# IDAHO
# DEPARTMENT OF FISH AND GAME

**FEDERAL AID IN FISH RESTORATION**
**1994 Job Performance Report**
**Program F-71-R-19**

**REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS**
**MCCALL SUBREGION (Subprojects I-C, II-C, III-C, IV-C)**

| | |
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| **PROJECT II.** | **TECHNICAL GUIDANCE** |

**BY**

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**IDFG Report 00-06**

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# 1994 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-19

Project I: Surveys and Inventories

Subproject I-C: McCall Subregion

Job: a

Title: Mountain Lakes Investigations

Contract Period: January 1. 1994 to December 31, 1994

## ABSTRACT

We completed standard mountain lake surveys on 15 mountain lakes in a cooperative project with the United States Forest Service. No fish were collected in 5 of the 15 lakes sampled. Three of the lakes contained natural reproducing rainbow trout *Oncorhynchus mykiss* populations. Brown trout *Salmo trutta* was found unexpectedly in one lake. Three of the lakes contained only cutthroat trout *O. Clarki.* Arctic grayling *Thymallus arcticus* were collected from two lakes.

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## OBJECTIVES

1. To evaluate fisheries management techniques in alpine lakes.

2. To identify problems and/or opportunities in lakes that currently are not being directly managed.

## INTRODUCTION

The Idaho Department of Fish and Game (IDFG) entered into a cooperative project with the U. S. Forest Service, Payette National Forest (PNF) in 1989 to assess fish population status, physical habitat parameters, and past stocking strategies in a selected number of alpine lakes. This program was continued through 1994. IDFG and PNF personnel worked together to collect the data used in this report. A more detailed habitat survey report will be written by the PNF. Past data collected from this project were presented by Weaver (1992, 1994) and Janssen and Anderson (1994a, 1994b). We examined a total of 15 alpine lakes in 1994.

## METHODS

Fish population status in each lake was determined by collecting fish with gill nets. Typically, one 150-foot experimental diving gill net was set perpendicular to the shore. The nets were set in the evening and pulled the next morning. All fish collected were weighed and total length measured. Physical and chemical habitat parameters were measured using standard IDFG mountain lakes survey procedures.

## RESULTS

We colleted fish from 10 of the 15 mountain lakes sampled in 1994. We collected no fish from Burnside Lake #1 (07-368), Teardrop Lake (09-388), Nola Lake (07-367), Vic's Lake(09-310), and Catherine Lake (07-688) (Table 1). Of these 5 lakes only Teardrop Lake had been stocked in recent years. Arctic grayling *Thymallus arcticus* was experimentally stocked in 1991.

Brown trout *Salmo trutta* and rainbow trout *Oncorhynchus mykiss* were collected from Fogg Lake (09-308)(Table 1). Brown trout was never scheduled for Fogg Lake and no doubt was the result of the wrong lake being stocked. North Fork Kennally Lake #2 (09-299) and Rapid Lake (09-312) both near Fogg Lake were both scheduled for brown trout in 1988.

We collected only naturally produced rainbow trout from Bear Lake (07-657) and Upper Bear Lake (07-658). Neither lake was currently on the stocking schedule. Caton Lake (07-423), which had been on a stocking rotation of cutthroat trout *Oncorhynchus clarki* and grayling, was found to contain a large, stunted, natural population of rainbow trout. One brook trout *Salvelinus fontinalis* was also collected.

We collected only cutthroat trout *O. Clarki* from Burnside Lake #1 (07-369), Taft Lake (07-687), and Lick Lake (07-703) all of which were currently on the stocking schedule for cutthroat trout.

Marge Lake (09-401) was currently on a cutthroat trout and arctic grayling stocking schedule, but rainbow trout and grayling were collected in the gill nets. We collected cutthroat trout and rainbow trout from Brush Lake (09-387). It was currently on a rainbow trout x cutthroat trout hybrid stocking schedule. The fish collected were probably hybrids that exhibited strong rainbow trout or cutthroat trout characteristics.

