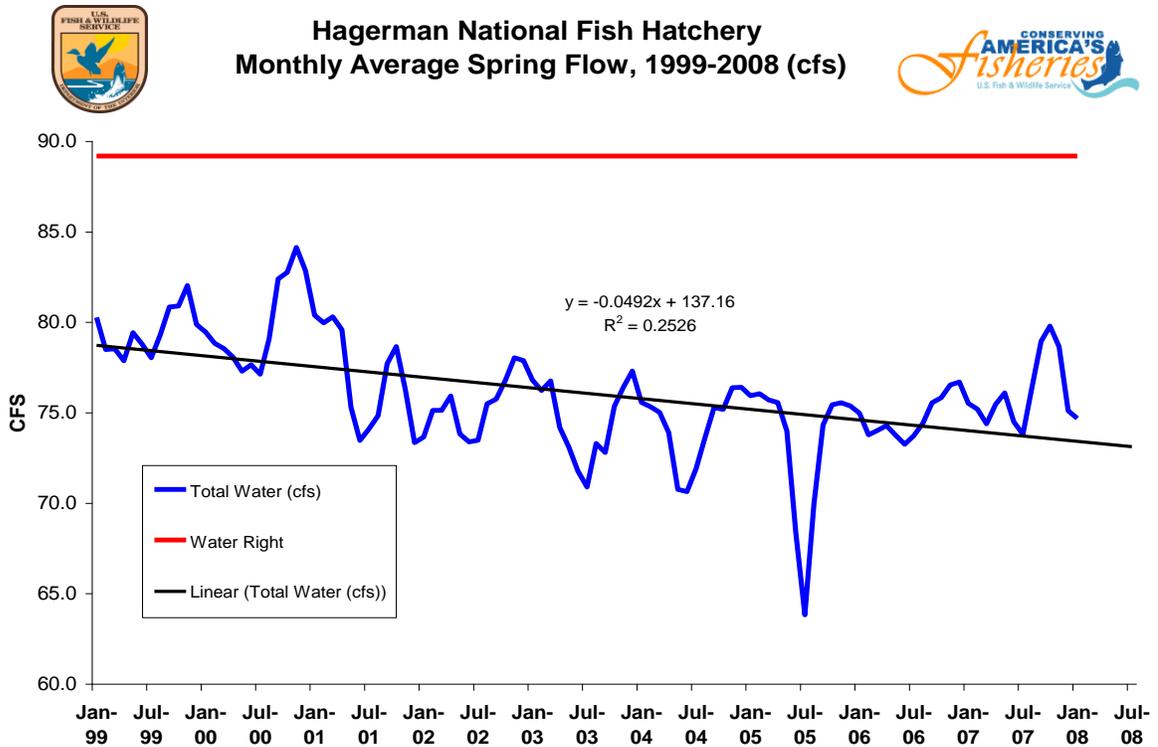
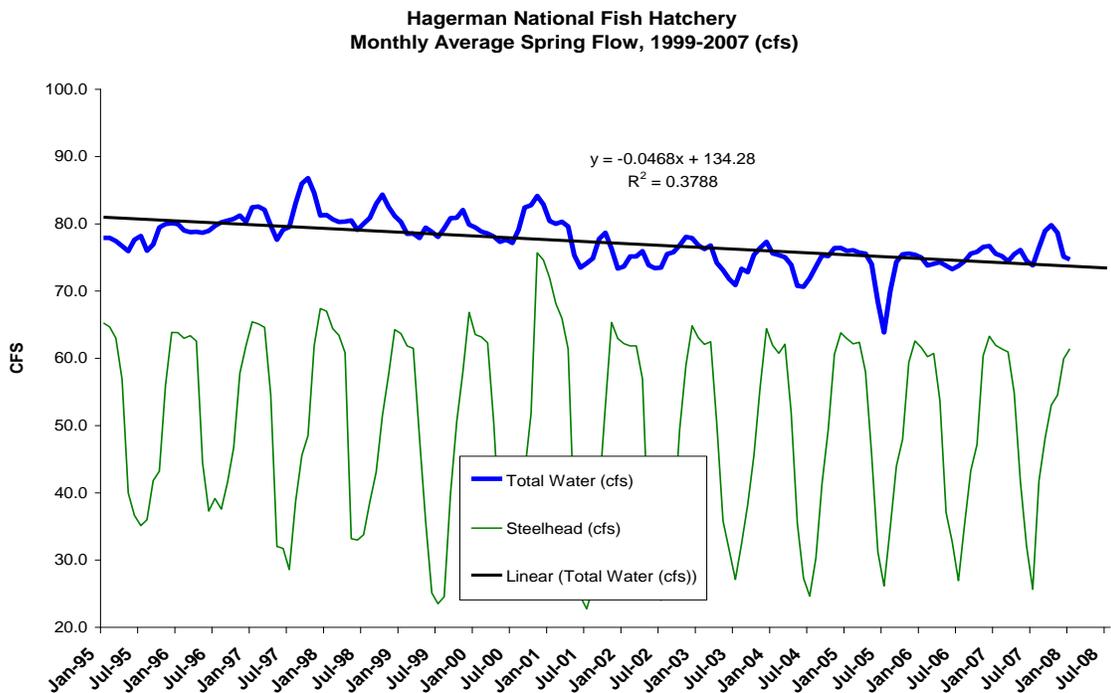


Table: Monthly average waerflow from spring at Hagerman NFH from 1999-2007.



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Table: Water usage at Hagerman NFH.

Water at Hagerman NFH, 2007 (cfs)		
	Min	Max
Total	73.8	79.8
% of Right	82%	89%
STT Water	25.6	61.9

- The Hatchery operates and maintains two pump stations to meet water delivery requirements for senior water rights. These two mechanisms are crucial to the efficient operation of the steelhead production program. Operational agreements for these systems allow the Hatchery to divert, out-of-priority, a portion of its required water supply for fish rearing, providing that the water is delivered immediately after use to the senior users.
- The Bickel Ditch system addresses an agreement with IDFG established during the expansion of the Hatchery in the early 1980's (U.S. Army Corps of Engineers 1980). It is concerned with water diverted from Bickel Spring. As part of the agreement the Corp of Engineers installed two 25 hp electric pumps in a sump at the tail end of the steelhead raceways. After water is diverted through the steelhead raceways it is delivered to the Bickel Ditch for use by the IDFG at the Hagerman WMA for irrigation and to the Oster lakes. At times when water is not diverted through the pump station there is an option to deliver water gravity feed via a pipeline from the Main Spring Diversion.
- The Brailsford Ditch pump-back system addresses an Idaho Fifth District Court approved agreement developed by the Department of Justice with the Brailsford Ditch Association which also includes IDFG (State of Idaho 1997). It allows the hatchery to continually divert water from the Len Lewis Spring (Spring 16) to the steelhead raceways during peak hatchery water demand (late fall and early spring) when the Brailsford Ditch Association makes a call for water during the irrigation season. Currently the IDWR recognizes February 15 through November 30 as the irrigation season. Water, diverted through the steelhead raceways, is discharged into Riley Creek, and is then picked up in a pump station located several hundred feet downstream in the creek. The water is diverted via a 300 hp pump back to the Brailsford Ditch Association conveyance ditch located several hundred feet downstream from their Len Lewis Spring diversion.

C. Adult broodstock collection facilities

The Hatchery operates under cooperative program management between the Service and the Idaho Department of Fish and Game (IDFG). The Hatchery receives eyed eggs from brood stock collected by IDFG at various broodstock collection facilities and is responsible for incubation and rearing to the smolt stage.

D. Broodstock holding and spawning facilities

See section C above.

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E. Incubation facilities

Strategies and procedures are similar for both resident and anadromous programs. Generally, only eyed eggs are received for incubation at the Hatchery. Upon arrival, the eggs are disinfected in a standard 100 ppm iodine solution for 10 minutes. The eggs are enumerated using either the Von-Bayer or displacement method. Approximately 20,000 eggs are placed into upwelling jars. The jars are supplied with 59°F spring water at a flow rate of six to eight gpm. Eggs are kept separate by spawn day to ensure even hatching among individual jars. Hatching usually occurs within three to five days.

F. Indoor rearing facilities

For the most part, strategies and procedures are similar for both resident and anadromous programs. Fry are poured out of the incubation jars and into inside rearing tanks after approximately five days. When 80 percent of the fry have swum-up, initial feeding begins. Fish are fed a minimum of every hour and up to eight times a day. Fish are fed dry commercially available salmon diets until they reach 250 fish per pound.

G. Outdoor rearing facilities

- At a maximum target density index of 0.80, fish are moved to outside raceways at two tanks per outside raceway. Steelhead are moved outside in late July and early August. The upper and middle decks are used for initial outside rearing. Once outside, fish are hand fed dry extruded floating salmon diets. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. The fish may be vaccinated in August. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. After splitting, fish are fed utilizing demand feeders. A representative group of fish from each stock being reared receives PIT tags in March. Rainbow trout are moved outside to the trout raceways in February and April. During the entire outside rearing cycle, all raceways are cleaned (swept) twice weekly. Sample counts are taken monthly, and length frequency checks are done periodically.

- The following are carrying capacity parameters not to be exceeded at Hagerman National Fish Hatchery

Hatchery Tanks	Density index	0.8
	Flow index	1.0
Raceways	Density index	0.2
	Flow index	
	fish size < 80 fpp	0.8
	fish size ≥ 80 and ≤ 15 fpp	1.0
	fish size > 15 fpp	1.2

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- Due to the reuse of water in the steelhead raceways, flow index for an individual raceway should not exceed 30% of the total system flow index when three banks are in use (20% if only two reuses).

H. Release locations and facilities

Smolts are transported to various sites in the Salmon River Basin for release and emigration to the Pacific Ocean and subsequent return as adults. The IDFG is responsible for developing and managing smolt release strategies, monitoring and evaluation activities, brood stock collection and spawning.

I. Outmigrant monitoring facilities

See Section H above.

J. Additional or special facilities

Cleaning effluents from nursery tanks and outside raceways are diverted to an off-line settling basin (OLSB) system where solids are removed prior to discharge to Riley Creek. Hatchery effluent is monitored according to the requirements of our National Pollution Discharge Elimination System (NPDES) permit. This permit requires periodic monitoring of flow, temperature, total suspended solids (TSS), total phosphorus (TP), and settleable solids (SS) (SS will be eliminated in the new permit which is still in draft format).

A complete description of all NPDES permit-mandated effluent criteria can be found in our permit (EPA 1999). There are two criteria which the Hatchery has, at times, failed to meet. These are removal efficiency standards for OLSB systems which require the removal of at least 90% of incoming TSS and 95% of incoming SS. The occasional failure to meet these criteria is due to the significant dilution of solid waste before it reaches the OLSB system. Our OLSB influent normally has concentrations of TSS and SS that are very diluted compared to those of many commercial fish hatcheries. The Environmental Protection Agency (EPA) and the Idaho Department of Environmental Quality (IDEQ) are aware of this unique situation, and they have not chosen to take any enforcement actions because these violations have not resulted in any environmental damage. The Hatchery will also monitor phosphorous when IDEQ finalizes the waste load allocation for aquaculture facilities in the mid-Snake River reach. This allocation will establish a daily limit the Hatchery will be authorized to discharge in its effluent and may limit the amount of fish that can be produced at the facility.

K. Outreach and public education facilities/programs

Recognizing that it is increasingly important for all staff to be involved in gaining or retaining public support for our programs, the outreach program at the Hatchery strives to ensure that staff are well-informed about policies, procedures, and issues; and that staff are willing and able to interact with our various publics. Program efforts will include providing information to staff, partners, and volunteers; through them, to members of the community and other publics. Outreach

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will be used as a management tool, providing support to the Service, the public, and our hatchery programs.

On Station. On station activities include: self guided tours and guided tours when requested by schools or other large groups. Information is provided to visitors at a well constructed information station which directs visitors via signs to all aspects of the hatchery, at an interactive touch screen computer kiosk that allows visitors to get information at their own pace, and a brochure rack which allows visitors to take home a variety of Service publications. The Hagerman Fifth Grade Class annually visits the Hatchery for an outdoor education day. When sufficient funding is available, volunteers stay at the hatchery on a full hook-up site, and serve as hatchery hosts to answer questions, and disseminate general information.

Off station. The Hatchery annually teams up with the IDFG to hold a Free Fishing Day event at the Hagerman State FH. The state fish hatchery has ample space and fishing waters in close proximity to efficiently handle the two hundred kids and parents that participate annually. Additional support for the event includes local sporting goods vendors, Boy Scouts, and concerned citizens.

As funding is available, the Hagerman NFH seeks partnerships to conduct environmental and wildlife education oriented programs directed towards local area schools.

The Hagerman NFH also maintains a web site whereby cyber-visitors can read and learn about the Hatchery, the Fisheries program, and other Fisheries related topics on the World Wide Web.

L. Special issues or problems (e.g. water and property rights issues, law suits, etc.)

Aquatic Nuisance Species. All hatcheries must consider their potential for adversely affecting the aquatic community and Hagerman NFH is no exception. Of particular concern is the potential impact of New Zealand Mud Snails (NZMS) to the Snake River ESU. To meet our obligation in this regard, Hagerman NFH implemented an Aquatic Nuisance Species-Hazard Analysis and Critical Control Point Plan (ANS-HACCP). Within this plan, control points are identified during the rearing cycle, which help minimize potential spread of NZMS around and from the facility. In addition, the Idaho FRO developed a risk analysis plan that was used to determine the potential risk involved regarding the spread of NZMS.

Beginning in release year 2004 (BY03) Hagerman NFH B steelhead were no longer released into the Clearwater River (restricted to the Salmon River) due to concerns about potential spread of New Zealand mud snails which were found in Hagerman NFH's water supply. New Zealand mud snails have been found in the Salmon River Basin but have not been found in the Clearwater Basin. [Mr. JK]

Water Quality and Quantity. Water quantity and quality in the aquifer and the mid-Snake River Reach is of regional concern. Land use practices associated with irrigated agriculture, municipal and industrial development, population growth, and large animal confined feeding operations (2,000 to 5,000 cow dairy farms) are suspected in diminishing the water quality of the aquifer and river. The (IDEQ) listed Riley Creek as water quality limited (water quality segment 2385) in 1994 due to bacteria, dissolved oxygen, sediment, nutrients, and nitrogen as pollutants of concern.

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It remains on the Clean Water Act 303(d) list and will be under a Total Maximum Daily Load (TMDL) for settleable solids and total phosphorous when established by IDEQ. (These limits are in the draft EPA NPDES Permit)

Continuous monitoring of the Hatchery springs has shown a steady decline in flow. On average spring flows diverted to the hatchery are approximately 15% below the Hatchery water rights. Other spring users in the Thousand Springs area report similar or greater declines. It is generally understood that continued ground-water withdrawals, changes in the efficiency of irrigation practices, and periods of drought, have combined to diminish spring flows emanating from the ESRPA. A number of basin-wide initiatives are being considered to address this issue.

Hagerman Fish Culture Experiment Station (HFCES). Because of their close proximity, the Hatchery maintains a cooperative agreement with the University of Idaho to insure that fish rearing and other programs do not cause adverse effects at either facility. University employees continue to use the hatchery entrance road. The MOU with the University requires their traffic to use their own entrance way. (USFWS & U of I, June 12, 2007)

Law Enforcement. The Hatchery must rely on IDFG Law Enforcement and the County Sheriff to provide service on the Hatchery grounds and adjacent high public use areas including the WMA and Oster Lakes. Their rapid response is often difficult due to workload and distance constraints.

IVA. Hagerman NFH B-Run Steelhead

A. General information

- The Hagerman NFH was authorized by 46 Stat, 371 on May 21, 1930, and was established in 1932. Construction of the physical facilities commenced in 1932, and fish production began in 1933. The primary goal of the hatchery, at that time, was the production of rainbow trout for stocking in Idaho, eastern Oregon, and northern Nevada.
- In the late 1970's the Hatchery became part of the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP), which was authorized by the Water Resources Development Act of 1976, Public Law 94-587. The LSRCP is designed to mitigate for fish and wildlife losses caused by the construction of four dams on the lower Snake River. The Hatchery's primary production was changed from resident rainbow trout to steelhead trout as part of the LSRCP

B. Stock/Habitat/Harvest Program Goals and Purpose

1. *Purpose and justification of program*

- With the Congressional Authorization of the LSRCP in the late 1970's, The Corp of Engineers, the Service, and representatives of the respective state agencies evaluated numerous options and sites to construct the necessary facilities for the LSRCP mitigation program. As part of that analysis, the parties agreed to the expansion of the Hatchery as an appropriate and feasible option to supply a portion of the steelhead production required for the State of Idaho. Included in this decision was the construction of twelve 8 x 80 concrete raceways that would allow the Service to meet other Federal and Tribal fishery obligations.
- **LSRCP Steelhead.** The Hatchery operates under cooperative program management between the Service and the Idaho Department of Fish and Game (IDFG). The Hatchery receives eyed eggs from brood stock collected by IDFG at various broodstock collection facilities and is responsible for incubation and rearing to the smolt stage. Smolts are transported to various sites in the Salmon River Basin for release and emigration to the Pacific Ocean and subsequent return as adults. The IDFG is responsible for developing and managing smolt release strategies, monitoring and evaluation activities, brood stock collection and spawning.

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2. Goals of program

The purposes for Hagerman NFH can be met by accomplishing five Goals, adapted from the federal authorizing legislation cited above, the Endangered Species Act (ESA) Biological Opinions, and U.S. v. Oregon.

Goal 1: Meet the Lower Snake River Compensation Plan mitigation goal of returning 13,600 adult summer steelhead to the project area above Lower Granite Dam annually.

Objective 1.1: Collect and spawn sufficient numbers of adult summer steelhead for broodstock annually.

Task 1.1.1: Collect sufficient green steelhead eggs to produce 1.4 million eyed eggs for transfer to Hagerman National Fish Hatchery for hatching and rearing. The eggs will come from adults recovered at either Sawtooth Fish Hatchery, Pahsimeroi Fish Hatchery, Oxbow Fish Hatchery, Dworshak National Fish Hatchery, or other temporary adult recovery structures.

Task 1.1.2: Sample all adults used in spawning for disease, and cull fertilized eggs from those with unacceptably high probability of disease.

Objective 1.2: Rear about 1.3 million summer steelhead smolts annually for release into the Salmon River Basin.

Task 1.2.1: Maintain incubation success to meet LSRCP performance measures and production goals.

Task 1.2.2: Perform rearing in accordance with established protocols, SOPs, and production goals.

Objective 1.3: Produce the healthiest, highest quality fish possible at every stage of production.

Task 1.3.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.

Task 1.3.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 1.3.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, brood stock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.

Task 1.3.4: Provide a high quality rearing habitat within the hatchery that favors hatchery production without compromising fish health and condition.

Task 1.3.5: Minimize chemical and drug use during fish rearing.

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Objective 1.4: Conduct monitoring and evaluation activities that will provide information on the progress of the hatchery in meeting its adult return goal for summer steelhead.

Task 1.4.1: Conduct regularly scheduled Hatchery Evaluation Team meetings.

Task 1.4.2: Biosample returning adult summer steelhead for fish health and genetic purposes as needed.

Task 1.4.3: Use coded-wire tags to evaluate adult recoveries from production groups.

Task 1.4.4: Use PIT tags to monitor and track juvenile migration performance through the Columbia River corridor.

Task 1.4.5: The Harvest Monitoring Biologist generates estimates of adult returns of summer steelhead to the project area as outlined in the Cooperative Agreement between the LSRCF and Idaho Department of Fish and Game.

Objective 1.5: Cooperate and coordinate with the Idaho Department of Fish and Game, the Nez Perce Tribe and the Shoshone Bannock Tribes.

Task 1.5.1: Conduct annual coordination meetings.

Task 1.5.2: Distribute data and reports as appropriate.

Goal 2 Use the additional 12 raceways to help meet U.S Fish and Wildlife Service obligations and needs.

Objective 2.1 Produce sufficient rainbow trout to meet the mitigation requirements for Dworshak Dam and Reservoir.

Objective 2.2 Obtain sufficient numbers of rainbow trout eggs of the appropriate genetic background to meet the management goals of the cooperators.

Objective 2.3 Produce 90 K spring fingerlings (5 in.).

Task 2.3.1: Maintain incubation success to meet established performance measures and production goals.

Task 2.3.2: Perform rearing in accordance with established protocols, SOPs, and production goals.

Objective 2.4 Produce 40 K fall catchables (9 in.).

Task 2.4.1: Maintain incubation success to meet established performance measures and production goals.

Task 2.4.2: Perform rearing in accordance with established protocols, SOPs, and production goals.

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Objective 2.5 Produce the healthiest, highest quality fish possible at every stage of production.

- Task 2.5.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.
- Task 2.5.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
- Task 2.5.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, brood stock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.
- Task 2.5.4: Provide a high quality rearing habitat within the hatchery that favors hatchery production without compromising fish health and condition.

Objective 2.6 Cooperate and Coordinate with the Idaho Department of Fish and Game and Dworshak NFH.

- Task 2.6.1: Establish and maintain regular communication and coordination with Department of Fish and Game.
- Task 2.5.2: Provide data and reports as appropriate.

Goal 3: Assure that all the requirements of legal orders and federally mandated legislation are met.

Objective 3.1: Conduct hatchery operations for summer steelhead consistently with requirements and obligations called for under the Endangered Species Act.

- Task 3.1.1: Mass mark selected lots of summer steelhead to identify them from naturally produced fish.
- Task 3.1.2: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).
- Task 3.1.3: Implement measures to minimize interactions between production and natural fish.
- Task 3.1.4: Draft and implement a Hatchery and Genetic Management Plan.
- Task 3.1.5: Meet ESA established size at release criteria.

Objective 3.2: Operate the hatchery so that all requirements and obligations called for under the Clean Water Act are satisfied.

- Task 3.2.1: Meet requirements for Best Management Practices and QAQC.
- Task 3.2.2: Collect and analyze water samples monthly in accordance with the NPDES permit.
- Task 3.2.3: Meet requirements of TMDL for phosphorus and sediment.

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Objective 3.3: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) production and harvest objectives.

Task 3.3.1: Provide pertinent data and information to Service representatives on U.S. v Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 3.3.2: Meet tribal trust responsibilities.

Objective 3.4: Meet the requirements for the National Invasive Species Act.

Task 3.4.1: Work under the recommendations of the Western Regional Panel and the Aquatic Nuisance Species Task Force.

Task 3.4.2: Implement Hazard Analysis and Critical Control Point plans for the summer steelhead and rainbow trout production programs.

Goal 4.0: Develop outreach to enhance public understanding, participation and support of the Service and Hagerman NFH programs.

Objective 4.1: Continue developing a proactive outreach program, to increase visibility of Hagerman NFH.

