# RAPID RIVER FISH HATCHERY

## 1999 BROOD YEAR REPORT


By:

Ralph E. Steiner, Fish Hatchery Assistant Manager
Bradford W. Dredge, Fish Hatchery Manager 2
Nicola A. Johnson, Fish Culturist



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## ABSTRACT


The Rapid River Fish Hatchery (RRFH) trap operated from March 16 to September 13, 1999. From May 24 to August 17, 863 marked chinook *Oncorhynchus tshawytscha* were collected. This included 244 adults (26%) and 639 jacks (74%).

There were 885 fish ponded at RRFH. This total includes 863 Rapid River returns and 22 received from Oxbow Fish Hatchery (OFH). The sex ratio of adult RRFH fish placed in holding was 78 males (32%), 146 females (60%). The age-class structure was 639 three-year-olds (74.04%), 152 four-year-olds (17.62%), and 72 five-year-olds (8.34%). The fish received from OFH included 19 jacks (86%) and 3 adults (14%). The sex ratio of the adult fish from OFH was one female, two males.

No sport fishery was opened on the Little Salmon River in 1999. The Idaho Fish and Game Commission elected not to open a fishery this year due to the low number of returning chinook salmon. Nez Perce Tribal officials opened a fishery this year. Harvest data was not reported. The Tribal fishery was confined to Rapid River below the hatchery trap.

Ancillary species were trapped in 1999. From May 25 to August 3, eight unmarked chinook were trapped and released into Rapid River above the trap. The age-class composition of the unmarked component of the 1999 salmon run was one three-year-old, six four-year-olds, and one five-year-old. From March 23 to June 1, 10 wild and 29 hatchery steelhead *O. mykiss* were trapped. The sex ratio of the returning steelhead was four wild males, six wild females, 15 hatchery males, and 14 hatchery females. Wild steelhead were released above the trap. Hatchery-produced steelhead were released into the Little Salmon River. From May 19 to August 4, 163 bull trout *Salvelinus confluentus* were trapped and released into Rapid River.

Prespawning mortality of the 885 fish placed in holding ponds was two adult males (0.2%), three females (0.3%), and two jacks (0.2%). This totals seven fish, or 0.8% of the fish held which is the lowest recorded at RRFH.

Spawning took place from August 9 to September 15, 1999. A total of 144 females were spawned. Average fecundity was 4,406 eggs/ female. All females were tested for Bacterial Kidney Disease (BKD) by enzyme linked immunosorbant assay (ELISA). Eggs from six females (about 26,436 eggs, based on average fecundity) with ELISA titers of 0.40 optical density (o.d.) or greater were culled. This left 608,084 green eggs (based on mechanical count) from 138 females. Survival to eye-up was 556,464 eggs or 91.5%. After spawning, 199,010 eggs were received from Lyons Ferry Hatchery. After primary pick of 5,925 bad eggs, 193,085 remained to be added to RRFH inventory. The total inventory at RRFH was 749,549 eyed-eggs.

Marking of Brood Year 1999 (BY99) fingerlings at RRFH took place from June 19 through June 28, 2000. There were 739,042 fish adipose fin (AD) clipped, and 345,288 marked with coded-wire-tags (CWT). During February 2001, 55,092 fish were marked with Passive Integrated Transponders (PIT tags) as part of the comparative survival study.

From March 15 to April 25, 2001, 736,601 smolts (39,090 lbs) were released from RRFH. All were released into Rapid River. Survival during the early rearing period was 99.4%. Survival from swim-up to release was 99.1%. Survival from marking to release was 99.8%. Feed conversion was 1.30.

# INTRODUCTION

## Funding Source

The RRFH was constructed in 1964 by Idaho Power Company (IPC) to mitigate for the loss of spring chinook salmon after construction of Brownlee, Oxbow, and Hells Canyon dams. Mitigation mandated by the Federal Energy Regulatory Commission (FERC) required IPC to transplant a run of spring chinook salmon from the Snake River to the Salmon River Drainage and 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 and into the Snake River below Hells Canyon Dam. RRFH is staffed and operated by the 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 for salmon to the ocean is approximately 600 river miles.

# OBJECTIVES

The following are objectives of RRFH:

1. To produce three million spring chinook salmon smolts annually. The average size is to be approximately 20 fish/pound (fpp). These fish are to be released into Rapid River and the Snake River below Hells Canyon Dam.

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

3. To evaluate various strategies and techniques for rearing spring chinook salmon.

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

# FACILITY DESCRIPTION

Fish-rearing facilities at RRFH consist of: 50 double vertical stack incubators, 12 outdoor concrete raceways (6-ft x 90-ft), and six earthen rearing ponds (RP) with concrete walls: RP-1A and RP-1B (42-ft x 188-ft each), RP-2A and RP-2B (35-ft x 197-ft each), and RP-2C and RP-2D (37-ft x 173-ft each). Holding facilities for adult salmon broodstock 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). These holding ponds provide space for up to 4,000 adult salmon prior to spawning. Production capacities by unit are listed in Appendix 1. Rearing space by unit is shown in Appendix 2.

The RRFH facilities include a fish trap located on Rapid River approximately 1.5 miles downstream from the hatchery. It is designed to trap and hold adult fish migrating upstream. The trap consists of a permanent wooden velocity barrier, a seven-step fish ladder, and a two-stage trap. Fish can be transferred from the trap by means of an Alaska Steep Pass Ladder to a 500-gallon bucket that is lifted by an overhead hoist to a 1,000-gallon tank truck for transport to the hatchery. The trap facility allows unimpeded migration of anadromous and resident fish around the velocity barrier when trapping operations are not in progress.

## RECOMMENDED FACILITY IMPROVEMENTS

Recently the gravity-flow system that provides backup water for incubation has deteriorated. Historically it provided enough water to supply to 38 incubator stacks. Currently the system is unreliable and is not used for incubation. Using a dye to trace the water, we have detected multiple breaks in the buried line. This is at least one of the causal factors. We use motorized pumps during power failures but the gravity system provided another dimension to our ability to supply water for incubation. The transition from electric pumps to the gravity supply was immediate and automatic. Switching to motorized pumps is a manual operation and requires hatchery personnel to monitor incubation water 24 hours a day throughout the entire incubation period. We believe restoration of this capability to be a high priority and critical to the integrity of our incubation plan.

We have identified two areas for improvement of the facility. One relates to adult salmon handling and the other to general hygiene and disease control. Average prespawning mortality at RRFH from 1970 to 1994 was 18.3%, with holding in all ponds. Examination of prespawning mortality records show that a sharp increase occurs after first sort and subsequent handling of the adults. Our current method of gathering fish for sorting involves netting all adult fish in a large seine each spawn day. This method causes severe handling stress twice each week during the spawning season. An improved system for crowding adult fish would reduce prespawning mortality. This approach would require modification of HP-2 to provide a better environment for holding adult salmon. The other area of improvement involves the way in which water is supplied to RP-1. All water entering RP-1 must pass through the raceways. When fingerlings are in the raceways, RP-1 receives their effluent. This can be a sanitation problem if detritus from sweeping raceways is directed into RP-1. Direct supply to RP-1 would solve this problem, however, the handling of fish waste from all rearing systems remains. This question must be addressed as the Environmental Protection Agency (EPA) re-evaluates hatchery discharge permits.

## WATER SUPPLY

### Water Source

Rapid River originates in Adams County and flows through an undeveloped canyon before reaching the hatchery. The drainage is protected as part of the Wild and Scenic Rivers Act. It is not subjected to perturbations, such as logging or road building. Rapid River generally provides adequate water for rearing salmon. The steep nature of the drainage makes it a highly variable river. Spring runoff and flash floods can be violent and carry tons of silt into the hatchery. Water flow data for Rapid River are recorded by the National Forest Service (NFS) but are not available for the spring of 1999 at this time. Rapid River crested several times between January and mid-June, however the runoff pattern was more docile this year than in recent years. Water temperature also varied considerably. The minimum in January 1999 was 34.5$^{o}$F, and the maximum in August was 57.0F. Pond temperatures during adult holding are shown in Appendix 3.

## Water Supply

Hatchery water is obtained through one 30-inch and one 24-inch pipeline. A 5-ft-high wooden diversion dam provides the necessary hydraulic head. Under a state license, RRFH has specific water rights to 28 $ft^3/s$ for the hatchery facility and 18.6 $ft^3/s$ for the fish trap. This water is diverted from Rapid River and then returned after passing through the hatchery. Rearing units operate on gravitational flow. Water for the incubation system is pumped from the headrace by one of two 5600-W electric pumps. A gasoline-operated pump and a gravitational-flow filter bed provide water during electrical failures. Water quality parameters are listed in Appendix 4. Effluent is monitored according to EPA guidelines.

# STAFFING

Three permanent employees: a Fish Hatchery Manager II, an Assistant Fish Hatchery Manager, and a Fish Culturist staff RRFH. Approximately five seasonal employees are hired each year. Housing accommodations include three residences for the permanent staff and a 65-ft x 14-ft mobile home for seasonal employees.

# FISH PRODUCTION

## Adult Collection

### Spring Chinook Salmon Returns to Rapid River

The RRFH fish trap operated from March 16 through September 13, 1999. Water conditions were benign for Rapid River during the steelhead and salmon runs, and did not inhibit fish migration. The trapping operation was interrupted for sand removal on May 21, June 2, and June 8. It was turned off for high water at night on May 24 and May 26. These closures were due to runoff from a higher than normal snowpack, however the associated cleanup required closing the trap less often than usual this year.

The first marked chinook was trapped on May 24 and the last on August 17, 1999. The last week of June marked the peak of the run. This year 863 marked chinook were trapped. They were collected for spawning and transported to holding ponds at the hatchery (Appendices 5 and 6).

Hatchery management and research staff met before the 1999 run to establish data collection standards that would meet agency needs. It was agreed that data collected for research and hatchery evaluation purposes should be collected at spawning and entered into a database.

Data collected on run timing and total numbers trapped are based on all 863 returns to Rapid River Trap (Appendices 5 and 6). Fin samples were randomly taken throughout the run from 19 marked and one unmarked chinook for genetic analysis. Trapping statistics, including fork lengths, injuries, marks, and tags were recorded for Rapid River returns at the trap. Fin clips recorded for this sample were all AD clips. Our CWT detector detected 196 CWT or 22.1% of the 885 fish placed in holding (863 trapped at RRFH and 22 received from OFH). The entire run was scanned for PIT-tags and scrutinized for jaw tags, visual identification (VI) tags or radio transmitters. These data were entered into the database.

There were 885 fish ponded, including 863 Rapid River returns and 22 received from OFH. As part of an agreement with the Nez Perce Tribe, most of the jacks removed from the trap were ponded in HP-2 for distribution to the tribe. All adults and the remaining jacks were held in HP-1. The adult sex ratio of the Rapid River run was 78 adult males, 146 adult females, and 639 jacks. This included 288 fish held for broodstock (ponded in HP-1) and 575 jacks (ponded in HP-2). Polymodal analysis of length frequencies and data from CWT returns were used to determine age-class criteria. Age-class composition was 639 (74.04%) three-year-olds (< 62 cm), 152 (17.62%) four-year-olds (62-83 cm), and 72 (8.34%) five-year-olds (> 83 cm) (Appendices 7 and 8).

Ancillary species were collected, recorded, and released. Unmarked chinook, unmarked steelhead, and bull trout were released into Rapid River above the trap, and marked steelhead were released into the Little Salmon River about one mile above its confluence with Rapid River. Scale samples were collected from wild steelhead.

Seventy PIT-tags were detected in marked Rapid River, marked Snake River, and unmarked Rapid River salmon (Appendix 9). Of the 70 PIT-tags read by the scanners, 37 were read at the trap, 13 were read at spawning and 20 were read both times. This indicates that although redundant scanning is a good practice, there may be a problem with the reliability of our equipment or methods. If we look at the ratio of percent PIT-tag returns and percent PIT-tag releases by age-class, the result is; 4%:5% for three-year-olds, 27%:47% for four-year-olds, and 7%:5% for five-year-olds. There may be some overlap of age-classes, but the data suggests a low detection rate for four-year-old adult salmon while three- and five-year-old age-classes contained the expected number of PIT-tagged fish. It is unclear if this is because of differential survivorship or a marking problem, or if the problem exists with subsequent detection. The latter can be addressed for next year's run. There were two fish with jaw tags trapped, but no radio or VI tags were observed this year.

Injuries were documented throughout the trapping season. When multiple injuries were present on the same fish, they were recorded separately. Injuries consisted of 27 nitrogen burns, one gill net scar, 39 other types of injuries (Appendix 10).