Table 1. Total number and average condition factors by length group of each species of fish gill-netted in mountain lakes in 1994.

| | | | Length (inches) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake** | **Cat. No.** | **Species Condition** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| Burnside #1 | 07-368 | | No Fish collected in 3 hour net set. | | | | | | | | | | | | | | |
| Burnside #2 | 07-369 | Cutthroat | | 3 | 2 | 0 | 4 | | 1 | 1 | 3 | | | | | | |
| | | Ktl | | 0.86 | 0.87 | | NA | | 0.92 | 0.84 | 0.63 | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Bear | 07-657 | Rainbow | 1 | 1 | | | 1 | | | | 1 | 1 | 1 | 1 | | | |
| | | Ktl | 1.30 | 1.13 | | | 1.05 | | | | 0.85 | 1.28 | 0.87 | 0.86 | | | |
| | | | | | | | | | | | | | | | | | |
| Summit | 09-313 | Grayling | | | | | | | | 10 | 3 | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Teardrop | 09-388 | | No Fish collected in overnight net set. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Upper Bear | 07-658 | Rainbow | | 2 | | | 1 | | | | 1 | | 1 | 1 | 1 | | 1 |
| | | Ktl | | 0.95 | | | 1.03 | | | | 1.2 | | 1.06 | 0.95 | 1.05 | | 0.95 |
| | | | | | | | | | | | | | | | | | |
| Marge | 09-401 | Grayling | | | 18 | | | | | 1 | | | | | | | |
| | | Rainbow | | | 11 | 14 | 1 | 1 | | | | 1 | | 1 | | | |
| | | Ktl | | | 0.92 | 0.86 | 1.12 | 0.88 | | | | 0.91 | | 0.91 | | | |
| | | | | | | | | | | | | | | | | | |
| Caton | 07-423 | Brook | | | | | | | 1 | | | | | | | | |
| | | Rainbow | | 20 | 18 | 7 | 17 | 3 | 2 | | | | | | | | |
| | | Ktl | | 0.87 | 0.84 | 0.95 | 0.86 | 0.77 | 0.9 | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Nola | 07-367 | | No Fish collected in overnight net set. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Vic's | 09-310 | | No fish collected in 4 hour gill net set. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Table 1. Continued

| | | | Length (inches) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Lake** | **Cat. No.** | **Species Condition** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** |
| Taft | 07-687 | Cutthroat | | | | | 1 | 2 | 4 | 2 | 1 | 2 | 1 | | | | |
| | | Ktl | | | | | 0.86 | 0.89 | 0.87 | 0.86 | 0.95 | 0.88 | 0.85 | | | | |
| | | | | | | | | | | | | | | | | | |
| Lick | 07-703 | Cutthroat | | | 2 | 2 | 1 | 1 | 1 | 3 | 4 | | | | | | |
| | | Ktl | | | 1.18 | 1.19 | 1.06 | 1.1 | 0.84 | 1.01 | 0.94 | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Catherine | 07-688 | | No fish collected in overnight net set. | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Fogg | 09-308 | Rainbow | | | | 3 | 4 | | | | | | | | | | |
| | | Ktl | | | | 0.99 | 1.01 | | | | | | | | | | |
| | | Brown | | | | | | | | 1 | 1 | 1 | | | | | |
| | | Ktl | | | | | | | | 1.09 | 1 | 0.95 | | | | | |
| | | | | | | | | | | | | | | | | | |
| Brush | 09-387 | Cutthroat | 3 hour net set | | | | | | | | | 3 | | | | 1 | |
| | | Ktl | | | | | | | | | | 1.03 | | | | 0.86 | |
| | | Rainbow | " " | | | | 1 | | | 1 | 1 | | 1 | 1 | | | |
| | | Ktl | | | | | 1.22 | | | 1.03 | 0.94 | | 0.95 | 1.03 | | | |

## RECOMMENDATIONS

1. Discontinue stocking Caton Lake (07-423).

2. Discontinue arctic grayling stocking in Teardrop Lake (09-388).

3. Continue working with the Payette National Forest personnel to collect fishery and habitat data in high mountain lakes.

## LITERATURE CITED


Janssen, P. and Anderson D. A. 1994a. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-16. Idaho Department of Fish and Game, Boise.