Task 4.1.1: Encourage a partnership of southern Idaho Service facilities to fund an outreach coordinator, and coordinate with other federal, state, and local information/public affairs offices to incorporate information about Hagerman NFH.

Task 4.1.2: Staff the hatchery when funding is available with Hatchery Hosts (May - August) to answer questions, and disseminate general information. Advertise early for hatchery hosts.

Task 4.1.3: Seek partnerships and outside funding (Challenge Grant) to develop teacher education workshops.

Task 4.1.4: Coordinate with Idaho Department of Fish and Game to assist with special events, such as Free Fishing day.

Task 4.1.5: Maintain website for the Hagerman NFH to inform cyber-visitors of programs, history and general information.

Task 4.1.6: Cooperate with the University of Idaho to maintain the information kiosk with the most recent fisheries information.

Goal 5.0: Ensure that all hatchery activities are conducted safely and that all hatchery facilities and equipment are properly maintained.

Objective 5.1: Conduct preventive maintenance on all hatchery equipment according to established SOPs.

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- Task 5.1.1: Follow SOP's on regular and annual maintenance of hatchery operating equipment, including: chillers, fish pumps, dissolved oxygen meter, pond scrubber, electric weir, freezers, etc.
- Task 5.1.2: Follow SOP's on inspection and maintenance of tractor/trailers prior to distribution, to include dissolved oxygen supply systems, watering and dewatering, general safety, and road worthiness.
- Task 5.1.3: Follow procedural maintenance guidelines and schedules for hatchery support equipment, to include water supply and delivery systems, pumps, alarm systems, raceway and tank maintenance, and miscellaneous electrical equipment.
- Task 5.1.4: Follow recommendations and standards as established under BPA and LSRCP Performance Measures.

Objective 5.2: Conduct regular safety and health program activities.

- Task 5.2.1: Hold regular safety meetings to discuss selected issues, problems, and topics.
- Task 5.2.2: Follow OSHA and other pertinent safety guidelines.
- Task 5.2.3: Review and revise the station's Safety and Health Plan according to Service policy.
- Task 5.2.4: Maintain and follow established MSDS guidelines.

3. Objectives of program

The Hagerman NFH LSRCP goal is to provide adult returns for lower river fisheries and return 13,600 adult steelhead over Lower Granite Dam and back to the Snake River Basin. 215,000 Dworshak B steelhead eggs for the program are obtained from Clearwater FH. The fish are reared from eyed eggs to smolts at Hagerman NFH, and transported for direct stream release at multiple sites in the Salmon River drainage. (IDG, March 12, 2007,, p.13)

4. Type of program (Integrated or Segregated)

Segregated harvest

5. Alignment of program with ESU-wide plans

The 1999 NOAA Fisheries Biological Opinion on Artificial Propagation in the Columbia River Basin lists a host of measures which either must in the case of Reasonable and Prudent Alternatives (RPA), be complied with, or in the case of Conservation Recommendations, should be implemented (NMFS 1999). Currently, the only RPA that is directly applicable to the Hatchery is the size at which summer steelhead are released. The constant 59 degree Fahrenheit rearing water temperature promotes rapid fish growth. The only means of reducing growth rate is by restricting dietary intake which may stress the fish and result in fish health and smolt quality concerns.

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6. *Habitat description and status where fish are released.*

- Unlike other subbasins in the Columbia River basin, the Salmon subbasin has large areas where the composition, structure, and function of the aquatic, wetland and riparian ecosystems have been relatively undisturbed by anthropogenic effects. (NWPPC, March 23, 2007, p.3-10)
- Twelve percent of the total stream length in the Upper Salmon watershed is identified as being impaired by sedimentation. There are about 2,585 points of water diversion and record of 603 stream-alteration permits. There are 216 road culverts in the Upper Salmon watershed, and only 10 are known to allow adult fish passage. Sediments impact approximately 12% of streams in the watershed, with the Salmon River, Yankee Fork, and seven other creeks in the watershed included on the 303(d) list as sediment -impaired streams. (NWPPC' Salmon River Subbasin Plan, p3-12)
- The primary limiting factor expressions in the mainstem Salmon River from the Pahsimeroi River upstream to the East Fork Salmon River (excluding the area known as the 12-mile reach) are increased fine sediments and reduction in discharge (primarily at low flows) Some barriers to fish movement from the mainstem into tributaries are present. These barriers are a concern because fish use the tributaries as thermal refuge when water temperatures in the main river increase. (NWPPC, March 12 2007, p.3-13)

7. *Size of program and production goals (No. of spawners and smolt release goals)*

The Hagerman B steelhead program obtains approximately 215,000 eyed eggs from Clearwater FH to incubate, rear and release 100,000 smolts into the East Fork Salmon River and 100,000 smolts into the Little Salmon River.

C. Description of program and operations

1. *Broodstock goal and source*

Hagerman NFH will request and disinfect eyed eggs (Dworshak B from Clearwater FH). Eyed steelhead eggs will be shipped between 370 and 450 TUs. Shipments will occur in May and June 2007. Egg shipments and deliveries will be coordinated with Clearwater FH. (NWPPC, March 12 2004, sec. 1.2.4.1)

2007 Summer Steelhead Eyed Egg or Swim Up Fry Requests. (NWPPC, May 28 2004, p.84)

Requesting Hatchery or Program	Source/Hatchery Stock	Current Year Request	Comments
Hagerman NFH	Dworshak NFH - B's	215,000	Via Clearwater FH

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2. *Adult collection procedures and holding*

Eyed eggs for Hagerman NFH are obtained from Clearwater FH.

3. *Adult spawning*

a) Spawning protocols

Eyed eggs for Hagerman NFH are obtained from and Clearwater FH.

b) No. of males and females spawned each year over past 10 years (Table)

Eyed eggs for Hagerman NFH are obtained from Clearwater FH.

4. *Fertilization*

a) Protocols

Eyed eggs for Hagerman NFH are obtained and Clearwater FH.

b) Number of eggs collected and fertilized each year over past 10 years (Table)

5. *Incubation*

- Strategies and procedures are similar for both resident and anadromous programs. Generally, only eyed eggs are received for incubation at the Hatchery. Upon arrival, the eggs are disinfected in a standard 100 ppm iodine solution for 10 minutes. The eggs are enumerated using either the Von-Bayer or displacement method. Approximately 20,000 eggs are placed into upwelling jars. The jars are supplied with 59°F spring water at a flow rate of six to eight gpm. Eggs are kept separate by spawn day to ensure even hatching among individual jars. Hatching usually occurs within three to five days.
- Eyed eggs are loaded into upwelling incubators at 20,000 to 25,000 eggs per jar with a flow rate of 6 to 8 gallons per minute (gpm). Typically, the Sawtooth stock is reared in Hatchery Building 1, and the Pahsimeroi and Dworshak stocks are reared in Hatchery Building 2. Sac fry are transferred from incubators into indoor rearing tanks and feeding is initiated when 80% of the fry achieve swim-up. Feeding typically begins 15 to 17 days post-hatch. Semi-moist salmon diets are fed at a minimum frequency of once per hour during rearing in the hatchery buildings. Flows in rearing tanks are ramped up to, and then maintained at, 60 gpm. Fish are reared inside to a maximum density index of 0.60 and a maximum flow index of 1.00. Fish are transferred at two tanks per outside raceway in late July and August at approximately 180 fpp. (NWPPC, March 12 2007, sec.1.2.4.2)

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6. Ponding

a) Protocols

- For the most part, strategies and procedures are similar for both resident and anadromous programs. Fry are poured out of the incubation jars and into inside rearing tanks after approximately five days. When 80 percent of the fry have swum-up, initial feeding begins. Fish are fed a minimum of every hour and up to eight times a day. Fish are fed dry commercially available salmon diets until they reach 250 fish per pound. At a maximum target density index of 0.80, fish are moved to outside raceways at two tanks per outside raceway. Steelhead are moved outside in late July and early August. The upper and middle decks are used for initial outside rearing. Once outside, fish are hand fed dry extruded floating salmon diets. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. The fish may be vaccinated in August. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. After splitting, fish are fed utilizing demand feeders. A representative group of fish from each stock being reared receives PIT tags in March. During the entire outside rearing cycle, all raceways are cleaned (swept) twice weekly. Sample counts are taken monthly, and length frequency checks are done periodically.
- The following are carrying capacity parameters not to be exceeded at Hagerman National Fish Hatchery

Hatchery Tanks	Density index	0.8
	Flow index	1.0
Raceways	Density index	0.2
	Flow index	
	fish size < 80 fpp	0.8
	fish size \geq 80 and \leq 15 fpp	1.0
	fish size > 15 fpp	1.2

- Due to the reuse of water in the steelhead raceways, flow index for an individual raceway should not exceed 30% of the total system flow index when three banks are in use (20% if only two reuses).
- The upper and middle decks are used for initial outside rearing. Once outside, fish are hand-fed the Hagerman Diet, a dry extruded floating salmon diet developed by the Abernathy Fish Technology Center. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. All fish are fed a dry extruded floating diet which is placed into demand

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feeders twice weekly. The NOAA Fisheries 180 to 250 mm length at release criteria is met by adjusting the hatchery constant. Sample counts are performed monthly on representative ponds and length frequencies are checked periodically. During February or March 2007, IDFG staff PIT tag a representative group of fish from each stock being reared. (NWPPC, March 12 2007, sec.2.4.3)

b) Number of fry ponded each year, including % hatch each year

Table: Survival of Dworshak Steelhead eggs reared at Hagerman NFH. Data listed below is for A-run steelhead, we would expect B-run survival to be similar. (HNFH B Steelhead HGMP, p.23)

Brood Year	# Eggs Taken	% Survival Green to Eyed	% Survival Eyed to Nursery Tanking (A-run)	% Survival Eyed to Nursery Tanking (B-run)
2006			98.00	97.42
2005			98.58	98.04
2004			97.66	98.13
2003			97.47	88.58
2002			98.96	97.27
2001			98.00	97.20
2000			98.30	87.26
1999			97.21	
1998			98.19	
1997			97.23	
1996			97.88	
1995			97.50	
1994			95.67	
1993			96.82	
1992			97.31	
1991			98.29	
1990			97.77	
1989			n/a	
1988			n/a	

% Eye-up is enumerated eye-up (after green culls).

Hatching success in %.

7. Rearing/feeding protocols

Fry are poured out of the incubation jars and into inside rearing tanks after approximately five days. When 80 percent of the fry have swum-up, initial feeding begins. Fish are fed a minimum of every hour and up to eight times a day. Fish are fed dry commercially available salmon diets until they reach 250 fish per pound. At a maximum target density index of 0.80, fish are moved to outside raceways at two tanks per outside raceway. Steelhead are moved

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outside in late July and early August. The upper and middle decks are used for initial outside rearing. Once outside, fish are hand fed dry extruded floating salmon diets. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. The fish may be vaccinated in August. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. After splitting, fish are fed utilizing demand feeders.

8. *Fish growth profiles*

Magic Valley and Hagerman National fish hatcheries rear juvenile steelhead under constant water temperature (15.0°C) conditions. As such, both facilities experience similar growth rates and design feeding schedules to produce fish between 180 and 250 to the pound at release. Length gained per month for the first three months of culture at both facilities is typically between 0.8 and 1.0 inches (20.3 to 25.4 mm). Fish gain approximately 0.65 to 0.75 inches per month (16.5 to 19.1 mm) thereafter. To meet the release size target, fish may be fed on an intermittent schedule beginning in their fourth month of culture. (IDFG Salmon River A Steelhead HGMP,p38)

9. *Fish health protocols and issues*

- A pathologist from the Idaho FHC visits periodically to examine fish at the hatchery. From each stock and brood year of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.

Diagnostic Examination - A pathologist will normally check symptomatic fish during a monthly examination. However, additional diagnostic examinations will be conducted as needed when determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. Samples may be sent by overnight carrier to the FHC for diagnosis in the case of urgency.

Ponding Examination - The first health exam of newly hatched fish occurs when approximately 50% of the animals are beyond the yolk sac stage and begin feeding. Sixty fish will be sampled and tested for virus.

Pre-release Examination - At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus

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(IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.

[Salmon River AOP, p1.2.4.4]

- Juvenile fish health monitoring is conducted monthly, except when there are no fish on station, and diagnostic exams are performed as needed. The Idaho Fish Health Center performs these tasks. Pre-liberation inspections are performed at least two weeks prior to the first day of liberation. Prior to release, a 60 fish sample is taken and assayed for IHNV, IPNV, VHSV, *Aeromonas salmonicida*, *Yersinia ruckeri*, and BKD. Fish health exam forms are provided to the hatchery as well as a summary at year-end.
- "Soreback", a deep wound in the dorsal musculature, appears to be brought on by steelhead nipping, dorsal fin erosion, and possibly compounded by the parasitic microsporidean *Nucleospora salmonis* (an immunosuppressor) and opportunistic bacteria like *Aeromonas hydrophila*. Soreback causes some mortality that occurs in the fall and is most prominent in the B run Clearwater steelhead juveniles (Idaho Fish Health Center records and Hagerman NFH monthly reports).
- The Clearwater steelhead experience increased mortality, beginning in January/February which continues to escalate in March. Total mortality can approach up to 9.4%. It is hypothesized that *N. salmonis* plays a role in this syndrome. The A-run steelhead stocks are not similarly affected. A study to identify the cause ruled out water quality issues and concluded that the out-of-basin Clearwater stock may be poorly adapted to the Hagerman Valley with its harder water and/or endemic pathogens (USFWS August 2006).

10. Chemotherapeutant use

- The Hatchery strives to minimize the use of chemicals and drugs in fish production. This reduces impacts on the local environment, makes compliance with the various safety regulatory agencies much easier, and reduces risks to employees.
- (*Flavobacterium psychrophilum*), and to control infestations of external protozoan parasites (*Gyrodactylus* spp.). The Hatchery has not used any chemotherapeutants (on the steelhead as per personal communication with K. Clemens, IDFHC) since the mid-1990's. Furunculosis is treated with medicated feeds (Romet, florfenicol, or Terramycin). Bacterial coldwater disease is treated with Terramycin or florfenicol medicated feeds. Fish afflicted with bacterial coldwater disease may also be treated with Diquat to address external bacterial growth. Applications of florfenicol can be done under a veterinary feed directive issued by a veterinarian.. florfenicol is administered orally at a target dosage of 15mg of drug per kg of fish per day for 10 days. Diquat is used only under an INAD permit, and it is administered as an immersion treatment (flow-through or standing bath) at 2 to 28 mg/l. External protozoan parasites can be treated with Formalin. Formalin application is done via a standing bath to ensure compliance with effluent limitations (0.7 mg/l) pertaining to its use in waters discharging to Riley Creek. Riley Creek is designated under Idaho Sate Water Quality Standards and the Clean Water Act, 303d list for cold water aquatic life, salmonid spawning, primary contact recreation, domestic water supply, and special resource water. The Hatchery consults with the Idaho FHC prior to any uses of chemotherapeutants.

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- Salmonid egg hardening and disinfection with an iodine compound is required by Service policy to minimize/prevent transmittance of viral and bacterial pathogens. All eggs received by the Hatchery are disinfected in a 100 ppm iodine solution for ten minutes. Vaccines for furunculosis and enteric redmouth disease have been used intermittently in the past with mixed results. All fish handling equipment is disinfected after each use.
- **Other Fish Health Precautions.** Fish transport tanks and fish marking trailers are disinfected before being brought onto the station and after use at the hatchery. Abernathy Fish Technology Center provides quarterly feed analysis to ensure fish feeds are free of contaminants and the feed meets nutritional requirements of fish.

11. Tagging and marking of juveniles

- All harvest mitigation fish are marked with an adipose fin clip. To evaluate emigration success and timing to main stem dams, PIT tags are inserted in production release groups annually. To evaluate adult return success, CWT tags are inserted in release groups annually. Coded wire-tagged fish may receive an additional ventral fin clip. Other releases may be released unmarked. (IDFG Salmon River A Steelhead HGMP,p43)
- Numbers of fish marked, mark type, and release location are established by the annual IDFG Steelhead Mark Plan which incorporates other agreements and processes such as US vs Oregon. Generally, numbers marked break out as follows: 200,000 AD clipped Dworshak B. In addition, a representative number of fish from each release site receives PIT tags (February 2008). Marking and tagging must occur in mid August 2007. Marking is coordinated with Niagara Springs FH, Magic Valley FH, and the IDFG Marking Crew. (IDFG, March 12, 2007, sec.1.2.4.5)

Table: LSCRP PIT Tag Request for BY07 Releases.

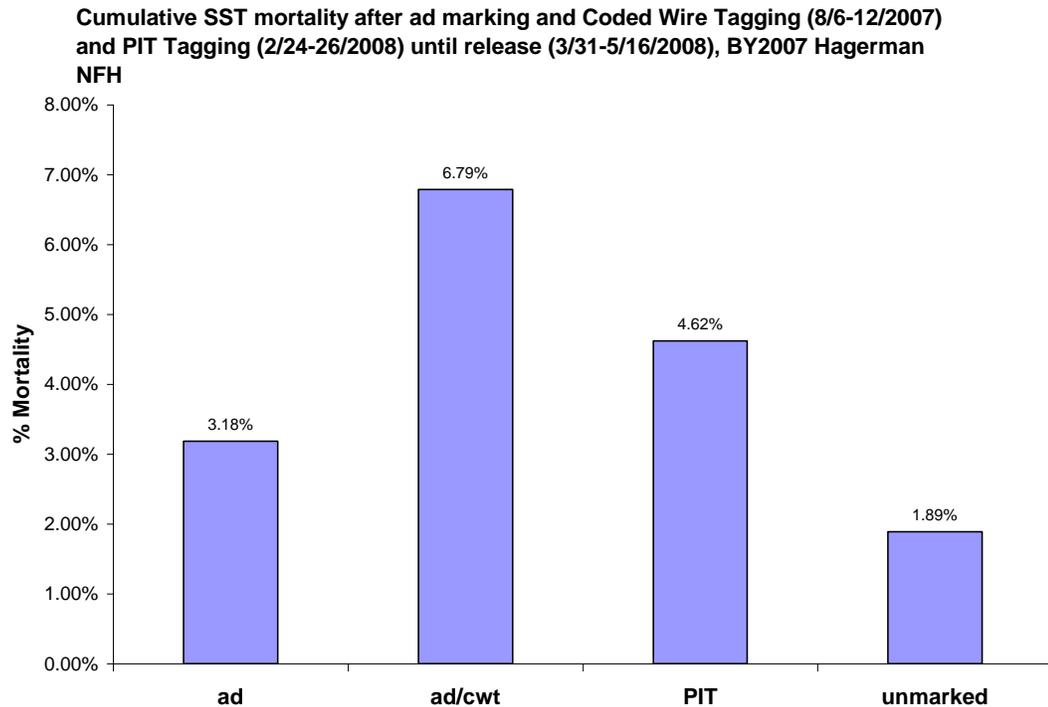
Fish			Brood	Release	Program	PITTAG Total	Adult PIT No.
Hagerman NFH	FWS	Dwor B	2007	L Salmon R - Stinky Springs	100,000	3,810	
Hagerman NFH	FWS	Dwor B	2007	EF Salmon R - Lower	100,000	1,890	
Hagerman NFH	FWS	Pah A	2007	L Salmon R - Stinky Springs	160,000	0	
Hagerman NFH	FWS	Pah A	2007	L Salmon R - Hazard Cr	40,000	0	
Hagerman NFH	FWS	Pah A	2007	Slate Cr	40,000	980	
Hagerman NFH	FWS	Saw A	2007	Sawtooth Weir	750,000	9,278	
Hagerman NFH	FWS	Saw A	2007	Yankee Fork	140,000	1,732	
Hagerman NFH	FWS	Saw A	2007	Yankee Fork	160,000	0	

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Table: LSRCP, Salmon River Basin B Steelhead Proposed Releases, 2007. (IDFG, March 12, 2007, p.74)

Stock	Brood Year	Release Location	Program Goal	Estimated Release	# AD	# CWT	# PIT	Other Marks	Comments
Dwor B	2006	L. Salmon R. Stinky Springs	100,000	97,000	97,000		300		Production
Dwor B	2006	East Fork Salmon R.	100,000	100,500	100,500		300		Production
			200,000	197,500	197,500		600		

Table: Cumulative Summer Steelhead mortality after adipose fin marking, coded wire tagging, and pit tagging, BY 2007 NFH.



- Data from BY2007 rearing at Hagerman National Fish Hatchery suggests that marking and tagging may increase overall raceway mortality for steelhead smolts. The BY2007 Salmon River Annual Operating Plan Mark Plan included: 1.01 million adipose clipped smolts, 140,000 Coded Wire Tagged (CWT) smolts, 440,000 unclipped smolts, and 31,000 PIT tags split between release groups. Hence, some PIT raceways were not adipose

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clipped, yet PIT tagged. On the other hand, all CWT smolts were ad clipped. No smolts were CWT and PIT tagged. Raceways were generally tagged with 1000 to 3200 PIT tags per raceway. Total smolt mortalities from raceways that were partially CWT or PIT tagged were also included in the mortality analysis because of the stress induced by crowding and handling additional fish from these raceways. BY2007 tagging was increased from BY2006 by 29,500 PIT tags and 60,000 CWT. Smolt numbers for each mark category in BY2007 were 679,560 Ad clipped only; 171,204 Ad clipped/CWT or partial CWT tag; 339,443 PIT tagged or partial PIT tag, and 255,885 unmarked and untagged. (personal communication, Bryan Kenworthy, June 2008)

12. Fish Release

a) Protocols

- Steelhead smolt release size is targeted to be between 180 and 250 millimeters in length (NMFS 1999). The targets are set to minimize potential impacts of non-listed steelhead on listed fish populations. Smolts are distributed utilizing semi-tractors and 5,000 gallon capacity fish transport tankers. The Hatchery adheres to the IHOT guidelines established for fish distribution. Distribution begins in early April, and continues throughout the second week of May. Duration of transport time ranges between five and ten hours, depending on the location of the release site. Chilled water, reduced tanker densities, and Point Four™ oxygen stones are utilized to reduce stress during hauling. The smolts reared by the Hatchery are released into the East Fork Salmon River and Little Salmon River in Idaho.
- Beginning in release year 2004 (BY03) Hagerman NFH B steelhead were no longer released into the Clearwater River (restricted to the Salmon River) due to concerns about potential spread of New Zealand mud snails which were found in Hagerman NFH's water supply. New Zealand mud snails have been found in the Salmon River Basin but have not been found in the Clearwater Basin. [Mr. JK]

b) Number of fish released each year (subyearlings?; yearlings?; other?)

