



CLEARWATER FISH HATCHERY
Brood Year 1997 Chinook
Brood Year 1998 Steelhead
Report



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1997 CHINOOK BROOD YEAR REPORT

ABSTRACT

Clearwater

Spring chinook salmon *Oncorhynchus tshawytscha* are reared at Clearwater Fish Hatchery (CFH), and typically brought on station as either green or eyed eggs. In 1997, due to the large number of adults returning to the South Fork of the Clearwater River, 440 adults were transported to the adult holding ponds and spawned at the CFH. Chinook were reared on station and released as parr, pre-smolts, or smolts.

Powell

The Walton Creek weir was installed on June 5, 1997 and taken out of operation on September 4, 1997. The run total was 718 fish, which consisted of 2 jacks, 355 adult males, and 361 adult females. A total of 115 fish were released to spawn naturally. All remaining fish were held for spawning. A total of 292 females were spawned, producing 948,387 green eggs.

A total of 330,555 pre-smolts from Rapid River and Powell stocks were released from Powell pond on September 23, 1998.

A total of 334,482 full-term smolts from Rapid River stock chinook were released from Powell pond during the period April 12 through April 14, 1999.

South Fork (Red River / Crooked River)

Adults returning to Crooked River and Red River weirs were combined into one South Fork stock starting in 1997. Stocks were combined due to high rate of straying. The integrity of all supplementation and natural fish will be maintained to their native streams.

The Red River weir was installed on June 19, 1997 and taken out of operation on September 19, 1997. The run total was 280 fish, which were combined with the returning adults from Crooked River. A total of 57 chinook (34 males and 23 females) were released to spawn naturally.

The Crooked River weir was installed May 30, 1997 and taken out of operation September 16, 1997. The run total was 1,034 fish, which were combined with returning adults from Red River. A total of 126 chinook, (52 males and 74 females) were released to spawn naturally.

The South Fork (Red River/Crooked River) run total was 1,314 fish. A total of 183 fish were released to spawn naturally. All remaining fish were held for spawning. A total of 562 females were spawned, producing 1,819,914 green eggs.

A total of 66,114 pre-smolts from the South Fork stock were released from the Red River pond on October 5, 1998.

A total of 360,983 full-term smolts from the South Fork stocks were released from the Red River pond April 12 through April 15, 1999.

A total of 162,119 pre-smolts from the South Fork stock were released from the Crooked River raceways on September 24, 1998.

A total of 600,981 full-term smolts from the South Fork stock were released from the Crooked River raceways April 12 through April 15, 1999.

Rapid River

During the 1997 spawning season, green eggs from 160 females, and eyed eggs from 169 females from Oxbow (Rapid River stock) and 12 females from Sawtooth (Rapid River stock) were transferred to CFH. Eggs from 127 females were used, producing 493,000 green eggs. A total of 543,843 Oxbow (Rapid River stock) and 39,365 Sawtooth (Rapid River stock) eyed-eggs were received; all low Bacterial Kidney Disease (BKD) (< 0.25) parentage.

Selway Captive Brood

A total of 12 Selway captive brood females were spawned in 1997 at CFH. A total of 15,187 green eggs were collected from 7 of 12 females spawned. These were the last fish in the captive Selway chinook program.

A total of 5,712 (BY97) chinook pre-smolts were released in the Magrudor Corridor on the Selway River on September 19, 1998.

The remaining 22 five-year-old adult Selway chinook were released to spawn naturally in the Selway River in the Magrudor Corridor on August 21, 1998.

Idaho Supplementation Study (ISS)/Nez Perce Tribal Hatchery (NPTH) Parr Production

A total of 428,390 parr were released during the summer of 1998 for ISS and NPTH monitoring programs. Release sites and numbers include: Colt Killed Creek (299,079), Squaw Creek (12,827), Pete King Creek (12,889), Warm Springs (19,847), and Boulder Creek (83,748).

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INTRODUCTION

Funding Source

Construction responsibility for the Lower Snake River Compensation Plan (LSRCP) was assigned to the Walla Walla District, U.S. Army Corps of Engineers (USACE), while responsibility for fish hatchery Operation and Maintenance (O&M) funding was to be accomplished by "one of the Federal fishery agencies." The question of O&M funding was settled in 1977 with the signing of an interagency agreement by the USACE, National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS). The agreement stated that the USFWS would budget for and administer O&M funding for LSRCP fish hatchery programs (responsibility for administration, and O&M for fish passage and wildlife programs remains with the USACE).

The USACE estimated cost for construction of CFH and three satellite facilities to be \$43,153,000 (Joe McMichael's report December 1991).

Location

Clearwater Fish Hatchery is located on the north bank of the North Fork of the Clearwater River, 1.5 miles downstream from Dworshak Dam, 72.5 miles upstream from Lower Granite Dam and 504 miles upstream from the mouth of the Columbia River.

Crooked River satellite facility is 20 miles downstream of Red River. The trap is one-half mile upstream of the mouth of Crooked River, a tributary of the South Fork of the Clearwater River. The juvenile rearing ponds are ten miles upstream from the Crooked River adult trap. Crooked River is 172.5 miles upstream from Lower Granite Dam and 604 miles upstream from the mouth of the Columbia River.

Powell satellite facility is 122 miles east of CFH at the headwaters of the Lochsa River. Missoula, MT, which is 45 miles east, is the closest town. Powell is 192.5 miles upstream from Lower Granite Dam and 624 miles upstream from the mouth of the Columbia River.

Red River satellite facility is 15 miles east of Elk City, ID, 186 miles upstream from Lower Granite Dam and 618 miles from the mouth of the Columbia River.

OBJECTIVES

Mitigation Goals

The goal of the CFH and satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead above Lower Granite Dam.

Idaho Department of Fish and Game Objectives

The objectives of Idaho Department of Fish and Game (Department) for the CFH are to reestablish fish runs in to the upper Clearwater River tributaries, to enhance the wild spawning population, and increase sport and tribal fish opportunities.

FACILITY DESCRIPTION

General Hatchery Description

Clearwater Hatchery

Clearwater Fish Hatchery is the final facility built by the USACE under the LSRCP. This facility is also the largest of the LSRCP hatcheries built.

Support buildings include the administration/dormitory building. The dormitory section includes four bunkrooms with maximum capacity of 16 people, a living room, dining room, kitchen, shower rooms for men and women, and laundry room. The administration portion consists of office space with a visitor center and entry lobby.

The shop area includes a vehicle maintenance shop and a smaller mechanical repair shop. A screen storage room has been altered for use as a carpentry shop.

The hatchery building also houses an incubation room and walk-in freezer. A screen and equipment storage building is on the west end of the hatchery.

There are seven residences on the hatchery grounds. Each residence has a storage building.

There is an isolation incubation building for receiving eggs with unknown disease status and a chemical storage building for storing barrels of formalin and chlorine.

A 1.8-mile long pipeline runs upstream to the Dworshak Dam. The pipeline goes up the face of the dam to an elevation of 1,357 feet then through the dam into Dworshak Reservoir. The 18-inch pipe is stationary at an elevation of 1,357 feet with a screened inlet to keep out debris. This pipe supplies coolwater to the hatchery. The 48-inch flexible plastic pipe suspended from a floating platform with a winch attached to the platform raises and lowers the intake of the pipe to the level of desired water temperature. This pipe supplies warmwater to the hatchery.

A distribution structure designed to reduce the 286 psi of the high pressure supply lines to the gravity flow of 7 psi is located approximately 200 yards upstream from the hatchery. The structure consists of a primary and a secondary chamber. Each chamber has two ported-sleeve valves used to reduce the pressure. One valve is in operation while the other is on standby for emergencies.

A 73,600 cubic foot (cf) cleaning sedimentation pond is used during cleaning to settle out the settleable solids produced by the hatchery. A 414,000 cf final sedimentation pond settles waste from the total flow of hatchery operation and the out-flow of the cleaning sediment.

Crooked River

There are two separate sites to this facility. The first is the adult trap and a support cabin located one-half mile upstream of the mouth of Crooked River. The weir at this location consists of removable posts and panels supported by an iron bridge across Crooked River. There are no holding ponds at the site, and all fish are either released directly from the trap or transported to Red River holding ponds.

Ten miles upstream from the adult trap are two raceways for summer rearing and spring acclimation of smolts. There is a cleaning waste pond and final settling pond to meet EPA water quality standards. Additional facilities include a garage, shop, walk-in freezer to store fish food, and a support cabin with kitchen, dining room, living room, bathroom, and bedroom.

Powell

The Powell facility is at the confluence of Crooked Fork and Colt Killed Creek (White Sands), which form the Lochsa River. There is one rearing pond for summer rearing and spring acclimation of smolts. A water supply diversion and intake screen structure are on Walton Creek, and a pump house is on White Sands Creek. A weir diverts fish that come up Walton Creek into the fish ladder and fish trap. The fish trap is connected to two adult holding ponds and covered spawning area. A floating weir that spans across the Lochsa River is stored at the facility for use when needed. Also on site is a support cabin with kitchen, dining room, living room, bedroom, bathroom, and walk-in freezer to store fish feed. During the summer of 1994, the USACE constructed a 16-ft x 14-ft formalin storage building.

Red River

The Red River site consists of four structures. A freezer/storage building houses a walk-in freezer, a workshop/garage area, a formalin storage building, and a support cabin.

The adult holding facility consists of two raceways with a holding capacity of 350 adult fish. A removable tripod and panel weir blocks fish passage across Red River and diverts them into the fish ladder.

There is one rearing pond for summer rearing and spring acclimation of smolts. This pond has a hypalon plastic liner with eight- to ten-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner, which aids in pond vacuuming.

Production Capacities by Unit

Clearwater Hatchery

The steelhead raceways consist of 300-ft x 10-ft x 6-ft raceways supplied by a center head raceway with an East and West Bank of 12 raceways. The total rearing space of 24 raceways is 216,000 cf. This area will rear a maximum of 2.4 million steelhead smolts with 0.3 density index (DI) (Piper 1986). A flow of approximately 1.67 cubic feet per second (cfs) is available for each raceway, but it is suspected this flow will only allow 1.7 million steelhead to be reared in these raceways without exceeding the flow index (FI) of 1.2 (Piper). All water for these raceways flows through degassing towers, then into the head raceway. These raceways are supplied with water from the surface intake only.

Chinook raceways are 200-ft x 10-ft x 3-ft. Eleven raceways have a total rearing space of 66,000 cf. The raceways are supplied with water from both primary and secondary intakes and a mixing chamber, which allows for the control of water temperature to rear chinook. The designed rearing capacity of these raceways is 1.5 million smolts at a 0.3 DI (Piper). The estimated flow per raceway is 2.4 cfs per raceway.

The adult holding facility consists of two ponds with a combined capacity of 8,000 cf and a maximum holding capacity of 800 adult salmon. There is also a covered spawning area with two live wells for on-site egg taking. This facility is supplied with water from the tailrace of the juvenile chinook raceways. Estimated flow per pond is 3.5 cfs.

The incubation room contains 40 double-stack FAL incubators with a total of 640 trays available for egg incubation. The upper and lower half of each stack (eight trays each) have different water supplies and drains. This design aids in segregation of diseased eggs. The maximum capacity of this facility is five million green eggs. The incubation room is supplied with both water sources to provide the desired temperature for incubation with a flow of 5 gallons per minute (gpm) to 8 gpm per one-half stack.

Isolation incubation consists of 12 double-stack FAL incubators with a total of 192 trays available for egg incubation. The maximum capacity of this facility is 1.5 million green eggs. The isolation incubation room is supplied with both water sources to provide the desired temperature for incubation with a flow of 5 gpm to 8 gpm per stack.

Early rearing consists of 60 concrete vats (40-ft x 4-ft x 3-ft) containing 480 cf of rearing space each. This part of the facility can rear 5.9 million fish to 287 fish/lb. at a 0.3 DI. The vats are supplied with water from each intake and have a flow of approximately 120 gpm per vat when all vats are in use. An incubation jar is plumbed directly into them. The 60 incubator jars have a total capacity of 2.6 million eggs with a flow of 15 gpm per jar.

Crooked River

The Crooked River facility has two raceways (145-ft x 20-ft x 4-ft) for a total of 23,200 cf. These raceways have a capacity of 700,000 juvenile chinook with a DI of 0.29. Water flow per raceway is six cfs. Each raceway is outfitted with three automatic Nielson feeders. The adult trapping facility measures 10-ft x 12-ft x 4-ft with a total of 480 cf. Water flow for the adult facility is 10 cfs. This facility has no provision for adult holding.

Powell

The rearing pond (165-ft x 65-ft x 5-ft) has 53,625 cf of rearing space. The normal loading of 320,000 fish produces the best looking smolts and a DI significantly less than 0.3. The maximum design capacity is 500,000 fish with a DI of 0.092. Water flow through this pond is 6.24 cfs. A catwalk across the length of the pond supports eight automated Nielson feeders.

The two adult ponds (100-ft x 20-ft x 4-ft 8-in.) have a volume of 9,500 cf and a holding capacity of 960 adult chinook. The adult trap measures 12-ft x 6-ft x 4-ft and is supplied with 6.24 cfs of water.

Red River

The adult holding facility consists of two ponds (10-ft x 45-ft x 4-ft) with a total of 3,400 cf of holding space and a trap area 8-ft x 16-ft x 4-ft. These ponds have a holding capacity of 350 fish. A removable tripod and panel weir blocks fish passage and diverts them into the fish ladder. Water flow through the ponds and trap is 4.09 cfs.

A 170-ft x 70-ft x 4-ft 6-in. rearing pond will rear a maximum of 320,000 chinook smolts. The maximum design capacity is 500,000 fish with a DI of 0.092. Water flow through this pond is 6.24 cfs. This pond has a hypalon plastic liner with eight- to ten-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner, which aids in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight automatic Nielson feeders. Water flow through the pond is 4.09 cfs.

WATER SUPPLY

Clearwater

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warmwater intake is attached to a floating platform and can be adjusted from five feet to forty feet below the surface. The coolwater intake is stationary at 245 feet below the top of the dam. An estimated 10 cfs of water is provided by the coolwater supply and 70 cfs of water from the warmwater supply. The coolwater supply has remained fairly constant between 38°F and 45°F. The warm water can reach 80°F, but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the warmest water available until water temperatures rise in the spring (Appendices A1, A2, and A3). All water is gravity flow to the hatchery.