Janssen, P.J., D.R. Anderson, and J. Patterson. 1994b. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-17. Idaho Department of Fish and Game, Boise.

Weaver, P. 1992. 1989/1990 High Mountain Lakes Survey. Payette National Forest. McCall District. U.S. Forest Service. McCall, Idaho.

Weaver, P. 1994. Vol. 2: 1992-93 High Mountain Lakes Survey. Payette National Forest. McCall District. McCall, Idaho.

## 1994 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-19

Project I: Surveys and Inventories

Subproject I-C: McCall Subregion

Job: b

Title: Lowland Lakes Investigation

Contract Period: July 1. 1994 to June 30, 1995

## ABSTRACT


We completed a standard lake survey, and conducted the annual kokanee *Oncorhynchus nerka kennerlyi* age class population estimate on Payette Lake in 1994. We collected a total of 11 species and 907 fish in 14 gill net units of effort. We found that largescale suckers *Catostomus macrocheilus* and northern squawfish *Ptychocheilus oregonensis* made up 68% and lake trout *Salvelinus namaycush* 22.5% of the total biomass of fish collected. We estimated the total population size of wild age 0+ kokanee in Payette Lake to be 152,689 fish.

We tagged 35 lake trout with $10 reward tags. We also tagged eight lake trout with sonar transmitter tags to determine fish movement patterns and spawning locations.

We surveyed fish populations in Little Payette Lake to monitor trout growth, condition and relative abundance of nongame fish populations. Rainbow trout *Oncorhynchus mykiss* made up 38.5% of the biomass and 57% by number of all fish collected. Of the rainbow trout collected, 15% were greater than 16 inches.

We completed a comprehensive creel survey and a standard lake survey on Horsethief Reservoir. We found that 78,900 angler hours (285 angler hours/acre) were spent to catch 39,731 fish. Of the total catch 32,216 (81.1%) were rainbow trout and 4,077 (10.3%) were yellow perch *Perca flavescens.* Results of the standard lake survey revealed that rainbow trout and yellow perch made up 88% and 8.5% of the fish by number and 51.5% and 29.6% by weight.

We gill netted Cascade Reservoir for 366 net hours to collect 27 salmonids including 15 kokanee, 11 rainbow trout and one coho salmon *O. kisutch.*

Splake S. *fontinalis x S. namaycush* were gill netted in both Upper Payette Lake and Granite Lake to track growth and condition of these fish. Splake averaged 341 mm and 281 mm with condition factors of 0.90 and 0.915.

Lost Valley Reservoir was chemically treated to eradicate an unwanted yellow perch population.

An angler survey conducted on Warm Lake from May 28 through September 16 revealed that hatchery catchable rainbow trout comprised 96% of the harvest. Forty-seven percent of the fish stocked in 1994 returned to the creel. Anglers fished 17,405 hours throughout the summer. The average catch rate was

0.48 fish/hr. The gill net sample collected in July was dominated by mountain whitefish Prosopium *williamsoni* and mountain suckers *C. platyrhynchus.* Anglers were generally satisfied with the fishing.

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## OBJECTIVE

To maintain information for fishery management activities and decisions for lowland lakes and reservoirs.

## INTRODUCTION

### Payette Lake

Payette Lake was previously described by Grunder et al. (1990). We completed a standard lake survey, and conducted the annual kokanee *Oncorhynchus nerka kennerlyi* age class population estimate in 1994.

Due to concerns of excessive exploitation of lake trout *Salvelinus namaycush* we began the process of repeating the lake trout reward tagging study that was begun in 1988 (Grunder 1990).

We also had concerns as to how comprehensive the tagging study would be and had been in the past. Biologists were concerned with the question of whether lake trout could be collected and tagged from relatively few areas and expect those fish to represent the entire population. We also had questions as to how much interaction there was between lake trout from the East and West basins of the lake and also where do Payette Lake lake trout spawn. We began a sonar tag telemetry study to help answer these questions.