## Hells Canyon Spring Chinook Salmon Returns

Personnel from OFH and IPC transported 22 chinook from the OFH trap to RRFH. The age-class composition was three five-year-olds, and 19 jacks. The sex ratio was one adult female, two adult males and 19 jacks. Seventeen of the jacks were ponded in HP-2 and the remaining five fish were added to the broodstock in HP-1. For more information, see the *Oxbow Hatchery Spring Chinook Salmon Run Report for 1997*.

## Inventory of Miscellaneous Species

Unmarked chinook entered the trap from May 25 through August 3, 1999. The timing of this part of the run is shown in Appendices 6 and 11. This component of the Rapid River run included seven adults and one jack. The fish were measured to the nearest centimeter fork length (Appendices 8 and 12), injected with antibiotics, and then released above the trap into Rapid River. The released salmon received a caudal fin punch to identify recaptures. Age-class composition of this part of the salmon run was one three-year-old (12.5%), six four-year-olds (75.0%), and one five-year-old (12.5%). The sex ratio was six males (75.0%), one female (12.5%), and one jack (12.5%).

From March 23 through June 1, 1999, 39 adult steelhead were trapped (Appendices 13 and 14) and measured to the nearest centimeter fork length (Appendices 15 and 16). The steelhead run included 10 wild fish and 29 hatchery fish. The sex ratio was 4 wild males, 6 wild females, 15 hatchery males, and 14 hatchery females. Hatchery steelhead were transported back to the Little Salmon River and released approximately one mile upstream from its confluence with Rapid River. Wild steelhead were released into Rapid River upstream from the trap. The released steelhead received a caudal fin punch to identify recaptures.

A total of 163 bull trout were trapped from May 19 through August 4, 1999 (Appendices 17 and 18). These fish ranged in size from 33 cm to 63 cm total length (Appendices 19 and 20). Department researchers continued a study of bull trout movement this year. Hatchery personnel assisted them with implanting PIT-tags, marking, and various other aspects of their study. Further information regarding this study should be obtained from the Department Research Office. An inventory of all species trapped in 1997 is shown in Appendix 21.

### Sport and Tribal Fishery

In 1999, the Fish and Game Commission voted not to allow a salmon sport fishery due to the extremely low number of returning chinook. However, the Nez Perce Tribe harvested salmon in Rapid River. The number of fish harvested by the Tribe was not reported.

## Holding and Spawning

### Adult Treatments

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 placed in HP-1 or released above the weir were anesthetized with 40 ppm MS-222, measured to the nearest centimeter fork length, and given an intraperitoneal injection of Erythromycin-based injectable (Gallimycin-200) at 20 mg/kg body weight. The antibiotic was administered according to veterinary extra-label usage as prescribed by Dr. Dave Hunter at the Department Caldwell Wildlife Laboratory. Fish placed in HP-2 were not anesthetized or injected.

The holding period extended from May 24 to September 20, 1999. This year 863 marked Rapid River chinook were placed in holding ponds. An additional 22 chinook were received from OFH. This yielded 885 chinook held at RRFH. From this, 544 jacks were removed from HP-2 and given to the Nez Perce Tribe. The remaining jacks from HP-2 were not injected and therefore were not used for spawning. We combined holding of Rapid River returns with Snake River returns in HP-1. Our holding pond HP-1 is concrete and provides a better environment than HP-2 does for holding prior to spawning. It also allows less stressful handling during the sorting and spawning process (see the sections entitled Recommended Facility Improvements and Prespawning Mortality). The fish received from OFH were marked with two left-operculum punches to identify them for separate data gathering. These punches often healed over prior to spawning. Notations of these punches on spawning records and on mortality records were inconsistent. Therefore, the identification of Snake River fish is omitted from this report.

Formalin treatments were administered to HP-1 three times each week from June 21 through September 17. Treatments consisted of precharging 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 3.9°C to 13.9°F (Appendix 3). The Walco Company hauled carcasses from holding and spawning to a landfill in Montana each week.

### Prespawning Mortality

The combined prespawning mortality for Rapid River and Hells Canyon chinook was seven fish or 0.8% of the 885 fish placed in holding. After August 25, males were not considered in prespawning mortality. The sex ratio was two adult males (0.2%), three females (0.3%), and two jacks (0.2%). This mortality rate is the lowest recorded at RRFH. The improvement may be due to precharging the ponds with formalin before formalin-drip treatments, low holding temperatures, and low density. The fish were also in generally good condition upon arrival.

Hatchery personnel did routine necropsies of all prespawning mortalities. Causal factors for prespawning mortality are unknown and are not discussed in this report. Appendix 22, recording causal factors, was included to be consistent with previous reports and to show the lack of historical causes. Snouts were collected from fish in which a CWT was detected and sent to the Department Fish Marking Laboratory at Lewiston, Idaho.

### Salmon Spawning

In 1999, 144 female chinook were spawned from August 9 to September 15. The eggs from six females were culled as part of a disease management program. About 26,436 eggs (based on an average fecundity of 4,406 eggs/female) were culled. The remaining 138 females produced 608,084 green eggs (based on electronic counts). Complete egg enumeration and disposition data are compiled in Appendix 23. Each female was sampled during spawning for BKD analysis. The results of enzyme-linked immunosorbant assay (ELISA) tests are shown in Appendix 24.

Spawning followed standard procedure recommended by the Department for split-random cross of two males per female. Females were killed with a blow to the head. The eggs from each female were put in a colander to drain off the ovarian fluid. Then they were transferred to two buckets where they were fertilized with the milt from two males and mixed with approximately 150 ml of temperature-adjusted well water. Then the two buckets were combined to ensure that all females were fertilized with a fertile male. 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. All fertilized eggs were water hardened for 30 minutes in 100-ppm iodophore. After water-hardening, green eggs were placed in vertical stack incubators that were set to a flow rate of 6 gal/min.

## Incubation

The 1999 egg-take (after culling six females) was 608,084 green eggs from 138 females. The average fecundity was 4,406 eggs/female. After primary pick of 51,620 bad eggs, 556,464 eyed-eggs remained. Eye-up was 91.5%. Eggs were incubated at a rate of one female per tray to segregate individual fish pending results of ELISA studies. After the ELISA results were received, eggs from females with an optical density (o.d.) reading of 0.40 or greater were culled and discarded.

Two shipments of eyed eggs from 58 females were received from Lyon’s Ferry Hatchery. The eggs were not shocked or picked before they were transferred, but were shocked, picked, and counted when they arrived at RRFH. A total of 199,010 eyed eggs, yielded 193,085 after primary pick off of 5,925 bad eggs. The fecundity was 3,431 eggs per female, and eye-up was 97.0%. This eye-up percentage is probably not accurate and secondary pick off may be high because the eggs were not allowed to rest between shocking and primary pick.

The total number of eggs remaining for incubation at RRFH was 749,549. All eggs spawned and reared at RRFH were shocked at 500 daily temperature units (DTU) by pouring them from the trays into water. They were picked two days later using a salt bath or by hand. A Jensorter egg counter was used to inventory eggs. After counting, the eggs were returned to clean trays. At 1,000 DTUs trays were picked again, and a third pick was performed at 1,500 DTUs. All trays were rodded weekly after 300 DTUs. Formalin was administered to each incubator stack at a rate of 1,667 ppm (1:600) for 15 minutes to retard external mycosis. This procedure was discontinued after each lot accumulated 800 DTUs. Mycosis was controlled, and fry will be ponded at approximately 1750 DTUs.

## Early Rearing

Fry were ponded from December 6, 1999 through March 13, 2000. The first two lots were initially placed in four indoor vats and a feed study was performed to compare starter feeds. For more information regarding this study contact RRFH. The subsequent lots were transferred to five raceways when they reached 1750 DTUs. Initially, the raceways were densely loaded to facilitate feed training. After the fish were acclimated and were feeding well, we increased raceway volume to lower Density Indices (DI) (Piper et al. 1982) below 0.3. Initial water depth was 24 in, and flow was adjusted to 0.6 $ft^3/s$. As the fish grew, water depth and flows were increased to a maximum depth of 36 in and flow of two $ft^3/s$. The fingerlings remained in the raceways until marking when they were transferred to rearing ponds. The average weight at the start of marking on June 19, 2000, was 128 fpp and ranged from 110 fpp to 140 fish/pound (fpp). Average DI and Flow Index (FI) (Piper et al. 1982) were 0.27 and 0.78. Initial raceway density is shown in Appendix 25, and final raceway density is shown in Appendix 26. Mortality during early rearing was 4,750 fish or 0.64% of the total of inventory reported at marking and the mortality recorded prior to marking.

## Final Rearing

Rearing ponds were disinfected with a chlorine bath at 200 ppm before fish were ponded. The fingerlings were transferred from raceways to ponds through 4-inch irrigation pipe. The marking crew reported that 739,042 fingerlings were marked and moved from June 19 through June 28, 2000. This total was an increase of 3.4% from hatchery inventory for the raceways. As in the past, hatchery inventory numbers were adjusted to the number reported marked. Initial pond loading densities are reported in Appendix 27. Fingerlings were ponded at a mean length of 2.7 in and grew to 5.2 in by release. Average DI before volitional releases began on March 15, 2001, was 0.11, and the average FI was 1.13 (Appendix 28). The maximum DI recommended by the Department is 0.30. The maximum recommended FI for $O_2$-saturated water at 41°F and 2100 ft above sea level is 2.42. These parameters were within prescribed limits. Mortality during final rearing was 1,755 fish or 0.24% of the combined inventory of those reported at marking, those recorded as mortalities prior to marking. Total mortality from swim-up through release was 6,505 fish or 0.88%.

## Feed Use and Conversion

A total of 54,471 lbs of feed was used for Brood Year 1999 fish prior to release. The overall feed conversion was 1.30. Specific data on feed types and sizes are listed in Appendix 29.

Two medicated feed treatments were administered to Brood Year 1999 fingerlings. Starting May 8, 2000, and continuing for 28 days, they were fed 2.25% Aquamycin-100 at a rate of 2.2% body weight/day to yield a dose of 100 mg/Kg/day Erythromycin. Then starting September 18, 2000, and continuing for 28 days, they were fed 4.5% Aquamycin-100 at a rate of 1.1% body weight/day to yield a dose of 100mg/Kg/day Erythromycin. Treatments were performed according to guidelines set forth in Investigational New Animal Drug (INAD) number 6013/4333 and were followed by toxicity testing.

## Fish Health

Portions of this section of the *Rapid River Hatchery 1999 Brood Year Report* are reproduced with permission from Mr. Doug Munson of the Eagle Fish Health Laboratory. A summary of Eagle Health Laboratory results for individual inspections of Brood Year 1999 juveniles and broodstock is shown in Appendix 30.

### Diseases Encountered and Treatment

The RRFH did not experience losses due to an epizootic of infectious agents during the Brood Year 1999 year-class during 2000 and 2001. These fish were treated with prophylactic erythromycin medicated feed, under INAD 6013/4333, to reduce the chance of an epizootic of BKD. Losses to other bacterial, viral, and mycotic agents were minimal. Adult salmon returning to this facility were injected with 20mg/KG of erythromycin. These injections are targeted to reduce pre-spawning mortality from *Renibacterium salmoninarum.*

### 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 31.

### Acute Losses

Neither acute nor chronic losses occurred during the rearing of Brood Year 1999 chinook at RRFH.

### Other Assessments

The chinook produced at this facility during this brood year were in excellent condition and preliberation sampling demonstrated low amounts of *Renibacterium,* and did not detect viral replicating agents or *Myxobolus cerebralis*, the causative agent of whirling disease. A different myxosoporidan, other than the whirling disease agent, was detected during routine preliberation sampling. Once again, external mycosis was not a problem at this facility.

The RRFH needs a modern brood holding facility. This would certainly reduce stress on holding, handling, and spawning adult chinook. A modern holding facility would reduce pre-spawning mortalities and ELISA titers for *Renibacterium*.

## Fish Marking

Protocol requires the adipose fin to be removed from all hatchery-reared salmon. The marking crew reported 739,042 fish were AD-clipped and CWT were placed in 345,288. Marking occurred from June 19 to June 28, 2000. After marking, fish were sampled monthly for a quality check of AD clips. A total of 1,176 fish were sampled. The results showed 87.5% with full clips, 1.7% without clips, and 10.8% with marginal clips.

PIT-tags were placed in 55,092 fish from February 5 through February 8, 2001. As the fish were marked they were transferred from RP-2A to RP-2B. During the remainder of the final rearing period, all mortalities from RP-2B were collected and scanned for PIT-tags.

