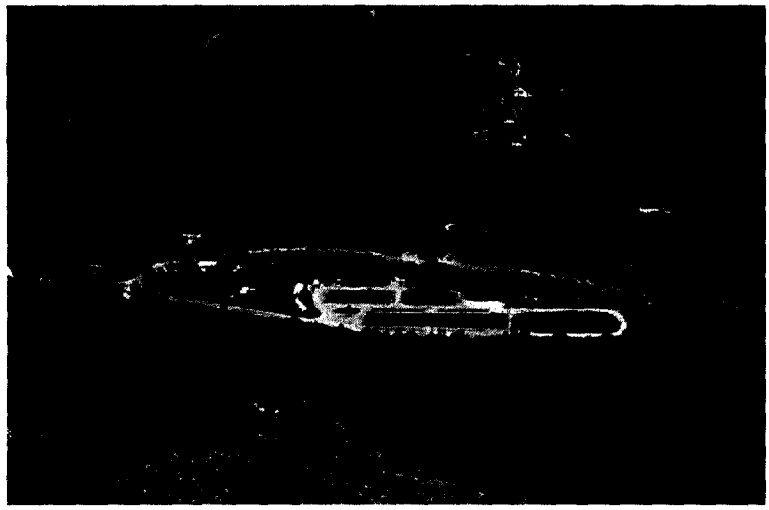
An IDACORP Company

RAPID RIVER FISH HATCHERY

2001 BROOD YEAR REPORT



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ABSTRACT

The production of spring Chinook salmon (*Oncorhynchus tshawytscha*) smolts at Rapid River Fish Hatchery (RRFH) partially fulfills Idaho Power Company's (IPC) mitigation responsibility for impacts to anadromous fish associated with the construction and operation of the Hells Canyon Dam Complex. The RRHF is owned and funded by IPC and operated by the Idaho Department of Fish and Game (Department).

The RRFH trap operated from March 14 to September 18, 2001. From April 18 to September 10, 12,770 (128 jacks and 12,546 four-year-olds and 96 five-year-olds) marked spring Chinook salmon were trapped. Of these, 2,437 were marked and released into local fisheries (587 into the Salmon River and 1,850 into the Little Salmon River). An additional 1,577 were transported to other drainages by the Department and 3,295 were transported to the Clearwater River drainage by the Nez Perce Tribe.

There were 6,262 fish ponded at RRFH in 2001 including: 955 sequestered for release (227 to Salmon R., 318 to Little Salmon R., 200 to Boise R., and 210 to Payette R.), 1234 donated to various organizations for subsistence, and 4,073 used for broodstock. Of the 4,073 fish held for broodstock, 3,965 were measured and used to generate length-frequency, age-class composition, and sex ratio for the 2001 run. The adult sex ratio (not including jacks) of the sub sample was 1,568 males (40.9%), 2,269 females (59.1%). The age-class structure was 128 three-year-olds (3.3%), 3,808 four-year-olds (96.0%), and 29 five-year-olds (0.7%).

Ancillary species were trapped in 2001. From May 11 to September 3, 399 unmarked Chinook salmon were trapped and released into Rapid River above the weir. The age-class composition of the unmarked salmon was 9 three-year-olds, 387 four-year-olds, and 3 five-year-olds. From April 2 to June 14, 68 steelhead (*Oncorhynchus mykiss*) were trapped. The sex ratio by origin of the returning steelhead was 15 wild males, 16 wild females, 17 hatchery males, and 20 hatchery females. Wild steelhead were released above the weir. Hatchery steelhead were released into the Little Salmon River. From May 15 to August 14, 360 bull trout (*Salvelinus confluentus*) were trapped and released into Rapid River above the weir.

Fisheries were open on the Salmon River and Little Salmon River in 2001. The Department's creel census estimated 15,549-marked Chinook salmon were harvested. Nez Perce Tribal officials reported subsistence and commercial harvest of 7,467.

Prespawning mortality was 1,374 fish or 34.6%. The sex ratio was 536 males (13.5%), 838 females (21.1%).

From August 16 to September 17, 2001, 1,303 females were spawned producing 4,946,614 eggs. Eggs from 425 females (1,613,300 eggs) were culled, which left 3,333,314 green eggs from 878 females. Average fecundity was 3,796 eggs/ female. Survival to eye-up was 2,983,744 or 89.5%.

Fingerlings were moved from raceways to rearing ponds during marking in June and July 2002. The Department's marking section reported 2,881,797 were Adipose-clipped. Of these 348,596 were also marked with a coded-wire-tag. In January 2003 the Department's markers returned and marked 54,769 pre-smolts with PIT-tags. Biomark Inc. marked another 129,721 with PIT-tags.

From March 17- April 28, 2003, 2,830,311 smolts were released including: 299,854 into the Snake River below Hells Canyon Dam, 199,900 into the Little Salmon River, and 2,330,557 into Rapid River.

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INTRODUCTION

Funding Source

The Rapid River Fish Hatchery (RRFH) was constructed in 1964 by Idaho Power Company (IPC) to mitigate for the loss of spring Chinook salmon (*Oncorhynchus tshawytscha*) due to construction of Brownlee, Oxbow, and Hells Canyon dams. Mitigation mandated by the Federal Energy Regulatory Commission requires IPC to provide funds for the annual production of three million spring Chinook salmon smolts at this facility. These fish are designated for release into Rapid River, the Little Salmon River, and the Snake River below Hells Canyon Dam. The RRFH is staffed and operated by the Idaho Department of Fish and Game (Department) and funded by IPC.

Location

The RRFH is located in Idaho County seven miles southwest of Riggins, Idaho. It lies on Rapid River, a tributary of the Little Salmon River. Travel distance by river to the ocean is about 600 miles.

Objectives

The main objectives of RRFH are:

1. To produce three million spring Chinook salmon smolts annually at an average size of 20 fish/lb (fpp) to be released at designated sites

2. To trap and spawn adult spring Chinook salmon returning to Rapid River.

3. To evaluate strategies and techniques for rearing spring Chinook salmon.

4. To provide eggs and/or fish for supplementation purposes.

FACILITY DESCRIPTION

Fish rearing facilities at RRFH consist of 52 double-stack vertical incubators, 12 outdoor concrete raceways (6 ft x 90 ft), and two earthen rearing ponds with concrete walls (RP). The RP are divided into six sections: RP-1A and RP-1B (42 ft x 188 ft each), RP-2A and RP-2D (35 ft x 197 ft), and RP-2B and RP-2C (37 ft x 173 ft each). Holding facilities for adult salmon consist of one concrete holding pond (HP), HP-1 (80 ft x 25 ft), and one earthen holding pond,

HP-2 (40 ft x 150 ft). The two HP provide space for up to 4,000 adult salmon. Production capacity by unit is listed in Appendix 1 and rearing space by unit is shown in Appendix 2.

The RRFH obtains adult salmon for broodstock from a fish trap located 1.5 miles downstream from the hatchery on Rapid River. It is designed to trap and hold adult fish migrating upstream. The fish trap consists of a permanent concrete velocity barrier, a seven-step fish ladder, and a two-stage trap. Adult salmon are transferred from the trap to a 1,000-gallon tanker-truck using an Alaska Steep Pass Ladder, which allows fish to move from the trap to a 500-gallon bucket that is lifted by a crane with a 2-ton electric hoist and discharged into the truck. The fish trap is designed to provide unimpeded migration around the velocity barrier when trapping is not in progress. In addition to trapping in Rapid River, RRFH receives fish from Oxbow Fish Hatchery (OFH) that are trapped in the Snake River below Hells Canyon Dam.

Recommended Facility Improvements

There are two areas for improvement of the facility that have existed for many years. One relates to adult salmon holding and handling and the other to general hygiene and disease control. Although the ten year average (by decade) for prespawning mortality has generally decreased over the past forty years it has been highly variable. Records have been kept continuously since 1969. The overall average through 2008 is 5.1% and the range is from 0.8% to 37.0%. Minimizing loss of adult fish during holding is a priority. Examination of prespawning mortality records reveals that an increase occurs after first sort and subsequent handling of the adult females. Gathering adults for sorting requires netting all adult fish in a large seine each spawn day, which causes handling stress twice each week during the spawning season. An improved system for crowding adult fish would reduce stress from sorting and the associated prespawning mortality. The solution for this problem will require replacement of HP-2 to provide for improved crowding and a more sanitary environment for holding adult salmon. Properly planned this could also increase flexibility for sequestering groups of adults. The other area of improvement involves the way in which water is supplied to fingerlings in RP-1 and adults in HP-2. Water entering the RP-1/HP-2 system must pass through the raceways. When fingerlings are in the raceways, the RP-1/HP-2 system receives their effluent. This creates a sanitation problem as detritus and fish waste from sweeping raceways is directed into RP-1 and HP-2. Direct supply to RP-1 or diversion of raceway effluent would solve this problem.

Water Supply

Water Source

The headwaters of Rapid River originate in Adams County and flow through an undeveloped canyon before reaching the hatchery. The Rapid River drainage is protected as part of the Wild and Scenic Rivers Act. It is not subjected to perturbations, such as logging or development. Rapid River generally provides adequate water for rearing salmon; however, the

steep gradient of the drainage makes it a highly variable river. Spring runoff and flash floods can be violent and carry a tremendous volume of silt into the hatchery. Water flows are measured by a gauging station upstream from the hatchery, which is operated by the United States Forest Service (USFS). The snow pack in the Rapid River drainage was low and runoff during the spring of 2001 was the lowest in recent years. In 2001, spring high water crested at 489 ft^3/s on May 24 and in 2002 the peak was 587 ft^3/s on May 29. Water temperature in Rapid River also varies considerably. The minimum in January 2001 was 33.6°F and the maximum in July was 61.2°F. Pond temperatures during adult holding are shown in Appendix 3.

Water Supply

Surface water for production at RRFH is obtained from Rapid River through one 30-inch and one 24-inch pipeline. A 5-ft wooden diversion dam provides the necessary hydraulic head to supply surface water to the rearing units via gravitational flow. Under a state license, RRFH has water rights for 28 ft^3/s for the hatchery and 18.6 ft^3/s for the fish trap. This water is diverted from Rapid River and then returned after passing through the facilities. Water for incubation is pumped from the headrace of the raceway system by one of two 5600-Watt electric pumps. A gasoline-operated pump and gravitational flow from a filter bed upstream from the hatchery intake provide water during electric utility failures. Water quality parameters are listed in Appendix 4. Effluent is monitored according to U.S. Environmental Protection Agency National Pollutant Discharge Elimination System permit.

Staffing

Three classified employees, a Fish Hatchery Manager II, an Assistant Fish Hatchery Manager, and a Fish Culturist staff RRFH. Approximately seven seasonal employees are hired each year. Housing accommodations include three residences for the classified staff and a 75-ft x 16-ft manufactured home and for seasonal employees.

FISH PRODUCTION

Adult Collection

Spring Chinook Salmon Returns to Rapid River

The RRFH fish trap operated from March 14 through September 18, 2001. Low flows resulted in a benign runoff and it was not necessary to interrupt the trapping operation for sand removal. The large fish run in 2001 required changes to trap operations. The trap entrance was closed for a few hours on several occasions to prevent overloading the holding area with fish.

In 2001, 12,770 marked spring Chinook salmon (128 jacks and 12,642 adults) were trapped. The first arrived on April 18 and the last on September 10. The peak of the run was during the first week of June. The first fish and the peak of the run were both earlier than normal.

Marked salmon were transported to holding ponds at the hatchery. A cross-section of the run was held in HP-2 for broodstock and some were sequestered in HP-1. The large number of hatchery returns required trapped fish to be released for fisheries or spawning supplementation. A total of 6,764 were loaded directly from the fish trap and an additional 955 were removed from the HP-1 for release. Fish released directly from the trap included 587 released into the Salmon River and 347 released into the Little Salmon River below the confluence of Rapid River this "downstream" group received a left-operculum-punch to identify recaptures. An additional 1,503 were released into the Little Salmon River above the confluence of Rapid River after receiving a dorsal fin punch. Trap counts showed that 256 released fish were recaptured (Appendix 5). This brought the total number of marked Chinook salmon trapped and handled, including recaptures, to 13,026. In addition to local releases 5,282 hatchery fish were released in other parts of Idaho for fisheries or supplementation (Appendix 6). In 2001, 1,234 hatchery fish were removed from the trap or holding ponds and donated to various organizations for subsistence (Appendix 7). Released fish, subsistence fish, and study fish were not anesthetized or injected. Subsistence fish were killed and scanned for tags when they were picked up by the receiving organizations.

Data collection was complicated this year by the need to return fish to fisheries or distribute them for subsistence quickly and without treatment. Hatchery management and research staff met before the 2001 run to establish data collection standards that would meet agency needs and be feasible, given time and fish quality constraints. It was agreed that data collected for research and hatchery evaluation should be collected at spawning and entered into a database. This sub-sample was not formally randomized but we expect that it is a representative cross section of the run, therefore sex ratio and age-class statistics can reasonably be applied to the entire run.

Information about run timing and the total number of returns was collected at the trap and is based on all 12,770 returns to RRFH (Appendices 8, and 9). Other trapping statistics,

including fork length, injuries, marks, and tags were recorded at the trap and included all RRFH fish placed in HP-2 but not fish distributed directly from the trap or those held in HP-1 for redistribution. The entire run was scanned for passive integrated transponder (PIT) tags and scrutinized for jaw-tags, visual identification (VI) tags, radio transmitters, and fin clips. The fin clips observed were all adipose fin (AD) clips.

There were 6,262 RRFH returns ponded. The sex and length of 2,189 fish that were removed from HP-1 for release or donated for consumption were not recorded. This left 4,073 that remained for broodstock. Statistics were recorded for 3,965 of them as they were removed from the ponds as prespawning mortalities or during spawning. The remaining 108 were unaccounted for and may have been removed from the ponds by raccoons or bears that were observed in the pond area. The 3,965 fish sub-sample was used to generate sex ratios and age-classes. The data was entered into an electronic database for analysis. Polymodal analysis of length frequency helped with age-class determination but was inconclusive due to the dominance of a single mode. Additional age-class criteria were based on coded-wire-tag (CWT) return data. The sex ratio of the sub-sample was 128 jacks (3%), 1,568 adult males (40%), 2,269 females (57%). Age-class composition was 128 (3%) three-year-olds (< 60 cm), 3,808 (96%) four-year-olds (60-86 cm), and 29 (1%) five-year-olds (> 86 cm) (Appendices 10 and 11).

