

# **RAPID RIVER FISH HATCHERY**

## **2003 BROOD YEAR REPORT**



By

Ralph E. Steiner, Fish Hatchery Manager 2  
Nicola A. Johnson, Fish Hatchery Assistant Manager

IDFG  
09-132

## TABLE OF CONTENTS

ABSTRACT.....	1
INTRODUCTION .....	3
FUNDING SOURCE.....	3
LOCATION.....	3
OBJECTIVES .....	3
FACILITY DESCRIPTION.....	3
RECOMMENDED FACILITY IMPROVEMENTS .....	4
WATER SUPPLY .....	5
Water Source.....	5
Water Supply .....	5
STAFFING .....	6
FISH PRODUCTION.....	6
ADULT COLLECTION .....	6
Spring Chinook Salmon Returns to Rapid River.....	6
Spring Chinook Salmon Transferred from Hells Canyon .....	8
Inventory of Ancillary Species Trapped in Rapid River .....	8
Fisheries .....	9
ADULT HOLDING.....	9
Adult Treatments .....	9
Prespawning Mortality.....	9
SALMON SPAWNING .....	10
INCUBATION .....	10
EARLY REARING.....	11
FINAL REARING .....	11
FEED USE AND CONVERSION .....	12
FISH HEALTH .....	12
Diseases Encountered and Treatment.....	12
Organosomatic Index.....	13
Acute and Chronic Losses .....	13
Other Assessments.....	13
FISH MARKING .....	13
FISH DISTRIBUTION .....	14
Egg Transfers .....	14
Fingerling Transfers.....	14
Smolt Releases.....	14
COST OF PRODUCTION .....	15
HISTORICAL INFORMATION.....	15
ACKNOWLEDGMENTS.....	16
LITERATURE CITED .....	17
APPENDICES.....	18
Appendix 1. Rapid River Hatchery production capacity.....	19

## TABLE OF CONTENTS

Appendix 2. Rapid River Hatchery pond volume.....	19
Appendix 3. Rapid River Hatchery adult holding pond temperatures (°F) for 2003. ....	19
Appendix 4. Rapid River water quality analysis.....	20
Appendix 5. Rapid River Fish Hatchery releases outside Salmon River Basin in 2003. ....	22
Appendix 6. Rapid River marked spring Chinook salmon run timing for 2003. ....	23
Appendix 7. Chinook salmon returns to Rapid River trap during 2003.....	24
Appendix 8. Rapid River spring Chinook salmon broodstock lengths for 2003. ....	25
Appendix 9. Length-frequency of Rapid River Fish Hatchery broodstock for 2003. ....	26
Appendix 10. Rapid River Hatchery returns with jaw tags during 2003.....	27
Appendix 11. Rapid River Hatchery returns with VI, radio, or floy tags during 2003. ....	27
Appendix 12. Injuries to Chinook salmon returning to Rapid River Hatchery for 2003. ....	28
Appendix 13. Rapid River unmarked Chinook salmon run timing for 2003. ....	28
Appendix 14. Rapid River unmarked Chinook salmon lengths for 2003. ....	29
Appendix 15. Rapid River steelhead run timing for 2003.....	30
Appendix 16. Adult steelhead returns to Rapid River during 2003.....	31
Appendix 17. Rapid River steelhead fork lengths for 2003. ....	32
Appendix 18. Length-frequency of steelhead returning to Rapid River trap during 2003. ...	33
Appendix 19. Rapid River bull trout run timing for 2003. ....	34
Appendix 20. Adult bull trout returns to Rapid River trap during 2003. ....	35
Appendix 21. Rapid River bull trout lengths for 2003.....	36
Appendix 22. Length-frequency of adult bull trout returning to Rapid River during 2003. ...	37
Appendix 23. Species trapped in Rapid River during 2003.....	38
Appendix 24. Causes of prespawning mortality at Rapid River Hatchery for 2003. ....	38
Appendix 25. Cumulative prespawning mortality at Rapid River Fish Hatchery for 2003. ...	39
Appendix 26. Rapid River broodstock ELISA results for 2003.....	40
Appendix 27. Rapid River Hatchery egg enumeration for 2003. ....	41
Appendix 29. Rapid River Hatchery final raceway loading densities (6/15/04). ....	42
Appendix 30. Rapid River Hatchery initial pond loading densities (5/15/04 to 7/1/04). ....	43
Appendix 31. Rapid River Hatchery pond loading densities at release (3/15/05).....	43
Appendix 32. Feed for Brood Year 2003 at Rapid River Hatchery.....	44
Appendix 33. Eagle Fish Health Laboratory inspection results for Brood Year 2003. ....	45
Appendix 34. Preliberation organosomatic index for Brood Year 2003.....	46
Appendix 35. Rapid River Hatchery marking summary for Brood Year 2003.....	47
Appendix 36. Smolts released from Rapid River Hatchery in 2005 (Brood Year 2003). ....	48
Appendix 37. Egg to release survival at Rapid River Hatchery for Brood Year 2003.....	49
Appendix 38. Cost of production at Rapid River Hatchery for Brood Year 2003. ....	49
Appendix 39. Returns to Rapid River Hatchery from 1964 to 2003. ....	50
Appendix 40. Returns to Rapid River Hatchery by Brood Year. ....	51
Appendix 41. Ten year average feed and growth data for Rapid River Hatchery. ....	53
Appendix 42. Release and transfer summary for Rapid River Hatchery By Brood Year for 1964-2003.....	54

## 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 RRFH is owned and funded by IPC and operated by the Idaho Department of Fish and Game (Department).

The RRFH fish trap operated from March 24 to September 15, 2003 with a closure from May 29 to June 4 due to flooding. From May 13 to August 26, 3,409 (893 jacks (26%) and 2,516 adults (74%)) marked spring Chinook salmon were trapped. Of these, 750 jacks were given to tribal agencies for subsistence, 12 (9 adults and 3 jacks) were released at the Morrison Knudson Nature Center and 5 adults were sacrificed for a study of nitrogen embolisms conducted by the U.S. Department of Energy Pacific Northwest National Laboratory. The remaining fish and 5 additional adults received from Oxbow Fish Hatchery were held for broodstock. The broodstock and the 5 study fish yielded a subsample of 2,652 fish on which records were kept to generate length-frequency, age-class and sex ratio statistics for the 2003 run. For that subsample the adult sex ratio (excluding jacks) was 1,013 males (40.3%), and 1,499 females (59.7%). The age-class structure was 140 three-year-olds, 504 four-year-olds (20.1%), and 2,008 five-year-olds (79.9%). Here again, percentages exclude jacks to compare adult age-class ratios.

Ancillary species were trapped in 2003. From May 13 to August 26, 122 unmarked Chinook salmon were trapped and released into Rapid River above the weir. The age-class composition of the unmarked salmon was 31 three-year-olds, 14 four-year-olds, and 77 five-year-olds. The adult sex ratio was 49 males and 42 females. From March 28 to May 23, 141 steelhead (*Oncorhynchus mykiss*) were trapped. The sex ratio by origin of the returning steelhead was 28 wild males, 59 wild females, 36 hatchery males, and 18 hatchery females. Wild steelhead were released above the weir. Hatchery steelhead were released into the Little Salmon River. From May 13 to July 9, 139 bull trout (*Salvelinus confluentus*) were trapped and released above the weir.

Fisheries were open on the Salmon and Little Salmon rivers in 2003. The Department estimated harvest of 2,111 marked spring Chinook salmon in the Salmon River and, 3,215 in the Little Salmon River. Nez Perce Tribal officials reported subsistence and commercial harvest of 4,189 marked and 16 unmarked Chinook salmon.

Prespawning mortality of the 3,414 fish held was 1,087 fish or 31.8%. The sex ratio was 372 males (10.9%), 715 females (20.9%).

Spawning occurred from August 11 to September 15, 2003. A total of 767 females were spawned producing a total egg take of 3,530,501 green eggs. Eggs from 107 females were culled (492,534 eggs) leaving 3,037,967 green eggs from 660 females. Average fecundity was 4,603 eggs/female and eye-up was 2,812,795 or 92.6%. In addition, there were 370,000 eyed eggs from Clearwater Fish Hatchery and 112,790 eggs from Dworshak National Fish Hatchery received for Brood Year 2003.

Brood Year 2003 fingerlings were marked and moved from raceways to rearing ponds in

from June 15 to July 1 2004. Markers reported 3,468,082 were Adipose-clipped and 109,201 were also coded-wire-tagged. From February 7 through February 11, 2005, 51,926 received PIT tags for a comparative survival study.

From March 8 - April 22, 2005, 3,261,430 smolts were released including: 300,000 into the Snake River below Hells Canyon Dam, 200,000 into the Little Salmon River, and 2,761,430 into Rapid River. In addition to smolt releases, personnel from the Nez Perce Tribe's Department of Fisheries Resource Management picked up 183,923 adipose-clipped fingerlings in September of 2004 for release into the Selway River.

Authors:

Ralph E. Steiner  
Fish Hatchery Manager 2

Nicola A. Johnson  
Assistant Fish Hatchery Manager

## 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 approximately 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/ pound (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 vertical double-stack 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 two holding ponds (HP) including one concrete holding pond HP-1 (80 ft x 25 ft), and one earthen holding pond, HP-2 (40 ft x 150 ft). The holding ponds 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. This 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.

Additional improvements were needed as the result of flooding during 2003 that washed out part of the fish trap compound and damaged the velocity weir. During the winter of 2003 – 2004 repairs were made including other necessary improvements. The wooden velocity weir was replaced with a concrete structure that included larger side walls. Utility power supply was replaced with underground service including additional service panels. Replacement of yard lighting and the trap dormitory were included in the project.

## Water Supply

### **Water Source**

The head waters 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. During the spring of 2003 a significant flood event occurred at the end of May while Brood Year 2003 adults were in the holding ponds. Snowpack that year was at or near one hundred percent of normal and most of the snow persisted until late May due to a cool spring. At the end of May several days of record high temperatures over one hundred degrees were followed by severe thunderstorms. Rapid River, the Little Salmon River, and Salmon River all rose quickly to flood stage and were extremely turbid. May 29 and May 30 the flood in Rapid River crested and logs that accumulated in the drainage over many years passed through the hatchery head pond. The flooding and associated debris load was the worst in many years. Local residents compared the event to 1974 when flooding caused damage to parts of the hatchery. All boards and posts were removed from the dam at the hatchery head pond. The hatchery intake was manned around-the-clock for several days but plugged significantly for several hours. Damage occurred at the fish trap where parts of the side walls of the velocity weir were washed out. Large logs that remained in Rapid River near the intake for the gravity incubation line were removed with a crane on September 2. Rapid River flows are monitored by a gauging station upstream from the hatchery operated by the United States Forest Service (USFS) Nez Perce National Forest Office in Grangeville, Idaho. Hydrographic records for 2003 show that flow exceeded 1,000 ft<sup>3</sup>/s for five days and peaked at 1,346 ft<sup>3</sup>/s on May 29. The average for that date from 2000 through 2008 excluding 2003 is 475 ft<sup>3</sup>/s. Water temperature in Rapid River also varies considerably. The minimum in February 2003 was 33.6 °F and the maximum in August was 59.0 °F. Pond temperatures during adult holding are shown in Appendix 3.