### Little Payette Lake

Little Payette Lake has been described previously by Janssen and Anderson (1992). In the last three years northern squawfish *Ptychocheilus oregonensis* and largescale sucker *Catastomus macrocheilus* biomass had increased significantly to where it threatened the trophy rainbow trout *Oncorhynchus mykiss* fishery in the lake. We surveyed the fish population to monitor trout growth, condition, and relative abundance with nongame fish populations In 1994.

In early May 1994, 10,000 nine to ten-inch rainbow trout with left ventral fin clips were stocked in Little Payette Lake. In addition to these fish another group of 10,000 nine to ten-inch, right maxillary clipped fish were stocked in the lake in June 1993. We used these fish to determine growth rates of stocked rainbow trout.

### Horsethief Reservoir

Horsethief Reservoir had not had a comprehensive creel survey completed on it since the 1970s and total use has not been documented since the change to year-around fishing. We completed a creel survey for the entire year in 1994 to document angling pressure and fish harvest.

Horsethief is stocked annually with 10,000 four-inch, rainbow x cutthroat *Oncorhynchus clarki* hybrids; 33,000 three to four inch rainbow trout; 5,000, eight inch brown trout; and 15,000 eight to ten inch rainbow trout.

In 1993 we received reports of, and then verified that, yellow perch *Perca flavescens* had become reestablished in Horsethief Reservoir, probably by illegal introduction. To determine relative abundance of yellow perch and trout we completed a standard lake survey on Horsethief Reservoir.

## Cascade Reservoir

Cascade Reservoir has been stocked annually with 150,000 to 300,000 eight to ten inch rainbow trout and up to 600,000 coho *Oncorhynchus kisutch* and/or kokanee salmon. To monitor stocking success we sampled the fishery in July 1994.

## Splake Introduction Evaluations

Both Upper Payette Lake and Granite Lake were stocked in the fall of 1992 with 13,409 and 4,000, 165 mm splake *Salvelinus fontinalis x Salvelinus namaycush*. Upper Payette Lake was also stocked on June 30, 1993 with 5,123, 330 mm splake at 275 g/fish, all of which were marked with an adipose fin clip. These lakes were sampled in 1994 to monitor growth and condition of these fish.

## Lost Valley Reservoir

Due to a required inspection of the Lost Valley Reservoir dam outlet structure in the fall of 1994 the reservoir was drained as low as possible. This gave us a prime opportunity to once again try and eradicate yellow perch from the reservoir. Therefore in October 1994 we treated Lost Valley Reservoir and its tributaries with rotenone.

## Warm Lake

Warm Lake is a 256 ha natural lake, at an elevation of 1615 m near the headwaters of the South Fork Salmon River. Warm Lake has seven species of salmonids, including rainbow trout, cutthroat trout, kokanee salmon, brook trout *Salvelinus fontinalis*, bull trout *S. confluentus*, lake trout, and mountain whitefish *Prosopium williamsoni*. Mountain sucker *Catostomus platyrhynchus* and redside shiner *Richardsonius balteatus* also occur. Since 1959 increasing numbers of catchable-size hatchery rainbow trout have been stocked annually into Warm Lake. There have been occasional plants of fry and fingerling rainbow trout. Lake trout were introduced in 1976, and restocked in 1981 through 1983 in an effort to develop a self sustained fishery. Past inventories of fish distribution and abundance and fishing success showed conflicting data and we were concerned that anglers were not optimally exploiting the diversity of fishing opportunities in Warm Lake.

In 1994, an angler survey and a fish inventory were designed to determine whether catch and harvest statistics coincided with abundance and distribution of fish populations in the lake.

## METHODS

### Payette Lake

Kokanee were sampled in Payette Lake, for the seventh consecutive year, on August 17 and 18, 1994 with a midwater trawl. Methodology for the trawling technique was reported by Bowles (1986, 1987) and Grunder (1991).

A modified, standard lake survey was completed on Payette Lake. See Intradepartment memo on Lowland Lakes Standard Surveys, April 8, 1992 for description and methodology. Because Payette is a deep lake with steep banks and limited littoral zone, gill nets were the only gear type used to collect fish. Figure 1 shows the location of each gill netting site and what type of nets were used.