2008 Release Site	Hatchery	Run	Release Goal	Type
Sawtooth FH	HNFH	"A"	810,000	Seg
Yankee Fk.	HNFH	"A"	240,000	Seg
E.F. Salmon R.	HNFH	"B"	100,000	Seg
Little Salmon R.	HNFH	"A"	200,000	Seg
Little Salmon R.	HNFH	"B"	100000	Seg

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Dwor B	2006	L. Salmon R. Stinky Springs	100,000	97,000	97,000		300		Production
Dwor B	2006	East Fork Salmon R.	100,000	100,500	100,500		300		Production
			200,000	197,500	197,500	0	600		

D. Program benefits and performance

Table: List of program “Performance Indicators”, designated by “benefits” and “risks”. (DNFH B steelhead HGMP, p.4-5)

Benefits Performance Standards	Performance Indicators	Monitoring and Evaluation
1) Emulate life history characteristics of wild “B” run steelhead.	Age composition, body size, sex ratio, juvenile emigration timing, adult run timing, and spawn timing of natural and hatchery fish are similar over generations.	Evaluate age composition, body size, sex ratio, and adult return timing of natural and hatchery steelhead.
2) Re-introduction of steelhead into the SF Clearwater basin.	Increase in redd counts and natural production.	Conduct annual redd surveys and juvenile surveys.
3) Surplus hatchery steelhead available for outplanting in underseeded habitat in the SF Clearwater basin.	An average of 550 female steelhead are needed to meet Dworshak’s broodstock and another 650 females to meet other programs needs. Additional fish will be outplanted in underseeded habitat.	Adults will be selected for outplanting in SF Clearwater basin at time of collection at the hatchery. Juvenile monitoring will evaluate the contribution of these steelhead to natural production in the Clearwater basin.
4) Maximize survival of hatchery steelhead 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.
5) Release healthy, functional smolts from Hagerman NFH.	Annually releases up to ~200,000 marked smolts from Hagerman NFH.	Three to six weeks prior to release or transfer, fish health specialists will give 60 fish from each lot a health exam.
6) Juvenile releases from	The adult production goal from	Smolt to adult survival rates

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Benefits	Performance Standards	Performance Indicators	Monitoring and Evaluation
	Hagerman NFH survive and return to the river in sufficient numbers to rebuild the natural run.	the ~200,000 smolts released from Hagerman NFH (plus IDFG releases) should provide a sufficient return to rebuild the natural run.	will be estimated for each brood year. Juvenile surveys conducted by IDFG and the Nez Perce Tribe will estimate natural production.
	7) Fulfill legal/policy obligations of fall harvest/production agreement.	Release of ~200,000 un-clipped steelhead in SF Clearwater tributaries.	Monitor emigration of PIT tagged smolts. Assess dorsal fin quality of smolts to evaluate adult returns of un-clipped hatchery fish as identified by dorsal erosion.

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) 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.
	3) Minimize potential negative ecological interactions.	No change in ecological parameters.	Evaluate potential negative ecological interactions.
	4) Assess genetic impacts among hatchery vs. wild where interaction exists	No change in genetic diversity of wild population.	Compare genetic profile of natural fish in the SF Clearwater River to genetic profile of hatchery population.
	5) Minimize straying of hatchery fish to areas outside of the basin.	Stray rate of Hagerman released steelhead is below 5% of the receiving population.	Monitor stray rate of hatchery population by tracking a sub-sample of returning adults.
	6) Juvenile hatchery releases minimize interactions with wild fish species.	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.

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1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Salmon River releases of B-run steelhead occurred in Slate Creek, the East Fork Salmon River, and the Little Salmon River between 1988 and 1996 (the period reported below). The table summarizes sport harvest for releases with complete return years. Fish reared at Magic Valley FH. (IDFG Salmon River B Steelhead HGMP, p.20)

Release Year	No. Fish Released	Release Site	Estimated Harvest	Hatchery Returns ^a	Total	Smolt-to-Adult Return Rate
1996	236,297	Slate Creek	27	12	39	0.02
1996	490,374	E.F. Salmon River	182	42	224	0.05
1996	403,281	Little Salmon River	331	331	662	0.16
1995	215,935	Slate Creek	50	2	52	0.02
1995	488,705	E.F. Salmon River	554	39	593	0.12
1995	342,680	Little Salmon River	246	105	351	0.10
1994	211,355	Slate Creek	198	5	203	0.10
1994	516,585	E.F. Salmon River	375	143	518	0.10
1994	238,725	Little Salmon River	98	97	195	0.08
1993	187,100	Slate Creek	169	24	193	0.10
1993	497,400	E.F. Salmon River	225	25	250	0.05
1993	325,300	Little Salmon River	164	164	328	0.10
1992	1,041,200	E.F. Salmon River	66	22	88	0.01
1992	302,335	E.F. Salmon River	304	20	324	0.11
1992	300,534	Little Salmon River	0	0	0	0.00
1991	967,800	E.F. Salmon River	2,416	112	2,528	0.26
1991	540,733	E.F. Salmon River	29	4	33	0.01
1991	577,433	Little Salmon River	362	141	503	0.09
1990	64,150	E.F. Salmon River	23	1	24	0.04
1990	132,071	E.F. Salmon River	243	34	277	0.21
1990	792,129	E.F. Salmon River	686	87	773	0.10
1990	393,352	Little Salmon River	437	437	874	0.22
1990	162,700	Slate Creek	0	0	0	0.00
1989	353,300	E.F. Salmon River	632	73	705	0.20
1989	436,576	E.F. Salmon River	408	41	449	0.10
1989	303,557	E.F. Salmon River	402	134	536	0.18

^a *Includes rack returns and in-river escapement.*

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b) Return timing and age-class structure of adults

East Fork Salmon River broodstock collection history. (IDFG Salmon River B Steelhead HGMP,p33)

Brood Year	Adults			Green Eggs	Juveniles
	Females Spawned (hatch./nat.)	Males Spawned (hatch./nat.)	Jacks		
1988	79	59	n/a	448,034	n/a
1989	79	72	n/a	415,000	n/a
1990	105 (105/0)	108 (108/0)	n/a	537,015	n/a
1991	25 (25/0)	31 (31/0)	n/a	100,902	n/a
1992	37 (37/0)	53 (53/0)	n/a	150,790	n/a
1993	43 (43/0)	57 (57/0)	n/a	211,993	n/a
1994	25 (25/0)	38 (38/0)	n/a	103,100	n/a
1995	14 (14/0)	17 (17/0)	n/a	53,370	n/a
1996	35 (35/0)	34 (34/0)	n/a	161,632	n/a
1997	84 (84/0)	55 (55/0)	n/a	435,954	n/a
1998	3 (3/0)	3 (3/0)	n/a	11,550	n/a
1999	16 (16/0)	16 (16/0)	n/a	62,442	n/a
2000	15 (15/0)	15 (15/0)	n/a	67,389	n/a
2001	30 (27/0)	20 (20/0)	n/a	142,348	n/a
2002	17 (7/0)	11 (11/0)	n/a	98,302	n/a

Note: Numbers of females and males spawned and resulting eggs generated for 1988 through 1995 represent East Fork Salmon River events only. From 1996 forward, numbers of fish spawned and eggs generated include Slate Creek and Squaw Creek trap sites.

c) Smolt-to-adult return rates

See above.

d) Stock productivity (e.g. recruits per spawner)

No information provided.

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2. Contributions to harvest and utilization (e.g. food banks)

- According to the IDFG HMP, the steelhead fishery in Idaho accounts for between 50-80% of the total return of steelhead adults from Hagerman NFH releases. While there is no clear trend to the data, it appears that a larger return sees higher exploitation in the fishery, with a roughly constant number escaping to the Sawtooth weir. Contribution of off-site releases to the fisheries in the Clearwater and Little Salmon rivers are much harder to get a good estimate for. Adult steelhead returning to the Little Salmon River are not recovered at a weir, so the only estimate of return comes from creel surveys.
- Fisheries that benefit from the release of hatchery-origin, B-run steelhead include sport, tribal, and commercial fisheries in Oregon, Washington and Idaho. Idaho fisheries for B-run steelhead begin at the Washington-Idaho border and occur in the Clearwater River Basin, the mainstem Snake River, and the Salmon River Basin. Salmon River releases of B-run steelhead occurred in Slate Creek, the East Fork Salmon River, and the Little Salmon River between 1988 and 1996 (the period reported below).
- *Estimated Harvest and escapement of Hagerman NFH B-Run releases (IDFG Steelhead Harvest Reports)*

Return Year	Estimated Harvest	Hatchery & Estimated In-River Returns	Total Return
2006/2007	364	43	407
2005/2006	203	0	203
2004/2005	35	0	35
2003/2004			
2002/2003			
2001/2002			
2000/2001			
1999/2000			
1998/1999			
1997/1998			

- *The table summarizes sport harvest for releases with complete return years. (IDFG Salmon River B Steelhead HGMP, p.20)*

Release Year	No. Fish Released	Release Site	Estimated Harvest	Hatchery Returns^a	Total	Smolt-to-Adult Return Rate
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1989	303,557	E.F. Salmon River	402	134	536	0.18

^a Includes rack returns and in-river escapement.

Interpreting steelhead harvest estimates by hatchery for Idaho releases.

- The Idaho Department of Fish and Game estimates the harvest of steelhead by recreational anglers using a telephone survey. A combination of roving creel surveys and check stations are used to recover coded micro-wire tags in Idaho to estimate the contribution of various hatchery releases to the recreational harvest. There are at least three known areas of technical concern with the existing methodology. First, the fraction of the harvest sampled in the lower Salmon River, and Clearwater areas has been extremely low

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historically (see Hanson 2006) and this severely limits precision of estimates. Second, many fish are released off-station and hence the escapement is not directly enumerated, rather, escapement must be estimated by assuming various patterns of harvest rates between release groups that share similar origin. Third, some anglers are reluctant to allow samplers to recover CWT's from large "trophy-sized" fish.

- Estimates of harvest outside of Idaho are made using reports provided by other agencies through the PSMFC database system. In recent years, Idaho has reduced/eliminated using a LV clip to flag a CWTed steelhead except for some releases of "B-Run" fish. We understand that not all Mainstem Columbia and Columbia River tributaries electronically screen steelhead harvest and as such data reported by these agencies may be biased. Last, no estimates are currently reported for steelhead release groups that do not have a representative CWT component.

3. Contributions to conservation

Hatchery production for harvest mitigation is influenced but not linked to habitat protection strategies in the Salmon Subbasin and other areas. The NMFS has not developed a recovery plan specific to Snake River steelhead, but the Salmon River B-run steelhead program is operated consistent with existing Biological Opinions. (IDFG Salmon River B Steelhead HGMP,p20)

4. Other benefits

- The economic benefit to the state of Idaho from steelhead fishing has not been quantified in recent years. An extensive survey conducted by the University of Idaho of 1982 steelhead fisherman suggested a perceived value to the fisherman of \$25-32 per trip depending on the estimating technique used (Donnelly *et al.* 1985). The study considered travel distance, and fishing quality, and concluded that a doubling of fishing quality due to either size or number could produce an approximate 30% increase in the value of the trip. This is an especially significant finding considering the great increase in total steelhead returns to Idaho during the end of the nineties.
- A thorough analysis on the benefit of steelhead fishing to the state of Idaho is expected to be completed by the summer of 2004. This will show the results of surveys sent out for each of the last four quarters covering the 2003 fishery, which includes the spring portion of the 02-03 return year, and the fall portion of the 03-04 return year.
- Every year, IDFG conducts a survey of angler effort and harvest as part of the Harvest Monitoring Program (HMP) under LSRCP. Effort is expressed as number of angler days fished, though the survey does not actually take note of the number of hours fished during the day. Therefore, the survey may reflect the number of trips, rather than the actual angling effort, which is probably more important when considering the recreational and economic impacts of fishing.
- Angling effort fluctuates depending on several socio-economic factors in addition to run size and timing. For the 2001-2002 steelhead season, there were about 22,000 angler/days on the Snake River, 15,000 angler/days on the Little Salmon River, and 148,000

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angler/days on the Salmon River. For the 2002-2003 season, those numbers were 18,000, 18,000, and 145,000 respectively. While Hagerman NFH steelhead were components of all of these fisheries, the Salmon River fishery would be expected to contain a greater proportion of Hagerman NFH steelhead than the other two fisheries, since the Salmon River fishery would include adults returning from only Hagerman NFH, Magic Valley FH, and a portion of the release from Niagara Springs FH.

- **Harvest Contribution and Economic Benefits.** According to the IDFG HMP, the steelhead fishery in Idaho accounts for between 50-80% of the total return of steelhead adults from Hagerman NFH releases. While there is no clear trend to the data, it appears that a larger return sees higher exploitation in the fishery, with a roughly constant number escaping to the Sawtooth weir. Contribution of off-site releases to the fisheries in the Clearwater and Little Salmon rivers are much harder to get a good estimate for. Adult steelhead returning to the Little Salmon River are not recovered at a weir, so the only estimate of return comes from creel surveys. Harvest of Hagerman NFH fish in the Clearwater River fishery generally consists of steelhead that have moved up into the cooler Clearwater River during the fall, before continuing their migration up the Snake River.
- **Cultural Values.** Both the Nez Perce Tribe and the Shoshone-Bannock Tribes share in the harvest of steelhead produced by the Hatchery. Both Tribes have a strong value system based on the traditional roles hunting, gathering and fishing played in their culture. Many of their stories and legends depict their close relationship with the natural environment. Steeped in long tradition, they now use their value system to look to the future to protect and enhance natural resources. In the area of fishery resources, both Tribes participate as co-managers with the States, Service and other Federal agencies to protect fish and wildlife important to their culture. With vision and commitment both Tribes maintain and operate multi-faceted fishery management programs in an effort to sustain the resource.

E. Research, monitoring, and evaluation programs

As a cooperator under the LSRCP the IDFG provides monitoring, evaluation, and coordination services concerning Hagerman NFH production. The IDFG staff monitors biological characteristics of the hatchery stock, fish marking, tag recovery, and other aspects of the hatchery program. The Service maintains the database that stores this information and serves as a link to databases maintained by other entities. The FRO also cooperates with the Hatchery, FHC, Abernathy Fish Technology Center, and the co-managers to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally. These activities are described in the following section:

Database Management. The Fisheries Information System (FIS) is a national database system for the Service's Fisheries Program. Each Service field office contributes to this database. The FIS consists of five different databases, two of which, Fish and Egg Distribution databases document production accomplishments from all National Fish Hatcheries. This database is discussed further in Chapter 4.

Information from and about the Hatchery is connected to the broader fisheries community of the West Coast of the North American Continent through the Service Columbia River (information)

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System (CRiS), the PTAGIS database managed by the Columbia River Fish Passage Office, and the Pacific States Marine Fishery Commission coded-wire database system. The following information is recorded in files that are components of the CRiS database: egg development and disposition; the origin of fish raised at the hatchery; and fish transfers and releases. The Hatchery maintains files containing information generated on incubation, rearing, and distribution. Staff from the FRO maintain files containing information on marked juvenile fish.

Use of CRiS database files and programs achieves the following multiple purposes: 1) reduces the amount of effort expended to meet reporting requirements, 2) increases the quality and consistency of data, 3) facilitates development of software usable at all stations, 4) provides a platform on which to build effective evaluation tools which can be used by hatcheries, fisheries management and regional offices, and 5) facilitates the exchange of information with other agencies. For example, release and recovery information is reported to both the Regional Mark Information Center and the StreamNet databases.

Computer programs that are components of the CRiS database are used to transform data into formats required by other agencies. These formats can be either electronic or printed. Other CRiS programs combine data from the hatchery, Idaho FRO, and from databases maintained by other agencies into other formats to accomplish reporting, monitoring, and evaluation.

Marking/Tagging Program. Juvenile fish are fin clipped, coded-wire tagged and/or PIT tagged at the Hatchery by personnel from the IDFG. Marks are used to evaluate fish culture techniques, survival, and fishery contribution. Presently, about two-thirds of the steelhead are adipose fin clipped to indicate their hatchery origin and availability to the fishery. This action complies with recommendations of NMFS (1999) and the Reinitiating of Consultation on Operation of the Federal Columbia River Power System, under the Endangered Species Act-Section 7 Consultation (NMFS 2000).

Bio-sampling and Reporting. Adult steelhead returning to Sawtooth FH are scanned for coded-wire tags (CWT). Additional CWT information is collected during bio-sampling of the sport fishery by IDFG. The CWT recovery information is used to evaluate the relative success of individual brood stocks and hatchery practices, as well as compare performance between years and hatcheries. Passive Integrated Transponder tags (PIT) are utilized to track downstream migration timing, and smolt survival through the mainstem Columbia River system. Fork length, sex, and marks of returning adult steelhead are monitored by IDFG at Sawtooth FH to evaluate the run composition and brood year contribution.

Hatchery Evaluation Studies. Hatchery evaluation is the use of replicable, statistically defensible studies to guide management decisions. The hatchery evaluation vision action plan developed in 1993 for Region 1 Fisheries describes hatchery evaluation in greater detail (USFWS 1993). The Hatchery conducts evaluations under the oversight of a Hatchery Evaluation Team (HET). The HET consists of staff from Hagerman NFH, Idaho FRO, Idaho FHC, LSRCP, and IDFG. The purpose of the HET is to determine what does and doesn't work through planning, implementing, documenting, monitoring, analyzing, and reporting. Listed below are the evaluation studies conducted with anadromous species since 1979. For further information, contact the Idaho FRO, Dworshak Fishery Complex, Ahsahka, Idaho.

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

All hatcheries must consider their potential for adversely affecting the aquatic community and Hagerman NFH is no exception. Of particular concern is the potential impact of New Zealand Mud Snails (NZMS) to the Snake River ESU. To meet our obligation in this regard, Hagerman NFH implemented an Aquatic Nuisance Species-Hazard Analysis and Critical Control Point Plan (ANS-HACCP). Within this plan, control points are identified during the rearing cycle, which help minimize potential spread of NZMS around and from the facility. In addition, the Idaho FRO is developing a risk analysis plan that can hopefully be used to determine the potential risk involved regarding the spread of NZMS for a particular stocking program in a particular habitat in a watershed.

Water Quality and Quantity. Water quantity and quality in the aquifer and the mid-Snake River Reach is of regional concern. Land use practices associated with irrigated agriculture, municipal and industrial development, population growth, and large animal confined feeding operations (2,000 to 5,000 cow dairy farms) are suspected in diminishing the water quality of the aquifer and river. The (IDEQ) listed Riley Creek as water quality limited (water quality segment 2385) in 1994 due to bacteria, dissolved oxygen, sediment, nutrients, and nitrogen as pollutants of concern. It remains on the Clean Water Act 303(d) list and will be under a Total Maximum Daily Load (TMDL) for settleable solids and total phosphorous when established by IDEQ.

Continuous-monitoring of the Hatchery springs has shown a steady decline in flow. On average spring flows diverted to the hatchery are approximately 15% below the Hatchery water rights. Other spring users in the Thousand Springs area report similar or greater declines. It is generally understood that continued ground-water withdrawals, changes in the efficiency of irrigation practices, and periods of drought, have combined to diminish spring flows emanating from the ESRPA. A number of basin-wide initiatives are being considered to address this issue.

Hagerman Fish Culture Experiment Station (HFCES). Because of their close proximity, the Hatchery maintains a cooperative agreement with the University of Idaho to insure that fish rearing and other programs do not cause adverse effects at either facility.

Law Enforcement. The Hatchery must rely on IDFG Law Enforcement and the County Sheriff to provide service on the Hatchery grounds and adjacent high public use areas including the WMA and Oster Lakes. Their rapid response is often difficult due to workload and distance constraints.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

Harvest. IDFG administers the sport harvest within Idaho and the Shoshone Bannock Tribe administers the Tribal fishery for steelhead returning to the Sawtooth FH. Because only those hatchery steelhead that are externally marked with an adipose fin clip can be sport harvested,

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and it is a requirement for fishermen to release all unmarked fish unharmed, we believe there is minimal negative impacts to listed steelhead.

3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

Genetics. The genetic identification of stocks of steelhead in the Salmon River is an area that has been getting increasing attention lately. The origin of some of the wild/natural and hatchery stocks will be very important to hatchery practices and release strategies over the next few years. Efforts will be made to limit the introgression of non-native stocks into natural populations, but first the populations must be identified. Samples have been collected from stocks in the upper Salmon River, as well as wild/natural fish trapped at the Sawtooth, East Fork, Pahsimeroi, and Squaw Creek weirs. Preliminary data suggests that the three A-strain steelhead stocks that have been raised at Hagerman NFH, are all genetically similar. Data taken from other tributaries is still being evaluated.

b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

Hatchery steelhead may affect listed Snake River summer steelhead and spring, summer, and fall Chinook salmon. The steelhead program has the potential to affect listed salmonids in several ways: 1) predation; 2) competition; 3) adverse behavioral interactions; 4) disease transmission; 5) alteration of the gene pool and; (6) harvest.

Predation. The level of predation by hatchery released steelhead smolts on wild/natural salmonids is not well documented. One study by Cannamela (1993) estimated that 744,000 hatchery steelhead smolts released in the Upper Salmon River consumed approximately 24,000 +/- 15,000 salmonids. Several factors suggest that predation by hatchery steelhead smolts on wild/natural salmonid fry and smolts is probably lower than these estimates. First, the steelhead smolts cited by Cannamela (1993) were released in early April, and took longer to reach Lower Granite Dam. Second, according to the literature, steelhead smolts released by Hagerman NFH are generally below the size that actively preys on fish. The mean size at release for steelhead smolts at Hagerman NFH is 220 mm. Though small steelhead may feed on fish (Horner 1978; Hillman and Mullan 1989), 250mm TL appears to be the lower threshold size that has the greatest propensity to be piscivorous (Beauchamp 1990; IDFG 1992). Current steelhead smolt releases occur towards the end of April and PIT tag data document emigration times from Sawtooth FH to Lower Granite Dam ranging from 9 to 30 days depending on river flows following release. Based on the rapid emigration time through the Salmon River, and size at release, predation on listed salmonids by hatchery smolts should be minimal in the free-flowing river sections.

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

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Hagerman NFH steelhead are released as smolts. Competition between hatchery smolts and wild salmonids is minimized due to the rapid emigration time in free flowing river sections (see section on predation above). Steelhead that are not ready to emigrate may residualize in Salmon River tributaries and may potentially compete directly with wild/natural salmonids for food, rearing space, and/or preferred habitats. Bigelow (1997) found that smaller fish (<180 mm FL) were much more likely to residualize than medium (180-200 mm) or larger fish (>200 mm). While we don't know if competition from residuals is a threat, we do know that these smaller fish do not emigrate at the same rate as the medium and large size groups. Bigelow (1997) also saw a decrease in the number of hatchery fish found in streams as the summer progressed. Hatchery practices are being evaluated to reduce residual hatchery steelhead.