Crooked River

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. The water rights stipulate 10 cfs from April 1 to June 30 and six cfs from July 1 to October 1 at the rearing facility. Temperatures ranged from 43°F to 62°F (Appendix B1). All temperatures were taken at the adult trap. All water supplied to both facilities is gravity flow.

Powell

The intake is 100 yards upstream from the facility. Powell's water right for the gravity intake is 6.24 cfs from a gravity flow system on Walton Creek and 2.5 cfs from a supply pumped out of White Sands Creek. Two 7.5 horsepower pumps can be used to supply Walton Creek with water from White Sands Creek during periods of low water. Water temperatures ranged from 42°F to 53°F from Walton Creek (Appendix B2).

Red River

Red River is supplied by gravity flow from an intake at the bottom of the South Fork of the Red River, 225 yards upstream from the facility. The water right for the facility is 8.18 cfs. During low flow in the summer, about 5 cfs is available to the hatchery. Temperatures ranged from 44 to 62°F (Appendix B3).

Water Quality Analysis

The water quality analysis at CFH was done by the Department of Health and Welfare in Boise and the satellite facilities was done by Anatek Labs in Moscow, Idaho.

The samples were taken from the hatchery incubation supply line June 1994 (Appendix C1).

Clearwater Hatchery water supply has a total alkalinity (as CaCO₃) of 16 mg/l which is very low regarding fish culture.

Water quality analysis were taken at Crooked River, Powell, and Red River rearing facilities from the intake in 1998 (Appendix C2, C3 and C4).

STAFFING

Clearwater Fish Hatchery has eight permanent staff employees: one Hatchery Manager, two Assistant Hatchery Managers, one Utility Craftsman, three Fish Culturists, and an Office Specialist II. The rest of the crew consists of temporary employees with the positions of Fishery Technicians, Biological Aides, Laborers, Mechanic Assistant, Grounds Maintenance Worker, and Clearwater Youth Program enrollees. There is one temporary person, supervised from CFH, at each of the satellites facilities: Red River, Crooked River, and Powell.

ADULT CHINOOK COLLECTION

South Fork of the Clearwater River

Due to the high rate of straying chinook returning to Crooked River and Red River, this stock was combined to make one stock, the South Fork of the Clearwater River.

The Crooked River weir and trap was in operation for chinook between May 30 and September 16, 1997. A total of 1,034 fish (two jacks and 1,032 adults) were trapped. Flow through the trap for adult attraction was ten cfs from May 30, 1997 to June 30, 1997 and six cfs from July 1997 to October 1, 1997.

The Red River weir and trap was installed on June 19, 1997 and taken out of operation on September 19, 1997. A total of 280 fish (four jacks and 276 adults) were trapped. Flow through the trap for adult attraction is five-cfs.

Age-class breakdown of this run included: four 1-ocean males and two 1-ocean females, 506 2-ocean males and 684 2-ocean females, 22 3-ocean females and 96 3-ocean males. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks or jills, 25 inches (64cm) to 31 inches (82cm) were four-year-olds and 32 inches and over were five-year-olds. The breakdown is from limited historic coded-wire-tagged (CWT) data (Appendices D1, D2, D3, E1, E2, E3, F1, and F2).

Powell

The weir and trap on Walton Creek were installed on June 5, 1997 and taken out of operation on September 4, 1997. A total of 718 fish (two jacks and 716 adults) were trapped. Flow through the trap was 6.2 cfs.

The floating weir across the Lochsa River was not installed this year. Adipose clipped (Ad) fish returning to the Powell trap were considered hatchery stock and were ponded for spawning. In March 1997, 46 floating weir panels were loaned to the Lookingglass Hatchery (Bob Lund) for the Imnaha River.

Age-class breakdown of this run included: two I-ocean males and no I-ocean females, 207 II-ocean males and 294 II-ocean females, 98 III-ocean males and 17 III-ocean females. The age-class breakdown was as follows: less than 25 inches (64cm) were jacks or jills, 25 inches (64 cm) to 31 inches (82cm) were four-year-olds and 32 inches (82cm) and over were five-year-olds. Breakdown is from limited historic CWT data from Clearwater Region Fisheries Biologist (Appendices G1, G2, G3, H and I).

Lower Granite Dam

Adult chinook were intercepted at Lower Granite Dam (LGD) destined for Lookingglass Hatchery (Rapid River stock). In five trips, 282 excess adults were transported from LGD to Sawtooth Hatchery by CFH personnel.

ADULT HOLDING

All fish were injected with erythromycin 200 at a rate of 20 mg/kg to inhibit BKD. Fish were treated with a formalin drip for one hour to prevent fungal growth. Fish held at Red River were treated at 150 ppm, and fish held at Clearwater and Powell were treated at 120 ppm. After separating males from females, fish were treated daily at the same concentration and duration.

There is no adult holding at the Crooked River satellite. Fish trapped from this facility are transported 28 miles to the Red River facility. These adults were combined with chinook returning to Red River. The capacity of the Red River holding ponds was exceeded, and 440 ad-clipped adult chinook were transported and held at CFH, the main facility.

SPAWNING AND EGG TRANSPORT

A one-to-one, male-to-female spawning ratio was used to comply with genetic protocol of fish runs over 100 females.

At the time of spawning at each facility, eggs were water-hardened in a 100-ppm iodine solution for one hour. Eggs collected from adults spawned at the main facility were placed directly into a FAL egg tray for water hardening. Eggs collected from adults spawned at the satellites were placed in egg tubes and transport containers for water hardening. Tissue and ovarian samples were collected at the time of spawning. These samples were airmailed the next day to Eagle Fish Health Lab for BKD and virus testing (Appendix J).

After water hardening, green eggs were drained and transported in freshwater to CFH for incubation. The transport vehicle was met at the front gate and egg tubes were removed from an egg cooler and placed in a clean egg cooler containing tempered 100 ppm Argentyne solution for 10 minutes. The clean egg cooler was then taken to the incubation room and eggs from each female were placed in individual FAL egg trays.

South Fork of the Clearwater

Chinook were sorted twice per week for ripeness. The first fish was spawned August 6 and the last on September 22, 1997. A total of 562 females were spawned. Pre-spawn mortality for the South Fork stock, including fish held at the main facility, was 75 fish (5.7% pre-spawning mortality). All pre-spawn carcasses not showing clinical signs of BKD were returned to either Crooked River or Red River to add nutrients to the system (Appendix E3).

Powell

Fish were checked twice per week for ripeness. The first fish was spawned on August 7, 1997 and the last on August 25, 1997. A total of 292 females were spawned. Fish carcasses not showing clinical signs of BKD were placed in the Lochsa and tributaries to add nutrients to the stream (Appendix G3). Pre-spawn mortality was 10.2%, with a total of 73 fish.

Eggs Received

During the 1997 spawning season, eyed eggs from low BKD parentage were received from Rapid River and Sawtooth hatcheries. Clearwater Fish Hatchery received 543,843 eyed eggs from 169 females from Rapid River and 39,365 eyed eggs from 12 females from Sawtooth Hatchery (Rapid River stock) (Appendix J).

Rapid River Stock

A total of 160 females were spawned on September 1, 1997 and September 4, 1997, at Rapid River Hatchery in Riggins, Idaho. Green eggs were transported to the CFH using the same protocols followed in egg transport from the satellites. After culling eggs from females with BKD optimal densities above 0.26, 127 female's eggs remained to be picked and enumerated (Appendix J).

Selway Captive Brood

A total of 12 BY92 Selway captive brood females were spawned at CFH. The same protocol was followed as the fish spawned at satellites (Appendix J).

INCUBATION

Clearwater Hatchery

Fertilized eggs from spring chinook salmon spawned at Powell and Red River (South Fork of Clearwater River stock), along with eggs from Rapid River (Rapid River stock) were transported in individual egg tubes to CFH for incubation. Approximately one-third of the adults from the South Fork stock and twelve Selway stock chinook were spawned at the hatchery. Green eggs were placed into FAL egg trays with one female per tray. All FAL stacks were operated at approximately 5.5 gallons per minute.

Females were screened for BKD using Elisa techniques. Females with optical density (O.D.) over 0.4 were culled. The BKD tests resulted in the culling of 219 females or approximately one million green eggs.

Green and Eyed Eggs

South Fork Stock	1,810,913 green eggs
Powell stock	948,387 green eggs
Rapid River	493,009 green eggs
Selway Captive Brood	15,970 green eggs
Rapid River stock	551,343 eyed eggs Low BKD parentage
Sawtooth (Rapid R stock)	39,365 eyed eggs Low BKD parentage

A total of 3,858,204 eggs (3,252,309 green eggs and 590,708 eyed-eggs) were incubated from BY97 spring chinook salmon. Overall development from green eggs to eyed-eggs numbered 2,921,344 for a total eye-up percentage of 89.8%. South Fork achieved 87.9% eye-up, Powell 91.3% eye-up, Rapid River 94.2% eye-up, and the Selway captive brood had 66.8% eye-up (Appendix J).

Beginning on the third or fourth day of incubation, all egg lots were treated with formalin to reduce fungal development. Treatments were administered three times per week at a 1:600 concentration (1,667 ppm) for 15 minutes and continued until each egg lot accumulated 800 thermal units (TUs).

Eye-up occurred at approximately 500 TUs, at which time all egg lots were shocked, picked, and enumerated by hand. All egg trays and screens were pressure washed clean before any eyed-eggs were placed back in the trays for final incubating.

Prior to hatching, all eyed-eggs were picked a second time. The second pick occurred at approximately 700 TUs. Hatching occurred at approximately 1,000 TUs at which time all egg lots were picked a third time. All trays received a fourth and final pick at 1,700 TUs to remove any dead yolk-sac fry. Swim-up fry were transferred to the early rearing vats at approximately 1,750 TUs. Survival of green eggs to swim-up fry for the South Fork, Powell, and Rapid River averaged 82.7%. Survival of green eggs to swim-up fry for Selway chinook was 42.1% (Appendix J).

Approximately one-third of the eggs were incubated in the isolation incubation building to advance development with warmer water. These eggs provided fry for parr releases and summer rearing at the satellites. The advancement of these fish allowed the hatchery to increase production by moving fish outside in April and therefore creating early rearing space for Nez Perce Tribal Hatchery (NPTH) coho and spring chinook programs.

EARLY REARING

At swim-up, fry were ponded in hatchery vats. Vats were loaded with fry at approximately 45,000 to 105,000 fish per vat. A total of 3,276,689 swim-up fry were ponded into 55 vats. Fish were segregated by stock and by BKD status. Fish were started on feed in a full-length vat with baffles in place. Initial water flows were set at 46 gpm for approximately 10 days to start the fry on feed. Water flows were increased to 92 gpm on day 11 and remained set at that rate until the fish were moved outside. Flow indices were held at or below 1.5 while DI never exceeded 0.3 during the entire early rearing period.

Water temperatures for the early rearing period ranged from 40°F to 57°F (Appendices A1 and A2).

Bioproduct starter and BioDiet grower formula were used to feed all lots of fish during early rearing. A total of 34,804 pounds of food was used at a cost of \$22,952.14. The conversion rate of this period was 1.31 pounds of feed for one pound of gain.

FINAL REARING

Releases from CFH occurred at three different life stages:

Parr	428,390
Pre-smolts	564,500
Full Term smolts	1,987,308

Parr

Parr were reared in steelhead raceways 8 east, 10 east (three sections) and 10 west until they were transported to five release sites. The fish size ranged from 29 fish per pound (fpp) to 71 fpp at release. The NPTH funded the rearing of 129,311 parr and LSRCP funded the rearing of 304,600 parr for ISS releases (Appendix K).

Total weight of parr released was 7,804 pounds. Conversion rate to the parr stage was 1.31. All parr received one 28-day erythromycin feed treatment prior to release.

A total of 224,742 parr were transferred at this stage in 1998. Rapid River received 220,250 fish at 175 fpp on June 11, 1998 and the University of Idaho received 4,492 fish 71.3 fpp on July 28, 1998.

Fall Pre-Smolt

Summer rearing and release of pre-smolts occurred at all three satellites rearing ponds in 1998. On June 10, 1998, a total of 330,645 fingerlings were transported to Powell, 84,218 fingerling to Red River on June 9, 1998 and 162,786 fingerlings to Upper Crooked River on June 9, 1998. Fish size ranged from 50 fpp to 70 fpp at loading into the satellite rearing ponds.

On September 23, 1998 330,555 fish were released from Powell acclimation pond into Walton Creek. These fish averaged 13.1 fpp. On September 24, 1998 162,119 fish were released from Upper Crooked River raceway into Crooked River. These fish were 18.4 fpp. On October 5, 1998 66,114 fish were released from Red River acclimation pond into Red River at 10.2 fpp (Appendix K).

Conversion rates for these fish were 0.88 at Powell, 1.12 at Red River, and 1.48 at Upper Crooked River. Water temperatures for this rearing period ranged from 47°F to 66°F. All rearing units were outfitted with electric bug zappers to add natural feed to the fishes diet. All pre-smolts received one 28-day erythromycin feed treatment prior to release.

On September 29, 1998 5,712 fish were transported from CFH into the Selway River in the Magrudor corridor. These fish averaged 37.5 fpp, converted feed at 1.83, and received one 28-day erythromycin feed treatment. Water temperatures ranged from 48 to 60°F during rearing cycle (Appendix K).

Full-Term Smolt

All spring chinook salmon reared to full-term smolts were raised at the main CFH. Chinook were reared for both the LSRCP and NPTH.

Lower Snake River Compensation Program

Chinook were acclimated for about two weeks at all three satellite rearing ponds in 1999. Smolts were transported to Powell March 24 through 26, 1999, to Red River March 29 through March 30, 1999 and April 2, 1999 and to Upper Crooked River March 30 through April 1, 1999. On April 12, 1999 screens were removed from all satellite acclimation ponds for volitional release.

Between April 12 and April 14, 1999, 334,482 fish at 12.4 fpp were released from Powell into Walton Creek. Between April 12 and April 15, 1999, 360,983 fish at 18.4 fpp were released from Red River. Between April 12 and April 15, 1999, 600,981 fish at 15.6 fpp were released from Upper Crooked River (Appendix K).