Ancillary species were collected, recorded, measured, and released. Unmarked Chinook salmon, wild steelhead, and bull trout (*Salvelinus confluentus*) were released into Rapid River above the weir at the fish trap. Hatchery steelheads were released into the Little Salmon River about one mile above its confluence with Rapid River.

Tag information was recorded for all fish entering the RRFH trap. PIT-tag data were collected and submitted to the Department's Research Office at Nampa Idaho. Seven salmon with jaw tags were trapped this year (Appendix 12) and 17 arrived at with radio transmitters (Appendix 13).

Injuries were documented throughout the trapping season. They were recorded at the trap and included both marked and unmarked Chinook salmon. When multiple injuries were present on the same fish, they were recorded separately. Injuries consisted of 70 nitrogen burns, 110 gill net scars, 41 gaff wounds and various other types of injuries (Appendix 14). This year we observed many fishhooks in trapped fish but only thirty were recorded.

Spring Chinook Salmon Transferred from Hells Canyon

The large number of returns to Rapid River made transfer of adult hatchery spring Chinook salmon from the Snake River to RRFH for broodstock unnecessary. No fish were received from Oxbow Fish Hatchery (OFH) in 2001.

Inventory of Ancillary Species Trapped in Rapid River

Unmarked Chinook salmon entered the RRFH trap from May 11 through September 3, 2001 (Appendices 9 and 15). They were anaesthetized, measured to the nearest centimeter fork length (Appendices 11, and 16), injected with antibiotic, and released above the trap into Rapid River. They received a right operculum punch to identify recaptures. Age-class composition of the 399 unmarked salmon was 9 three-year-olds (2%), 387 four-year-olds (97%), and 3 five-year-old (1%). The adult sex ratio was 206 males (53%), 184 females (47%).

From April 2 through June 14, 2001, 68 adult steelhead were trapped (Appendices 17 and 18) and measured to the nearest centimeter fork length (Appendices 19 and 20). The steelhead run included 31 wild and 37 hatchery fish. The sex ratio by origin was 15 wild males, 16 wild females, 17 hatchery males, and 20 hatchery females. Hatchery steelhead were transported to the Little Salmon River and released at least one mile above the confluence of Rapid River. Wild steelheads were released into Rapid River upstream of the weir. All steelhead released received a right-operculum punch to identify recaptures. Two hatchery fish were recaptured from releases in the Little Salmon River.

In 2001, 360 bull trout were trapped from May 15 through August 14 (Appendices 21, and 22). They ranged in size from 32 cm to 58 cm total length (Appendices 23 and 24). The Department and the United States Forest Service's Rocky Mountain Research Station (RMRS) continued a study of bull trout movement in 2001. Personnel from RRFH provided support by collecting and recording fish, scanning for marks and tags, implanting PIT-tags, and assisted with other aspects of their study. As part of this cooperative program, the RMRS supplied a staff member who coordinated the bull trout operations at the trap and assisted with other trap and hatchery operations. Further information about their study should be obtained from the RMRS Office in Boise, Idaho. An inventory of all species trapped in 2001 is shown in Appendix 25.

Fisheries

The large number of hatchery Chinook salmon returning in 2001 allowed the Idaho Fish and Game Commission to open fisheries on the Salmon River and Little Salmon River to target fish returning from RRFH releases in 1998, 1999, and 2000. This was the first time in many years the Salmon River was open for salmon fishing. The Salmon River fishery extended from the Hammer Creek Recreation Area to the confluence of the Little Salmon River and was open from April 21 to June 10. Total catch was 7,612 and harvest was 6,091. The fishing season in the Little Salmon River extended from April 21 through August 5. Total catch was estimated at 11, 482 with a harvest of 9,458. For more information regarding the fisheries, contact the Department's Southwest Region Office in McCall or the Clearwater Region Office in Lewiston. The Nez Perce Tribe held a fishery in Rapid River downstream from the RRFH fish trap. Nez Perce Tribal officials reported subsistence and commercial harvest of 7,467 fish.

Adult Holding

Adult Treatments

The adult holding period extended from April 18 to September 17. Hatchery personnel removed fish from the trap daily and processed them on site. They were handled as little as possible and processed while the fish were immersed. All Chinook salmon placed in HP-2 or released above the weir were anesthetized with 40-ppm MS-222 and measured to the nearest cm fork length. They were also given an intraperitoneal injection of Erythromycin base injectable Gallimycin-100 at a rate of 20 mg/kg. This was administered according to veterinary extra-label usage as prescribed by the Department's Caldwell Wildlife Laboratory. Neither fish removed from the trap and released to supplement fisheries nor those donated for subsistence were anesthetized or injected.

Formalin treatments were administered to adults in the holding ponds three times each week from June 7 through August 29. Treatments consisted of pre-charging the pond with formalin to 170 ppm and then introducing formalin into inflow water at a rate of 170 ppm for one hour. During the holding and spawning period, water temperatures ranged from 36.7 F to 61.2 F (Appendix 3). The Walco Company hauled carcasses to a landfill twice each week.

Prespawning Mortality

Prespawning mortality at RRFH in 2001 was 1,374 fish or 34.6% of the 3,965 fish held and recorded. After August 27 males were not considered prespawning mortality. The sex ratio was 536 males (13.5%), 838 females (21.1%). The 2001 mortality rate was one of the highest recorded at RRFH and was largely due to nitrogen embolism related mycosis and bacterial kidney disease (BKD). Low flows and the resulting warm water may have been a contributing factor.

Hatchery personnel did cursory necropsies of all prespawning mortalities. Causal factors for prespawning mortality are shown in Appendix 26. A profile of cumulative prespawning mortality is shown in Appendix 27. As fish were removed from the ponds they were scanned for CWT and snouts were collected from fish in which a CWT was detected. The snouts were placed in numbered plastic bags, cataloged, and held until the end of the spawning season when they were delivered to the Department's Fish Marking Laboratory at Lewiston, Idaho.

Salmon Spawning

In 2001, 1,405 female spring Chinook salmon were processed from August 16 to September 17. Of these, 102 females were destroyed and their eggs rejected because they showed gross evidence of BKD or other pathology. The remaining 1,303 were spawned. Spawning followed the standard procedure recommended by the Integrated Hatchery Operations Team (IHOT) for random cross of two males with each female. This procedure was followed to ensure that all eggs received milt from a fertile male. Females were killed with a blow to the head. The eggs from each female were placed in a colander to drain off ovarian fluid. Then they were transferred to a numbered bucket where they were fertilized with the milt from two males and mixed with 250 ml of temperature adjusted well water. Jacks were included for fertilization, and no male was used more than three times. Males were given a right operculum punch to identify them as having been spawned and then returned to the holding pond. Each female was sampled during spawning for BKD. Samples were analyzed by enzyme-linked immunosorbent assay (ELISA) (Appendix 28). All fish removed during spawning were scanned for CWT and snouts were collected.

Incubation

The 2001 egg take was 4,946,614 green eggs from 1,303 females (based on average fecundity). Eggs from 425 of the spawned females (1,613,300 eggs based on average fecundity) were culled. The remaining 878 females produced 3,333,314 green eggs (Appendix 29).

Eggs to be incubated to eye-up at RRFH were water hardened for 30 minutes in 100-ppm iodophore then placed in vertical double-stack incubators that were set to a flow of 5 gal/min. Most of the eggs were incubated at a rate of one female per tray to segregate individual fish pending results of ELISA studies. Some trays received two females due to limited incubation space. As ELISA results were received, eggs from 224 females with an optical density (o.d.) >0.250 o.d. were culled. Eggs from the remaining 611 females were incubated to eye-up then shocked at 500 daily temperature units (DTU) by pouring them from the trays into water. They were picked and counted two days later using a salt bath. Eyed eggs were counted using a Jensorter™ Model BCM counter and dead eggs were enumerated by average weight. After counting, the eggs were returned to clean trays. The 611 females produced 2,491,085 green eggs. After a primary pick of 298,862 dead eggs, 2,192,223 eyed eggs remained. Eye-up was 88.0% and the average fecundity was 4,077 eggs/female. The RRFH has incubation space for about 3.3 million eggs (based on single female/tray incubation). Additional incubation space was required. To ensure space for eggs returning from OFH some were consolidated and returned to trays at a rate of 2 females/tray.

During spawning, eggs from 468 females were transferred to OFH for incubation to the eyed stage. Before they were transported they were packed in EggTube™ containers and water hardened for one hour in 100-ppm iodophore in EggBox™ coolers. After water hardening, ice was added to adjust water temperature to 45°F. On arrival at OFH the eggs were disinfected in 100-ppm iodophore and transferred to incubation stacks. Eggs from 201 females (762,996 eggs biased on average fecundity) with an Elisa result >0.250 o.d. were culled. The remaining 267 females produced 842,230 green eggs, which were incubated to eye-up. After

eye-up they were shocked and picked using salt bath flotation. Both live and dead eggs were counted using a Jensorter™ Model BCM counter. After a primary pick of 50,709 dead eggs the remaining 791,521 eyed eggs were returned to RRFH in EggTube™ containers immersed in coolers. When they arrived at RRFH they were disinfected in 100-ppm iodophore for 30 minutes then placed in clean incubation trays. At OFH average eye-up was 94.0% and the average fecundity was 3,154 eggs/female. All of the eggs at OFH were incubated at a rate of one female per tray to segregate individual fish pending results of ELISA studies.

In summary a total of 1,303 females were spawned in 2001, from which 425 were culled. The remaining 878 females produced 3,333,314 green eggs. After picking off 349,570 dead eggs, 2,983,744 eyed eggs were reared at RRFH for Brood Year 2001 production. Overall eye-up was 89.5% and average fecundity was 3,796 eggs/female. All trays were picked again at 760 DTU, 1,000 DTU, and 1,500 DTU. Egg trays were rodded at least weekly after 300 DTU. Formalin was administered to each incubator stack starting three days after spawning at a rate of 1,667 ppm for 15 minutes three times each week. This procedure was discontinued after each lot accumulated 800 DTU. Mycosis was controlled, and fry were ponded at approximately 1750 DTU.

Early Rearing

Fry were ponded from December 18, 2001 through March 15, 2002. The first lot was initially placed in an indoor vat then added to subsequent lots as they were transferred to 10 outdoor raceways. Fry were ponded in the upper half of the raceways to facilitate feed training. After they were acclimated and feeding well, raceway volume was increased to lower density indices (DI) below 0.3 lb/ft^3/in. Initial water depth was adjusted to 24 in, and flow was set at 0.25 ft^3/s. As the fish grew, water depth and flows were increased to a maximum depth of 36 in and flow of 1.62 ft^3/s. The fingerlings remained in the raceways until marking when they were transferred to rearing ponds. The average size at the start of marking on June 17, 2002 was 132 fish/lb (fpp). The average DI was 0.69 lb/ft^3/in and the average flow index (FI) was 1.89 lb/gal/min/in. Initial raceway density is shown in Appendix 30 and final raceway density is shown in Appendix 31. Mortality during early rearing was 27,033 fish or 0.9% of the number ponded (i.e. adjusted swim-up which was back-calculated as the inventory reported at marking plus the mortality recorded before marking).

Final Rearing

Rearing ponds were disinfected with 200 ppm active chlorine before introducing fish. The fingerlings were transferred from raceways to ponds through a 4 in aluminum pipe as they were marked. The marking staff reported that 2,881,797 fingerlings were marked and moved from June 17 through July 2, 2002. This total was a decrease of 0.8% from hatchery inventory calculated as electromechanically counted eggs minus recorded mortality. As in the past, hatchery inventory was adjusted to the total reported at marking. Initial pond loading densities are reported in Appendix 32. The fish averaged 113.1fpp and 3.0 in total length at the end of marking and grew to 19.0 fpp and 5.2 in at release. The volitional release began on March 17, 2003. Just prior to release, the average DI was 0.19 lb/ft^3/in, and the average FI was 1.88

lb/gal/min/in (Appendix 33). The maximum DI recommended by the Department (IHOT goal) for Chinook salmon at this facility is 0.30 lb/ft^3/in. The maximum recommended FI for O_2-saturated water at 41°F and 2,100 ft above sea level is 2.42 lb/gal/min/in. These parameters were within prescribed limits. Mortality during final rearing was 51,486 fish or 1.8% of the inventory reported at marking. Total mortality from swim-up through release was 78,519 fish or 2.7% of the adjusted swim-up.

Feed Use and Conversion

A total of 211,541 pounds of feed was used for Brood Year 2001 fish. The overall feed conversion was 1.44. Specific data on feed types and sizes are listed in Appendix 34.

Two medicated feed treatments were administered to Brood Year 2001 fingerlings. Starting May 21, 2002 and continuing for 28 days, they were fed 2.25% Aquamycin-100 at a rate of 2% body weight/day to yield an erythromycin dose of 100 mg/kg/day. Then starting September 3, 2002, and continuing for 28 days, they were fed 4.5% Aquamycin-100 at a rate of 1% body weight/day to yield an erythromycin dose of 100mg/kg/day. Treatments were performed according to guidelines set forth in INAD number 6013.

Fish Health

Portions of this section of the *Rapid River Hatchery 2001 Brood Year Report* are reproduced with permission from Mr. Doug Munson from the Department's Eagle Fish Health Laboratory (EFHL). A summary of EFHL results for individual inspections of Brood Year 2001 juveniles and broodstock is shown in Appendix 35.

Diseases Encountered and Treatments

Elevated losses were attributed to *Pseudomonas sp.*, which categorizes this event into a motile aeromonad septicemia (MAS). Mortality from this event was controlled with one application of oxytetracycline (OTC) medicated feed, at a rate of 3.75g/100 pounds body weight/day for 10 days. Two prophylactic applications of erythromycin medicated feed were fed for 28 days each to control *Renibacterium salmoninarum*. Infectious Hematopoietic Necrosis Virus (IHNV) and *Renibacterium salmoninarum* were detected in routine broodstock sampling.

Organosomatic Index

The Organosomatic Index in this context is a measure of fish health developed as part of the Autopsy Based Fish Health/Condition Assessment System (Goede and Houghton 1987). A summary of the fish autopsy is shown in Appendix 36.

Acute and Chronic Losses

Acute losses were not experienced at this facility during the reporting period. Chronic losses were experienced due to an episode of MAS. Associated mortality totaled 43,280 or 1.5% of the population.

Other Assessments

Rapid River Hatchery could benefit from a renovation of the broodstock holding ponds. A modern structure similar to those at Sawtooth Hatchery or Clearwater Hatchery would improve holding conditions for the adult Chinook salmon before spawning. A neurotropic form of the genus *Myxobolus* has been detected in juvenile Chinook salmon prior to release. This species of *Myxobolus* seems to be non-pathogenic and to-date has not been found in returning adults.