We fished a total of 29 gill nets during the survey. Nets were set in the afternoon and pulled the next morning. We set gill nets in the west basin on August 9, 17, and 31, 1994. On September 27, 1994 we set nets in the Narrows area of the lake. On October 7 and 13, 1994 we set nets in the north end of the lake and in the mid and south end of the east basin of the lake, respectively.

Yellow perch scales collected from the standard survey were each aged. Each annuli on the scales were measured. These measurements were used to back-calculate lengths at given ages of each fish.

We also used gill nets to collect lake trout for tagging. Nets were set throughout the spring, summer and fall months as time permitted. We used 150 foot gill nets with a square mesh size of 1.5 inches. The small mesh size prevented large lake trout from being suffocated by the net holding the gill covers closed. Virtually all lake trout caught in these nets were caught by the net entangling their teeth. Typically, we set nets in the early morning, just prior to first light, let them fish for two hours and then check them for fish. We also set nets in the evening, one to two hours before dusk, let them fish two hours and then checked them.

We placed lake trout collected from each net into a live cage and then suspended the live cage on a float and line at a depth of 40 feet. At this depth, water temperatures were in the mid 40s even in mid summer. This allowed fish to recover from netting and handling stress very quickly. We also found that at this depth fish did not have air bladder problems when brought back up to the surface for data collection and tagging.

Due to problems with large ulcers around the tags on fish previously tagged with cinch up spaghetti tags, we tried two different types of tags in 1994. We used a laminated internal anchor tag. The anchor was a plastic oblong disc that was surgically implanted into the body cavity. The other tag used was a long vinyl tubing (spaghetti) tag that was inserted through the anterior base of the dorsal fin with a special applicator needle and then tied into a loop.

