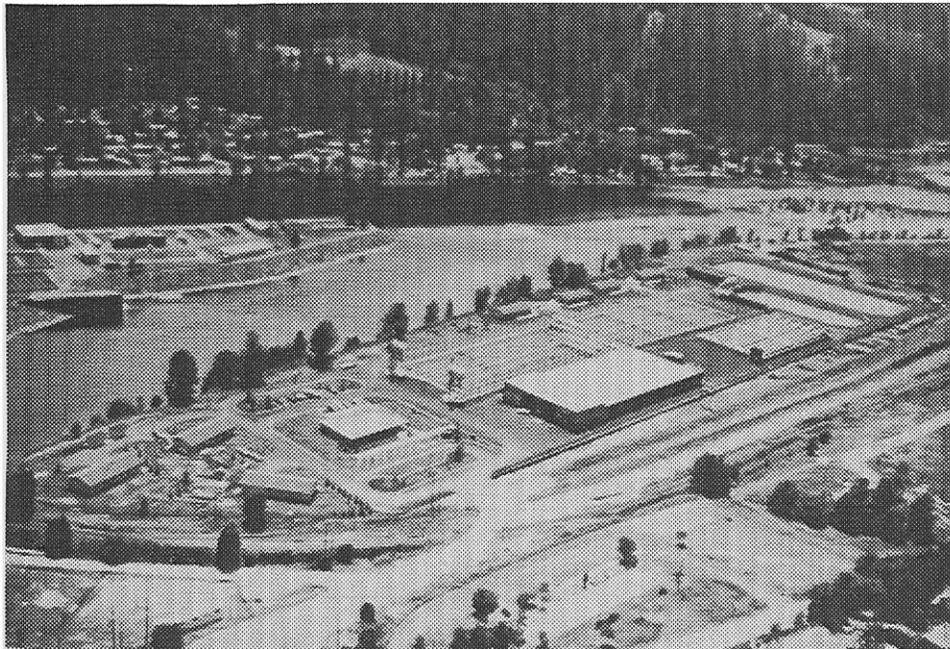




**CLEARWATER FISH HATCHERY**

**1992 Chinook Brood Year**  
**1993 Steelhead Brood Year Report**



By

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## **ABSTRACT**

### **Clearwater Hatchery**

Chinook salmon *Oncorhynchus tshawytscha* were raised at Clearwater Hatchery for the first time this year. All chinook were brought on station as either green or eyed eggs, then reared on station until they were transported to the satellite facilities or directly released.

Direct released fish from Lookingglass Hatchery eggs (Rapid River stock) were transported to Red River and released by helicopter into Meadow Creek (Selway River). A total of 54,100 were released in the upper drainage and 59,600 were released in the lower drainage. Helicopter planting was done by Nez Perce Tribe fisheries personnel.

Fish released from Powell stock during April 1994 included 80,000 pre-smolts released by helicopter into White Sands Creek, 40,875 pre-smolts released by helicopter in Big Flat Creek, 12,000 pre-smolts directly released into Pete King Creek, and 12,000 pre-smolts directly released into Squaw Creek. An additional 16,110 smolts were released into Papoose Creek in April 1994.

### **Red River**

Red River weir was installed on May 18, 1992 and taken out of operation on September 16, 1992. The run total was 39 spring chinook salmon; 18 adult males, 16 females, and 5 jacks. Fish released during the trapping season to spawn naturally included 12 males, 10 females and 4 jacks; and 6 males, 6 females, and 1 jack were spawned by hatchery personnel.

Age class breakdown of this run was 5 jacks, 17 four-year-old males, 1 five-year-old male, 14 four-year-old females, and 2 five-year-old females. There were no pre-spawn mortalities of ponded adults.

A total of 22,246 pre-smolts were released in October 1993.

### **Crooked River**

The Crooked River weir was installed on March 18, 1992 and taken out of operation on September 1, 1992. The run total was 228 spring chinook salmon; 121 adult males, 94 females, and 13 jacks. Fish released immediately to spawn naturally included 110 males, 86 females, and 10 jacks; with 10 males, 7 females, and 2 jacks ponded for later release. Trap mortality totals were 1 male, 1 female, and 1 jack.

Since there is no adult holding at this site, ponded fish were transported 28 miles to the Red River facility. These chinook were held separate from the Red River stock. All ponded fish were held at Red River until June 25, 1992, then transported to Clearwater Hatchery because of high water temperatures (70°F or higher for three consecutive days). All fish were held at Clearwater Hatchery until ripe, then transported to a confined section of Relief Creek in the Crooked River drainage to spawn naturally.

Age class breakdown of this run was 13 jacks, 117 four-year-old males, 4 five-year-old males, 91 four-year-old females, and 3 five-year-old females. Pre-spawning mortality was six fish, or 40.9% of ponded fish.

A total of 273,766 smolts were released at Crooked River in April 1994.

### Powell

The Walton Creek weir was installed on May 28, 1992 and taken out of operation on September 17, 1992. The run total was 270 spring chinook salmon; 131 adult males, 133 females, and 6 jacks. All fish trapped were ponded and held for spawning.

Age class breakdown of this run was 6 jacks, 118 four-year-old males, 13 five-year-old males, 131 four-year-old females, and 2 five-year-old females. Pre-spawning mortality was 15 fish; 5.6% of ponded fish.

A total of 261,628 smolts were released in April 1994. A total of 144,823 smolts were acclimated for 21 days, 61,060 were not acclimated, and 55,745 were released directly into Walton Creek.

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## **INTRODUCTION**

### **Funding Source**

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

The Corps estimated cost for construction of Clearwater Hatchery and three satellite facilities at \$43,153,000 (Joe McMichael's report, December 1991).

### **Location**

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

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

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

Powell satellite facility is located 122 miles east of the Clearwater Hatchery at the headwaters of the Lochsa River. The closest town to the facility is Missoula, Montana, located 45 miles to the east. Powell is 192.5 miles upstream from Lower Granite Dam, and 624 miles upstream from the mouth of the Columbia River.

### **Species Reared**

Chinook, steelhead *O. mykiss*, and rainbow trout were reared at Clearwater Fish Hatchery this year. A total of 113,700 spring chinook salmon at 100 fish/lb were released by helicopter in the Meadow Creek drainage (Selway River tributary) on July 20 and 22, 1993. These fish came from eggs received from Lookingglass Hatchery in Oregon, and are from the Rapid River stock. These fish were hatched and reared until release at the Clearwater Fish Hatchery.

A total of 160,985 spring chinook salmon from Powell stock were released in the Lochsa drainage as part of the chinook supplementation plan. This included 80,000 chinook at 35.5 fish/lb, helicopter planted on August 4 and 5, 1993, into White Sands Creek; 40,875 chinook at 35.5 fish/lb, helicopter planted on August 5, 1993, into Big Flat Creek; 12,000 chinook at 35.5 fish/lb, directly

released on August 5, 1993, into Squaw Creek; 12,000 directly released into Pete King Creek; and 16,110 chinook at 13.9 fish/lb, directly released into Papoose Creek on April 15, 1994.

A total of 22,246 spring chinook salmon at 21.0 fish/lb, were released from Red River pond on October 12, 1993. The fish were hatched and reared to 85 per pound at Clearwater Fish Hatchery, then transported on June 29 and 30, 1993 to Red River for final rearing.

A total of 273,766 spring chinook salmon at 15.07 fish/lb were released from the Crooked River pond on April 8 through April 14, 1994. These fish came from eggs received from Lookingglass Hatchery in Oregon, and are from Rapid River stock. These fish were hatched and reared to full term smolts at Clearwater Fish Hatchery, then transported between March 21 and 24, 1994 to Crooked River for release.

A total of 261,628 spring chinook salmon, at 12.37 per pound, were volitionally released from the Powell pond between on April 8 through April 13, 1994. These fish were hatched and reared to full term smolts at Clearwater Fish Hatchery, then transported between March 21 and April 14, 1994, to Powell for release.

## **OBJECTIVES**

### **Mitigation Goals**

The goal of Clearwater Fish Hatchery and the satellite facilities is to return 12,000 adult salmon and 14,000 adult steelhead over Lower Granite Dam.

### **Idaho Department of Fish and Game Objectives**

The objectives of Idaho Department of Fish and Game (IDFG) for the Clearwater Hatchery are to re-establish historic fish runs into the Clearwater River tributaries, to enhance the wild spawning population, and increase sport and tribal fishing opportunities.

## **FACILITY DESCRIPTION**

### **General Hatchery Description**

#### **Clearwater Hatchery**

The Clearwater Fish Hatchery is the final facility to be built by the U.S. Army Corps of Engineers under the Lower Snake River Compensation Plan. This facility is also the largest of the hatcheries built.

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

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

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

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

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

Near the dam is a distribution structure designed to reduce the 286 psi of the high pressure supply lines to the gravity flow of 7 psi to the hatchery. The structure consists of a primary and secondary chamber. Each chamber has two ported sleeve valves that are used to reduce the pressure. One valve is in operation while the other is on standby for emergencies.

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

### **Red River**

The Red River site consists of three structures built on 6.29 acres. A freezer storage building housing a walk-in freezer, some dry storage shelves, an area to weigh out daily feed, a work shop and formalin storage building, and a support cabin.

### **Crooked River**

There are two separate sites to this facility. The first is the adult trap and support cabin located one-half mile upstream of the mouth of Crooked River. The weir at this location consists of removable posts and panels supported by an iron bridge across Crooked River. The trap is a 9 ft x 13 ft x 4 ft deep holding container. There are no holding ponds at this site, and all fish are either released directly from the trap or transported to Red River holding ponds.

Ten miles upstream from the adult trap are two raceways measuring 145 ft x 20 ft x 4 ft deep with 23,200 cubic feet of rearing space. There is a cleaning waste pond and final settling pond to meet EPA water quality standards. Additional facilities include a garage, shop, walk-in freezer to store fish food, and a support cabin with kitchen, dining room, living room, bathroom, and bedroom.

## **Powell**

The Powell facility is located at the confluence of Crooked Fork and White Sands Creek which form the Lochsa River. There is one rearing pond that measures 165 ft x 65 ft x 5 ft deep. A diversion and intake screen structure are located on Walton Creek, and a pump house on White Sands Creek. There are two adult ponds that measure 100 ft x 12 ft x 4 ft deep. A weir diverts fish coming into Walton Creek to the fish ladder and fish trap. A floating weir that spans across the Lochsa River is stored at the facility for use when needed. An open bay spawning shelter at the head of the adult ponds provides work space. Also on site is a shop with walk-in freezer to store fish food, and a support cabin with kitchen, dining room, living room, bedroom, and bathroom.

### **Production Capacities by Unit**

#### **Clearwater Hatchery**

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

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

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

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

Sixty concrete vats, measuring 40 ft x 4 ft x 3 ft deep, are located inside the hatchery building for early rearing and contain 480 cubic feet of rearing space in each. This part of the facility can rear 5.9 million fish to 287 fish/lb at a 0.3 DI. The vats are supplied with water from each intake and have a flow of 120 gpm per vat. Every vat also has an incubation jar plumbed directly into it, with a total jar capacity of 2.6 million eggs with a flow of 15 gpm per jar.

## **Red River**

The adult holding facility consists of two ponds, measuring 10 ft x 45 ft x 4 ft deep, with a total area of 3,400 cubic feet, and a trap area 8 ft x 16 ft x 4 ft deep. These ponds have a holding capacity of 350 adult fish. A removable tripod and panel weir block fish passage and divert them into the fish ladder. Water flow through the ponds and trap is 4.09 cfs.

A 170 ft x 70 ft x 4 ft 6 in deep rearing pond was designed to rear a maximum of 320,000 chinook smolts. This pond has a hypalon plastic liner with 8- to 10-inch diameter cobblestones on the inclined banks. The bottom of the pond is a bare liner which has aided in pond vacuuming. A catwalk runs the entire length of the rearing pond and holds eight automated Nielson feeders. Water flow through the ponds is 4.09 cfs.

## **Crooked River**

The Crooked River facility has two raceways, measuring 145 ft x 20 ft x 4 ft deep, with a total of 23,200 cubic feet. These raceways have a designed capacity of 700,000 juvenile chinook with a DI of 0.29. Water flow per raceway is 6 cfs. Each raceway is outfitted with three automated Nielson feeders. The adult trapping facility measures 10 ft x 12 ft x 4 ft deep, with a total of 480 cubic feet. Water flow for the adult facility is 10 cfs.

## **Powell**

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

The adult ponds, measuring 100 ft x 20 ft x 4 ft 8 in deep, have a volume of 9,500 cubic feet and a holding capacity of 960 adult chinook. The adult trap measures 12 ft x 6 ft x A ft deep and is supplied with 6.24 cfs of water.

## **WATER SUPPLY**

### **Source**

Clearwater Fish Hatchery receives water through two supply pipelines from Dworshak Reservoir. The warm water intake is attached to a floating platform and can be adjusted from 5 feet to 40 feet below the surface. The cool water intake is stationary at about 245 feet below the top of the dam. An estimated 10 cfs will be provided by the cool water supply and 70 cfs from the warm water supply. The cool water supply has remained constant at 40°F. The warm water can reach 80°F, but is adjusted regularly to maintain 56°F for as long as possible throughout the year. When water temperatures drop in the fall, the intake will be moved to the 40°F level until water temperatures rise in the spring (Appendix A-1). All water is gravity flow to the hatchery.

## **Red River**

Red River is supplied by gravity flow from an intake located at the bottom of the South Fork of Red River, 225 yards upstream from the facility. The maximum water right for the facility is 8.18 cfs. During low flow in the summer, about 5 cfs is available to the hatchery. Temperatures ranged from 33°F in the fall to 74°F in early August (Appendix A-2). There were 14 days during the summer of 1991 when water temperatures reached 70°F or higher.

## **Crooked River**

Crooked River rearing raceways are supplied by an intake 200 yards upstream of the raceways at Crooked River. The water rights stipulate 12 cfs at the rearing facility; in late summer only 6 cfs is available. The water right allows for 10 cfs at the adult trapping facility. Temperatures ranged from 68°F in mid-August to 34°F in late September (Appendix A-3). All temperatures were taken at the adult trap. All water supplied to both facilities is gravity flow.

## **Powell**

The intake is located 100 yards upstream from the facility. Powell's water rights are for 6.24 cfs from a gravity flow system on Walton Creek, and 2.5 cfs from a supply pumped out of White Sands Creek. Two 7.5-horsepower pumps can be used to supply Walton Creek with water from White Sands Creek during periods of low water. Water temperatures ranged from 45.8°F to 50.2°F from the Walton Creek intake, and 41°F to 65°F from the White Sands pump station (Appendix A-4).

## **Water Quality Analysis**

### **Clearwater**

The water quality analysis report was done by the Idaho Department of Health and Welfare water quality laboratory in Boise (Appendix B). The samples were taken from the hatchery incubation supply line on December 29, 1992.

Clearwater Hatchery's water supply has a total alkalinity (as CaCO<sub>3</sub>) of 14 mg/l, which is very low with regard to fish culture. This may prove a stress factor for some species or stocks of fish which are not adapted to this level of alkalinity.

### **Red River**

The following water quality analysis is from one-quarter mile above the mouth of Red River.

Table 1. Red River water quality analysis from one-quarter mile above the mouth.

Analysis	Results (mq/1)	Date analyzed	Optimal rearing levels
Alkalinity	25.0	10/02/92	120 - 400 mg/1
Arsenic	<0.005	10/06/92	N/A
Cadmium Graphite	<0.001	10/28/92	<.0004 mq/1
Copper	<0.01	10/05/92	<.006 mq/1
Hardness	22.0	10/20/92	120 - 400 mq/1
Lead Graphite	<0.002	10/14/92	<.03 mq/1
Mercury	<0.0005	10/16/92	<.002 mg/1

### **Crooked River**

Water quality analysis for Crooked River is not available at this time.

### **Powell**

The following is a water quality analysis taken two miles upstream of Powell.

Table 2. Powell water quality analysis from two miles upstream.

Analysis	Results (mq/1)	Date analyzed	Optimal rearing levels
Alkalinity	23.0	10/20/92	120 -400 mg/1
Arsenic	<0.005	10/23/92	N/A
Copper	<0.01	10/16/92	<.0004 mq/1
Lead Graphite	<0.002	10/15/92	<.006 mq/1
Mercury	<0.0005	10/16/92	120 - 400 mq/1
Hardness	31.0	10/20/92	<.03 mq/1
Cadmium Graphite	<0.001	10/28/92	<.002 mg/1

### **STAFFING**

This year, Clearwater Fish Hatchery had eight permanent staff members; one Fish Hatchery Superintendent III, two Fish Hatchery Superintendent I, one Utility Craftsman, three Fish Culturists, and an Office Secretary. The crew also consisted of three temporary technicians, thirteen Biological Aides and Laborers, and one Youth Conservation Corps enrollee.