Fish Marking

Protocol requires the adipose (AD) fin to be removed from all spring Chinook salmon reared at RRFH for Brood Year 2001. The marking crew reported 2,881,797 fish were AD-clipped and a CWT was placed in 348,596. Marking occurred from June 17 to July 2, 2002. After marking, 3,240 fish were sampled during monthly pound counts for a quality check of AD-clips. The results showed 89.3% with full clips, 1.9% without clips, and 8.8 with marginal clips.

PIT-tags were placed in 184,490 fish from January 28 through February 6, 2003. A total of 54,769 fish were PIT tagged by the Department for the Comparative Survival Study (CSS) and 129,721 were PIT tagged for the U.S. Army Corps of Engineers by Biomark Inc. As the fish were marked, they were transferred from RP-2A and RP-2B to the catch basin at the end of RP2B where they were held for ten days following the completion of marking. After ten days the screens were pulled and the fish were allowed to mix with the population in RP-2A and RP-2B. During the remainder of the final rearing period, all mortalities from those ponds were collected and scanned for PIT tags.

Specific release information about marked fish is presented in Appendix 37. For more information regarding marking, consult the *Annual Release Summary of Marked Salmon and Steelhead* published by the Department.

Fish Distribution

Egg Transfers

Eggs from 468 females were transferred to OFH for incubation then returned (see Incubation). No other Brood Year 2001 eggs were transferred to or from RRFH.

Fingerling Transfers

No Brood Year 2001 fingerlings were transferred to or from RRFH.

Smolt Releases

There were 2,830,311 smolts (148,720 lb) released from RRFH in 2003 (Appendix 38). Of these, 299,854 (15,100 lb) were loaded onto IPC tank-trailers and released into the Snake River at the USFS's boat ramp below Hells Canyon Dam from March 19 through March 20, 2003. Another 199,900 (9,456 lb) were loaded onto IPC tank-trailers and released into the Little Salmon River above the confluence of Hazard Creek on March 18. The remaining 2,330,557 (124,164 lb) were released volitionally from RRFH from March 17 through April 28.

Final sample counts were performed before the start of release. The smolts averaged 19.0 fpp and 5.2 inches fork length. Rearing densities at the time of release are listed in Appendix 33. Based on visual observations, almost all the smolts emigrated volitionally from RP-1 and 99% from RP-2. The remaining fish were seined from RP-2. The last fish emigrated on April 28 2003. Survival from marking to release was 98.2% (Appendix 39).

Before the start of the volitional release from RP-2, hatchery personnel assisted technicians from Biomark Inc. with the placing of a pair of PIT-tag antenna arrays in the exit-weir of pond 2B. Out migration of PIT-tagged fish was monitored during the volitional release and uploaded automatically to the PTAGIS database operated by the Pacific States Marine Fisheries Commission.

Cost of Production

The total cost of production for any specific brood year is not a straight forward calculation of expenditure over a specific period at RRFH. The rearing cycle for a brood year-class is 19 months. Therefore for any brood year, the cycle extends from September, when the eggs are taken, through March, nineteen months later when the smolts are released. In the past, cost of production has been reported as the total cost incurred by IPC for the entire 19-month period. Overlap in brood year-classes caused the expenditures for September through March of the first year, and the expenditures for September through March of the second year to be reported repeatedly in consecutive reports i.e. for more than one brood year. This resulted in inflated estimates of production cost because expenditures for 14 months of the 19-month rearing cycle were reported twice rather than being associated with production of a specific brood year. To address this, one approach would be to apportion each month's total expenditures by the percentage that a given brood year-class comprises of the total hatchery inventory during that month and report that portion of the expenditure once. In our report for Brood Year 1995, we proposed this apportionment plan. To assist, IPC supplied RRFH with expenditures listed by month (letter from Paul Abbott, IPC Hatchery Biologist, P.O. Box 70, Boise, Idaho). The resulting cost/pound that year was one third of the cost calculated using the traditional method. The results were presented at an IHOT evaluation meeting held March 8, 1996. The change was confusing for the participants because the cost of production was much less than in previous years. At that time RRFH was directed to continue reporting production cost using the traditional method so that values could be comparable to past data. We recommend continued discussion and list values for both methods in this report (Appendix 40).

The total cost paid by IPC for September 1, 2001, through March 30, 2003, was $999,165.51 (letter dated June 1 2003, from Paul Abbott, IPC Hatchery Biologist, P.O. Box 70, Boise, Idaho). This was used to calculate cost of production. For comparison, the cost apportioned by Brood Year 2001's percent of total monthly inventory for the same period was $761,351.96, which is 76.1% of the cost calculated using the total amount, and addresses reporting expenditures twice. It also has the effect of smoothing cost/lb or cost/1000 fish released estimates over years with greater or smaller inventory. This may be relevant because fixed costs by definition are similar from year to year while variable costs e.g., feed, are dependent on inventory. Using the revised method for Brood Year 2001 the cost/thousand fish went from $353.02 to $268.99 and cost/lb went from $6.72 to $5.11.

HISTORICAL INFORMATION

We have included some archival information for context. Historic information about returns by return year is listed in Appendix 41 and by Brood Year in Appendix 42. Average feed and growth statistics are listed in Appendix 43. Release and transfer information is listed in Appendix 44.

ACKNOWLEDGMENTS

The staff at RRFH would like to thank Mr. Paul Abbott and the fisheries staff at IPC for their support and assistance in helping to maintain and improve the hatchery facility. We would also like to thank Department personnel who helped during the spawning and trapping season. Our gratitude goes to Officer Brian Holbrook and Officer Craig Mickelson and other Conservation Officers for security at the hatchery and trapping facilities. In addition, we extend our appreciation to Mr. Doug Munson and the EFHL staff for diagnostic work at the hatchery and assistance in preparing this document. This team effort allows the continued success of the Rapid River project.

LITERATURE CITED

Goede, R. W., and S. Houghton. 1987. ASUM: A computer program for the Autopsy-Based Fish Health/Condition Assessment System. Utah Division of Wildlife Resources Fisheries Experiment Station, 1465 West 200 North, Logan, Utah 84321.

APPENDICES

Appendix 1. Rapid River Hatchery production capacity.

Rearing unit	Volume		Carrying capacity	
Incubators	832	Trays	3,300,000	Eggs
Raceways (12)	1,890	ft^3	3,800.000	Fry
Rearing Ponds 1	54,625	ft^3	1,000,000	Smolts
Rearing Ponds 2	92,827	ft^3	2,000,000	Smolts
Adult Holding Pond 1	12,000	ft^3	1,000	Adults
Adult Holding Pond 2	24,000	ft^3	3,000	Adults

Appendix 2. Rapid River Hatchery pond volume.

Rearing/holding area	Volume (ft^3)
Rearing pond 1A	27,496
Rearing pond 1B	27,129
Rearing pond 2A	23,858
Rearing pond 2B	22,607
Rearing pond 2C	22,468
Rearing pond 2D	23,894
Adult holding pond 1	12,000
Adult holding pond 2	24,000

Appendix 3. Rapid River Hatchery adult holding pond temperatures (°F) for 2001.

Month	Maximum	Minimum	Average	Ten-year average
April	50.5	36.7	42.9	44.9
May	53.2	38.1	45.6	46.6
June	58.0	43.7	49.1	50.2
July	61.2	50.9	54.5	54.3
August	60.8	53.3	55.8	55.7
September	59.0	47.8	52.8	51.4

Appendix 4. Rapid River water quality analysis.

Analyte	PQL	Result	Units
Nitrate/N	0.1	ND	mg/L
Nitrite	0.1	ND	mg/L
Sulfate	0.1	19.9	mg/L
Orthophosphate	0.05	ND	mg/L
Ammonia/N	0.05	ND	mg/L
Alkalinity	10	69	mg/L as CaCO3
Hardness	0.1	85	mg/L as CaCO4
PH		7.63	mg/L
Hydrogen Sulfide	0.5	ND	mg/L
Res Chlorine	0.1	ND	mg/L
Arsenic	0.001	ND	mg/L
Cadmium	0.001	ND	mg/L
Chromium	0.001	ND	mg/L
Mercury	0.0001	ND	mg/L
Lead	0.001	ND	mg/L
Selenium	0.001	ND	mg/L
Silver	0.005	ND	mg/L
Iron	0.03	0.07	mg/L
Zinc	0.001	ND	mg/L
Cooper	0.001	ND	mg/L
Alpha-BHC	0.01	ND	µg/L
gamma-BHC (Lindane)	0.01	ND	µg/L
Heptachlor	0.01	ND	µg/L
Aldern	0.01	ND	µg/L
beta- BHC	0.01	ND	µg/L
Delta-BHC	0.01	ND	µg/L
Heptachlor Epoxide	0.01	ND	µg/L
Endosulfan I	0.01	ND	µg/L
4,4'-DDE	0.01	ND	µg/L
Dieldrin	0.01	ND	µg/L
Endfin	0.01	ND	µg/L
Endosulfan II	0.01	ND	µg/L
44,4'DDD	0.01	ND	µg/L
4,4'DDT	0.01	ND	µg/L
Endrin aldehyde	0.01	ND	µg/L
Endosulfin Sulfate	0.01	ND	µg/L
Methoxychlor	0.05	ND	µg/L

Appendix 4. (Continued)

Endrin Ketone	0.01	ND	µg/L
Chlordane	0.1	ND	µg/L
Toxaphene	0.1	ND	µg/L
Dichlorovos	0.5	ND	µg/L
Mevinphos	0.3	ND	µg/L
Demeton	0.1	ND	µg/L
Ethoprop	0.1	ND	µg/L
Phorate	0.1	ND	µg/L
EPN	0.1	ND	µg/L
Diazinon	0.1	ND	µg/L
Dimethoate	0.1	ND	µg/L
Disulfoton	0.1	ND	µg/L
Methyl Parathion	0.1	ND	µg/L
Ethyl Parathion	0.1	ND	µg/L
Ronnel	0.1	ND	µg/L
Malathion	0.1	ND	µg/L
Fenthion	0.1	ND	µg/L
Chlorpyrifos	0.1	ND	µg/L
Trichoronate	0.1	ND	µg/L
Stirophos	0.1	ND	µg/L
Tokuthion	0.1	ND	µg/L
Fensulfothion	0.1	ND	µg/L
Bolstar	0.1	ND	µg/L
Azinphos-Methyl	0.1	ND	µg/L
Coumaphos	0.1	ND	µg/L
Merphos	0.1	ND	µg/L
Naled	0.3	ND	µg/L
Sulfotep	0.1	ND	µg/L

PQL = Practical Quantitation Limit
ND = not detected (< PQL)

Appendix 5. Rapid River marked Chinook salmon releases and recaptures during 2001.

Date	Recaptures		[a] Recruits	Total	[b] Disposition
	Adults	Jacks			
4/18-5/15			1,181	1,181	Adults Held
4/18-5/15			3	3	Jacks Held
5/16			283	283	Adults Held
5/16			40	40	Adults to LSR
5/17			112	112	Adults Held
5/18			145	145	Adults Held
5/18			1	1	Jack Held
5/18			130	130	Adults to LSR
5/19			154	154	Adults to LSR
5/21			648	648	Adults Held
5/22			290	290	Adults Held
5/22			1	1	Jacks Held
5/23			232	232	Adults Held
5/24			8	8	Adults Held
5/24			244	244	Adults to LSR
5/25			55	55	Adults Held
5/25			240	240	Adults to LSR
5/29			608	608	Adults Held
5/29			4	4	Jacks Held
5/30			130	130	Adults to Payette R.
5/30			200	200	Adults to Boise R.
5/31			154	154	Adults Held
5/31			1	1	Jack Held
5/31			133	133	Adults to Payette R.
6/1			187	187	Adults Held
6/1			4	4	Jacks Held
6/1	2		129	131	Adults to LSR
6/1			200	200	Adults to Boise R.
6/4			322	322	Adults Held
6/4			10	10	Jacks Held
6/5	3		164	167	Adults Held
6/5			4	4	Jacks Held
6/5	2		398	400	Adults to Selway R.
6/7			4	4	Adults Held
6/7			1	1	Jack Held
6/7	1		449	450	Adults to Selway R.
6/8	1		129	130	Adults to Payette R.
6/8			153	153	Adults to Boise R.
6/11			391	391	Adults Held

Appendix 5. (Continued)

Date	Recaptures		[a] Recruits	Total	[b] Disposition
	Adults	Jacks			
6/11			10	10	Jacks Held
6/12			5	5	Adults Held
6/12			400	400	Adults to Selway R.
6/12			200	200	Adults to Boise R.
6/13			1	1	Adults Held
6/13	1		209	210	Adults to LSR
6/14			6	6	Adults Held
6/14			5	5	Jacks Held
6/14	2		398	400	Adults to Selway R.
6/18			319	319	Adults Held
6/18			4	4	Jacks Held
6/19			4	4	Adults Held
6/19	6		439	445	Adults to Selway R.
6/20			82	82	Adults Held
6/20			9	9	Jacks Held
6/20			130	130	Adults to LSR
6/20			200	200	Adults to Boise R.
6/21			6	6	Adults Held
6/21			4	4	Jacks Held
6/21	1		399	400	Adults to Selway R.
6/26			7	7	Adults Held
6/26	3		397	400	Adults to Selway R.
6/27	1		148	149	Adults to Boise R.
6/27			7	7	Jacks to Boise R.
6/28	3		72	75	Adults to Boise R.
6/29	13		41	54	Adults Held
6/29			3	3	Jacks Held
6/29	5		68	73	Adults to SR
6/29			8	8	Jacks to SR
6/29	2		62	64	Adults to LSR
7/3	13		41	54	Adults Held
7/3		1	3	4	Jacks Held
7/3	21		376	397	Adults to Selway R.
7/3			3	3	Jacks to Selway R.
7/3			80	80	Adults SR
7/6	6		74	80	Adults SR
7/10	18		26	44	Adults Held
7/10		1	5	6	Jacks Held

Appendix 5. (Continued)

Date	Recaptures Adults	Recaptures Jacks	[a] Recruits	Total	[b] Disposition
7/10			80	80	Adults SR
7/12	23		107	130	Adults Held
7/12		2	6	8	Jacks Held
7/17	20		145	165	Adults Held
7/17			9	9	Jacks Held
7/17			39	39	Adults SR
	2		145	147	Adults to LSR
			6	6	Jacks Held
7/19	9		32	41	Adults Held
7/19		1	6	7	Jacks Held
7/24			42	42	Adults to LSR
7/30	30		35	65	Adults Held
7/30			4	4	Jacks Held
8/8	15		55	70	Adults Held
8/8			1	1	Jack Held
8/14	17		80	97	Adults Held
8/22	15		83	98	Adults Held
8/22			3	3	Jacks Held
8/28	11		69	80	Adults Held
8/28			1	1	Jacks Held
8/31	3		17	20	Adults Held
8/31			1	1	Jacks Held
9/2			4	4	Adults Held
9/2			1	1	Jacks Held
9/5	2		1	3	Adults Held
9/10			5	5	Adults Held
Total	251	5	12,770	13,026	

[a] Recruit = First time at trap, i.e., not a recapture

[b] Disposition includes fish held at the hatchery and lists release sites:

LSR = Little Salmon River 1,850 fish released from trap

SR = Salmon River at the Riggins Boat Ramp 587 fish released from trap

Held = Fish held for spawning and; 318 released into the LSR, 227 into the SR, 200 into the Boise R. and 210 into the Payette R.