Specific release information about marked fish is presented in Appendix 32. For more information regarding marking consult the *Annual Release Summary of Marked Salmon and Steelhead* published by the Department.

## Fish Distribution

### Egg Transfers

After the 1999 spawning season 199,010 eyed-eggs were received from the Lyons Ferry Hatchery. No eggs were transferred from RRFH in 1999.

### Fingerling Transfers

No brood year 1999 fingerlings were transferred to or from RRFH.

## Smolt Releases

There were 736,601 smolts (39,090 lbs) released from RRFH in 2001. All of these were released into Rapid River at the hatchery. Releases took place from March 15 through April 25, 2001. Release data are reported in Appendix 33.

Final sample counts were taken at the start of volitional smolt releases on March 15, 2001. Smolts averaged 18.2 fpp and 5.2 in fork length. Rearing densities at the time of release are listed in Appendix 31. Based on visual observations, we estimated that about 99% of the smolts emigrated volitionally. The remaining fish were seined from the ponds. The last fish emigrated on April 25. Survival from marking to release was 99.8% (Appendix 34).

## Cost of Production

The total cost of production for any specific brood year is not a straightforward calculation. At RRFH, the rearing cycle is 19 months. For any brood year, the cycle extends from September when spawning starts, through March nineteen months later, when the smolts are released. Cost of production has been reported as the total cost incurred by IPC for the entire 19-month period. Overlap in brood year classes causes the expenditure for September through March of the first year and the expenditure for September through March of the second year to be reported twice. The result is inflated estimates of production cost. Our traditional method reports total cost for 14 of the 19-month rearing cycle in three successive brood year reports. Thus, we report inflated production cost figures because we report the total cost paid by IPC for the entire period rather than costs associated with production of a given brood year. To address this problem, IPC has supplied us with total cost broken down by month (letter dated June 8 2001, from Paul Abbott, IPC Hatchery Biologist, P.O. Box 70, Boise, Idaho). One approach would be to apportion each month's cost by the percentage that a given brood year's fish comprised of the total hatchery inventory. In our report for brood year 1995, we proposed this apportionment plan and compared total cost. The method would have resulted in reporting cost numbers only once. The resulting cost per pound that year was one third the cost calculated using the old method. At the IHOT evaluation meeting held March 8, 1996, we were directed to continue to use the old method to be consistent with data from previous years. We recommend a future meeting with further discussion on this concern. For now, we continue to report total cost paid by IPC for the entire period.

The total cost paid by IPC for September 1, 1999 through March 30, 2001, was $898,243.13 (letter dated June 8 2001, from Paul Abbott, IPC Hatchery Biologist, P.O. Box 70, Boise, Idaho). This was used to calculate the cost of production data listed in Appendix 35. For comparison, the total cost apportioned by percent of total monthly inventory for the same period was $367,210.20. This is 41% of the total cost for the same period, and addresses the problem of reporting the same dollars twice. It also has the effect of smoothing cost/pound or cost/1,000 over years with greater or smaller inventory. This may be important because fixed costs stay the same from year to year while variable costs, such as feed, change with inventory. Using this method cost/thousand fish went from $1219.44 to $498.85 and cost/pound went from $22.98 to $9.39.

## HISTORICAL INFORMATION

As always, we have included some archival information for context. Historic information about returns by return year is listed in Appendix 36 and by brood year in Appendix 37. Average feed and growth statistics are listed in Appendix 38. Release and transfer information is listed in Appendix 39.

## ACKNOWLEDGMENTS

The crew at RRFH would like to thank Mr. Paul Abbott and the fisheries staff at IPC for their support and assistance in helping us maintain and improve the hatchery facility. We would also like to thank Department personnel who helped us during the spawning season. Our gratitude goes to Officer Brian Holbrook and other conservation officers for security at the hatchery and trapping facility. In addition, we extend our appreciation to Doug Munson and the Eagle Fish Health Lab staff for diagnostic work at the hatchery and assistance in preparing this document. This team effort helps Rapid River continue to be a successful hatchery.

## LITERATURE CITED

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Piper, P. G., I. B. McElwain, L. E. Orme, J.P. McCraren, J.R. Leonard. 1982. Fish hatchery management. United States Department of the Interior Fish and Wildlife Service, Washington D.C.

# APPENDICES

Appendix 1. Rapid River Hatchery production capacity.

| Rearing unit | Volume | | Carrying capacity | |
|---|---|---|---|---|
| Incubators | 800 | Trays | 3,200,000 | 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 ($^oF$) for 1999.

| Month | Maximum | Minimum | Average | Ten-year average |
|---|---|---|---|---|
| April | 47.3 | 36.9 | 42.3 | 45.0 |
| May | 49.6 | 39.0 | 44.1 | 46.6 |
| June | 49.6 | 41.7 | 46.1 | 50.9 |
| July | 54.5 | 47.1 | 50.3 | 54.3 |
| August | 57.0 | 50.2 | 53.1 | 55.8 |
| September | 52.8 | 42.5 | 48.6 | 51.4 |

Appendix 4. Rapid River water quality analysis.

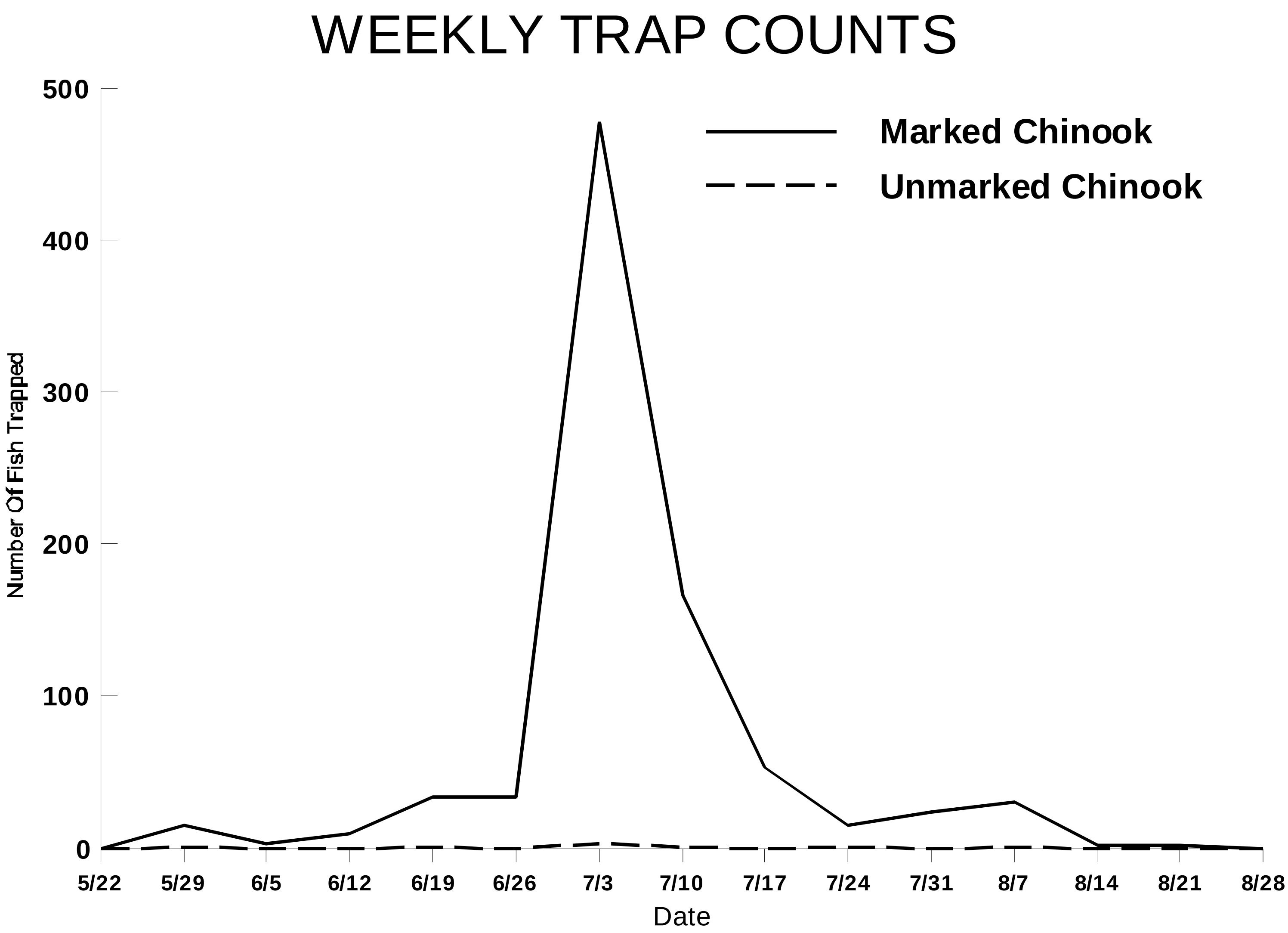
| Analyte | PQL | Result | Units |
|---|---|---|---|
| Nitrate/N | 0.05 | ND | m/L |
| Nitrite | 0.05 | ND | m/L |
| Sulfate | 1 | 14 | m/l |
| Orthophosphate | 0.05 | ND | m/L |
| Ammonia/N | 0.5 | ND | m/L |
| Alkalinity | 10 | 74 | mg/L as CaCO3 |
| Hardness | 10 | 80 | mg/L as CaCO4 |
| pH | | 7.63 | |
| Hydrogen Sulfide | 0.2 | ND | m/L |
| Chlorine | 0.1 | ND | m/L |
| Arsenic | 1 | ND | µg/L |
| Cadmium | 1 | ND | µg/L |
| Chromium | 1 | ND | µg/L |
| Mercury | 1 | ND | µg/L |
| Lead | 1 | ND | µg/L |
| Selenium | 1 | ND | µg/L |
| Silver | 1 | ND | µg/L |
| Iron | 30 | 120 | µg/L |
| Zinc | 1 | 51 | µg/L |
| Cooper | 1 | ND | µg/L |
| Aldrin | 0.1 | ND | µg/L |
| Endrin | 0.1 | ND | µg/L |
| Dieldrin | 0.1 | ND | µg/L |
| Heptachlor | 0.1 | ND | µg/L |
| Chlordane | 0.1 | ND | µg/L |
| Methoxychlor | 0.1 | ND | µg/L |
| Lindane | 0.1 | ND | µg/L |
| Guthion | 0.1 | ND | µg/L |
| Malathion | 0.1 | ND | µg/L |

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

Appendix 5. Rapid River marked chinook run timing for 1999.

| Week ending | Number of fish | Percentage of marked chinook |
|---|---|---|
| May 22 | 0 | 0.00 |
| May 29 | 15 | 1.73 |
| June 5 | 3 | 0.35 |
| June 12 | 9 | 1.04 |
| June 19 | 33 | 3.82 |
| June 26 | 33 | 3.82 |
| June 3 | 478 | 55.39 |
| July 10 | 166 | 19.24 |
| July 17 | 53 | 6.14 |
| July 24 | 15 | 1.74 |
| July 31 | 24 | 2.78 |
| August 7 | 30 | 3.48 |
| August 14 | 2 | 0.23 |
| August 21 | 2 | 0.23 |
| August 28 | 0 | 0.00 |
| Total | 863 | 100.00 |

Appendix 6. Adult salmon returns to Rapid River during 1999.