On April 7, 1999, 47,950 fish were released directly into East Fork of Papoose Creek. These fish were 19.1 fpp (Appendix K).

Conversion rates for these fish were 1.28 for Powell stock, 1.27 for Red River stock, 1.27 for Upper Crooked River stock and 1.18 at Papoose Creek. Water temperatures during this sixteen-month rearing period ranged from 40°F to 59°F (Appendix A1 and A2). All smolts released at the satellites received one 28-day erythromycin feed treatment, and the smolts released at Papoose Creek received three erythromycin feed treatments.

Nez Perce Tribal Hatchery

A total of 642,912 chinook smolts were reared for the NPTH in a cooperative effort with the Department. The NPTH personnel direct-released fish at five sites. On March 19, 1999, 74,109 fish at 19.0 fpp were released in Newsome Creek and 39,640 fish at 11.0 fpp were released in Mill Creek. Between March 22 and 29, 1999, 285,573 fish at 18.0 fpp were released in Meadow Creek of the Selway. Between March 31 and April 2, 1999, 147,975 fish at 20.0 fpp were released in Lolo Creek. Between April 5 and April 7, 1999, 95,615 fish at 18.0 fpp were released in Boulder Creek. The Warm Springs site was cancelled and the fish re-directed into Boulder Creek due to lack of helicopter availability. The Warm Springs fish were included in Boulder Creek total (Appendix A1 and A2).

Conversion rates for these fish were 1.11 at Newsome Creek, 1.90 at Mill Creek, 1.54 at Meadow Creek, 1.24 at Lolo Creek, and 1.60 at Boulder Creek. Water temperatures during this sixteen-month rearing period ranged from 40°F to 59°F (Appendix A1 and A2). All smolts released received two 28-day erythromycin feed treatments, and the smolts released at Boulder Creek received three erythromycin feed treatments.

Bioproducts' BioDiet grower feed was the diet used throughout the final rearing period. A total of 172,140 pounds of fish food was used during final rearing at a cost of \$160,280.03. Total feed used in early and final rearing was 206,944 pounds at a cost of \$160,280.03 (a conversion rate of 1.17). Included in this cost is 63,360 pounds of feed purchased by NPTH at

an estimated cost of \$55,809.60. The feed cost estimate was based on Department contract feed prices. Percent body weights fed ranged from 1.0 to 7.5 percent (Appendix L).

Chinook were fed full rations until mid-April 1998. At that time, most chinook salmon were fed five days on feed, and two days off feed. After the medicated feed treatment in June 1998, most chinook were fed four-days on and three-days off feed regime. Fish were fed continuously during the weeks of medicated feed treatments in June. This feed regime was done to slow growth but maintain fin quality, fat reserves, and reduce the necessary manpower to one outside person on weekends. Fin quality and fat reserves remained excellent. This program worked well at minimizing fish size and did not cause poor feed conversions as seen in past years. The remaining chinook were allocated to the "large size" in the size-at-release study. These three raceways of chinook were fed until mid-November 1998 on a rotating schedule of four days on feed and three days off for three months. This was necessary so that the flow index (i.e. life support indices) of the chinook bank was not compromised due to too much biomass of fish at the time of release. Two separate sizes of fish were maintained for the size-at-release study. The two size groups were normal size smolts (14-16 per pound) and large smolts (10-11 per pound). In February, all chinook were fed daily until release.

All final rearing raceways were set up with jump screens and floating shade structures (3-4 per pond) to reduce stress and increase available shade to fish. Shade was available over 20% of the pond surface.

Water temperatures during the final rearing period were kept as cool as possible to reduce growth rates. Every effort was made to stay below 55°F. Hatchery water temperatures varied from 40°F to 57°F during the final rearing period (Appendices A1 and A2). An estimated 2.2 cfs of water was supplied to each raceway.

FISH HEALTH

All spring chinook reared from BY97 at Clearwater Hatchery were progeny from low-BKD parents. All eggs from adults above 0.4 O.D. were culled. Fish were segregated into two groups for rearing. The first group was progeny from parents with O.D. below 0.25 and the second group with O.D. between 0.26 to 0.4.

Chinook produced for the LSRCP programs received one 28-day erythromycin medicated feed treatment. This treatment varied between life-cycle release groups. All parr releases were treated in mid-May to mid-June. All pre-smolts were treated in August and all full-term smolts were treated in August 1998.

All spring chinook salmon reared at CFH for the NPTH programs received at least two 28-day erythromycin medicated feed treatments. These feedings occurred in June and August 1998. A third medicated feeding was applied to fish released in Boulder and Papoose creeks. Fish were treated with medicated feed every other day from mid-February to early March 1999, for a total of 25 days on medicated feed.

All fish were fed Bioproducts feed with 2.25% Aquamycin-100. The fish were fed between 75 and 150 mg erythromycin per kilogram of fish weight to comply with Investigational New Animal Drug (INAD) specifications.

Diseases Encountered and Treatment

The pre-smolts released on October 5, 1998 at Red River were survivors of an outbreak of *Icthyophtherius multifiliis* (ICH). Mortality from this infestation peaked at 4,410 (5.5%) on September 12, 1998. Total mortality was estimated at 18,050 fish or 21.4%. An every-other-day drip treatment of formalin was started September 9 and completed on September 29. Formalin was administered starting at 125 ppm for one hour on the first day increasing to 150 ppm for two hours for the next ten treatments. The incoming water was so infested with this parasite that the formalin treatment had little effect until the water temperature dropped below 50°F. Each day several wild fish died in the South Fork of Red River and collected on the intake. These fish were covered with the ICH parasite.

Acute Losses

An estimated 55,000 spring chinook were reported killed on January 5, 1999. A cleaning valve had been left open in raceway 4A. The open valve cut off the downstream water flow which suffocated fish in raceway 4B. Remedial actions taken include night rounds by the staff. These fish were to have been released into Crooked River on the South Fork of the Clearwater.

PATHOLOGIST REPORT

Diseases Encountered and Treatment

Clearwater Fish Hatchery

Fish health at the CFH was essentially uneventful. Resident fish problems have been reported on by Doug Burton, Department resident fish pathologist, in the resident fish program's annual report. Nez Perce Tribe's fish health will be documented by the USFWS Fish Health Laboratory at Dworshak Hatchery. Fish health on the Clearwater satellite facilities will be found specifically in those sections pertaining to those facilities.

Crooked River

Renibacterium was found via ELISA technology in juvenile chinook salmon at this facility. Optical densities were low and not considered a problem. *Renibacterium* was not a source of morbidity or mortality at this facility. A second prophylactic treatment of erythromycin-medicated feed was applied under INAD 4333.

A high prevalence of precocial males was noticed in these chinook. Six fish, out of 200, were found to be precocial. This is attributed to the large size these fish attained during their culture at CFH and the Crooked River satellite facility.

Powell

Renibacterium was detected via ELISA technology in juvenile and brood chinook at this facility. The optical densities were low in juveniles and not considered a threat to immediate fish health.

A higher than normal number of precocial males were found at pre-liberation sampling. This is attributed to the advanced size attained during culture at CFH and Powell satellite facility.

Red River

Renibacterium has been found via ELISA technology in brood chinook and in juvenile spring chinook at this facility. Mortality was not attributed to *Renibacterium* at any time at this facility. A second prophylactic feeding of erythromycin was applied to the chinook once they arrived at this satellite facility.

Ichthyophthirius multifiliis infestation began to cause mortality in August 1998. This disease was treated with 120 ppm flow-through bath of formalin. The treatments were applied three to four times per week until release in October 1998.

Organosomatic Index. Appendices M1, M2, M3, M4, M5 and M6

Acute Losses

No acute losses were experienced at the CFH, Crooked River, or Powell facility. Chronic losses should be attributed to aeromonads and pseudomonads.

Ichthyophthirius multifiliis caused acute mortalities at the Red River facility until water temperatures dropped back into the upper 50s (Fahrenheit). Due to low alkalinity, higher doses of formalin are most stressful to the fish of the South Fork of the Clearwater River. Thus, a more effective formalin treatment could not be applied. A total of 18,020 fish died as a result of this parasite.

Other Assessments

Other than the actual size of fish and possibly the percent fat content of the fish, differences in the groups of the size-at-releases study were not obvious.

Crooked River

Since *Ichthyophthirius multifiliis* is a problem at the Red River satellite, Crooked River should take over all long-term rearing and acclimation destined for any tributary of the South Fork of the Clearwater River.

Powell

The Powell satellite has started to produce a reliable hatchery run of spring chinook. All consideration should be given to keeping this facility's run "seeded" with smolts from adults from this facility. Excess juveniles can be used for other programs in addition to excess juveniles from other facilities. Furthermore, Powell stock excess juveniles should be utilized to "backfill" the South Fork of the Clearwater River programs. This should be a welcome boost to those programs.

Red River

The fall program at Red River satellite has been challenged by ICH almost every year it has been implemented. Serious deliberation should be given to this fall program and consideration of dropping a summer acclimation at Red River. Fish could be acclimated at the Upper Crooked River facility and transferred to Red River prior to release, or fish could be transported by truck from the main CFH and directly released in October. At this point, infestation by *Ichthyophthirius multifiliis* is too costly to the Red River fall program to continue.

FISH MARKING

A total of 3,052,284 spring chinook were marked as follows: 2,039,470 were Ad-clipped, 443,609 were Ad-clipped and CWT-tagged, 165,000 were right ventral (RV) clipped, 85,000 were left ventral (LV) clipped, and 319,205 had no fin clip but were CWT-tagged (Appendix L).

Chinook were marked from early rearing vats (inside) into final rearing raceways (outside). Marking started on March 11 and was completed on May 22, 1998. Fish ranged in size from 100 to 225 fpp).

FISH DISTRIBUTION

Releases from CFH occurred at three different life stages: parr 428,390, pre-smolts-564,500, and smolts-1,987,308.

Parr Release

A total of 428,390 BY97 parr were raised at the CFH and released in 1998 by the CFH and NPTH personnel. On July 7 and 8, 83,748 parr (48 fpp) were released in Boulder Creek. These fish were CWT-tagged and had no fin clip. On July 8, 19,847 parr (29 fpp) were released in Warm Springs Creek. These fish were also CWT-tagged and had no fin clip. On July 20, 12,889 parr (30 fpp) were released in Pete King Creek. These fish were CWT-tagged and had no fin clips. On July 29, 12,827 parr were released in Squaw Creek. These fish were 31 fpp, CWT-tagged and had no fin clips. A total of 299,079 parr were released in three separate groups over a three-week period in Colt Killed Creek (White Sands Creek),. The first group of 111,544 parr were released between July 15 and 17. Fish averaged 71 fpp, all had ad clips and 618 fish carried Passive Integrated Transponder (PIT) tags. The second group of 96,207 parr were released on July 27 and 28. These fish were 70 fpp, all had ad clips and 654 fish carried

PIT tags. The last group of 91,328 parr were released on August 7 and 8. These fish were 62 fpp, all had Ad clips and 641 carried PIT tags (Appendix K).

Fall Pre-Smolt

Satellites

Powell

A total of 330,555 fish (13.1 fpp) were released into Walton Creek on September 23, 1998. All pre-smolts were Ad clipped, 106,000 fish were CWT-tagged, and 700 were PIT-tagged (Appendix K).

Crooked River

A total of 162,119 fish (18.4 fpp) were released into Crooked River on September 24, 1998. All pre-smolts were RV clipped, no fish were CWT-tagged, and 700 were PIT-tagged (Appendix K).

Red River

A total of 66,114 fish (10.2 fpp) were released into Red River on October 5, 1998. All pre-smolts were LV clipped, no fish were CWT-tagged, and 700 were PIT-tagged (Appendix K).

Direct Release

Selway River

A total of 5,712 fish (progeny from captive brood stock) were transported from CFH and direct released into the Magrudor corridor of the Selway River on September 29, 1998. These fish averaged 37.5 fpp. No pre-smolts were fin-clipped or CWT-tagged, but 600 fish were PIT-tagged (Appendix K).

Full Term Smolt

Satellites

Powell

A total of 334,482 smolts (12.4 fpp) were released into Walton Creek. Smolts were transported to Powell March 24 through 26. After approximately two weeks of acclimation, fish were released volitionally on April 12. On April 14, 1999 the pond was drained and all remaining smolts were released from the pond. All smolts were Ad-clipped, 326,676 were CWT-tagged and 1,000 fish were PIT-tagged.

Red River

A total of 360,983 smolts (15.4 fpp) were released into Red River. Smolts were transported to Red River from March 29 through 30 and on April 2. After approximately two weeks of acclimation, fish were released volitionally on April 12. On April 15, 1999 the pond was drained and all remaining smolts were released. All smolts were ad clipped, no fish were CWT-tagged, and 500 fish were PIT-tagged.

Crooked River

A total of 600,981 smolts (15.6 fpp) were released into Crooked River. Smolts were transported to Crooked River March 30 through April 1 and after approximately two weeks of acclimation were released volitionally on April 12. On April 15, 1999 the pond was drained and all remaining smolts were released. All smolts were Ad-clipped, no fish were CWT-tagged, and 500 fish were PIT-tagged.

Direct Releases

Papoose Creek--A total of 47,950 fish (19.1 fpp) were released directly into the East Fork of Papoose Creek on April 7. All smolts were CWT-tagged, had no fin clip, and 1,000 fish were PIT-tagged.

Newsome Creek—A total of 74,109 smolts (19.0 fpp) were released in Newsome Creek on March 19. All fish were CWT-tagged, had no fin clip, and were PIT-tagged.

Mill Creek—A total of 39,640 smolts (11.0 fpp) were released in Mill Creek on March 19. All fish were CWT-tagged, had no fin clip, and were PIT-tagged.

Meadow Creek (Selway)— A total of 285,573 smolts (18.0 fpp) were released in Meadow Creek of the Selway between March 22 and 29. All fish were Ad-clipped, no fish were CWT-tagged, and fish were PIT-tagged.

Lolo Creek— A total of 147,975 smolts (20.0 fpp) were released in Lolo Creek on March 31 and April 2. All fish were CWT-tagged, had no fin clip, and were PIT-tagged.