Appendix 6. Rapid River Hatchery marked Chinook salmon returns released in other parts of Idaho in 2001.

Date	Department catalog number	Stream	County	Region	Number of fish	Weight (lb)	Actual site	Remarks
5/30/01	0914000003	Payette R.	Valley	3	80	1,200	Cascade	Transported by Rapid River Hatchery staff
5/30/01	1000040000	Boise R.	Ada	3	200	3,000	Glenwood and Barber Park	Transported by Nampa Hatchery staff
5/30/01	0914000003	Payette R.	Valley	3	50	750	Cascade	Transported by Rapid River Hatchery staff
5/31/01	0914000003	Payette R.	Valley	3	50	750	Cascade	Transported by Rapid River Hatchery staff
5/31/01	0914000003	Payette R.	Valley	3	83	1,245	Cascade	Transported by Rapid River Hatchery staff
6/1/01	1000040000	Boise R.	Ada	3	200	3,000	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/5/01	0618150000	Selway R.	Idaho	2	360	5,400	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/5/01	0618150000	Selway R.	Idaho	2	40	600	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/7/01	0618150000	Selway R.	Idaho	2	400	6,500	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/7/01	0618150000	Selway R.	Idaho	2	50	750	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/8/01	1000040000	Boise R.	Ada	3	153	2,295	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/8/01	0914000003	Payette R.	Valley	3	50	750	Cascade	Transported by Rapid River Hatchery staff
6/8/01	0914000003	Payette R.	Valley	3	80	1,200	Cascade	Transported by Rapid River Hatchery staff
6/12/01	1000040000	Boise R.	Ada	3	200	3,000	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/12/01	0618150000	Selway R.	Idaho	2	40	600	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/12/01	0618150000	Selway R.	Idaho	2	360	5,400	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/14/01	0618150000	Selway R.	Idaho	2	40	600	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/14/01	0618150000	Selway R.	Idaho	2	360	5,400	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/19/01	0618150000	Selway R.	Idaho	2	45	675	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/19/01	0618150000	Selway R.	Idaho	2	400	6,000	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/20/01	1000040000	Boise R.	Ada	3	200	3,000	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/21/01	0618150000	Selway R.	Idaho	2	400	6,000	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/26/01	0618150000	Selway R.	Idaho	2	400	6,000	McGruder / Beaver point	Transported and released by Nez Perce Tribe
6/27/01	1000040000	Boise R.	Ada	3	156	2,340	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/28/01	1000040000	Boise R.	Ada	3	75	1125	Glenwood	Transported by Rapid River Hatchery staff
7/3/01	0618150000	Selway R.	Idaho	2	400	6,000	McGruder / Beaver point	Transported and released by Nez Perce Tribe
Total loaded directly from trap for release.					4,872	73,580		
6/6/01	0914000003	Payette R.	Valley	3	80	1,200	Cascade	Transported by Rapid River Hatchery staff
6/6/01	1000040000	Boise R.	Ada	3	200	3,000	Glenwood and Barber Park	Transported by Nampa Hatchery staff
6/14/01	0914000003	Payette R.	Valley	3	80	1,200	Cascade	Transported by Rapid River Hatchery staff
6/15/01	0914000003	Payette R.	Valley	3	50	750	Cascade	Transported by Rapid River Hatchery staff
Total placed in pond HP-1 then loaded for release.					410	6,150		
Total released outside the Little Salmon River and vicinity					5,282	79,730		

Appendix 7. Salmon donated to Idaho institutions by Rapid River Hatchery in 2001.

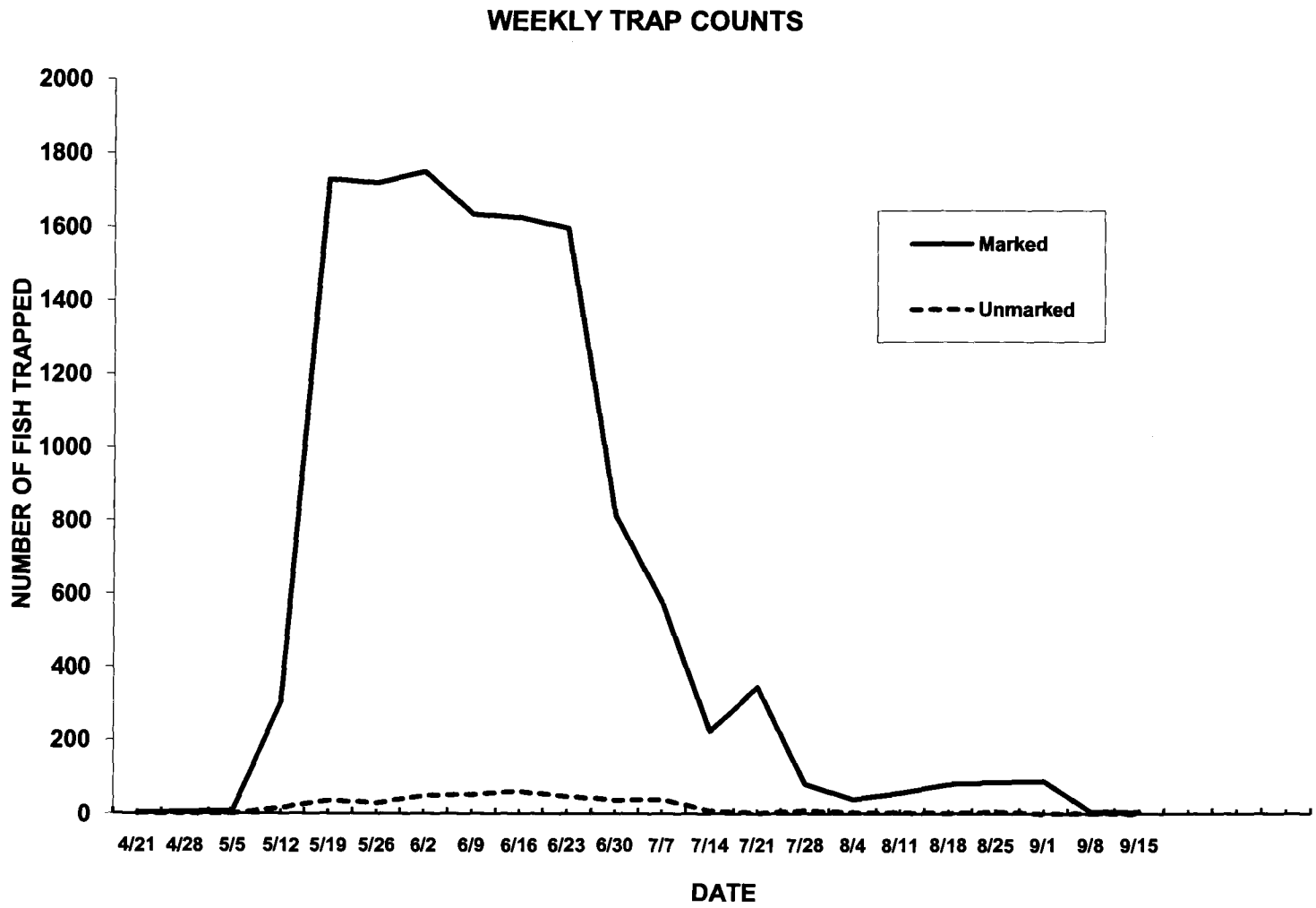
Date	Number of fish	Name of group
5/14	2	Idaho Hunger Action Council, Riggins
5/16	100	Shoshone Bannock Tribe
5/16	72	Calvary Christian Center
5/21	200	Shoshone Bannock Tribe
5/21	71	Calvary Christian Center
5/21	106	Kooskia ICAN
5/21	75	Kamiah ICAN
5/21	87	McCall Christian Fellowship
5/21	95	Grangeville Community Action
5/25	11	Youth With A Mission, Riggins
5/25	25	Parma Rod and Gun Club
5/25	25	Riggins Manor
5/29	205	Shoshone Bannock Tribe
5/29	100	Council Senior Citizens
5/29	30	Council Community Church
5/29	30	Idaho Hunger Action Council, Riggins
Total	1,234	

All of the fish listed above were adults.

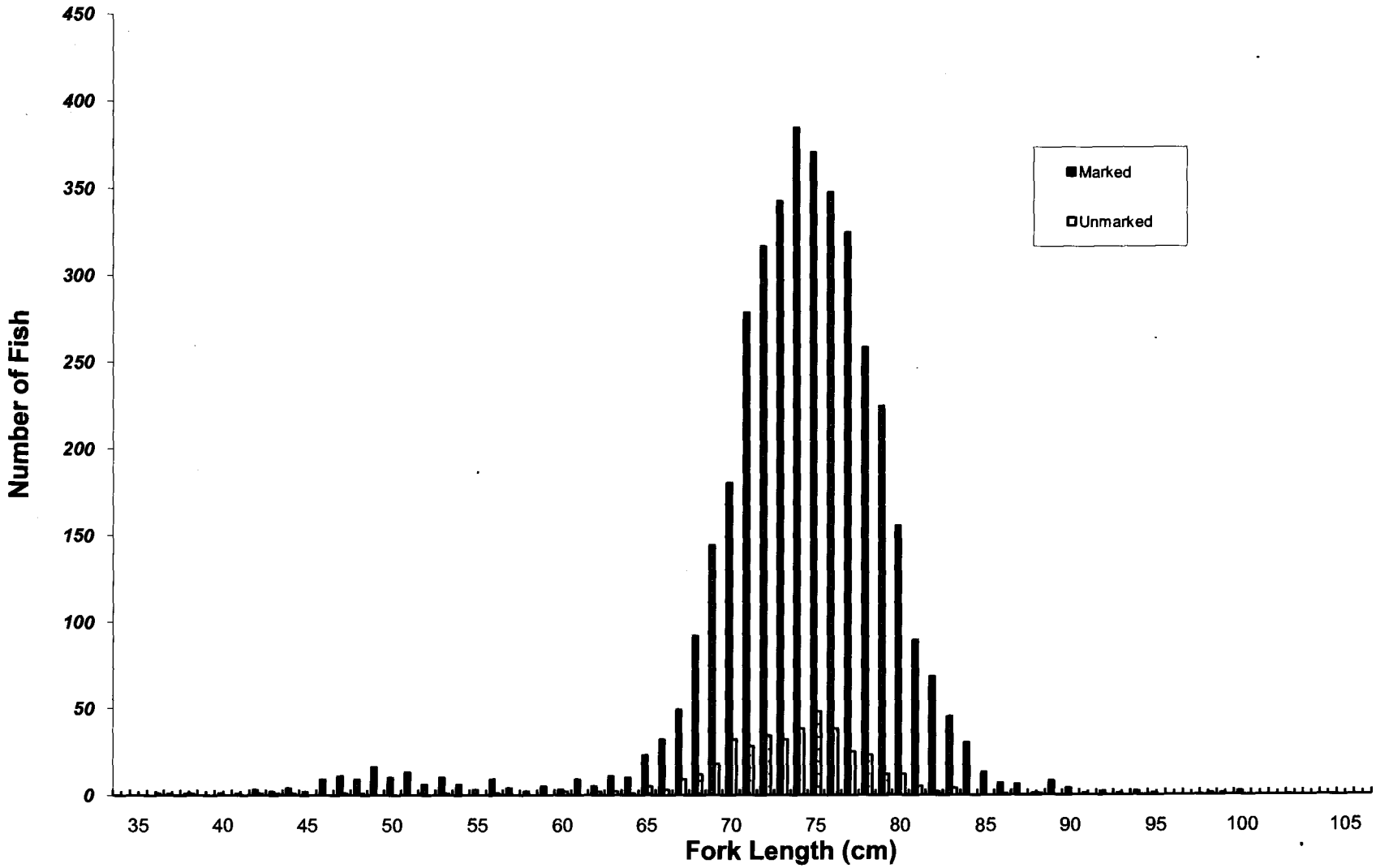
Appendix 8. Rapid River marked Chinook salmon run timing for 2001.

Week ending	Number of fish	Percentage of marked Chinook salmon
April 21	2	0.02
April 28	5	0.04
May 5	8	0.06
May 12	305	2.39
May 19	1,729	13.54
May 26	1,718	13.45
June 2	1,750	13.70
June 9	1,634	12.80
June 16	1,625	12.73
June 23	1,596	12.50
June 30	813	6.37
July 7	577	4.52
July 14	224	1.75
July 21	344	2.69
July 28	80	0.63
August 4	39	0.31
August 11	56	0.44
August 18	80	0.63
August 25	86	0.67
September 1	88	0.69
September 8	6	0.05
September 15	5	0.04
Total	12,770	100.0

Appendix 9. Salmon returns to Rapid River trap during 2001.



Appendix 11. Length-frequency of Rapid River Fish Hatchery broodstock for 2001.



Appendix 12. Rapid River Hatchery recaptures with jaw tags during 2001.

Trap date	Recapture location	Jaw tag number	PIT tag	Length (cm)	Sex	Remarks
5/9/01	Little Salmon	00049	-	74	U	Red WDFW tag
5/25/01	Little Salmon	00113	-	78	U	Yellow WDFW tag
6/6/01	Little Salmon	00224	-	74	F	Yellow WDFW tag
6/12/01	Little Salmon	00745	-	-	U	Red WDFW tag
6/14/01	Rapid River	00390	-	-	U	Yellow WDFW tag
7/3/01	Rapid River	00019	52716D3925	76	M	WDFW tag
7/5/01	Rapid River	00879	-	74	F	White WDFW tag

Appendix 13. Rapid River Hatchery recaptures with VI and radio tags during 2001.