Appendix 7. Rapid River spring chinook lengths for 1999.

| Fork length (cm) | Number of fish | Fork length (cm) | Number of fish |
|---|---|---|---|
| <38 | 3 | 81 | 4 |
| 38 | 3 | 82 | 3 |
| 39 | 3 | 83 | 2 |
| 40 | 4 | 84 | 9 |
| 41 | 5 | 85 | 7 |
| 42 | 12 | 86 | 8 |
| 43 | 18 | 87 | 9 |
| 44 | 17 | 88 | 10 |
| 45 | 41 | 89 | 5 |
| 46 | 56 | 90 | 4 |
| 47 | 82 | 91 | 3 |
| 48 | 59 | 92 | 2 |
| 49 | 75 | 93 | 1 |
| 50 | 65 | 94 | 2 |
| 51 | 57 | 95 | 4 |
| 52 | 65 | 96 | 5 |
| 53 | 33 | 97 | 0 |
| 54 | 18 | 98 | 1 |
| 55 | 4 | 99 | 2 |
| 56 | 4 | 100 | 0 |
| 57 | 4 | >100 | 0 |
| 58 | 1 | Total | 863 |
| 59 | 1 | | |
| 60 | 0 | | |
| 61 | 1 | | |
| 62 | 2 | | |
| 63 | 0 | | |
| 64 | 0 | | |
| 65 | 0 | | |
| 66 | 0 | | |
| 67 | 1 | | |
| 68 | 3 | | |
| 69 | 6 | | |
| 70 | 4 | | |
| 71 | 10 | | |
| 72 | 16 | | |
| 73 | 18 | | |
| 74 | 11 | | |
| 75 | 18 | | |
| 76 | 14 | | |
| 77 | 16 | | |
| 78 | 21 | | |
| 79 | 6 | | |
| 80 | 8 | | |

Adult sex ratio

| | |
|---|---|
| 78 ( 34.82%) | Males |
| 146 ( 65.18%) | Females |
| 224 (100.00%) | *Total |

Age-class data

| | |
|---|---|
| 639 ( 74.04%) | Jacks |
| 152 ( 17.62%) | Four-year-olds |
| 72 ( 8.34%) | Five-year olds |
| 863 (100.00%) | Total |

Age-class criteria

| | |
|---|---|
| <62 cm = | Three-year old |
| 63 - 83 cm = | Four-year-old |
| > 83 cm = | Five-year-old |

* Total adult Rapid River returns

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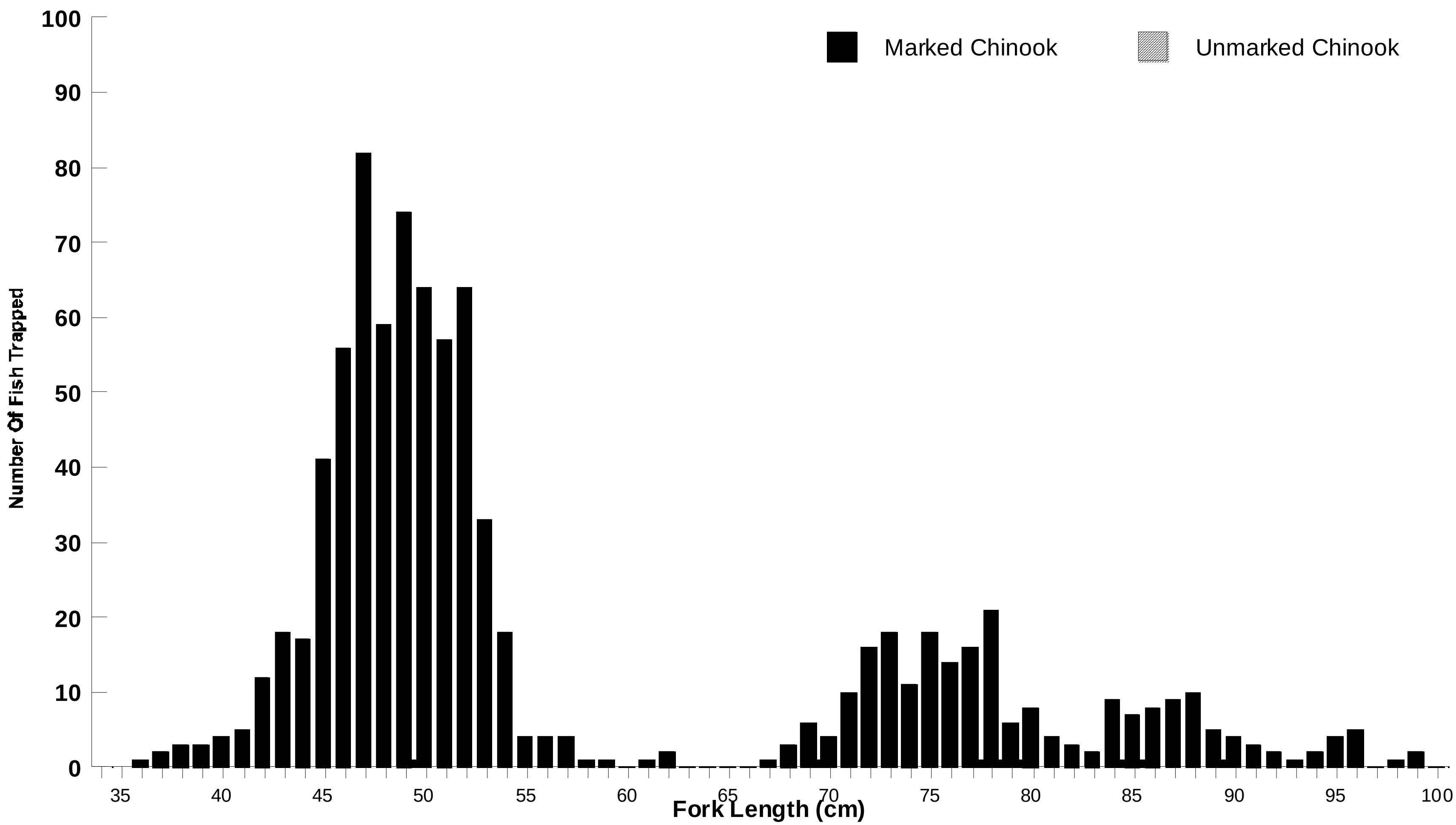
Appendix 8. Length-frequency of salmon returning to Rapid River for 1999.



Appendix 9. Rapid River chinook PIT-tag detection for 1999.

| Capture date | PIT-tag code | W/H | Fork length (cm) | Clips | Other tags | Sex M/F | Disposition | Scale bag # | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 5/24 | 222D1B445A | H | 73 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |
| 5/24 | 415614722C | H | 75 | AD | | U | Ponded, HP-1 | | |
| 5/25 | 222B361B65 | H | 74 | AD | | U | Ponded, HP-1 | | |
| 5/25 | 7F7A082350 | H | 71 | AD | | F | Ponded, HP-1 Spawned 8/26/99 | | Female # 3486 |
| 6/14 | 222C676145 | H | 73 | AD | JT# C4-172 | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3452 |
| 6/15 | 222B3B1A09 | H | 75 | AD | | U | Ponded, HP-1 | | |
| 6/21 | 222C5F0955 | H | 67 | AD | | M | Ponded, HP-1 | | |
| 6/24 | 51085D361E | H | 50 | AD | | M | Ponded, HP-1 | | |
| 6/28 | 510F3C5402 | H | 49 | AD | | M | Ponded, HP-1 | | |
| 6/28 | 5131691C23 | H | 46 | AD | CWT | M | Ponded, HP-1 | | |
| 6/28 | 41560A6F7D | H | 74 | AD | | U | Ponded, HP-1 | | |
| 6/28 | 510F13217F | H | 55 | AD | CWT | M | Ponded, HP-1 | | |
| 6/28 | 5119390075 | H | 51 | AD | | M | Ponded, HP-2 | | |
| 6/28 | 511B2A376D | H | 49 | AD | | M | Ponded, HP-2 | | |
| 6/29 | 2235234040 | H | 72 | AD | | F | Ponded, HP-1 Spawned 8/26/99 | | Female # 3481 |
| 6/29 | 22303E1939 | H | 74 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3444 |
| 6/29 | 41556E6566 | H | 83 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |
| 6/29 | 222D7E602D | H | 62 | AD | | M | Ponded, HP-1 Spawned 9/10/99 | | |
| 6/29 | 4154020E04 | H | 77 | AD | | U | Ponded, HP-1 | | |
| 6/30 | 222E59294A | H | 76 | AD | | U | Ponded, HP-1 | | |
| 6/30 | 5131622105 | H | 47 | AD | | M | Ponded, HP-2 | | |
| 6/30 | 2237593019 | H | 72 | AD | | M | Ponded, HP-1 Spawned 8/30 | | |
| 6/30 | 5139781F46 | H | 46 | AD | CWT | M | Ponded, HP-2 | | |
| 7/1 | 2230206626 | H | 72 | AD | | F | Ponded, HP-1 Spawned 8/26/99 | | Female # 3496 |
| 7/1 | 223640521C | H | 76 | AD | | U | Ponded, HP-1 | | |
| 7/2 | 5105710875 | H | 46 | AD | | M | Ponded, HP-2 | | |
| 7/2 | 5134380579 | H | 50 | AD | | M | Ponded, HP-2 | | |
| 7/2 | 5102706305 | H | 44 | AD | | M | Ponded, HP-2 | | |
| 7/2 | 204843597C | H | 72 | AD | | F | Ponded, HP-1 Spawned 9/2/99 | | Female # 35 |
| 7/2 | 4169506138 | H | 90 | AD | JT # C4-164 | F | Ponded, HP-1 Spawned 9/2/99 | | Female #36 |
| 7/2 | 222C653C5A | H | 81 | AD | | U | Ponded, HP-1 | | |
| 7/2 | 41560E7749 | H | 73 | AD | | U | Ponded, HP-1 | | |
| 7/2 | 51376D0608 | H | 53 | AD | CWT | M | Ponded, HP-2 | | |

Appendix 9. (Continued)

| Capture date | PIT-tag code | W/H | Fork length (cm) | Clips | Other tags | Sex M/F | Disposition | Scale bag # | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 7/3 | 51397A3647 | H | 50 | AD | CWT | M | Ponded, HP-2 | | |
| 7/3 | 511C60424E | H | 47 | AD | | M | Ponded, HP-2 | | |
| 7/3 | 51310C4222 | H | 43 | AD | CWT | M | Ponded, HP-2 | | |
| 7/3 | 415429472B | H | 76 | AD | | U | Ponded, HP-1 | | |
| 7/3 | 221C370A36 | H | 84 | AD | | F | Ponded, HP-1 Spawned 8/30/99 | | Female # 20 |
| 7/3 | 41534C783C | H | 76 | AD | | U | Ponded, HP-1 | | |
| 7/3 | 222C773968 | H | 76 | AD | | M | Ponded, HP-1 Spawned 8/30/99 | | |
| 7/4 | 5115622530 | H | 45 | AD | | M | Ponded, HP-2 | | |
| 7/4 | 222D402130 | H | 69 | AD | | U | | | |
| 7/6 | 5134F2346 | H | 52 | AD | | M | Ponded, HP-2 | | |
| 7/6 | 5138103451 | H | 42 | AD | | M | Ponded, HP-2 | | |
| 7/6 | 45163A616E | H | 73 | AD | | M | Ponded, HP-1 Spawned 8/30/99 | | |
| 7/6 | 22363D007A | H | 74 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3464 |
| 7/6 | 2237173921 | H | 77 | AD | | U | Ponded, HP-1 | | |
| 7/6 | 222B29796F | H | 75 | AD | | F | Ponded, HP-1 Spawned 8/19/99 | | Female # 3426 |
| 7/8 | 512F512E41 | H | 44 | AD | | M | Ponded, HP-2 | | |
| 7/8 | 5114763916 | H | 49 | AD | | M | Ponded, HP-2 | | |
| 7/8 | 5136167D07 | H | 49 | AD | CWT | M | Ponded, HP-2 | | |
| 7/8 | 4155334858 | H | 77 | AD | | U | Ponded, HP-1 | | |
| 7/22 | 222A531329 | H | 88 | AD | | F | Ponded, HP-1 Spawned 8/16/99 | | Female # 3422 |
| 7/26 | 510E307756 | H | 49 | AD | CWT | M | Ponded, HP-1 Spawned 8/25/99 | | Snout bag # 78 |
| 7/28 | 51240C2072 | H | 47 | AD | | M | Ponded, HP-2 | | |
| 8/2 | 4151106728 | H | 87 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3461 |
| 8/10 | 1F7E4F672D | H | 98 | AD | | M | Ponded, HP-1 Spawned 8/26/99 | | |
| * | 4152772E2E | H | 88 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3446 |
| * | 2043322F3C | H | 71 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3458 |
| * | 223214623C | H | 78 | AD | | F | Ponded, HP-1 Spawned 8/23/99 | | Female # 3497 |
| * | 222D727705 | H | 71 | AD | | F | Ponded, HP-1 Spawned 8/30/99 | | Female # 11 |
| * | 222B710343 | H | 77 | AD | | F | Ponded, HP-1 Spawned 8/30/99 | | Female # 12 |
| * | 20441F631A | H | 96 | AD | | M | Ponded, HP-1 Spawned 8/30/99 | | |
| * | 222D4D005F | H | 79 | AD | | M | Ponded, HP-1 Spawned 8/30/99 | | |
| * | 223546767D | H | 78 | AD | | M | Ponded, HP-1 Spawned 8/30/99 | | |
| * | 4153746028 | H | 78 | AD | | F | Ponded, HP-1 Spawned 8/30/99 | | Female # 18 |
| * | 2231455B2E | H | 80 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |

Appendix 9. (Continued)

| Capture date | PIT-tag code | W/H | Fork length (cm) | Clips | Other tags | Sex M/F | Disposition | Scale bag # | Comments |
|---|---|---|---|---|---|---|---|---|---|
| * | 222C242A7F | H | 69 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |
| * | 223511317B | H | 81 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |
| * | 2237424B04 | H | 78 | AD | | M | Ponded, HP-1 Spawned 9/7/99 | | |

* Data for capture date is not available the information shown was recorded at spawning.