## 1992 CHINOOK BROOD YEAR REPORT

### Clearwater Hatchery

#### **Incubation**

Green and eyed eggs from spring chinook salmon spawned from Powell, Red River, and Lookingglass (Rapid River stock) fish were transported to Clearwater Hatchery for incubation. All green eggs were transported in individual egg tubes (one female per tube) to Clearwater Hatchery. The transport vehicle was met at the front gate, and egg tubes were removed from egg coolers and placed in clean egg coolers containing 200 ppm argentyne solution for ten minutes. The coolers were then taken to the incubation room and eggs were placed into Heath egg trays. Since individual females eggs were not kept separate, eyed eggs from Lookingglass Hatchery were placed into Heath egg trays at 7,700 eggs per tray. All Heath stacks were operated at 5.5 gpm.

A total of 521,014 green eggs were incubated from Powell stock, 22,864 green eggs from Red River stock, and 336,401 green eggs from Lookingglass (Rapid River stock). An additional 109,950 eyed eggs were incubated from Lookingglass (Rapid River stock).

A total of 880,279 green eggs were spawned from brood year 1992 spring chinook. Total eye-up was 810,344 eggs from a total eye-up of 92.1%. Powell achieved a 90.8% eye-up, Red River 95.9% eye-up, and Lookingglass 93.7% eye-up.

At eye-up, all eggs from high and medium levels of Bacterial Kidney Disease (BKD) parentage were moved and segregated from the low and negative BKD parentage. This segregation continued through all life stages until release.

#### **Early Rearing Procedures**

At swim-up, fry were moved to hatchery vats 31 through 60 with a loading of approximately 30,000 fish per vat. Approximate survival from eyed egg to swim-up was 894,582 fish (96.7%). These fish were divided as evenly as possible among vats, while still keeping fish separated by stock, egg spawning lots, and high BKD parentage. The initial DI was 0.12, and the FI was 0.31. Fish were started in the first 10-foot section with baffles in place until they were actively feeding, then extended to the full 40 feet. The water flows were increased to keep the FI below 1.10. A 45 gpm flow was maintained while fish were in the 10 foot section, while flow in the 40 foot section was 80 gpm to 120 gpm.

All chinook were fin clipped, and some were coded wire tagged (CWT) while being moved from early rearing to final rearing. Fish were held for over one month longer than planned because of construction work in the chinook raceway headbox. Average length of fish at the end of the early rearing cycle was 82.5 mm (3.3 inches). The fish averaged 67 fish/lb with a condition factor of  $c=3.700 \times 10^{-4}$ , and ranged from 53 to 100 fish/lb.

No significant fish mortalities occurred during early rearing. There was some loss of cripples and "pinheads" during the first few months, as well as a small loss due to Pseudomonas sp.

Water temperatures for the early rearing period ranged from 4°C to 14°C (39°F to 56°F). When water temperatures exceeded 13°C (56°F) for more than two days, it was cooled by lowering the primary intake or adding more secondary water.

Bioproducts Biodiet Starter and Biodiet grower formula were used to feed fish throughout early rearing. A total of 14,400 pounds of food was used at a cost of \$10,254.46. The conversion rate of this period was 1.37 pounds of feed for 1 pound of gain.

## **Final Rearing Procedures**

Juvenile chinook were moved from vats number 3 through 60 to chinook raceways. Powell chinook from low BKD parentage were moved into raceways 1A through 7A and 7B, and those from high BKD parentage were moved into raceway 9A. Chinook from Lookingglass (Rapid River stock) from low BKD parentage were moved into 1B through 6B, from unknown BKD parentage to raceways 8A and 8B, and from high BKD parentage to raceway 9B. All Red River chinook were transferred to Red River for final rearing and fall release.

All chinook except the unknown BKD group from Lookingglass were allowed a 21-day erythromycin feeding right after ponding. The unknown BKD fish (raceway 8A and 8B) were first transported to Red River and Selway Falls, then transferred to the Nez Perce Tribe, and later released by helicopter into Meadow Creek, a tributary of the Selway River.

The Powell low BKD supplementation (raceway 7A and 7B) fish were put on erythromycin feedings for 21 days, and then allowed a 21-day withdrawal period to avoid toxicity before being transported to Powell rearing pond, and helicopter released into tributaries of the Lochsa River.

The remainder of the low BKD fish from the Powell stock (raceways 1A through 6A) were put into an experimental naturalized rearing test. Raceways 1A, 5A, and 6A were painted camouflage to simulate natural stream colorations, and shade structures made of PVC heavy plastic netting (approximately 50% shading) were placed the length of the raceways. Raceways 2A, 3A, and 4A were control raceways which incorporated standard rearing practices. The raceway numbers for this experiment were randomly chosen, and the fish in each raceway were marked with different CWT numbers to identify them separately when they return as adults.

Chinook greatly utilized the shade structures, and the painted raceways appeared to help relieve stress and produce more natural behavior in the immature fish for about three weeks after ponding. This marked improvement continued noticeably until the algae grew up and covered the painted concrete.

The low BKD fish from Lookingglass (Rapid River stock, raceways 1B through 6B) were set up in an experimental feeding test used for Investigational New Animal Drug (INAD) testing between two different drugs. Raceways 1B through 3B were fed 2.25% aquamycin 100 feed, and raceways 4B through 6B were fed 4.5% gallimycin 50. These groups were fed two 21-day feedings during final rearing. The first feeding took place in June right after fish were fin-clipped and moved to final rearing, and the second feeding took place in October before hatchery water temperatures dropped too low for maximum effectiveness. There was no difference in toxicity between the two groups, and palatability appeared to be the same.

The only significant mortalities that occurred during final rearing were on September 23, 1993 when the 8,691 high BKD fish from Lookingglass Hatchery were chlorinated and hauled to the local landfill, as requested by IDFG, and on

October 28, 1993 when 30,077 fish died in raceway 5B after one of the cleaning valves was left open.

Water temperatures during the final rearing period were kept as cool as possible to reduce growth rates on these fish. Water from the primary pipeline and secondary pipeline were mixed to achieve this (Appendix A). Hatchery water temperatures varied from 5°C to 14°C (41° to 57°F) during the final rearing. An estimated 2 cfs of water supplied each raceway.

Bioproducts Biodiet grower diet was used throughout the final rearing period. A total of 87,001 pounds of fish food was used during final rearing at a cost of \$63,015.09. Total feed used in early and final rearing was 101,401 pounds at a cost of \$73,269.55 (conversion rate of 2.0:1). Percent body weights fed ranged from 1.61% to 2.30% (Appendix K).

All chinook were fed a week-on feeding, week-off feeding except during medicated feed treatments during final rearing. This feed regime was intended to slow growth, yet maintain fin quality and fat reserves. No negative effects from this regimen were detected, and fin quality and fat reserves remained excellent.

## **Fish Health**

**Diseases Encountered and Treatment**-No significant epizootics were experienced at Clearwater Hatchery. Isolations of pseudomonads and aeromonads were common in moribund fish. In high BKD segregation groups, moribund fish showed gross lesions of BKD. Enzyme-Linked Immunosorbent Assay (ELISA) optical density tests of fish kidneys in these groups confirmed the visual diagnosis. Negative pools were also found in the high BKD segregation groups. Treatments were limited to prophylactic erythromycin treatments for Renibacterium Salmoninarum.

**Acute Losses**-No acute losses were experienced from contagious etiologic agents. Chronic losses were usually a product of aeromonad or pseudomonad infection. Viral agents were not isolated on this hatchery.

**Organosomatic Index**-See Appendices J.1, J.2, and J.3.

**Other Assessments**-Clearwater Hatchery participated in a comparison of gallimycin and aquamycin medicated feed. Both are erythromycin medicated feed treatments. When fed to the fish at Clearwater Hatchery in equivalent dosages, no difference was noticed.

Cataracts were found in salmon reared and outplanted at Crooked River and Powell. After an investigation, no conclusion was reached concerning the cause of these eye abnormalities.

## **Fish Marking**

All of Red River fish were marked at Clearwater Fish Hatchery with a right ventral clip. There were 1,000 Passive Integrated Transponder (PIT) tags in this group (Appendix I).

## Red River

### **Adult Chinook Collection**

The weir and trap were put into operation on May 18, 1992, and were taken out of operation on September 15, 1992. A total of 18 adult males, 16 females, and 5 jacks were trapped (Appendices D-1 and D-4). Water flow through the trap for adult attraction and the adult holding pond was 4.5 cfs.

Twelve adult males, ten females, and four jacks were released directly from the trap above the weir to spawn naturally. Six adult males, six females, and one jack were ponded and held for spawning. There were no pre-spawn mortalities of adults ponded (Appendices F-1 and G-1).

Age class breakdown of this run was 5 jacks, 17 four-year-old males, 1 five-year-old male, 14 four-year-old females, and 2 five-year-old females. The age class breakdown was as follows: less than 25 inches (64 cm) were jacks, 25 inches (64 cm) to 32 inches (82 cm) were four-year-olds, and over 32 inches (82 cm) were five-year-olds. The breakdown is from limited historic CWT data from Ron Lindlund and Rodney Duke (Appendices C-2, C-4, and E-1).

### **Holding and Spawning**

On June 25, 1992, all chinook adults being held at Red River were transported to Clearwater Fish Hatchery because of high water temperatures (70°F or higher for three consecutive days) (Appendix A-2).

All female chinook and 50% of the male chinook were injected with erythromycin 200 to inhibit BKD. Erythromycin injections were determined by a dosage rate table developed at the University of Idaho.

Fish being held for spawning were also treated every other day with a 100 ppm formalin drip for one hour. After the sorting operation started, the fish were treated with formalin every day. The females were checked for ripeness two days per week. The first female was ripe on August 25, 1992. Eggs from each female were first spawned into a colander and drained of ovarian fluid. They were then placed into a bucket containing the sperm of one male, and activated with one cup of well water. Eggs were water-hardened in a minimum 100 ppm iodophor solution. Tissue and ovarian tissue samples were collected at the time of spawning. These samples were air mailed the next day to the Eagle Fish Health Lab for BKD and virus testing. No mortalities were seen due to fungus. All carcasses were returned to the Red River drainage system to add nutrients to the system.

### **Incubation**

All eggs collected from brood year 1992 adults were transported immediately after water hardening from the adult facility to the incubation room at Clearwater Fish Hatchery.

### **Early Rearing Procedures**

All early rearing took place at Clearwater Hatchery. Fish were transported to Red River at 85 fish/lb on June 29 through 30, 1993.

## **Final Rearing**

Due to the low number of fish being held, two 35 ft x 35 ft x 5 ft deep net pens were constructed to confine the fish for feeding, monitoring, and BKD segregation.

These fish were fed erythromycin-medicated feed twice. The first feeding was right after ponding, and the second was completed 21 days before being released on October 12, 1993. These fish were fed according to a variable percent body weight ranging from 1.5% to 2.8%. The growth rate ranged from 0.12 in/month in October to 0.93 in/month in August. Final DI was 0.05 and FI was 0.03.

## **Fish Distribution**

A total of 22,246 spring chinook salmon were released directly from the rearing pond into Red River on October 12, 1993. These fish were 21.0 fish/lb (Appendix H).

### **Crooked River**

#### **Adult Chinook Collection**

The weir and trap were put into operation on March 18, 1992, and taken out of operation on September 16, 1992. The run peaked on May 26 with 26 fish trapped. A total of 121 adult males, 94 females, and 13 jacks were trapped (Appendices D-2 and D-5). Flow through the trap for adult attraction was maintained at 10 cfs.

There were 110 adult males, 86 females, and 10 jacks released directly from the trap above the weir to spawn naturally. Four adult males, five females, and one jack were ponded, held until ripe, then released into a confined section of Relief Creek in the Crooked River drainage to spawn naturally. Trap mortality totalled 1 adult male, 1 adult female, and 1 jack. Mortality prior to releasing all of the fish was seven adult males and two jacks for a mortality rate of 40.9% (Appendices F-2 and G-2).

Age class breakdown of this run was 13 jacks, 117 four-year-old males, 4 five-year-old males, 91 four-year-old females, and 3 five-year-old females. The age class breakdown was as follows: less than 25 inches (64 cm) were jacks, 25 inches (64 cm) to 32 inches (82 cm) were four-year-old, and over 32 inches were five-year-olds. Breakdown is from limited historic CWT data (Appendices C-2, C.5, and E.2).

#### **Holding and Spawning**

There is no adult holding at this site. Ponded fish from this facility must be transported 28 miles to the Red River facility. These adults were held separate from the Red River stock. On June 25 all ponded fish were transported to Clearwater Fish Hatchery due to high water temperatures (70°F or higher for three consecutive days) (Appendices A-2 and A-3).

Ponded fish were injected with erythromycin 200 to inhibit BKD. Fish being held were also treated every other day with a 100 ppm formalin drip for one hour to prevent the growth of fungus. After the sorting operation started the fish were treated every day. Adult mortalities were returned to Crooked River to add nutrients to the system.

No fish were spawned from the 1992 chinook returns at Crooked River.

### **Fish Distribution**

A total of 273,766 spring chinook salmon which were received from Lookingglass Hatchery were acclimated for over two weeks, and then volitionally released from the rearing raceways into Crooked River. The volitional release started on April 8, 1993, and all fish were completely released by April 14, 1993. These fish were 15.07 fish/lb at the release date (Appendix H).

### **Powell**

#### **Adult Chinook Collection**

The floating weir and trap were put into operation on March 9, 1992 to collect data on steelhead migrations in the Lochsa drainage. The U.S. Forest Service required that the weir panels be removed from the Lochsa and Walton Creek drainage because of concerns about steelhead not being able to migrate upstream to spawn, and because this operation was outside the guidelines of the special use permit. River flows were too high to allow safe removal of the Lochsa weir, so on April 13, 1992, five end panels were removed to allow fish access upstream. The removal of these five panels weakened the integrity of the weir, and on May 1, 1992, high water destroyed the remainder of the weir panels, therefore no weir was across the Lochsa River during the chinook trapping operation.

The weir across Walton Creek was installed on May 28, 1992, and taken out of operation on September 17, 1992. A total of 131 adult males, 133 adult females, and 6 jacks were trapped (Appendices D-3 and D-6). All fish returning to the Powell trap were considered hatchery stock (Walton Creek attraction water), so all fish trapped were ponded for spawning. Flow through the trap and ponds was 6.2 cfs. Pre-spawning mortalities included 9 males, 5 females, and 1 jack for a mortality rate of 5.6% (Appendices F-3 and G-3).

Age class breakdown of this run was 6 jacks, 118 four-year-old males, 13 five-year-old males, 131 four-year-old females, and 2 five-year-old females. The age class breakdown was as follows: less than 25 inches (64 cm) were jacks, 25 inches (64 cm) to 32 inches (82 cm) were four-year-olds, and over 32 inches (82 cm) were five-year-olds. Our breakdown is from limited historic CWT data from Region 2 Fisheries Biologists (Appendices C-3, C-6, and E-3).

#### **Holding and Spawning**

Ponded females were injected with erythromycin 200 to inhibit BKD. Fish being held for spawning were also treated every other day with a 100 ppm formalin drip for one hour. After the sorting and spawning operations started, fish were treated every day.

Females were sorted twice per week for ripeness, and 128 females were spawned during six spawning days between August 14 and August 31, 1994. All fish carcasses were returned to the Lochsa River drainage to add nutrients to the system.

Eggs were water hardened in a minimum 100 ppm argentyne solution for one hour in egg tubes, drained, and transported in fresh water to Clearwater Fish Hatchery for incubation. Tissue and ovarian samples were collected at the time of spawning. These samples were air mailed the next day to Eagle Fish Health Lab for BKD and virus testing.

Water temperatures varied from 4.5°C to 14°C (40°F to 58°F) through the summer (Appendix A-4).

### **Incubation**

All green eggs were transported in individual egg tubes to Clearwater Fish hatchery. The transport vehicle was met at the front gate, and egg tubes were removed from egg coolers and placed in clean egg coolers containing 200 ppm argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room, and eggs were placed into Heath egg trays with one female per tray.

### **Fish Marking**

All of the fish were marked at Clearwater Fish Hatchery with an adipose fin clip, and most of the fish had CWT. Prior to release, 2,000 chinook were given a passive PIT tag.

### **Fish Distribution**

A total of 144,823 spring chinook salmon were transported to Powell Pond from Clearwater Hatchery on March 21 and 22, 1994 for acclimation. The screens were pulled after two weeks on April 8, 1994, to allow fish to leave volitionally, and all fish remaining were released on April 13, 1994. These fish were 12.32 fish/lb (Appendix H).