Trap date	VI tag/PIT number	Radio CH/code	Fin clip	Length (cm)	Sex	*Disposition
4/26/01	O38	13/149	AD	71	F	R
5/21/01		12/105	AD	78	F	H
5/29/01		13/103	AD	76	F	H
5/31/01		12/42	AD	77	F	H
5/31/01		14/19	AD	81	M	R
6/5/01		11/67	AD	74	M	H
6/5/01		14/44	AD	75	U	H
6/11/01		14/7	AD	73	M	H
6/11/01	526E757ED9	11/86	AD	78	F	H
6/11/01		12/136	AD	76	F	H
6/14/01		12/68	AD	76	M	H
6/14/01		8/99	AD	76	M	H
6/19/01	53046C2B2F	12/75	AD	73	F	H
6/19/01		11/84	AD	74	F	H
6/21/01		12/146	AD	74	M	H
7/30/01		12/24	AD	76	M	H
8/14/01		12/52	AD	74	U	H

*H = held, R = released, D = donated for subsistence

Appendix 14. Injuries to Chinook salmon returning to Rapid River Hatchery in 2001.

Nitrogen blister	Body injury	Gill net scar	Gaff wound	Eye damage	Lamprey mark	Fin damage	Fish hook	Bite Wound
70	13	110	41	3	8	6	30	5

These numbers are from a sample size of 12,770 Rapid River returns.

Appendix 15. Rapid River unmarked Chinook salmon run timing for 2001.

Week ending	Number of fish	Percentage of unmarked Chinook salmon
April 21	0	0.0
April 28	0	0.0
May 5	0	0.0
May 12	15	3.8
May 19	36	9.0
May 26	29	7.3
June 2	49	12.3
June 9	52	13.0
June 16	60	15.0
June 23	48	12.0
June 30	37	9.2
July 7	39	9.8
July 14	8	2.0
July 21	2	0.5
July 28	9	2.3
August 4	3	0.8
August 11	3	0.8
August 18	2	0.5
August 25	6	1.5
September 1	0	0.0
September 8	1	0.2
September 15	0	0.0
Total	399	100.0

Appendix 16. Rapid River unmarked Chinook salmon lengths for 2001.

Fork length (cm)	Number of fish	Fork length (cm)	Number of fish
< 50	7	88	0
50	0	89	1
51	0	90	0
52	0	91	0
53	0	92	0
54	1	93	0
55	0	94	0
56	0	95	0
57	1	96	0
58	0	97	0
59	0	98	1
60	0	99	0
61	2	100	0
62	0	> 100	0
63	2	Total	399
64	2		
65	1		
66	5	[a] Sex ratio data	
67	3	206 (52.8%)	males
68	9	184 (47.2%)	females
69	12	390 (100.0%)	*total
70	18		
71	32		
72	28		
73	34		
74	32	[b] Age-class data	
75	38	9 (2.3%)	three-year-old
76	48	387 (97.0%)	four-year-old
77	38	3 (0.7%)	five-year old
78	25	399 (100.0%)	total
79	23		
80	12		
81	12		
82	5	Age-class criteria	
83	2	< 61 cm =	three-year old
84	4	61 – 86 cm =	four-year-old
85	0	> 86 cm =	five-year-old
86	0		
87	1		

[a] Sex ratio data includes adult Chinook salmon released above the weir and excludes jacks.
[b] Age-class data includes all Chinook salmon released above the weir including jacks.

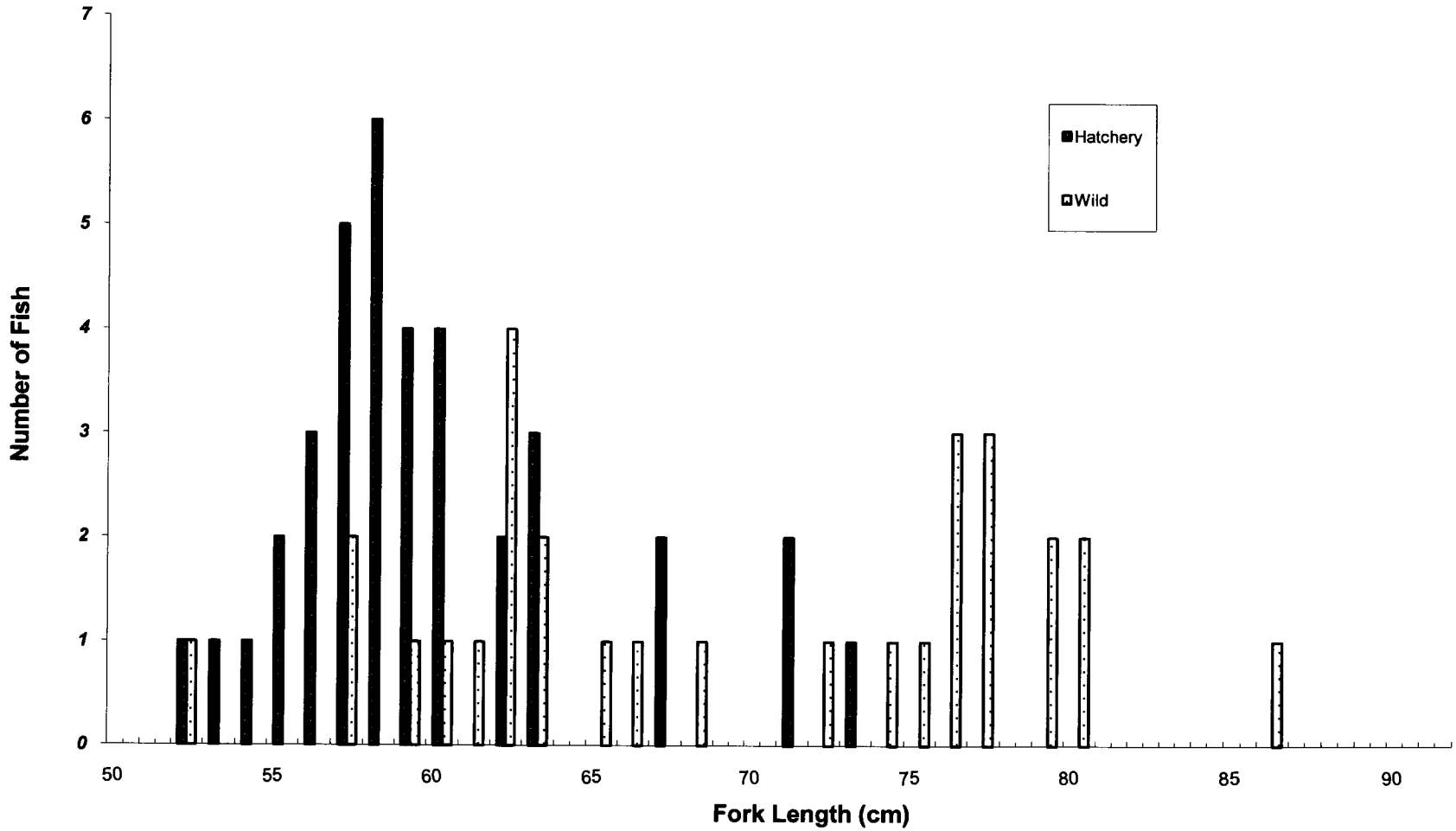
Appendix 17. Rapid River steelhead run timing for 2001.

Week ending	Number of hatchery fish	Percentage of steelhead run	Number of wild fish	Percentage of steelhead run
April 7	3	4.41	0	0.00
April 14	2	2.94	2	2.94
April 21	22	32.35	8	11.76
April 28	5	7.35	1	1.47
May 5	4	5.88	3	4.41
May 12	1	1.47	4	5.88
May 19	0	0.00	5	7.35
May 26	0	0.00	3	4.41
June 2	0	0.00	0	0.00
June 9	0	0.00	4	5.88
June 1	0	0.00	1	1.84
Total by origin	37	54.41	31	45.59
Total steelhead		68		

Appendix 19. Rapid River steelhead fork lengths for 2001.

Fork length (cm)	Hatchery		Wild	
	Male	Female	Male	Female
51				
52		1	1	
53		1		
54		1		
55	1	1		
56	2	1		
57	4	1	1	1
58	1	5		
59	3	1	1	
60	2	2		1
61			1	
62	2		2	2
63	2	1	2	
64				
65			1	
66			1	
67		2		
68			1	
69				
70				
71		2	1	1
72				1
73		1		
74				1
75				1
76			1	2
77				3
78				
79				2
80			1	1
81				
82				
83				
84				
85				
86			1	
87				
88				
89				
Column total	17	20	15	16
Origin total	37		31	
Total run	68			

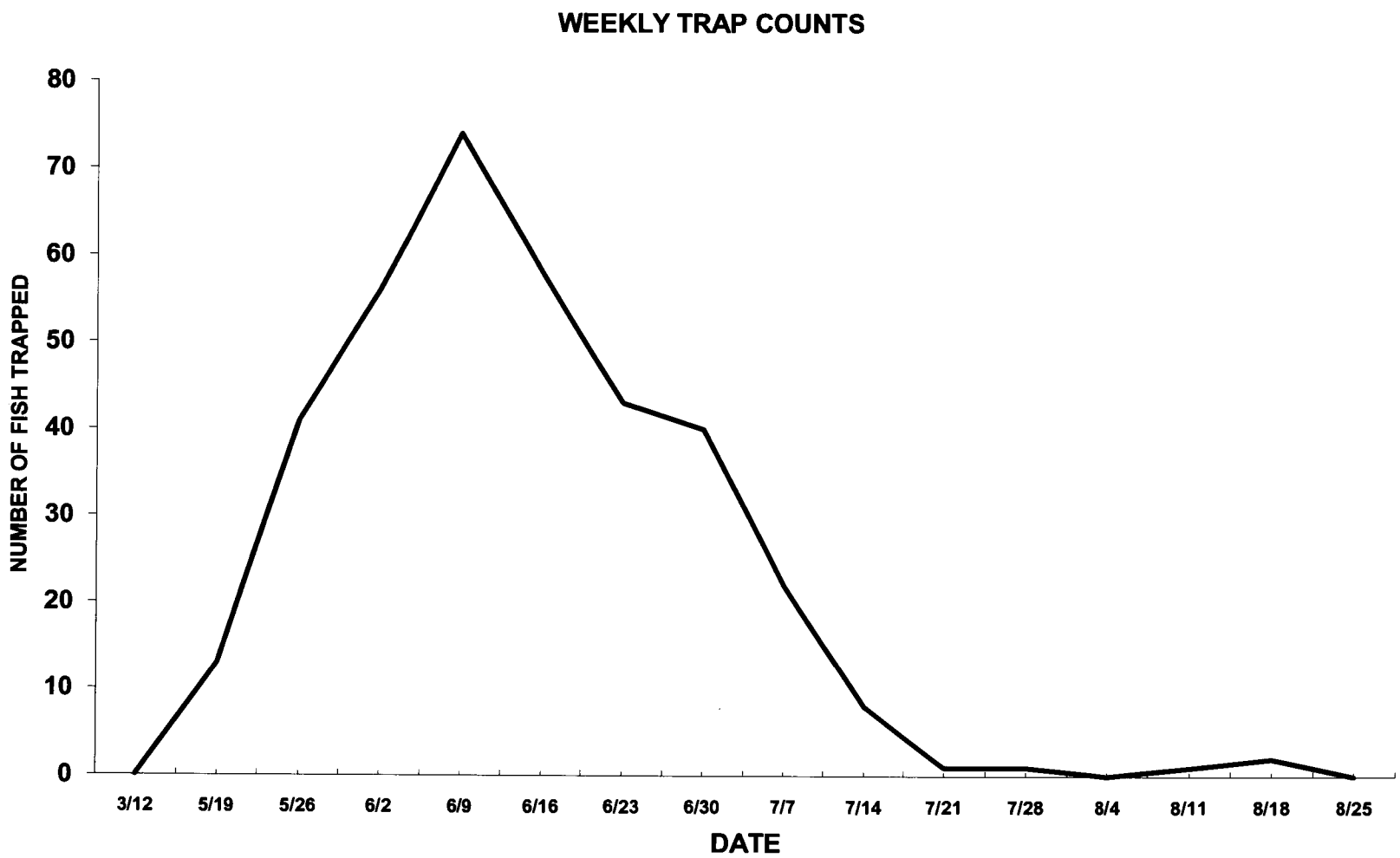
Appendix 20. Length-frequency of steelhead returning to Rapid River trap in 2001.



Appendix 21. Rapid River bull trout run timing for 2001.