Behavior. There are limited data describing adverse behavioral effects of hatchery steelhead 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. As mentioned above, several steps have been taken 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 steelhead smolts before release have all been modified over the last several years to prepare juvenile steelhead for smoltification. Reducing emigration time will also reduce the potential for adverse interactions with listed salmonids.

Disease. Service fish health guidelines are strictly practiced. The potential for horizontal transmission of IHN and other diseases from hatchery steelhead to wild/natural fish still exists. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest this pattern of transmission is widespread. It is common knowledge that pathogens and diseases occur in wild/natural fish populations and that stresses can cause them to exhibit themselves. As mentioned, hatchery fish could potentially induce stresses on wild/natural populations through predation, competition, or adverse interactions.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

Bliss Rapids Snail. Several Hatchery springs and water courses provide refuge for the Bliss Rapids Snail (*Taylorconcha serpenticola*) which is listed as threatened under ESA. The Hatchery is currently undergoing Section 7 consultation with Ecological Services, Snake River Office, Boise, Idaho and will be developing a management plan that provides protection for the Bliss Rapids Snail while allowing the hatchery to continue its legally mandated mitigation activities under LSRCP.

IVB. Hagerman NFH A-Run Steelhead

A. General information

The primary purpose of this program is harvest mitigation. The Lower Snake River Compensation Program has been in operation since 1983 to provide for mitigation for lost steelhead production caused by the construction and operation of the four lower Snake River dams. The LSRCP steelhead program in the Salmon River is managed as an integrated program with Idaho Power Company hatcheries. Idaho Power Company hatcheries are operated by the IDFG. The upper Salmon River A-run steelhead program was designed as an *Isolated Harvest Program*. However, some broodstock management, eyed-egg production, and smolt production may occur to support ongoing Shoshone-Bannock Tribes streamside and in stream incubation programs and smolt release programs for natural production augmentation pursuant to U.S. v. Oregon agreements. The Sawtooth Fish Hatchery, Magic Valley Fish Hatchery and the Hagerman National Fish Hatchery are associated with the Salmon River A-run steelhead program. (IDFG Salmon River A Steelhead HGMP, p.4)

B. Stock/Habitat/Harvest Program Goals and Purpose

- The primary purpose of this program is harvest mitigation. The Lower Snake River Compensation Program has been in operation since 1983 to provide for mitigation for lost steelhead production caused by the construction and operation of the four lower Snake River dams. The 1999 NMFS Biological Opinion on Artificial Propagation in the Columbia River Basin (NMFS 1999) concluded that Snake River summer steelhead artificial propagation actions are expected to adversely affect listed Snake River summer steelhead. The release of hatchery steelhead into natural production areas is expected to result in predation and competition with listed steelhead juveniles. The Biological Opinion provided reasonable and prudent alternatives to avoid jeopardy.
- The LSRCP steelhead program in the Salmon River is managed as an integrated program with Idaho Power Company hatcheries. Idaho Power Company hatcheries are operated by the IDFG.

(IDFG Salmon River A Steelhead HGMP, p.4)

1. Goals of program

The goal of the Lower Snake River Compensation Plan is to return approximately 25,000 adult steelhead to the project area above Lower Granite Dam (13,600 for HNFH) to mitigate for survival reductions resulting from construction and operation of the four lower Snake River dams.

- Goal 1** **Meet the Lower Snake River Compensation Plan mitigation goal of returning 13,600 adult summer steelhead to the project area above Lower Granite Dam annually.**

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- Objective 1.1: Collect and spawn sufficient numbers of adult summer steelhead for broodstock annually.
- Task 1.1.1: Collect sufficient green steelhead eggs to produce 1.4 million eyed eggs for transfer to Hagerman National Fish Hatchery for hatching and rearing. The eggs will come from adults recovered at either Sawtooth Fish Hatchery, Pahsimeroi Fish Hatchery, Oxbow Fish Hatchery, Dworshak National Fish Hatchery, or other temporary adult recovery structures.
 - Task 1.1.2: Sample all adults used in spawning for disease, and cull fertilized eggs from those with unacceptably high probability of disease.
- Objective 1.2: Rear about 1.3 million summer steelhead smolts annually for release into the Salmon River Basin.
- Task 1.2.1: Maintain incubation success to meet LSRCF performance measures and production goals.
 - Task 1.2.2: Perform rearing in accordance with established protocols, SOPs, and production goals.
- Objective 1.3: Produce the healthiest, highest quality fish possible at every stage of production.
- Task 1.3.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.
 - Task 1.3.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.
 - Task 1.3.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, brood stock management, incubation, rearing, and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.
 - Task 1.3.4: Provide a high quality rearing habitat within the hatchery that favors hatchery production without compromising fish health and condition.
 - Task 1.3.5: Minimize chemical and drug use during fish rearing.
- Objective 1.4: Conduct monitoring and evaluation activities that will provide information on the progress of the hatchery in meeting its adult return goal for summer steelhead.
- Task 1.4.1: Conduct regularly scheduled Hatchery Evaluation Team meetings.
 - Task 1.4.2: Biosample returning adult summer steelhead for fish health and genetic purposes as needed.
 - Task 1.4.3: Use coded-wire tags to evaluate adult recoveries from production groups.

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Task 1.4.4: Use PIT tags to monitor and track juvenile migration performance through the Columbia River corridor.

Task 1.4.5: The Harvest Monitoring Biologist generates estimates of adult returns of summer steelhead to the project area as outlined in the Cooperative Agreement between the LSRCP and Idaho Department of Fish and Game.

Objective 1.5: Cooperate and coordinate with the Idaho Department of Fish and Game, the Nez Perce Tribe and the Shoshone Bannock Tribes.

Task 1.5.1: Conduct annual coordination meetings.

Task 1.5.2: Distribute data and reports as appropriate.

Goal 2: Use the additional 12 raceways to help meet U.S Fish and Wildlife Service obligations and needs.

Objective 2.1 Produce sufficient rainbow trout to meet the mitigation requirements for Dworshak Dam and Reservoir.

Objective 2.2 Obtain sufficient numbers of rainbow trout eggs of the appropriate genetic background to meet the management goals of the cooperators.

Objective 2.3 Produce 90 K spring fingerlings (5 in.).

Task 2.3.1: Maintain incubation success to meet established performance measures and production goals.

Task 2.3.2: Perform rearing in accordance with established protocols, SOPs, and production goals.

Objective 2.4 Produce 40 K fall catchables (9 in.).

Task 2.4.1: Maintain incubation success to meet established performance measures and production goals.

Task 2.4.2: Perform rearing in accordance with established protocols, SOPs, and production goals.

Objective 2.5 Produce the healthiest, highest quality fish possible at every stage of production.

Task 2.5.1: Monitor health and disease status of fish, following the Service Fish Health Policy and Integrated Hatchery Operation Team (IHOT) Guidelines.

Task 2.5.2: Maximize survival at all life stages using disease control and prevention techniques. Prevent introduction, spread or amplification of fish pathogens.

Task 2.5.3: Conduct hatchery evaluation studies to investigate alternative strategies to improve water management, brood stock management, incubation, rearing,

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and release strategies. Support research on physiology, diet, fish health, and genetics and other Columbia and Snake River Basin projects.

Task 2.5.4: Provide a high quality rearing habitat within the hatchery that favors hatchery production without compromising fish health and condition.

Objective 2.6 Cooperate and Coordinate with the Idaho Department of Fish and Game and Dworshak NFH.

Task 2.6.1: Establish and maintain regular communication and coordination with Department of Fish and Game.

Task 2.5.2: Provide data and reports as appropriate.

Goal 3: Assure that all the requirements of legal orders and federally mandated legislation are met.

Objective 3.1: Conduct hatchery operations for summer steelhead consistently with requirements and obligations called for under the Endangered Species Act.

Task 3.1.1: Mass mark selected lots of summer steelhead to identify them from naturally produced fish.

Task 3.1.2: Implement measures to produce juvenile fish that are fully smolted and ready to emigrate (reduce residualism).

Task 3.1.3: Implement measures to minimize interactions between production and natural fish.

Task 3.1.4: Draft and implement a Hatchery and Genetic Management Plan.

Task 3.1.5: Meet ESA established size at release criteria.

Objective 3.2: Operate the hatchery so that all requirements and obligations called for under the Clean Water Act are satisfied.

Task 3.2.1: Meet requirements for Best Management Practices and QAQC.

Task 3.2.2: Collect and analyze water samples monthly in accordance with the NPDES permit.

Task 3.2.3: Meet requirements of TMDL for phosphorus and sediment.

Objective 3.3: Assure that hatchery operations support Columbia River Fish Management Plan (U.S. v Oregon) production and harvest objectives.

Task 3.3.1: Provide pertinent data and information to Service representatives on U.S. v Oregon Production Advisory Committee (PAC) and Technical Advisory Committee (TAC) meetings.

Task 3.3.2: Meet tribal trust responsibilities.

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Objective 3.4: Meet the requirements for the National Invasive Species Act.

Task 3.4.1: Work under the recommendations of the Western Regional Panel and the Aquatic Nuisance Species Task Force.

Task 3.4.2: Implement Hazard Analysis and Critical Control Point plans for the summer steelhead and rainbow trout production programs.

Goal 4.0: Develop outreach to enhance public understanding, participation and support of the Service and Hagerman NFH programs.

Objective 4.1: Continue developing a proactive outreach program, to increase visibility of Hagerman NFH.

Task 4.1.1: Encourage a partnership of southern Idaho Service facilities to fund an outreach coordinator, and coordinate with other federal, state, and local information/public affairs offices to incorporate information about Hagerman NFH.

Task 4.1.2: Staff the hatchery when funding is available with Hatchery Hosts (May - August) to answer questions, and disseminate general information. Advertise early for hatchery hosts.

Task 4.1.3: Seek partnerships and outside funding (Challenge Grant) to develop teacher education workshops.

Task 4.1.4: Coordinate with Idaho Department of Fish and Game to assist with special events, such as Free Fishing day.

Task 4.1.5: Maintain website for the Hagerman NFH to inform cyber-visitors of programs, history and general information.

Task 4.1.6: Cooperate with the University of Idaho to maintain the information kiosk with the most recent fisheries information.

Goal 5.0: Ensure that all hatchery activities are conducted safely and that all hatchery facilities and equipment are properly maintained.

Objective 5.1: Conduct preventive maintenance on all hatchery equipment according to established SOPs.

Task 5.1.1: Follow SOP's on regular and annual maintenance of hatchery operating equipment, including: chillers, fish pumps, dissolved oxygen meter, pond scrubber, electric weir, freezers, etc.

Task 5.1.2: Follow SOP's on inspection and maintenance of tractor/trailers prior to distribution, to include dissolved oxygen supply systems, watering and dewatering, general safety, and road worthiness.

Task 5.1.3: Follow procedural maintenance guidelines and schedules for hatchery support equipment, to include water supply and delivery systems, pumps,

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alarm systems, raceway and tank maintenance, and miscellaneous electrical equipment.

Task 5.1.4: Follow recommendations and standards as established under BPA and LSRCP Performance Measures.

Objective 5.2: Conduct regular safety and health program activities.

Task 5.2.1: Hold regular safety meetings to discuss selected issues, problems, and topics.

Task 5.2.2: Follow OSHA and other pertinent safety guidelines.

Task 5.2.3: Review and revise the station's Safety and Health Plan according to Service policy.

Task 5.2.4: Maintain and follow established MSDS guidelines.

2. Objectives of program

The Hatchery's primary role within the LSRCP program is to rear steelhead smolts from eyed eggs. A-strain eyed eggs for the program are incubated at Sawtooth Fish Hatchery (FH), a LSRCP facility operated by the IDFG. These eggs are obtained from brood stock returning to the Sawtooth FH and the Pahsimeroi FH, an Idaho Power Corporation owned facility also operated by IDFG. At times when adult returns are insufficient to meet the required number of eggs for the program, egg numbers are supplemented from the Oxbow FH, another Idaho Power Corporation owned facility, operated by IDFG.

After approximately ten months of rearing, smolts are transported to various sites in the Salmon River Basin for release and emigration to the Pacific Ocean. Under the LSRCP, IDFG is responsible for developing and managing smolt release strategies, monitoring and evaluation activities, brood stock collection and spawning.

3. Type of program (Integrated or Segregated)

The upper Salmon River A-run steelhead program was designed as an *Isolated Harvest Program*. However, some broodstock management, eyed-egg production, and smolt production may occur to support ongoing Shoshone-Bannock Tribes streamside and in stream incubation programs and smolt release programs for natural production augmentation pursuant to U.S. v. Oregon agreements. The Sawtooth Fish Hatchery, Magic Valley Fish Hatchery and the Hagerman National Fish Hatchery are associated with the Salmon River A-run steelhead program. (IDFG Salmon River A Steelhead HGMP, p.4)

4. Alignment of program with ESU-wide plans

Hatchery production for harvest mitigation is influenced but not specifically linked to habitat protection strategies in the Salmon subbasin or other areas. The NMFS has not developed a recovery plan specific to Snake River steelhead, but the Salmon River A-run steelhead program is operated consistent with existing Biological Opinions. (IDFG Salmon River A Steelhead HGMP, p.20)

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5. *Habitat description and status where fish are released.*

- Unlike other subbasins in the Columbia River basin, the Salmon subbasin has large areas where the composition, structure, and function of the aquatic, wetland and riparian ecosystems have been relatively undisturbed by anthropogenic effects.
- Twelve percent of the total stream length in the Upper Salmon watershed is identified as being impaired by sedimentation. There are about 2,585 points of water diversion and record of 603 stream-alteration permits. There are 216 road culverts in the Upper Salmon watershed, and only 10 are known to allow adult fish passage. Sediments impact approximately 12% of streams in the watershed, with the Salmon River, Yankee Fork, and seven other creeks in the watershed included on the 303(d) list as sediment -impaired streams.
- The primary limiting factor expressions in the mainstem Salmon River from the Pahsimeroi River upstream to the East Fork Salmon River (excluding the area known as the 12-mile reach) are increased fine sediments and reduction in discharge (primarily at low flows) Some barriers to fish movement from the mainstem into tributaries are present. These barriers are a concern because fish use the tributaries as thermal refuge when water temperatures in the main river increase.

(NWPPC' Salmon River Subbasin Plan)

6. *Size of program and production goals (No. of spawners and smolt release goals)*

Three stocks of BY 2006 summer steelhead were programmed for the 2007 release year. Since the Hatchery does not have the capability to capture anadromous brood stock on site, eyed eggs are obtained from other spawning and incubation facilities. In 2005 the LSRCP Cooperators agreed to increase the Hatchery's smolt production from 1,290,000 to 1,390,000 fish. This additional 100,000 fish replaces smolt production lost at the Magic Valley Hatchery due to decreasing spring flows at that LSRCP facility located in Filer, Idaho. For BY 2006 the Hatchery increased its production another 60,000 fish to further mitigate the loss of production at the Magic Valley Fish Hatchery. The Hatchery's production goal is now 1,250,000. (NFH Annual Report FY2006, p.3)

C. Description of program and operations

1. *Broodstock goal and source*

Hagerman NFH will request and disinfect eyed eggs (Sawtooth A-run and Pahsimeroi A-run from Sawtooth FH and , Dworshak B-run from Clearwater FH). Eyed steelhead eggs will be shipped between 370 and 450 TUs. Shipments will occur in May and June 2007. Egg shipments and deliveries will be coordinated with Sawtooth FH, Magic Valley FH, and Clearwater FH. (IDFG, March 12, 2007, sec.1.2.4.1)

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Table: 2007 Summer A Steelhead Eyed Egg or Swim Up Fry Requests. (IDFG, March 12, 2007, p.84)

Requesting Hatchery or Program	Source/Hatchery Stock	Current Year Request	Comments
Hagerman NFH	Sawtooth FH - A's Pahsimeroi FH - A's	1,100,000 215,000	Via Sawtooth FH

2. Adult collection procedures and holding

Eyed eggs for Hagerman NFH are obtained from Sawtooth and Pahsimeroi FH's.

3. Adult spawning

a) Spawning protocols

Eyed eggs for Hagerman NFH are obtained from Sawtooth, Pahsimeroi, and Oxbow FH's.

b) No. of males and females spawned each year over past 10 years (Table)

Eyed eggs for Hagerman NFH are obtained from Sawtooth, Pahsimeroi, and Oxbow FH's.

4. Fertilization

a) Protocols

Eyed eggs for Hagerman NFH are obtained from Sawtooth, Pahsimeroi, and Oxbow FH's.

b) Number of eggs collected and fertilized each year over past 10 years (Table)

Eyed eggs for Hagerman NFH are obtained from Sawtooth, Pahsimeroi, and Oxbow FH's.

5. Incubation

- Strategies and procedures are similar for both resident and anadromous programs. Generally, only eyed eggs are received for incubation at the Hatchery. Upon arrival, the eggs are disinfected in a standard 100 ppm iodine solution for 10 minutes. The eggs are enumerated using either the Von-Bayer or displacement method. Approximately 20,000 eggs are placed into upwelling jars. The jars are supplied with 59°F spring water at a flow rate of six to eight gpm. Eggs are kept separate by spawn day to ensure even hatching among individual jars. Hatching usually occurs within three to five days.
- Eyed eggs are loaded into upwelling incubators at 20,000 to 25,000 eggs per jar with a flow rate of 6 to 8 gallons per minute (gpm). Typically, the Sawtooth stock is reared in Hatchery Building 1, and the Pahsimeroi and Dworshak stocks are reared in Hatchery

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Building 2. Sac fry are transferred from incubators into indoor rearing tanks and feeding is initiated when 80% of the fry achieve swim-up. Feeding typically begins 15 to 17 days post-hatch. Semi-moist salmon diets are fed at a minimum frequency of once per hour during rearing in the hatchery buildings. Flows in rearing tanks are ramped up to, and then maintained at, 60 gpm. Fish are reared inside to a maximum density index of 0.60 and a maximum flow index of 1.00. Fish are transferred at two tanks per outside raceway in late July and August at approximately 180 fpp. (IDFG, March 12, 2007., sec.1.2.4.2)

6. Ponding

a) Protocols

- For the most part, strategies and procedures are similar for both resident and anadromous programs. Fry are poured out of the incubation jars and into inside rearing tanks after approximately five days. When 80 percent of the fry have swum-up, initial feeding begins. Fish are fed a minimum of every hour and up to eight times a day. Fish are fed dry commercially available salmon diets until they reach 250 fish per pound. At a maximum target density index of 0.80, fish are moved to outside raceways at two tanks per outside raceway. Steelhead are moved outside in late July and early August. The upper and middle decks are used for initial outside rearing. Once outside, fish are hand fed dry extruded floating salmon diets. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. The fish may be vaccinated in August. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. After splitting, fish are fed utilizing demand feeders. A representative group of fish from each stock being reared receives PIT tags in March. During the entire outside rearing cycle, all raceways are cleaned (swept) twice weekly. Sample counts are taken monthly, and length frequency checks are done periodically.

- The following are carrying capacity parameters not to be exceeded at Hagerman National Fish Hatchery

Hatchery Tanks	Density index	0.8
	Flow index	1.0
Raceways	Density index	0.2
	Flow index	
	fish size < 80 fpp	0.8
	fish size \geq 80 and \leq 15 fpp	1.0
	fish size > 15 fpp	1.2

- Due to the reuse of water in the steelhead raceways, flow index for an individual raceway should not exceed 30% of the total system flow index when three banks are in use (20% if only two reuses).

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- The upper and middle decks are used for initial outside rearing. Once outside, fish are hand-fed the Hagerman Diet, a dry extruded floating salmon diet developed by the Abernathy Fish Technology Center. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. All fish are fed a dry extruded floating diet which is placed into demand feeders twice weekly. The NOAA Fisheries 180 to 250 mm length at release criteria is met by adjusting the hatchery constant. Sample counts are performed monthly on representative ponds and length frequencies are checked periodically. During February or March 2007, IDFG staff PIT tag a representative group of fish from each stock being reared. (IDFG, March 12, 2007, sec.1.2.4.3)

b) Number of fry ponded each year, including % hatch each year

Table: Hagerman National Fish Hatchery survival information by hatchery life stage for A-run steelhead from hatch through release (includes eggs received from Pahsimeroi, Sawtooth, and Oxbow fish hatcheries). Information produced from Hagerman National Fish Hatchery annual reports. (IDFG Salmon River A Steelhead HGMP, p.37 and HNFH annual reports)

Brood Year	Spawning Hatchery	Eyed-Eggs Received	Eyed-Egg To Hatch Survival	Eyed-Egg to Smolt Survival (Brood Year Total)	Number of Smolts Released
1989	Sawtooth	1,491,956	99.3%	65.8%	981,764
1990	Sawtooth	592,302	96.9%	62.1%	979,799
1990	Sawtooth & Pahsimeroi	986,523	95.9%		
1991	Sawtooth	112,398	96.3%	85.5%	850,189
1991	Pahsimeroi	881,538	95.3%		
1992	Sawtooth	1,256,701	97.1%	63.8%	1,487,842
1992	Pahsimeroi	1,076,009	97.8%		
1993	Sawtooth	1,014,960	97.2%	75.2%	1,519,168
1993	Pahsimeroi	1,005,013	96.3%		
1994	Sawtooth	593,953	92.6%	68.8%	1,151,544
1994	Pahsimeroi	362,118	98.9%		
1994	Oxbow	717,576	96.6%		
1995	Sawtooth	562,513	98.5%	80.2%	1,324,593
1995	Pahsimeroi	345,164	97.5%		
1995	Oxbow	744,888	96.8%		
1996	Sawtooth	898,587	98.3%	81.8%	1,148,370
1996	Pahsimeroi	505,291	97.1%		
1997	Sawtooth	836,648	97.5%	83.6%	1,032,407
1997	Pahsimeroi	398,452	96.7%		
1998	Sawtooth	803,057	98.2%	83.7%	1,133,825

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1998	Oxbow	552,261	98.2%		
1999	Sawtooth	899,444	98.0%	80.8%	1,174,882
1999	Oxbow	554,520	96.1%		
2000	Sawtooth	946,595	98.7%	90.7%	1,052,659
2000	Pahsimeroi	213,977	98.1%		
2000	Sawtooth	946,595	98.30	93.1%	1,052,657
2000	Pahsimeroi	213,977	97.74		
2001	Sawtooth	958,941	98.00	93.2%	1,139,275
2001	Pahsimeroi	216,897	94.97		
2002	Sawtooth	965,031	98.96	93.6%	1,075,411
2002	Pahsimeroi	212,405	98.33		
2003	Sawtooth	939,025	97.47	94.1%	1,127,696
2003	Pahsimeroi	218,749	97.70		
2004	Sawtooth	946,363	97.66	94.4%	1,087,860
2004	Pahsimeroi	204,822	97.88		
2005	Sawtooth	1,084,195	98.58	95.8%	1,201,557
2005	Pahsimeroi	204,370	99.33		
2006	Sawtooth	1,143,749	98.00	96.1%	1,266,348
2006	Pahsimeroi	200,908	94.06		

7. Rearing/feeding protocols

Fry are poured out of the incubation jars and into inside rearing tanks after approximately five days. When 80 percent of the fry have swum-up, initial feeding begins. Fish are fed a minimum of every hour and up to eight times a day. Fish are fed dry commercially available salmon diets until they reach 250 fish per pound. At a maximum target density index of 0.80, fish are moved to outside raceways at two tanks per outside raceway. Steelhead are moved outside in late July and early August. The upper and middle decks are used for initial outside rearing. Once outside, fish are hand fed dry extruded floating salmon diets. Feeding duration varies by fish and feed size from as high as six times per day, to as low as two times per day. The fish may be vaccinated in August. In late September and early October, fish are split to all raceways in all three decks. Generally, the lower deck raceways are filled by hand with fish that receive no external marks. The upper and middle deck raceways are filled during adipose fin clipping and coded wire tagging. Once these splits are made, fish remain in their respective raceways until distribution. After splitting, fish are fed utilizing demand feeders.