### **Water Supply**

Both RRFH and the adult trap located downstream from RRFH are supplied with surface water diverted from Rapid River. Water for production at the hatchery is obtained through one 30-inch pipe and one 24-inch pipe. A 5-ft high wooden diversion dam upstream of the hatchery provides the necessary hydraulic head to supply the facility via gravity flow. The RRFH has specific water rights of 28 ft<sup>3</sup>/s of water under Idaho Department of Water Resources (IDWR) water right number A78-02074. Water diverts from the river through the 30-inch pipe into a collection box where it is distributed to the early rearing raceways, incubation building (via one of two electric pumps in the headrace of the raceways), the adult holding ponds and one of the final rearing ponds. The second final rearing pond receives water through the 24-inch pipe. The incubation building can also receive water through a gravitational flow filter bed that gravity feeds river water from further upstream of the diversion dam or from a gasoline-operated pump which takes water from the headrace of the raceways. The gravitational flow pipe and gasoline-

operated pump provide a redundant water supply to the incubation building during electrical failures. Water discharges from the facility either to Rapid River or to Shingle Creek, a tributary to Rapid River. Discharges are monitored under National Pollutant Discharge Elimination System permit. Water quality parameters are listed in Appendix 4. The adult trap has specific water rights of 18.6 ft<sup>3</sup>/s of water under IDWR water right number A78-07013. Water is diverted from Rapid River via gravity flow through a seven-step fish ladder and a two-stage trap and then discharges back into Rapid River.

### **Staffing**

Three classified employees, a Fish Hatchery Manager 2, an Assistant Fish Hatchery Manager, and a Fish Culturist staff RRFH. Approximately seven temporary employees are hired each year. Housing accommodations include three residences for the classified staff and a 75-ft x 16-ft manufactured home for temporary employees.

## **FISH PRODUCTION**

### **Adult Collection**

#### **Spring Chinook Salmon Returns to Rapid River**

The RRFH fish trap operated from March 24 through September 15, 2003. The trapping operation was terminated after removing fish on May 29 due to flooding and restarted June 4. The high silt load required removing silt from the trap several times and trap was closed overnight on one other occasion in June to remove silt.

In 2003, 3,409 (893 jacks and 2,516 adults) marked Chinook salmon were trapped between May 13 and August 26. The peak of the run was from June 15 to July 5. Marked spring Chinook salmon were transported to holding ponds at the hatchery. All hatchery fish were held for broodstock or redistribution. No hatchery fish were released to supplement fisheries or spawning in 2003. A total of 12 (9 adults and 3 jacks) were released at the Morrison Knudsen Nature Center (Appendix 5). The Nez Perce Tribe received 343 jacks and the Shoshone Bannock Tribe received 407 jacks for subsistence distribution. An additional 5 adults (4 females and 1 male) were sacrificed for a nitrogen burn study conducted by researchers from the United States Department of Energy Pacific Northwest National Laboratory (PNNL). Subsistence fish were killed and scanned for tags when they were picked up. Released fish, study fish, and subsistence fish were not anesthetized or injected.

Data collection must be compatible with the need to return fish to fisheries or distribute them for subsistence quickly and without treatment. Hatchery management and research staff

met before the 2002 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 purposes should be collected at spawning and entered into a database. This sub-sample was not formally randomized but was representative of the run so 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 3,409 returns to the RRFH (Appendices 6, and 7). Other trapping statistics including fork length, injuries, marks, and tags were also recorded at the trap. 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. Fin clips were all adipose fin (AD) clips. All RRFH fish placed in HP-1 and HP-2 were measured for fork length as they were removed from the ponds with the exception of the 12 transported to Boise or the 750 jacks distributed for subsistence.

In addition to the 3,409 marked Rapid River returns 5 adults were received from OFH yielding 3,414 fish held. Of these 750 jacks were given to tribal agencies, 5 adults (4 females and 1 male) were given to the PNNL, and 12 (3 jacks and 9 adults) were released at the Morrison Knudson Nature Center. The remaining 2,647 were held for broodstock. Records were kept as the fish were removed from the holding ponds during spawning or as prespawning mortalities and on the 5 fish sacrificed for the PNNL study making the sub-sample for sex ratio and age-classes 2,652 fish for which records were kept. Polymodal analysis of length-frequencies helped with age-class determination but was inconclusive due to the low number of five-year-old fish. Additional age-class criteria were based on coded-wire-tag (CWT) return data and historical records. The adult sex ratio (excluding jacks) was 1,013 males (40.3%), 1499 females (59.7%). The age-class composition was 140 three-year-olds (< 60 cm), 504 (20.1%) four-year-olds (60-78 cm), and 2,008 (79.9%) five-year-olds (> 78 cm) (Appendices 8 and 9). Here again, the percentages are given to compare adults only. Extending the adult age and sex ratios to the entire 2003 Rapid River Hatchery run (including the fish given away and transferred) and assuming jacks (enumerated by actual count) are all three-year-old males, yields age by sex breakdown of: 893 three-year-old males, 204 four-year-old males, 810 five-year-old males, 302 four-year-old females, and 1,200 five-year-old females.

Ancillary species were collected, recorded, measured, marked, and released. Unmarked Chinook salmon, wild steelhead (*Oncorhynchus mykiss*) and bull trout (*Salvelinus confluentus*) were released into Rapid River above the weir at the fish trap. Hatchery steelhead including unmarked hatchery fish (determined by morphology) were released into the Little Salmon River at least one mile above its confluence with Rapid River.

Tag information was recorded for all fish entering RRFH trap. PIT tags were detected in 95 fish (2.8%) and the data was submitted to the Department's Research Office at Nampa Idaho. Snouts with CWT were collected from 302 fish (11.4%) and placed in labeled plastic bags. The snout bags were cataloged and held until the end of the spawning season when they were taken to the fish marking lab in Lewiston. Nineteen fish with jaw tags were trapped this year (Appendix 10). Twelve arrived at Rapid River with radio transmitters and no floy tags were observed (Appendix 11).

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 48 nitrogen burns, 243 gaff wounds and various other types of injuries (Appendix 12).

### **Spring Chinook Salmon Transferred from Hells Canyon**

During 2003, 5 adult marked spring Chinook salmon were trapped below Hells Canyon Dam and transported to RRFH. They were added to the broodstock and not tracked separately. The release history for Hells Canyon indicated that the 2003 run should have been mostly jacks i.e., three-year-old or one-ocean fish from a release of 500,195 RRFH Brood Year 2000 smolts in 2002. The RRFH did not release smolts into the Snake River in 2000 or 2001. Trapping operations were started at Hells Canyon Dam in order to include the Snake River component of the run in the hatchery broodstock and for run analysis. The Hells Canyon trap operated for 10 days between June 10 and July 9, 2003 trapping 141(5 adults and 131 jacks) marked spring Chinook salmon.

### **Inventory of Ancillary Species Trapped in Rapid River**

From May 13 through August 26, 2003, 122 unmarked Chinook salmon entered the RRFH fish trap (Appendices 7 and 13). They were anesthetized, measured to the nearest centimeter fork length (Appendices 9 and 14), injected with antibiotic, and released above the weir into Rapid River. They received a right operculum punch to identify recaptures. Thirteen were recaptured and released. The age-class composition of the 122 unmarked Chinook salmon was 31 three-year-olds (25.4%), 14 four-year-olds (11.5%), and 77 five-year-olds (63.1%). The adult sex ratio was 49 males (53.8%), 42 females (46.2%).

From March 28 through May 23, 2003, 141 adult steelhead were trapped (Appendices 15 and 16) and measured to the nearest centimeter fork length (Appendices 17 and 18). The steelhead run included 87 wild fish and 54 hatchery fish. The sex ratio by origin was 28 wild males, 59 wild females, 36 hatchery males, and 18 hatchery females. Hatchery steelhead including unmarked hatchery steelhead (determined by morphology) were transported to the Little Salmon River and released at least one mile above the confluence of Rapid River. Wild steelhead were released into Rapid River upstream of the weir. All released steelhead received a right operculum punch to identify recaptures.

A total of 139 bull trout were trapped from May 13 through July 9, 2003 (Appendices 19, and 20). Of these, 11 were recaptured a second time. They ranged in size from 34 cm to 65 cm total length (Appendices 21 and 22). The USFS Rocky Mountain Research Station (RMRS) continued a study of bull trout movement this year. Personnel from RRFH supported their project by trapping adults, scanning for PIT tags, record keeping, and by assisting 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 2003 is shown in Appendix 23.

## **Fisheries**

Fisheries on the Salmon and Little Salmon Rivers were productive in 2003. The Little Salmon season extended from April 26 through August 3. Total catch was estimated at 4,798 with 3,215 harvested. The Salmon River season extended from April 26 through June 15. Total catch was 3,587 with 2,111 harvested. For more information regarding the fisheries contact the Department's McCall Regional Office or the Clearwater Regional Office. Nez Perce Tribal officials reported subsistence and commercial harvest of 4,189 marked and 16 unmarked Chinook salmon.

## **Adult Holding**

### **Adult Treatments**

The adult holding period extended from May 13 to September 15, 2003. 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-1, HP-2, or released above the trap 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 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 was administered to the holding ponds three times each week from June 11 to September 8. The start of formalin treatment this year was delayed by water conditions during flooding. Chemical treatment during high turbidity and low dissolved oxygen was deemed unwise. Treatment consisted of pre-charging ponds with formalin to 170 ppm then introducing formalin into inflow water at a rate of 170 ppm for one hour. During holding, water temperature ranged from 40.1°F to 59.0°F (Appendix 3). Carcasses were picked up twice each week by the Walco Co. for disposal in a landfill.

### **Prespawning Mortality**

Prespawning mortality at RRFH in 2003 was 1,087 fish or 31.8% of the fish held. After August 24 males were not considered prespawning mortality. The sex ratio was 372 males (10.9%) and 715 females (20.9%). Prespawning mortality was largely due to nitrogen embolism related mycosis and bacterial kidney disease (BKD).

Hatchery personnel performed cursory necropsies of all prespawning mortalities.

Causal factors for prespawning mortality are shown in Appendix 24. A profile of cumulative prespawning mortality is shown in Appendix 25. As fish were removed from the ponds they were scanned for CWT and snouts were collected from 302 fish (11.4%) 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 2003, 780 female spring Chinook salmon were processed from August 11 to September 15. Of these, 13 were destroyed and their eggs rejected because they showed gross evidence of BKD or other pathology. The remaining 767 females were spawned. Spawning followed standard procedure recommended by the Integrated Hatchery Operations Team (IHOT) for random cross of two males for each female. This procedure was used to ensure that all females were fertilized with a fertile male. Females were killed with a blow to the head. The eggs from each female were placed a colander to drain off the 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 left operculum punch to identify them as having been spawned and then returned to the holding pond. All 767 spawned females were sampled at spawning for BKD. Samples were analyzed by enzyme-linked immunosorbent assay (ELISA) (Appendix 26).

### **Incubation**

The total egg take for 2003 was 3,530,501 green eggs from 767 females (based on average fecundity). Eggs from 107 of the spawned females (492,534 eggs based on average fecundity) were culled. The remaining 660 females produced 3,037,967 green eggs (Appendix 27).

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 adjusted to a flow of 5 gal/min. Most of the eggs were incubated at a rate of one female/tray to segregate individuals pending results of ELISA studies although some trays received two females due to limited incubation space. As ELISA results were received, eggs from 104 females with an optical density (o.d.)  $\geq$  0.250 o.d. were culled. Another 3 were culled for gross pathology. Eggs from the remaining 660 females at RRFH were incubated to eye-up then 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. A Jensorter™ Model BCM egg counter was used to inventory live eggs. Dead eggs were enumerated by average weight. After counting, the eggs were returned to clean trays. The 660 females produced 3,037,967 green eggs. After primary pick of 225,172 dead eggs, 2,812,795 eyed eggs remained. Eye-up was 92.6 and the average fecundity was 4,603 eggs/female.