Week ending	Number of fish	Percentage of bull trout run
May 19	13	3.61
May 26	41	11.39
June 2	56	15.56
June 9	74	20.56
June 16	58	16.11
June 23	43	11.94
June 30	40	11.11
July 7	22	6.11
July 14	8	2.22
July 21	1	0.28
July 28	1	0.28
August 4	0	0.00
August 11	1	0.28
August 18	2	0.56
Total	360	100.00

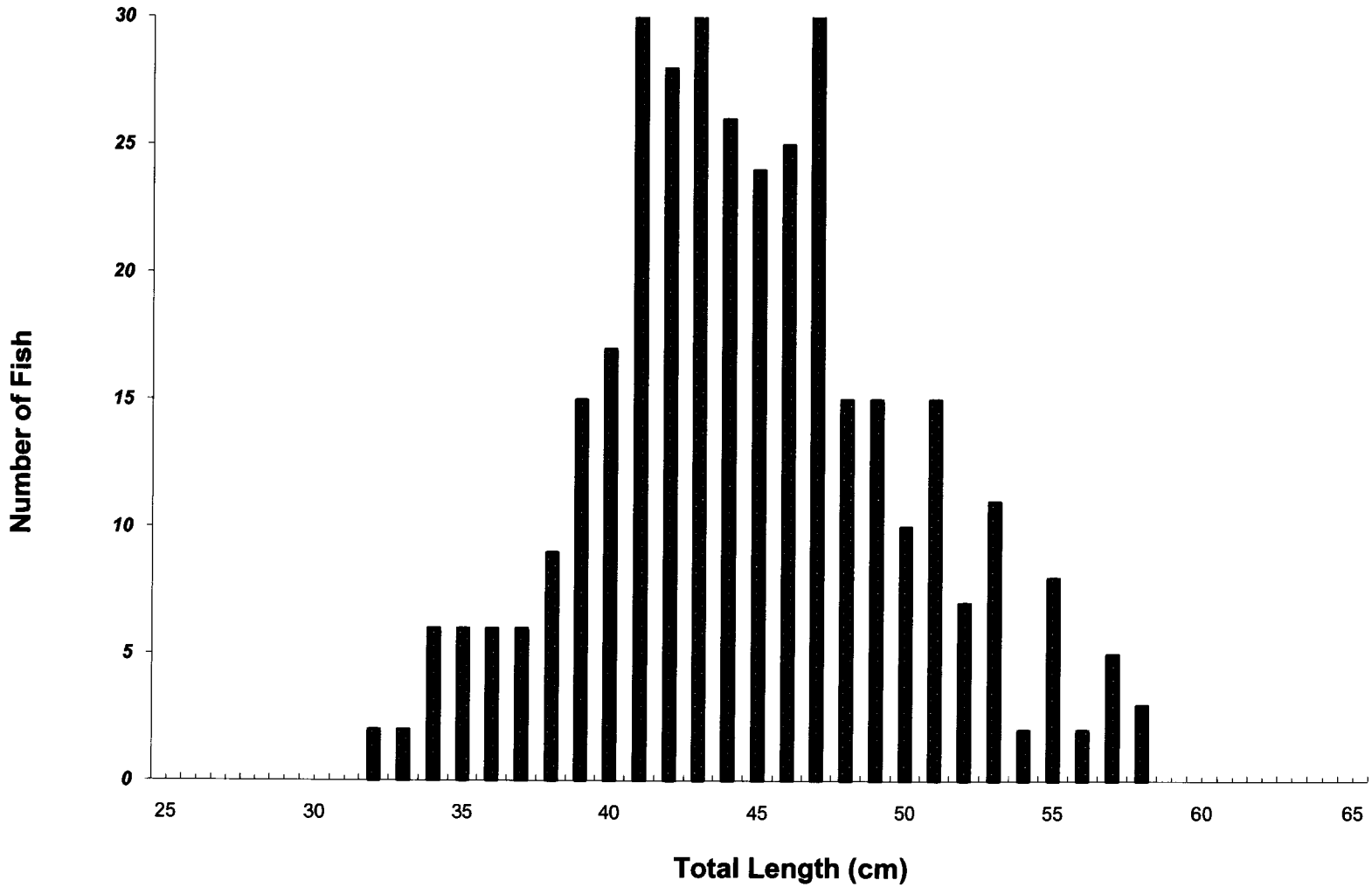
Appendix 22. Adult bull trout returns to Rapid River trap during 2001.



Appendix 23. Rapid River bull trout lengths for 2001.

Total length (cm)	Number of fish	Total length (cm)	Number of fish
25	0	45	24
26	0	46	25
27	0	47	33
28	0	48	15
29	0	49	15
30	0	50	10
31	0	15	15
32	2	52	7
33	2	53	11
34	6	54	2
35	6	55	8
36	6	56	2
37	6	57	5
38	9	58	3
39	15	59	0
40	17	60	0
41	30	61	0
42	28	62	0
43	32	63	0
44	26	64	0
Total			360

Appendix 24. Length-frequency of adult bull trout returning to Rapid River in 2001.



Appendix 25. Species trapped in Rapid River during 2001.

Species	Number trapped
Marked Chinook salmon	12,770
Unmarked Chinook salmon	399
Steelhead	68
Bull trout	360

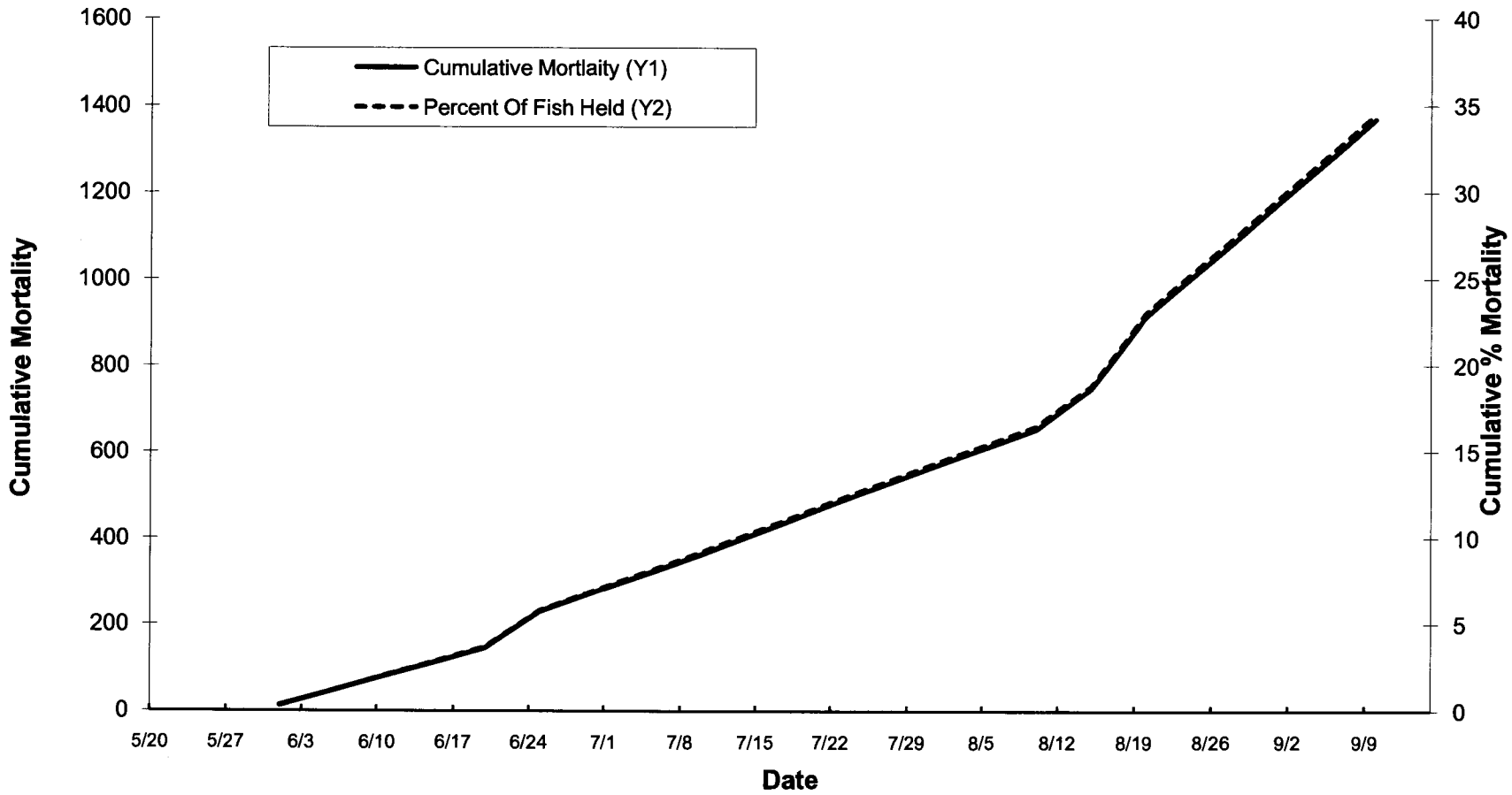
This table does not include recaptures.

Appendix 26. Causes of prespawning mortality at Rapid River Hatchery for 2001.

Cause	Number of fish	*Percentage of fish held
Nitrogen embolism	184	4.64
BKD	248	6.25
Injury	4	0.10
Unknown	938	23.66
Total	1,374	34.65

*Percentages are of 3,965 fish held for spawning.

Appendix 27. Cumulative pre-pawning mortality at Rapid River Hatchery in 2001.



Appendix 28. Rapid River broodstock ELISA results for 2001.

			Negative	Positive			
Lot number	Date sampled	Number sampled	0-0.999	Low .100-.250	Low .251-.400	Moderate .401-.800	High > .800
1	8/16	31	3	17	0	0	11
2	8/20	95	2	55	6	4	28
3	8/23	173	26	95	2	4	46
4	8/27	295	12	196	23	6	58
5	8/30	243	11	174	18	8	32
6	9/3	278	11	147	31	20	69
7	9/4	52	1	25	7	4	15
8	9/6	190	9	105	25	13	38
9	9/10	36	2	17	5	3	9
10	9/13	9	0	5	1	2	1
11	9/17	3	0	0	1	1	1
Total		1,405	154	836	119	65	308

Eggs were culled from females with ELISA results > 0.250 o.d. In some instances additional eggs were culled that were incubated in two female trays with culled females.
Eggs were culled from 425 of the 1,303 spawned females. An additional 102 samples were taken from females discarded on the spawning platform due to gross signs of BKD or other pathology.

Appendix 29. Rapid River Hatchery egg enumeration for 2001.

Lot	Spawn date	Eyed	Primary pick	green	Percent eyed	Average fecundity	Females
1	8/16	54,901	10,618	65,519	83.8	3,276	20
2	8/20	192,610	10,443	203,053	94.9	3,760	54
3	8/23	459,587	45,045	504,632	91.1	4,241	119
4	8/27	760,891	97,618	858,509	88.6	4,127	208
5	8/30	654,743	119,321	774,064	84.6	4,162	186
6	9/3	533,987	35,479	569,466	93.8	3,604	158
7	9/4	85,250	3,125	88,375	96.5	3,399	26
8	9/6	189,842	14,979	204,821	92.7	2,301	89
9	9/10	38,379	10,980	49,359	77.8	3,797	13
10	9/13	13,554	1,962	15,516	87.4	3,103	5
11	9/17	0	0	0	0	0	0
Total		2,983,74	349,570	3,333,314	89.5	3,796	878

This table does not include eggs from 425 females that were spawned and culled.

Appendix 30. Rapid River Hatchery initial raceway loading density 12/18/01–3/15/02.

Raceway	Inflow (ft^3/sec)	Number of fish	Weight (lb)	Density index	Flow index
2	0.25	302,752	218.6	0.20	1.45
3	0.25	302,581	218.5	0.20	1.45
4	0.25	300,422	216.9	0.20	1.44
5	0.25	301,835	217.9	0.20	1.45
6	0.25	299,890	216.5	0.20	1.44
7	0.25	300,378	216.9	0.20	1.44
8	0.25	301,114	217.4	0.20	1.45
9	0.25	301,456	217.6	0.20	1.45
10	0.25	305,157	220.3	0.20	1.47
11	0.25	215,993	155.9	0.14	1.04
Total		2,931,578	2,116.5		

Inventory data are based on egg enumeration values when final fish were added to each raceway minus 20,260 fry lost in 4 trays in one incubator stack that contained all dead fry.

Appendix 31. Rapid River Hatchery final raceway loading density 6/17/02.

Raceway	Inflow (ft^3/sec)	Number of fish	Weight (lb)	Density index	Flow index
2	0.88	299,830	2,677.1	0.80	2.19
3	0.88	300,161	2,680.0	0.80	2.19
4	0.88	298,454	2,387.6	0.74	2.02
5	0.88	299,503	2,396.0	0.74	2.03
6	0.88	297,766	2,290.5	0.72	1.97
7	0.88	298,648	2,297.3	0.72	1.97
8	0.88	299,169	2,216.1	0.70	1.93
9	0.88	299,252	1,906.1	0.64	1.74
10	0.88	302,916	1,917.2	0.64	1.76
11	0.88	214,619	1,240.6	0.43	1.17
Total		2,910,318	22,008.4		

Inventory data are based on egg enumeration minus recorded mortality, which is slightly more than the number reported by markers.

Appendix 32. Rapid River Hatchery initial pond loading density 7/3/02.

Pond	Inflow (ft^3/sec)	Number Of fish	Weight (lb)	Density index	Flow index
RP-1A	6.72	543,501	4,606	0.06	0.54
RP-1B	6.72	536,027	4,873	0.06	0.56
RP-2A	6.22	443,727	3,760	0.06	0.48
RP-2B	6.22	443,507	3,759	0.06	0.96
RP-2C	6.22	443,032	4,028	0.06	0.50
RP-2D	6.22	472,003	4,453	0.06	1.04
Total		2,881,797	25,479		

Inventory data are based on reported number marked, which was a decrease of 0.8% from hatchery inventory based on egg enumeration.

Appendix 33. Rapid River Hatchery pond loading density at release 3/17/03.

Pond	Inflow (ft^3/sec)	Number Of fish	Weight (lb)	Density index	Flow index
RP-1A	8.3	535,468	29,897	0.20	1.47
RP-1B	8.3	522,875	29,162	0.20	1.49
RP-2A	8.6	436,635	20,982	0.18	1.08
RP-2B	8.6	437,753	22,565	0.19	2.18
RP-2C	8.6	433,680	23,529	0.20	2.27
RP-2D	8.6	463,900	22,585	0.19	1.16
Total		2,830,311	148,720		

Appendix 34. Feed for Brood Year 2001 at Rapid River Hatchery.

Product		[a] Amount used	Unit price	Total Cost
Type/size	Additives			
Moore-Clark				
No. 1 Nutra Plus		40.0kg		
No. 2 Nutra Plus		80.0kg		
No. 3 Nutra Plus		120.0kg		
BioDiet:				
No. 2 Starter		460.0kg	2.23	$1,025.80
No. 3 Starter		640.0kg	2.23	$1,427.20
1.0 mm Grower		1460.0kg	1.76	$2,569.60
1.3 mm Grower		420.1kg	1.72	$ 722.57
1.3 mm Grower	Aquamycin-100	3240.0kg	3.51	$11,372.40
1.5 mm Grower	EIBS	6820.0kg	1.77	$12,071.40
BioMoist:				
2.0 mm Grower	W/TM-100	13,075.0lb	1.41	$18,435.75
2.0 mm Grower	[b] EIBS PAC	41,250.0lb	0.74	$30,525.00
2.5 mm Grower	[b] EIBS PAC	12,850.0lb	0.64	$8,224.00
2.5 mm Grower	Aquamycin-100 [b] EIBS PAC	20,525.0lb	1.99	$40,844.75
2.5 mm Grower	Aquamycin-100	3,125.0lb	1.90	5937.50
3.0 mm Feed	[b] EIBS PAC	73,000.0lb	0.49	$35,770.00
3.0 mm Feed		18,500.0lb	0.41	$7,585.00
[c] Total		211,541.0lb		$147,322.00

[a] Feed units are given in kg or lb as provided by manufacturer.

[b] EIBS PAC = 5 x C and B12, and 10 x Folic Acid over normal feed.

[c] Total includes 198,528 lb fed prior to the start of release and 13,013 fed after the start of release.