Boulder Creek—A total of 95,615 smolts (18.0 fpp) were released in Boulder Creek on April 5 and 7. All fish were CWT-tagged, had no fin clip, and were PIT-tagged. The Warm Springs site was cancelled and the fish re-directed into Boulder Creek due to lack of helicopter availability. The Warm Springs fish are included in Boulder Creek total. See Appendix K for all full-term smolt releases.

BROOD YEAR 1999 STEELHEAD REPORT

ABSTRACT

Clearwater Hatchery received 699,768 eyed BY98 North Fork B-run steelhead eggs from Dworshak National Fish Hatchery (DNFH). A total of 595,997 smolts from the North Fork stock were released from April 20 through April 29, 1999; 400,465 at Red House Hole, 190,539 at Kooskia Hatchery on Clear Creek, and 4,993 at Red River near Soda Creek. The size of fish at release for the one year rearing cycle was 5.2 fpp, for a total of 113,532 pounds and average length was 208mm.

A total of 172,355 pounds of feed was fed (125,960 Rangen, 20,867 Moore Clark, and 25,088 Bio-Oregon) with a cost of \$74,288.24 to produce 113,532 pounds of fish at CFH. The conversion rate was 1.52.

Authors:

Jerry McGehee
Hatchery Manager

Scott Patterson
Assistant Hatchery Manager

SYNOPTIC HISTORY

Clearwater Hatchery

Brood Source

Dworshak National Fish Hatchery was the source for North Fork stock B-run steelhead eggs.

Disease History

Dworshak Hatchery has a long history of Infectious Hematopoietic Necrosis Virus (IHNV). Therefore, Clearwater Hatchery only accepts steelhead eggs from IHNV-negative females and follows a strict disinfecting protocol when transporting them onto the station.

Spawning

Dworshak BY98 North Fork Stock: When eggs were being collected for CFH at DNFH, two of the CFH crew assisted with the spawning operation. All the disease samples to ship by airmail to Eagle Fish Health Lab.

Incubation

Dworshak BY98 North Fork stock: Eyed steelhead eggs were received from DNFH April 3 through April 17, 1998 in three weekly shipments (Appendix O). The eggs from DNFH lots seven (March 17) through nine (April 1) were incubated approximately 17 days at DNFH until the eggs eyed-up. All eggs from negative IHNV females were disinfected and transported to CFH. The transport vehicle was met at the front gate and egg baskets were removed from egg coolers and placed in clean egg coolers containing tempered 100 ppm Argentyne solution for 10 minutes. The clean egg coolers were then taken to the incubation room, eggs were placed into FAL egg trays with approximately 7,000 eggs per basket, and water flows through each stack were set at six gallons per minute (gpm). A total of 828,458 eggs were received (Appendix N).

During incubation, steelhead eggs were on primary water only.

EARLY REARING

Dworshak BY98 North Fork stock: At swim-up, un-fed fry from DNFH stock B-run steelhead were moved to vats 1 through 6, 39 through 60, and were divided as evenly as possible (23,000 fish/vat to 27,000). The initial DI was 0.05 and FI was 0.25. Fish were held in the hatchery vats until August when they were marked and moved to ten steelhead raceways (7 through 11 east and west). Average length of the fish at the end of early rearing was 3.97 inches. The fish averaged 40 fpp.

Water temperatures for the early rearing period ranged from 42°F to 59° F (Appendix A3). Whenever the temperatures exceeded 58°F for more than two days, the water was cooled down by either blending in more secondary water or by lowering the primary intake in Dworshak Reservoir.

Bio-Oregon's starter and grower and Moore Clark feed were used to feed these fish during the early rearing period. A total of 16,832 pounds of feed was used to achieve a feed conversion of 1.14 for a cost of \$13,465.68.

FINAL REARING

Dworshak BY98 North Fork Stock: The juvenile DNFH stock B-run steelhead were moved to outside steelhead raceways 7 through 11-east and west. The move outside was done in late August. The move was done in conjunction with fin-clipping and CWT-tagging to avoid double stressing the fish. All fin-clipping was done in one eight-hour shift per day. Baffles were removed from vats and fish were then moved to the clipping trailers using the transfer tanks.

The DI of the DNFH steelhead ranged from 0.12 to 0.33 and the FI ranged from 0.57 to 1.20. These indexes were recalculated biweekly and were never allowed to exceed DI of 0.33 or FI of 1.5.

Water temperatures during final rearing period were maintained to keep temperatures as close to 57°F as possible (Appendix A3). Reservoir water temperatures began to drop in late October and bottomed out in January at 42°F. Temperatures began to slowly increase in mid-March and reached 50°F by late April when the steelhead smolts were being stocked out. Estimated water flows per raceway was 3.2 cfs.

Fish were fed semi-moist feed one to two weeks after marking in final rearing. Semi-moist and dry feeds were mixed for three days before fish were converted to dry feed.

Fish were fed dry feed until released. A total of 155,523 pounds of feed was used during final rearing to produce 98,515 pounds of fish at a cost of \$60,822.56. A total of 172,355 pounds of feed was used throughout the entire rearing period to produce 113,532 pounds of fish at a cost of \$74,288.24. The overall conversion rate from fry to smolt was 1.541. Percent body weight fed ranged from 0.75 to 12% (Appendix L).

A feed performance test was conducted comparing Bio-Oregon starter and grower feeds to Moore-Clark feed. Feed amounts and costs were included in production costs. A complete report on our findings will be printed at a later date.

FISH HEALTH

The steelhead program did not experience significant epizootic event (Appendix O). However, a prophylactic medicated feed treatment of Oxytetracycline (3.75 mg/100lbs for 10 days) was administered in August prior to marking.

FISH MARKING

Dworshak BY96 North Fork Stock: North Fork stock steelhead released into the south fork of the Clearwater River and Clear Creek were all marked with Ad-clips. Each of these groups contained a number of PIT-tags and CWTs (Appendix P). Another group of 4,993 fish with PIT-tags were released in Red River in the spring of 1999.

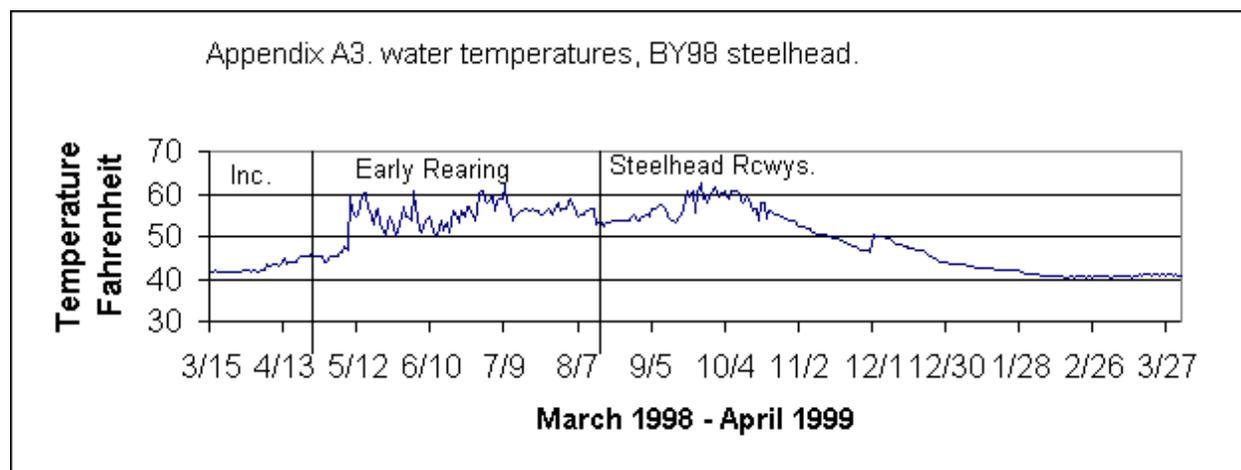
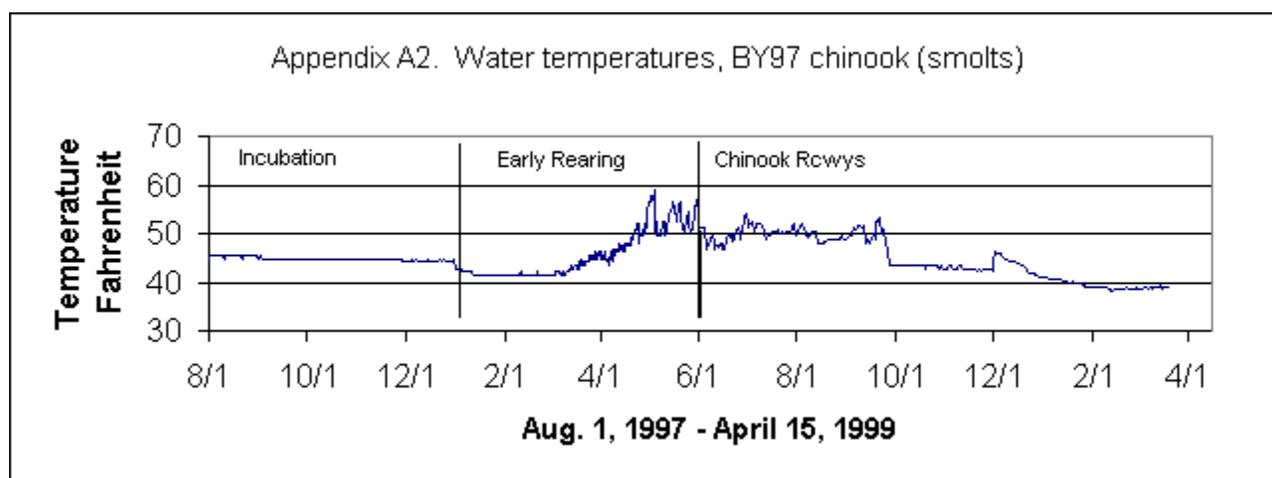
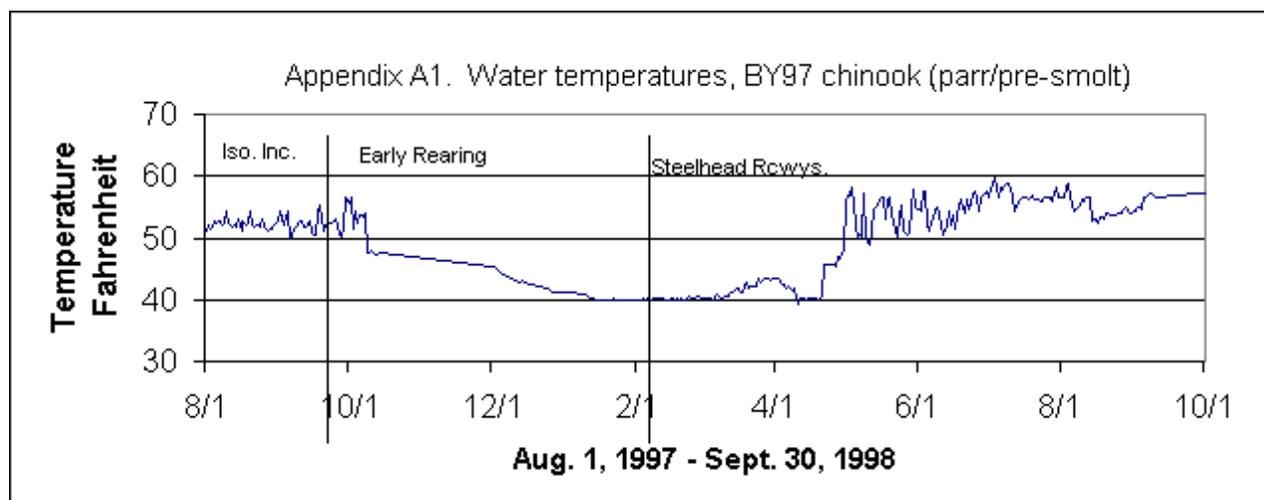
FISH DISTRIBUTION

Dworshak BY96 North Fork stock: Between April 27 and 29, 1999 a total of 400,465 (5 fpp) DNFH B-run steelhead were direct released at the Red House Hole plant site (approximately 3.5 miles upstream of the Highways 13 and 14 junction) on the lower South Fork of the Clearwater River. The remaining 190,539 (5.1 fpp) DNFH B-run steelhead was direct released into Clear Creek at Kooskia Hatchery on the Middle Fork of the Clearwater River. There were 4,993 fish released at Red River, which averaged 5.9 fpp. There was very little crowding and hauling mortality from the fish transportation to the release sites (Appendix P).

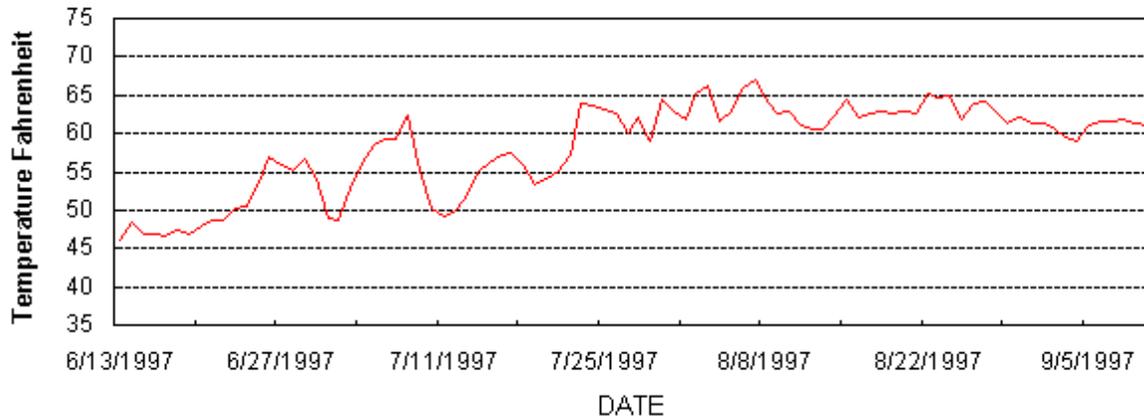
ACKNOWLEDGEMENTS

The CFH has a crew of 22 people and all are assigned a wide variety of responsibilities. Everyone on station has contributed to the success of the program. The hatchery crew consists of; Jerry McGehee (Hatchery Manager), Brad George, Scott Patterson (Assistant Hatchery Managers), John Rankin, Cal Lee Davenport, Marc Arms, and Tom Tighe (Fish Culturists), Ernie Yost (Utility Craftsman), Rene'e Hedrick (Office Assistant), Ric Downing, Chris Shockman, and John Zakrajsek (Fish Technicians), Chris Bennett, Art Butts, Theresa Elliott, Marc Garst, Jim Thompson, Craig Lenzmeier, Marc Rudd, Ron Hopper, Stacey Goeckner (Bio-aides), Tony Dmitter (Grounds Maintenance Worker), Bernard O'Donnell (Laborer), and Chris Estrada (Assistant Mechanic).