In 2003 RRFH received 370,000 eyed eggs from Clearwater Fish Hatchery and 112,790 eggs from Dworshak National Fish Hatchery. Dworshak eggs were shocked when they arrived. They were picked and counted with a Jentsorter™ model BM4 picker/counter leaving 107,123 eyed eggs. Average fecundity was 4,117 and eye-up was 95.0%. Female Chinook salmon from Dworshak Hatchery were tested for Infectious Hematopoietic Necrosis (IHN) and BKD and females from Clearwater Hatchery were tested for BKD by the Eagle Fish Health Laboratory (EFHL). Only eggs from females that tested negative for IHN and with an ELISA reading <0.250 o.d. were transferred to RRFH. All of the eggs obtained from other facilities were disinfected in 100-ppm iodophore for 30 minutes then placed in vertical stack incubators that were set to a flow of 6 gallons/minute. The additional eggs yielded a total inventory of 3,289,918 eyed eggs to start Brood Year 2003 (Appendix 27). The eggs 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 1,750 DTU.

### **Early Rearing**

Fry were ponded from December 8, 2003 through April 12, 2004. The first 3 lots were initially placed in one 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<sup>3</sup>/in. Initial water depth was adjusted to 24 in, and flow was set to 0.25 ft<sup>3</sup>/s. As the fish grew, water depth and flows were increased to a maximum depth of 36 in and flow of 1.62 ft<sup>3</sup>/s. The fingerlings remained in raceways until marking when they were transferred to rearing ponds. At the end of early rearing on June 15, 2004 the fingerlings averaged 146.3 fish/lb (fpp) and 2.7 in total length. The average DI was 0.50 lb/ft<sup>3</sup>/in and the average flow index (FI) was 1.39 lb/gal/min/in. Initial raceway density is shown in Appendix 28 and final raceway density is shown in Appendix 29. Mortality during early rearing was 19,858 fish or 0.6% of the number ponded i.e. adjusted swim-up, which was back-calculated as the total 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 four-inch aluminum pipe as they were marked. The marking crew reported that 3,468,082 fingerlings were marked and moved from June 15 through July 1, 2004. This total was an increase of 7.1% from hatchery inventory calculated as electromechanically counted eyed eggs minus recorded mortality. As in the past, hatchery inventory was adjusted to the number reported at marking. Initial pond loading densities are reported in Appendix 30. The fish averaged 67.4 fpp and 3.6 in total length at the end of marking, and grew to 19.5 fpp and 5.3 in total length at release. The volitional release began on March 15, 2005. The average DI before release was 0.21 lb/ft<sup>3</sup>/in,

and the average FI was 2.39 lb/gal/min/in (Appendix 31). The maximum DI recommended by the Department (IHOT goal) at this facility is 0.30 lb/ft<sup>3</sup>/in. The maximum recommended FI for O<sub>2</sub>-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 22,729 fish or 0.7% of the inventory reported at marking. Total mortality from swim-up through release was 42,314 fish or 1.2% of the adjusted swim-up.

### **Feed Use and Conversion**

A total of 248,384 lb of feed was used for Brood Year 2003 fish. The overall feed conversion was 1.46. Specific data on feed types and sizes are listed in Appendix 32.

Four medicated feed treatments were administered to Brood Year 2003 fingerlings. Starting April 26, 2004 and again starting July 15, they were fed medicated feed containing 4% TM-100 (oxytetracycline (OTC)). Starting May 10, 2004 they were fed medicated feed containing erythromycin as 2.25% Aquamycin-100 and starting September 15 they were fed medicated feed containing 4.5% Aquamycin-100.

### **Fish Health**

Portions of this section of the *Rapid River Hatchery 2003 Brood Year Report* are reproduced with permission from Mr. Doug Munson of the EFHL. A summary of EFHL results for individual inspections of Brood Year 2003 juveniles and broodstock is shown in Appendix 33.

### **Diseases Encountered and Treatment**

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 OTC medicated feed, at the standard dose 3.75g/100 lb of fish treated for 10 days. Two prophylactic applications of erythromycin medicated feed were fed for 28 days to control *Renibacterium salmoninarum* (INAD 6013/4333). After the first prophylactic application of erythromycin, elevated mortalities were found to have clinical signs of BKD (*Renibacterium salmoninarum* causative agent). OTC medicated feed was applied at the high dose rate (provided by INAD 9332) of 10 g/100 lbs for 14 days. This application of OTC medicated feed seemed to control the disease outbreak. *Renibacterium salmoninarum* was detected in routine brood sampling and infectious hematopoietic necrosis virus (IHNV) was detected in two pools of ovarian fluid (twenty pools taken, three fish per pool) during routine brood stock examination.

## **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 34.

## **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 clinical outbreak of BKD. This outbreak was treated successfully with a high dose of OTC medicated feed application. This was allowed through INAD 9332-04-70 at the 10g/100 lb rate for 14 days.

## **Other Assessments**

Other factors associated with pre-spawning mortality included extreme turbidity and low flows associated with the flood event at the end of May. While less than 250 adults were in holding ponds during the flood, stress undoubtedly occurred in-river lower in the drainage. The hatchery received several phone calls from concerned citizens regarding observations of adult fish mortality along the Salmon River during and after local flooding

## **Fish Marking**

Protocol requires adipose fin (AD) clips for all spring Chinook salmon reared at RRFH for Brood Year 2003. The marking crew reported 3,468,082 fish were AD-clipped and a CWT was placed in 109,201. Marking occurred from June 15 through July 1, 2004. After marking, 2,940 fish were sampled during monthly pound counts for a quality check of AD clips. The results showed 90.6% with full clips, 1.1% without clips, and 8.3% with marginal clips.

From February 7 through February 11, 2005 PIT tags were placed in 51,926 pre-smolts for a comparative survival study (CSS). 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 35. For more information regarding marking, consult the *Annual Release Summary of Marked Salmon and Steelhead* published by the Department.

## Fish Distribution

### **Egg Transfers**

There were 370,000 eyed eggs received from Clearwater Fish Hatchery and 112,790 eggs received from Dworshak National Fish Hatchery to start Brood Year 2003 (Appendix 27).

### **Fingerling Transfers**

On September 1, 2004, personnel from the Nez Perce Tribe's Department of Fisheries Resource Management picked up 183,923 AD-clipped fingerlings (2,122 lb) out of raceway 10 and 11 for release into the Selway River. The remaining 50,314 fingerlings (581 lb) from raceway 10 and 11 were split evenly between ponds RP2A-RP2D.

### **Smolt Releases**

There were 3,261,430 smolts (167,278 lb) released from RRFH in 2005 (Appendix 36). Of these 300,000 (14,400 lb) were loaded onto trucks and released into the Snake River at the USFS's boat ramp below Hells Canyon Dam from March 7 through March 10. Another 200,000 (8,200 lb) were loaded onto trucks and released into the Little Salmon River above the confluence of Hazard Creek on March 11. The remaining 2,761,430 (144,678 lb) were released volitionally from RRFH from March 8 through April 22, 2005.

Final sample counts were taken before the start of release. The smolts averaged 19.5 fpp and 5.3 in fork length. Rearing densities at the time of release are listed in Appendix 31. Based on visual observations, almost all the smolts from RP-1 and 99% from RP-2 emigrated volitionally. The remaining fish were seined from RP-2. The last fish emigrated on April 22. Survival from marking to release was 99.3% (Appendix 37).

Before the volitional release, RRFH personnel assisted technicians from Biomark Inc. in placing a pair of PIT-tag antenna arrays in the tail weir of RP-2B. Out migration of PIT-tagged fish was monitored during volitional release and uploaded automatically to the PTAGIS database operated by the Pacific States Marine Fisheries Commission. Two thirds of the detections (22,328) occurred overnight during a storm March 27 that was accompanied by some local flooding and high turbidity.

## **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 38).

The total cost paid by IPC for September 1, 2003, through March 31, 2005, was \$1,334,224.82 (letter dated June 24, 2005, 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 2003's percent of total monthly inventory for the same period was \$832,586.54, which is 62.4% of the cost calculated using the total amount, and addresses reporting expenditures twice. It also has the effect of smoothing estimates of cost/lb or cost/1000 fish released over years with greater or smaller inventory. This may be relevant because fixed costs are by definition similar from year to year while variable costs e.g., feed, are dependent on inventory. Using the revised method for Brood Year 2003 the cost/1000 fish went from \$409.09 to \$255.28 and cost/lb went from \$7.98 to \$4.98.

## **HISTORICAL INFORMATION**

We have included some archival information for context. Historic information about returns by return year is listed in Appendix 39 and by brood year in Appendix 40. Average feed and growth statistics are listed in Appendix 41. Release and transfer information is listed in Appendix 42.

## **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 us maintain and improve the hatchery facility. We would also like to thank Department personnel who helped us during the spawning and trapping season. Our gratitude goes to Officer Brian Holbrook and other Conservation Officers for security at the hatchery and trapping facilities. In addition, we extend our appreciation to Doug Munson and the EFHL 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.

Finally mention should be made of the commitment demonstrated during flooding that occurred during the spring of 2003. The RRFH staff worked around-the-clock for days and was supported by other Department projects and people from the Riggins area. Department Hatcheries, Regional Offices, and Headquarters all provided additional staff to assist with high water operations and residents of the Riggins area helped out during the critical period. Survival of the fish was only possible because of this cooperative effort.

## 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 <sup>3</sup>	3,800,000 Fry
Rearing Ponds 1	54,625 ft <sup>3</sup>	1,000,000 Smolts
Rearing Ponds 2	92,827 ft <sup>3</sup>	2,000,000 Smolts
Adult Holding Pond 1	12,000 ft <sup>3</sup>	1,000 Adults
Adult Holding Pond 2	24,000 ft <sup>3</sup>	3,000 Adults

**Appendix 2. Rapid River Hatchery pond volume.**

Rearing/holding area	Volume (ft <sup>3</sup> )
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 2003.**

Month	Maximum	Minimum	Average	Ten-year average
May	49.1	40.1	45.3	46.6
June	57.0	43.0	48.0	50.2
July	59.0	48.0	54.3	54.3
August	59.0	49.0	55.0	55.7
September	57.5	45.3	51.0	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 CaCO <sub>3</sub>
Hardness	0.1	85	mg/L as CaCO <sub>4</sub>
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
Trichloronate	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)