An additional 61,060 spring chinook were transported to the Powell pond on April 13, 1994, and released with the acclimated chinook that day. These fish were 11.67 fish/lb (Appendix H).

The 55,745 spring chinook salmon smolts from high BKD parentage were transported on April 14, 1994, and released off the Forest Service road bridge located at the satellite facility, directly into Walton Creek. These fish were 13.40 fish/lb (Appendix H).

## **Lookingglass**

### **Spawning**

Both green and eyed eggs were received from Lookingglass Hatchery in Oregon from chinook salmon trapped in excess of their needs. This is the Rapid River chinook stock that was supplied to Lookingglass to start the hatchery run.

On each of these spawning days, two to three members of our staff and three members of the Nez Perce Tribe went to Lookingglass Hatchery to spawn these fish. During the first egg take, eggs were removed from nine females, which were spawned by Oregon Department of Fish and Wildlife and fertilized on site. These eggs were placed into individually marked egg tubes, water-hardened in 200 ppm argentyne, and transported to Clearwater Fish Hatchery. At the hatchery entry gate, the eggs in the tubes were transferred to clean egg coolers containing 200 ppm argentyne for 15 minutes, then placed into the incubators. Also during the first egg take, three females were spawned by Ed Larsen of the Nez Perce Tribe for a delayed fertilization test. The gametes were transported to Clearwater Fish Hatchery by IDFG where the eggs were fertilized, water-hardened in 200 ppm argentyne, and put into incubators.

The second spawn day, a total of 72 fish were spawned. Oregon Department of Fish and Wildlife spawned 38 fish in the traditional manner with on-site fertilization; the remaining 38 fish were spawned by Jerry McGehee, John Rankin, and Don Davis. The gametes from these fish were kept separate for a delayed fertilization test. The males were spawned into a paper cup, then milt was poured into a 2 in x 7 in whirl pack bag, injected with pure O<sub>2</sub>, and placed onto a piece of cardboard in an ice chest with ice. The females were spawned directly into a 1-gallon ziplock bag and placed on ice in an ice chest. Bags containing gametes were numbered to track disease sampling. Delayed fertilization took place after a four-hour trip to Clearwater Fish Hatchery. The fertilization was done 1:1, male:female mix. Ovarian fluid was drained off prior to fertilization. Eggs from each female were kept separate in egg tubes, placed into coolers containing 200 ppm argentyne solution for one hour, then placed into the incubators. Eye-up and hatch percentages were kept separate for each female for this evaluation. Eye-up for delayed fertilization ranged from 46.5% to 99%, with an average of 94.3%. Eye-up for spawning fertilization ranged from 51% to 99%, with an average of 92.6%.

Tissue and ovarian samples were taken at the time of spawning. Samples for green eggs transported to Clearwater Fish Hatchery were processed by Eagle Fish Health Lab. Samples for eyed eggs transported to Clearwater Fish Hatchery were processed by Oregon Fish Health Lab. The green egg portion of the egg takes included one high and two moderate BKD females, which were destroyed. The eyed egg portion contained an unknown number of BKD positive eggs, so the entire group was treated as unknowns.

## 1993 STEELHEAD BROOD YEAR REPORT

### ABSTRACT

This was the second brood year B-steelhead were raised at Clearwater Hatchery from Dworshak (North Fork Clearwater) stock, and the first brood year B-steelhead were raised of Selway River stock. Selway River stock were trapped in the fish ladder at Selway Falls and held at Kamiah ponds until spawning. All steelhead were brought on station as either green or eyed eggs, then reared on station until they were transported to Crooked River satellite facility or direct released.

A total of 104,450 North Fork B-steelhead and 71,566 Selway steelhead smolts were acclimated and released at Crooked River satellite facility. The remaining North Fork B-steelhead were released on the South Fork of the Clearwater River, including 103,696 at the confluence of Cottonwood Creek, 104,302 at the Stites picnic area, 185,067 at the Red House Hold, and 153,860 at Kooskia Hatchery on Clear Creek, a tributary of the Middle fork of the Clearwater River.

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Fish Hatchery Superintendent I

## CLEARWATER

This is the second brood year of Dworshak (North Fork stock) and the first brood year of Selway stock reared at Clearwater Fish Hatchery. Both stocks of steelhead reared are considered to be B-run (Clearwater River) fish.

### Synoptic History

#### Brood Source

Dworshak National Fish Hatchery was the source for Dworshak stock B-run steelhead eggs. Wild B-run steelhead were trapped at the fish ladder on the Selway River, and held at Kamiah ponds for spawning. The two stocks cumulatively made up the total of brood year 1993 steelhead reared at Clearwater Fish Hatchery.

#### Disease History

No disease problems were detected at Clearwater Hatchery during the second steelhead rearing cycle. Dworshak Hatchery has a long history of Infectious Hematopoietic Necrosis Virus (IHNV); therefore, Clearwater Hatchery only accepts steelhead eggs from IHNV-negative females and follows a strict disinfection protocol when transporting them onto the station.

All Selway steelhead eggs were disinfected as green eggs, brought onto the station, and put into an isolation incubation set up at the bottom of the chinook raceways until they were cleared of any possible IHNV.

#### Adult Collection

Selway Stock-Forty-two wild adult Selway B-run steelhead were trapped between March 11 and April 2, 1993 (Appendix 0). Clearwater Region Fisheries personnel hand netted fish from a ladder located at Selway Falls. The fish were put into burlap sacks, attached to floats, and sent downstream to an awaiting boat. People in the boat caught the floats, brought the fish to shore, and loaded them into a fish truck. Clearwater Hatchery personnel transported the fish to Kamiah ponds where they were held for spawning, due to the disease policy at Clearwater Hatchery. A total of 42 fish were netted during seven days of trapping, for a total of 5 one-ocean females, 4 one-ocean males, 23 two-ocean females, and 10 two-ocean males (Appendices N-1 and N-2). There was one female pre-spawn mortality for a total mortality of 2.4%. Fish were treated daily with a 110 ppm formalin drip for one hour.

#### Spawning

Selway Stock-Spawning began on April 8 and ended on May 5, 1993. Fish were checked for ripeness twice a week. A total of eight spawning days were needed to spawn a total of 27 females. Eggs from each female were divided into two to four buckets, depending on how many fish were ripe that day, and one male was used per bucket to fertilize the eggs. This process helped maintain genetic variability. After fertilization occurred, the eggs were poured into one bucket and then put into individual egg tubes. The tubes were placed in 200 ppm

argentyne for one hour to water harden. The argentyne was then drained off, and fresh water and ice were added to lower the water temperature from 52°F to 42°F. The eggs were then transported to Clearwater Fish Hatchery.

**Dworshak North Fork Stock**-When eggs were being collected for Clearwater Fish Hatchery and Dworshak National Fish Hatchery, one to two crew members assisted with their spawning operation, collected and packaged all the disease samples, and shipped them air mail to Eagle Fish Health Lab.

## **Incubation**

**Selway Stock**-Selway steelhead were transported as green eggs from Kamiah ponds and brought to Clearwater Fish Hatchery. The transport vehicle was met at the front gate, and egg tubes were removed from Kamiah egg coolers and placed in clean egg coolers containing 200 ppm argentyne solution for ten minutes. The clean egg coolers were then taken to the isolated incubation area in chinook raceway #2 and placed in individual Heath trays. The eggs were treated every other day with 1,000 ppm formalin for 15 minutes. At approximately 370 temperature units the eggs had a strong eye-up. After confirmation from the Eagle Lab on disease samples, the eggs were shocked into a bucket with 100 ppm argentyne and transferred to the inside egg room for final incubation rearing.

At the time of spawning, ovarian samples were taken and sent to Eagle for IHNV testing. Samples from all 27 females tested negative for IHNV. Eye, heart, liver, and white muscle tissue samples were taken to Reg Reisenbachlor, U.S. Fish and Wildlife Service, for electrophoresis.

A total of 136,476 green eggs were obtained from 27 females for an average fecundity of 5,504 eggs per female. Total eyed eggs numbered 127,162 for a total percent eye-up of 93.2% (Appendices L-1 and L-2)

**Dworshak North Fork Stock**-Eyed steelhead eggs were received from Dworshak Hatchery on April 16, 22, 29, and May 6, 1993 (Appendix L-1). The eggs from egg takes 10 through 13 were incubated approximately 14 days at Dworshak until the eggs were eyed-up. All eggs from negative IHNV females were transported to Clearwater Fish Hatchery, then disinfected. The transport vehicle was met at the front gate, egg tubes were removed from egg coolers, and placed in clean egg coolers containing 200 ppm argentyne solution for ten minutes. The clean egg coolers were then taken to the incubation room and eggs were placed into Heath egg trays with one female per tray. A total of 869,900 eggs were received.

Each egg basket in the Heath stacks was loaded with approximately 5,000 eggs per basket, and water flows through each stack were set at six gpm. Results of the initial pick-off showed a 11.5% loss from handling and transportation mortality. Most of these eggs were lost from egg take number ten, which was probably the result of these eggs being double shocked and double picked just prior to shipment (Appendix L-2).

## **Early Rearing Procedures**

**Selway Stock**-At swim-up, unfed fry from Selway River B-run steelhead were moved to vats 28 through 30 and divided as evenly as possible (41,145 fish/vat). The initial DI was 0.21 and FI was 0.64. Final DI was 0.25 and FI was 0.31. The rearing area in the vats was extended to full length as soon as the fish were feeding well. Fish were held in the vats from September 15 to September 17, 1993, at which time they were moved to outside raceways (12 east and west).

Average length of the fish at the end of early rearing was 66 mm (2.6 inches). Fish averaged 306 fish/kg (138 fish/lb;  $c=4 \times 10^{-4}$ ).

No significant fish mortalities occurred during early rearing. There was some loss of cripples and "pinheads" during the first month (approximately 8.7%), but this loss decreased to about 0.4% per month in July, August, and September, 1993.

Biodiet Starter and Biodiet formula were used as feed during early rearing. A total of 1,721 pounds of food was used at a cost of \$1,182.75. The conversion rate for this period was 2.40 pounds of feed for 1 pound of gain.

All steelhead in early rearing were adipose fin-clipped, some with CWT or ventral fin-clipped, between early rearing and final rearing (Appendix Q).

**Dworshak North Fork Stock**-At swim-up, unfed fry from Dworshak stock B-run steelhead were moved to vats 6 through 27, and were divided as evenly as possible (34,055 fish/vat). The initial DI was 0.13 and FI was 0.3. The rearing area in the vats was extended to full length as soon as the fish were feeding well. Fish were held in the vats until August 23 through August 27, 1993, when they were moved to 14 outside raceways (1 through 7, east and west). Average length of the fish at the end of early rearing was 80 mm (3.1 inches). The fish averaged 207 fish/kg.

No significant fish mortalities occurred during early rearing. There was some drop-off of cripples and "pinheads" during the first month (approximately 3%), but this loss decreased to about 0.2% per month in July and August.

Water temperatures for the early rearing period ranged from 8°C to 14°C (46° to 57°F) (Appendix M). Due to a colder and wetter than normal summer, water temperatures stayed relatively constant. Whenever the temperatures exceeded 13°C (56°F) for more than two days, the water was cooled back down by either blending in more secondary water or by lowering the primary intake in Dworshak Reservoir. Gaining clearance to lower the intake requires 24-hour prior notice to the control room at the dam, so there was always some lag-time in making the adjustment. There were also times during the year when it was not possible to get clearance to enter the log boom because the dam was spilling water.

Bioproducts BioDiet Starter and Biodiet formulas were used to feed these fish during early rearing. A total of 8,361 pounds of feed was used, or 1.07 pounds of feed for 1 pound of gain.

## **Final Rearing Procedures**

**Selway Stock**-The juvenile Selway stock B-run steelhead were moved from vats 28 through 30 to steelhead raceways 12 (east and west sections). The move outside was completed during the period of September 15 through 17, 1993. The move was done in conjunction with the fin clipping operation of these fish.

The initial DI of these fish was 0.04 and the FI was 0.31. Final FI was 1.54 and final DI was 0.18.

Use of the bridge feeding system was suspended when it was discovered that the noise and movement produced by the system spooked the fish significantly enough to affect growth patterns. The bridge system was replaced with belt feeders which trickle feed out during the daylight hours. In response to a heavy toll of bird depredation in late December, the fish were crowded up near one end, and the raceway section was covered with chicken wire to prevent further losses. This made cleaning and feeding very difficult.

Fish were fed a 50-50 mix of Rangens and Bioproducts BioMoist feed throughout the final rearing. A total of 12,149 pounds of fish food was used during final rearing to produce 2,108 pounds of fish at a cost of \$5,538.34. The overall conversion rate from fry to smolt was 4.9 pounds of feed for 1 pound of gain. Conversion was poor due to overfeeding fish to try and get as much growth on them as possible before release and loss from bird depredation.

**Dworshak North Fork Stock**-The juvenile Dworshak stock B-run steelhead were moved from vats 6 through 27 to steelhead raceways 1 through 7 (east and west sections) during the period of August 23 to August 27. The move was completed in conjunction with the fin-clipping and CWT tagging operation of these fish to avoid double stressing by fin clipping at a later date. All fin clipping was performed in 16 hour shifts. Baffles were removed from vats, fish were then loaded into two 200-gallon transport tanks, then emptied into fin-clipping trailers. Fish were marked, counted, and sent down an aluminum pipe to the appropriate raceways (Appendix Q.)

After fin clipping, 50,027 Dworshak steelhead (at 86 fish/lb) were transported to the upper South Fork of Red River and released. The remaining 666,986 fish were loaded into 14 raceways according to plant site releases.

The initial DI of these fish ranged from 0.02 to 0.04, and the FI ranged from 0.18 to 0.22. These indices were recalculated biweekly and were never allowed to exceed a DI of 0.2 or FI of 1.10.

Water temperatures during the final rearing period were maintained to keep temperatures as close to 13°C (56°F) as possible (Appendix M). Reservoir water temperatures began to drop early in November and bottomed in mid-January at 5°C (41°F). Temperatures began to slowly increase in late March and had reached 8°C (46°F) by mid-April when the steelhead smolts were being stocked out. Estimated water flows per raceway was 2 cfs.

Growth rates were negatively effected by the steelhead bridge being non-functional over 40 days during final rearing. While the bridge was non-functional, fish could not be automatically fed and raceways could not be cleaned. Difficulties with the bridge included numerous electrical problems, contractors installing a new drive system and track, the motor burning out, and freezing weather which iced the wheels, freezing them to the walls. Most of these problems were later corrected.

The fish were fed a 50-50 mix of soft moist feed from Bioproducts and dry feed from Rangens for the first month after ponding. Fish were fed dry feed until released. A total of 151,624 pounds of fish food used during final rearing produced 66,617 pounds of fish at a cost of \$43,858.46. The overall conversion rate from fry to smolt was 2.2 pounds of feed for 1 pound of gain. Percent body weight fed ranged from 1.28% to 2.78%.

Floating shade structures were installed in all of the steelhead raceways. The fish appeared to utilize them during the daylight hours, especially when overhead movement (feeding and cleaning) occurred.

## **Fish Health**

Steelhead rearing experienced no epizootics.

**Acute Losses**-No acute losses were experienced from contagious etiologic agents. Chronic losses were usually a product of aeromonad or pseudomonad infection and no viral agents were isolated at this hatchery.

Clearwater Hatchery has made extra efforts to minimize disease losses, and to date, these efforts have been successful. Released steelhead did not exhibit any signs of cataracts this year (Appendix P).

### **Fish Marking**

All the Dworshak steelhead were adipose fin-clipped with some receiving CWT between August 23 and 27, 1993. A total of 200,051 fish were marked with adipose clips and CWT. A total of 465,760 fish were adipose-clipped only. An additional 45,320 fish were right ventral fin-clipped for supplementation, and 5,000 were PIT-tagged only for supplementation. An additional 1,350 fish were PIT-tagged prior to full smolt releases (Appendix Q).

The Selway steelhead were right ventral fin-clipped between September 15 and 17, 1993. A total of 114,140 fish were clipped, and 300 fish were PIT-tagged prior to release. All Selway steelhead were ventral clipped using a large portable station built at Clearwater Fish Hatchery, and no problems were encountered with the unit (Appendix Q).

### **Fish Distribution**

A total of 104,450 (8.92/lb) Dworshak B-run steelhead and 71,566 (24.6/lb) Selway B-run steelhead were transported to Crooked River raceways on April 18 and 19, 1994 for acclimation. Volitional releases began on this group on April 29, 1994 and were flushed from the raceways on May 3, 1994.