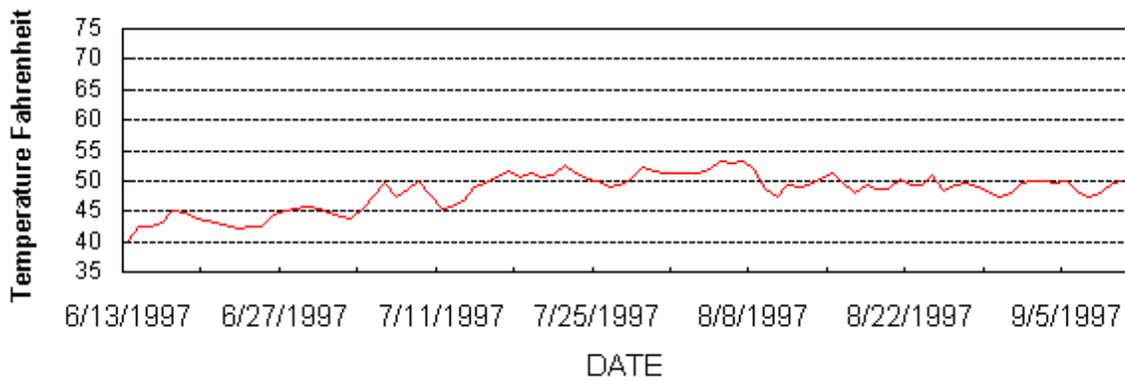
APPENDIX



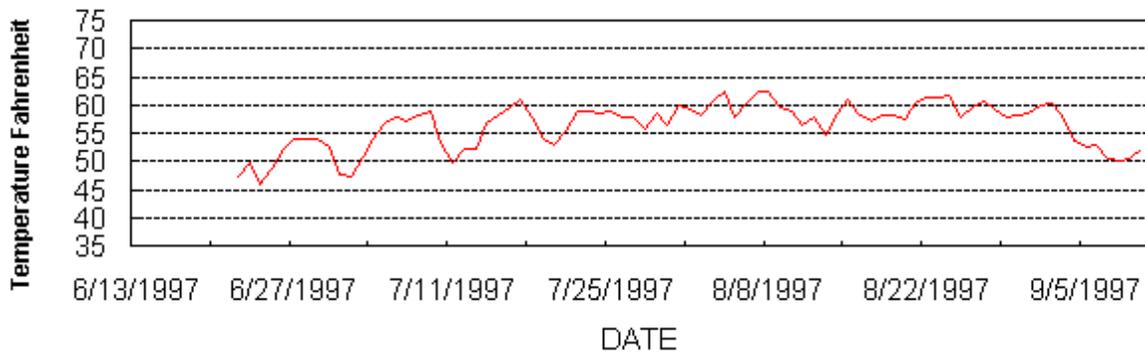
Appendix B1. Crooked River water temperatures



Appendix B2. Powell water temperatures



Appendix B3. Red River water temperatures



Appendix C.1. Clearwater Hatchery water quality analysis taken from the hatchery rearing facility on August 4, 1994.

ANALYSIS	RESULTS (mg/l)	DATE ANALYZED	OPTIMAL REARING LEVELS
Alkalinity	16.0	08/04/94	120 0 400 mg/l
Ammonia (as N)	<0.005	08/04/94	0.0125
Arsenic	<0.01	08/04/94	N/A
Barium	<0.1	08/04/94	N/A
Cadmium	<0.001	08/04/94	<.0004 mg/l
Calcium	3.8	08/12/94	N/A
Chloride	0.0	08/12/94	N/A
Chromium	<0.01	08/04/94	0.1
Color (C.U.)	15	08/12/94	N/A
Copper	<0.02	08/04/94	<.006 mg/l
Cyanide	<0.005	08/12/94	N/A
Detergents(surfacant)	<0.08	08/09/94	N/A
Fluoride	<0.1	08/30/94	N/A
Hardness	14.0	08/04/94	120 – 400 mg/l
Hydrogen Sulfide	<0.01	N/A	N/A
Iron	<0.02	N/A	N/A
Lead	<0.005	08/04/94	<.03 mg/l
Magnesium	<0.8	08/11/94	N/A
Manganese	<0.01	08/11/94	N/A
Mercury	<0.0005	08/11/94	<.002 mg/l
Nitrogen Nitrate	<0.013	08/18/94	0.2 mg/l
Potassium	0.5	08/12/94	N/A
Selenium	<0.005	08/10/94	N/A
Silica	11	08/30/94	N/A
Silver	<0.001	08/17/94	N/A
Sodium	1.5	08/17/94	N/A
Sulfate	<1	08/26/94	N/A
Total Dissolved Solids	28	08/11/94	80 mg /l
Zinc	<0.005	08/10/94	0.03 mg/l
pH (pH units)	7.20	08/09/94	6.5 – 8.0

Appendix C2. Upper Crooked River rearing pond water quality analysis report.
 Analysis done by Anatek Labs, Inc., Moscow, Idaho.

PRIMARY CONTAMINANTS

Contaminant	Result	MDL	Analysis			Contaminant	Result	MDL	Analysis	
			Method	Date	Date				Method	Date
Antimony (0.006)	---	0.001	EPA 200.8	07/02/97	Nickel	---	0.001	EPA 200.8	07/02/97	
Arsenic (0.05)	ND	0.005	EPA 200.8	07/02/97	Selenium(0.05)	ND	0.005	EPA 200.8	07/02/97	
Barium (2)	0.029	0.01	EPA 200.8	07/02/97	Sodium	2.9	1	EPA 200.8	07/02/97	
Beryllium (0.004)	---	0.001	EPA 200.8	07/02/97	Thallium(0.02)	---	0.001	EPA 200.8	07/02/97	
Cadmium(0.005)	ND	0.001	EPA 200.8	07/02/97	Cyanide(0.2)	ND	0.01	EPA 200.8	07/02/97	
Chromium (0.1)	0.002	0.005	EPA 200.8	07/02/97	Fluoride(4.0)	ND	0.1	EPA 300.0	06/27/97	
Mercury (0.002)	ND	0.001	EPA 200.8	07/02/97						

SECONDARY CONTAMINANTS

Contaminant	Result	MDL	Analysis			Contaminant	Result	MDL	Analysis	
			Method	Date	Date				Method	Date
Chloride	ND	0.001	EPA 300.0	06/27/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97	
Color	2	0.005	EPA110.2	06/27/97	Calcium	3.6	1	EPA 200.8	07/02/97	
Sulfide(HS)	ND	0.01	EPA 376.1	06/27/97	Hardness(CaCO3)	12	5	2340 B	07/02/97	
Iron	0.26	0.05	EPA 236.1	07/02/97	Magnesium	0.6	1	EPA 200.8	07/02/97	
Manganese	0.01	0.001	EPA 200.8	07/02/97	pH	6.9		EPA 150.1	07/02/97	
Odor	---	1	EPA 140.1		Potassium	0.15	1	EPA 200.8	06/27/97	
Surfactants	ND	0.05	SM5540C	06/27/97	Silica(SiO3)	6.8	1	EPA 200.8	07/02/97	
TDS	18	1	EPA 160.1	06/27/97	Lead	0.002	0.001	EPA 200.8	07/02/97	
Zinc	0.012	0.001	EPA 200.8	07/02/97	Copper	0.016	0.001	EPA 200.8	07/02/97	
Sulfate	ND	1	EPA 300.0	06/27/97	Conductivity(uS/cm)	25	10	EPA 120.1	06/27/97	
Aluminum	---	0.001	EPA 200.8	07/02/97	Langlier Index	---				
Alkalinity	12	5	EPA 310.1	06/27/97	Silver	ND	0.01	EPA 200.8	07/02/97	
Turbidity(NTU)	---	0.5	EPA 180.1							

Laboratory Reporting Codes:
Results are mg/L (ppm) unless otherwise noted
ND - Not detected within the sensitivity of the instrument
--- = No analysis performed for this contaminant
Numerical Entry = Detection at level indicated
MCL (numbers in parenthesis)= EPA maximum contaminant level

Appendix C3. Powell adult holding pond water quality analysis report.

Analysis done by Anatek Labs, Inc., Moscow, Idaho.

PRIMARY CONTAMINANTS

Analysis					Analysis				
Contaminant	Result	MDL	Method	Date	Contaminant	Result	MDL	Method	Date
Antimony (0.006)	---	0.001	EPA 200.8	07/02/97	Nickel	---	0.001	EPA 200.8	07/02/97
Arsenic (0.05)	ND	0.005	EPA 200.8	07/02/97	Selenium(0.05)	ND	0.005	EPA 200.8	07/02/97
Barium (2)	0.009	0.01	EPA 200.8	07/02/97	Sodium	1.9	1	EPA 200.8	07/02/97
Beryllium (0.004)	---	0.001	EPA 200.8	07/02/97	Thallium(0.02)	---	0.001	EPA 200.8	07/02/97
Cadmium(0.005)	ND	0.001	EPA 200.8	07/02/97	Cyanide(0.2)	ND	0.01	EPA 200.8	07/02/97
Chromium (0.1)	0.002	0.005	EPA 200.8	07/02/97	Fluoride(4.0)	ND	0.1	EPA 300.0	06/27/97
Mercury (0.002)	ND	0.001	EPA 200.8	07/02/97					

SECONDARY CONTAMINANTS

Analysis					Analysis				
Contaminant	Result	MDL	Method	Date	Contaminant	Result	MDL	Method	Date
Chloride	ND	0.001	EPA 300.0	06/26/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97
Color	4	0.005	EPA110.2	06/26/97	Calcium	4.2	1	EPA 200.8	07/02/97
Sulfide(HS)	ND	0.01	EPA 376.1	06/26/97	Hardness(CaCO3)	14	5	2340 B	07/02/97
Iron	0.15	0.05	EPA 236.1	07/02/97	Magnesium	0.7	1	EPA 200.8	07/02/97
Manganese	0.009	0.001	EPA 200.8	07/02/97	pH	---		EPA 150.1	
Odor	---	1	EPA 140.1		Potassium	0.07	1	EPA 200.8	07/02/97
Surfactants	ND	0.05	SM5540C	06/26/97	Silica(SiO3)	5	1	EPA 200.8	07/02/97
TDS	15	1	EPA 160.1	06/26/97	Lead	0.002	0.001	EPA 200.8	07/02/97
Zinc	0.006	0.001	EPA 200.8	07/02/97	Copper	0.016	0.001	EPA 200.8	07/02/97
Sulfate	ND	1	EPA 300.0	06/26/97	Conductivity(uS/cm)	27.2	10	EPA 120.1	06/25/97
Aluminum	---	0.001	EPA 200.8	07/02/97	Langlier Index	---			
Alkalinity	---	5	EPA 310.1		Silver	ND	0.01	EPA 200.8	07/02/97
Turbidity(NTU)	---	0.5	EPA 180.1						

Laboratory Reporting Codes:
Results are mg/L (ppm) unless otherwise noted
ND - Not detected within the sensitivity of the instrument
--- = No analysis performed for this contaminant
Numerical Entry = Detection at level indicated
MCL (numbers in parenthesis)= EPA maximum contaminant level

Appendix C4. Red River adult holding pond water quality analysis report.

Analysis done by Anatek Labs, Inc., Moscow, Idaho.

PRIMARY CONTAMINANTS

Analysis					Analysis				
Contaminant	Result	MDL	Method	Date	Contaminant	Result	MDL	Method	Date
Antimony (0.006)	---	0.001	EPA 200.8	07/16/97	Nickel	---	0.001	EPA 200.8	07/16/97
Arsenic (0.05)	ND	0.005	EPA 200.8	07/16/97	Selenium(0.05)	ND	0.005	EPA 200.8	07/16/97
Barium (2)	0.03	0.01	EPA 200.8	07/16/97	Sodium	3.2	1	EPA 200.8	07/16/97
Beryllium (0.004)	---	0.001	EPA 200.8	07/16/97	Thallium(0.02)	---	0.001	EPA 200.8	07/16/97
Cadmium(0.005)	ND	0.001	EPA 200.8	07/16/97	Cyanide(0.2)	ND	0.01	EPA 200.8	07/16/97
Chromium (0.1)	0.001	0.005	EPA 200.8	07/16/97	Fluoride(4.0)	ND	0.1	EPA 300.0	07/03/97
Mercury (0.002)	ND	0.001	EPA 200.8	07/16/97	Nitrate /N	ND	0.5	EPA 300.0	07/03/97

SECONDARY CONTAMINANTS

Analysis					Analysis				
Contaminant	Result	MDL	Method	Date	Contaminant	Result	MDL	Method	Date
Chloride	ND	0.001	EPA 300.0	07/03/97	Ammonia/N	ND	0.1	EPA 350.2	07/01/97
Color	15	0.005	EPA110.2	07/03/97	Calcium	3.92	1	EPA 200.8	07/16/97
Sulfide(HS)	ND	0.01	EPA 376.1		Hardness(CaCO3)	13	5	2340 B	07/16/97
Iron	0.37	0.05	EPA 236.1	07/16/97	Magnesium	0.76	1	EPA 200.8	07/16/97
Manganese	0.014	0.001	EPA 200.8	07/16/97	pH	7.06		EPA 150.1	07/03/97
Odor	---	1	EPA 140.1		Potassium	0.53	1	EPA 200.8	07/16/97
Surfactants	---	0.05	SM5540C		Silica(SiO3)	7.9	1	EPA 200.8	07/16/97
TDS	21	1	EPA 160.1	07/03/97	Lead	0.002	0.001	EPA 200.8	07/16/97
Zinc	0.016	0.001	EPA 200.8	07/16/97	Copper	0.016	0.001	EPA 200.8	07/16/97
Sulfate	ND	1	EPA 300.0	07/03/97	Conductivity(uS/cm)	32	10	EPA 120.1	07/03/97
Aluminum	---	0.001	EPA 200.8	07/16/97	Langlier Index	---			
Alkalinity	---	5	EPA 310.1		Silver	ND	0.01	EPA 200.8	07/16/97
Turbidity(NTU)	1.4	0.5	EPA 180.1	07/03/97					