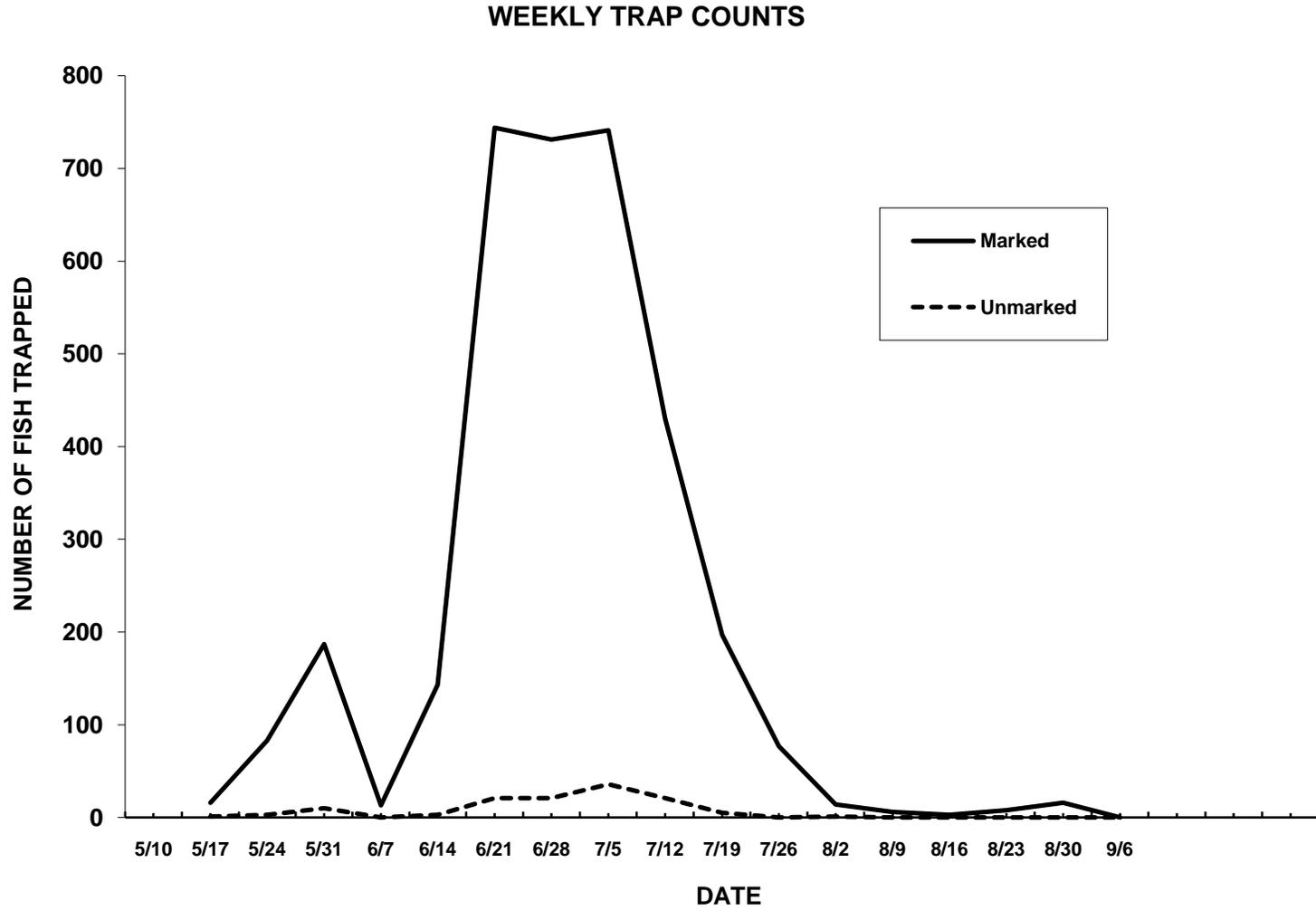
**Appendix 5. Rapid River Fish Hatchery releases outside Salmon River Basin in 2003.**

Date	Department catalog number	Stream	County	Region	Number of fish	Weight (lb)	Actual site	Remarks
6/24/2003	1000040000	Boise River	Ada	3	2	29	Nature Center	Transported by Rapid River Hatchery staff All adults
7/10/2003	1000040000	Boise River	Ada	3	4	60	Nature Center	Transported by Rapid River Hatchery staff All adults
9/12/2003	1000040000	Boise River	Ada	3	6	50	Nature Center	Transported by Rapid River Hatchery staff Included 3 jacks and 3 adults.
Total released outside the Little Salmon River and vicinity					12	139		

**Appendix 6. Rapid River marked spring Chinook salmon run timing for 2003.**

Week ending	Number of fish	Percentage of marked Chinook
May 10	0	0.00
May 17	16	0.47
May 24	83	2.43
May 31	187	5.49
June 7	13	0.38
June 14	143	4.19
June 21	744	21.82
June 28	731	21.44
July 5	741	21.74
July 12	430	12.61
July 19	197	5.78
July 26	77	2.26
August 2	14	0.41
August 9	6	0.18
August 16	3	0.09
August 23	8	0.23
August 30	16	0.53
September 6	0	0.00
		0.00
Total	3,409	100

Appendix 7. Chinook salmon returns to Rapid River trap during 2003.



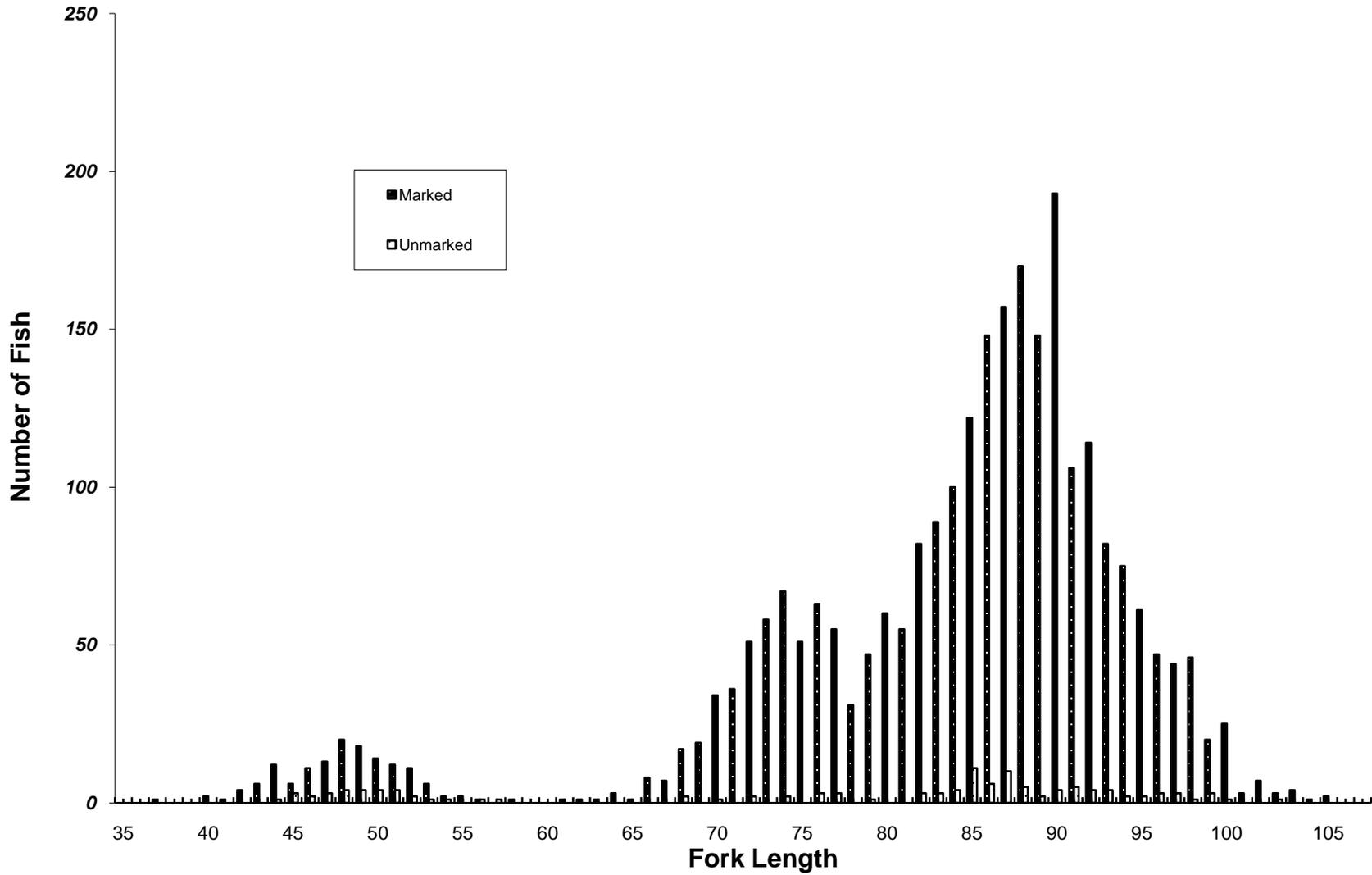
**Appendix 8. Rapid River spring Chinook salmon broodstock lengths for 2003.**

Fork length (cm)	Number of fish	Fork length (cm)	Number of Fish
< 50	92	88	170
50	14	89	148
51	12	90	193
52	10	91	106
53	6	92	114
54	2	93	81
55	2	94	75
56	1	95	61
57	0	96	47
58	1	97	44
59	0	98	46
60	0	99	20
61	1	100	25
62	1	> 100	20
63	1	<sup>a</sup> Total	2,652
64	3		
65	1		
66	8	<sup>b</sup> Adult Sex ratio	
67	7	140 Jacks	
68	17	1,013 (40.3%) Males	
69	19	1,499 (59.7%) Females	
70	34	2,652(100.0%) Total	
71	36		
72	51	<sup>b</sup> Age-class data	
73	58	140 Three-year-old	
74	67	504 ( 20.1%) Four-year-old	
75	51	2,008 ( 79.9%) Five-year old	
76	63	2,652 (100.0%) Total	
77	55		
78	31		
79	48		
80	60		
81	54		
82	82	Age-class criteria	
83	89	< 60 cm = Three-year old	
84	99	61 to 78 cm = Four-year-old	
85	122	> 78 cm = Five-year-old	
86	147		
87	157		

<sup>a</sup> This total includes five adults donated to a study by the United States Department of Energy Pacific Northwest National Laboratory and five adults received from Oxbow Hatchery. It does not include 12 fish (9 adults and 3 jacks) transported to Boise or 750 jacks given to tribal organizations. The total number of jacks that returned to Rapid River 893 making jacks 26.2% of the 2003 Rapid River return.

<sup>b</sup> Sex ratio and age-class percentages are for adults only and do not include jacks.

### Appendix 9. Length-frequency of Rapid River Fish Hatchery broodstock for 2003.



**Appendix 10. Rapid River Hatchery returns with jaw tags during 2003.**

Trap Date	Recapture location	Jaw tag number	Color	Length (cm)	Sex	Disposition
06/06	LSR	00732	Red	Unknown	F	Angler Catch
06/18	R.R. Fish	03004	White	81	F	Hatchery
06/18	R.R. Fish	05487	Red	90	M	Hatchery
06/19	R.R. Fish	00845	Red	87	F	Hatchery
06/21	R.R. Fish	7194X	Black	92	M	Hatchery
06/23	R.R. Fish	05621	Red	83	F	Hatchery
07/01	R.R. Fish	04956	Red	82	F	Hatchery
07/01	R.R. Fish	04201	White	74	F	Hatchery
07/01	R.R. Fish	05896	Red	86	Unknown	Hatchery
07/03	R.R. Fish	05613	Red	72	M	Hatchery
07/03	R.R. Fish	8036X	Black	84	F	Hatchery
07/03	R.R. Fish	7314X	Black	99	F	Hatchery
07/03	LSR	04930	Red	104	M	Angler Catch
07/07	R.R. Fish	02119	Yellow	78	F	Hatchery
07/07	R.R. Fish	0310	White	72	F	Hatchery
07/07	R.R. Fish	05611	Red	72	M	Hatchery
07/22	R.R. Fish	05654	Red	93	M	Hatchery
07/25	R.R. Fish	04929	Red	87	M	Hatchery
09/03	R.R. Fish	7571X	Black	86	M	Hatchery

**Appendix 11. Rapid River Hatchery returns with VI, radio, or floy tags during 2003.**

Trap Date	VI tag number	Radio CH/code	Tag #	Length (cm)	Sex	Disposition
05/20/03	None	10/017	3D9.1BF1904	93	Unknown	Hatchery
06/16/03	None	14/043	None	85	Unknown	Hatchery
06/18/03	None	12/023	3D9.1BF1906	72	F	Hatchery
06/18/03	None	14/162	3D9.1BF1906	79	F	Hatchery
06/19/03	None	10/198	3D9.1BF1906	75	F	Hatchery
06/23/03	None	14/096	3D9.1BF1905	71	F	Hatchery
07/01/03	None	14/094	3D9.1BF1BF1	68	F	Hatchery
07/07/03	None	14/020	3D9.1BF1906	90	F	Hatchery
07/09/03	None	12/103	3D9.1BF0EB4	87	F	Hatchery
07/14/03	None	14/161	3D9.1BF1905	99	M	Hatchery
08/08/03	None	12/066	3D9.1BF1886	85	Unknown	Hatchery
08/21/03	None	11/112	3D9.1BF18F1	67	M	Hatchery

**Appendix 12. Injuries to Chinook salmon returning to Rapid River Hatchery for 2003.**

Nitrogen Blister	Gill net scar	Gaff wound	Fish hook
48	21	243	47

These numbers are for all Chinook salmon returns to Rapid River including marked and unmarked fish.