On April 18, 1994, an accidental spill of North Fork stock steelhead smolts occurred during unloading into the north raceway. Approximately 500 to 1,000 fish went onto the ground. Four people immediately collected the fish from the ground and put them into the raceway. Mortality from this accident was 20 to 30 fish.

On April 23, 1994, a supplier of our new punch plate screens removed each screen and replaced the old punch plate. The installer made no effort to communicate with us on this installation. The result was that there were fish in the supply line, sediment pond, and in the river. This occurred several days prior to the scheduled release date. We obtained a seine, removed all fish from the sediment pond, and released them directly into the river on the final release day.

Between April 25 and 26, 1994, a total of 393,065 Dworshak B-run steelhead were direct released at three plant sites on the lower South Fork of Clearwater River. These included 103,696 (9.99/lb) at the mouth of Cottonwood Creek, 104,302 (8.30/lb) at the park near Stites (milepost 18), and 185,067 (8.30/lb) at Red House Hole approximately 3.5 miles upstream of the Highway 14 junction. The remaining 153,860 (8.9/lb) Dworshak B-run steelhead were direct released into Clear Creek at Kooskia Hatchery on the middle fork of the Clearwater River. There was very little crowding and hauling mortality from the fish transportation to the release sites (Appendix R).

### **CONCLUSION and RECOMMENDATIONS**

Despite some major set-backs due to design deficiencies, and attempting to rear fish around clean-up contractors, the Clearwater Fish Hatchery crew was able to raise very good quality steelhead smolts. Although the fish quality was very good, there are several changes that should be made in the future. First, baffles need to be installed in all the raceways to improve efficiency and reduce

the labor needed to clean the ponds. Second, small tanks and/or raceways should be installed for rearing small groups of specialty fish. Third, outside raceways need to be covered with bird netting to prevent future bird depredations, as there is no satisfactory method of covering individual raceways. A variety of clean-up contract items are scheduled to be completed during 1994 and 1995, which will address most facility deficiencies.

#### **ACKNOWLEDGEMENTS**

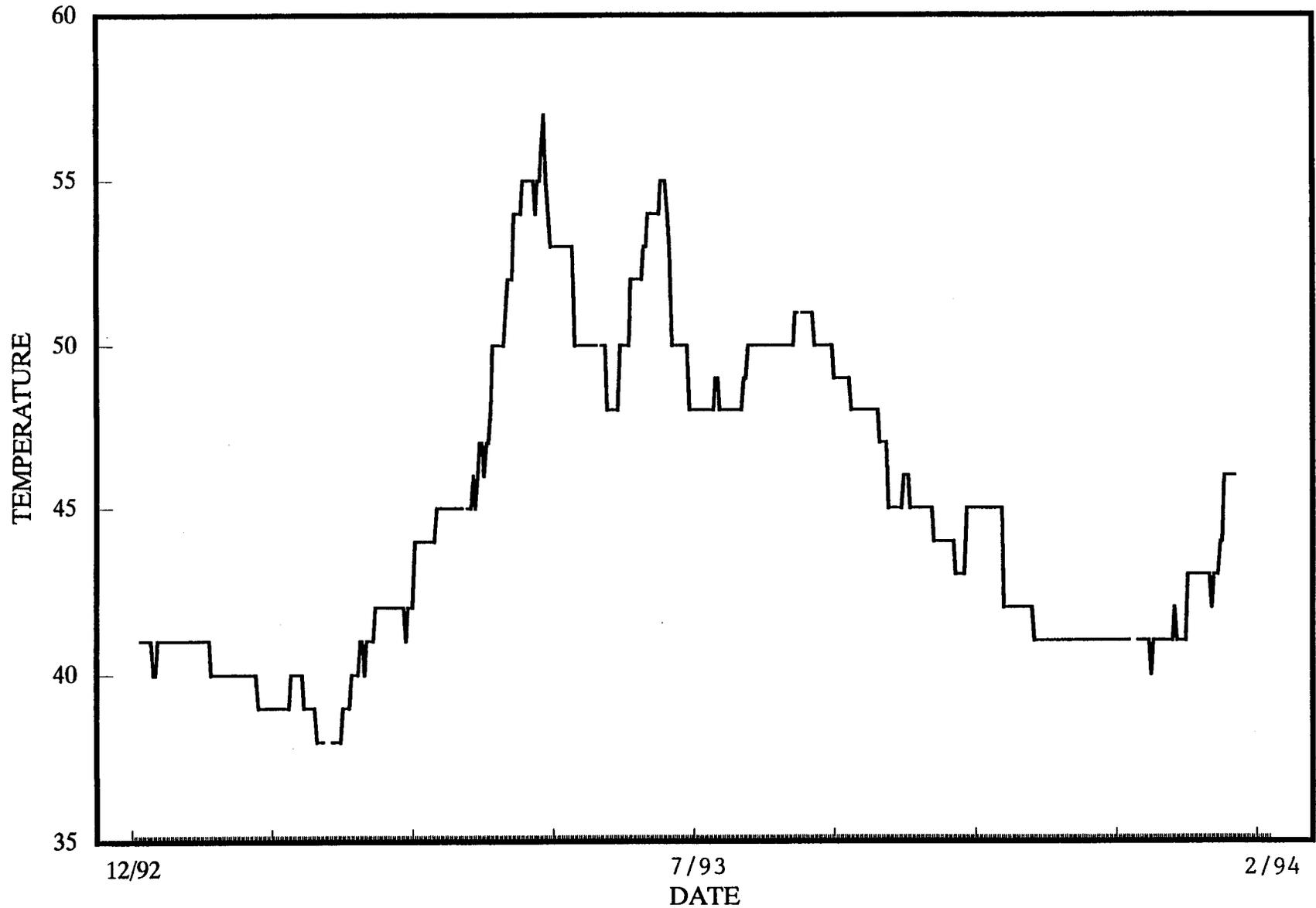
The Clearwater Hatchery crew is large, and all are assigned a wide diversity of responsibilities. Everyone on station has contributed to the success of the program. The hatchery crew consists of Jerry McGehee (Hatchery Superintendent III), Brad George (Hatchery Superintendent I), Doug Burton (Hatchery Superintendent I), Dan Baker, Kent Bourbon, John Rankin, CalLee Davenport, and Bob Turik (Fish Culturists), Ernie Yost (Utility Craftsman), Renee' Hedrick (Office Secretary), Don Davis, Ric Downing, and Don West (Fish Technicians), Dave Robertson, Shayne Goff, Dave Marsanskis, Dale Kellar, Tom Kendall, Yolanda Inguanzo, Brian Spence, John Walz, LeeRoy Jones, Bob Nelson, Jim Niles, Jeremy Olson, Colby Van Vooren, Kent Hills, and Tyler Rowland (Bio-aides).

Special acknowledgment goes to Ernie Yost, Utility Craftsman, and Don West, Ric Downing, and Don Davis, Fisheries Technicians, whose work was critical in getting the physical and mechanical aspects of the fish hatchery and satellites to function; Jerry McGehee, Fish Hatchery Superintendent III, who provided the leadership and logistic support that made this operation a success; CalLee Davenport, Fish Culturist, who helped with the editing of this report; and especially to Renee' Hedrick for editing and typing this manuscript.

**A P P E N D I C E S**

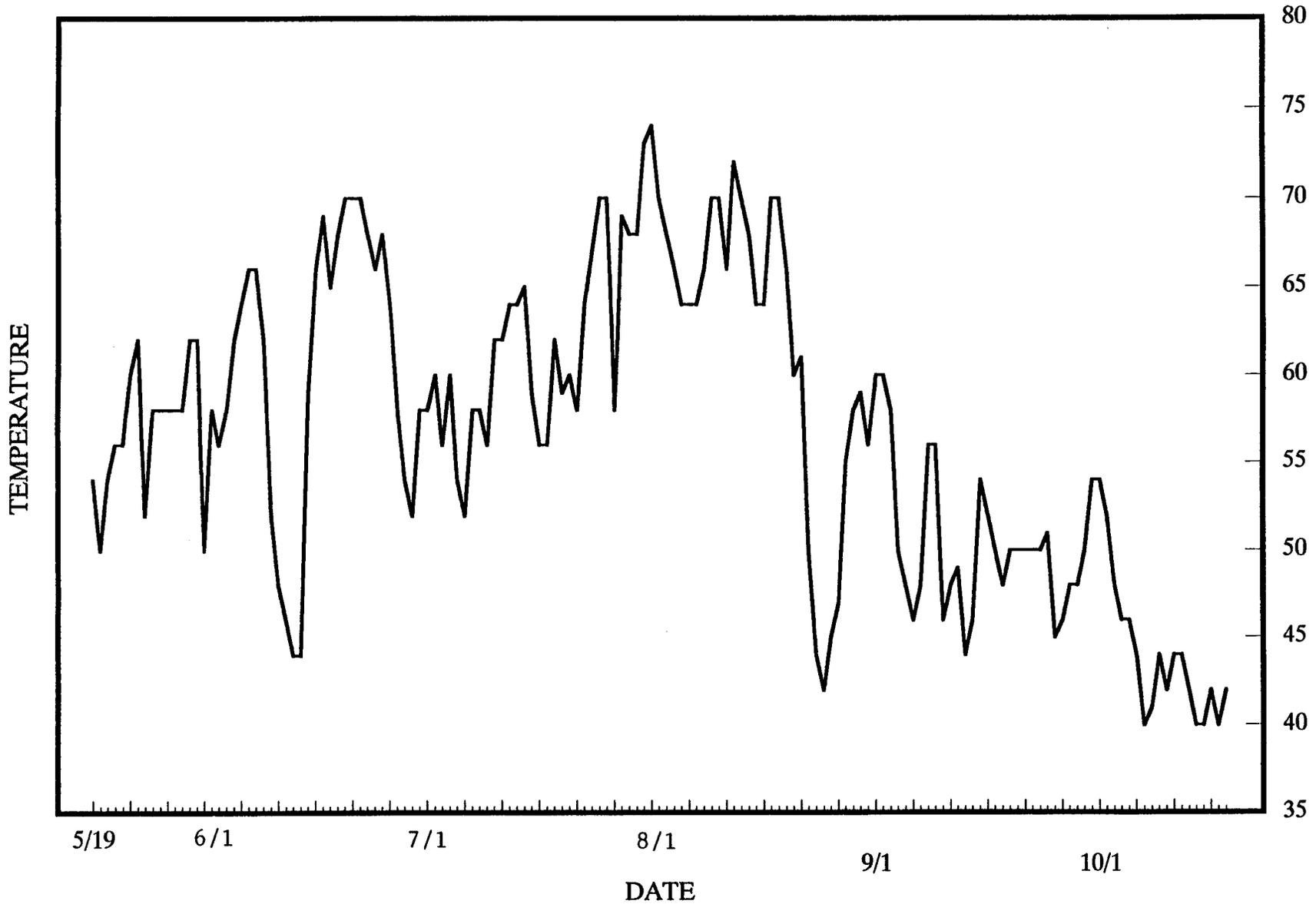
# CLEARWATER CHINOOK DAILY WATER TEMPERATURES

DEC. 1992 – APRIL 1994



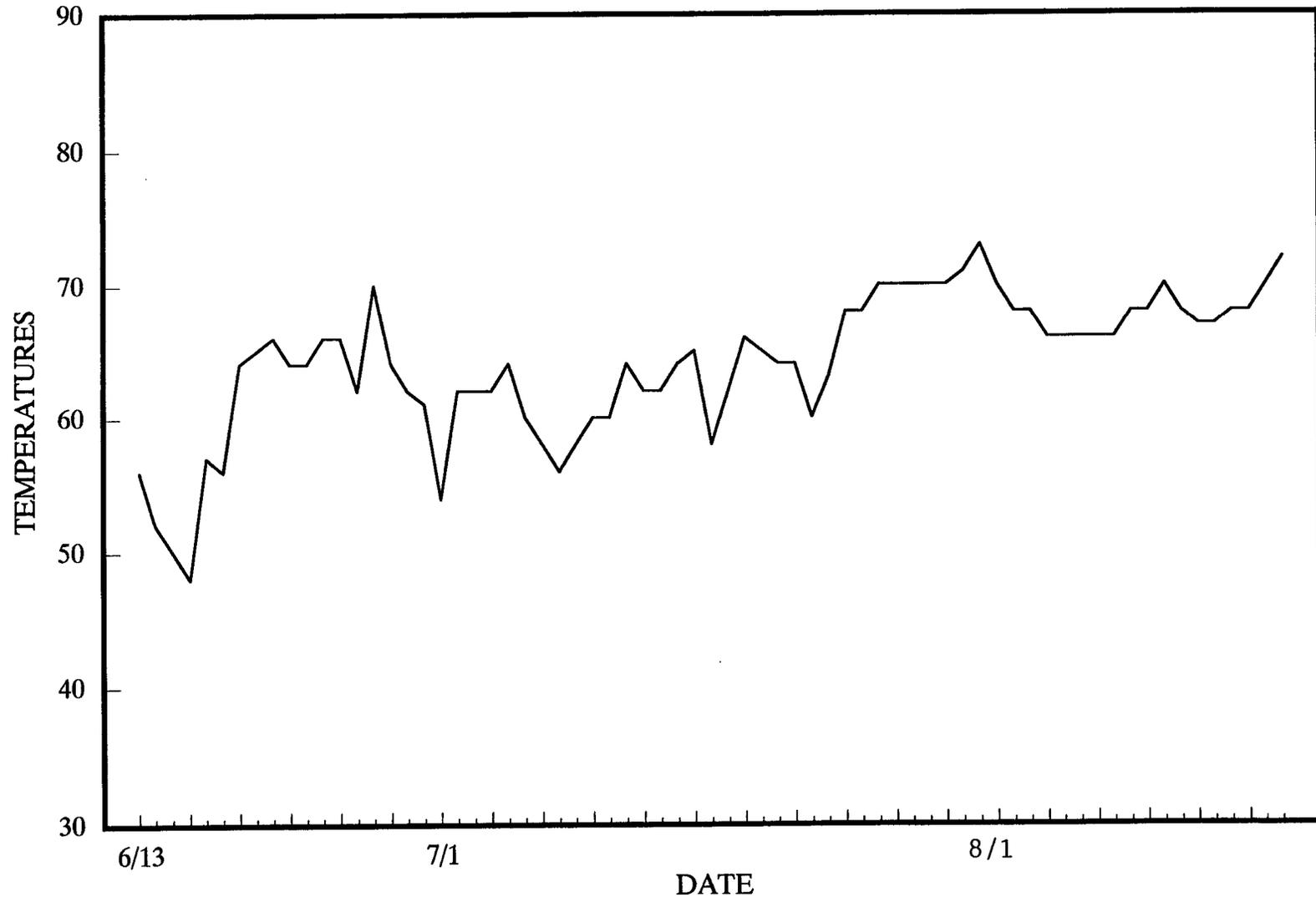
# RED RIVER DAILY WATER TEMPERATURES

BROOD YEAR 1992



# CROOKED RIVER DAILY WATER TEMPERATURES

BROOD YEAR 1992

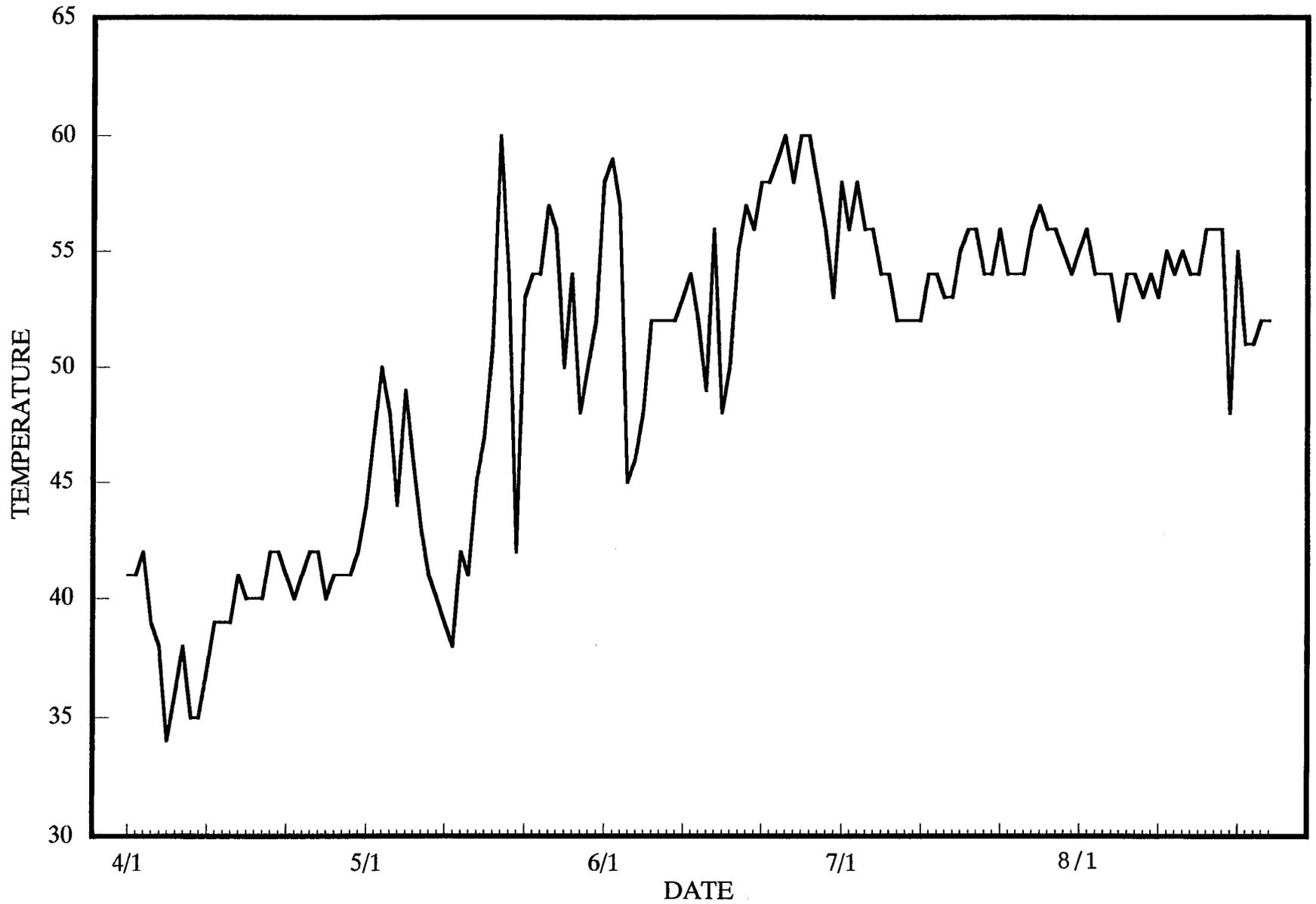


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Appendix A-5. Crooked River water temperatures.