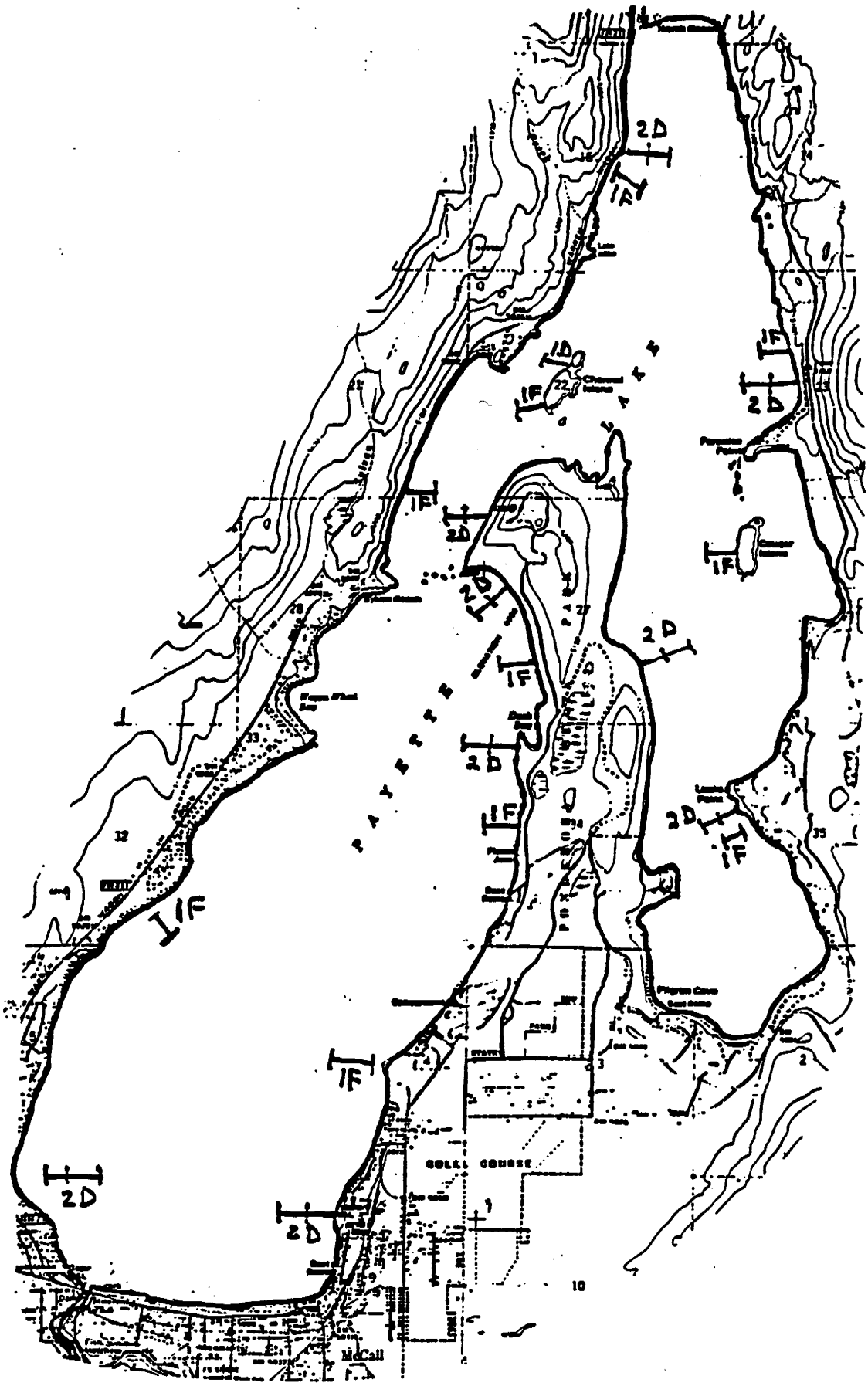


Figure 1. Standard lake survey gill net sites on Payette Lake, Idaho (1F = 1 floater, 1D = 1 diver, 2D = 2 divers connected end to end).

Once all fish had been removed from the nets, we then placed two to three fish into a cooler that contained a water and MS-222 solution, cooled to 45° F with lake water ice from McCall Fish Hatchery. A recirculation pump was used to keep the solution aerated. When anaesthetized, we then weighed and measured each fish to the nearest g and mm. We then surgically implanted the internal anchor tag. Fish tagged with the spaghetti tag were not anesthetized.

To place the internal anchor tag in the fish, an incision wide enough to slide the anchor through, was made on the left side of the fish. We located the incision 2/3 of the way down between the lateral line and the pelvic girdle and just anterior to the girdle. We applied an iodine solution to the incision site and then made the incision. Once the tag was in place, a triple antibiotic topical ointment was applied to the wound. We then used a surgical metal staple gun to suture the wound. We then applied another iodine solution treatment to the wound. After tagging we placed the fish back in the live cage and held them at 40 feet for approximately ½ hour. We held some fish overnight to ensure their recovery.

We used the identical procedure as described above for the placement of the internal sonar transmitter tags. The incision was longer to accommodate the sonar tag. After the sonar tag was inserted an internal anchor tag was also inserted into the same incision.

The sonar transmitter tag had a frequency of 75 khz. They were round cylinders with a length of 65 mm, a diameter of 18 mm, and a battery life of 50 months. A reward notice was hand printed on the tags to encourage tag returns from harvested fish.

Once we had sonar transmitter tags placed in fish we then relocated the fish monthly up until September when fish began spawning. During spawning time (September 15 through November 1), fish were relocated every four to ten days.

## Little Payette Lake

On October 28, 1994, we set six standard lake survey gill nets in Little Payette Lake (two floating and four diving nets). We connected two of the diving nets end to end so they would fish a longer, deeper section of bottom contour. We fished four locations with the six nets. All fish collected were measured to the nearest mm and weighed to the nearest 5 g. All fish collected were examined for fin clips.

## Horsethief Reservoir

We began a creel survey on the reservoir on January 1, 1994, and ran it through December 1994. The survey was set up to sample two randomly chosen weekdays and four randomly chosen weekend days per month. We randomly chose instantaneous angler count times for each creel day. During the one daily angler count, the creel person would count all shore anglers and number of boats actively fishing. We utilized a volunteer to do the survey on weekends while regular Idaho Department of Fish and Game employees conducted the survey on weekdays.

Information collected during angler interviews included number of anglers in each party, number of hours fished, number of fish harvested, and what county or state of residence.