Laboratory Reporting Codes:
Results are mg/L (ppm) unless otherwise noted
ND - Not detected within the sensitivity of the instrument
--- = No analysis performed for this contaminant
Numerical Entry = Detection at level indicated
MCL (numbers in parenthesis)= EPA maximum contaminant level

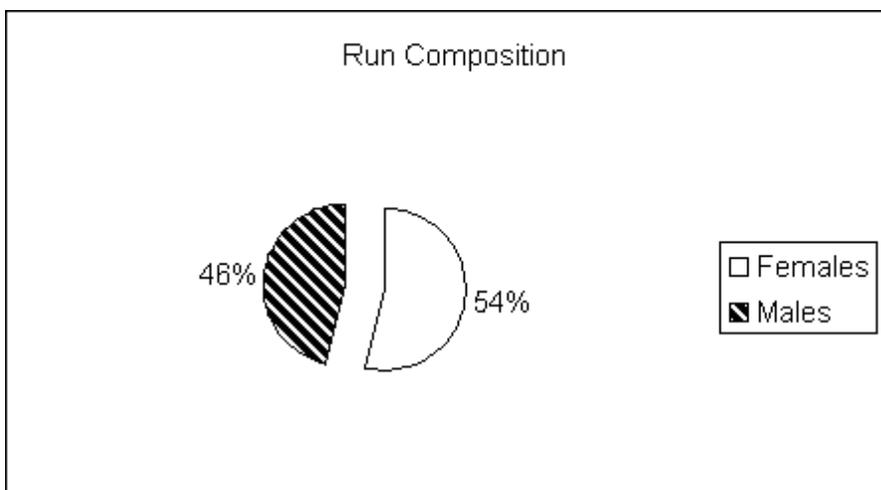
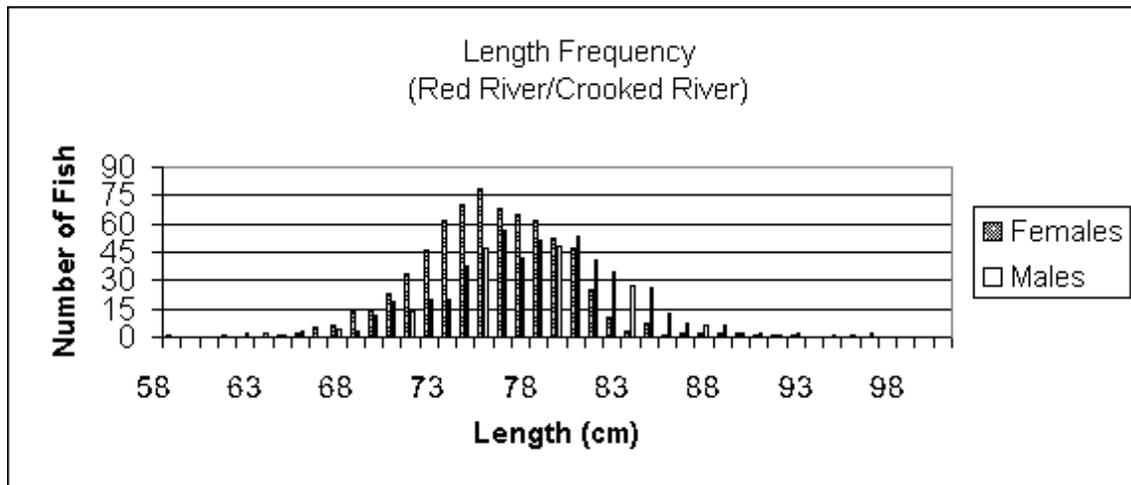
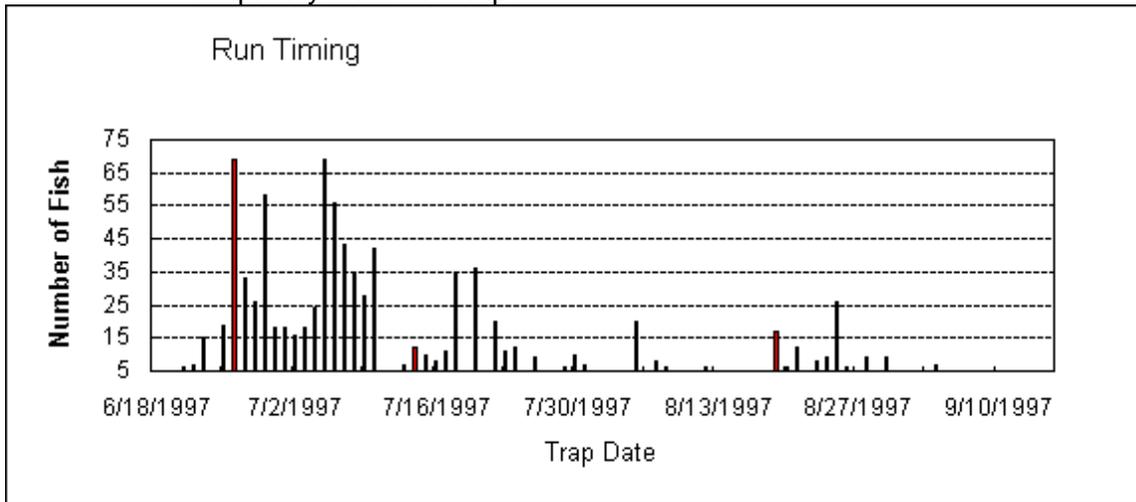
Appendix D1. Crooked River chinook run timing, 1997.

<u>Date</u>	<u>Number Trapped</u>	<u>Date</u>	<u>Number Trapped</u>
06/18/97	1	08/10/97	1
06/19/97	0	08/11/97	3
06/20/97	3	08/12/97	6
06/21/97	6	08/13/97	0
06/22/97	7	08/14/97	4
06/23/97	15	08/15/97	0
06/24/97	4	08/16/97	4
06/25/97	19	08/17/97	5
06/26/97	69	08/18/97	0
06/27/97	33	08/19/97	17
06/28/97	26	08/20/97	6
06/29/97	58	08/21/97	12
06/30/97	18	08/22/97	5
07/01/97	18	08/23/97	8
07/02/97	16	08/24/97	9
07/03/97	18	08/25/97	26
07/04/97	24	08/26/97	6
07/05/97	69	08/27/97	5
07/06/97	56	08/28/97	9
07/07/97	43	08/29/97	0
07/08/97	35	08/30/97	9
07/09/97	28	08/31/97	4
07/10/97	42	09/01/97	4
07/11/97	4	09/02/97	0
07/12/97	3	09/03/97	4
07/13/97	7	09/04/97	7
07/14/97	12	09/05/97	3
07/15/97	10	09/06/97	5
07/16/97	8	09/07/97	3
07/17/97	11	09/08/97	0
07/18/97	35	09/09/97	2
07/19/97	2	09/10/97	2
07/20/97	36	09/11/97	2
07/21/97	0	09/12/97	0
07/22/97	20	09/13/97	0
07/23/97	11	09/14/97	0
07/24/97	12	09/15/97	0
07/25/97	3	TOTAL	1034
07/26/97	9		
07/27/97	0		
07/28/97	2		
07/29/97	6		
07/30/97	10		
07/31/97	7		
08/01/97	5		
08/02/97	1		
08/03/97	3		
08/04/97	0		
08/05/97	20		
08/06/97	0		
08/07/97	8		
08/08/97	6		
08/09/97	4		

Appendix D2. South Fork length frequency, 1997.
(Red River and Crooked River)

Fork Length	Females	Males	Total
58	1	0	1
59	0	0	0
60	0	0	0
61	1	0	1
62	0	2	2
63	0	2	2
64	1	1	2
65	2	3	5
66	5	0	5
67	6	4	10
68	14	3	17
69	15	11	26
70	23	19	42
71	33	14	47
72	46	20	66
73	62	20	82
74	70	38	108
75	78	47	125
76	68	56	124
77	65	42	107
78	62	51	113
79	52	48	100
80	47	53	100
81	25	41	66
82	10	35	45
83	3	27	30
84	7	26	33
85	1	13	14
86	2	7	9
87	2	6	8
88	2	6	8
89	2	2	4
90	1	2	3
91	1	1	2
92	1	2	3
93	0	0	0
94	0	1	1
95	0	1	1
96	0	2	2
97	0	0	0
98	0	0	0
99	0	0	0
100	0	0	0
	708	606	1314

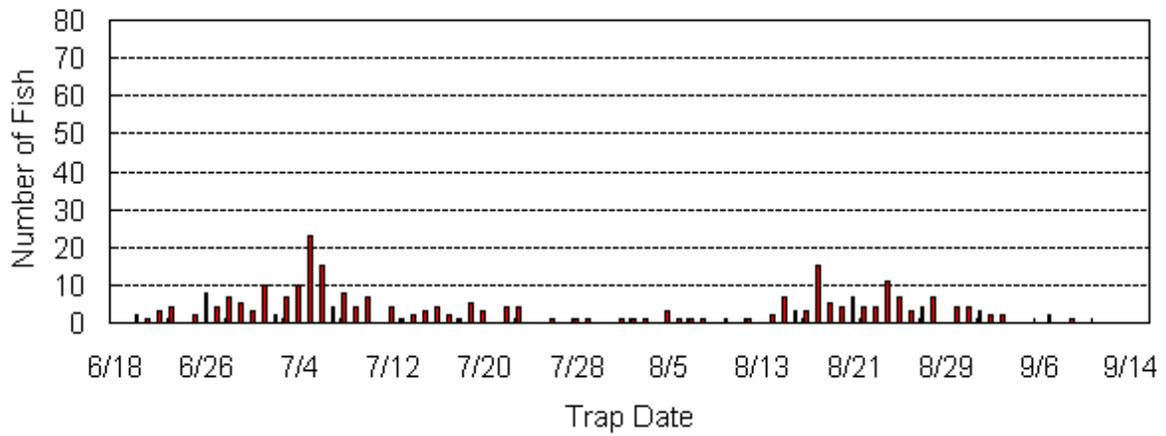
Appendix D3. Crooked River chinook run timing, South Fork length frequency and run composition.



Appendix E1. Red River chinook run timing 1997.

Date	Number Trapped	Date	Number Trapped
06/18/97	0	08/10/97	1
06/19/97	0	08/11/97	0
06/20/97	2	08/12/97	1
06/21/97	1	08/13/97	0
06/22/97	3	08/14/97	2
06/23/97	4	08/15/97	7
06/24/97	0	08/16/97	3
06/25/97	2	08/17/97	3
06/26/97	8	08/18/97	15
06/27/97	4	08/19/97	5
06/28/97	7	08/20/97	4
06/29/97	5	08/21/97	7
06/30/97	3	08/22/97	4
07/01/97	10	08/23/97	4
07/02/97	2	08/24/97	11
07/03/97	7	08/25/97	7
07/04/97	10	08/26/97	3
07/05/97	23	08/27/97	4
07/06/97	15	08/28/97	7
07/07/97	4	08/29/97	0
07/08/97	8	08/30/97	4
07/09/97	4	08/31/97	4
07/10/97	7	09/01/97	3
07/11/97	0	09/02/97	2
07/12/97	4	09/03/97	2
07/13/97	1	09/04/97	0
07/14/97	2	09/05/97	0
07/15/97	3	09/06/97	0
07/16/97	4	09/07/97	2
07/17/97	2	09/08/97	0
07/18/97	1	09/09/97	1
07/19/97	5	09/10/97	0
07/20/97	3	09/11/97	0
07/21/97	0	09/12/97	0
07/22/97	4	09/13/97	0
07/23/97	4	09/14/97	0
07/24/97	0	09/15/97	0
07/25/97	0	TOTAL	280
07/26/97	1		
07/27/97	0		
07/28/97	1		
07/29/97	1		
07/30/97	0		
07/31/97	0		
08/01/97	1		
08/02/97	1		
08/03/97	1		
08/04/97	0		
08/05/97	3		
08/06/97	1		
08/07/97	1		
08/08/97	1		
08/09/97	0		

Appendix E2. Red River run timing graph, 1997



Appendix E3. South Fork summary of fish trapped, released, spawned and disposition of Carcasses 1997 (combination of Red River and Crooked River fish).

Breakdown of total fish trapped:

Red River	280
Crooked River	<u>1031</u>
TOTAL	1314

AGE CLASSES	FEMALES	MALES
3 Years = (<64 cm)	2	4
4 Years = (64 - 82 cm)	684	506
5 Years = (> 83 cm)	<u>22</u>	<u>96</u>
TOTAL	708	606

FISH DISPOSITION FEMALES:

SPAWNED	562	
RELEASED	23	Released at Red River
	74	Released at Crooked River
MORTALITY	<u>49</u>	
TOTAL	708	

FISH DISPOSITION MALES:

SPAWNED	494	
RELEASED	34	Released at Red River
	52	Released at Crooked River
MORTALITY	<u>26</u>	
TOTAL	606	

All spawning carcasses were put back in the river.

Appendix F1. Summary of spring chinook returns to Crooked River by brood year.

Brood Year	Year Released	Number Released	3-yr-olds	Year Returned	4-yr-olds	Year Returned	5-yr-olds	Year Returned	Total by return	% return from plant
1985	-----	-----		1988	-----	1989	4	1990	4	
1986	-----	-----		1989	23	1990	5	1991	28	
1987	Spr 1989 (a)	199,700	2	1990	13	1991	7	1992	22	0.011%
1988	Spr 1990 (b)	300,407	2	1991	208	1992	276	1993	486	0.162%
1989	Fall 1990 (c)	339,087	13	1992	119	1993	10	1994	142	0.042%
1990	Fall 1991 (a)	320,400	7	1993	15	1994	0	1995	22	0.002%
1991	-----	-----	1*	1994	0	1995	1	1996	1	0.000%
1992	Spr 1994 (d)	273,766	6	1995	241 (g)	1996	59	1997	306	0.110%
1993	Fall 1994	199,255								
	Fall 1994 (e)	216,280	94 (g)	1996	935	1997	213	1998	1274	0.000%
	Spr 1995	258,293								
	Spr 1995 (f)	<u>279,615</u>								
		953,443								
1994	Spr 1996	37,071	2	1997	22	1998		1999		
1995	Spr 1997		0	1998		1999		2000		
1996	1998	205,906		1999		2000		2001		
1997	Fall 1998	162,119		2000		2001		2002		
	Spr 1999	600,981								

(a) Transferred from Dworshak Hatchery

(b) Direct released from Kooskia Fish Hatchery

(c) Transferred from Dworshak and Rapid River hatcheries

(d) Eggs from Lookingglass Hatchery (Rapid River stock) reared at Clearwater Hatchery

(e) Eggs from Rapid River hatchery reared at Clearwater Hatchery

(f) Non-acclimated release

(g) These numbers do not match run report numbers. Each one has been corrected to reflect straying from other stocks.