# POWELL WATER TEMPERATURES

BROOD YEAR 1992



Appendix B. Water quality analysis for Clearwater Fish Hatchery, December 29, 1992.

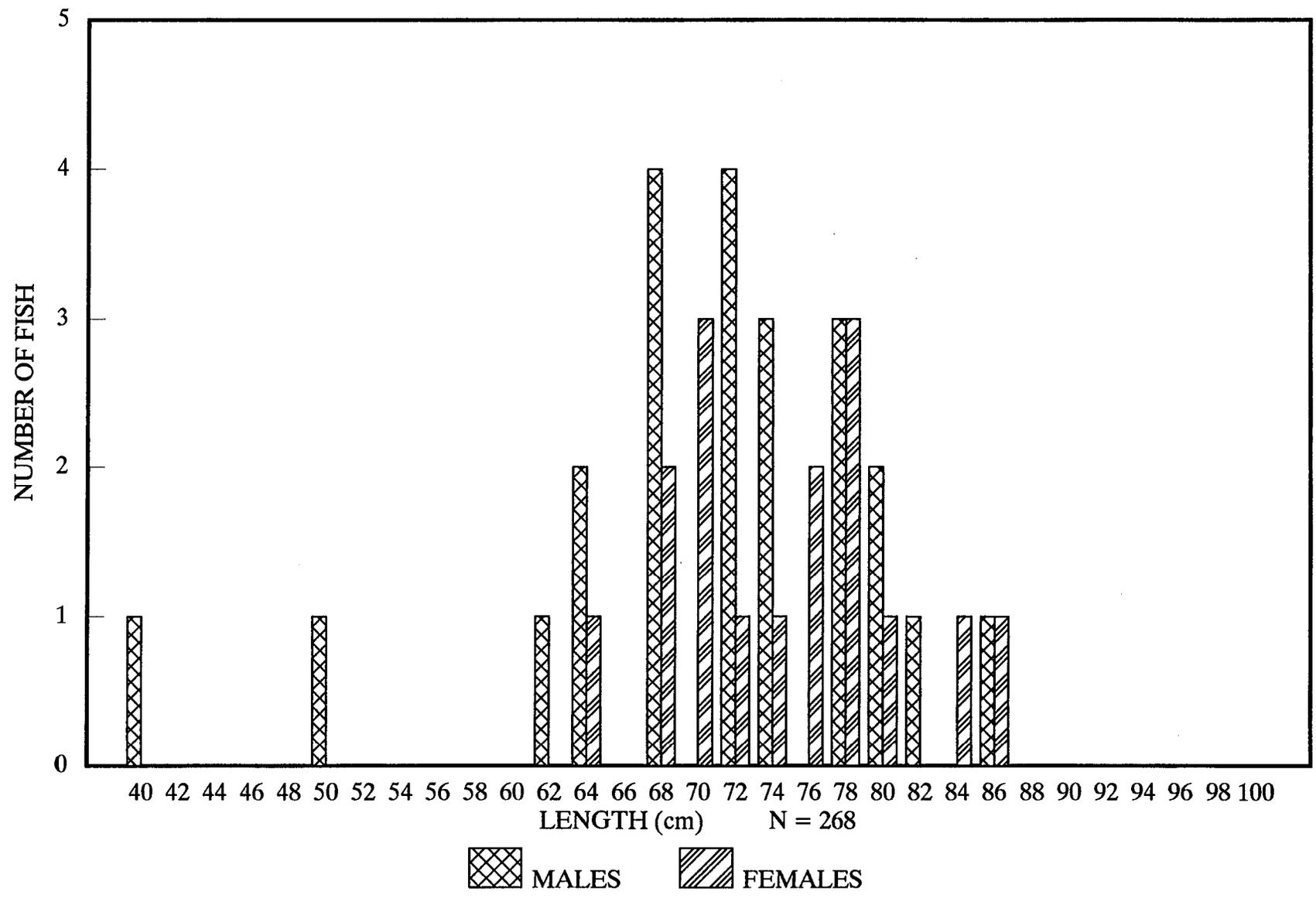
Test performed	Results (mg/L)	Optimal rearing levels
Alkalinity (total as CaCO <sub>3</sub> )	14	120 - 400
Ammonia	0.022	.0125
Arsenic	<0.01	
Barium	<0.1	
Cadmium	<0.001	.0004
Calcium	3.7	4 - 160
Chloride	2	
Chromium	0.01	
Color (C.U.)	5	
Copper	<0.01	
Corrosivity*	-0.76	.006
Cyanide	<0.005	
Detergents (surfactants)	<0.08	
Fluoride, colorimetric, distillation	<0.01	
Hardness (as CaCO <sub>3</sub> )	12	10 - 400
Hydrogen sulfide	<0.005	.002
Iron	0.03	0 - .15
Lead	<0.005	.03
Magnesium	0.7	
Manganese	<0.01	.01
Mercury	<0.0005	.002
Nitrogen nitrate (automated)	0.026	3
Potassium	0.7	
Selenium	<0.005	
Silica	11	
Silver	<0.001	
Sodium	1.8	
Sulfate	<1	
Total dissolved	27	
Zinc	0.002	.03
pH (pH units)	7.2	6.5 - 9.0

\* A positive Langlier index indicates a tendency of water to deposit calcium carbonate and a negative index indicates a tendency to dissolve to corrosion but to the deposition of a thin coherent scale which may be protective. Therefore, a slightly positive index is frequently associated with non-corrosive conditions and a negative index indicates the possibility of corrosion.

<u>Langlier index</u>	<u>Indicated water corrosive characteristics</u>
more negative than -2.0	Highly aggressive
-2.0 to 0.0	Moderately aggressive
more positive than 0.0	Non aggressive

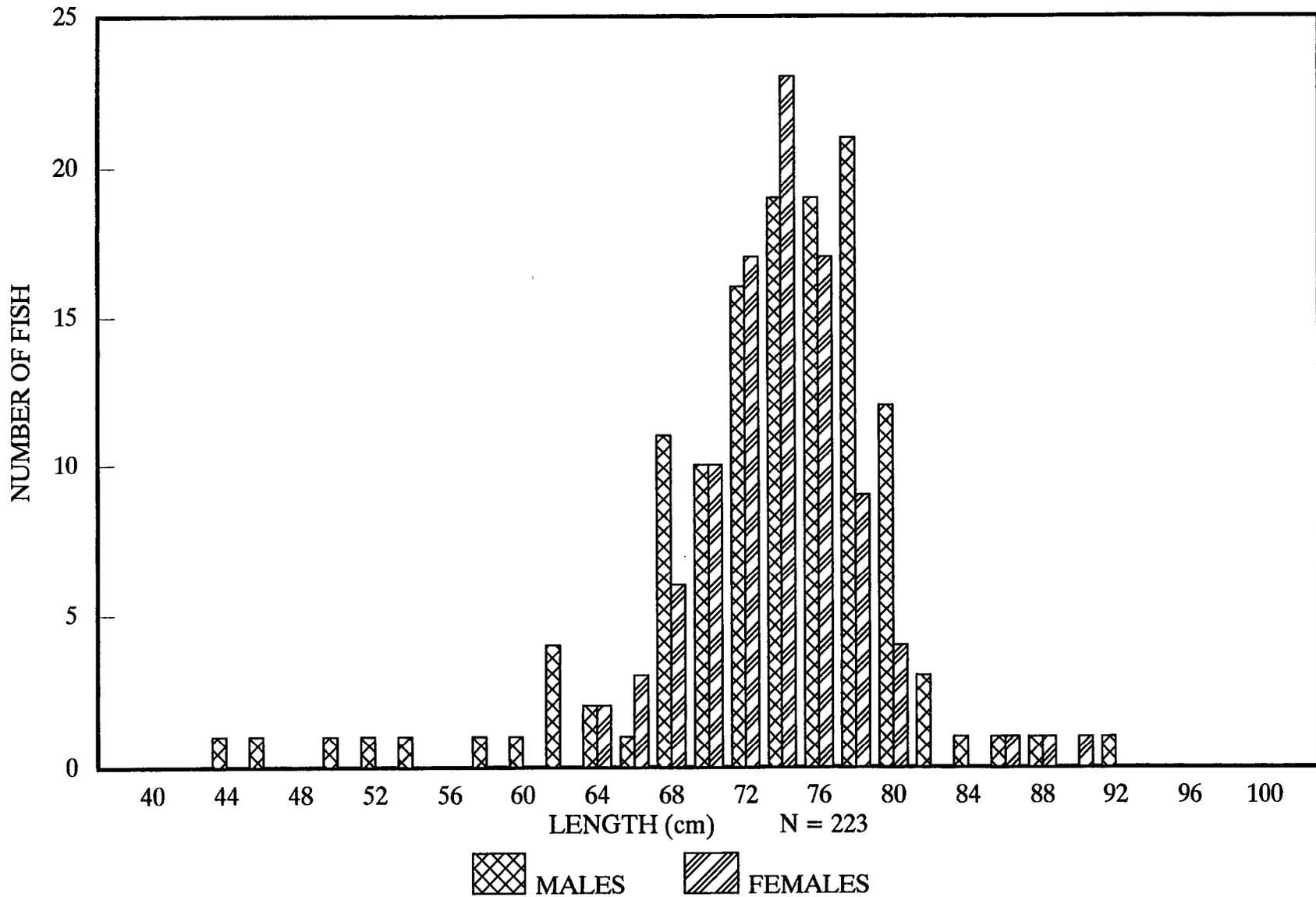
# SPRING CHINOOK SALMON LENGTH FREQUENCY

## RED RIVER TRAP 1992



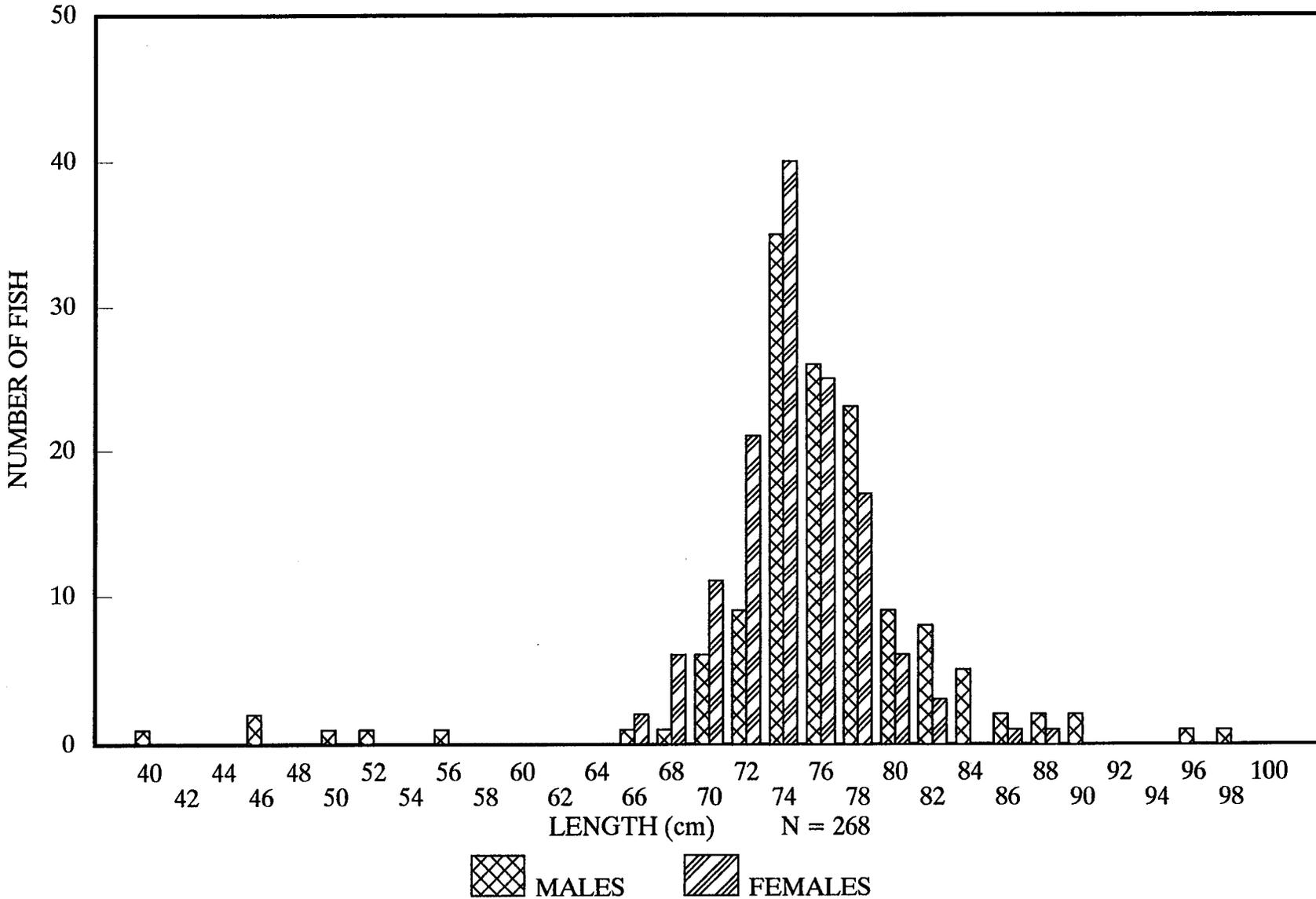
# SPRING CHINOOK SALMON LENGTH FREQUENCY

## CROOKED RIVER 1992



# SPRING CHINOOK SALMON LENGTH FREQUENCY

POWELL TRAP 1992



Appendix C-4. Red River 1992 chinook length frequency distribution.

Length (cm)	Red River	
	Males	Females
40	1	
42		
44		
46		
48		
50	1	
52		
54		
56		
58		
60		
62	1	
64	2	1
66		
68	4	2
70	3	
72	4	1
74	3	1
76	2	
78	3	3
80	2	1
82	1	
84	1	
86	1	1
88		
90		
92		
94		
96		
98		
100		
TOTALS :	23	16

Appendix C-5. Crooked River 1992 chinook length frequency distribution.