Appendix 10. Injuries to chinook returning to Rapid River during 1999.

| Nitrogen blister | Body injury | Gill net scar | Gaff wound | Eye damage | Lamprey mark | Fin damage | Body scar | Bite wound |
|---|---|---|---|---|---|---|---|---|
| 27 | 31 | 1 | 0 | 1 | 0 | 5 | 0 | 2 |

Appendix 11. Rapid River unmarked chinook run timing for 1999

| Week ending | Number of fish | Percent of unmarked chinook |
|---|---|---|
| May 22 | 0 | 0.00 |
| May 29 | 1 | 12.50 |
| June 5 | 0 | 0.00 |
| June 12 | 0 | 0.00 |
| June 19 | 1 | 12.50 |
| June 26 | 0 | 0.00 |
| July 3 | 3 | 37.50 |
| July 10 | 1 | 12.50 |
| July 17 | 0 | 0.00 |
| July 24 | 1 | 12.50 |
| July 31 | 0 | 0.00 |
| August 7 | 1 | 12.50 |
| August 14 | 0 | 0.00 |
| August 21 | 0 | 0.00 |
| August 28 | 0 | 0.00 |
| Total | 8 | 100.00 |

Appendix 12.  Rapid River unmarked chinook lengths for 1999.

| Fork length (cm) | Number of fish | Fork length (cm) | Number of fish |
|---|---|---|---|
| 47 | | 88 | |
| 48 | 1 | 89 | 1 |
| 49 | | 90 | |
| 50 | | 91 | |
| 51 | | 92 | |
| 52 | | 93 | |
| 53 | | 94 | |
| 54 | | 95 | |
| 55 | | 96 | |
| 56 | | 97 | |
| 57 | | 98 | |
| 58 | | 99 | |
| 59 | | 100 | |
| 60 | | >100 | |
| 61 | | Total run | 8 |
| 62 | | | |
| 63 | | | |
| 64 | | | |
| 65 | | | |
| 66 | | | |
| 67 | | | |
| 68 | | | |
| 69 | 1 | | |
| 70 | | | |
| 71 | | | |
| 72 | | | |
| 73 | | | |
| 74 | | | |
| 75 | | | |
| 76 | | | |
| 77 | 1 | | |
| 78 | 1 | | |
| 79 | 1 | | |
| 80 | | | |
| 81 | | | |
| 82 | | | |
| 83 | | | |
| 84 | 1 | | |
| 85 | 1 | | |
| 86 | | | |

| Adult Sex ratio | |
|---|---|
| 6 (  85.7%) | Males |
| 1 (  14.3%) | Females |
| 7 (100.0%) | Total |

| Age-class data | |
|---|---|
| 1 (  12.5%) | Three-year-old |
| 6 (  75.0%) | Four-year-old |
| 1 (  12.5%) | Five-year old |
| 8 (100.0%) | Total |

| Age-class criteria | |
|---|---|
| < 59 cm = | Three-year old |
| 59 - 85 cm = | Four-year-old |
| > 85 cm = | Five-year-old |

Appendix 13. Rapid River steelhead run timing for 1999.

| Week ending | Number of hatchery fish | Percentage of steelhead run | Number of wild fish | Percentage of steelhead run |
|---|---|---|---|---|
| March 20 | 0 | 0.00 | 0 | 0.00 |
| March 27 | 8 | 20.51 | 0 | 0.00 |
| April 3 | 2 | 5.13 | 0 | 0.00 |
| April 17 | 3 | 7.69 | 0 | 0.00 |
| April 24 | 3 | 7.69 | 0 | 0.00 |
| May 1 | 8 | 20.51 | 1 | 2.56 |
| May 8 | 0 | 0.00 | 0 | 0.00 |
| May 15 | 4 | 10.26 | 2 | 5.13 |
| May 22 | 1 | 2.56 | 4 | 10.26 |
| May 29 | 0 | 0.00 | 2 | 5.13 |
| June 5 | 0 | 0.00 | 1 | 2.56 |
| June 12 | 0 | 0.00 | 0 | 0.00 |
| Total | 29 | 74.35 | 10 | 25.64 |

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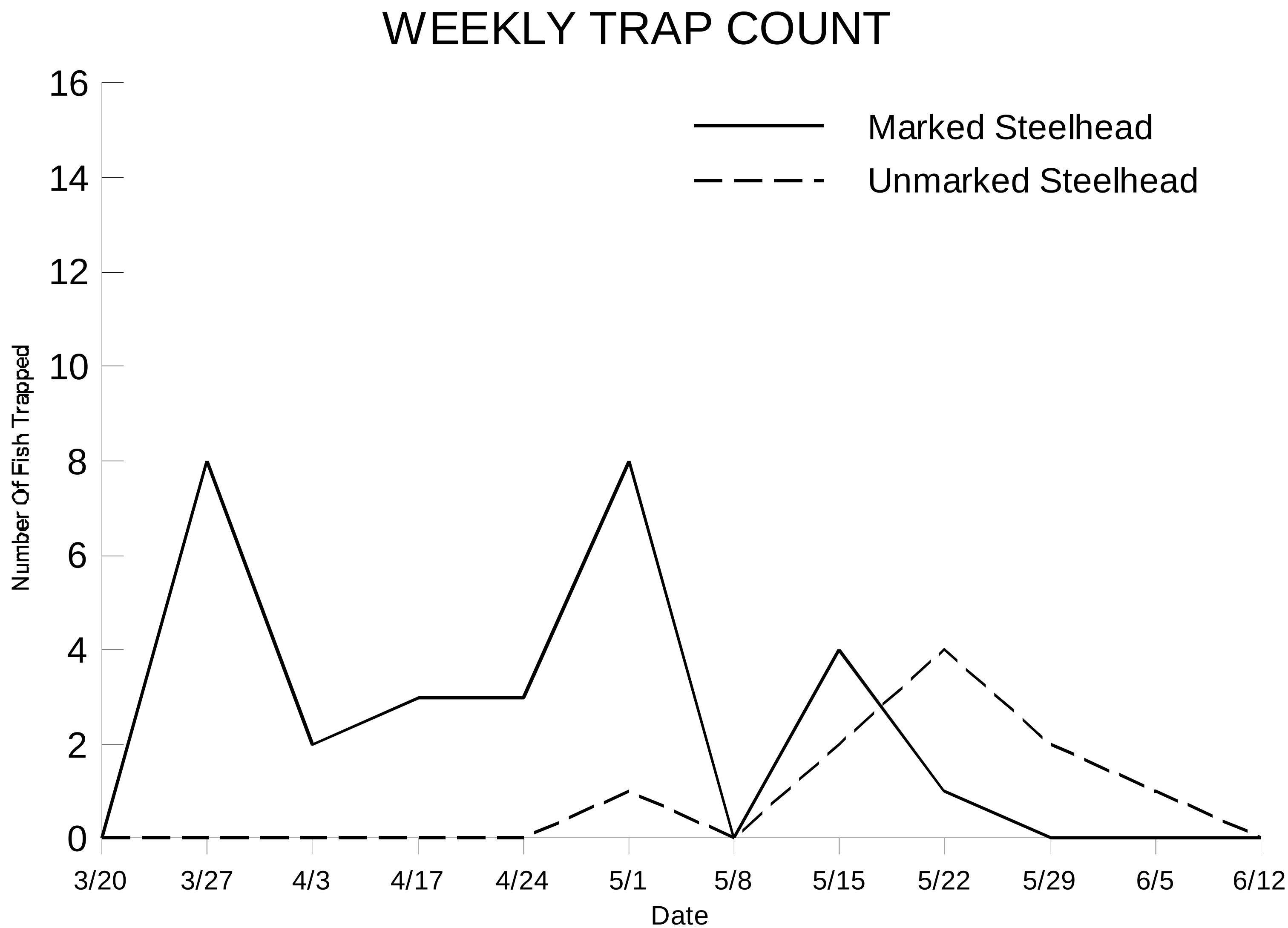
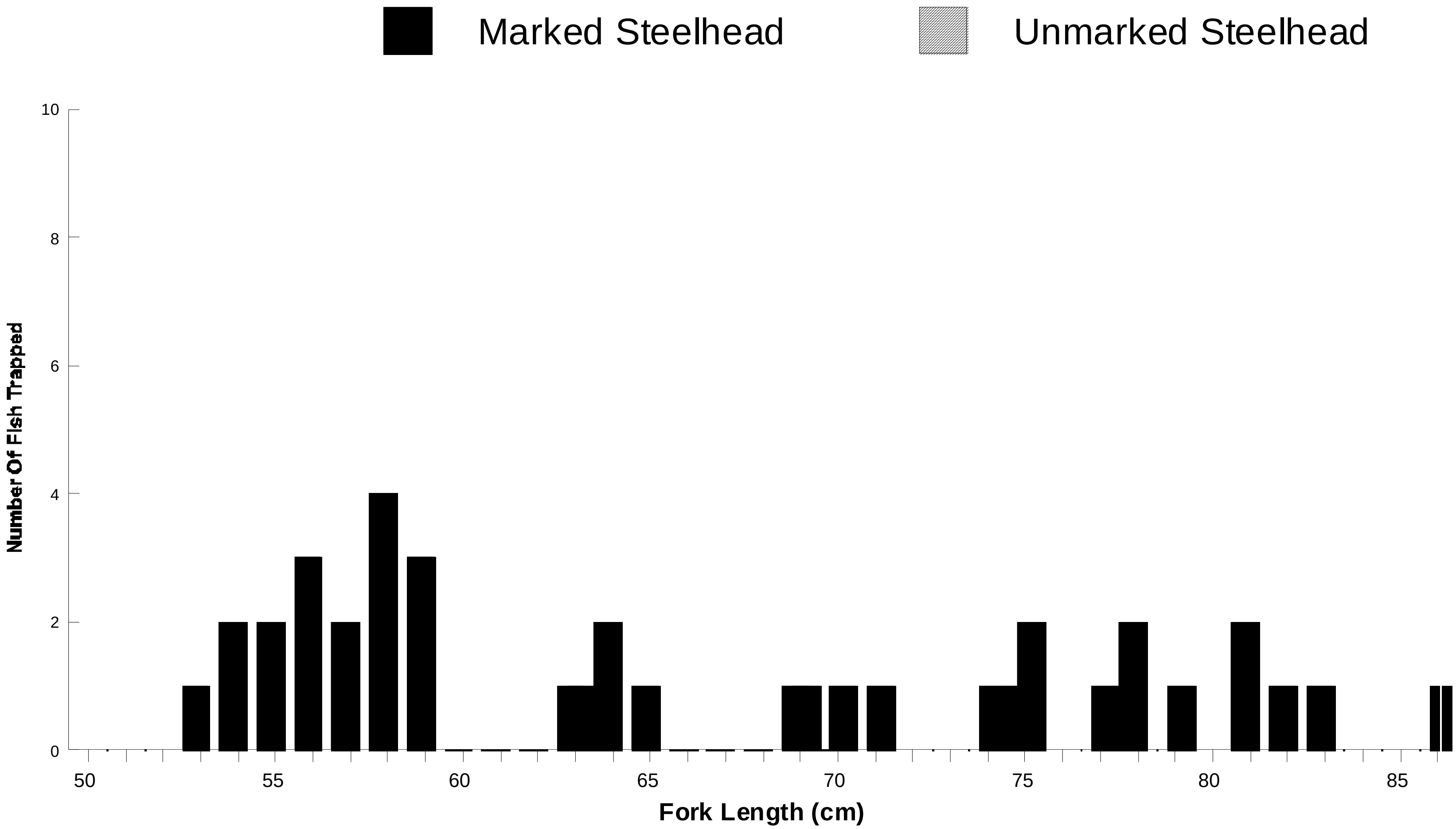
Appendix 14. Steelhead returns to Rapid River during 1999.