*Natural Fish.

Appendix F2. Summary of spring chinook returns to Red River by brood year.

Brood Year	Year Released	Number Released	3-yr-olds	Year Returned	4-yr-olds	Year Returned	5-yr-olds	Year Returned	Total by return	% return from plant
1982	Fall 1983	260,000	2	1985	a	1986	107	1987	109	0.036%
	Spr 1984	40,000								
1983	Spr 1985 (b)	80,000	a	1986	377	1987	259	1988	636	0.795%
1984	Spr 1986(b)	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986(c)	96,400	3	1988	25	1989	13	1990	41	0.021%
	Spr 1987 (c)	96,800								
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992	39	1993	71	0.029%
1989	Fall 1990	273,800	5	1992	99	1993	13	1994	117	0.025%
	Spr 1991 (d)	63,000								
	Spr 1991(e)	<u>124,000</u>								
		460,800								
1990	Fall 1991	354,700	1	1993	18	1994	1	1995	20	0.004%
	Spr 1992 (f)	<u>207,500</u>								
		562,200								
1991	Fall 1992	6,000		1994	0	1995	0	1996	0	0.000%
1992	Fall 1993	22,246	3	1995	4 (g)	1996	45	1997	56	0.013%
1993	Fall 1994	320,755	5	1996	191	1997	42	1998	238	
1994	Spr 1996	24,002	2	1997	25	1998		1999		
1995	Spr 1997	2,983	1	1998		1999		2000		
1996	Spr 1998	51,208		1999		2000		2001		
1997	Fall 1998	66,114								
	Spr 1999	360,983								

(a) Trap was not installed in 1986 due to construction

(b) These fish wintered in the rearing pond.

(c) These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.

(d) Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater Stock

(e) Planted off bridge at ranger station, reared at Kooskia, Clearwater stock.

(f) Acclimated in rearing pond for 21 days, transferred from Dworshak

(g) These numbers do not match run report numbers. Each one has been corrected to reflect straying from other stocks

*Natural Fish.

Appendix G1. Powell chinook run timing, 1997

<u>Date</u>	<u>Number Trapped</u>	<u>Date</u>	<u>Number Trapped</u>
06/18/97	0	08/10/97	2
06/19/97	0	08/11/97	1
06/20/97	0	08/12/97	3
06/21/97	0	08/13/97	1
06/22/97	0	08/14/97	0
06/23/97	0	08/15/97	6
06/24/97	1	08/16/97	2
06/25/97	1	08/17/97	4
06/26/97	1	08/18/97	0
06/27/97	0	08/19/97	2
06/28/97	1	08/20/97	0
06/29/97	9	08/21/97	3
06/30/97	25	08/22/97	1
07/01/97	8	08/23/97	1
07/02/97	17	08/24/97	2
07/03/97	11	08/25/97	0
07/04/97	23	08/26/97	0
07/05/97	15	08/27/97	1
07/06/97	35	08/28/97	0
07/07/97	34	08/29/97	1
07/08/97	26	08/30/97	0
07/09/97	21	08/31/97	0
07/10/97	40	09/01/97	0
07/11/97	14	09/02/97	0
07/12/97	17	09/03/97	1
07/13/97	14	09/04/97	0
07/14/97	23	09/05/97	0
07/15/97	28	09/06/97	0
07/16/97	34	09/07/97	0
07/17/97	38	09/08/97	0
07/18/97	34	09/09/97	0
07/19/97	23	09/10/97	0
07/20/97	15	09/11/97	0
07/21/97	6	09/12/97	0
07/22/97	19	09/13/97	0
07/23/97	18	09/14/97	0
07/24/97	10	TOTAL	718
07/25/97	10		
07/26/97	12		
07/27/97	9		
07/28/97	5		
07/29/97	6		
07/30/97	6		
07/31/97	11		
08/01/97	15		
08/02/97	6		
08/03/97	9		
08/04/97	8		
08/05/97	10		
08/06/97	3		
08/07/97	9		
08/08/97	5		
08/09/97	2		

Appendix G2. Powell length frequency, 1997

Total Length	Females	Males	Total
unknown*	50	50	100
58	0	1	1
59	0	1	1
60	0	0	0
61	0	0	0
62	0	1	1
63	0	0	0
64	0	1	1
65	0	0	0
66	0	2	2
67	2	2	4
68	2	6	8
69	1	5	6
70	2	5	7
71	7	12	19
72	7	13	20
73	12	18	30
74	31	16	47
75	25	30	55
76	34	25	59
77	38	20	58
78	50	30	80
79	36	21	57
80	15	20	35
81	25	13	38
82	7	20	27
83	5	15	20
84	2	8	10
85	1	8	9
86	1	2	3
87	1	3	4
88	5	1	6
89	0	1	1
90	0	0	0
91	1	2	3
92	0	1	1
93	1	2	3
94	0	0	0
95	0	0	0
96	0	1	1
97	0	1	1
98	0	0	0
99	0	0	0
100	0	0	0
Total	361	357	718

Appendix G3. Powell summary of fish trapped, released, spawned,
and distribution of carcasses 1997.

	TOTAL FISH TRAPPED:		718
AGE CLASSES	FEMALES	MALES	
3 Years = (<64 cm)	0	2	
4 Years = (64 - 82 cm)	294	207	
5 Years = (> 83 cm)	17	98	
TOTAL	311	307	*

FISH DISPOSITION FEMALES:

SPAWNED	292
RELEASED	55
MORTALITY	<u>14</u>
TOTAL	361

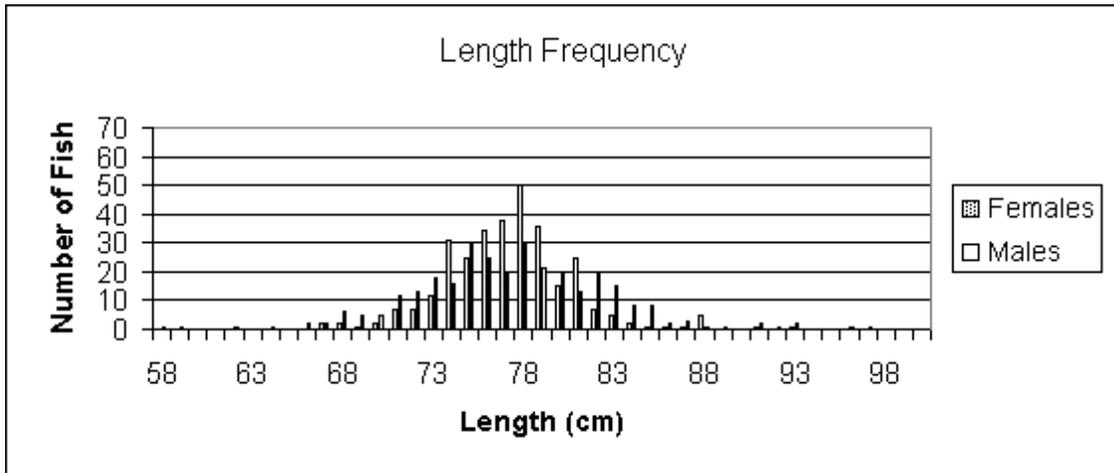
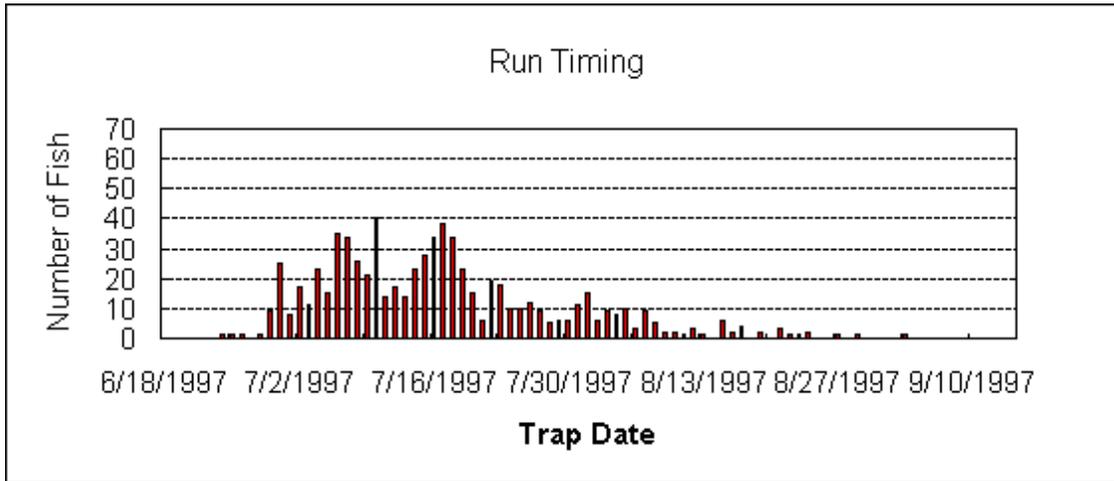
FISH DISPOSITION MALES:

SPAWNED	238
RELEASED	60
MORTALITY	<u>59</u>
TOTAL	357

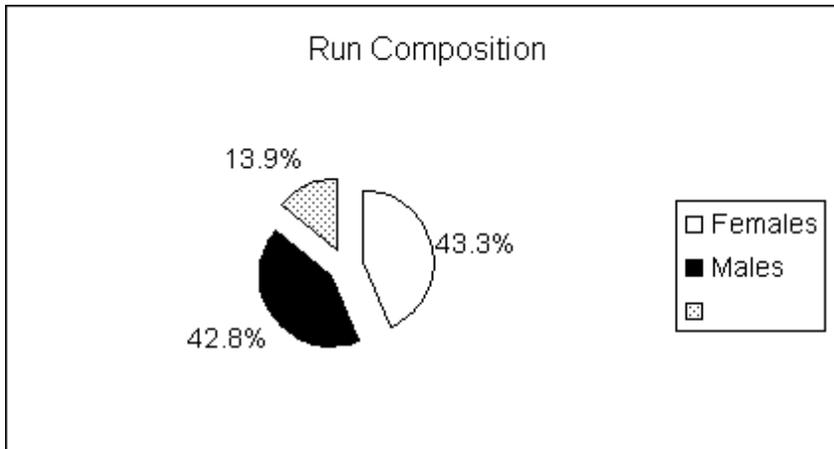
All spawning carcasses were put back in the river.

*50 pair of chinook were released to spawn naturally (no length taken)

Appendix H. Powell chinook run timing, length frequency and run composition graph.



* 50 pairs were released to spawn naturally, size unknown.



Appendix I. Summary of spring chinook returns to Powell by brood year.

Brood Year	Year Released	Number Released	3-yr-olds	Year Returned	4-yr-olds	Year Returned	5-yr-olds	Year Returned	Total by return	% return from plant
1984	Spr 1986	-----		1987		1988	16	1989	16	
1985	Spr 1987	-----		1988	111	1989	20	1990	131	
1986	Spr 1988 (a)	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spr 1989 (b)	200,639	2	1990	16	1991	15	1992	33	0.016%
1988	Fall 1989	314,500	7	1991	249	1992	288	1993	544	0.173%
1989	Fall 1990	307,100	6	1992	204	1993	57	1994	267	0.054%
	Spr 1991 (c)	180,764								
1990	Fall 1991	358,400	8	1993	28	1994	1	1995	37	0.007%
	Spr 1992 (d)	150,800								
	Spr 1992 (e)	<u>53,500</u>								
		562,700								
1991	Fall 1992 (f)	500	1	1994	1	1995	0	1996	2	
	Fall 1992 (g)									
1992	Spr 1994 (h)	144,823	12	1995	141	1996	129	1997	268	0.102%
	Spr 1994 (i)	61,060								
	Spr 1994 (j)	<u>55,745</u>								
		261,628								
1993	Fall 1994	311,690	45	1996	587	1997	310	1998	942	
	Spr 1995	290,417								
1994	Spr 1996	232,731	2	1997	177	1998		1999		
1995	Spr 1997	3,549	1	1998		1999		2000		
1996	Spr 1998	244,847		1999		2000		2001		
1997	Spr 1998	330,555		2000						
	Fall 1999	334,482								
1998				2001						

(a)Rapid River stock reared at Dworshak

(b)Clearwater stock reared at Kooskia and Dworshak

(c)Clearwater stock reared at Kooskia; acclimated in rearing pond

(d)Acclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak

(e)Not acclimated, transferred to rearing pond and immediately released

(f)These smolts were released from the rearing pond to Walton Creek

(g)Released at headwaters of Crooked Fork Creek

(h)Acclimated 17 days, volitional release 5 days, released in Walton Cr.

(i)Non-acclimated, transferred to rearing pond and immediately released.

(j)Released directly into Walton Creek

Appendix J. Clearwater Hatchery spring Chinook egg inventory information, Brood Year 1997. Sources of eggs are shown.