Length (cm)	Crooked River	
	Males*	Females
40	0	0
42	0	0
44	1	0
46	1	0
48	0	0
50	1	0
52	1	0
54	1	0
56	0	0
58	1	0
60	1	0
62	4	0
64	2	2
66	1	3
68	11	6
70	10	10
72	16	17
74	19	23
76	19	17
78	21	9
80	12	4
82	3	0
84	1	0
86	1	1
88	1	1
90	0	1
92	1	0
94	0	0
96	0	0
98	0	0
100	0	0
TOTALS:	129	94

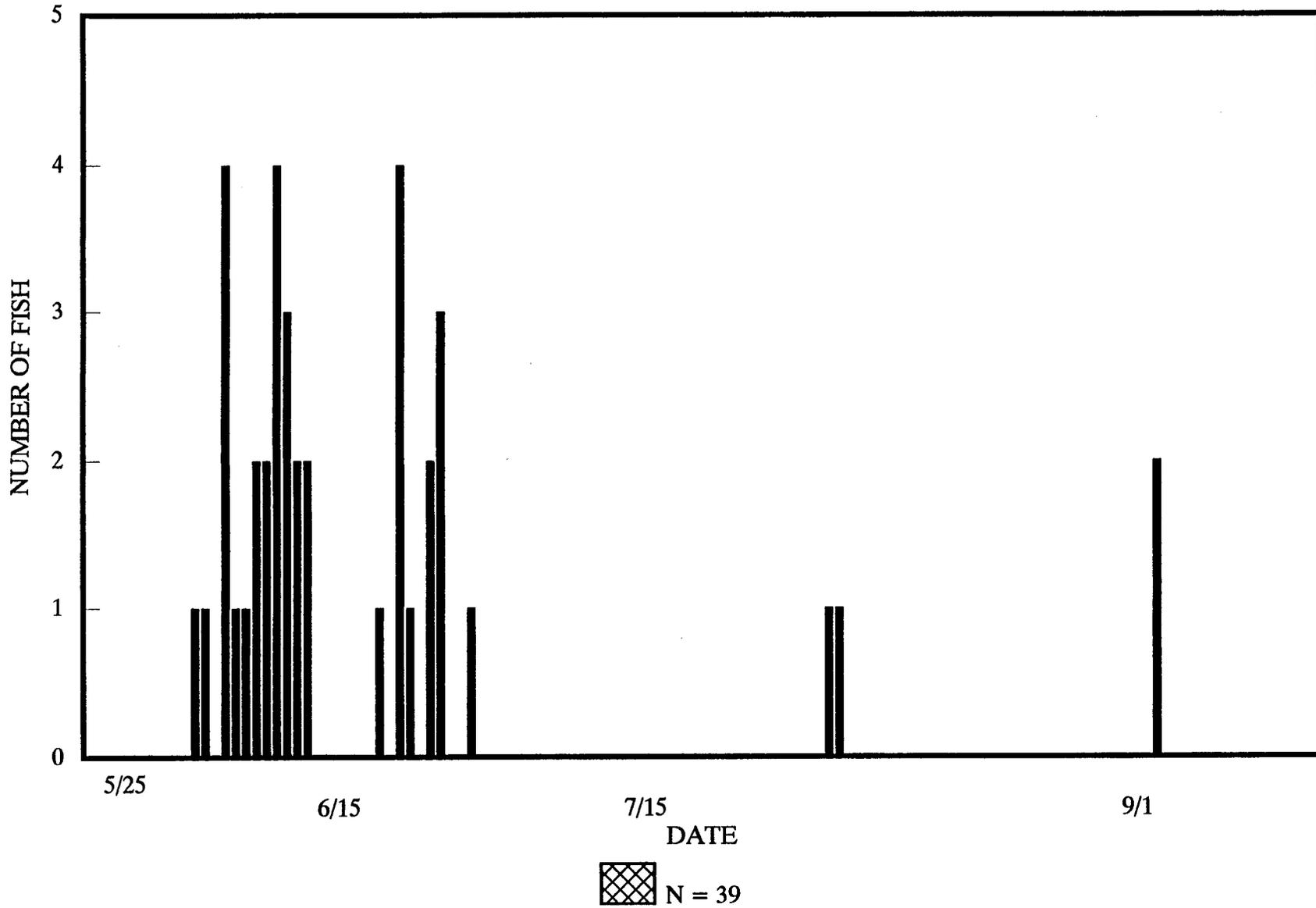
\* Note: Lengths unknown on five males.

Appendix C-6. Powell trap 1992 chinook length frequency distribution.

Length (cm)	Powell trap	
	Males	Females
40	1	
42		
44		
46	2	
48		
50	1	
52	1	
54		
56	1	
58		
60		
62		
64		
66	1	2
68	1	6
70	6	11
72	9	21
74	35	40
76	26	25
78	23	17
80	9	6
82	8	3
84	5	
86	2	1
88	2	1
90	2	
92		
94		
96	1	
98	1	
100		
TOTALS:	137	133

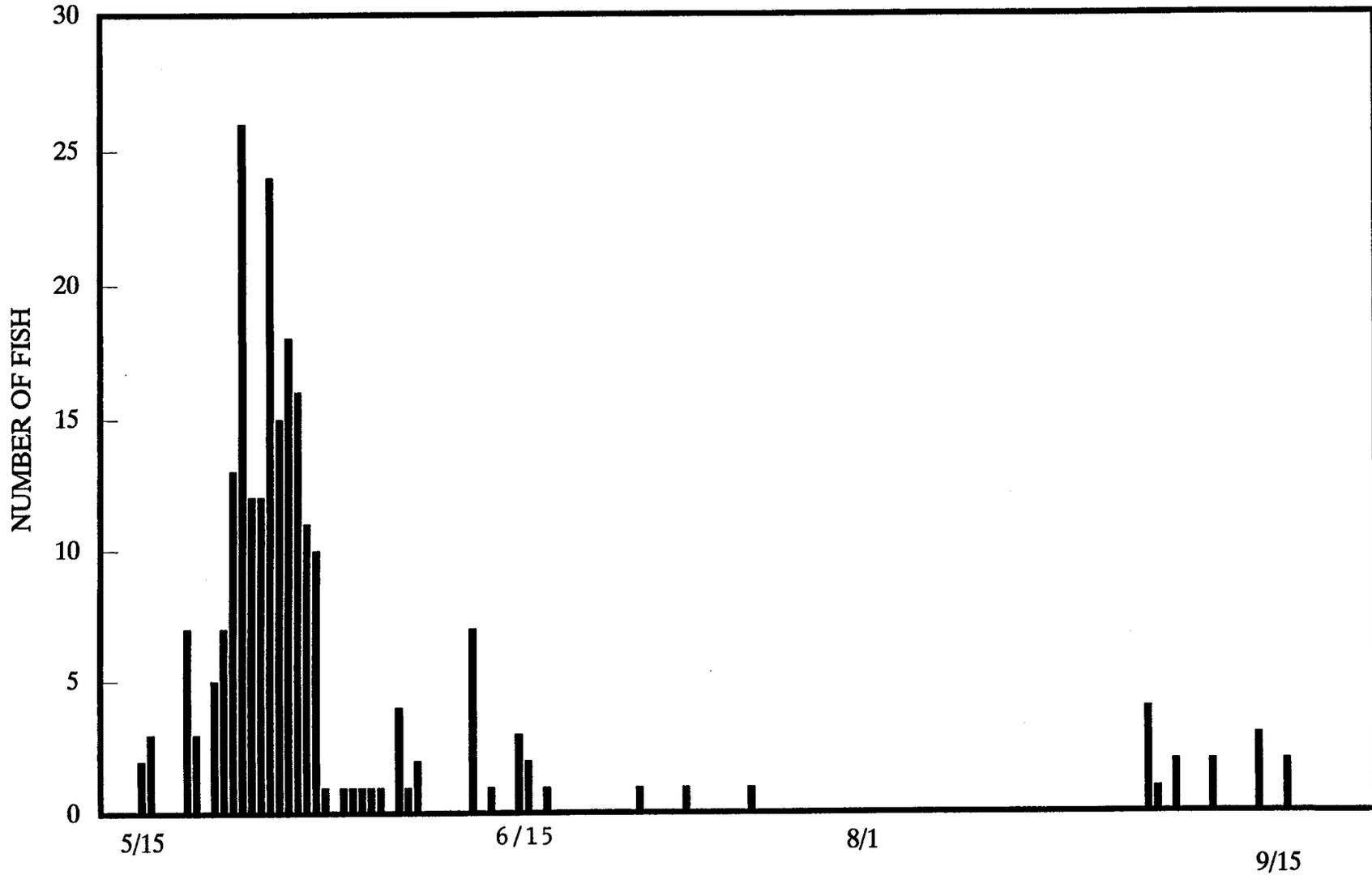
# SPRING CHINOOK SALMON RUN TIMING

RED RIVER 1992



# SPRING CHINOOK SALMON RUN TIMING

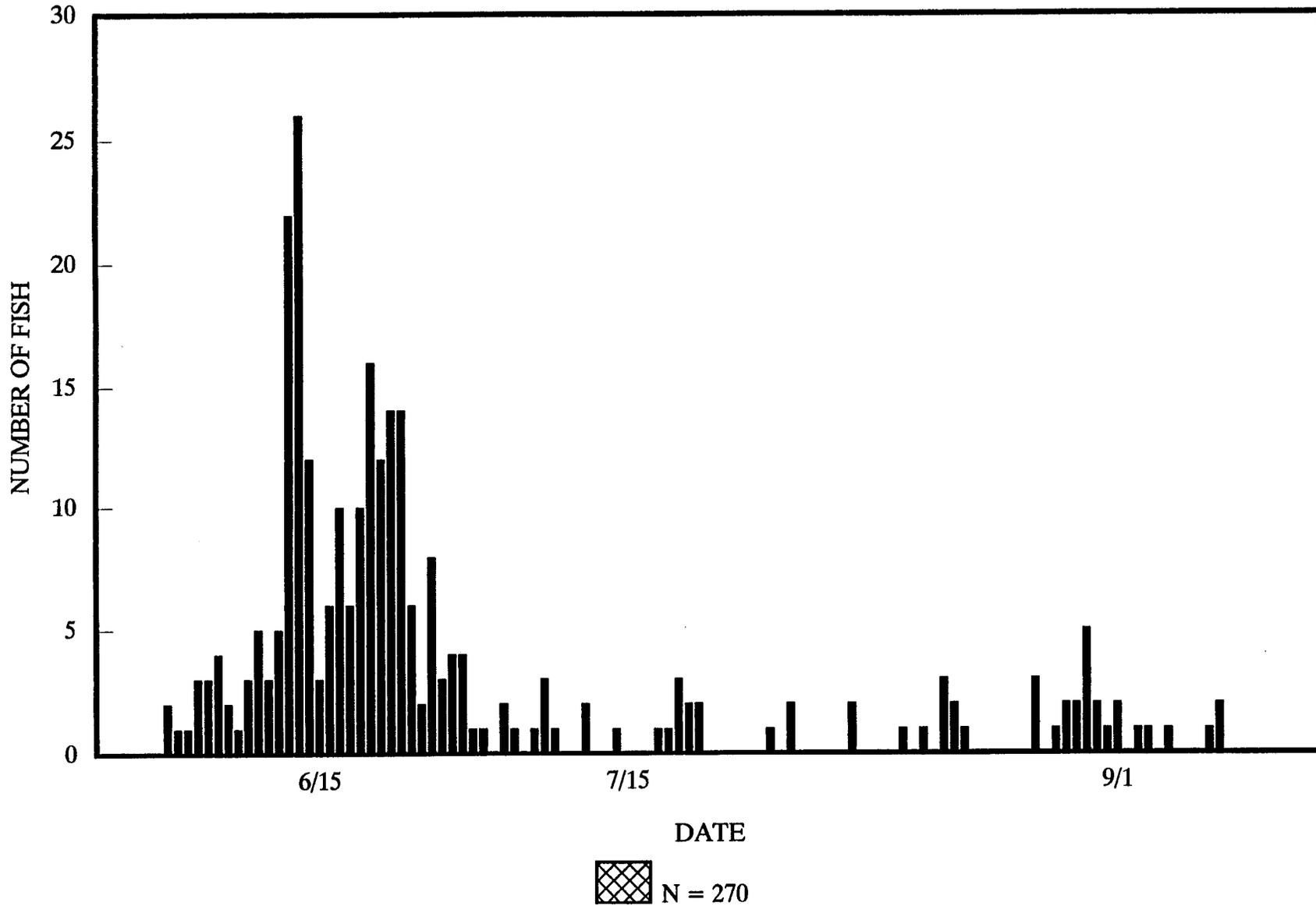
CROOKED RIVER 1992



DATE  
N = 228

# SPRING CHINOOK SALMON RUN TIMING

POWELL TRAP 1992





Appendix D-5. Crooked River 1992 run timing

Date	Number of fish	Date	Number of fish
5/15	2		0
	3		0
	0		1
	0		0
	0		0
	7		0
	3		0
	0		0
	5		0
	7		0
	13		0
	26		0
	12		0
	12		0
	24	8/1	0
	15		0
	18		0
6/1	16		0
	11		0
	10		0
	1		0
	0		0
	1		0
	1		0
	1		0
	1		0
	1		0
	0		0
	4	8/15	0
	1		0
	2		0
6/15	0		0
	0		0
	0		0
	0		0
	0		0
	7		0
	0		0
	1		0
	0		0
	0		0
	3		0
	2		0
	0		0
	1		0
	0	9/1	4
	0		1
7/1	0		0
	0		2
	0		0
	0		0
	0		0
	0		2
	0		0
	1		0
	0		0
	0		0
	0		3
	0		0
	1	9/15	0
	0		2
7/15	0		
	0		
	0		

Appendix D-6. Powell 1992 chinook run timing.

Date	Number of fish	Date	Number Of fish
	0	7/15 Cont.	2
	0	8/1	0
	0		0
6/1	2		0
	1		0
	1		0
	3		2
	3		0
	4		0
	2		0
	1		0
	3		1
	5		0
	3		1
	5		0
	22	8/15	3
	26		2
6/15	12		1
	3		0
	6		0
	10		0
	6		0
	10		0
	16		0
	12		3
	14		0
	14		1
	6		2
	2		2
	8		5
	3		2
	4		1
	4	9/1	2
7/1	1		0
	1		1
	0		1
	2		0
	1		1
	0		0
	1		0
	3		0
	1		1
	0		2
	0		0
	2		0
	0		0
	0	9/15	0
7/15	1		0
	0		0
	0		0
	1		
	1		
	3		
	2		
	2		
	0		
	0		
	0		
	0		
	0		
	0		
	1		
	0		

Appendix E-1. Red River summary of chinook trapped, released, spawned and disposition of carcasses.

Age classes	Females	Males
3 Years = (< 64 cm)	0	5
4 Years = (64-82 cm)	14	17
5 Years = (>83 cm)	<u>2</u>	<u>1</u>
Total	16	23
Total fish trapped:		39

Fish disposition females:

Spawned	6
Released	10
Mortality	<u>0</u>
Total	16

Fish disposition males:

Spawned	6 adults	1 jack	7 total
Released	12 adults	4 jacks	16 total
Mortality	<u>0</u>		
Total	23		

All spawning carcasses were returned to Red River, scattered to the mouth below the trap.

Egg take and eye up

Spawn date	Green egg Estimate	Eyed eggs	Percent eye up	Females
8/25	6,523	6,294	96.5	2
8/31	7,377	7,227	98.0	2
9/3	8,964	8,416	93.9	2
Totals:	22,864	21,937	95.9	6

Appendix E-2. Crooked River summary of chinook trapped, released, spawned and disposition of carcasses.

Acre classes	Females	Males
3 YRS. (<64 cm)	0	13
4 YRS. (64-82 cm)	91	117
5 YRS. (>83 cm)	3	4
Total fish trapped:		228

Fish disposition females:

Ponded*	5
Released	86
Mortality	<u>3</u>
Total	94

Fish disposition males:

Ponded*	4 adults	1 jack
Released	110 Adults	10 Jacks
Mortality	<u>7</u> Adults	2 Jacks
Total	121 Adults	13 Jacks

All mortality carcasses were returned to Crooked River and scattered throughout the drainage.

\* Fish ponded were held until ripe and returned to Relief Creek, as part of Russ Kiefer's study.

Appendix E-3. Powell summary of chinook trapped, released, spawned and disposition of carcasses.

Age classes	Females	Males
3 yrs. (<64 cm)	0	6
4 Yrs. (64-82 cm)	131	118
5 Yrs. (>83 cm)	<u>2</u>	<u>13</u>
Total	133	137
Total fish trapped:		270

Fish disposition females:

Spawned	128
Released	0
Mortality	<u>5</u>
Total	133

Fish disposition males:

Spawned	121*	Adults	6	Jacks	Total	127
Released	0					
Mortality	10					
Ponded/released	<u>28**</u>					
Total	137					

\* Some males were used twice for spawning.