Appendix 15. Rapid River steelhead lengths for 1999.

| Fork length (cm) | Hatchery | | Wild | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| 51 | | | | |
| 52 | | | | |
| 53 | 1 | | | |
| 54 | 1 | 1 | | |
| 55 | 2 | | | |
| 56 | 3 | | | |
| 57 | 1 | 1 | | |
| 58 | 2 | 2 | | |
| 59 | 3 | | | |
| 60 | | | | |
| 61 | | | | |
| 62 | | | | |
| 63 | | 1 | | 1 |
| 64 | | 2 | | |
| 65 | | 1 | | |
| 66 | | | | |
| 67 | | | | |
| 68 | | | | |
| 69 | | 1 | 1 | |
| 70 | | | | 1 |
| 71 | | | 1 | |
| 72 | | | | |
| 73 | | | | |
| 74 | | | 1 | |
| 75 | 1 | | | 2 |
| 76 | | | | |
| 77 | | | | 1 |
| 78 | | 2 | | |
| 79 | | | | 1 |
| 80 | | | | |
| 81 | | 2 | | |
| 82 | | 1 | | |
| 83 | 1 | | | |
| 84 | | | | |
| 85 | | | | |
| 86 | | | 1 | |
| 87 | | | | |
| 88 | | | | |
| 89 | | | | |
| Column total | 15 | 14 | 4 | 6 |
| Origin total | 29 | | 10 | |
| Total run | 39 | | | |

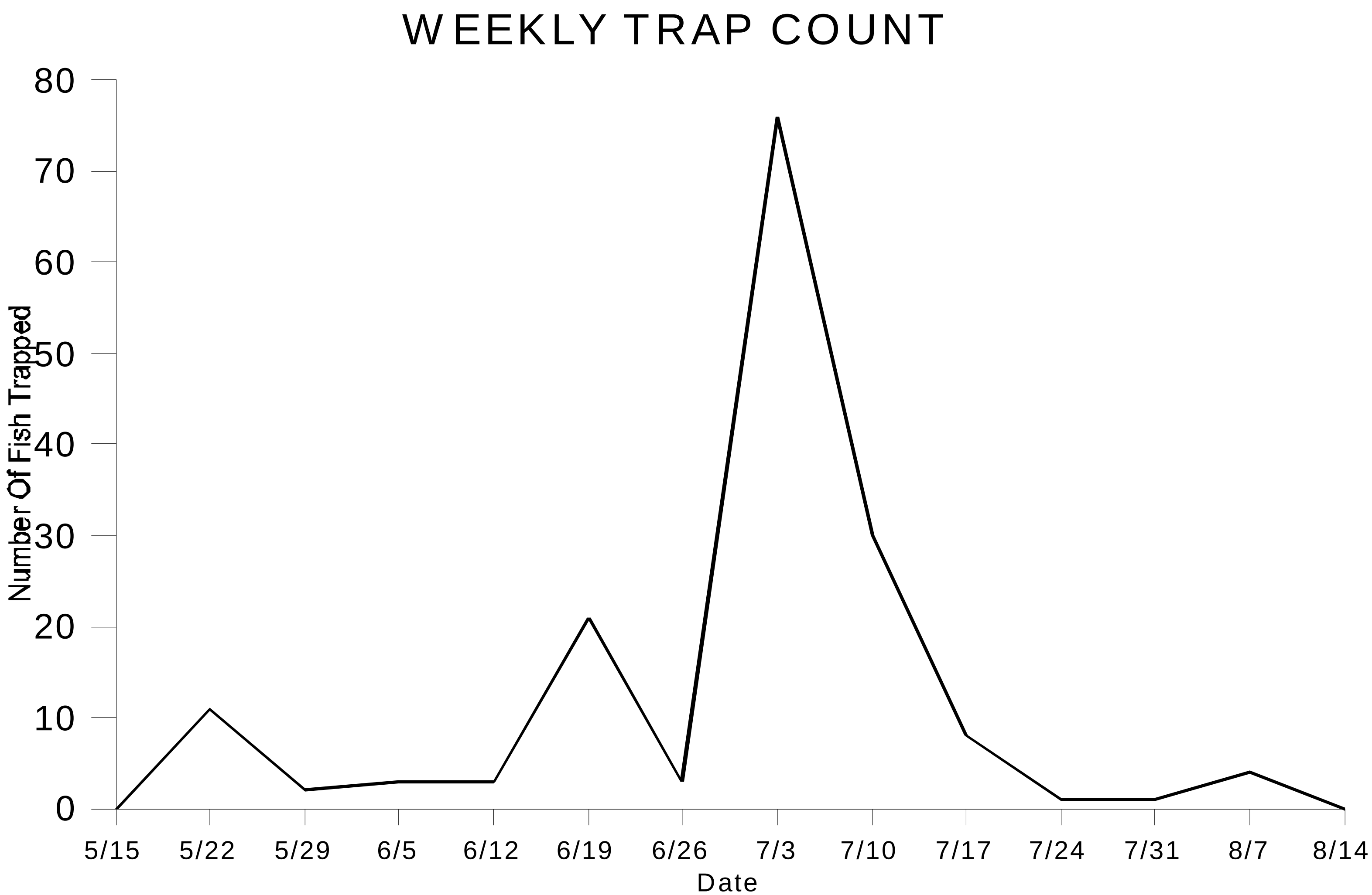
Appendix 16. Length-frequency of steelhead returning to Rapid River during 1999.



Appendix 17. Rapid River bull trout run timing+ for 1999.

| Week ending | Number of fish | Percent of bull trout run |
|---|---|---|
| May 15 | 0 | 0.00 |
| May 22 | 11 | 6.75 |
| May 29 | 2 | 1.24 |
| June 5 | 3 | 1.84 |
| June 12 | 3 | 1.84 |
| June 19 | 21 | 12.88 |
| June 26 | 3 | 1.84 |
| July 3 | 76 | 46.63 |
| July 10 | 30 | 18.40 |
| July 17 | 8 | 4.91 |
| July 24 | 1 | 0.61 |
| July 31 | 1 | 0.61 |
| August 7 | 4 | 2.45 |
| August 14 | 0 | 0.00 |
| Total | 163 | 100.00 |

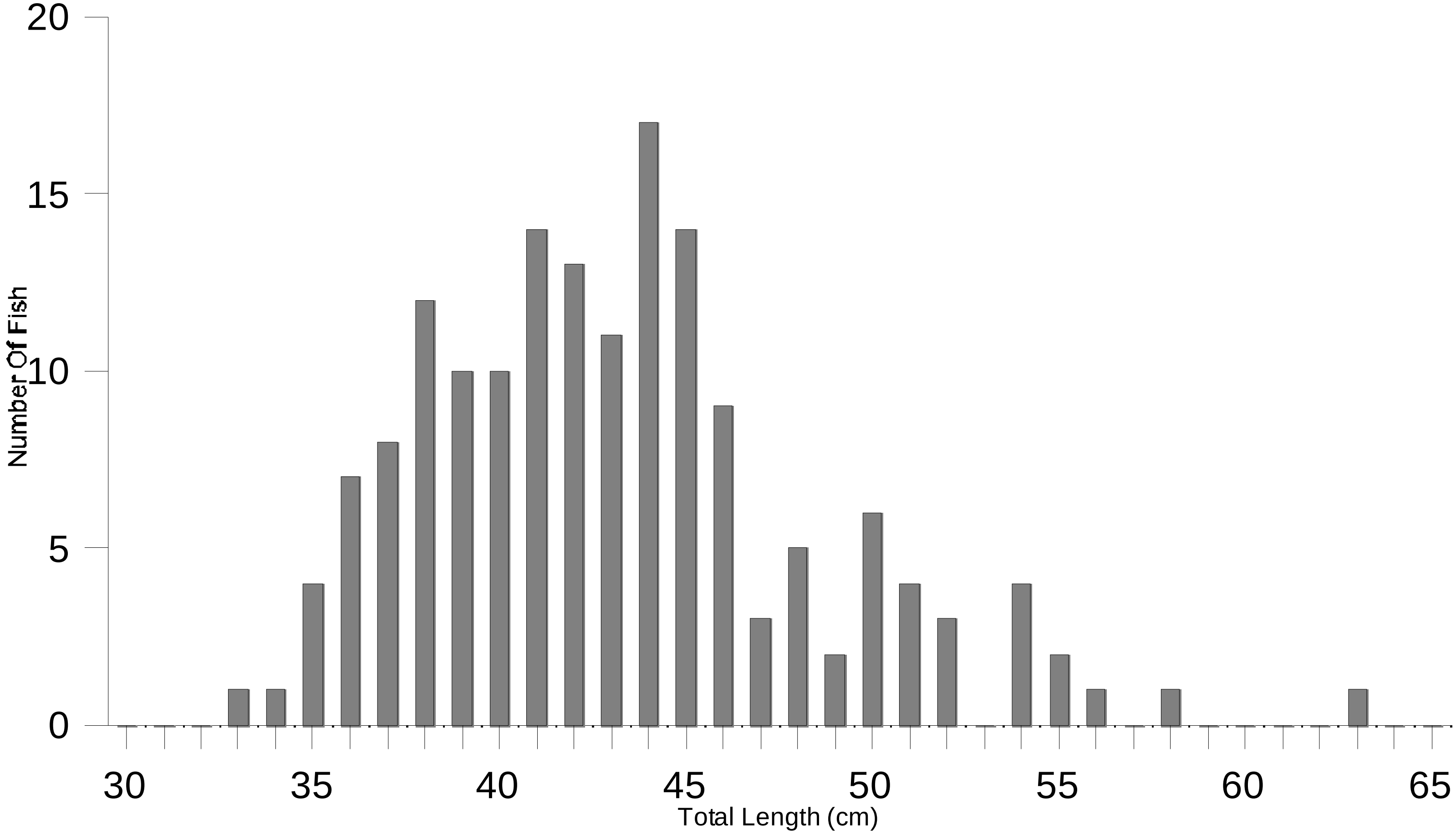
Appendix 18. Bull trout returns to Rapid River during 1999.



Appendix 19. Rapid River bull trout lengths for 1999.

| Total length (cm) | Number of fish | Total length (cm) | Number of fish |
|---|---|---|---|
| 30 | 0 | 50 | 6 |
| 31 | 0 | 51 | 4 |
| 32 | 0 | 52 | 3 |
| 33 | 1 | 53 | 0 |
| 34 | 1 | 54 | 4 |
| 35 | 4 | 55 | 2 |
| 36 | 7 | 56 | 1 |
| 37 | 8 | 57 | 0 |
| 38 | 12 | 58 | 1 |
| 39 | 10 | 59 | 0 |
| 40 | 10 | 60 | 0 |
| 41 | 14 | 61 | 0 |
| 42 | 13 | 62 | 0 |
| 43 | 11 | 63 | 1 |
| 44 | 17 | 64 | 0 |
| 45 | 14 | 65 | 0 |
| 46 | 9 | 66 | 0 |
| 47 | 3 | 67 | 0 |
| 48 | 5 | 68 | 0 |
| 49 | 2 | 69 | 0 |
| Total | | | 163 |

Appendix 20.  Length-frequency of Bull trout returning to Rapid River during 1999.

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Appendix 21. Species trapped in Rapid River during 1999.

| Species | Number trapped |
|---|---|
| Marked chinook | 863 |
| Unmarked chinook | 8 |
| Steelhead | 29 |
| Bull trout | 163 |

Appendix 22. Causes of prespawning mortality at Rapid River Hatchery during 1999.

| Cause | Number of fish | Percent of fish held |
|---|---|---|
| Unknown | 7 | 0.8 |
| Jaundice | 0 | 0.0 |
| Nitrogen burn | 0 | 0.0 |
| Wounds | 0 | 0.0 |
| Total | 7 | 0.8 |

Appendix 23. Rapid River Hatchery egg enumeration for 1999.

Total Eggs Taken at Rapid River Hatchery in 1999.

| Lot | Spawn date | Eyed | Primary pick | Green | Percent eyed | Average fecundity | Females |
|---|---|---|---|---|---|---|---|
| 1 | 8/9 | 9,806 | 382 | 10,188 | 96.3 | 5,094 | 2 |
| 2 | 8/16 | 28,767 | 7,660 | 36,427 | 79.0 | 4,553 | 8 |
| 3 | 8/19 | 66,347 | 6,974 | 73,321 | 90.5 | 4,583 | 16 |
| 4 | 8/23 | 149,509 | 8,317 | 157,826 | 94.7 | 4,509 | 35 |
| 5 | 8/26 | 122,977 | 7,674 | 130,651 | 94.1 | 4,215 | 31 |
| 6 | 8/30 | 83,807 | 11,579 | 95,386 | 87.9 | 4,336 | 22 |
| 7 | 9/2 | 57,982 | 5,548 | 63,530 | 91.3 | 4,235 | 15 |
| 8 | 9/7 | 33,512 | 2,373 | 35,885 | 93.4 | 5,126 | 7 |
| 9 | 9/13 | 1,014 | 653 | 1,667 | 60.8 | 1,667 | 1 |
| 10 | 9/15 | 2,743 | 460 | 3,203 | 85.6 | 3,203 | 1 |
| Total | | 556,464 | 51,620 | 608,084 | 91.5 | 4,406 | 138 |

This table does not include females or eggs that were culled.