**Appendix 13. Rapid River unmarked Chinook salmon run timing for 2003.**

Week ending	Number of fish	Percentage of unmarked Chinook
May 10	0	0.0
May 17	1	0.8
May 24	3	2.5
May 31	10	8.2
June 7	0	0.0
June 14	3	2.5
June 21	21	17.2
June 28	21	17.2
July 5	36	29.5
July 12	21	17.2
July 19	5	4.1
July 26	0	0.0
August 2	1	0.8
August 9	0	0.0
August 16	0	0.0
August 23	0	0.0
Total	122	100

**Appendix 14. Rapid River unmarked Chinook salmon lengths for 2003.**

Fork length (cm)	Number of fish	Fork length (cm)	Number of fish
< 50	17	88	5
50	4	89	2
51	4	90	4
52	2	91	5
53	1	92	4
54	1	93	4
55	0	94	2
56	1	95	2
57	1	96	3
58	0	97	3
59	0	98	1
60	0	99	3
61	0	100	1
62	0	> 100	1
63	0	<sup>a</sup> Total	122
64	0		
65	0		
66	0		
67	0	Adult sex ratio	
68	2	31	<sup>b</sup> (not included in percentage)
69	0	49	53.8% Males
70	1	42	46.2% Females
71	0	122	Total
72	2		
73	0		
74	2	Age-class data	
75	0	31	25.4% Three-year-old
76	3	14	11.5% Four-year-old
77	3	77	63.1% Five-year old
78	0	122	(100.0%) Total
79	1		
80	0		
81	0		
82	3	Age-class criteria	
83	3	< 60 cm =	Three-year old
84	4	60 to 78 cm =	Four-year-old
85	11	> 78 cm =	Five-year-old
86	6		
87	10		

<sup>a</sup> Includes all Chinook salmon released above the weir at the Rapid River Trap.

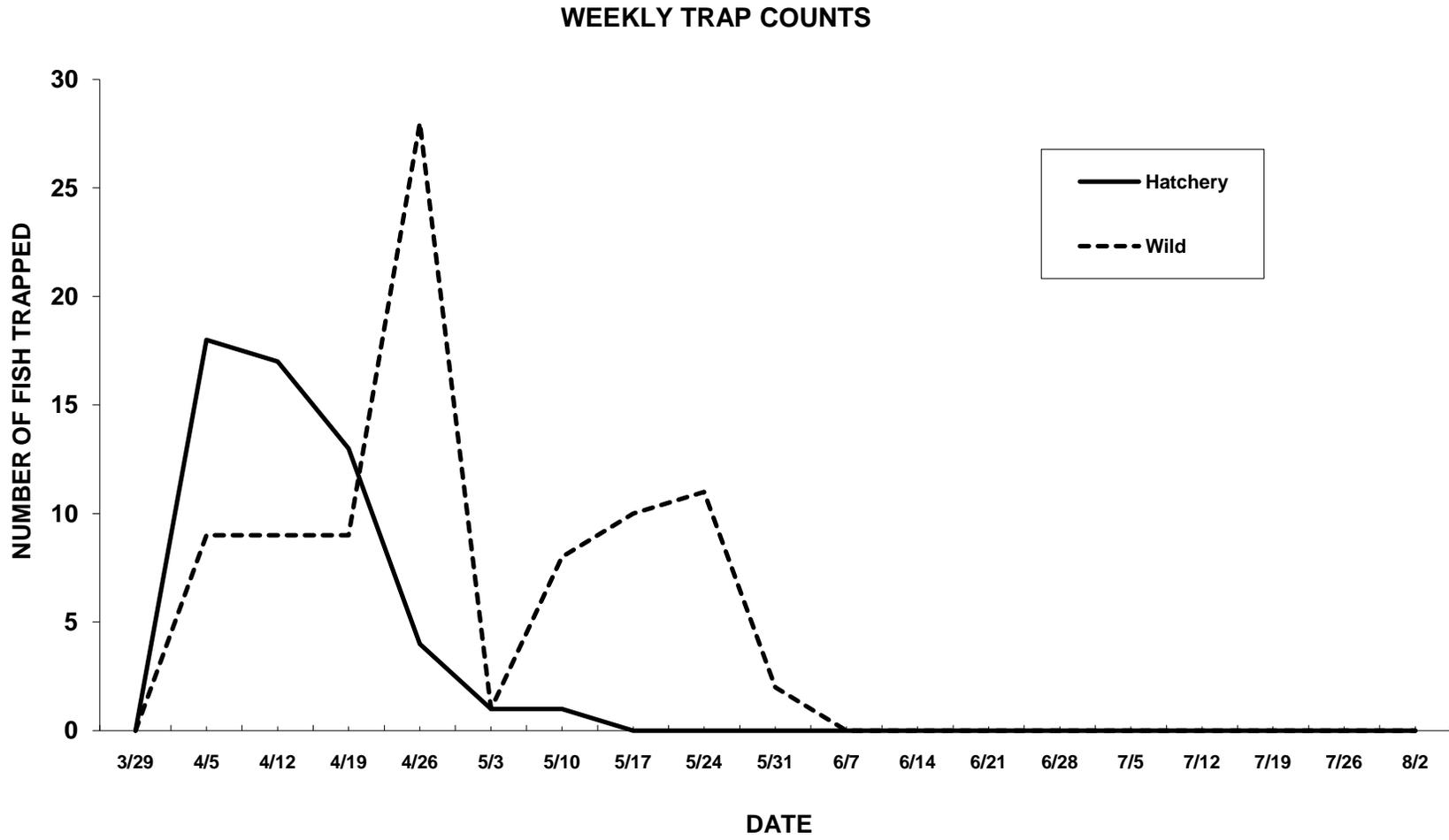
<sup>b</sup> Jacks are not included in adult sex ratio.

**Appendix 15. Rapid River steelhead run timing for 2003.**

Week ending	<sup>a</sup> Number of hatchery fish	Percentage of steelhead run	Number of wild fish	Percentage of steelhead run
March 29	0	0.0	0	0.0
April 5	18	12.8	9	6.4
April 12	17	12.1	9	6.4
April 19	13	9.2	9	6.4
April 26	4	2.8	28	19.9
May 3	1	0.7	1	0.7
May 10	1	0.7	8	5.7
May 17	0	0.0	10	7.1
May 24	0	0.0	11	7.8
May 31	0	0.0	2	1.4
June 7	0	0.0	0	0.0
June 14	0	0.0	0	0.0
June 21	0	0.0	0	0.0
June 28	0	0.0	0	0.0
July 5	0	0.0	0	0.0
July 12	0	0.0	0	0.0
July 19	0	0.0	0	0.0
July 26	0	0.0	0	0.0
August 2	0	0.0	0	0.0
Total by origin	54	38.3	87	61.7
Total steelhead		141		

<sup>a</sup> Hatchery steelhead include marked and unmarked fish.

### Appendix 16. Adult steelhead returns to Rapid River during 2003.

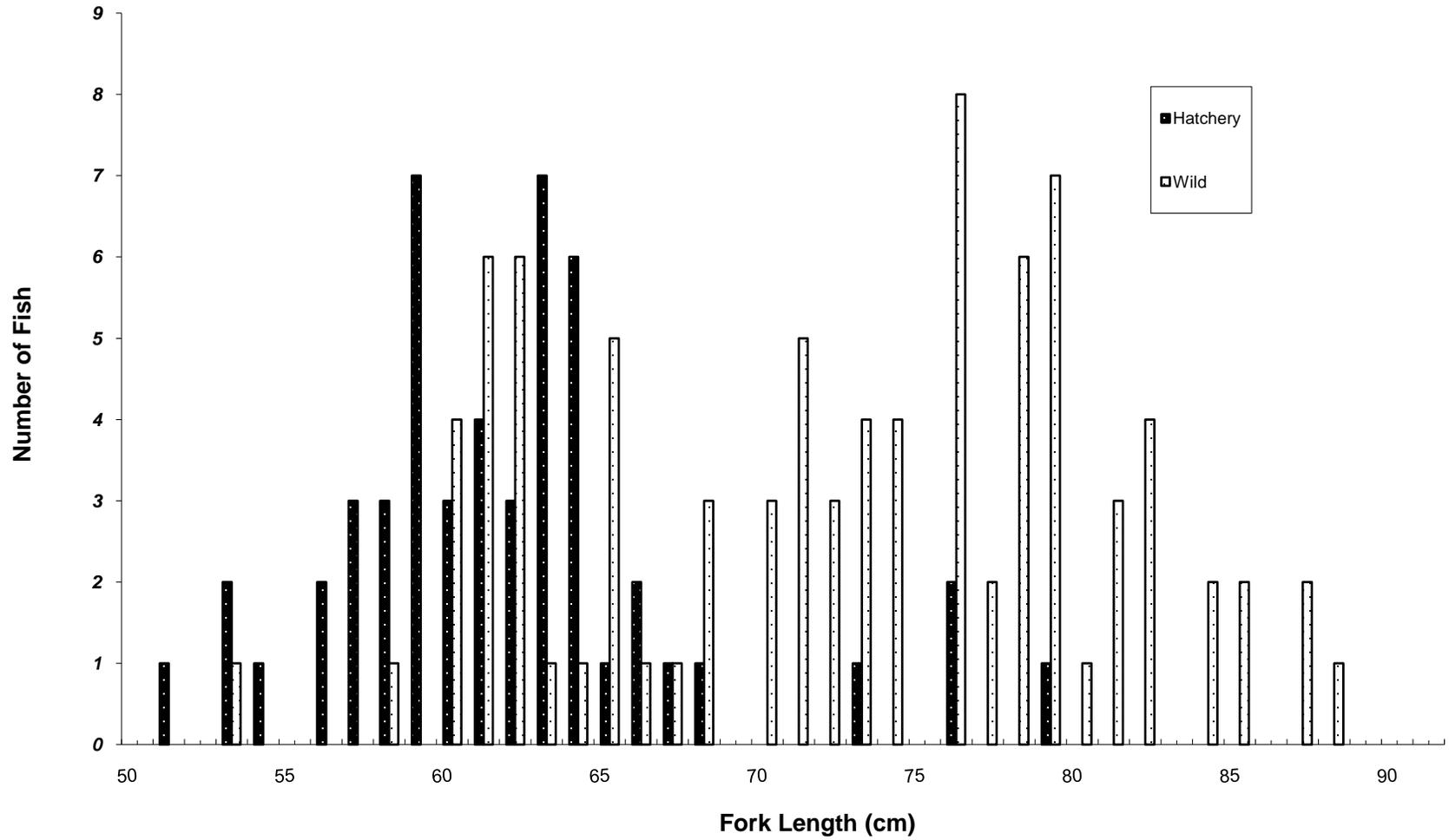


**Appendix 17. Rapid River steelhead fork lengths for 2003.**

Fork length (cm)	<sup>a</sup> Hatchery		Wild	
	Male	Female	Male	Female
50				
51		1		
52				
53	1	1	1	
54	1			
55				
56	1	1		
57		3		
58	1	2		1
59	6	1		
60	3			4
61	2	2	3	3
62	2	1	1	5
63	5	2		1
64	3	3	1	
65	1		3	2
66	2		1	
67	1		1	
68		1	1	2
69				
70			3	
71			1	4
72	3			3
73	1			4
74				4
75				
76	2		3	5
77				2
78			1	5
79	1		3	4
80				1
81				3
82				4
83				
84			1	1
85			1	1
86				
87			2	
88			1	
89				
column total	36	18	28	59
origin total	54		87	
total run	141			

<sup>a</sup> Hatchery fish include marked and unmarked fish.