A modified, standard lake survey was completed on Horsethief Reservoir. See Intradepartment memo on Lowland Lakes Standard Surveys, April 8, 1992 for description and methodology. On June 19, 1994, we set one floating gill net, and two diving gill nets that were fished overnight. On August 8, 1994, we electrofished a total of one hour. This equaled one unit of effort of electrofishing and one and a half units of gill netting effort (standard lake survey units).

## Cascade Reservoir

During the weeks of July 26 and August 2, 1994, we set three midwater suspended gill nets at six different locations. We set three nets at a time at a given location. Nets were set in late July to take advantage of the strongly stratified water column which helped concentrate salmonids. We set the nets in pelagic, deep water areas away from the shoreline to minimize the catch of non-salmonids.

At each location, dissolved oxygen (DO) and temperature profiles were measured to determine at what depths the nets should be located. We used 6-ft-high experimental diving gill nets which were suspended at a given depth with the use of floats tied on to the nets with a measured amount of rope. One net was hung to cover the thermocline the other two nets were set to cover the water column just above and below the middle net. With this arrangement we covered 18 vertical ft of the water column at each location. The nets were set, allowed to fish all night and then pulled the next day. After all fish were removed from the nets, the nets were reset at the next location. All salmonids collected were weighed and total length measured.

## Splake Introduction Evaluations

We set two diving experimental gill nets in Upper Payette Lake on July 8, and two diving experimental gill nets in Granite Lake on July 12, 1994. The nets were set in the afternoon, allowed to fish overnight and then pulled the following morning. We weighed and measured total length of all splake collected. Stomachs were also examined to get an idea food habits.

## Lost Valley Reservoir

We submitted an application for short-term activity exemption to the Idaho Department of Environmental Quality in advance of the rotenone treatment (Appendix A). We electrofished all reservoir tributaries to determine range of yellow perch, and we measured flows of all tributaries to determine amount of rotenone needed to treat each tributary.

By October 19, 1994, the reservoir had been drained so that all that remained of the lake was the creek channel, mud flats, spring, and seep areas and a 3 to 5 acre pond in front of the dam.

On October 19, 1994, we employed a Hiller 12E helicopter, set up with a pesticide application boom to apply liquid rotenone to the small pond, wet mud flats, and seep areas. The helicopter was also utilized to apply a sand and gelatin powdered rotenone mixture (see rotenone manual) to the spring and seep areas.

The sand mixture dissolved slowly keeping water in the springs and seeps "hot" with rotenone for several hours.

We set up seven drip stations on tributaries to the reservoir which included:

1. Butter Gulch road bridge on East Fork Lost Creek (EFLC).
2. On Lost Creek (LC) approx. 2 mi. above confluence with EFLC.
3. At confluence of LC and EFLC.
4. In LC on first bridge crossing above Slaughter Gulch.
5. On LC at Mid Reservoir (exposed when lake drained).
6. On a spring creek tributary to LC west south west of Slaughter Gulch on the west side of LC.
7. On a spring creek tributary that flowed directly into the west side of the reservoir.

We started the upper four drip stations on LC and EFLC the night before the reservoir proper was treated. The other three were started the day of the lake treatment.

Backpack sprayer crews were sent down the entire length of reservoir tributaries to search for and treat any water pockets or wet areas that were isolated from the rotenone in the tributaries themselves. The crews were also given a supply of sand and gelatin rotenone mixture to treat any seeps or small springs encountered.

## Warm Lake

A stratified random roving survey (McArthur et al. 1994) was designed to estimate angler effort, methods, catch, and harvest at Warm Lake during the summer of 1994. Angler counts and interviews were conducted on two weekend days and one week day during each of eight two-week intervals from May 28 through September 16. We conducted two instantaneous angler counts on each survey day. The first angler count for each day was randomly chosen, with a second count taken four hours later. The lake was not stratified for this survey. Number of anglers were tallied by craft type (boat, float tube, or shore). Typically, angler interviews were conducted between the two angler counts. Information collected during interviews included angling craft type, method (bait, lure, or fly), hours fished during current trip, trip completed (yes or no), county or state of residence, species targeted, number and size of each species caught, released, and harvested.