8. Fish growth profiles

Magic Valley and Hagerman National fish hatcheries rear juvenile steelhead under constant water temperature (15.0°C) conditions. As such, both facilities experience similar growth rates and design feeding schedules to produce fish between 180 and 250 to the pound at release. Length gained per month for the first three months of culture at both facilities is typically between 0.8 and 1.0 inches (20.3 to 25.4 mm). Fish gain approximately 0.65 to 0.75 inches per month (16.5 to 19.1 mm) thereafter. To meet the release size target, fish may be fed on an intermittent schedule beginning in their fourth month of culture. (IDFG Salmon River A Steelhead HGMP, p.38)

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9. Fish health protocols and issues

- A pathologist from the Idaho FHC visits periodically to examine fish at the hatchery. From each stock and brood year of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.

Diagnostic Examination - A pathologist will normally check symptomatic fish during a monthly examination. However, additional diagnostic examinations will be conducted as needed when determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. Samples may be sent by overnight carrier to the FHC for diagnosis in the case of urgency.

Pre-release Examination - At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.

- Juvenile fish health monitoring is conducted monthly, except when there are no fish on station, and diagnostic exams are performed as needed. The Idaho Fish Health Center performs these tasks. Pre-liberation inspections are performed at least two weeks prior to the first day of liberation. Prior to release, a 60 fish sample is taken and assayed for IHNV, IPNV, VHSV, *Aeromonas salmonicida*, *Yersinia ruckeri*, and BKD. Fish health exam forms are provided to the hatchery as well as a summary at year-end. (IDFG, March 12, 2007., sec.1.2.4.4)

10. Chemotherapeutant use

- The Hatchery strives to minimize the use of chemicals and drugs in fish production. This reduces impacts on the local environment, makes compliance with the various safety regulatory agencies much easier, and reduces risks to employees.
- Chemotherapeutants are used on an infrequent basis in response to outbreaks of diseases such as furunculosis (*Aeromonas salmonicida*) and bacterial coldwater disease (*Cytophaga psychrophilus*), and to control infestations of external protozoan parasites (*Gyrodactylus* spp.). Furunculosis is treated with medicated feeds (Romet, Florfenicol, or Terramycin). Bacterial coldwater disease is treated with Terramycin or Florfenicol medicated feeds. Fish afflicted with bacterial coldwater disease may also be treated with Diquat to address external bacterial growth. Applications of Florfenicol can be done under a veterinary feed directive issue by a veterinarian. Florfenicol is administered orally at a target dosage of 15mg of drug per kg of fish per day for 10 days. Diquat is used only

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under an INAD permit, and it is administered as an immersion treatment (flow-through or standing bath) at 2 to 28 mg/l. External protozoan parasites can be treated with Formalin. Formalin application is done via a standing bath to ensure compliance with effluent limitations (0.7 mg/l) pertaining to its use in waters discharging to Riley Creek. Riley Creek is designated under Idaho Sate Water Quality Standards and the Clean Water Act, 303d list for cold water aquatic life, salmonid spawning, primary contact recreation, domestic water supply, and special resource water. The Hatchery consults with the Idaho FHC prior to any uses of chemotherapeutants.

- Salmonid egg hardening and disinfection with an iodine compound is required by Service policy to minimize/prevent transmittance of viral and bacterial pathogens. All eggs received by the Hatchery are disinfected in a 100 ppm iodine solution for ten minutes. Vaccines for furunculosis and enteric redmouth disease have been used intermittently in the past with mixed results. All fish handling equipment is disinfected after each use.
- **Other Fish Health Precautions.** Fish transport tanks and fish marking trailers are disinfected before being brought onto the station and after use at the hatchery. Abernathy Fish Technology Center provides quarterly feed analysis to ensure fish feeds are free of contaminants and the feed meets nutritional requirements of fish.

11. Tagging and marking of juveniles

- All harvest mitigation fish are marked with an adipose fin clip. To evaluate emigration success and timing to main stem dams, PIT tags are inserted in production release groups annually. To evaluate adult return success, CWT tags are inserted in release groups annually. Coded wire-tagged fish may receive an additional ventral fin clip. Other releases may be released unmarked. (IDFG Salmon River A Steelhead HGMP,p.43)
- Numbers of fish marked, mark type, and release location are established by the annual IDFG Steelhead Mark Plan which incorporates other agreements and processes such as US vs Oregon. Generally, numbers marked break out as follows: 910,000 AD clipped Sawtooth A (of which 80,000 are CWT), 200,000 unmarked Pahsimeroi A, and 140,000 unmarked Sawtooth A. In addition, a representative number of fish from each release site receives PIT tags (February 2008). Marking and tagging must occur in mid August 2007. Marking is coordinated with Niagara Springs FH, Magic Valley FH, and the IDFG Marking Crew. (IDFG, March 12, 2007. sec.1.2.4.5)

Table: LSCR PIT Tag Request for BY07 Releases.

Fish			Brood	Release	Program	PITTAG Total	Adult PIT No.
Hagerman NFH	FWS	Dwor B	2007	L Salmon R - Stinky Springs	100,000	3,810	
Hagerman NFH	FWS	Dwor B	2007	EF Salmon R - Lower	100,000	1,890	
Hagerman NFH	FWS	Pah A	2007	L Salmon R - Stinky Springs	160,000	0	
Hagerman NFH	FWS	Pah A	2007	L Salmon R - Hazard Cr	40,000	0	

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Hagerman NFH	FWS	Pah A	2007	Slate Cr	40,000	980	
Hagerman NFH	FWS	Saw A	2007	Sawtooth Weir	750,000	9,278	
Hagerman NFH	FWS	Saw A	2007	Yankee Fork	140,000	1,732	
Hagerman NFH	FWS	Saw A	2007	Yankee Fork	160,000	0	

Table: LSRCP, Salmon River Basin Steelhead Proposed Releases, 2007. (IDFG, March 12, 2007. p.74)

Stock	Brood Year	Release Location	Program Goal	Estimated Release	# AD	# CWT	# PIT	Other Marks	Comments
Saw A	2006	Sawtooth Weir	750,000	759,000	759,000	80,000	300		Production
Saw A	2006	Yankee Fork	140,000	139,500			300		Supplementation
Saw A	2006	Yankee Fork	160,000	165,500	165,500				Production
Pah A	2006	L. Salmon R. Stinky Springs	160,000	145,500			300		Supplementation
Pah A	2006	L. Salmon R. Hazard Ck.	40,000	40,000					Supplementation
			1,250,000	1,249,500	924,500	80,000	900		

12. Fish Release

a) Protocols

Steelhead smolt release size is targeted to be between 180 and 250 millimeters in length (NMFS 1999). The targets are set to minimize potential impacts of non-listed steelhead on listed fish populations. Smolts are distributed utilizing semi-tractors and 5,000 gallon capacity fish transport tankers. The Hatchery adheres to the IHOT guidelines established for fish distribution. Distribution begins in early April, and continues throughout the second week of May. Duration of transport time ranges between five and ten hours, depending on the location of the release site. Chilled water, reduced tanker densities, and Point Four™ oxygen stones are utilized to reduce stress during hauling. The majority of the smolts reared by the Hatchery are released into the upper Salmon River near Stanley, Idaho. Steelhead smolts are released directly into the Salmon River below the adult ladder at the Sawtooth FH. Additional smolts reared at the Hatchery are released directly into the Yankee Fork Salmon River, East Fork of the Salmon River, and the Little Salmon River.

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b) Number of fish released each year (subyearlings?; yearlings?; other?)

2008 Release Site	Hatchery	Run	Release Goal	Type
Sawtooth FH	HNFH	"A"	810,000	Seg
Yankee Fk.	HNFH	"A"	240,000	Seg
E.F. Salmon R.	HNFH	"B"	100,000	Seg
Little Salmon R.	HNFH	"A"	200,000	Seg
Little Salmon R.	HNFH	"B"	100000	Seg

Table: The number of A-run steelhead released by rearing hatchery from 1991 through 2001 is presented below. (IDFG Salmon River A Steelhead HGMP, p.42)

Release Year	Rearing Hatchery	Life Stage Released	Avg. Size (fish/pound)	Number Released
1991	Hagerman Nat.	Yearling	4.41	850,189
1992	Hagerman Nat.	Yearling	4.48	1,487,842
1993	Hagerman Nat.	Yearling	4.79	1,519,168
1994	Hagerman Nat.	Yearling	4.62	1,151,544
1995	Hagerman Nat.	Yearling	n/a	1,324,593
1996	Hagerman Nat.	Yearling	5.30	1,148,370
1997	Hagerman Nat.	Yearling	4.50	1,032,407
1998	Hagerman Nat.	Yearling	n/a	1,133,825
1999	Hagerman Nat.	Yearling	n/a	1,174,882
2000	Hagerman Nat.	Yearling	n/a	1,052,659
		Avg. =	4.68	1,187,548

D. Program benefits and performance

[Note: Performance Standards and Indicators used to develop Sections 1.10.1 and 1.10.2 were taken from the final January 17, 2001 version of Performance Standards and Indicators for the Use of Artificial Production for Anadromous and Resident Fish Populations in the Pacific Northwest. Numbers referenced below correspond to numbers used in the above document.]

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- 3.1.1 Standard: Program contributes to fulfilling tribal trust responsibility mandates and treaty rights, as described in applicable agreements such as under U.S. v. Oregon and U.S. v. Washington.

Indicator 1: Total number of fish harvested in tribal fisheries targeting program.

- 3.1.2 Standard: Program contributes to mitigation requirements.

Indicator 1: Number of fish returning to mitigation requirements estimated.

- 3.1.3 Standard: Program addresses ESA responsibilities.

Indicator 1: ESA Section 7 Consultation completed.

- 3.2.1 Standard: Fish are produced and released in a manner enabling effective harvest, as described in all applicable fisheries management plans, while avoiding over harvest of not-target species.

Indicator 1: Number of target fish caught by fishery estimated.

Indicator 2: Number of non-target fish caught in fishery estimated.

Indicator 3: Angler days by fishery estimated.

Indicator 4: Escapement of target fish estimated.

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

Indicator 1: Marking rate by type in each release group documented.

Indicator 2: Sampling rate by mark type for each fishery estimated.

Indicator 3: Number of marks by type observed in fishery documented.

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

Indicator 1: Annual number of spawners on spawning grounds estimated in specific locations.

Indicator 2: Spawner-recruit ratios estimated in specific locations.

Indicator 3: Number of redds in natural production index areas documented in specific locations.

- 3.3.2 Standard: Releases are sufficiently marked to allow statistically significant evaluation of program contribution.

Indicator 1: Marking rates and type of mark documented.

Indicator 2: Number of marks identified in juvenile and adult groups documented.

1.10.2) “Performance Indicators” addressing risks.

- 3.4.1 Standard: Fish collected for broodstock are taken throughout the return in proportions approximating the timing and age structure of the population.

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Indicator 1: Temporal distribution of broodstock collection managed.

Indicator 2: Age composition of broodstock collection managed.

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

Indicator 1: No spawners of natural origin removed for broodstock.

Indicator 2: All natural origin spawners released to migrate to natural spawning areas.

Indicator 3: Number of adults, eggs or juveniles placed in natural rearing areas managed.

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

Indicator 1: Life history characteristics of natural and hatchery-produced populations are measured (e.g., juvenile dispersal timing, juvenile size at outmigration, juvenile sex ratio at outmigration, adult return timing, adult age and sex ratio, spawn timing, hatch and swim-up timing, rearing densities, growth, diet, physical characteristics, fecundity, egg size).

- 3.4.4 Standard: Annual release numbers do not exceed estimated basin-wide and local habitat capacity.

Indicator 1: Annual release numbers, life-stage, size at release, length of acclimation documented.

Indicator 2: Location of releases documented.

Indicator 3: Timing of hatchery releases documented.

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

Indicator 1: Genetic profiles of naturally-produced and hatchery-produced adults developed.

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

Indicator 1: Total number of natural spawners reaching collection facilities documented.

Indicator 2: Total number of natural spawners estimated passing collection facilities documented.

Indicator 3: Timing of collection compared to overall run timing.

- 3.5.3 Standard: Artificially produced adults in natural production areas do not exceed appropriate proportion.

Indicator 1: Ratio of natural to hatchery-produced adults monitored (observed and estimated through fishery).

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Indicator 2: Observed and estimated total numbers of natural and hatchery-produced adults passing counting stations.

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

Indicator 1: Location of juvenile releases documented.

Indicator 2: Length of acclimation period documented.

Indicator 3: Release type (e.g., volitional or forced) documented.

Indicator 4: Adult straying documented.

- 3.5.5 Standard: Juveniles are released at fully smolted stage of development.

Indicator 1: Level of smoltification at release documented.

Indicator 1: Release type (e.g., forced or volitional) documented.

- 3.5.6 Standard: The number of adults returning to the hatchery that exceeds broodstock needs is declining.

Indicator 1: The number of adults in excess of broodstock needs documented in relation to mitigation goals of the program.

- 3.6.1 Standard: The artificial production program uses standard scientific procedures to evaluate various aspects of artificial production.

Indicator 1: Scientifically based experimental design with measurable objectives and hypotheses.

- 3.6.2. Standard: The artificial production program is monitored and evaluated on an appropriate schedule and scale to address progress toward achieving the experimental objectives.

Indicator 1: Monitoring and evaluation framework including detailed time line.

Indicator 2: Annual and final reports.

- 3.7.1 Standard: Artificial production facilities are operated in compliance with all applicable fish health guidelines and facility operation standards and protocols.

Indicator 1: Annual reports indicating level of compliance with applicable standards and criteria.

- 3.7.2 Standard: Effluent from artificial production facility will not detrimentally affect natural populations.

Indicator 1: Discharge water quality compared to applicable water quality standards.

- 3.7.3 Standard: Water withdrawals and in stream water diversion structures for artificial production facility operation will not prevent access to natural spawning areas, affect spawning, or impact juveniles.

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Indicator 1: Water withdrawals documented – no impacts to listed species.

Indicator 2: NMFS screening criteria adhered to.

- 3.7.4 Standard: Releases do not introduce pathogens not already existing in the local populations and do not significantly increase the levels of existing pathogens.

Indicator 1: Certification of juvenile fish health documented prior to release.

- 3.7.5 Standard: Any distribution of carcasses or other products for nutrient enhancement is accomplished in compliance with appropriate disease control regulations and guidelines.

Indicator 1: Number and location(s) of carcasses distributed to habitat documented.

- 3.7.6 Standard: Adult broodstock collection operation does not significantly alter spatial and temporal distribution of natural population.

Indicator 1: Spatial and temporal spawning distribution of natural population above and below trapping facilities monitored.

- 3.7.7 Standard: Weir/trap operations do not result in significant stress, injury, or mortality in natural populations.

Indicator 1: Mortality rates in trap documented. No ESA-listed fish targeted.

Indicator 2: Prespawning mortality rates of trapped fish in hatchery or after release documented. No ESA-listed fish targeted.

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

Indicator 1: Size and time of release of juvenile fish documented and compared to size and timing of natural fish.

(IDFG Salmon River A Steelhead HGMP, p.6-10)

1. Adult returns

a) Numbers of adult returns (need data for the past 10-20 years)

Information presented in the following table includes release and harvest data for all A-run steelhead released from the Magic Valley, Hagerman National, and Niagara Springs fish hatcheries. (IDFG Salmon River A Steelhead HGMP, p.18-20)

Salmon River Releases and Sport Harvest of "A" Steelhead, 1988 - 1997

Release Year	No. Fish Released	Release Site	Rearing Hatchery	Est. No. y Harvest	Hatcher Returns Total	SAR (#Ret)
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1997	84,715	Sawtooth Hatchery	MVFH	177	88	265	0.31
1997	601,349	Sawtooth Hatchery	HNFH	1,262	622	1,884	0.31
1997	65,420	Salmon River at Torrey's Hole	HNFH	228	60	288	0.44
1997	154,471	Salmon River at McNabb's Point	MVFH	249	219	468	0.30
1997	75,946	Salmon River at McNabb's Point	HNFH	122	108	230	0.30
1997	150,280	Salmon River at Bruno's Bridge	MVFH	242	214	456	0.30
1997	830,654	Pahsimeroi Hatchery	NSFH	1,433	1,168	2,601	0.31
1997	241,510	Salmon River at Lemhi River	MVFH	595	344	939	0.39
		Salmon River at North Fork Salmon					
1997	134,310	River	MVFH	545	190	735	0.55
1997	137,833	Salmon River at Hammer Creek	NSFH	329	329	658	0.48
1997	29,700	Salmon River at Pine Bar Rapids	NSFH	73	73	146	0.49
1997	342,281	Little Salmon River	HNFH	161	746	907	0.26
		Little Salmon River at Warm Springs					
1997	94,815	Bridge	NSFH	0	162	162	0.17
1997	2,943,284	Subtotal 1997 'A' Releases		5,416	4,323	9,739	0.33
1996	708,109	Sawtooth Hatchery	HNFH	2,141	628	2,769	0.39
1996	66,022	Salmon River at Torrey's Hole	HNFH	201	47	248	0.38
1996	201,968	Salmon River at McNabb's Point	MVFH	800	345	1,145	0.57
1996	207,245	Salmon River at Bruno's Bridge	MVFH	509	306	815	0.39
1996	799,220	Pahsimeroi River at Trap	NSFH	3,842	1,754	5,596	0.70
1996	21,196	Pahsimeroi Ponds	HNFH	102	47	149	0.70
1996	201,212	Salmon River at Lemhi River	MVFH	921	462	1,383	0.69
		Salmon River at North Fork Salmon					
1996	127,708	River	MVFH	997	365	1,362	1.07
1996	106,025	Salmon River at Hammer Creek	NSFH	39	39	78	0.07
1996	30,090	Salmon River at Pine Bar Rapids	NSFH	11	11	22	0.07
1996	529,266	Little Salmon River	HNFH	1,224	1,224	2,448	0.46
1996	158,008	Little Salmon River	NSFH	46	46	92	0.06
1996	3,156,069	Subtotal 1996 'A' Releases		10,833	5,274	16,107	0.51
1995	184,435	Sawtooth Hatchery	HNFH	674	214	888	0.48
1995	500,571	Sawtooth Hatchery (246,302 - PFH)	HNFH	3196	1059	4255	0.85
1995	64,167	Salmon River at Torrey's Hole	HNFH	262	104	366	0.57
1995	207,845	Salmon River at McNabb's Point	MVFH	1,106	414	1,520	0.73
1995	162,870	Salmon River at Bruno's Bridge	MVFH	1,095	440	1,535	0.94
1995	829,278	Pahsimeroi	NSFH	3,890	2,425	6,315	0.76
1995	198,270	Salmon River at Lemhi River	MVFH	1,018	689	1,707	0.86
		Salmon River at North Fork Salmon					
1995	115,050	River	MVFH	934	464	1,398	1.22
1995	97,221	Salmon River at Hammer Creek	NSFH	115	115	230	0.24
1995	29,400	Salmon River at Pine Bar Rapids	NSFH	35	35	70	0.24
1995	131,157	Little Salmon River	NSFH	625	625	1,250	0.95
1995	84,853	Little Salmon River	HNFH	98	98	196	0.23
1995	316,011	Little Salmon River (43,988 - PFH)	HNFH	554	553	1107	0.35
1995	2,921,128	Subtotal 1995 'A' Releases		13,602	7,235	20,837	0.71
1994	773,134	Sawtooth Hatchery	HNFH	2,027	484	2,511	0.32
1994	182,083	Salmon River at Bruno's Bridge	HNFH	415	183	598	0.33
1994	199,962	Salmon River at Challis	NSFH	1,010	229	1,239	0.62
1994	484,440	Pahsimeroi Hatchery	MVFH	1,955	1,178	3,133	0.65
1994	379,948	Pahsimeroi River	NSFH	1,464	1,778	3,242	0.85
1994	235,788	Salmon River at Lemhi River	HNFH	646	256	902	0.38
1994	134,979	North Fork Salmon River	NSFH	802	442	1,244	0.92
1994	193,022	Salmon River at Hammer Creek	NSFH	82	91	173	0.09