\*\* Entered trap after all females were spawned. Held until trap was closed and then released

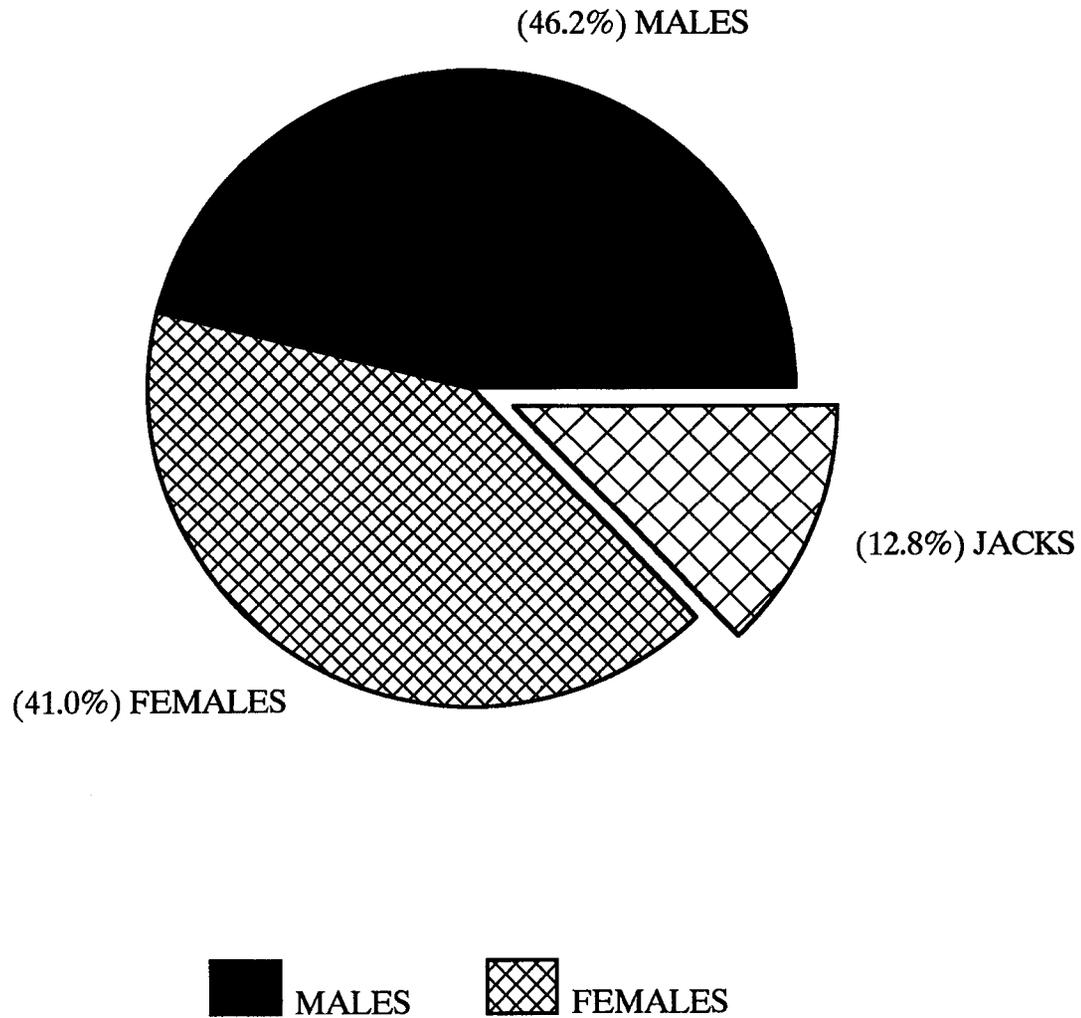
All spawned and mortality carcasses were returned to the Lochsa River below the trap.

Egg takes and eye up

Spawn date	Green egg estimate	Eyed eggs	Percent eye up	Females
8/14	156,490	138,554	88.5	40
8/17	82,493	76,639	92.9	21
8/20	122,510	105,336	86.0	29
8/24	77,466	74,012	95.5	18
8/27	37,744	35,959	95.3	9
8/31	44,311	42,608	96.2	11
Total 6 dates:	521,014	473,108	90.8	128

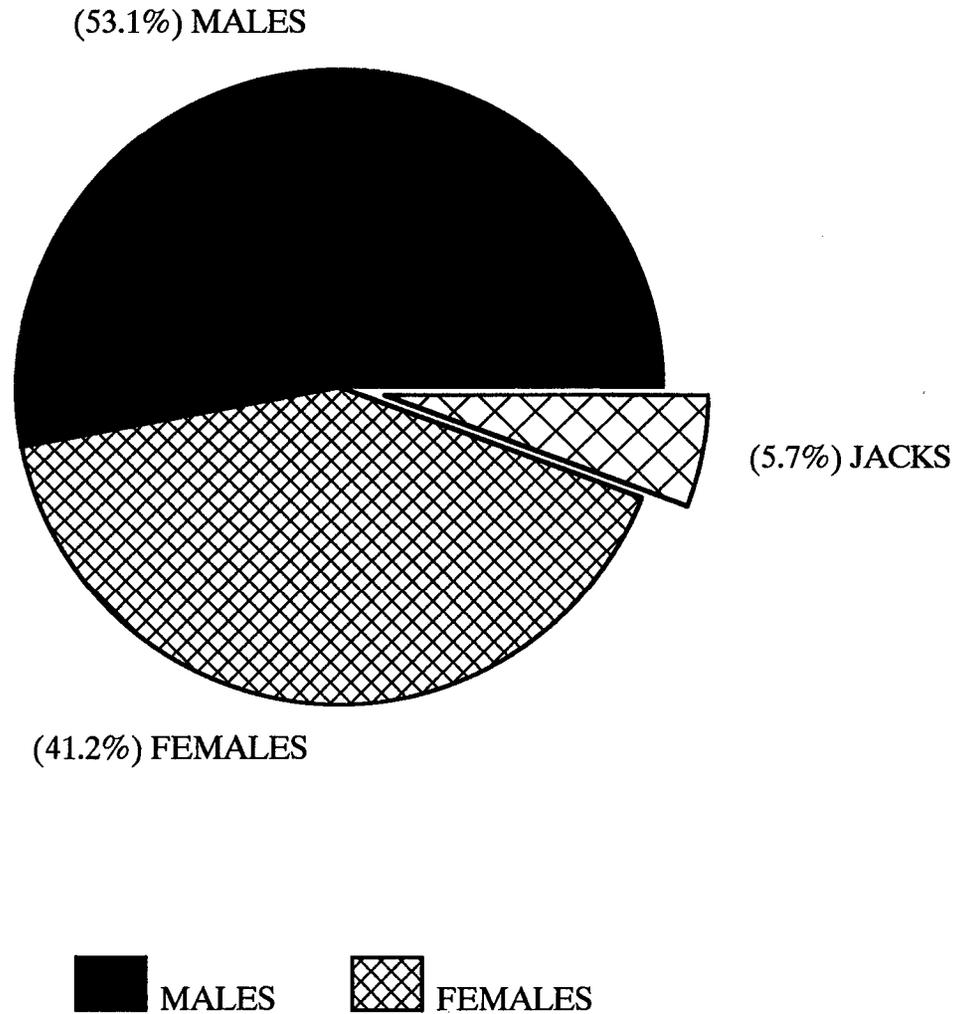
# CHINOOK RUN COMPOSITION

RED RIVER 1992



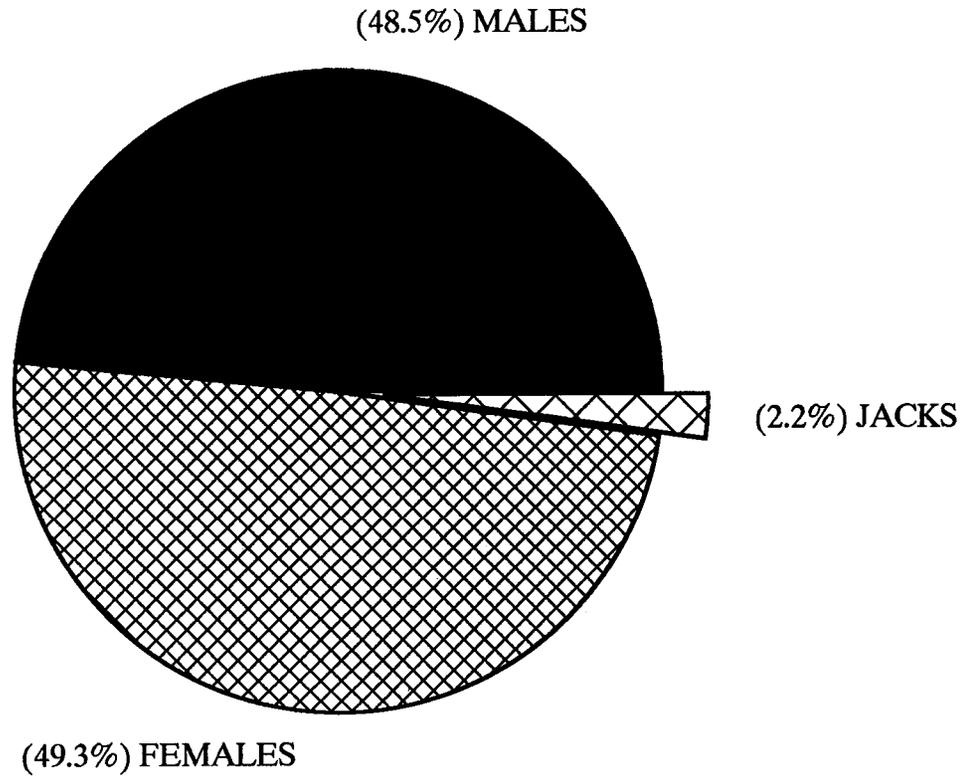
# SPRING CHINOOK SALMON RUN COMPOSITION

CROOKED RIVER 1992



# SPRING CHINOOK SALMON RUN COMPOSITION

POWELL TRAP 1992



■ MALES    ▨ FEMALES

Appendix G-1. Summary of spring chinook returns to Red River by brood year.

Brood year	Year released	Number released	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Total brood year return	Percent return from plant
1982	Fall 1983 Spring 1984	260,000 40,000	2	1985	a	1986	107	1987	109	0.036%
1983	Spring 1985 <sup>b</sup>	80,000	a	1986	377	1987	259	1988	636	0.795%
1984	Spring 1986 <sup>b</sup>	136,800	35	1987	132	1988	74	1989	241	0.176%
1985	Fall 1986 <sup>c</sup> Spring 1987 <sup>c</sup>	96,400 96,800	3	1988	25	1989	13	1990	41	0.021%
1986	Fall 1987	233,100	5	1989	38	1990	8	1991	51	0.022%
1987	Fall 1988	291,200	2	1990	9	1991	3	1992	14	0.005%
1988	Fall 1989	240,500	1	1991	31	1992	39	1993	71	0.029%
1989	Fall 1990	273,800	5	1992	99	1993		1994	104	0.022%
1989	Spring 1991 <sup>d</sup>	63,000								
1989	Spring 1991 <sup>e</sup>	124,000								
1990	Fall 1991	354,700	1	1993		1994		1995	1	0.002%
1990	Spring 1992 <sup>f</sup>	207,500								
1991	Fall 1992	6,000		1994		1995		1996	0	
1992	Fall 1993	22,246		1995		1996		1997	0	0.000%

<sup>a</sup> Trap was not installed in 1986 due to construction.

<sup>b</sup> These fish overwintered in the rearing pond.

<sup>c</sup> These fish were Rapid River stock reared at Sawtooth and released directly into Red River with no acclimation.

<sup>d</sup> Planted off bridge at ranger station, reared at Dworshak National Fish Hatchery, Clearwater stock.

<sup>e</sup> Planted off bridge at ranger station, reared at Kooskia, Clearwater stock.

<sup>f</sup> Acclimated in rearing pond for 21 days, transferred from Dworshak.

Appendix G-2. Summary of spring chinook returns to Crooked River by brood year.

Brood year	Year released	Number released	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Total brood year return	Percent return from plant
1985		-		1988	----	1989	4	1990	4	ERR
1986	----	----	----	1989	23	1990	5	1991	28	ERR
1987	Spring 1989 <sup>a</sup>	199,700		2	1990	13	1991	7	1992	22
1988	Spring 1990 <sup>b</sup>	300,407	2	1991	208	1992	276	1993	486	0.162%
1989	Fall 1990 <sup>c</sup>	339,087	13	1992	119	1993		1994	132	0.039%
1990	Fall 1991 <sup>a</sup>	320,400	7	1993		1994		1995	7	0.002%
1991	----	----		1994		1995		1996	0	0.000%
1992	Spring 1994 <sup>d</sup>	273,766		1995	1996	1997			0	0.000%

<sup>a</sup> Transferred from Dworshak Hatchery.

<sup>b</sup> Direct release from Kooskia Hatchery.

<sup>c</sup> Transferred from Dworshak and Rapid River hatcheries.

<sup>d</sup> Eggs from Looking Glass Hatchery (Rapid River stock) reared at Clearwater Hatchery.

Appendix G-3. Summary of spring chinook returns to Powell by brood year.

Brood year	Year released	Number released	3-year-olds	Year returned	4-year-olds	Year returned	5-year-olds	Year returned	Total brood year return	Percent return from plant
1984	Spring 1986	----		1987		1988	16	1989	16	ERR
1985	Spring 1987	----		1988	111	1989	20	1990	131	ERR
1986	Spring 1988 <sup>a</sup>	200,100	27	1989	157	1990	10	1991	194	0.097%
1987	Spring 1989 <sup>b</sup>	200,639	2	1990	16	1991	15	1992	<b>33</b>	0.016%
1988	Fall 1989	314,500	7	1991	249	1992	288	1993	544	0.173%
1989	Fall 1990 Spring 1991 <sup>c</sup>	307,100 180,764	6	1992	204	1993		1994	210	0.043%
1990	Fall 1991 Spring 1992 <sup>d</sup> Spring 1992 <sup>e</sup>	358,400 150,800 53,500	8	1993		1994		1995	8	0.001%
1991	Fall 1992 <sup>f</sup> Fall 1992 <sup>g</sup>	500 7,600		1994		1995		1996	0	0.000%
1992	Spring 1994 <sup>h</sup> Spring 1994 <sup>i</sup> Spring 1994 <sup>j</sup>	144,823 61,060 55,745		1995		1996		1997	0	0.000%

<sup>a</sup> Rapid River stock reared at Dworshak.

<sup>b</sup> Clearwater stock reared at Kooskia and Dworshak.

<sup>c</sup> Clearwater stock reared at Kooskia; acclimated in rearing pond.

<sup>d</sup> Acclimated 21 days in rearing pond before release into Walton Creek, transferred from Dworshak.

<sup>e</sup> Not acclimated, transferred to rearing pond and immediately released.

<sup>f</sup> These smolts were released from the rearing pond to Walton Creek.

<sup>g</sup> Released at headwaters of Crooked Fork Creek

<sup>h</sup> Acclimated 17 days, volitional release 5 days, release in Walton Cr.

<sup>i</sup> Non-acclimated, transferred to rearing pond and immediately released.

<sup>j</sup> Released directly into Walton Creek.

Appendix H. Brood Year 1992 chinook presmolt and smolt distribution.

Destination	Date	Weight	Number/ pound	Number Released
Meadow Cr - Selway R	7/20/93	540	100.0	54,100
Meadow Cr - Selway R	7/22/93	600	100.0	59,600
White Sands Cr - Lochsa	8/4/93	1,127	35.5	40,000
White Sands Cr - Lochsa	8/5/93	1,127	35.5	40,000
Big Flat Cr - Lochsa	8/5/93	1,151	35.5	40,875
Squaw Cr - Lochsa	8/5/93	340	35.5	12,000
Pete King Cr - Lochsa	8/6/93	340	35.5	12,000
Red River	10/12/93	1,059	21.0	22,246
Powell (acclimated)	4/8 - 13/94	11,755	12.3	144,823
Powell (non-acclimated)	4/13/94	5,232	11.7	61,060
Walton Cr	4/14/94	4,160	13.4	55,745
Papoose Cr	4/15/94	1,158	13.9	16,110
Crooked River	4/8 - 14/94	18,166	15.1	273,766
Total		46,755		832,325

Appendix I. Brood year 1992 chinook marking and tagging data.

Release site	Date marked	Number marked	Type of mark/code	Purpose	Number of marked fish released	Site group release
Meadow Creek - Selway River	6/93	113,817	Ad-clip supplementation	Tribal	113,700	113,700
White Sands - Lochsa River	6/93	80,077	LV, 1k PIT	Supplementation	80,000	80,000
Big Flat Creek - Lochsa River	6/93	41,000	LV, 1k PIT	Supplementation	40,875	40,875
Squaw Creek - Lochsa River	6/93	12,015	LV, 1k PIT	Supplementation	12,000	12,000
Pete King Creek - Lochsa River	6/93	12,015	LV, 1k PIT	Supplementation	12,000	12,000
Red River	6/93	22,279	RV, 1k PIT Ad clip, CWT	Management	22,246	22,246
Powell (acclimated)	6/93	145,179	1K PIT Ad clip, CWT	Management	144,823	144,823
Powell (non-acclimated)	6/93	61,144	500 PIT	Management	61,060	61,060
Walton Creek	6/93	56,267	Ad clip, PIT	Management	55,745	55,745
Papoose Creek	6/93	16,165	500 LV, PIT Ad Clip	Supplementation	16,110	16,110
Crooked River	6/93	306,675	500 PIT	Management	273,766	273,766

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Appendix K. Brood year production cost.