The size of fish at release and overall feed conversion are based on 211,541.0 lb of feed.

Appendix 35. Eagle Fish Health Laboratory inspection results for Brood Year 2001.

Brood Year stock	Log number	IHN	IPN	EIBS	BKD	FUR	ERM	CWD	WHD	CSH	Comments
Juvenile samples											
RRSC	02-210	-	-		-	-	-	-			NO PATHOGENS DETECTED; VIRO 0/10, FAT 0/10, BACTE 0/8
RRSC	02-237	-	-		-						NO PATHOGENS DETECTED; VIRO 0/10, FAT 0/10
RRSC	02-271	-	-		-	-	-	-			DIAGNOSTIC MAS: VIRO 0/10, FAT 0/10, PSUDOMONAS 2/5
RRSC	02-547	-	-		-	-	-	-			NO PATHOGENS DETECTED; VIRO 0/10, FAT 0/10, BACTE 0/10
RRSC	03-006	-	-		-	-	-	-			CWD; VIRO 0/10, FAT 0/10, FLAVOBACTERIUM PSYCHROPHILUM 5/10
RRSC	03-063	-	-		-	-	-	-			NO PATHOGENS DETECTED; VIRO 0/10, FAT 0/10, BACTE 0/10
RRSC	03-079	-	-		-				-		NEURO; VIRO 0/20, FAT 0/20, ELISA 0/20, PTD-MYXOBOLUS SPP ¼(X5), PCR-WHD 0/5, NEUROTROPIC MYXO 5/5
Broodstock samples											
RRSC	01-319				+				-		BKD; ELISA 28/31 (LOW 17, HIGH 11), WHD-DIGEST 0/22
RRSC	01-327										BKD; ELISA 93/95 (LOW 55 HIGH 38)
RRSC	01-332	-	-	-	+						BKD; IHNV, 4/20(X3), IPNV 0/60, NAVHS 0/30, ELISA 147/173 (LOW 95, HIGH 52)
RRSC	01-347				+						BKD; ELISA 283/295 (LOW 196 HIGH 87)
RRSC	01-371				+						BKD; ELISA 232/243 (LOW 174 HIGH 58)
RRSC	01-376				+						BKD; ELISA 267/278 (LOW 147, HIGH 120)
RRSC	01-382				+						BKD, ELISA 51/52 (LOW 25, HIGH 26)
RRSC	01-386				+						BKD; VIRO 0/20, ELISA 20/20 (LOW 11, HIGH 9)
RRSC	01-413				+						BKD; ELISA 24/36 (LOW 17, HIGH 17)
RRSC	01-432				+						BKD, ELISA 9/9 (LOW 5, HIGH 4)
RRSC	01-433				+						BKD; ELISA 3/3 (HIGH 3)

Appendix 36. Preliberation organosomatic index for Brood Year 2001.

	Hematology					
	Hematocrit			Serum protein		
Date	[a] Mean	[a] SD	[b] CF	[a] Mean	[b] SD	[c] CF
03/4/03	43.70	4.01	0.09	8.6	0.98	0.11

[a] Standard deviation
[b] Coefficient of variation

Combined autopsy summary

Eyes		Gills		Pseudo-branchs		Thymus		Mesen. fat		Spleen		Hind gut		Kidney		Liver		Bile	
N	20	N	20	N	20	0	20	0	0	B	1	0	20	N	20	A	1	0	0
B1	0	F	0	S	0	1	0	1	4	R	19	1	0	S	0	B	19	1	0
B2	0	C	0	L	0	2	0	2	5	G	0	2	0	M	0	C	0	2	0
E1	0	M	0	S&L	0			3	7	NO	0			G	0	D	0	3	0
E2	0	P	0	I	0	Mean=0.00		4	4	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			2.55								OT	0		
M1	0																		
OT	0																		
Summary of normals																			
	20		19		20		20		20		20		20		20		20		20

N = normal
OT = other
Thymus: 0 = no hemorrhage
Mesenteric fat: 0 = none, 1 = < 50% coverage, 2 = 50%, 3 = > 50%, 4 = 100%
Spleen: R = red, E = enlarged (EIBS enlarges spleens)
Hind gut: 0 = no inflammation
Liver: B = pail red
Bile: 0 = yellow bile < full bladder

Appendix 37. Rapid River Hatchery marking summary for Brood Year 2001.

Coded wire tag releases						
Release site	Date released	Number of fish marked	Release group mark code	Clip	Purpose	Pond
Rapid River	3/17/-4/28/03	58,009	10-83-73	AD	US-Canada	1B
Rapid River	3/17/-4/28/03	58,260	10-84-73	AD	US-Canada	1B
Rapid River	3/17/-4/28/03	58,774	10-85-73	AD	US-Canada	1B
Rapid River	3/17/-4/28/03	57,564	10-86-73	AD	US-Canada	1B
Rapid River	3/17/-4/28/03	58,242	10-87-73	AD	US-Canada	1B
Rapid River	3/17/-4/28/03	57,747	10-88-73	AD	US-Canada	1B
Total		348,596				

PIT tag releases						
Release site	Date released	[a] Number of PIT-tagged fish	Release group mark code	Clip	Purpose	Pond
Rapid River	3/17-4/28/03	54,769 (CSS)	AD only	AD	Hatchery PIT tag study	2B Catch Basin
Rapid River	3/17-4/28/03	129,721 (NMFS)	AD only	AD	FPC PIT tag study	2B Catch Basin
[b] Total		184,490				

[a] See the Annual Release Summary of Marked Salmon and Steelhead (unpublished Department document) for estimated numbers of marked fish released.
[b] Total number = 54,769 pit tagged fish for CSS study and 129,721 for National Marine Fisheries Service (NMFS) study.

Appendix 38. Smolts released from Rapid River Hatchery in 2003 (Brood Year 2001).

Release site and date	Release method	Number released	Weight (lb)
Rapid River			
3/19/03	Loaded to trucks from pond 2D and Released below Hells Canyon Dam.	150,094	7,100.0
3/20/03	Loaded to trucks from pond 2D and Released below Hells Canyon Dam.	149,760	8,000.0
3/19-20/03	**Total to Snake River**	**299,854**	**15,100**
3/18/03	Loaded to trucks from pond 2C and Released in the Little Salmon River.	199,900	9,456.0
3/18	**Total release into Little Salmon River**	**199,900**	**9,456**
3/17-4/28/03	Volitional release into Rapid River		
	1A	535,468	29,898
	1B	522,875	29,162
	2A	436,635	20,982
	2B	437,753	22,565
	2C	283,920	14,073
	2D	113,906	7,484
	Total release into Rapid River	**2,330,557**	**124,164**
	Total hatchery release	**2,830,311**	**148,720**

Appendix 39. Eggs to smolt Survival at Rapid River Hatchery for Brood Year 2001.

Green eggs	Eyed-eggs	Percent survival (eye-up)	[a] Swim-up	[b] Percent survival	[c] Marked number	Released smolts	[d] Percent survival
3,333,315	2,983,744	89.5	2,931,578	87.9	2,881,797	2,830,311	98.2

[a] Swim-up numbers are the initial ponding numbers (Appendix 30).
[b] Survival from eyed-eggs to swim-up was 98.3%. Survival from green eggs to swim-up was 87.9%.
[c] The reported number marked was 0.8% less than hatchery inventory. Hatchery inventory at the time marking commenced was based on electronic enumeration minus eggs used for a survival study and recorded mortality to date. After marking the hatchery inventory was adjusted to the number marked.
[d] Percent survival from marking to release was 98.2%. Back calculating for "adjusted" swim-up by adding the recorded mortality before marking to the reported number marked yields a survival from swim-up to release of 97.3%.

Appendix 40. Cost of production at Rapid River Hatchery for Brood Year 2001.

Number of fish	Weight of fish (lb)	Weight of feed (lb)	Cost of feed	Feed conversion	[a] Total cost	Cost/ thousand fish	Cost/ pound
2,830,311	148,720	211,541	$147,322.00	1.42	$999,165.51	$353.02	$6.72
2,830,311	148,720	211,541	$147,322.00	1.42	$761,351.96	$268.99	$5.11

[a] Total cost in the top row is the total expenditure by IPC from 9/1/2001 through 3/30/2003. This amount exceeds the cost associated with production of Brood Year 2001 due to overlap in Brood Year rearing cycles. Total cost in the second row is based on apportionment by Brood Year inventory (see discussion in the Cost of Production section). The total cost includes funds provided to the Department by IPC, as well as internal costs incurred by IPC. It does not include IPC capital outlay expenditures.

Appendix 41. Returns to Rapid River Hatchery from 1964 to 2002.

Return year	Snake R. return (adults)	Rapid R. return (adults)	Rapid R. return (jacks)	Percent prespawning mortality	Females spawned	Eggs/ female	Number of eggs taken
1964	349			16	182	4,874	887,000
1965	408			21	133	4,541	604,000
1966	1,5111			18	621	3,697	2,296,000
1967	974	1,039		11	581	3,537	2,055,000
1968	351	3,416	740	2	1,809	3,671	6,540,000
1969	672	2,817	1,043	8	1,415	3,655	5,151,697
1970		6,470	887	10	3,520	4,136	14,560,280
1971		3,357	1,754	19	1,722	3,507	6,038,785
1972		12,310	943	15	3,825	3,941	15,072,604
1973		17,054	286	37	3,454	3,912	13,510,465
1974		3,457	538	27	1,756	3,924	6,890,186
1975		4,428	573	7	2,184	3,894	8,503,606
1976		6,342	1,765	15	3,055	3,762	11,492,878
1977		7,767	437	11	3,781	3,745	14,160,330
1978		5,735	34	21	2,350	4,266	10,026,888
1979		3,054	350	31	1,141	4,950	5,648,722
1980		1,528	432	30	543	3,235	1,756,827
1981		3,087	176	7	1,666	3,675	6,122,273
1982		3,646	30	11	1,883	3,973	7,482,330
1983		1,864	94	15	859	4,015	3,449,471
1984		1,705	651	7	821	3,807	3,125,911
1985	673	6,376	351	8	2,962	3,741	11,535,461
1986	360	6,546	177	34	2,451	4,355	10,673,138
1987	534	3,808	210	30	1,133	4,379	5,656,145
1988	381	3,608	172	19	1,645	4,879	7,905,702
1989	86	2,372	428	11	1,082	4,139	4,478,045
1990		2,566	40	13	1,063	3,967	4,217,103
1991		1,675	238	10	657	3,886	2,553,218
1992	912	2,370	96	24	1,177	3,988	4,534,404
1993	411	4,451	17	17	1,737	4,090	6,404,312
1994	29	261	4	21	116	4,226	490,249
1995	35	70	59	7	35	3,771	132,002
1996	58	1,412	751	6	329	3,561	1,171,610
1997	788	10,510	10	10	1,138	3,930	4,472,573
1998	60	1,584	7	16	723	4,715	3,409,130
1999	22	224	639	0.8	138	4,406	608,084
2000	967	3,098	1,701	4.1	1226	3,900	4,780,850
2001	0	12,642	128	34.6	878	3,796	3,333,314
2002	27	6,466	137	19.8	1072	3,522	3,670,292

From 1985 on, total eggs taken includes those from Snake River adults transferred to RRFH.

Appendix 42. Returns to Rapid River Hatchery by Brood Year.

Brood year	Year released	Release Into Rapid River	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Returns to Rapid River	Percent return from release
1964	1966	588,000	1,309	1967	3,422	1968	197	1969	4,928	0.84
1965	1967	479,267	740	1968	2,620	1969	874	1970	4,234	0.88
1966	1968	1,460,150	1,043	1969	5,596	1970	364	1971	7,003	0.48
1967	1969	900,192	887	1970	2,992	1971	1,544	1972	5,423	0.60
1968	1970	3,172,000	1,754	1971	10,766	1972	4,403	1973	16,923	0.53
1969	1971	2,718,720	943	1972	12,654	1973	1,759	1974	15,356	0.56
1970	1972	2,809,200	285	1973	1,698	1974	386	1975	2,369	0.08
1971	1973	2,908,425	538	1974	4,206	1975	1,120	1976	5,864	0.20
1972	1974	2,707,917	573	1975	5,222	1976	634	1977	6,429	0.24
1973	1975	3,373,700	1,765	1976	7,110	1977	1,845	1978	10,720	0.32
1974	1976	3,358,940	437	1977	3,890	1978	2,413	1979	6,740	0.20
1975	1977	2,921,172	34	1978	598	1979	46	1980	678	0.02
1976	1978	2,412,678	350	1979	1,482	1980	146	1981	1,978	0.08
1977	1979	2,866,993	432	1980	3,068	1981	557	1982	4,057	0.14
1978	1980	2,604,823	176	1981	3,089	1982	1,206	1983	4,471	0.17
1979	1981	2,372,607	30	1982	838	1983	356	1984	1224	0.05
1980	1982	1,476,766	94	1983	1,349	1984	199	1985	1,642	0.11
1981	1983	2,998,103	651	1984	6,177	1985	1,456	1986	8,284	0.28
1982	1984	3,246,197	351	1985	5,090	1986	1,155	1987	6,596	0.20
1983	1985	2,491,238	177	1986	2,444	1987	1,557	1988	4,178	0.17
1984	1986	1,594,688	210	1987	2,051	1988	379	1989	2,640	0.17
1985	1987	2,836,400	172	1988	1,933	1989	135	1990	2,240	0.08
1986	1988	2,630,200	428	1989	2,431	1990	421	1991	3,280	0.12
1987	1989	2,319,500	40	1990	1,254	1991	161	1992	1,455	0.06
1988	1990	2,520,400	238	1991	2,209	1992	1,905	1993	4,352	0.17
1989	1991	2,564,900	96	1992	2,546	1993	122	1994	2,764	0.11
1990	1992	2,615,500	17	1993	139	1994	9	1995	165	0.01

Appendix 42. Continued

Brood Year	Year Released	Release Into Rapid River	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Returns to Rapid River	Percent return from release
1991	1993	2,060,300	4	1994	61	1995	2	1996	67	0.003
1992	1994	2,547,624	59	1995	659	1996	177	1997	895	0.04
1993	1995	2,786,919	751	1996	10,333	1997	1,322	1998	12,406	0.45
1994	1996	379,167	10	1997	262	1998	72	1999	344	0.09
1995	1997	85,840	7	1998	152	1999	12	2000	171	0.20
1996	1998	896,170	639	1999	3,086	2000	96	2001	3,821	0.43
1997	1999	2,847,283	1,701	2000	12,546	2001	157	2002	14,404	0.51
1998	2000	2,462,354	128	2001	2872	2002	2008	2003	5008	0.20
1999	2001	736,601	119	2002	504	2003	57	2004	680	0.09
2000	2002	2,669,476	140	2003	2,317	2004	51	2005	2,508	0.09
2001	2003	2,330,557	431	2004	1,527	2005	28	2006	1,986	0.09

Returns to Rapid River are hatchery rack returns and do not account for harvest.