Spawn or transfer Date	Number Females Spawned	Number Males *	Number Females Culled	Number Production Females	Number Green Eggs	Number Eyed Eggs
08/06	4	4	2	2	10,634	9,341
08/12	8	8	1	7	28,760	27,850
08/15	19	19	0	19	79,164	63,373
08/19	50	50	12	38	165,201	153,530
08/20	4	6	0	4	16,105	15,410
08/22	53	53	1	52	188,698	156,668
08/25	4	8	0	4	14,494	13,308
08/26	72	72	21	51	182,322	162,665
08/28	19	16	3	16	68,876	64,015
08/29	47	47	8	39	156,898	142,257
09/02	128	128	27	101	408,655	340,433
09/05	36	36	6	30	113,996	101,620
09/08	29	29	3	26	102,517	97,806
09/09	16	16	2	14	54,131	43,057
09/11	41	41	10	31	119,678	104,093
09/12	3	6	0	3	10,427	9,754
09/15	24	24	6	18	70,028	68,671
09/18	4	8	0	4	16,630	13,750
09/22	1	2	0	1	3,699	3,522
TOTAL	562	573	102	460	1,810,913	1,591,123

POWELL

08/07	56	56	15	41	192,099	176,648
08/11	38	38	9	29	123,784	111,664
08/14	50	50	13	37	153,286	142,857
08/18	103	103	17	86	367,393	329,524
08/21	41	41	14	27	105,026	98,727
08/25	4	4	2	2	6,799	6,648
TOTAL	292	292	70	222	948,387	866,068

SELWAY CAPTIVE BROOD

09/05	4	4	1	3	5,257	3,653
09/11	2	4	1	1	2,660	2,618
09/18	4	4	1	3	7,270	7,007
TOTAL	10	12	3	7	15,187	13,278

RAPID RIVER

09/01	100	100	27	73	282,521	263,576
09/04	60	60	6	54	210,488	200,577
10/ 1 & 15	19	19	7	12	NA	39,365**
11/04	39	39	0	39	NA	136,200
11/12	132	132	0	132	NA	415,143
TOTAL	350	350	40	310	493,009	1,015,496

* Some males used more than once for spawning.

**These came from Sawtooth (Rapid River stock)

Appendix K. Clearwater Hatchery BY97 spring chinook fish marking and distribution summary.

Species	Stock	BY	Release Site	Release Dater	Number Released	Size No./lb	Length T.L.	Pounds	Marks	Number Of Marks Released
Chinook*	Powell	97	Warm Springs	7/8/98	19,847	29	116.8	684	CWT – no AD	18,847
Chinook*	Powell	97	Boulder Cr	7/7-8/98	83,748	48	99.0	1,745	CWT – no AD	83,748
Chinook*	Powell	97	Squaw Cr	7/29/98	12,827	31	101.0	445	CWT – no AD	12,827
Chinook*	Powell	97	Pete King Cr	7/20/98	12,889	30	114.3	430	CWT – no AD	12,889
Chinook*	Powell	97	Colt Killed Cr	7/15-17/98	111,344	71	78.4	1,600	AD Only, 618 PIT	111,344
Chinook*	Powell	97	Colt Killed Cr	7/27-28/98	96,207	70	78.4	1,400	AD Only 654 PIT	96,207
Chinook*	Powell	97	Colt Killed Cr	8/7-5/98	91,328	62	86.3	1,500	AD Only, 641 PIT	91,328
Chinook*	Rapid River	97	Walton Cr	9/23/98	154,555	13.1	146.3	11,798	AD 106K CWT, 350 PIT	154,555
Chinook*	Powell	97	Walton Cr	9/23/98	176,000	13.1	146.3	13,435	AD Only, 350 PIT	176,000
Chinook*	South Fork	97	Crooked River	9/24/98	162,119	16.4	130.5	8,811	RV Only, 700 PIT	172,119
Chinook*	South Fork	97	Red River	10/5/98	66,114	10.2	169	6,482	LV Only, 700 PIT	66,114
Chinook*	Selway	97	Selway River	9/29/98	5,712	37.5	101.6	152.3	No Ad, 600 PIT	5,712
TOTAL					992,690					992,690

*Released by the tribe

Species	Stock	BY	Release Site	Release Date	Number Released	Size No./lb	Total Length	Pounds	Marks	Number Of Marks Released
Chinook	Powell	97	Papoose Cr (ISS)	4/7/99	47,950	19.1	5.3	2,510	No AD, all CWT, 1,000 PIT	2,510
Chinook	Crooked R.	97	Crooked River	4/12-15/99	600,981	15.6	5.43	38,562	All AD, 500 PIT	38,562
Chinook	Powell	97	Walton Creek	4/12-14/99	334,482	12.4	5.86	26,933	All AD, 1,000 PIT, 326,676 CWT	26,933
Chinook	Red River	97	Red River	4/12-15/99	360,983	15.4	5.46	23,4984	All AD, 500 PIT	23,494
TOTAL					1,334,396	14.7		91,499		91,499

FISH TRANSFERS

Species	Stock	BY	Transfer To	Release Date	Number Released	Size** No./lb	Length FL or TL	Pounds	Marks	Number Of Marks Released
Chinook	Rapid River	97	Newsome Cr	3/19/99	74,109	19.0	5.3	3,904	No AD. All CWT, PIT=	74,109
Chinook	So Fork Clw	97	Mill Cr	3/19/99	39,640	11.0	5.4	3,604	No AD, All CWT, PIT=	39,640
Chinook	Rapid River	97	Meadow Cr	3/22-29/99	285,573	18.0	5.4	15,865	All AD	285,573
Chinook	So Fork Clw	97	Lolo Cr	3/31 & 4/2/99	147,975	20.0	5.2	7,399	No AD, all CWT, PIT=	147,975
Chinook	Powell	97	Boulder Cr	4/3-7/99	95,615	18.0	5.4	5,312	No AD, all CWT, PIT=	95,615
TOTAL					642,912	17.8		36,084		

*Warm Springs Creek allocation was stocked in Boulder Cr.

**NeZ Perce Tribal Hatchery sample counts

Appendix L. Production cost for BY-97 chinook, and BY98
North Fork steelhead

REARING TO RELEASE

	Chinook (BY-97)	North Fork Steelhead (BY-98)
No. Produced	3,210,461	595,997
Weight	177,628	113,532
% Mortality (from eyed eggs)	17.7%	14.5%
Conversion Rate	1.17	1.52

* week on - week off feeding

FOOD FED AND WEIGHT GAINED

	Chinook (BY-97)	North Fork Steelhead (BY-98)
Period Fed	Oct. 97 - Apr. 99	May 98 - Apr 99
Lbs. Feed Used	206,944	172,355
Weight Gain	177,628	113,532

Feed Cost \$160,280.03 \$74,288.24

Total Feed Cost \$234,568.27

Cost / pound steelhead and chinook \$0.806

Appendix M1. Summary of Fish Autopsy, Crooked River chinook fall 1998 season

ACCESSION NO: 9 98-345 LOCATION: Crooked River
 SPECIES: Spring Chinook AUTOPSY DATE: 9/17/1998
 STRAIN: South Fork Clw AGE: juv
 UNIT: So. pond SAMPLE SIZE: 20
 REASON FOR AUTOPSY: prelib
 INVESTIGATOR: Munson
 REMARKS: Blood parameters not assayed. Centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	0.00	0.00	0.00
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
 **CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	2	R	20	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	2	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	11	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	8	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.45						OT	0				
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS

FINS: GONADS:
 SKIN: OTHER:

Appendix M3. Summary of fish autopsy, Powell chinook fall 1998 releases

ACCESSION NO: 98-346 LOCATION: Powell
 SPECIES: Spring Chinook AUTOPSY DATE: 9/20/1998
 STRAIN: Powell AGE: juv
 UNIT: Pond SAMPLE SIZE: 20
 REASON FOR AUTOPSY: prelib
 INVESTIGATOR: Munson
 REMARKS: Blood parameters not assayed. Centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRIT	0.00	0.00	0.00
LEUCOCRIT	0.00	0.00	0.00
SERUM PROTEIN	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER
 **CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
N	20	N	20	N	20	0	20	0	0	B	20	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	0	1	0	S	0	B	20	1	0
B2	0	C	0	L	0	2	0	2	0	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	8	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	12	E	0	Mean=0.00		U	0	E	0		
H1	0	OT	0	OT	0					OT	0			T	0	F	0	Mean=0.00	
H2	0			O	0			Mean=3.6						OT	0				
M1	0																		
OT	0																		

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS

FINS: GONADS:
 SKIN: OTHER:

Appendix M4. Summary of fish autopsy, Powell chinook spring 1999 releases

ACCESSION NO: 99-90 LOCATION: Powell
 SPECIES: Spring Chinook AUTOPSY DATE: 4/8/1999
 STRAIN: Powell AGE: juv
 UNIT: Pond SAMPLE SIZE: 20
 REASON FOR AUTOPSY: prelib
 INVESTIGATOR: Munson
 REMARKS: Blood parameters not assayed. Centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRI	0.00	0.00	0.00
LEUCOCRI	0.00	0.00	0.00
SERUM PR	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

	EYES	GILLS	PSEUDO-BRANCHS	THYMUS	MESEN. FAT	SPLEEN	HIND GUT	KIDNEY	LIVER	BILE
N	20	N 20	N 20	0 20	0 0	B 0	0 20	N 20	A 0	0 0
B1	0	F 0	S 0	1 0	1 2	R 20	1 0	S 0	B 20	1 0
B2	0	C 0	L 0	2 0	2 10	G 0	2 0	M 0	C 0	2 0
E1	0	M 0	S&L 0		3 8	NO 0		G 0	D 0	3 0
E2	0	P 0	I 0	Mean=0.00	4 0	E 0	Mean=0.00	U 0	E 0	
H1	0	OT 0	OT 0			OT 0		T 0	F 0	Mean=0.00
H2	0		O 0		Mean=2.3				OT 0	
M1	0									
OT	0									

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS

FINS: GONADS:
 SKIN: OTHER:

Appendix M5. Summary of fish autopsy, Red River chinook fall 1998 releases

ACCESSION NO: 98-346 LOCATION: Red River
 SPECIES: Spring Chinook AUTOPSY DATE: 9/17/1998
 STRAIN: South Fork CLW AGE: juv
 UNIT: Pond SAMPLE SIZE: 20
 REASON FOR AUTOPSY: prelib
 INVESTIGATOR(S): Munson
 REMARKS: Blood parameters not assayed. centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRI	0.00	0.00	0.00
LEUCOCRI	0.00	0.00	0.00
SERUM PR	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

	EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
	N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
B1	0	F	0	S	0	1	0	1	0	R	20	1	0	S	0	B	20	1	0	0
B2	0	C	0	L	0	2	0	2	1	G	0	2	0	M	0	C	0	2	0	0
E1	0	M	0	S&L	0			3	14	NO	0			G	0	D	0	3	0	0
E2	0	P	0	I	0		Mean=0.00	4	5	E	0	Mean=0.00	U	0	E	0				
H1	0	OT	0	OT	0					OT	0			T	0	F	0		Mean=0.00	0
H2	0			O	0			Mean=3.15								OT	0			
M1	0																			
OT	0																			

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0				

GENERAL REMARKS

FINS: GONADS:
 SKIN: OTHER:

Appendix M6. Summary of fish autopsy, Red River chinook fall 1998 releases

ACCESSION NO: 99-89 LOCATION: Red River
 SPECIES: Spring Chinook AUTOPSY DATE: 04/0/99
 STRAIN: South Fork CLW AGE: juv
 UNIT: Pond SAMPLE SIZE: 20
 REASON FOR AUTOPSY: prelib
 INVESTIGATOR(S): Munson
 REMARKS: Blood parameters not assayed. centrifuge down.

	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION
LENGTH	0.00	0.00	0.00
WEIGHT	0.00	0.00	0.00
KTL*	0.00	0.00	0.00
CTL**	0.00	0.00	0.00
HEMATOCRI	0.00	0.00	0.00
LEUCOCRI	0.00	0.00	0.00
SERUM PR	0.00	0.00	0.00

*EXPRESSED AT KTL TIMES 10 TO THE FIFTH POWER

**CONVERTED FROM KTL; EXPRESSED AS CTL TIMES 10 TO FOURTH POWER

VALUES AS PERCENTS OF TOTAL SAMPLE

	EYES		GILLS		PSEUDO-BRANCHS		THYMUS		MESEN. FAT		SPLEEN		HIND GUT		KIDNEY		LIVER		BILE	
	N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0
N	20	N	20	N	20	0	20	0	0	B	0	0	20	N	20	A	0	0	0	0
B1	0	F	0	S	0	1	0	1	2	R	20	1	0	S	0	B	20	1	0	0
B2	0	C	0	L	0	2	0	2	11	G	0	2	0	M	0	C	0	2	0	0
E1	0	M	0	S&L	0			3	7	NO	0			G	0	D	0	3	0	0
E2	0	P	0	I	0	Mean=0.00		4	0	E	0	Mean=0.00		U	0	E	0			0
H1	0	OT	0	OT	0					OT	0			T	0	F	0			Mean=0.00
H2	0			O	0			Mean=2.25								OT	0			
M1	0																			
OT	0																			

SUMMARY OF NORMALS

20	20	20	20	20	20	20	20	20	20	0
SEX	M: 0		F: 0		U: 0					

GENERAL REMARKS

FINS: GONADS:

SKIN: OTHER:

Appendix N. Brood Year 1998 steelhead (B) eggs received from Dworshak National Fish Hatchery

Egg Take Number	Spawn Date	Eyed Egg Deliver Date	Number Eyed Eggs	Temperature Units
7	03/17/99	04/13/99	225,548	360
8	03/24/99	04/10/99	300,820	360
9	03/31/99	04/17/99	173,400	360
TOTAL			699,768	

Machine enumeration done at Dworshak National Fish Hatchery.

Brood Year 98 steelhead survival from eggs to released smolts.

Stock	#Eyed Eggs	Released Smolts	Percent Survival
North Fork	699,768	585,997	85.2
Total		585,997	

Appendix P. Brood Year 1998, North Fork Steelhead marking and distribution

Species	Stock	Brood Year	Release Site	Release Date	Number Released	Size No./lb	Total Length	Pounds	Marks	Number of Marks Released
Steelhead	North Fork	1998	Red River	4/20/1999	4,993	5.90	8	845	All PIT, no AD	4,993
									40K CWT, All CWT had LV clip	
Steelhead	North Fork	1998	Clear Crk	4/22-23/99	190,539	5.07	8.20	37,617	600 PIT, All Ad	190,539
			S.F. Clearwater						300 PIT, 20K CWT with LV clip	
Steelhead	North Fork	1998	(Red House Hole)	4/27 - 29/99	400,465	5.30	8.18	75,070	380,000 AD only	400,465
			TOTAL		595,997	5.2		113,532		595,997

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