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1994	21,070	Salmon River at Pine Bar Rapids	NSFH	10	8	18	0.09
1994	328,163	Little Salmon River	HNFH	72	72	144	0.04
1994	467,550	Little Salmon River	MVFH	132	132	264	0.06
1994	3,400,139	Subtotal 1994 'A' Releases		8,615	4,853	13,468	0.40
1993	125,129	Sawtooth Hatchery	HNFH	251	70	321	0.26
1993	604,391	Sawtooth Hatchery (140,626 - SFH)	HNFH	2674	611	3285	0.54
1993	260,600	Salmon River at Challis	MVFH	488	283	771	0.30
1993	266,300	Salmon River at Ellis Bridge	MVFH	312	201	513	0.19
1993	760,800	Pahsimeroi Trap	NSFH	1,698	1,415	3,113	0.41
1993	198,500	Salmon River at Lemhi River	MVFH	255	179	434	0.22
		Salmon River at North Fork Salmon					
1993	190,500	River	MVFH	327	199	526	0.28
1993	547,316	Little Salmon River	HNFH	423	423	846	0.15
1993	211,006	Salmon River at Hammer Creek	HNFH	55	55	110	0.05
1993	3,164,542	Subtotal 1993 'A' Releases		6,483	3,436	9,919	0.31
1992	622,060	Sawtooth Hatchery	HNFH	768	168	936	0.15
1992	117,300	Sawtooth Hatchery	MVFH	95	39	134	0.11
1992	223,406	Pahsimeroi River	HNFH	439	201	640	0.29
1992	503,180	Pahsimeroi Ponds and Trap	NSFH	786	326	1,112	0.22
1992	282,300	Salmon River at Hammer Creek	NSFH	-	-	-	-
1992	1,001,900	Little Salmon River	MVFH	1,066	1,066	2,132	0.21
1992	2,750,146	Subtotal 1992 'A' Releases		3,154	1,800	4,954	0.18
1991	1,284,706	Sawtooth Hatchery	HNFH	3,662	945	4,607	0.36
1991	364,700	Sawtooth Hatchery	MVFH	1343	343	1686	0.46
1991	475,000	Pahsimeroi River	NSFH	1,863	1,492	3,355	0.71
1991	135,100	Pahsimeroi River	MVFH	650	509	1159	0.86
1991	174,400	Salmon River at Ellis Bridge	NSFH	519	547	1,066	0.61
1991	97,800	Salmon River at Shoup Bridge	MVFH	346	63	409	0.42
1991	48,200	Salmon River at Shoup Bridge	NSFH	-	-	-	-
1991	186,300	Salmon River at Hammer Creek	MVFH	316	316	632	0.34
		Salmon River at North Fork Salmon					
1991	158,400	River	NSFH	703	497	1,200	0.76
1991	310,300	Little Salmon River	MVFH	527	526	1,053	0.34
1991	3,234,906	Subtotal 1991 'A' Releases		9,929	5,238	15,167	0.47
1990	301,156	Sawtooth Hatchery	HNFH	2,468	619	3,087	1.03
1990	1,198,700	Sawtooth Hatchery	MVFH	4,807	1,040	5,847	0.49
1990	200,246	Salmon River at Shoup Bridge	HNFH	326	173	499	0.25
1990	501,600	Pahsimeroi River	NSFH	487	1,335	1,822	0.36
1990	200,295	Salmon River at Ellis Bridge	HNFH	508	192	700	0.35
		Salmon River at North Fork Salmon					
1990	199,602	River	HNFH	501	176	677	0.34
1990	229,000	Salmon River at Hammer Creek	NSFH	180	95	275	0.12
1990	80,465	Little Salmon River	HNFH	63	63	126	0.16
1990	225,500	Little Salmon River	NSFH	178	86	264	0.12
1990	3,136,564	Subtotal 1990 'A' Releases		9,518	3,779	13,297	0.42
1989	636,551	Sawtooth Hatchery	HNFH	754	194	948	0.15
1989	857,300	Sawtooth Hatchery	MVFH	1,053	274	1,327	0.15
1989	104,400	Yankee Fork Salmon River	MVFH	157	42	199	0.19
1989	508,300	Pahsimeroi River	NSFH	298	377	675	0.13
1989	209,700	Salmon River at Shoup Bridge	NSFH	106	137	243	0.12
		Salmon River at North Fork Salmon					
1989	208,500	River	NSFH	106	135	241	0.12
1989	136,000	Salmon River at Hammer Creek	MVFH	124	124	248	0.18
1989	7,200	Salmon River at Hammer Creek	NSFH	-	-	-	-
1989	450,400	Little Salmon River	MVFH	404	404	808	0.18

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1989	300,600	Slate Creek (section 11)	MVFH	274	275	549	0.18
1989	3,418,951	Subtotal 1989 'A' Releases		3,276	1,962	5,238	0.15
1988	1,195,745	Sawtooth Hatchery	HNFH	2,825	887	3,712	0.31
1988	176,000	Yankee Fork Salmon River	MVFH	382	120	502	0.29
1988	665,800	Pahsimeroi River	NSFH	1,259	1,374	2,633	0.40
1988	147,500	Salmon River at Shoup Bridge	MVFH	74	77	151	0.10
1988	103,500	Salmon River at Shoup Bridge	NSFH	126	95	221	0.21
		Salmon River at North Fork Salmon					
1988	253,100	River	MVFH	127	132	259	0.10
1988	162,800	Panther Creek	MVFH	198	207	405	0.25
1988	102,800	Panther Creek	NSFH	73	76	149	0.14
1988	100,000	Salmon River at French Creek	MVFH	134	134	268	0.27
1988	701,252	Little Salmon River	MVFH	939	939	1,878	0.27
1988	50,725	Slate Creek (section 11)	HNFH	38	38	76	0.15
1988	346,100	Slate Creek (section 11)	MVFH	282	282	564	0.16
1988	87,200	Salmon River at Hammer Creek	MVFH	117	117	234	0.27
1988	4,092,522	Subtotal 1988 'A' Releases		6,574	4,478	11,052	0.27

b) Return timing and age-class structure of adults

Sawtooth Fish Hatchery A-run steelhead adult return history. All natural fish are released upstream to spawn. (IDFG Salmon River A Steelhead HGMP, p.11-12)

Return Year	Total Returns (Hatchery-Produced/Natural)	Total Poned	Total Released	Total Male Returns	Total Female Returns
1991	261 (249/12)	170	91	213	48
1992	1,705 (1,661/44)	1,051	654	1,206	499
1993	1,591 (1,584/7)	923	668	1,154	437
1994	338 (332/6)	278	60	174	164
1995	532 (528/4)	434	98	379	153
1996	553 (545/8)	499	54	299	254
1997	1,243 (1,229/14)	1,089	361	767	476
1998	768 (762/6)	615	153	506	262
1999	933 (923/10)	869	64	529	404
2000	2,061 (2,046/15)	1,866	195	1,082	979
2001	3,055(3,018/37)	1,649	1,406	1,689	1,366
2002	7,104(7,009/95)	5,809	1,295	3,499	3,605

c) Smolt-to-adult return rates

See 1.a above

d) Stock productivity (e.g. recruits per spawner)

No information provided.

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2. Contributions to harvest and utilization (e.g. food banks)

Estimated Harvest and escapement of Hagerman NFH A-Run releases (IDFG Steelhead Harvest Reports)

Return Year	Estimated Harvest	Hatchery & Estimated In-River Returns	Total Return
2006/2007	7,227	4,019	11,246
2005/2006	3,872	2,014	5,886
2004/2005	3,183	1,494	4,677
2003/2004	2,966	2,405	5,371
2002/2003	7,127	3,173	10,300
2001/2002	11,591	10,263	21,854
2000/2001	6,369	6,639	13,008
1999/2000	4,779	3,483	8,262
1998/1999	2,378	1,585	3,963
1997/1998	4,304	1,727	6,031

3. Contributions to conservation

Lower Snake River Compensation Plan hatchery were constructed to mitigate for fish losses caused by construction and operation of the four lower Snake River federal hydroelectric dams. Lower Snake River Compensation Plan hatcheries have a combined goal of returning approximately 25,000 A-run, adult steelhead to the project area above Lower Granite Dam. The Idaho Department of Fish and Game’s objective is to ensure that harvestable components of hatchery-produced steelhead are available to provide fishing opportunity, consistent with meeting spawning escapement and preserving the genetic integrity of natural populations (IDFG 1992). (IDFG Salmon River A Steelhead HGMP, p.12-13)

4. Other benefits

Public Uses. The economic benefit to the state of Idaho from steelhead fishing has not been quantified in recent years. An extensive survey conducted by the University of Idaho of 1982 steelhead fisherman suggested a perceived value to the fisherman of \$25-32 per trip depending on the estimating technique used (Donnelly *et al.* 1985). The study considered travel distance, and fishing quality, and concluded that a doubling of fishing quality due to either size or number could produce an approximate 30% increase in the value of the trip. This is an especially significant finding considering the great increase in total steelhead returns to Idaho during the end of the nineties.

A thorough analysis on the benefit of steelhead fishing to the state of Idaho is expected to be completed by the summer of 2004. This will show the results of surveys sent out for each of the last four quarters covering the 2003 fishery, which includes the spring portion of the 02-03 return year, and the fall portion of the 03-04 return year.

Every year, IDFG conducts a survey of angler effort and harvest as part of the Harvest Monitoring Program (HMP) under LSRCP. Effort is expressed as number of angler days fished, though the survey does not actually take note of the number of hours fished during the

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day. Therefore, the survey may reflect the number of trips, rather than the actual angling effort, which is probably more important when considering the recreational and economic impacts of fishing.

Angling effort fluctuates depending on several socio-economic factors in addition to run size and timing. For the 2001-2002 steelhead season, there were about 22,000 angler/days on the Snake River, 15,000 angler/days on the Little Salmon River, and 148,000 angler/days on the Salmon River. For the 2002-2003 season, those numbers were 18,000, 18,000, and 145,000 respectively. While Hagerman NFH steelhead were components of all of these fisheries, the Salmon River fishery would be expected to contain a greater proportion of Hagerman NFH steelhead than the other two fisheries, since the Salmon River fishery would include adults returning from only Hagerman NFH, Magic Valley FH, and a portion of the release from Niagara Springs FH.

Harvest Contribution and Economic Benefits. According to the IDFG HMP, the steelhead fishery in Idaho accounts for between 50-80% of the total return of steelhead adults from Hagerman NFH releases. While there is no clear trend to the data, it appears that a larger return sees higher exploitation in the fishery, with a roughly constant number escaping to the Sawtooth weir. Contribution of off-site releases to the fisheries in the Clearwater and Little Salmon rivers are much harder to get a good estimate for. Adult steelhead returning to the Little Salmon River are not recovered at a weir, so the only estimate of return comes from creel surveys.

Cultural Values. Both the Nez Perce Tribe and the Shoshone-Bannock Tribes share in the harvest of steelhead produced by the Hatchery. Both Tribes have a strong value system based on the traditional roles hunting, gathering and fishing played in their culture. Many of their stories and legends depict their close relationship with the natural environment. Steeped in long tradition, they now use their value system to look to the future to protect and enhance natural resources. In the area of fishery resources, both Tribes participate as co-managers with the States, Service and other Federal agencies to protect fish and wildlife important to their culture. With vision and commitment both Tribes maintain and operate multi-faceted fishery management programs in an effort to sustain the resource.

E. Research, monitoring, and evaluation programs

- As a cooperator under the LSRCP the IDFG provides monitoring, evaluation, and coordination services concerning Hagerman NFH production. The IDFG staff monitors biological characteristics of the hatchery stock, fish marking, tag recovery, and other aspects of the hatchery program. The Service maintains the database that stores this information and serves as a link to databases maintained by other entities. The FRO also cooperates with the Hatchery, FHC, Abernathy Fish Technology Center, and the co-managers to evaluate fish culture practices, assess impacts to native species, and coordinate hatchery programs both locally and regionally.
- An extensive monitoring and evaluation program is conducted in the basin to document hatchery practices and evaluate the success of the hatchery programs at meeting program mitigation objectives, Idaho Department of Fish and Game management objectives, and to monitor and evaluate the success of supplementation programs. The hatchery monitoring and

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evaluation program identifies hatchery rearing and release strategies that will allow the program to meet its mitigation requirements and improve the survival of hatchery fish while avoiding negative impacts to natural (including listed) populations.

- To properly evaluate this compensation effort, adult returns to facilities, spawning areas, and fisheries that result from hatchery releases are documented. The program requires the cooperative efforts of the Idaho Department of Fish and Game's hatchery evaluation study, harvest monitoring project, and the coded-wire tag laboratory programs. The Hatchery evaluation study evaluates and provides oversight of certain hatchery operational practices, (e.g., broodstock selection, size and number of fish reared, disease history, and time of release). Hatchery practices will be assessed in relation to their effects on adult returns. Recommendations for improvement of hatchery operations will be made.
- Part of the evaluation of hatchery performance includes the identification and collection of suitable broodstock, as well as the evaluation of different methods for releasing juveniles. Current research efforts by the hatchery evaluation team on steelhead are primarily focused in these areas. A project is underway on Squaw Creek to establish a local origin steelhead broodstock by trapping and spawning adults returning to a temporary weir. A second project centered around Squaw Creek deals with evaluating acclimation and volitional release strategies, as well as looking at the adult return performance of locally derived versus out-of-basin broodstocks.
- The harvest monitoring project provides comprehensive harvest information, which is key to evaluating the success of the program in meeting adult return goals. Numbers of hatchery and wild/natural fish observed in the fishery and in overall returns to the project area in Idaho are estimated. Data on the timing and distribution of the marked hatchery and wild stocks in the fishery are also collected and analyzed to develop harvest management plans. Harvest data provided by the harvest monitoring project are coupled with hatchery return data to provide an estimate of returns from program releases. Coded-wire tags continue to be used extensively to evaluate fisheries contribution of representative groups of program production releases. However, most of these fish serve experimental purposes as well, i.e., for evaluation of hatchery-controlled variables such as size, time, and location of release, rearing densities, etc.
- Continuous coordination between the hatchery evaluation study and Idaho Department of Fish and Game's BPA-funded supplementation research project is required because these programs overlap in several areas for different species including: juvenile outplanting, broodstock collection, and spawning (mating) strategies.

(IDFG Salmon River A Steelhead HGMP, p.47-48)

F. Program conflicts

1. Biological conflicts (e.g. propagated stock maladapted to hatchery water source)

- All hatcheries must consider their potential for adversely affecting the aquatic community and Hagerman NFH is no exception. Of particular concern is the potential impact of New

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Zealand Mud Snails (NZMS) to the Snake River ESU. To meet our obligation in this regard, Hagerman NFH implemented an Aquatic Nuisance Species-Hazard Analysis and Critical Control Point Plan (ANS-HACCP). Within this plan, control points are identified during the rearing cycle, which help minimize potential spread of NZMS around and from the facility. In addition, the Idaho FRO is developing a risk analysis plan that can hopefully be used to determine the potential risk involved regarding the spread of NZMS for a particular stocking program in a particular habitat in a watershed.

- **Water Quality and Quantity.** Water quantity and quality in the aquifer and the mid-Snake River Reach is of regional concern. Land use practices associated with irrigated agriculture, municipal and industrial development, population growth, and large animal confined feeding operations (2,000 to 5,000 cow dairy farms) are suspected in diminishing the water quality of the aquifer and river. The (IDEQ) listed Riley Creek as water quality limited (water quality segment 2385) in 1994 due to bacteria, dissolved oxygen, sediment, nutrients, and nitrogen as pollutants of concern. It remains on the Clean Water Act 303(d) list and will be under a Total Maximum Daily Load (TMDL) for settleable solids and total phosphorous when established by IDEQ.

Continuous-monitoring of the Hatchery springs has shown a steady decline in flow. On average spring flows diverted to the hatchery are approximately 15% below the Hatchery water rights. Other spring users in the Thousand Springs area report similar or greater declines. It is generally understood that continued ground-water withdrawals, changes in the efficiency of irrigation practices, and periods of drought, have combined to diminish spring flows emanating from the ESRPA. A number of basin-wide initiatives are being considered to address this issue.

2. Harvest conflicts (e.g. mixed stock fishery on hatchery and wild fish limits harvest opportunities on hatchery fish)

- Contribution to the fishery is determined by the Harvest Monitoring Program (HMP) within IDFG as part of the LSRCP Hatchery Evaluations program. This program conducts extensive creel surveys in all river reaches open to steelhead fishing in Idaho. A phone and mail survey conducted after the end of the steelhead fishery determines the total take by river section in Idaho, and allows the HMP to determine the sampling rate for the creel surveys by river section. The goal of the HMP program is to determine the adult return success of all release groups in the Salmon River, as well as the proportion of hatchery fish taken in the fishery. Trends in stock performance, and release group performance over several years of this data are used to improve management decisions in these two areas.
- The Lower Snake River Compensation Plan defined replacement of adults “in place” and “in kind” for appropriate state management purposes. The Idaho Department of Fish and Game, the U.S. Fish and Wildlife Service, and other tribal and agency fish managers work cooperatively to develop annual production and mark plans. Juvenile production and adult escapement targets were established at the outset of the LSRCP program. (IDFG Salmon River A Steelhead HGMP, p.17-18)

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- As part of its harvest management and monitoring program, the IDFG conducts annual creel and angler surveys to assess the contribution program fish make toward meeting program harvest objectives. (IDFG Salmon River A Steelhead HGMP, p.17-18)

3. Conservation conflicts and risks

a) Genetic conflicts associated with straying and natural spawning of hatchery fish (Stray rates, proportion of hatchery-origin fish on natural spawning grounds, etc. Provide tables or figures where appropriate)

The genetic identification of stocks of steelhead in the Salmon River is an area that has been getting increasing attention lately. The origin of some of the wild/natural and hatchery stocks will be very important to hatchery practices and release strategies over the next few years. Efforts will be made to limit the introgression of non-native stocks into natural populations, but first the populations must be identified. Samples have been collected from stocks in the upper Salmon River, as well as wild/natural fish trapped at the Sawtooth, East Fork, Pahsimeroi, and Squaw Creek weirs. Preliminary data suggests that the three A-run steelhead stocks that have been raised at Hagerman NFH, are all genetically similar. Data taken from other tributaries is still being evaluated.

Table Xa: Steelhead recoveries at locations other than their release location

Year	Tributary	Adults collected		Release site (cwt's)
		Hatchery	Natural	
1992-95	Squaw (lower)	42	9	Ellis Br., Sawtooth, Challis
	Indian	43	2	Sawtooth, E.F. Salmon, N.F. Salmon, Pahsimeroi
	Owl	3	1	N.F. Salmon
	Slate	6	0	Sawtooth, Pahsimeroi
	Hat	175	13	Pahsimeroi, N.F. Salmon, Ellis Br., Sawtooth, E.F. Salmon, Lemhi R.
	Cow	31	3	Ellis Br., Pahsimeroi
	Warm Springs	14	0	Ellis Br., Sawtooth
	Morgan	105	6	E.F. Salmon, Ellis Br., Sawtooth
	Challis	1	0	
	Williams	28	1	N.F. Salmon, Sawtooth, E.F. Salmon
	Iron	4	1	N.F. Salmon
	Fourth of July	35	1	N.F. Salmon
	Thompson	19	3	Sawtooth
	Tower	2	0	
	Salmon golf course	4	0	
	Carmen	87	0	N.F. Salmon, Ellis Br., Sawtooth, Pahsimeroi, Lemhi R.
	Rattlesnake	35	2	E.F. Salmon, Ellis Br., N.F. Salmon, Pahsimeroi
	Bayhorse	2	0	
	Hughes	1	1	
	Lake Ck. Diversion	9	1	N.F. Salmon
	Turner's Ditch	16	0	Sawtooth, E.F. Salmon, N.F. Salmon

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Table Xb: Steelhead recoveries at locations other than their release location

Year	# CWT recoveries	Recovery location	CWT tag origin	
1985-86	2	E.F. Salmon	Pahsimeroi	
	1	Sawtooth	Dworshak	
1986-87	1	E.F. Salmon	Sawtooth	
	1	Sawtooth	E.F. Salmon	
	1	L.Salmon	Dworshak	
	2	Pahsimeroi	Grande Ronde	
	4	Dworshak	Lyons Ferry	
1987-88	6	Dworshak	Tucannon	
	1	Pahsimeroi	E.F. Salmon	
	1	E.F. Salmon	Sawtooth	
	3	S.F. Clearwater	Dworshak	
1988-89	1	Dworshak	E.F. Salmon	
	5	Dworshak	Tucannon	
	8	Dworshak	Lyons Ferry	
	1	Panther Ck.	Pahsimeroi	
1989-90	38	S.F. Clearwater	Dworshak	
	3	Dworshak	Tucannon	
	1	Dworshak	Lyons Ferry	
	1	Oxbow	L.Sheep	
1989-90	1	Pahsimeroi	Panther Ck.	
	1	Pahsimeroi	Shoup Br.	
	1	Pahsimeroi	Sawtooth	
	114	Dworshak	Kooskia/S.F. Clear.	
	6	Dworshak	Tucannon	
1990-91	3	Dworshak	Touchet	
	7	Dworshak	Lyons Ferry	
	1	Sawtooth	Pahsimeroi	
	1	Pahsimeroi	E.F. Salmon	
1991-92	8	Dworshak	Kooskia/S.F. Clear.	
	2	Dworshak	Touchet	
	1	Dworshak	Lyons Ferry	
	1	Pahsimeroi	Sawtooth	
1991-92	1	Dworshak	Tucannon	
	2	Dworshak	Lyons Ferry	
	7	Pahsimeroi	Ellis Br.	0.7 km below mouth of Pahsimeroi R.
1992-93	4	Pahsimeroi	N.F. Salmon	
	1	E.F. Salmon	Pahsimeroi	
	1	Hells Canyon	Pahsimeroi	
	2	Dworshak	Tucannon	
	1	Dworshak	Lyons Ferry	
1993-94	6	Pahsimeroi	Ellis Br.	0.7 km below mouth of Pahsimeroi R.
	1	Pahsimeroi	E.F. Salmon	
	3	Dworshak	Tucannon	
	1	Dworshak	Touchet	
1994-95	5	Pahsimeroi	Ellis Br.	0.7 km below mouth of Pahsimeroi R.
	1	Pahsimeroi	Sawtooth	
	1	Hells Canyon	E.F. Salmon	
1995-96	5	Pahsimeroi	Ellis Br.	0.7 km below mouth of Pahsimeroi R.
	7	Pahsimeroi	Bruno's Br.	12.6 km upstream from mouth of Pahsimeroi R.
	1	Pahsimeroi	Challis	33.5 km upstream from mouth of Pahsimeroi R.
	1	E.F. Salmon	Sawtooth	
1996-97	1	Pahsimeroi	Sawtooth	
	8	Pahsimeroi	Bruno's Br.	12.6 km upstream from mouth of Pahsimeroi R.
	2	Pahsimeroi	McNabb's Pt.	13.9 km upstream from mouth of Pahsimeroi R.
	20	Sawtooth	Torrey's Hole	40.7 km downstream from Sawtooth
	1	Slate Ck.	Torrey's Hole	2.1 km upstream of mouth of Slate Ck.
	1	Slate Ck.	Sawtooth	42.8 km upstream of mouth of Slate Ck.

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b) Ecological conflicts (e.g. competition between hatchery fish and wild fish, predation,)

Hatchery steelhead may affect listed Snake River summer steelhead and spring, summer, and fall Chinook salmon. The steelhead program has the potential to affect listed salmonids in several ways: 1) predation; 2) competition; 3) adverse behavioral interactions; 4) disease transmission; 5) alteration of the gene pool and; (6) harvest.