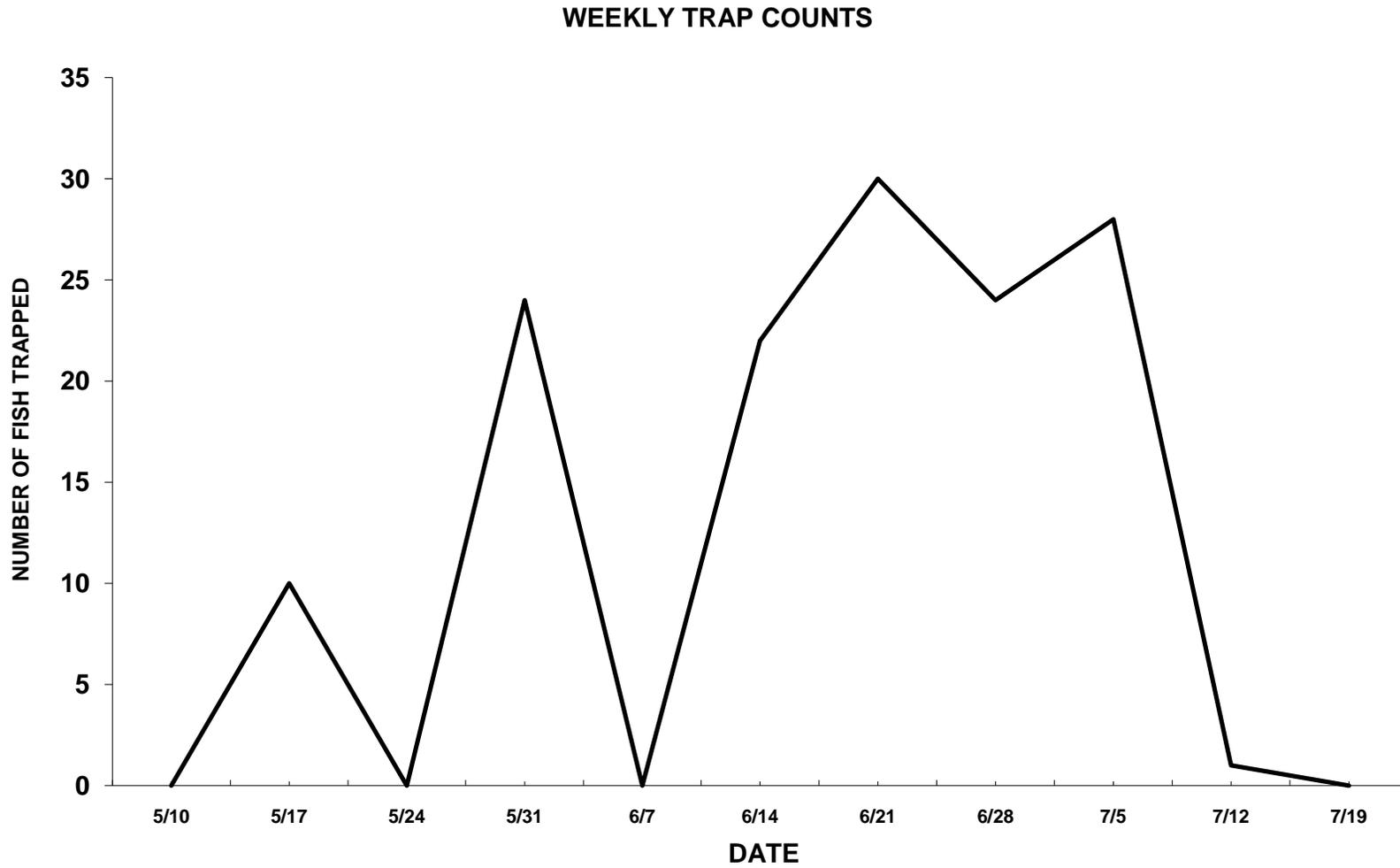
### Appendix 18. Length-frequency of steelhead returning to Rapid River trap during 2003.



**Appendix 19. Rapid River bull trout run timing for 2003.**

Week ending	Number of fish	Percentage of bull trout run
May 25	10	7.2
June 1	0	0.0
June 8	24	17.3
June 15	0	0.0
June 22	22	15.8
June 29	30	21.6
July 6	24	17.3
July 13	28	20.1
July 20	1	0.7
July 27	0	0.0
August 4	0	0.0
Total	139	100.0

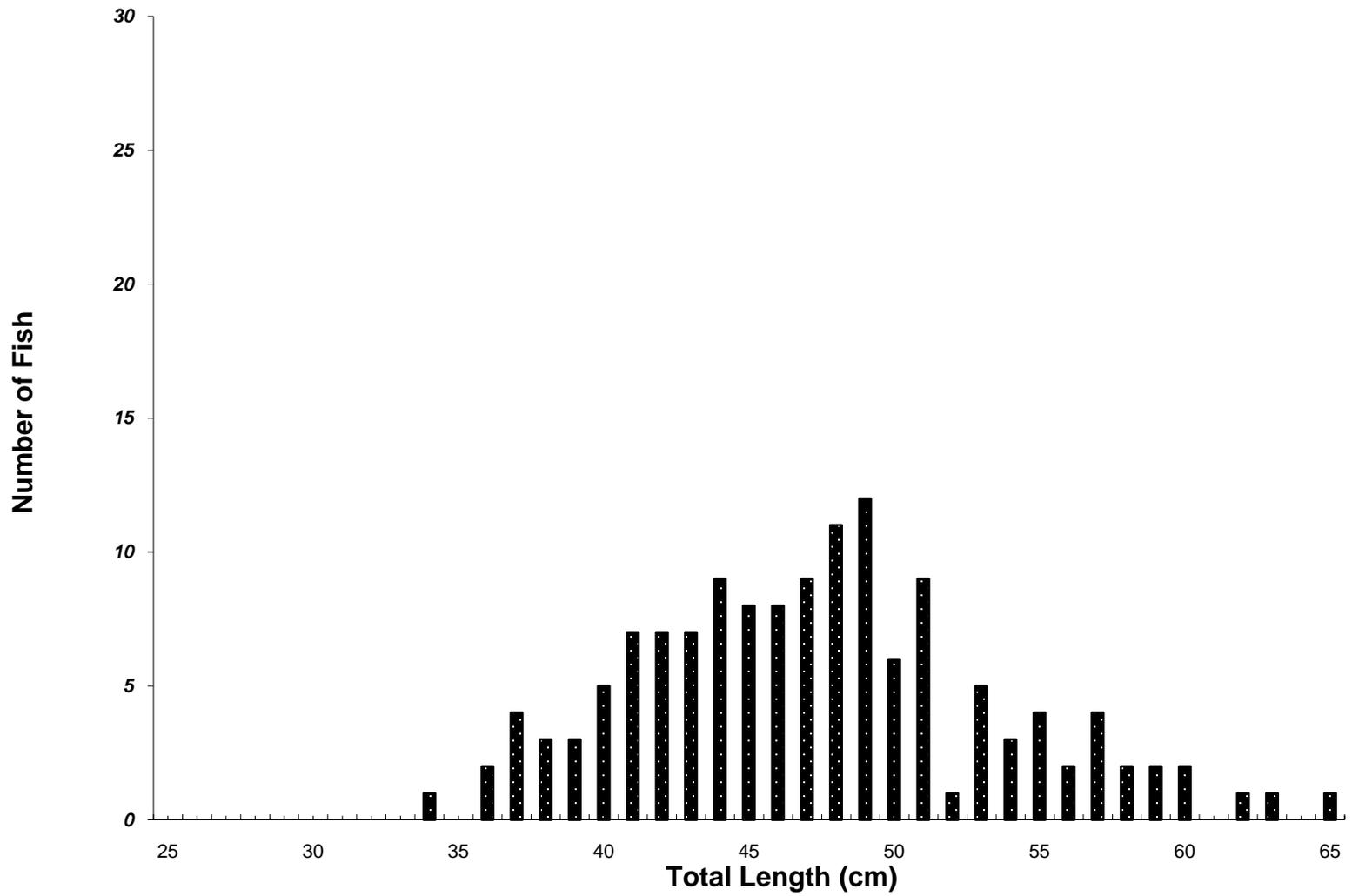
**Appendix 20. Adult bull trout returns to Rapid River trap during 2003.**



**Appendix 21. Rapid River bull trout lengths for 2003.**

Total length (cm)	Number of fish	Total length (cm)	Number of fish
25	0	45	8
26	0	46	8
27	0	47	9
28	0	48	11
29	0	49	12
30	0	50	6
31	0	15	9
32	0	52	1
33	0	53	5
34	1	54	3
35	0	55	4
36	2	56	2
37	4	57	4
38	3	58	2
39	3	59	2
40	5	60	2
41	7	61	0
42	7	62	1
43	7	63	1
44	9	64	0
		65	1
Total			139

### Appendix 22. Length-frequency of adult bull trout returning to Rapid River during 2003.



**Appendix 23. Species trapped in Rapid River during 2003.**

Species	Number trapped
Marked spring Chinook salmon	3,409
Unmarked Chinook salmon	122
Steelhead	141
Bull trout	128

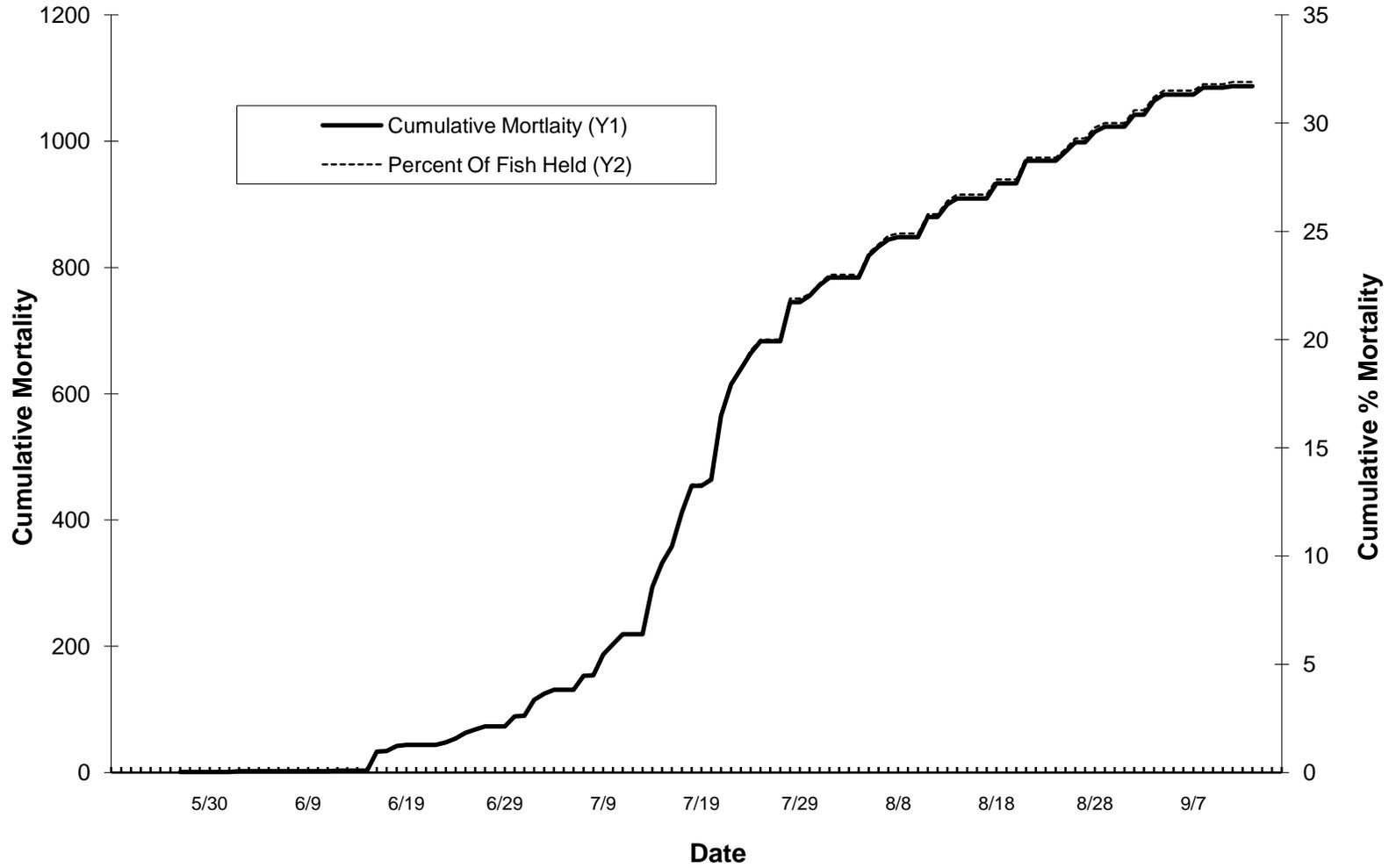
This table does not include recaptures.