Eggs Received from Lyon's Ferry Hatchery in 1999.

| Lot | Date | Eyed | Primary | Green | Percent | Average | Females |
|---|---|---|---|---|---|---|---|
| 1 | 9/29 | 64,885 | 3,520 | 68,405 | 94.9 | 3,420 | 20 |
| 2 | 10/6 | 128,200 | 2,405 | 130,605 | 98.2 | 3,437 | 38 |
| Total | | 193,085 | 5,925 | 199,010 | 97.0 | 3,431 | 58 |

Eggs transferred from Lyons Ferry Hatchery were not picked prior to shipment. The primary pick numbers here include pick off after arrival at RRFH. The second pick off is expected to be high because the eggs were picked immediately after shocking. Therefore, eye-up percentages are not reliable.

Appendix 24. Rapid River brood stock ELISA results for 1999.

| | | | Negative | Positive | | |
|---|---|---|---|---|---|---|
| Lot number | Date sampled | Number sampled | < 0.099 | Low .1-.249 | Moderate .250-.399 | High > .400 |
| 1 | 8/9/99 | 2 | 0 | 2 | 0 | 0 |
| 2 | 8/16/99 | 12 | 4 | 4 | 0 | 4 |
| 3 | 8/19/99 | 16 | 2 | 14 | 3 | 0 |
| 4 | 8/23/99 | 36 | 1 | 31 | 0 | 1 |
| 5 | 8/26/99 | 31 | 6 | 25 | 0 | 0 |
| 6 | 8/30/99 | 23 | 2 | 20 | 0 | 1 |
| 7 | 9/2/99 | 15 | 0 | 15 | 0 | 0 |
| 8 | 9/7/99 | 7 | 1 | 6 | 0 | 0 |
| 9 | 9/13/99 | 1 | 0 | 1 | 0 | 0 |
| 10 | 9/15/99 | 1 | 0 | 1 | 0 | 0 |
| Total | | 144 | 16 | 118 | 3 | 6 |

Appendix 25. Rapid River Hatchery initial raceway loading densities (1/19/00–3/13/00).

| Raceway | Inflow ($ft^3$/sec) | Number of fish | Weight (lb) | Density Index | Flow Index |
|---|---|---|---|---|---|
| 2 | 0.45 | 103,225 | 74.2 | 0.13 | 0.50 |
| 3 | | | | | |
| 4 | 0.45 | 126,729 | 91.5 | 0.21 | 0.81 |
| 5 | | | | | |
| 6 | 0.45 | 121,681 | 87.8 | 0.16 | 0.58 |
| 7 | | | | | |
| 8 | 0.45 | 176,769 | 127.6 | 0.23 | 0.85 |
| 9 | | | | | |
| 10 | 0.45 | 189.297 | 136.6 | 0.24 | 0.91 |
| 11 | | | | | |

Inventory data are based on egg enumeration values when final fish were added to each raceway.

Appendix 26. Rapid River Hatchery final raceway loading densities (6/19/00).

| Raceway | Inflow ($ft^3$/sec) | Number of fish | Weight (lb) | Density Index | Flow Index |
|---|---|---|---|---|---|
| 2 | 1.11 | 102,578 | 932.5 | 0.22 | 0.64 |
| 3 | | | | | |
| 4 | 1.11 | 126,075 | 1115.7 | 0.28 | 0.79 |
| 5 | | | | | |
| 6 | 1.11 | 120,752 | 928.9 | 0.22 | 0.63 |
| 7 | | | | | |
| 8 | 1.11 | 175,966 | 1248.0 | 0.31 | 0.87 |
| 9 | | | | | |
| 10 | 1.11 | 188,477 | 1346.3 | 0.34 | 0.97 |
| 11 | | | | | |

Inventory data are based on egg enumeration values minus documented mortality; they differ slightly from the number reported marked.

Appendix 27. Rapid River Hatchery initial pond loading densities (6/30/00).

| Pond | Inflow ($ft^3$/sec) | Number of fish | Weight (lb) | Density Index | Flow Index |
|---|---|---|---|---|---|
| RP-1A | | | | | |
| RP-1B | | | | | |
| RP-2A | 5.10 | 393,314 | 2,815.4 | 0.05 | 0.48 |
| RP-2B | | | | | |
| RP-2C | 5.40 | 344,928 | 2,986.4 | 0.04 | 0.44 |
| RP-2D | | | | | |

Inventory data are based on reported number marked, which shows an increase of 3.4% from hatchery inventory based on egg enumeration.

Appendix 28. Rapid River Hatchery pond loading densities at release (3/15/01).

| Pond | Inflow ($ft^3$/sec) | Number of fish | Weight (lb) | Density Index | Flow Index |
|---|---|---|---|---|---|
| RP-1A | | | | | |
| RP-1B | | | | | |
| RP-2A | 7.42 | 337,410 | 17,040.9 | 0.13 | 0.97 |
| RP-2B | 7.42 | 54,986 | 2,777.1 | 0.02 | 0.16 |
| RP-2C | | | | | |
| RP-2D | 7.42 | 344,205 | 19,272.4 | 0.16 | 1.13 |

Appendix 29. Feed for brood year 1999 at Rapid River Hatchery.

| Product | | [a]Amount | Unit | Total |
|---|---|---|---|---|
| Type/size | Additives | used | price | cost |
| BioDiet: | | | | |
| No. 2 Starter | | 186.3kg | 2.2300 | $ 415.45 |
| No. 3 Starter | | 219.5kg | 2.2300 | $ 489.49 |
| No. 2 & No. 3 | Bio Flake MC | 2.7kg | 0.0000 | $ 0.00 |
| 1.0 mm Grower | | 439.1kg | 1.7500 | $ 768.43 |
| 1.3 mm Grower | | 119.7kg | 1.7100 | $ 204.69 |
| 1.3 mm Grower | Aquamycin-100 | 798.3kg | 3.4440 | $2,749.35 |
| 1.5 mm Grower | | 1676.5kg | 1.5900 | $2,665.64 |
| 2.0 mm Grower | | 2794.1kg | 1.4900 | $4,163.21 |
| BioMoist: | | | | |
| 1.5 mm Grower | [b]EIBS PAC | 0.0lb | 0.6600 | $ 0.00 |
| 2.0 mm Grower | EIBS PAC | 4500.0lb | 0.7352 | $3,308.40 |
| 2.5 mm Grower | EIBS PAC | 7250.0lb | 0.6452 | $4,677.70 |
| 3.0 mm Grower | | 7000.0lb | 0.5450 | $3,815.00 |
| 3.0 mm Grower | Aquamycin-100 EIBS PAC | 9975.0lb | 1.8730 | $18,683.18 |
| 3.0 mm Feed | EIBS PAC | 12000.0lb | 0.4950 | $5,940.00 |
| [c]Total | | 54,471.0lb | | $36,424.28 |

[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.

[c]Total includes 51,350 lb fed prior to the start of release and 3,121 fed after the start of release.
The size of fish at release and overall feed conversion are based on 51,350 lb of feed.

Appendix 30: Eagle Fish Health Laboratory inspection results for brood year 1999

| rood ear ock | Log number | IHN | IPN | EIBS | BKD | FUR | ERM | CWD | WHD | CSH | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| enile samples | | | | | | | | | | | |
| RSC | 00-144 | - | - | | - | - | - | - | | | NO PATHOGENS DETECTED; VIRO 0/5, FAT 0/5, BACTE 0/4 |
| RSC | 00-177 | - | - | | - | - | - | - | | | NO PATHOGENS DETECTED; VIRO 0/10, FAT 0/10 , BACTE 0/8 |
| RSC | 00-315 | - | - | | - | | | | | | NO PATHOGENS DETECTED, VIRO 0/5 FAT 0/5 |
| RSC | 00-369 | | | | - | - | - | - | | | NO PATHOGENS DETECTED; FAT 0/10, BACTE 0/8 |
| RSC | 00-400 | - | - | | - | - | - | - | | | NO PATHOGENS DETECTED, VIRO 0/10, FAT 0/10, BACTE 0/8 |
| RSC | 01-037 | - | - | | - | - | - | - | | | NO PATHOGENS DETECTED, VIRO 0/10, FAT 0/10, BACTE 0/8 |
| RSC | 01-052 | - | - | | - | | | | - | | OPEN CASE; VIRO 0/20, ELISA, Myxobolus spp?? 2/4(x5) |
| od samples | | | | | | | | | | | |
| RSC | 99-262 | | | | + | | | | | | RS; ELISA 2/2(LOW) |
| RSC | 99-263 | - | - | | + | | | | | | BKD, VIRO 0/20, ELISA 8/12 |
| RSC | 99-266 | - | - | | + | | | | | | RS; VIRO 0/16, ELISA 14/16, WHD 0/20 |
| RSC | 99-272 | - | - | | + | | | | | | BKD; VIRO 0/32, ELISA 35/36 |
| RSC | 99-281 | | | | + | | | | | | RS; ELISA 25/31 |
| RSC | 99-289 | | | | + | | | | | | RS; ELISA 21/23 |
| RSC | 99-305 | | | | + | | | | | | RS; ELISA 15/15 |
| RSC | 99-306 | | | | | | | | | | RS; ELISA 6/7 |
| RSC | 99-345 | | | | + | | | | | | RS; ELISA 2/2 |


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Appendix 31. Preliberation organosomatic index for brood year 1999.

| Hematology | | | | | | |
|---|---|---|---|---|---|---|
| | Hematocrit | | | Serum protein | | |
| Date | [a]Mean | [a]SD | [b]CF | [a]Mean | [b]SD | [c]CF |
| 03/14/01 | 42.53 | 5.05 | 0.1187 | 7.84 | 1.099 | 1.402 |

[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 | 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 | 14 | 1 | 0 |
| B2 | 0 | C | 0 | L | 0 | 2 | 0 | 2 | 1 | G | 0 | 2 | 0 | M | 0 | C | 6 | 2 | 0 |
| E1 | 0 | M | 0 | S&L | 0 | | | 3 | 9 | ON | 0 | | | G | 0 | D | 0 | 3 | 0 |
| E2 | 0 | P | 0 | I | 0 | | | 4 | 10 | E | 0 | | | U | 0 | E | 0 | | |
| H1 | 0 | OT | 0 | OT | 0 | | | | | OT | 0 | | | T | 0 | F | 0 | | |
| H2 | 0 | | | O | 0 | | | | | | | | | | | OT | 0 | | |
| M1 | 0 | | | | | | | | | | | | | | | | | | |
| OT | 0 | | | | | | | | | | | | | | | | | | |
| Summary of normals | | | | | | | | | | | | | | | | | | | |
| | 20 | | 20 | | 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 32.  Rapid River Hatchery marking summary for brood year 1999

Coded wire tag releases

| Release site | Date released | Number of fish marked | Release group mark code | Clip | Purpose | Pond |
|---|---|---|---|---|---|---|
| Rapid River | 3/15/-4/25/01 | 69,603 | 10-36-10 | AD | US-Canada | 2D |
| Rapid River | 3/15/-4/25/01 | 69,100 | 10-36-11 | AD | US-Canada | 2D |
| Rapid River | 3/15/-4/25/01 | 67,030 | 10-36-12 | AD | US-Canada | 2D |
| Rapid River | 3/15/-4/25/01 | 70,454 | 10-36-13 | AD | US-Canada | 2D |
| Rapid River | 3/15/-4/25/01 | 69,101 | 10-36-14 | AD | US-Canada | 2D |
| **Total** | | **345,288** | | | | |

PIT tag releases

| Release site | Date released | [b] Number of PIT-tagged fish | Release group mark code | Clip | Purpose | Pond |
|---|---|---|---|---|---|---|
| Rapid River | 3/15-4/25/01 | 55,092 | AD only | AD | Hatchery PIT tag study and FPC | 2B |

[b] See the *Annual Release Summary of Marked Salmon and Steelhead* (unpublished Department document) for estimated numbers of marked fish released.