Predation. The level of predation by hatchery released steelhead smolts on wild/natural salmonids is not well documented. One study by Cannamela (1993) estimated that 744,000 hatchery steelhead smolts released in the Upper Salmon River consumed approximately 24,000 +/- 15,000 salmonids. Several factors suggest that predation by hatchery steelhead smolts on wild/natural salmonid fry and smolts is probably lower than these estimates. First, the steelhead smolts cited by Cannamela (1993) were released in early April, and took longer to reach Lower Granite Dam. Second, according to the literature, steelhead smolts released by Hagerman NFH are generally below the size that actively preys on fish. The mean size at release for steelhead smolts at Hagerman NFH is 220 mm. Though small steelhead may feed on fish (Horner 1978; Hillman and Mullan 1989), 250mm TL appears to be the lower threshold size that has the greatest propensity to be piscivorous (Beauchamp 1990; IDFG 1992). Current steelhead smolt releases occur towards the end of April and PIT tag data document emigration times from Sawtooth FH to Lower Granite Dam ranging from 9 to 30 days depending on river flows following release. Based on the rapid emigration time through the Salmon River, and size at release, predation on listed salmonids by hatchery smolts should be minimal in the free-flowing river sections.

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

Hagerman NFH steelhead are released as smolts. Competition between hatchery smolts and wild salmonids is minimized due to the rapid emigration time in free flowing river sections (see section on predation above). Steelhead that are not ready to emigrate may residualize in Salmon River tributaries and may potentially compete directly with wild/natural salmonids for food, rearing space, and/or preferred habitats. Bigelow (1997) found that smaller fish (<180 mm FL) were much more likely to residualize than medium (180-200 mm) or larger fish (>200 mm). While we don't know if competition from residuals is a threat, we do know that these smaller fish do not emigrate at the same rate as the medium and large size groups. Bigelow (1997) also saw a decrease in the number of hatchery fish found in streams as the summer progressed. Hatchery practices are being evaluated to reduce residual hatchery steelhead.

Behavior. There are limited data describing adverse behavioral effects of hatchery steelhead 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. As mentioned above, several steps have been taken 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

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steelhead smolts before release have all been modified over the last several years to prepare juvenile steelhead for smoltification. Reducing emigration time will also reduce the potential for adverse interactions with listed salmonids.

Disease. Service fish health guidelines are strictly practiced. The potential for horizontal transmission of IHN and other diseases from hatchery steelhead to wild/natural fish still exists. However, Stewart and Bjornn (1990) stated that there was little evidence to suggest this pattern of transmission is widespread. It is common knowledge that pathogens and diseases occur in wild/natural fish populations and that stresses can cause them to exhibit themselves. As mentioned, hatchery fish could potentially induce stresses on wild/natural populations through predation, competition, or adverse interactions.

4. Other conflicts between the hatchery program, or fish produced by the program, and other non-hatchery issues

- **Bliss Rapids Snail.** Several Hatchery springs and water courses provide refuge for the Bliss Rapids Snail (*Taylorconcha serpenticola*) which is listed as threatened under ESA. The Hatchery is currently undergoing Section 7 consultation with Ecological Services, Snake River Office, Boise, Idaho and will be developing a management plan that provides protection for the Bliss Rapids Snail while allowing the hatchery to continue its legally mandated mitigation.
- The Hatchery continues to be concerned with diminishing spring water supplies for steelhead and rainbow trout production (Figure 1) which requires careful scheduling of rearing units and water management. The incubation and early rearing of rainbow trout production competes for water with steelhead production from December to March (Figure 2). During this period, up to 2.4% of the available steelhead production water is diverted to Hatchery Building #2 for the early rearing of rainbow trout. However, during maximum steelhead production at the end of March, only one cubic feet per second (cfs) of water flow (1.5%) is required. This reduced requirement is due to the spring fingerlings being moved outside to the Trout Raceways which receives Spring 17 water. Due to the Hatchery's plumbing configuration, Spring 17 can only be diverted to the Trout Raceways. Although the water diverted for rainbow trout production during March represents a potential production loss of 20,500 steelhead smolts (4,500 pounds), it is offset by the annual production of 130,000 rainbow trout (18,500 pounds). More importantly, during the early rearing of steelhead in the Hatchery Buildings, the rearing of the fall catchable rainbow trout increases the efficiency of the Hatchery and maintains beneficial use of its water rights. (USFWS 2006a, p.4-5)
- The Hatchery's water supply, which emanates from the Eastern Snake Plain Aquifer (Aquifer), has continued a slow but steady decline. The Aquifer covers a 10,000 square mile area with an estimated storage capacity of 200 million acre feet of water. Most of the water, however, is below spring outlets and economical pumping depths. During the latter part of the last century, increased groundwater withdrawals, irrigation efficiencies, and drought have combined to diminish the volume of water stored in the Aquifer. This diminished storage capacity has resulted in a decline in spring flows throughout the Thousand Springs Reach. In its 1995 "Annual Report", the Hatchery reported that a review of flow data for the period of 1974 through 1994 for two of the Hatchery's spring

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sources, Riley Creek and Bickel Spring Creek, showed a decline in flow of 9.6% and 21.5% respectively. At this time, the Hatchery's spring water winter supply (Dec – Mar, 2006) is approximately 14% (12.7 cfs) below its water right and has been declining at a rate of one cfs per year from 1999 to 2006.

(USFWS 2006a, p.7-8)

Production Capacity Assessment (PCA) Study

- In response to diminishing spring flows (Figure 1), the HET initiated a study to determine the Hatchery's maximum carrying capacity. The study used a modification of the Production Capacity Assessment (PCA) technique outlined in *Aquaculture Management* by James W. Meade, 1989. The PCA quantifies production capacity by monitoring growth rate reductions over time. The fish culturist then uses best judgment to determine the maximum acceptable reduction in growth for the facility. The Hatchery's standard for smolt quality should not allow for any compromise in growth rate. Thus, the theoretical maximum capacity is reached when any growth rate reduction is observed.
- The modified PCA method provides an estimate of actual production capacity since it models the techniques, water supply, and rearing units that are similar to the actual Hatchery production protocols. Three replicates of experimental rearing tanks were set-up to mimic the design of the production raceways. Fresh water entered the upper tank and was serially reused through the middle and bottom tanks. Water flowed through the production section of the tank and then entered a quiescent zone before exiting a top-drain standpipe and falling to the next tank. Twenty-one steelhead fingerlings were stocked in each of the nine tanks (189 total fish).
- The PCA experiment results suggest that steelhead growth is affected at a Flow Index of 1.48. Instantaneous dissolved oxygen levels at this Flow Index neared and dipped below the lower recommended limit of 5 parts per million (ppm) suggested by Piper (1982). However, a review of information presented in *Physiology of Fish in Intensive Culture Systems*, by Wedemeyer 1996, suggests minimum oxygen levels range as high as 7 ppm. Furthermore, other factors relevant to smolt quality such as fish migratory behavior and ability to adapt to seawater may be compromised at, or before, the 1.48 Flow Index. The Hatchery will continue the modified PCA to further evaluate steelhead carrying capacity.
- At the current spring flow loss rate, and maintaining a production level of 1.45 million smolts, the Hatchery will exceed a Flow Index of 1.48 in BY 2009. The Hatchery will continue to monitor smolt quality, dissolved oxygen and ammonia conditions, and smolt survival in the interim. The HET recommends a differential CWT study be initiated to determine the affects of the increased Flow Index on smolt survival for steelhead reared in each of the subsequent serial reuse raceways. By careful monitoring and proactive research, the Hatchery hopes to maintain smolt production levels until conditions in the Aquifer improve.

(USFWS 2006a, p.7-8)

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IVC. Hagerman NFH Resident Rainbow Trout

- The Hatchery also produces rainbow trout for the Dworshak Dam Mitigation program as an in-kind exchange with the IDFG. The trout are stocked into southern Idaho reservoirs; fish reared at the IDFG Nampa State Fish Hatchery are stocked into Dworshak Reservoir. The program calls for stocking sub-catchable trout in the spring and catchable trout in the fall. The Hatchery conducts relevant coordination on this program directly with the IDFG resident trout programmatic staff. (USFWS 2006a, p.3)
- Rainbow trout are distributed to southern Idaho waters in accordance to annual management plans developed by IDFG. Spring fingerling distribution occurs in May when the fish reach about 5 inches in length. Fall catchables are distributed in October when the fish reach 9 inches utilizing semi-tractors and 5,000 gallon capacity fish transport tankers. The Hatchery adheres to the IHOT guidelines established for fish distribution.
- The Hatchery received triploid rainbow trout eggs from the IDFG Hayspur State Fish Hatchery in December and January (Table 2). December eggs (117,000) were earmarked for spring fingerling production and January eggs (48,000) were obtained for the fall catchable commitment. Both spring and fall release trout eggs were incubated in Hatchery Building #2 to avoid interfering with the New Zealand Mud Snail and Production Capacity Assessment experiments being conducted in Hatchery Building #1.
- The spring fingerlings were transferred into the Trout Raceways in February and subsequently released in late May into Little Camas Reservoir as five-inch fingerlings (107,265 released in 2006 @ 7,475lbs). The fall catchable trout were transferred into the Steelhead Raceways in April to maintain beneficial use of the water rights for Bickel and Riley springs. They were transferred again on June 27th to the Trout Raceways to make room for the incoming BY 2006 steelhead. In early September, the Hatchery and IDFG staff marked 1,000 trout with Floy® Tags to evaluate angler exploitation of catchable rainbow trout in Lake Walcott. The fall catchable trout (31,176 @ 12725lbs) were stocked in late September in Lake Walcott (Gifford Springs) and CJ Strike Reservoir (12,422 @ 5,070lbs) at the Cottonwood access. (USFWS 2006a, p.4)
- The Hatchery continues to be concerned with diminishing spring water supplies for steelhead and rainbow trout production (Figure 1) which requires careful scheduling of rearing units and water management. The incubation and early rearing of rainbow trout production competes for water with steelhead production from December to March (Figure 2). During this period, up to 2.4% of the available steelhead production water is diverted to Hatchery Building #2 for the early rearing of rainbow trout. However, during maximum steelhead production at the end of March, only one cubic feet per second (cfs) of water flow (1.5%) is required. This reduced requirement is due to the spring fingerlings being moved outside to the Trout Raceways which receives Spring 17 water. Due to the Hatchery's plumbing configuration, Spring 17 can only be diverted to the Trout Raceways. Although the water diverted for rainbow trout production during March represents a potential production loss of 20,500 steelhead smolts (4,500 pounds), it is offset by the annual production of 130,000 rainbow trout (18,500 pounds). More importantly, during the early rearing of steelhead in the Hatchery Buildings, the rearing of the fall catchable rainbow trout increases the efficiency of the Hatchery and maintains beneficial use of its water rights. (USFWS 2006a, p.4-5)

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1. *Fish health protocols and issues*

- A pathologist from the Idaho FHC visits periodically to examine fish at the hatchery. From each stock and brood year of juveniles, fish are randomly sampled to ascertain general health. Based on pathological signs, age of fish, concerns of hatchery personnel, and the history of the facility, the examining pathologist determines the appropriate tests. This usually includes a necropsy with an external and internal exam of skin, gills, and internal organs. Blood is checked for signs of anemia or other infections, including viral anemia. Additional tests for virus or parasites are done if warranted. The pathologist will also examine fish that are moribund or freshly dead to ascertain potential disease problems in the stocks.

Diagnostic Examination - A pathologist will normally check symptomatic fish during a monthly examination. However, additional diagnostic examinations will be conducted as needed when determined by the pathologist or requested by hatchery personnel. Moribund, freshly dead fish or fish with unusual signs or behavior are examined for disease using necropsy and appropriate diagnostic tests. Samples may be sent by overnight carrier to the FHC for diagnosis in the case of urgency.

Pre-release Examination - At two to four weeks prior to a release or transfer from the hatchery, 60 fish from the stock of concern are necropsied and tissues taken for testing of listed pathogens. The listed pathogens, defined in Service policy 713 FW include infectious hematopoietic necrosis virus (IHNV), infectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV), *Renibacterium salmoninarum*, *Aeromonas salmonicida*, *Yersinia ruckeri*, and *Myxobolus cerebralis*.

- Juvenile fish health monitoring is conducted monthly, except when there are no fish on station, and diagnostic exams are performed as needed. The Idaho Fish Health Center performs these tasks. Pre-liberation inspections are performed at least two weeks prior to the first day of liberation. Prior to release, a 60 fish sample is taken and assayed for IHNV, IPNV, VHSV, *Aeromonas salmonicida*, *Yersinia ruckerii*, and BKD. Fish health exam forms are provided to the hatchery as well as a summary at year-end. (IDFG, March 12, 2007, sec.1.2.4.4)

2. *Chemotherapeutant use*

- The Hatchery strives to minimize the use of chemicals and drugs in fish production. This reduces impacts on the local environment, makes compliance with the various safety regulatory agencies much easier, and reduces risks to employees.
- Chemotherapeutants are used on an infrequent basis in response to outbreaks of diseases such as furunculosis (*Aeromonas salmonicida*) and bacterial coldwater disease (*Cytophaga psychrophilus*), and to control infestations of external protozoan parasites (*Gyrodactylus* spp.). The Hatchery has not used any chemotherapeutants since the mid-1990's. Furunculosis is treated with medicated feeds (Romet, Florfenicol, or Terramycin). Bacterial coldwater disease is treated with Terramycin or Florfenicol medicated feeds. Fish afflicted with bacterial coldwater disease may also be treated with Diquat to address external bacterial growth. Applications of Florfenicol can be done under a veterinary feed directive issued by a veterinarian.. Florfenicol is administered orally at a target dosage of

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15mg of drug per kg of fish per day for 10 days. Diquat is used only under an INAD permit, and it is administered as an immersion treatment (flow-through or standing bath) at 2 to 28 mg/l. External protozoan parasites can be treated with Formalin. Formalin application is done via a standing bath to ensure compliance with effluent limitations (0.7 mg/l) pertaining to its use in waters discharging to Riley Creek. Riley Creek is designated under Idaho State Water Quality Standards and the Clean Water Act, 303d list for cold water aquatic life, salmonid spawning, primary contact recreation, domestic water supply, and special resource water. The Hatchery consults with the Idaho FHC prior to any uses of chemotherapeutants.

- Salmonid egg hardening and disinfection with an iodine compound is required by Service policy to minimize/prevent transmittance of viral and bacterial pathogens. All eggs received by the Hatchery are disinfected in a 100 ppm iodine solution for ten minutes. Vaccines for furunculosis and enteric redmouth disease have been used intermittently in the past with mixed results. All fish handling equipment is disinfected after each use.
- **Other Fish Health Precautions.** Fish transport tanks and fish marking trailers are disinfected before being brought onto the station and after use at the hatchery. Abernathy Fish Technology Center provides quarterly feed analysis to ensure fish feeds are free of contaminants and the feed meets nutritional requirements of fish.

V. Cooperative Programs

VA. Nez Perce Tribe Clearwater River Coho Reintroduction Program

A. Goals

Provide a brief description of program goals in the subsections below. Put “this program has no xxx goal” if a subsection does not apply to the program.

- *Harvest goal:* Reintroduce and restore coho salmon to the Clearwater River Subbasin at levels of abundance and productivity sufficient to support sustainable runs and harvest at an annual escapement of 14,000 coho salmon to the basin.

Incidental harvest of Clearwater River Subbasin coho in ocean and mainstem Columbia river fisheries is expected to occur. Targeted Clearwater River Subbasin harvest opportunities are expected to arise under two circumstances:

1. The abundance of natural origin adults allows for ample escapement for natural spawning while simultaneously provide for some of the broodstock needs. Using a fraction of natural origin adults for broodstock should result in a surplus of hatchery origin adults that could be targeted in a fishery.
 2. If supplementation activities successfully establish highly productive naturally spawning coho salmon aggregates, the number of locations and size of supplementation release groups could be scaled down. If this occurs, production from the expanded NPTH facility could provide a targeted fishery.
- *Broodstock escapement goal:* (Phase 1) Sustainable return of 954 Clearwater Localized stock (CLS) adult coho salmon to fulfill broodstock needs for existing Clearwater River Subbasin facilities (452 for Clearwater Fish Hatchery and 502 for Dworshak National Fish Hatchery). (Phase 2) Sustainable return of an additional 1,404 adults to ensure that broodstock will be available for an expansion of the Nez Perce Tribal Hatchery should Phase II be implemented.
 - *Conservation goal:* Reintroduce and restore coho salmon to the Clearwater River Subbasin at levels of abundance and productivity sufficient to support sustainable runs and harvest at an annual escapement of 14,000 coho salmon to the basin.
 - *Escapement goal for natural-origin adults:* The ultimate goal of the coho reintroduction program is the establishment of substantial coho natural production within the Clearwater River Subbasin that in concert with hatchery production can sustain tribal and recreational fisheries. While the primary goal of Phase I is acquisition of a CLS broodstock, a comprehensive evaluation of natural production is planned in order to determine whether CLS coho salmon are capable of spawning under natural conditions. If natural production is documented in a limited set of streams, managers could more confidently implement Phase II, wherein the reestablishment of natural production is the primary goal.

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- *Research, education, and outreach goals:* A number of indicators of success and failure have been compiled that are amenable to evaluation using the RM&E program. (Phase I) Establishment of baseline production and productivity estimates for naturally spawning coho in Clear and Lolo creeks and establishment of measures of competition between coho and spring Chinook salmon and steelhead in Clear and Lolo creek. (Phase II) Achieving all Phase I indicators of success (establishment of 100% CLS broodstocks at Clearwater Fish Hatchery and Dworshak National Fish Hatchery within nine years of the implementation of Phase I will indicate success, failure to achieve this goal within the this time period will indicate failure (p.35)), establishing that competition has not surpassed acceptable limits due to reintroduction of coho salmon, and confirming that the availability of LCR coho smolts for a minimum of six years (two coho generations) following completion of the Nez Perce Tribal Hatchery expansion.

((NPT, Oct. 2004)

B. Objectives

Describe program objectives, such as broodstock collection, spawning, and release numbers. Include transfers, contributions to other programs, etc., if applicable.

- The Nez Perce developed management objectives (these should be measurable and time-limited) aimed at achieving the overall goal of the program.
- Establish a localized Clearwater River coho salmon broodstock.
- Establish natural spawning populations of coho salmon in the Clearwater River Subbasin.
- Utilize hatchery production to achieve optimal production effectiveness while meeting the management objectives for natural production enhancement, diversity, and impacts to non-targeted populations.
- Restore and maintain treaty-reserved tribal and recreational fisheries.
- Monitor and evaluate program activities and communicate program findings to resource managers.

(NPT, Oct. 2004, p. 15)

Broodstock goals for phase one have two associated indicators of success.

1. A sustainable return of 954 Clearwater localized stock adult coho salmon to fulfill broodstock needs for the existing Clearwater River basin facilities (452 for Clearwater FH and 502 for Dworshak NFH).
2. A sustainable return of an additional 1,404 adults to ensure that broodstock will be available for an expansion of the NPTH facility should phase two be implemented.

Escapement will be measured at capture facilities on Lolo Ck., Clear Ck., and Lapwai Ck. Enumeration of an average of 2,358 adult coho at capture facilities over one three-year period

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within nine years (three generations) after implementation of phase one will be an indicator of success. Failure to achieve a three-year average of 2,358 adult coho at capture facilities within this period will indicate failure.

The second component of broodstock acquisition is the replacement of the lower Columbia River origin coho with Clearwater localized stock coho. Establishment of 100% Clearwater localized stock broodstocks at Clearwater FH and Dworshak NFH within nine years of the implementation of phase one will indicate success, failure to achieve this goal within this period will indicate failure.

In short, activities in phase one must demonstrate that a sustainable broodstock source is available for Clearwater FH and Dworshak NFH, and an expansion of NPTH, prior to construction of the NPTH expansion (phase two).

Indicators of success for phase one broodstock acquisition.

Location Escapement Origin

CFH	452 naturalized stock
DNFH	502 naturalized stock
Lapwai/Potlatch	1,404 lower Columbia and naturalized
Total	2,358 total escapement past LGR

Collection, spawn, transfer and release objectives

- Before BY2006, the Phase I objective was to establish a localized Clearwater coho broodstock and meet broodstock needs by releasing 1.1 million juvenile coho throughout the Clearwater Basin. This included:
 - Transport 550,000 coho smolts from Eagle Creek NFH for direct release into several sites in Lapwai Creek (275,000) and Potlatch River (275,000).
 - Trap and spawn sufficient numbers of returning adults (954) returning to the Clearwater and Snake River (Dworshak NFH, Clear Creek/Kooskia NFH, Potlatch River weir, Lapwai Creek weir, Lyons Ferry FH) to produce 638,000 eggs.
 - The first 308,000 eggs collected from returning adults will be incubated at Dworshak National Fish Hatchery then transported as pre-smolts to Kooskia NFH for a four to six week acclimation period prior to release as smolts into Clear Creek. The release goal is 280,000.
 - The next 330,000 eggs obtained from adult coho returning to the Clearwater River will be incubated and reared at Clearwater Anadromous Fish Hatchery for pre-smolt releases. 270,000 coho pre-smolts are direct stream released into Lolo Creek in late September or early October. Returning adults are intended to spawn naturally in Lolo Creek (supplementation). *(This objective has been discontinued effective BY2006)*
- If there is a shortage of broodstock from the Clearwater River, then additional eggs may be taken at Eagle Creek NFH, incubated to eye-up and transported to

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Clearwater Anadromous Fish Hatchery and Dworshak NFH to backfill production. (100,000 eyed eggs were transferred from Eagle Creek NFH, BY2007).

- Any eggs obtained in excess of 638,000 may be shipped to Eagle Creek NFH for hatch and rearing prior to transfer back to Clearwater River for the Lapwai Creek and Potlatch River smolt releases.
- The Nez Perce Tribe identified in the 2007 Clearwater Annual Operating Plan that in 2007, due to funding cuts in the Pacific Coastal Salmon Recovery Fund, the Nez Perce Tribe was forced to discontinue coho salmon production at Clearwater Hatchery (452 adults to produce 270,000 pre-smolts for acclimation and release in Lolo Creek) and that there would be insufficient funds to operate weirs on the Potlatch River and Lapwai Creek for monitoring and broodstock collection; therefore, the Potlatch smolt release will be transferred to Clear Creek to facilitate future broodstock collection at Kooskia NFH. The release goal is now 830,000.
 - 550,000 smolts from Eagle Creek into Clear Creek (275,000) and Lapwai Creek (275,000).
 - 280,000 smolts from Dworshak/Kooskia NFH, acclimated at Kooskia NFH, then released into Clear Creek (from up to 502 adults).
- Phase II of the coho reintroduction plan will focus on establishing natural production in a number of Clearwater River Subbasin tributaries. To accomplish this goal, Phase II will utilize existing Clearwater River Subbasin hatchery facilities, and expand facilities at the Nez Perce tribal Hatchery Site 1705 facility to rear approximately 687,700 smolts (from 1,404 adults) annually for use in a rotating supplementation schedule.

C. Program Description

Provide a general overview of program, including details such as broodstock origin and source, adult collection, spawning, rearing, release and monitoring and evaluation strategies.