Appendix 43. Ten year average feed and growth data for Rapid River Hatchery.

Month	Average water temperature (°F)	Density index	Flow index	[a] Feed conv.	Hatchery constant	[b] Daily length increase (in)	[b] Monthly length increase (in)	Condition factor *C* ($x10^4$)	Percent body weight fed	Number feedings per day	Average #/lb at end of month	Average length at end of month (in)
FEB	38	N.A.	N.A.	N.A.	1.98	0.0024	0.07	2.7	1.42	8	1109	1.50
MAR	41	0.24	0.59	1.07	2.26	0.0070	0.20	2.8	1.89	8	809	1.64
APR	44	0.29	0.64	1.02	3.23	0.0105	0.34	3.1	2.40	8	439	1.95
MAY	46	0.29	0.74	1.00	4.54	0.0151	0.29	3.1	2.30	8	271	2.29
JUN	49	0.0	0.69	1.20	7.10	0.0297	0.59	3.1	2.93	4	136	2.87
JUL	54	0.09	0.83	1.59	7.36	0.0155	0.47	3.6	2.75	4	79	3.43
AUG	55	0.12	1.33	1.59	7.82	0.0164	0.50	3.5	2.70	5	46	3.86
SEP	51	0.15	1.57	1.70	8.66	0.0170	0.51	3.5	2.00	5	36	4.31
OCT	46	0.16	1.69	1.71	5.03	0.0098	0.30	3.5	1.37	3	30	4.60
NOV	51	0.17	1.81	2.22	1.54	0.0023	0.07	3.5	0.47	2	28	4.67
DEC	38	0.17	1.88	4.46	2.12	0.0016	0.03	3.4	0.21	1	30	4.67
JAN	37	0.18	1.89	2.83	1.15	0.0013	0.03	3.4	0.21	1	29	4.69
FEB	38	0.18	2.01	1.24	1.47	0.0040	0.12	3.2	0.53	2	26	4.95
MAR	41	0.19	1.97	1.55	3.47	0.0074	0.22	3.2	0.92	2	22	5.19

[a] Feed conversion is expressed as feed weight over fish weight gain.
[b] Growth data may vary during periods of high water.

Appendix 44. Release and transfer summary for Rapid River Hatchery for 1964-2001.

Brood Year	No. eggs taken	Egg or fry plants and site			Smolt plants and site	Fish/ pound
1964	887,000	None			588,000Rapid River	20.1
1995	60,400	None			479,267Rapid River	19.6
1966	2,296,000	None			1,460,150Rapid River	18.1
1967	2,055,000	None			900,192Rapid River	18.9
1968	6,540,000	757,376	eggs	Clearwater H Channel	3,172,000Rapid River	22.6
1969	5,171,697	497,610	eggs	Dworshak NFH to start	2,718,720Rapid River	21.6
1970	14,560,280	4,417,454	eggs	Sweetwater Eye Stat.	2,809,200Rapid River	23.3
		2,224,119	eggs	Kooskia NFH.	91,800Lochsa River	23.8
		526,516	eggs	Hayden Cr. Hatchery		
		2,473,983	eggs	Clearwater H Channel		
		4,607,736	eggs	Rapid River Hatchery		
		200,520	fry	Lemhi River		
		353,970	fry	Decker Pond		
		100,094	fry	Sandpoint Hatchery		
1971	6,038,785	600,496	eggs	Hayden Cr. Hatchery	2,908,425Rapid River	26.7
		53,562	fry	Lemhi River	197,303SF Clearwater	
		104,300	fry	Red River		
		29,800	fry	Ten Mile Creek		
		44,700	fry	American River		
		14,900	fry	Papoose Creek		
		59,600	fry	Brushy Creek		
		44,700	fry	Fish Creek		
		14,900	fry	Post Office Creek		
		44,700	fry	Squaw Creek (Lochsa)		
		61,500	fry	Lochsa River		
		60,000	fry	Ten Mile Creek		
		200,880	fry	Sandpoint Hatchery		
		401,305	fry	Decker Pond		
1972	15,072,604	5,256,662	eggs	Sweetwater Eye Stat.	2,707,917Rapid River	25.9
		3,012,358	eggs	Hayden Creek Hatchery		
		1,293,592	eggs	Red River H Channel		
1973	13,510,464	3,915,900	eggs	Sweetwater Eye Stat.	3,373,700Rapid River	30.6
		1,295,424	eggs	Hayden Creek Hatchery	117,000SF Clearwater	
		104,760	eggs	Hagerman Hatchery		
		502,200	eggs	Crooked R. H Channel		
		702,000	eggs	Kooskia NFH		
		806,400	eggs	Hayden Creek Hatchery		
		504,000	eggs	Minnesota walleye trade		
		210,734	fry	Sandpoint Hatchery		
		206,360	fry	Kooskia NFH		
		88,480	fry	Ten Mile Creek.		
		18,200	fry	Newsome Creek		
		633,000	fry	Lemhi River		
		10,428	fry	Capehorn Creek		
1974	6,890,186	809,400	eggs	Hayden Creek Hatchery	3,358,940Rapid River	24.7
		407,012	eggs	Indian Creek	205,700SF Clearwater	
		203,500	fry	Sandpoint Hatchery		
		21,840	fry	Capehorn Creek		
		59,962	fry	Red River		
		30,750	fry	Newsome Creek		
		10,250	fry	Ten Mile Creek		
		1,140,300	fry	Lemhi River		

Appendix 44. continued

Brood Year	No. eggs taken	Egg or fry plants and site			Smolt plants and site	Fish/ pound
1975	8,503,606	2,363,200	eggs	Sweetwater Eye Stat.	2,921,172Rapid River	28.5
		252,200	eggs	Mullan Hatchery	249,750SF Clearwater	
		255,000	eggs	Hayden Creek Hatchery		
		280,659	eggs	Indian Creek H Chan.		
		4,906,492	eggs	Rapid River Hatchery		
		34,000	fry	Ten Mile Creek		
		156,000	fry	Lemhi River		
		65,960	fry	SF Clearwater River		
		412,800	fry	Decker Pond		
		209,950	fry	Sandpoint Hatchery		
		36,143	fry	Bear Valley Creek		
1976	11,492,878	1,615,608	eggs	Mullan Hatchery	2,413,678Rapid River	28.9
		2,937,994	eggs	Sweetwater Eye Stat.		
		261,900	eggs	Hayden Creek Hatchery		
		261,900	eggs	Sandpoint Hatchery		
		1,267,208	eggs	Mackay Hatchery		
		47,008	fry	Univ. of Idaho		
		311,850	fry	Mackay Hatchery		
		104,500	fry	Lolo Creek		
		501,600	fry	Red River Pond		
		80,600	fry	SF Clearwater		
1977	14,160,330	2,633,400	eggs	Sweetwater Eye Stat.	2,866,993Rapid River	30.2
		2,287,800	eggs	Kooskia NFH	156,362White Sand Cr.	
		2,689,200	eggs	Mullan Hatchery	44,373Newsome Creek	
		288,000	eggs	Hayden Creek Hatchery		
		20,700	eggs	Univ. of Idaho		
		1,007,340	eggs	Crooked River H Chan.		
		723,000	fry	Mackay Hatchery		
		50,800	fry	Decker Pond		
		200,025	fry	Red River Pond		
		265,600	fry	Lemhi River		
1978	10,026,888	729,246	eggs	Hayden Creek Hatchery	2,604,823Rapid River	30.2
		970,728	eggs	Mackay Hatchery	57,440White Sand Cr.	
		1,540,282	eggs	Sweetwater Eye Stat.		
		706,936	eggs	Dworshak NFH		
		38,160	eggs	Univ. Of Idaho		
		48,940	eggs	U of I Hayden Cr.		
		1,250,010	eggs	Crooked River H Chan.		
		249,696	eggs	Sweetwater Eye Stat.		
		232,500	fry	Red River Pond		
		10,000	fry	Ten Mile Creek		
1979	5,646,722	806,400	eggs	Hayden Creek Hatchery	2,372,607Rapid River	25.3
		330,880	eggs	Dworshak NFH	1,001,700Snake River	21.6
		293,249	fry	Red River Pond		
1980	1,756,827	None			1,473,733Rapid River	16.2
1981	6,122,273	608,384	eggs	Pahsimeroi Hatchery	2,998,103Rapid River	20.6
		256,608	eggs	Oxbow Hatchery	250,020Snake River	16.8
		449,280	eggs	Dworshak NFH		
1982	7,420,450	493,346	eggs	Looking Glass (Ore)	3,246,197Rapid River	22.7
		1,332,000	eggs	Pahsimeroi Hatchery	500,850Snake River	16.8
		375,028	eggs	Dworshak NFH		
		125,055	eggs	Hagerman NFH		
		306,000	fry	Red River Pond		

Appendix 44. continued

Brood Year	No. eggs taken	Egg or fry plants and site			Smolt plants and site	Fish/ pound
1983	3,449,471	None			2,491,238Rapid River	19.7
					437,360Snake River	16.8
1984	3,125,911	None			1,594,688Rapid River	20.6
					140,000Snake River	22.7
					136,000Red River	15.1
1985	11,535,461	497,520	eggs	Oregon	2,630,200Rapid River	20.2
		3,668,000	eggs	Dworshak NFH	103,000Snake River	14.6
		2,450,907	eggs	Sawtooth Hatchery		
		100,590	fry	Boulder Creek		
		349,650	fry	Crooked River		
		200,158	fry	Eldorado Creek		
		55,123	fry	Hopeful Creek		
		144,443	fry	Crooked Fork Creek		
		70,282	fry	White Sand Creek		
		49,437	fry	Ten Mile Creek		
		102,282	fry	Newsome Creek		
		115,352	fry	Brushy Fork Creek		
1986	10,673,138	2,368,400	eggs	Dworshak NFH	2,630,200Rapid River	23.9
		712,905	eggs	Sawtooth Hatchery	400,600Snake River	22.9
		348,600	fry	Crooked Fork Creek		
		202,400	fry	White Sand Creek		
		98,000	fry	Big Flat Creek		
		238,900	fry	Red River Pond		
1987	5,656,145	30,000	fry	Little Salmon River	2,319,500Rapid River	20.6
		103,800	fry	Lolo Creek	500,000Snake River	22.7
		53,200	fry	Eldorado Creek		
		137,800	fry	Crooked Fork Creek		
		62,200	fry	Hopeful Creek		
		228,800	fry	White Sand Creek		
		72,200	fry	Big Flat Creek		
		113,800	fry	American River		
		112,100	fry	Newsome Creek		
		100,100	fry	Meadow Creek		
		200,100	fry	Crooked River		
		50,100	fry	Red River		
		50,100	fry	Yankee Fork		
		202,000	fry	Brushy Fork		
		150,100	fry	Ten Mile Creek		
		100,200	fry	White Sand Creek		
1988	7,881,379	1,475,677	eggs	Oregon Fish and Game	2,520,400Rapid River	17.4
		149,570	fry	Little Salmon River	250,000Little Salmon	16.3
		100,278	fry	Ten Mile Creek	551,200Snake river	15.1
		149,570	fry	Little Salmon River		
		100,278	fry	Ten Mile Creek		
		101,062	fry	Crooked River		
		100,862	fry	Crooked River		
		100,628	fry	Newsome Creek		
		100,299	fry	Boulder Creek		
		100,342	fry	Boulder Creek		
		100,097	fry	Newsome Creek		
		195,398	fry	Brushy Fork		
		99,919	fry	White Sand Creek		
		100,148	fry	White Sand Creek		
		99,401	fry	American River		
		51,369	fry	American River		
		39,163	fry	Meadow Creek		

Appendix 44. continued

Brood Year	[a] No. eggs taken	Egg or fry plants and site			Smolt plants and site	Fish/ pound
1989	3,925,585	211,509	fry	Crooked River	2,564,900Rapid River	18.7
		548,876	fry	Sawtooth Hatchery	100,100Little Salmon	20.2
					500,500Snake River	20.2
1990	4,271,103	200,000	eggs	Looking Glass Hatch.	2,615,500Rapid River	22.3
		403,400	fry	Sawtooth Hatchery	500,500Snake River	22.3
1991	2,553,218	3,050	fry	Hayden Creek Hatchery	2,060,300Rapid River	18.4
	22,235	Eggs received				
	26,694	Eggs received				
		10,126	fry	Squaw Creek	200,300Snake River	16.9
		90,125	fry	White Sand Creek		
1992	4,534,404	942,897	eggs	Dworshak Hatchery	2,547,624Rapid River	22.2
					380,600Snake River	22.1
1993	7,103,702	2,176,157	eggs	Clearwater Hatchery	2,786,919Rapid River	24.5
					499,536Snake River	23.7
1994	490,249	58,791	eggs	Clearwater Hatchery	379,167Rapid River	27.0
1995	132,002	16,402	eggs	Clearwater Hatchery	85,840Rapid River	22.1
1996	1,171,610	168,754	eggs	Clearwater Hatchery	896,170Rapid River	22.3
1997	5,407,913	1,015,496	eggs	Clearwater Hatchery	2,847,283Rapid River	25.3
					200,000Little Salmon	20.8
					300,000Snake River	20.8
1998	3,720,135	510,848	eggs	Clearwater Hatchery	2,462,354Rapid River	19.2
1999	634,520				736,601Rapid River	18.8
	199,010	Eggs received				
2000	5,100,650	911,919	eggs	Clearwater Hatchery	2,669,476Rapid River	19.8
					300,018Little Salmon	18.6
					500,195Snake River	22.7
2001	4,946,614				299,854Snake River	19.8
					199,900Little Salmon	21.1
					2,330,557Rapid River	18.7

[a] In 1992 RRFH started routine sampling of all spawned females for BKD by ELISA. Since that year, eggs from females that tested positive for BKD were transferred to other facilities of isolated rearing or culled. In some years culling has also occurred for other reasons e.g., inventory. The number of eggs taken includes culled eggs and is therefore total egg take. Egg transfers are included in this table. The number of culled eggs is not. More detailed information is available in individual Brood Year reports.

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