**Appendix 24. Causes of prespawning mortality at Rapid River Hatchery for 2003.**

Cause	Number of fish	*Percentage of fish held
<sup>a</sup> Nitrogen Embolism/mycosis	517	15.1
Jaundice	14	0.4
Bacterial Kidney Disease	129	3.8
Gaff Wound	131	3.8
Unknown	296	8.7
Total	1,087	31.8

<sup>a</sup> This year the fish in the hatchery holding ponds and in the river suffered abrasions and subsequent mycosis that may have been related to nitrogen emboli or other wounds that were exacerbated by the high silt content of the water.

### Appendix 25. Cumulative prespawning mortality at Rapid River Fish Hatchery for 2003.



**Appendix 26. Rapid River broodstock ELISA results for 2003.**

Lot number	Date sampled	Number sampled	Negative	Positive
			< 0.250	>= 0.250
1	8/11	2	5	0
2	8/14	6	3	3
3	8/18	28	22	6
4	8/21	57	53	4
5	8/25	100	94	6
6	8/26	56	48	8
7	8/28	169	150	18
8	8/29	95	75	18
9	9/2	142	121	21
10	9/4	91	77	14
11	9/8	17	12	5
12	9/11	1	0	1
13	9/15	3	3	0
Total		767	663	104

Eggs were culled from 104 females with ELISA results of greater than 0.25 and 3 fish were culled for egg quality. Eggs from 660 females were kept and reared.

## Appendix 27. Rapid River Hatchery egg enumeration for 2003.

Lot	Spawn date	Number eyed	Primary pick	Number green	Percent eyed	Average fecundity	Number of females
1	8/11	4,587	3,133	7,720	59.4	3,860	2
2	8/14	12,628	1,668	14,296	88.3	4,765	3
3	8/18	82,642	16,435	99,077	83.4	4,504	22
4	8/21	209,856	35,277	245,133	85.6	4,624	53
5	8/25	437,073	20,396	457,469	95.5	4,867	94
6	8/26	229,465	12,973	242,438	94.6	5,051	48
7	8/28	661,268	47,919	709,187	93.2	4,728	150
8	8/29	309,431	15,373	324,804	95.3	4,331	75
9	9/2	493,221	39,605	532,826	92.6	4,404	121
10	9/4	324,087	26,241	350,328	92.5	4,550	77
11	9/8	36,524	4,607	41,131	88.8	3,428	12
12	9/11	0	0	0	0	0	0
13	9/15	12,013	1,545	13,558	88.6	4,519	3
<b>Total</b>		<b>2,812,795</b>	<b>225,172</b>	<b>3,037,967</b>	<b>92.6</b>	<b>4,603</b>	<b>660</b>

### Eyed eggs received from Clearwater Fish Hatchery.

Lot	Spawn date	Number eyed	Primary pick	Number green	Percent eyed	Number eggs / tray	Number of trays
Powell 6	8/25	55,000				5,000	11
South Fork 6	8/26	160,000				5,000	32
Powell 7	8/28	35,000				5,000	7
South Fork 7	8/29	55,000				5,000	11
Powell 8	9/2	5,000				5,000	1
South Fork 8	9/3	50,000				5,000	10
Powell 9	9/4	10,000				5,000	2
<b>Total</b>		<b>370,000</b>					<b>74</b>

### Eggs received from Dworshak Fish Hatchery

Lot	Spawn date	Number eyed	Primary pick	Number green	Percent eyed	Average fecundity	Number of females
D 4	9/16	58,400	3,802	62,202	93.9	4,147	15
D 5	9/23	48,723	1,865	50,588	96.3	4,216	12
<b>Total</b>		<b>107,123</b>	<b>5,667</b>	<b>112,790</b>	<b>95.0</b>	<b>4,117</b>	<b>27</b>

**Total** **3,289,918**

Rapid River Hatchery data does not include eggs from 107 females that were culled. Eggs from Clearwater Hatchery were received after they were eyed and picked.

Appendix 28. Rapid River Hatchery initial raceway loading densities (12/8/03–4/12/04).

Raceway	Inflow (ft <sup>3</sup> /sec)	Number of fish	Weight (lb)	Density Index	Flow Index
2	0.31	321,774	217	0.31	1.20
3	0.31	323,219	218	0.31	1.20
4	0.31	321,670	217	0.31	1.20
5	0.48	324,946	219	0.31	0.78
6	0.40	323,620	218	0.31	0.93
7	0.31	326,767	220	0.31	1.22
8	0.31	327,997	221	0.31	1.22
9	0.31	325,650	219	0.31	1.21
10	0.31	313,903	211	0.30	1.17
11	0.31	333,578	225	0.32	1.24
Total		3,243,124	2,185		

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

Appendix 29. Rapid River Hatchery final raceway loading densities (6/15/04).

Raceway	Inflow (ft <sup>3</sup> /sec)	Number of fish	Weight (lb)	Density Index	Flow Index
2	1.46	318,512	2,753	0.57	1.40
3	1.46	321,188	2,570	0.57	1.40
4	1.46	318,797	2,624	0.56	1.38
5	1.46	322,824	2,495	0.55	1.36
6	1.46	321,664	2,165	0.49	1.20
7	1.36	324,810	2,344	0.53	1.40
8	1.16	326,318	2,093	0.47	1.46
9	1.16	324,059	1,912	0.45	1.41
10	1.11	312,091	1,814	0.45	1.46
11	0.97	333,003	1,266	0.36	1.32
TOTAL		3,223,266	22,036		

The inventory data in this appendix are based on egg enumeration minus recorded mortality.

**Appendix 30. Rapid River Hatchery initial pond loading densities (5/15/04 to 7/1/04).**

Pond	Inflow (ft <sup>3</sup> /sec)	Number of fish	Weight (lb)	Density Index	Flow Index
RP-1A	7.2	599,695	6,848	0.07	0.63
RP-1B	7.2	592,820	6,602	0.07	0.61
RP-2A	7.0	522,119	5,322	0.07	0.51
RP-2B	7.0	500,513	4,936	0.07	0.48
RP-2C	7.0	495,463	4,509	0.06	0.45
RP-2D	7.0	522,548	5,613	0.07	0.53
RWY 11	1.9	234,924	2,725	0.38	0.84
TOTAL		3,468,082	36,555		

The Inventory data in this appendix are based on the number of fish marked as reported by the Department Fish Marking Lab in July of 2004. It is an increase of 244,816 fish or 7.1% from hatchery inventory.

**Appendix 31. Rapid River Hatchery pond loading densities at release (3/15/05).**

Pond	Inflow (ft <sup>3</sup> /sec)	Number of fish	Weight (lb)	Density Index	Flow Index
RP-1A	10.0	592,222	32,883	0.22	1.38
RP-1B	10.0	587,085	31,734	0.22	1.33
RP-2A	5.7	532,552	28,029	0.21	1.97
RP-2B	5.7	511,530	25,199	0.21	3.95
RP-2C	5.7	504,731	22,634	0.20	3.74
RP-2D	5.7	533,310	26,799	0.22	1.99
TOTAL		3,261,430	167,278		

The Inventory data in this appendix include 50,314 fish transferred from raceway 10 and 11 to ponds RP2A-RP2D in July of 2004. It does not include the 183,923 fingerlings transferred from raceway 10 and 11 to the Nez Perce Tribe in September of 2004 for release.

## Appendix 32. Feed for Brood Year 2003 at Rapid River Hatchery.

Product		<sup>a</sup> Amount used	Unit price	Total cost
Type/size	Additives			
BioDiet:				
No. 2 Starter		660kg	2.288	\$1,471.80
No. 3 Starter		1060kg	2.288	\$2,363.80
No. 2 & No. 3	Bio Flake MC			
1.0 mm Grower		1920kg	1.870	\$3,417.60
1.3mm Grower		1100kg	1.826	\$ 0.00
1.3 mm Grower	TM	940kg	3.058	\$1,635.60
1.3 mm Grower	Aquamycin-100	1660kg	4.048	\$6,025.80
1.5 mm Grower		3817kg	1.694	\$6,107.20
1.5 mm Grower	Auqamycin-100	3732kg	4.048	\$13,547.16
1.5 mm Grower	TM			\$ 0.00
BioMoist:				
1.5 mm Grower	<sup>b</sup> EIBS PAC			\$ 0.00
2.0 mm Grower	<sup>b</sup> EIBS PAC	32,500lb	0.775	\$23,725.00
2.0 mm Grower	TM			
2.0 mm Grower	EIBS PAC	11,425lb	1.655	\$23,764.00
2.5 mm Grower	<sup>b</sup> EIBS PAC	42,000lb	0.685	\$27,300.00
2.5 mm Grower	Aquamycin-100			
2.5 mm Grower	<sup>b</sup> EIBS PAC	13,775lb	2.045	\$27,412.25
3.0 mm Grower	<sup>b</sup> EIBS PAC	6075lb	0.675	\$4,100.63
3.0 mm Feed	Aquamycin-100			
3.0 mm Feed	<sup>b</sup> EIBS PAC	16,450lb	2.045	\$33,640.25
3.0 mm Feed	<sup>b</sup> EIBS PAC	97,000lb	0.5348	\$51,875.60
<sup>c</sup> Total		248,384.lb		\$191,817.73

<sup>a</sup>Feed units are given in kg or lb as provided by manufacturer

<sup>b</sup>EIBS PAC = 5 x C and B12, and 10 x Folic Acid.

<sup>c</sup>Total includes 183,942 lb fed prior to the start of release and 16,260 fed after the start of release.

The feed conversion is based on size of fish at release and the 200,202.0 lb of feed fed.