The Nez Perce Tribe proposes to utilize a two-phased approach to coho reintroductions. Phase I of the coho reintroduction program will focus on the establishment of a localized coho salmon stock capable of enduring the migration to the Clearwater River Subbasin. To test achieving this goal, the Nez Perce Tribe proposes to utilize space at existing Clearwater River Subbasin hatchery facilities in concert with the construction of two low-tech acclimation facilities, to capitalize on the higher survival observed for acclimated versus direct released coho. In addition, Phase I will document the natural productivity of localized coho salmon released in two targeted tributaries within the Clearwater River Subbasin. If Phase I is successful at establishing a localized coho salmon stock in an abundance capable of filling existing hatchery space, and the rates of natural productivity are promising, and the inner-specific interactions between coho and sympatric resident and anadromous salmonids are deemed acceptable, then Phase II will be triggered. (NPT, Oct. 2004, p. ii-iii)

The primary tasks identified in Phase I were to continue the shipment of 550,000 smolts from Eagle Creek National Fish Hatchery for acclimation and release from the North Lapwai Valley

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Satellite, establish a sustainable return of 954 CLS adult coho salmon to fulfill broodstock needs for Clearwater Fish Hatchery (452 adults to produce 270,000 presmolts for acclimation and release in Lolo Creek) and 502 for Dworshak National Fish Hatchery (502 adults to produce 280,000 smolts for acclimation at Kooskia National Fish Hatchery and release into Clear Creek), establish a sustainable return of an additional 1,404 CLS adults to ensure that broodstock would be available for an expansion of NPTH facility should Phase II be implemented, conduct tests of supplementation aimed at determining whether returning adult coho can spawn under natural conditions and produce viable progeny, and Implement a RM&E program capable of providing information necessary to inform management, quantitatively track progress toward meeting Phase I goals, Phase II triggers, and determine the optimal size3 release groups for establishing natural production. (NPT, Oct. 2004, p. 23)

The Nez Perce Tribe identified in the 2007 Clearwater Annual Operating Plan that in 2007, due to funding cuts in the Pacific Coastal Salmon Recovery Fund, the Nez Perce Tribe was forced to discontinue coho salmon production at Clearwater Hatchery (452 adults to produce 270,000 pre-smolts for acclimation and release in Lolo Creek) and that there would be insufficient funds to operate weirs on the Potlatch River and Lapwai Creek for monitoring and broodstock collection; therefore, the Potlatch smolt release will be transferred to Clear Creek to facilitate future broodstock collection at Kooskia NFH.

Smolts from Eagle Creek NFH will be released into Clear and Lapwai Creeks in mid-March 2007/08. Approximately 550,000 (275,000 each stream) will be direct stream released. Approximately 25,000 will be CWT/AD, and 25,000 will be CWT only per release site. There will be 1,500 PIT in each release group.

Adult coho returning to the Snake River basin and Clearwater River are a priority for use as BY2007 broodstock (502 adults to produce 280,000 smolts for rearing at Dworshak National Fish Hatchery, acclimation at Kooskia National Fish Hatchery, and release into Clear Creek. 100,000 CWT and 1,500 PIT). Fish will be collected at fish ladders at Dworshak NFH, Kooskia NFH, Lyons Ferry FH, Nez Perce Tribal Hatchery, and two weirs. (IDFG March 8, 2007, p. 19-21)

Phase II of the coho reintroduction plan will focus on establishing natural production in a number of Clearwater River Subbasin tributaries. To accomplish this goal, Phase II will utilize existing Clearwater River Subbasin hatchery facilities, and expand facilities at the Nez Perce tribal Hatchery Site 1705 facility to rear approximately 687,700 smolts annually for use in a rotating supplementation schedule. (NPT, Oct. 2004, p. ii-iii)

The primary tasks identified in Phase II were to continue development of a Clearwater River Subbasin localized coho salmon stock, construct facilities at Nez Perce Tribal Hatchery to accommodate holding and spawning 1,404 adults and rearing 687,000 smolts, increase supplementation using a rotating release schedule, and provide harvest opportunities for tribal and recreational anglers. (NPT, Oct. 2004, p. 25)

Adult collection at Dworshak NFH

- Ladder operation will begin on October 1, 2007 to begin trapping steelhead and Coho salmon at Dworshak and Kooskia NFH. (IDFG March 8, 2007, p21)

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- *Once adults are on station Nez Perce Tribal staff take over responsibility for spawning and rearing operations at Dworshak NFH through the remainder of on station operations.

Adult collection at all trapping locations 2005-2007

Table: The weekly and total number of adult coho salmon captured at Lapwai Creek weir, Potlatch River weir, Clear Creek weir, Dworshak Hatchery, and Lyons Ferry Hatchery in 2005.

Period	Lapwai Creek	Potlatch River	Dworshak NFH	Clear Creek	Lyons Ferry Hatchery
9/30-10/7	0	1	NA ¹	NA ¹	NA ¹
10/7-10/13	0	0	5	0	20
10/14-10/20	3	1	17	0	15
10/21-10/27	50	15	18	5	23
10/28-11/3	21	57	18	41	14
11/4-11/10	17	7	13	11	15
11/11-11/17	11	15	15	0	15
11/18-11/24	43	4	14	NA ²	1
11/25-12/1	15	4	NA ³	1	NA ¹
12/2-12/8	25 ⁵	1 ⁴	NA ³	NA ³	NA ¹
Total	185	105	100	58	103

NPT Coho adult collection

Collection Site	2005	2006	2007
Lapwai Creek Weir	185		
Potlatch Weir	105		
Dworshak NFH	100	194	194
Clear Creek Weir	58		
Lyons Ferry Hatchery	103	130	41
Kooskia NFH		130	305
Nez Perce Tribal Hatchery		11	21
Lolo Creek Weir		1	
Subtotal	551	466	561

D. Program Benefits²⁴

Provide a brief description of program benefits, including adult return numbers over a ten year period, contribution to harvest, contribution to conservation and any other benefits (ceremonial, subsistence, education, research, uniqueness of stock, etc).

Preliminary Reintroduction Results

Short-term Clearwater River Subbasin coho reintroduction plans were developed for the *U.S. v Oregon* Production Advisory Committee in 1996 (Ashe and Johnson 1996) and amended in 1997 (Johnson and Ashe 1997). The Clearwater River Subbasin coho reintroduction program has been

²⁴ Section figures, tables and text from NPT, Oct. 2004, p.86-90.

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adopted as part of the Fall Fisheries Agreement developed through *U.S. v Oregon*. The program was authorized by NOAA Fisheries in their Snake River Basin Hatchery Biological Opinion (NOAA 1999).

The NPT coho reintroduction began in 1995 with the release of 622,227 parr originating from Cascade National Fish Hatchery (CNFH; Table 6-1). The program is ongoing and continues to derive the majority of its production from juveniles reared at LCR hatcheries. However, a progressively larger component of Clearwater River Subbasin coho production is obtained using adults returning to the Clearwater River Subbasin collected from Clear Creek at the Kooskia National Fish Hatchery (KNFH). These adults are spawned at the Dworshak National Fish Hatchery (DNFH) where progeny are reared to the smolt stage for acclimation at KNFH and release into Clear Creek. In addition, adults collected at temporary weirs located on Lapwai Creek, the Potlatch River, Meadow Creek (Selway River drainage), and Lolo Creek are spawned at the DNFH, and their progeny are reared for release into Lolo Creek. In recent years production at DNFH has produced 280,000 smolts for release into Clear Creek, while production at CAFH will allow the release of 270,000 presmolts into Lolo Creek in 2004. Hence, the transition from LCR stock coho salmon to CLS coho has already been initiated.

Preliminary results from NPT coho reintroduction efforts indicate that a substantial survival benefit can be realized by acclimating juveniles prior to release and/or using CLS stock as a brood source (Table 6-2). Acclimation, and/or use of CLS broodstock (or some combination of these factors) appears to increase post-release survival to Lower Granite Dam (LGD). Unfortunately, data are insufficient to determine whether the observed survival benefit results primarily from acclimation or from using CLS broodstock. The preliminary results do show a clear survival advantage for smolt versus parr releases. Finally, adult collection facilities that are located lower in the Clearwater River Subbasin appear to decrease losses due to “drop out” between LGD and capture facilities.

To date, the primary focus of preliminary reintroduction efforts has been the formation of a Clearwater Localized Stock (CLS) of coho salmon. Hence, substantial effort has been expended in attempting to capture all returning adult coho salmon. However, weirs on the Potlatch River and Lolo Creek are not 100% efficient, and redd surveys have documented coho salmon redds in these locations (Table 6-3). The presence of these redds suggests that adult coho salmon returning from the release of lower Columbia River hatchery origin juvenile coho salmon can construct redds. However, since the number of adults that constructed the redds is unknown, and since juvenile trapping activities for coho salmon are opportunistic, it is impossible to estimate productivity.

Finally, the number of adult coho passing Lower Granite Dam (LGD) has been increasing steadily since 1997 (Table 6-4; <http://www.cbr.washington.edu/dart/dart.html>), suggesting that preliminary reintroduction efforts have successful at stimulating adult returns.

Table 6-1. Summary of NPT juvenile coho releases in the Clearwater River subbasin.

Release Year	Life Stage	Brood Source¹/Hatchery²	Number Released	Release Location
1995	Parr	LCR/CNFH	142,456	Potlatch River
	Parr	LCR/CNFH	49,849	Orofino Creek
	Parr	LCR/CNFH	94,777	Eldorado Creek
	Parr	LCR/CNFH	335,145	Meadow Creek (SR ³)

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			622,227	
1998	Parr	LCR/BFH	175,000	Potlatch River
	Parr	LCR/BFH	125,000	Eldorado Creek
	Parr	LCR/BFH	150,000	Meadow Creek (SR)
			450,000	
	Smolt	LCR/WNFH, LCR/BFH	244,640	Lapwai Creek
	Smolt	LCR/WNFH, LCR/BFH	231,076	Potlatch River
	Smolt	LCR/WNFH, LCR/BFH	218,501	Clear Creek
			694,217	
1999	Parr	LCR/BFH	175,000	Potlatch River
	Parr	LCR/BFH	125,000	Eldorado Creek
	Parr	LCR/BFH	150,000	Meadow Creek (SR)
			450,000	
	Smolt	LCR/WNFH, LCR/BFH	290,176	Lapwai Creek
	Smolt	LCR/WNFH, LCR/BFH	276,682	Potlatch River
	Smolt	LCR/WNFH, LCR/BFH	245,168	Clear Creek
			812,026	
2000	Parr	LCR/ECNFH, LCR/WNFH	124,470	Eldorado Creek
	Parr	LCR/ECNFH, LCR/WNFH	148,578	Meadow Creek (SFCR4)
	Parr	LCR/ECNFH, LCR/WNFH	149,300	Meadow Creek (SR)
			422,348	
	Smolt	LCR/WNFH	267,102	Lapwai Creek
	Smolt	LCR/WNFH	267,166	Potlatch River
	Smolt	CLS/DNFH	280,750	Clear Creek
			815,018	
2001	Fry	LCR/ECNFH	23,000	Mission Creek
	Parr	CLS/CAFH, LCR/ECNFH	140,000	Eldorado Creek
	Parr	LCR/ECNFH	120,000	Meadow Creek (SFCR ⁴)
	Parr	LCR/ECNFH	85,000	Meadow Creek (SR)
			345,000	
	Smolt	LCR/WNFH, LCR/ECNFH	286,504	Lapwai Creek
	Smolt	LCR/WNFH, LCR/ECNFH	275,688	Potlatch River
	Smolt	CLS/DNFH	30,191	Clear Creek
			629,283	
2002	Fry	LCR/ECNFH	25,000	Mission Creek
	Parr	CLS/CAFH, LCR/ECNFH	140,000	Eldorado Creek
	Parr	LCR/ECNFH	120,000	Meadow Creek (SFCR)
	Parr	LCR/ECNFH	85,000	Meadow Creek (SR)
			345,000	
	Smolt	LCR/ECNFH	275,000	Lapwai Creek

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	Smolt	LCR/ECNFH	552,298	Potlatch River
	Smolt	CLS/DNFH	236,692	Clear Creek
			1,063,990	
2003	Parr	LCR/CAFH	157,012	O'Hara Creek
	Parr	LCR/CAFH	121,920	Eldorado (Lolo) Creek
	Parr	LCR/CAFH	135,500	Meadow Creek (SFCR)
			414,432	
	Smolt	LCR/ECNFH	274,125	Potlatch River
	Smolt	LCR/ECNFH	279,500	Lapwai Creek
	Smolt	CLS/DNFH	293,879	Clear Creek
			847,504	
2004	Parr	LCR/ECNFH	150,000	Eldorado (Lolo) Creek
	Parr	LCR/ECNFH	75,000	Lolo Creek
	Parr	LCR/ECNFH	75,000	Musselshell Creek
			300,000	
	Smolt	LCR/ECNFH	297,271	Potlatch River
	Smolt	LCR/ECNFH	299,084	Lapwai Creek
	Smolt	CLS/CAFH, LCR/ECNFH	356,323	Clear Creek
			952,678	
2005	Smolt	LCR/ECNFH	275,000	Potlatch River
	Smolt	LCR/ECNFH	275,000	Lapwai Creek
	Smolt	CLS/CAFH, LCR/ECNFH	280,000	Clear Creek
			830,000	

¹Refers to progeny from Lower Columbia River (LCR) origin adults, or Clearwater River localized stock (CLS).

²Refers to the hatchery facility that reared the juveniles:

CNFH = Cascade National Fish Hatchery
 BFH = Bonneville Fish Hatchery
 WNFH = Willard National Fish Hatchery
 ECNFH = Eagle Creek National Fish Hatchery
 DNFH = Dworshak National Fish Hatchery
 CAFH = Clearwater Fish Hatchery

³SR refers to the Selway River watershed.

⁴SFCR refers to the South Fork Clearwater River watershed.

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Table 6-2. Summary of observed survival rates of NPT coho release groups.

Stream	Stock	Life Stage	Survival to LGR (%) ¹	SAR LGR to LGR (%)	Dropout LGR to Trap (%)
Clear Creek	CLS	Smolt	56.2 - 75.0	0.5 - 0.6	49.1
Potlatch River	LCR	Smolt	8.6	1.1	60.0
Lapwai Creek	LCR	Smolt	24.2	0.2	51.5
Meadow Creek SR	CLS	Parr	2.4 - 10.4	NS ²	100.0
Eldorado Creek	CLS	Parr	5.9 - 8.0	NS ²	92.0
¹ Calculated using SURPH 2.1 (Lady <i>et al.</i> 2001)					
² Sample size was insufficient for calculation.					

Table 6-3. Number of coho salmon redds enumerated in the Potlatch River and Lolo Creek from 1999 through 2003.

Year	Redds		
	Potlatch River	Lolo Creek	Total
1999	11	N/A	11
2000	14	N/A	14
2001	32	0	32
2002	20	0	20
2003	15	1	16

N/A - Redd counts were not conducted in Lolo Creek in 1999 and 2000.

Table 6-4. Counts of adult and jack coho salmon passing LGD from preliminary NPT coho salmon reintroduction efforts.

Year	Adult Coho	Jack Coho	Total
1997	84	10	94
1998	10	1	11
1999	250	42	292
2000	883	35	918
2001	937	111	1,048
2002	247	149	396
2003	1,129	130	1,259
2004*	3,291	97	3,388

*Adult returns as 27 October 2004.

E. Program Conflicts

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Provide a brief description of program conflicts if any. This could include biological, harvest or conservation conflicts, such as conflicts with other harvest or conservation objectives, genetic, demographic or ecological conflicts with other stocks or species in the watershed or region, or conflicts within the program itself.

The Nez Perce Tribe developed an extensive RM&E plan to monitor and evaluate the results of the coho restoration program so that operations could be adaptively managed to optimize hatchery and natural production, and minimize deleterious ecological impacts. (NPT Coho Master Plan Clearwater River Basin 2004, p. 39-41)

Funding limitations have resulted in changes to the proposed program and the RM&E program has not currently been fully funded.

VI. References

Reference/supporting documents can be found at the Columbia River Basin Hatchery Review web site <<http://www.fws.gov/pacific/Fisheries/Hatcheryreview/index.html>> under “Reports & Publications”.

- BPA (Bonneville Power Administration). Aug. 31, 2007. Comparative Survival Study of PIT-Tagged Spring/Summer Chinook and Steelhead In the Columbia River Basin, Ten-year Retrospective Analysis Report. BPA Fish Passage Center. Portland, OR.
- Burge, H. Jan. 2007. Adult Spring Chinook Salmon Returns to Dworshak and Kooskia Fish Hatcheries in 2006 and Predictions for 2007. USFWS Idaho Fishery Resource Office, Ahsahka, ID.
- Burge, H. Jan. 2007. Adult Steelhead Returns to Dworshak NFH in 2005-2006 and Prognosis for 2006-2007. USFWS Idaho Fishery Resource Office, Ahsahka, ID.
- Hansen. Dec. 2006. Evaluation of Idaho Steelhead Harvest for Lower Snake River Compensation Plan Hatchery Programs, Project Progress Report, Report Period September 2000 to April 2001. IDFG, Boise, ID.
- ICTRT (Interior Columbia Basin Technical Recovery Team) Independent Populations of Chinook, Steelhead, and Sockeye for Listed Evolutionarily Significant Units Within the Interior Columbia River Domain, Working Draft, Jul. 2003, Interior Columbia Basin Technical Recovery Team – NOAA Fisheries web site.
- IDFG (Idaho Department of Fish and Game). Mar. 12, 2007. Annual Operating Plan (AOP) for Fish Production Programs in the Salmon river Basin. IDFG, Boise, ID.
- IDFG. Mar. 8, 2007. Annual Operating Plan for Fish Production Programs in the Clearwater River Basin, IDFG, Boise, ID.
- IDFG. Sept. 30, 2002a. Idaho Department of Fish and Game Clearwater River Basin, B-Run Steelhead Hatchery Genetic Management Plan. IDFG, Boise, ID.
- IDFG. Sept. 30, 2002b. Idaho Department of Fish and Game Salmon River Basin, Spring Chinook Hatchery Genetic Management Plan. IDFG, Boise, ID.
- IDFG. Sept. 30, 2002c. Idaho Department of Fish and Game Salmon River Basin, A-Run Steelhead Hatchery Genetic Management Plan. IDFG, Boise, ID.
- IDFG. Sept. 30, 2002d. Idaho Department of Fish and Game Salmon River Basin, B-Run Steelhead Hatchery Genetic Management Plan. IDFG, Boise, ID.
- NPT (Nez Perce Tribe). Oct. 2004. Coho Salmon Master Plan, Clearwater River Basin, Nez Perce tribe and FishPro, Lapwai, ID.
- NPT and IDFG. September 1, 1999. Clearwater River Subbasin Salmon and Steelhead Production Plan – NPT, IDFG for NWPPC and CBFWA, September 1, 1990.

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Lower Snake NFHs Assessments and Recommendations Report – June 2009

NWPPC (Northwest Power Planning and Conservation Council). November 2003. Draft Clearwater Subbasin Assessment. NWPPC, Portland, OR.

NWPPC. 2004. Mountain Snake Province Artificial Production Review and Evaluation (APRE) Report. NWPPC, Portland, OR.

NWPPC. May 28, 2004. Draft Salmon River Subbasin Plan - Salmon Subbasin Assessment.

NWPPC. May 2004. Snake Hells Canyon Subbasin Assessment. NWPPC, Portland, OR.

NWPPC. May 28, 2004 Lower Snake Mainstem Subbasin Plan, NWPPC, Portland, OR.

NMFS (National Marine Fisheries Service). June 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead, NOAA Technical Memorandum NMFS-NWFSC-66. NOAA NMFS NWFSC, Seattle, WA.

Pastor, S.M. 2009. Annual Stock Assessment - CWT (USFWS). Project No. 1982-013-03. Annual report to Bonneville Power Administration by the U.S. Fish and Wildlife Service, Columbia River Fisheries Program Office, Vancouver, WA. www.fws.gov/columbiariver/publications.

Pastor, S. Jan. 2007. Annual Report 2005, Annual Stock Assessment – CWT Report. USFWS Columbia River Fisheries Program Office, Vancouver, WA.

Pollard, H. Dec. 2003. Snake River Basin Hatchery Management Strategies. Presentation for NOAA Fisheries. NW Region Salmon Recovery Division, Seattle, WA.

USFWS (U.S. Fish & Wildlife Service). May 1990. A Review of the LSRCP Hatchery Program – “Red Book”. USFWS, LSRCP Office, May 1990. Boise, ID.

USFWS. Apr. 2004. Comprehensive Hatchery Management Plan for the Dworshak National Fish Hatchery. Dworshak National Fish Hatchery (DNFH), Ahsahka, ID.

USFWS. Oct. 6 2005. Comprehensive Hatchery Management Plan for the Hagerman National Fish Hatchery. Hagerman National Fish Hatchery (HNFH), Hagerman, ID.

USFWS. Mar. 2007. Comprehensive Hatchery Management Plan for the Kooskia National Fish Hatchery. Kooskia National Fish Hatchery (KNFH), Kooskia, ID.

USFWS. Sept. 16, 2002. Dworshak National Fish Hatchery, Spring Chinook Salmon Hatchery Genetic Management Plan. USFWS, Dworshak National Fish Hatchery, Ahsahka, ID.

USFWS. Oct. 1, 2002. Dworshak National Fish Hatchery (DNFH) B- Steelhead Hatchery Genetic Management Plan. USFWS, Dworshak National Fish Hatchery, Ahsahka, ID.

USFWS. Aug. 2006. Evaluation of Clearwater Steelhead stock performance in serial re-use raceways at Hagerman National Fish Hatchery, Final Report. Hagerman Hatchery Evaluation Team, Lower Snake River Compensation Plan Office, Boise, ID.

USFWS. 2006. Hagerman National Fish Hatchery, Fiscal Year 2006, Summary of Operations and Expenditures. USFWS HNFH, Hagerman, ID.

USFWS Columbia Basin Hatchery Review Team
Lower Snake NFHs Assessments and Recommendations Report – June 2009

USFWS. Aug. 9, 2006. Spawning Report, Brood Year 2006 Steelhead. USFWS Dworshak Fisheries Complex, Ahsahka, ID.

USFWS. Aug. 9, 2006. Spawning Report, Brood Year 2006 (BY06) Summer Steelhead. USFWS Idaho Fishery Resource Office, Ahsahka, ID.

USFWS. Oct. 30, 2006. Spawning Report, Broodyear 2006 Spring Chinook Salmon – IFRO, October 30, 2006. USFWS Idaho Fishery Resource Office, Ahsahka, ID.

USFWS & University of Idaho. June 12, 2007. Memorandum of Agreement Between the USFWS and the University of Idaho, USFWS, Portland, OR.

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