Appendix 33. Smolts released from Rapid River Hatchery in 2001 (brood year 1999).

| Release site date | Release method | | Number Released | Weight (lb) |
|---|---|---|---|---|
| Rapid River | | | | |
| 3/15-4/17/00 | Volitional release by pond: | 1A | 0 | 0 |
| | | 1B | 0 | 0 |
| | | 2A | 334,036 | 16,871 |
| | | 2B | 54,436 | 2,749 |
| | | 2C | 0 | 0 |
| | | 2D | 340,763 | 19,079 |
| | Volitional release Subtotal | | 729,235 | 38,699 lb |
| 4/03-4/25/00 | Smolts flushed by pond: | 1A | 0 | 0 |
| | | 1B | 0 | 0 |
| | | 2A | 3,374 | 170 |
| | | 2B | 550 | 28 |
| | | 2C | 0 | 0 |
| | | 2D | 3,442 | 193 |
| | Pond flush subtotal | | 7,366 | 391 lb |
| Site total | Site total | | 736,601 | 39,090 lb |
| | Hatchery total | | 736,601 | 39,090 lb |

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Appendix 34.  Survival from eggs to smolts at Rapid River Hatchery for brood year 1999.

| [a]Green eggs | Eyed egg number | [b]Percent survival | Swimup | [c]Percent survival | [d]Marked number | Released smolts | [e]Percent survival |
|---|---|---|---|---|---|---|---|
| 807,094 | 749,549 | 92.9 | 717,176 | 88.9 | 739,042 | 736,601 | 99.7 |

[a]Green eggs retained by Rapid River Hatchery including eggs received from  Lyon's Ferry Hatchery.
[b]Percent eye-up of eggs retained at Rapid River Hatchery.
[c]Percentage of green eggs retained at Rapid River Hatchery that survived to swim-up.
[d]The reported number marked was 3.4% more than hatchery inventory at the time of marking.
[e]Percent survival from marking to release was 99.7%.  Percent survival from adjusted swim-up to release was 99.1%.

Appendix 35.  Cost of production at Rapid River Hatchery for brood year 1999.

| Number of fish | Weight of fish (lb) | Weight of feed (lb) | Cost of feed | Feed conversion | [a]Total cost | Cost/ thousand fish | Cost/ pound |
|---|---|---|---|---|---|---|---|
| 736,601 | 39,090 | 54,471 | $36,424.28 | 1.30 | $898,243.13 | $1219.44 | $22.98 |

[a]The total represents the total cost incurred by IPC from 9/1/99 through 3/30/01.  This amount may exceed cost associated with production of Brood Year 1998 due to overlap in the brood year rearing cycle (see discussion in the Cost of Production section).  These costs include funds provided to the Department by IPC, as well as internal costs incurred by IPC.  It does not include capital outlay expenditures.

Appendix 36. Returns to Rapid River Hatchery from 1964 to 2000.

| 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 |

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

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Appendix 37. 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 from release | % 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 | 1,224 | 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 |
| 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 |

Appendix 37. (Continued).

| | 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 from release | % Return from release |
|---|---|---|---|---|---|---|---|---|---|---|
| 1995 | 1997 | 85,840 | 7 | 1998 | 152 | 1999 | 12 | 2000 | 171 | 0.20 |
| 1996 | 1998 | 896,170 | 639 | 199 | 3,086 | 2000 | | 2001 | 3,725 | 0.42 |
| 1997 | 1999 | 2,847,283 | 1,701 | 2000 | | 2001 | | 2002 | 1,701 | 0.06 |
| 1998 | 2000 | 2,462,354 | | 2001 | | 2002 | | 2003 | 0 | 0.00 |
| 1999 | 2001 | 736,601 | | 2002 | | 2003 | | 2004 | 0 | 0.00 |

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



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Appendix 38. Average feed and growth data for Rapid River Hatchery.

| Month | Average Water Temperature ($^{o}$F) | Density Index | Flow Index | [a]Feed conv. | Hatchery constant | [b]Daily length increase (in) | [b]Monthly length increase (in) | Condition factor *C* (x$10^{4}$) | 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 actual feed weight over weight gain.
[b]Growth data may vary during periods of high water.


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Appendix 39. Release and transfer summary for Rapid River Hatchery for 1964 to 2000.

| Brood year | No. eggs taken | Egg or fry plants and site | | | Smolt plants and site | | Size (g/fish) |
|---|---|---|---|---|---|---|---|
| 1964 | 887,000 | None | | | 588,000 | Rapid River | 20.1 |
| 1995 | 60,400 | None | | | 479,267 | Rapid River | 19.6 |
| 1966 | 2,296,000 | None | | | 1,460,150 | Rapid River | 18.1 |
| 1967 | 2,055,000 | None | | | 900,192 | Rapid River | 18.9 |
| 1968 | 6,540,000 | 757,376 | eggs | Clearwater H Channel | 3,172,000 | Rapid River | 22.6 |
| 1969 | 5,171,697 | 497,000 | eggs | Dworshak NFH to start Kooskia NFH. | 2,718,720 | Rapid River | 21.6 |
| 1970 | 14,560,280 | 4,417,454 | eggs | Sweetwater Eye Stat. | 2,809,200 | Rapid River | 23.3 |
| | | 2,224 | eggs | Kooskia NFH. | 91,800 | Lochsa 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 | | | |
| | | 100,000 | fry | Sandpoint Hatchery | | | |
| 1971 | 6,038,785 | 600,000 | eggs | Hayden Cr. Hatchery | 2,908,425 | Rapid River | 26.7 |
| | | 53,562 | fry | Lemhi River | 197,303 | SF 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 | | | |
| | | 200,000 | fry | Sandpoint Hatchery | | | |
| | | 401,305 | fry | Decker Pond | | | |
| 1972 | 15,072,604 | 5,256,662 | eggs | Sweetwater Eye Stat. | 2,707,917 | Rapid 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. | 3,373,700 | Rapid River | 30.6 |
| | | 1,295,424 | eggs | Hayden Creek Hatchery | 117,000 | SF 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 | 3,358,940 | Rapid River | 24.7 |
| | | 407,012 | eggs | Indian Creek | 205,700 | SF 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 39. (Continued).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1975 | 8,503,606 | 2,363,200 | eggs | Sweetwater Eye Stat. | 2,921,172 | Rapid River | 28.5 |
| | | 252,200 | eggs | Mullan Hatchery | 249,750 | SF 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 | 1,161,608 | eggs | Mullan Hatchery | 2,413,678 | Rapid 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 | | | |
| | | 3,111,850 | 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. | 2,866,993 | Rapid River | 30.2 |
| | | 2,287,800 | eggs | Kooskia NFH | 156,362 | White Sand Cr. | |
| | | 2,689,000 | eggs | Mullan Hatchery | 44,373 | Newsome 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 | 767,322 | eggs | Hayden Creek Hatchery | 2,604,823 | Rapid River | 30.2 |
| | | 970,728 | eggs | Mackay Hatchery | 57,440 | White Sand Cr. | |
| | | 1,540,282 | eggs | Sweetwater Eye Stat. | | | |
| | | 706,936 | eggs | Dworshak NFH | | | |
| | | 38,160 | eggs | Univ. Of Idaho | | | |
| | | 10,864 | 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 | 2,372,607 | Rapid River | 25.3 |
| | | 330,880 | eggs | Dworshak NFH | 1,001,700 | Snake River | 21.6 |
| | | 293,249 | fry | Red River Pond | | | |
| 1980 | 1,756,827 | None | | | 1,473,733 | Rapid River | 16.2 |
| 1981 | 6,122,273 | 608,384 | eggs | Pahsimeroi Hatchery | 2,998,103 | Rapid River | 20.6 |
| | | 256,608 | eggs | Oxbow Hatchery | 250,020 | Snake River | 16.8 |
| | | 449,280 | eggs | Dworshak NFH | | | |
| 1982 | 7,420,450 | 493,346 | eggs | Looking Glass (Ore) | 3,246,197 | Rapid River | 22.7 |
| | | 1,332,200 | eggs | Pahsimeroi Hatchery | 500,850 | Snake River | 16.8 |
| | | 375,028 | eggs | Dworshak NFH | | | |
| | | 125,055 | eggs | Hagerman NFH | | | |
| | | 306,000 | fry | Red River Pond | | | |

Appendix 39. (Continued).

| Brood year | No. eggs taken | Egg or fry plants and site | | | Smolt plants and site | | Fish/ pound |
|---|---|---|---|---|---|---|---|
| 1983 | 3,449,471 | None | | | 2,491,238 | Rapid River | 19.7 |
| | | | | | 437,360 | Snake River | 16.8 |
| 1984 | 3,125,911 | 152,000 | fry | Red River | 159,688 | Rapid River | 20.6 |
| | | | | | 140,000 | Snake River | 22.7 |
| | | | | | 136,000 | Red River | 15.1 |
| 1985 | 11,535,461 | 497,520 | eggs | Oregon | 2,630,200 | Rapid River | 20.2 |
| | | 3,668,000 | eggs | Dworshak NFH | 103,000 | Snake 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 | 2,630,200 | Rapid River | 23.9 |
| | | 712,905 | eggs | Sawtooth Hatchery | 400,600 | Snake 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 | 2,319,500 | Rapid River | 20.6 |
| | | 103,800 | fry | Lolo Creek | 500,000 | Snake River | 22.7 |
| | | 137,800 | fry | Eldorado Creek | | | |
| | | 62,200 | fry | Crooked Fork Creek | | | |
| | | 108,300 | fry | Hopeful Creek | | | |
| | | 72,200 | fry | White Sand Creek | | | |
| | | 19,500 | 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 | 2,520,400 | Rapid River | 17.4 |
| | | 149,570 | fry | Little Salmon River | 250,000 | Little Salmon | 16.3 |
| | | 100,278 | fry | Ten Mile Creek | 551,200 | Snake 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 | | | |

Appendix 39. (Continued).

| Brood year | No. eggs taken | Egg or fry plants and site | | | Smolt plants and site | | Size (g/fish) |
|---|---|---|---|---|---|---|---|
| 1988 | | 100,148 | fry | White Sand Creek | | | |
| | | 99,401 | fry | American River | | | |
| | | 51,369 | fry | American River | | | |
| | | 39,163 | fry | Meadow Creek | | | |
| 1989 | 3,925,585 | 211,509 | fry | Crooked River | 2,564,900 | Rapid River | 18.7 |
| | | 548,876 | fry | Sawtooth Hatchery | 100,100 | Little Salmon | 20.2 |
| | | | | | 500,500 | Snake River | 20.2 |
| 1990 | 4,271,103 | 200,000 | eggs | Looking Glass Hatch. | 2,615,500 | Rapid River | 22.3 |
| | | 403,400 | fry | Sawtooth Hatchery | 500,500 | Snake River | 22.3 |
| 1991 | 2,553,218 | 3,050 | fry | Hayden Creek Hatchery | 2,060,300 | Rapid River | 18.4 |
| | | 10,126 | fry | Squaw Creek | 200,300 | Snake River | 16.9 |
| | | 90,125 | fry | White Sand Creek | | | |
| 1992 | 4,534,404 | 92,897 | eggs | Dworshak Hatchery | 2,547,624 | Rapid River | 22.2 |
| | | | | | 380,600 | Snake River | 22.1 |
| 1993 | 6,404,312 | 2,176,157 | eggs | Clearwater Hatchery | 2,786,919 | Rapid River | 24.5 |
| | | | | | 499,536 | Snake River | 23.7 |
| 1994 | 490,249 | 58,791 | eggs | Clearwater Hatchery | 379,167 | Rapid River | 27.0 |
| 1995 | 132,002 | 16,402 | eggs | Clearwater Hatchery | 85,840 | Rapid River | 22.1 |
| 1996 | 1,171,610 | 168,754 | eggs | Clearwater Hatchery | 896,170 | Rapid River | 22.3 |
| 1997 | 4,472,573 | 1,015,496 | eggs | Clearwater Hatchery | 2,847,283 | Rapid River | 25.3 |
| | | | | | 200,000 | Little Salmon | 20.8 |
| | | | | | 300,000 | Snake River | 20.8 |
| 1998 | 3,409,130 | 510,848 | eggs | Clearwater Hatchery | 2,462,354 | Rapid River | 19.2 |
| 1999 | 606,084 | | | | | | |
| | 199,010 | Eggs received form Lyon's Ferry Hatchery | | | 736,601 | Rapid River | 18.8 |
| 2000 | e,780,850 | 911,919 | eggs | Clearwater Hatchery | | | |

**Submitted by:**

Bradford W. Dredge
Fish Hatchery Manager II

Ralph Steiner
Assistant Fish Hatchery Manager

Nicola A. Johnson
Fish Culturist

**Approved by:**

__________________________________
Virgil K. Moore, Chief
Fisheries Bureau

__________________________________
Tom Rogers
Anadromous Fish Hatcheries Supervisor