**Appendix 33. Eagle Fish Health Laboratory inspection results for Brood Year 2003.**

Log		Stock number	IHN	IPN	NAVHS	BKD	FUR	ERM	CWD	MAS	WHD	CSH	ICH	Comments
<u>Juvenile samples</u>														
RRSC	04-235	-	-			-	-	-	-	-				NO PATHOGENS DETECTED, VIRO 0/10, FAT 0/10, BACTE 0/10
RRSC	04-265	-	-			+	-	-	+	-				BKD,CWD;VIRO 0/7, FAT 5/7,FLAVOBACTERIUM PSYCHROPHILUM 1/7
RRSC	04-301					-	-	-	-	+				MAS;FAT 0/10,PSEUDOMONAS FLUORENSCENS 7/10
RRSC	05-036	-	-			-	-	-	-	-				NO PATHOGENS DETECTED; VIRO 0/10,DFAT 0/10,BACT 0/10
RRSC	05-062	-	-			+								BKD,NEURO;VIRO 0/20,DFAT 1/20, ELISA 4/4 (X5),PTD-MYXOB 4/4(X5),PCR-NEUROTROPIC MYXOOLUS 5/5
<u>Brood samples</u>														
RRSC	03-252					-								NO PATHOGENS DETECTED 0/2
RRSC	03-260					+								BKD; ELISA 3/6 (HIGH 3)
RRSC	03-261					+								BKD; ELISA 8/28 (LOW 2, HIGH 8)
RRSC	03-282					+								BKD; ELISA 18/57 (LOW 14, HIGH 4)
RRSC	03-286					+							-	BKD; ELISA 21/100 (LOW 15, HIGH 6), PTD-WHD 0/20
RRSC	03-291					+								BKD; ELISA 25/56 (LOW 15, HIGH 8)
RRSC	03-306	+	-	-		+								BKD; IHNV 2/20 (X3), IPNV 0/60, NAVHS 0/24, ELISA 60/169 (LOW 42,HIGH 18)
RRSC	03-308					+								BKD; ELISA 46/95 (LOW 28, HIGH 18)
RRSC	03-325					+								BKD; ELISA 65/142 (LOW 44,HIGH 21)
RRSC	03-332					+								BKD; ELISA 33/91 (LOW 19,HIGH 14)
RRSC	03-348					+								BKD; ELISA 11/17 (LOW 6, HIGH 5)
RRSC	03-372					+								BKD; ELISA 1/1 (HIGH 1)
RRSC	03-418					+								BKD; ELISA 2/3 (LOW 2)

**Appendix 34. Preliberation organosomatic index for Brood Year 2003.**

Hematology						
Date	Hematocrit			Serum protein		
	<sup>a</sup> Mean	<sup>a</sup> SD	<sup>b</sup> CF	<sup>a</sup> Mean	<sup>b</sup> SD	<sup>c</sup> CF
03/10/05	44.30	4.40	0.10	7.30	1.43	0.19

<sup>a</sup> Standard deviation

<sup>b</sup> Coefficient of variation

**Combined autopsy summary**

Eyes	Gills	Pseudo-branch's	Thymus	Mesen. fat	Spleen	Hind gut	Kidney	Liver	Bile
N 20	N 19	N 20	0 20	0 0	B 4	0 20	N 20	A 0	0 20
B1 0	F 0	S 0	1 0	1 4	R 16	1 0	S 0	B 20	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 1	OT 0			OT 0		T 0	F 0	Mean=0.0
H2 0		O 0		2.55				OT 0	
M1 0									
OT 0									

**Summary of normal's**

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 35. Rapid River Hatchery marking summary for Brood Year 2003.**

Coded wire tag releases						
Release site	Date released	Number of fish marked	Release group mark code	Clip	Purpose	Pond
Rapid River	3/15/-4/22/05	54,392	10-72-76	AD	US-Canada	1A
Rapid River	3/15/-4/22/05	54,809	10-73-76	AD	US-Canada	1A
Total		109,201				

PIT tag releases						
Release site	Date released	<sup>a</sup> Number of PIT-tagged fish	Release group mark code	Clip	Purpose	Pond
Rapid River	3/18-4/21/05	51,926	AD only	AD	Hatchery PIT tag study	2B

<sup>a</sup> See the *Annual Release Summary of Marked Salmon and Steelhead* (unpublished Department document) for estimated numbers of marked fish released.

**Appendix 36. Smolts released from Rapid River Hatchery in 2005 (Brood Year 2003).**

Release site Date	Release Method	Number Released	Weight (lb)
Rapid River			
3/8/05	Loaded to trucks from pond 2D and Released below Hells Canyon Dam.	100,000	4,800
3/9/05	Loaded to trucks from pond 2D and Released below Hells Canyon Dam.	100,000	4,800
3/10/05	Loaded to trucks from pond 2D and Released below Hells Canyon Dam.	100,000	4,800
<b>3/8-10/05</b>	<b>Total to Snake River</b>	<b>300,000</b>	<b>14,400</b>
3/11/05	Loaded to trucks from pond 2C and Released in the Little Salmon River.	200,000	8,200
<b>3/15/05</b>	<b>Total release into Little Salmon River</b>	<b>200,000</b>	<b>8,200</b>
3/15-4/22/05	Volitional release into Rapid River		
	1A	592,222	32,883
	1B	587,085	31,734
	2A	532,552	28,029
	2B	511,530	25,199
	2C	304,731	14,434
	2D	233,310	12,399
	<b>Total release into Rapid River</b>	<b>2,761,430</b>	<b>144,678</b>
	<b>Total hatchery release</b>	<b>3,261,430</b>	<b>167,278</b>

**Appendix 37. Egg to release survival at Rapid River Hatchery for Brood Year 2003.**

<sup>a</sup> Green eggs	<sup>a</sup> Eyed eggs	<sup>a</sup> Percent survival (eye-up)	<sup>b</sup> Swim-up	<sup>c</sup> Percent survival	<sup>d</sup> Marked number	<sup>e</sup> Released smolts	<sup>f</sup> Percent survival
3,037,967	2,812,795	92.6	3,243,124	98.6	3,468,082	3,261,430	99.3

<sup>a</sup> Includes only eggs spawned at Rapid River Fish Hatchery.

<sup>b</sup> Swim-up includes eggs surviving from eggs spawned at Rapid River Fish Hatchery, 370,000 eyed eggs received from Clearwater Fish Hatchery, and 112,790 eggs received from Dworshak National Fish Hatchery.

<sup>c</sup> The number shown is survival from eyed eggs to swim-up including eggs received from other facilities.

<sup>d</sup> The reported number marked was an increase of 7.1% from hatchery inventory, which was based on electronic enumeration minus mortality to date at the start of marking.

<sup>e</sup> Smolts released does not include 183,923 fingerlings transferred to the Nez Perce Tribe on September 1, 2004.

<sup>f</sup> Percent survival from marking to release does not include transferred fingerlings. Mortality from marking to release was 0.7%. Total mortality from adjusted swim-up to release was 1.2% yielding a survival of 98.8% from swim-up to release.

**Appendix 38. Cost of production at Rapid River Hatchery for Brood Year 2003.**

Number of fish	Weight of fish (lb)	Weight of feed (lb)	Cost of feed	Feed Conversion	<sup>a</sup> Total cost	Cost/ thousand fish	Cost/ pound
3,261,430	167,278	248,384	\$191,817.73	1.48	\$1,334,224.82	\$409.09	\$7.98
3,261,430	167,278	248,384	\$191,817.73	1.48	\$832,586.54	\$255.28	\$4.98

<sup>a</sup> Total cost in top row is the total expenditure by IPC from 9/1/2003 through 3/30/2005. This amount exceeds the cost associated with production of Brood Year 2003 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 39. Returns to Rapid River Hatchery from 1964 to 2003.

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	1,226	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	1,072	3,522	3,670,292
2003	5	2,516	893	40.9	660	4,603	3,037,967

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

### Appendix 40. 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 40. 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
2002	2004	2,762,058	109	2005	2,322	2006	701	2007	3,132	0.11
2003	2005	2,761,460	209	2006	2,317	2007	3,47	2008	2,576	0.09

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

### Appendix 41. Ten year average feed and growth data for Rapid River Hatchery.

Month	Average water temperature (°F)	Density index	Flow index	<sup>a</sup> Feed conv.	Hatchery constant	<sup>b</sup> Daily length increase (in)	<sup>b</sup> Monthly length increase (in)	Condition factor C (x10 <sup>4</sup> )	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

<sup>a</sup> Feed conversion is expressed as feed weight over fish weight gain.

<sup>b</sup> Growth data may vary during periods of high water.

**Appendix 42. Release and transfer summary for Rapid River Hatchery By Brood Year for 1964-2003.**

Brood Year	No. eggs taken	Egg or fry plants and site		Smolt plants and site		Fish/pound
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	497,610	eggs Dworshak NFH to start	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
		2,224,119	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			
		100,094	fry Sandpoint Hatchery			
1971	6,038,785	600,496	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			
		200,880	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 42. 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.	2,921,172 Rapid River 249,750 SF Clearwater	28.5				
		252,200	eggs Mullan Hatchery						
		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	2,413,678 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								
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.	2,866,993 Rapid River 156,362 White Sand Cr. 44,373 Newsome Creek	30.2		
		2,287,800	eggs Kooskia NFH						
		2,689,200	eggs Mullan Hatchery						
		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			2,604,823 Rapid River 57,440 White Sand Cr.	30.2
970,728	eggs Mackay Hatchery								
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	2,372,607 Rapid River 1,001,700 Snake River	25.3 21.6		
		330,880	eggs Dworshak NFH						
		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 250,020 Snake River	20.6 16.8				
		256,608	eggs Oxbow Hatchery						
		449,280	eggs Dworshak NFH						
1982	7,420,450	493,346	eggs Looking Glass (Ore)	3,246,197 Rapid River 500,850 Snake River	22.7 16.8				
		1,332,000	eggs Pahsimeroi Hatchery						
		375,028	eggs Dworshak NFH						
		125,055	eggs Hagerman NFH						
		306,000	fry Red River Pond						

**Appendix 42. 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	None		1,594,688 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		7
		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
		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	2,520,400 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		
		100,148	fry White Sand Creek		
		99,401	fry American River		
		51,369	fry American River		
		39,163	fry Meadow Creek		

## Appendix 42. continued.

Brood Year	<sup>a</sup> No. eggs taken	Egg or fry plants and site		Smolt plants and site		Fish/pound	
1989	3,925,585	211,509	fry	Crooked River	2,564,900	Rapid River	18.7
		548,876	fry	Sawtooth Hatchery	100,100	Little Salmon	20.2
1990	4,271,103	200,000	eggs	Looking Glass Hatch.	2,615,500	Rapid River	20.2
		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
		22,235	Eggs received				
		26,694	Eggs received				
		10,126	fry	Squaw Creek	200,300	Snake River	16.9
		90,125	fry	White Sand Creek			
1992	4,534,404	942,897	eggs	Dworshak Hatchery	2,547,624	Rapid River	22.2
					380,600	Snake River	22.1
1993	7,103,702	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	5,407,913	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	3,720,135	510,848	eggs	Clearwater Hatchery	2,462,354	Rapid River	19.2
1999	634,520	199,010	Eggs received		736,601	Rapid River	18.8
2000	5,100,650	911,919	eggs	Clearwater Hatchery	2,669,476	Rapid River	19.8
					300,018	Little Salmon	18.6
					500,195	Snake River	22.7
2001	4,946,614				2,330,557	Rapid River	18.7
					199,900	Little Salmon	21.1
					299,854	Snake River	19.8
2002	4,596,671				2,762,058	Rapid River	24.5
					300,140	Little Salmon	27.4
					499,956	Snake River	27.3
2003	3,530,501	183,923	fingering	Selway River (NPT)	2,761,430	Rapid River	19.1
					370,000	Eggs received	200,000
		107,123	Eggs received		300,000	Snake River	20.8

<sup>a</sup> 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 for 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.

**Submitted by:**

Ralph Steiner  
Fish Hatchery Manager II

**Approved by:**

---

Edward B. Schriever, Chief  
Fisheries Bureau

---

Tom Rogers  
Hatchery Supervisor