Rearing to Release	Chinook Brood Year 1992	Steelhead Brood Year 1993
No. Produced	832,325	772,968
Weight	46,755	77,805
Percent Mortality	8.1	14.8
Conversion Rate	2	2.2
Food Fed and Weight Gained		
Period Fed	12/3/92 - 4/11/94	6/5/93 - 5/1/94
Feed Used LBS.	101,401	173,855
Weight Gain	48,391	78,757
Cost	\$73,269.55	\$56,497.48
Operating cost using total budget (less capital outlay)		
Cost to operate entire project for 1992 - 1993		
Personnel Cost	\$444,005.00	
Operation Cost	\$331,264.00	
Capital Outlay	<u>\$60,559.00</u>	
Total	\$835,828.00	

Appendix L-1. Brood year 1993 steelhead (B) eggs received from Dworshak National Fish Hatchery.

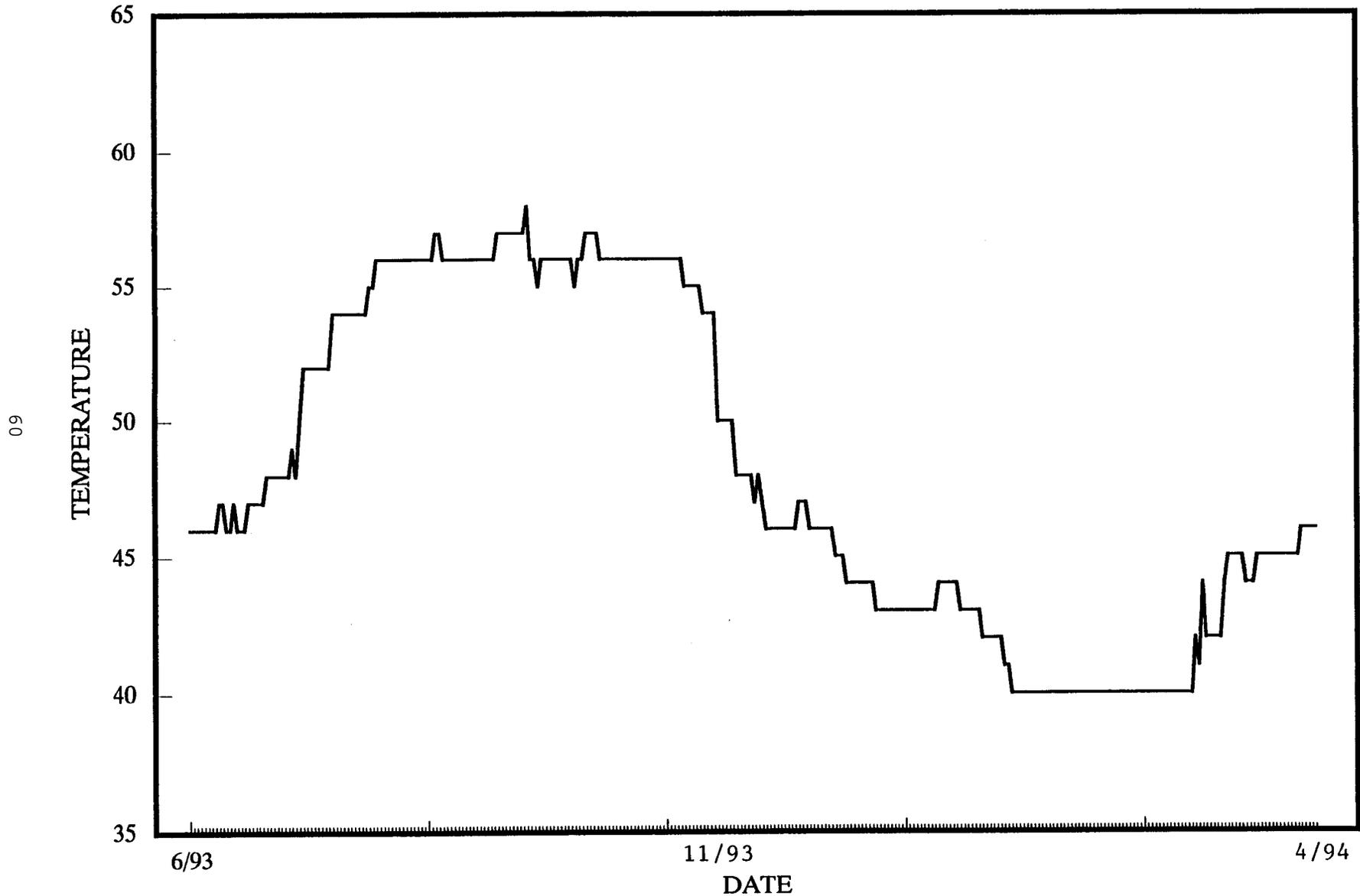
Egg take number	Eyed egg deliver date	Number eyed eggs	Temperature units
10	4/16/93	240,000	368
11	4/22/93	209,900	354
12	4/29/93	250,000	340
13	5/06/93	170,000	340
Total		869,900	

Appendix L-2. Brood year steelhead survival from eggs to released smolts.

Stock	Number of green eggs	Number of eyed eggs	Percent survival	Percent 500/lb	Released survival	Percent smolts	Survival
Dworshak	Reared at Dworshak	869,900	88.5	755,500	86.8	701,400	80.6
Selway	136,400	127,100	93.2	116,300	85.3	71,600	52.3

# CLEARWATER STEELHEAD DAILY WATER TEMPERATURES

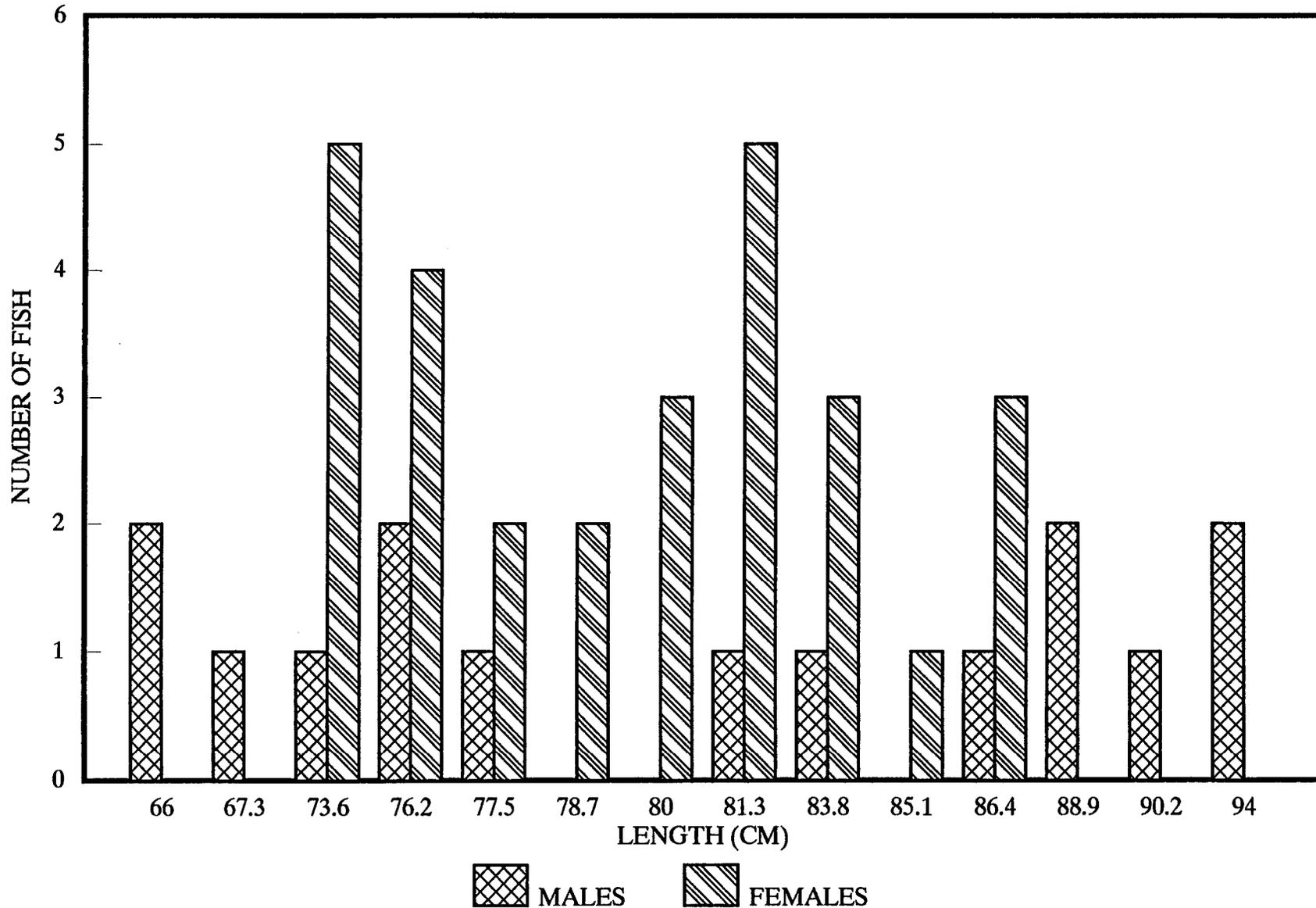
DEC. 1992 – APRIL 1994



Appendix M. Clearwater Hatchery steelhead daily water temperatures.

# SELWAY STEELHEAD LENGTH FREQUENCIES

BROOD YEAR 1993

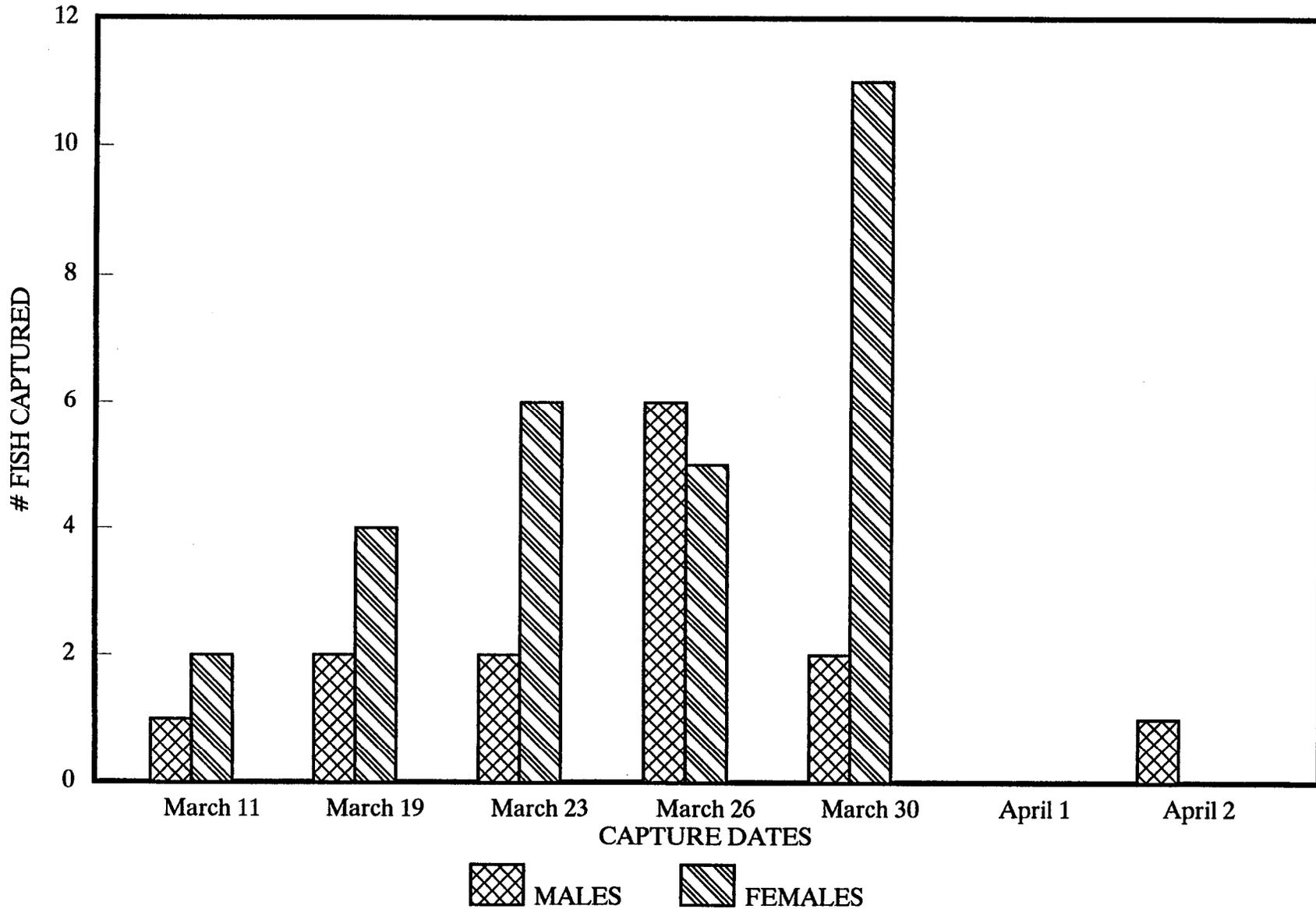


Appendix N-2. Selway steelhead length frequency distribution.

Length (cms)	Selway River	
	males	females
66	2	0
67.3	1	0
73.6	1	5
76.2	2	4
77.5	1	2
78.7	0	2
80	0	3
81.3	1	5
83.8	1	3
85.1	0	1
86.4	1	3
88.9	2	0
90.2	1	0
94	2	0
Totals:	14	28

# SELWAY STEELHEAD

## CAPTURE RECORD



Appendix P. Brood year 1993 steelhead fish marking.

Stock	Number of fish marked	Mark/code	Purpose	Marked Fish Released	Site Group Release
Dworshak	50,320	RV, 5K PIT	Supplementation	50,027	South Fork Red River
Dworshak	106,084	Ad only Ad -CWT #104734 200 PIT	Production	103,696	South Fork Clearwater Cottonwood Creek
Dworshak	106,023	Ad only Ad-CWT #104735 200 PIT	Production	104,302	South Fork Clearwater near Stites
Dworshak	188,511	Ad only Ad-CWT #104736 #104731 450 PIT	Production	185,067	South Fork Clearwater Red House hole
64 Dworshak	106,132	Adonly Ad-CWT #104737 #104732 450 PIT	Comparison	104,450	Crooked River
Dworshak	159,061	Ad only Ad-CWT #104729 #104730 #104733 300 PIT	Comparison	153,860	Kooskia National Fish Hatchery Clear Cr.
Selway	114,140	RV only 300 PIT	Supplementation	71,566	Crooked River

Appendix Q. Steelhead smolt distribution in the Clearwater River tributaries.

Destination	Released stock	Number date	Number weight	Per pound	Released
South Fork Red River	Dworshak	9/1/93	577	86.7	50,027
South Fork Clearwater Cottonwood Creek	Dworshak	4/25/94	10,496	9.88	103,696
South Fork Clearwater Stites	Dworshak	4/25 - 26/94	12,567	8.30	104,302
South Fork Clearwater Red House Hole	Dworshak	4/25 - 26/94	22,297	8.30	185,067
Crooked River	Dworshak	4/29 to 5/3/94	11,710	8.92	104,450
Kooskia Rack	Dworshak	5/3/94	17,249	8.92	153,860
Crooked River	Selway	4/29 to 5/3/94	2,909	24.6	71,566

**Submitted by:**

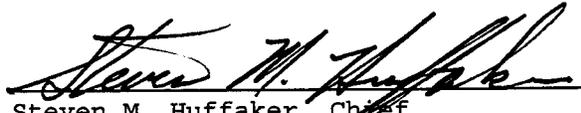
Brad George  
Fish Hatchery Superintendent I

Jerry McGehee  
Fish Hatchery Superintendent III

Doug Munson  
Fish Pathologist

**Approved by:**

IDAHO DEPARTMENT OF FISH AND GAME

  
Steven M. Huffaker, Chief  
Bureau of Fisheries

  
Bill Hutchinson  
State Hatcheries Manager