Fish were sampled from Warm Lake using experimental gill nets on July 13, 1994. Two sinking nets and one floating net were fished overnight (approximately 18 hours) (Figure 2). Standard lowland lake survey nets were used (memo from Al VanVooren, April 8, 1992) .

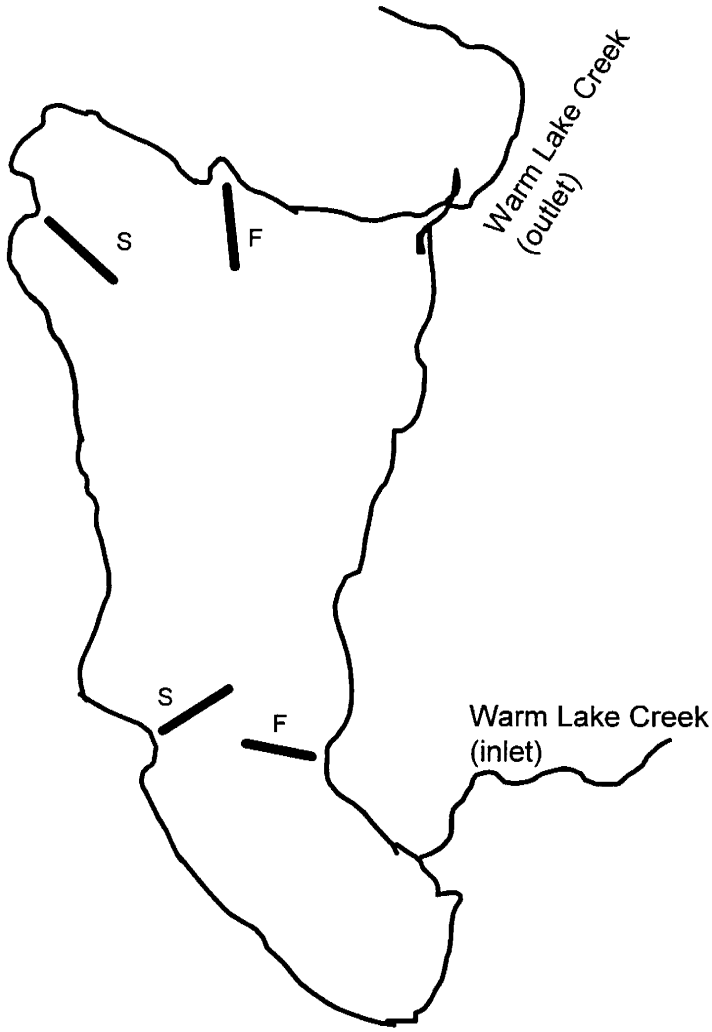


Figure 2. Warm Lake, Idaho, with locations of 1991 and 1994 gill net sets. Floating nets = F, and sinking nets = S.

# RESULTS

## Payette Lake

### Kokanee Population Status

We estimated the total population size of age 0+ kokanee in Payette Lake on August 10, 1994 to be 152,689 fish (Table 1). We estimated survival of the age 0+ 1993 cohort to age 1+ in 1994 to be 15.5%. Estimated mean densities (fish/ha) of age 0+ and 1+ were 89 and 27 fish/ha respectively. (Table 1).

Total kokanee biomass, not including adult fish, (this year's spawners) was estimated at 2.5 kg/ha, which equals the 1993 estimate. Total biomass, including 1994 spawner escapement estimates was 8.0 kg/ha. This biomass estimate includes very few fish > 180 mm (age 2+) in length that did not spawn this year, due to avoidance of the trawl by larger fish. In addition to this estimate there is a shoreline spawning kokanee population, about which virtually nothing is known.

Table 1. Summary of mid-water trawl data collected at Payette Lake, Idaho, 1980, and 1988 through 1994 with (95% confidence intervals). All estimates are based on a useable surface area of 1715 ha (> 40 ft depth).

| Year of Estimate | Number Stocked Biomass | AGE 0+ | 1+ | 2+ | 3+[1] | ADULT SPAWN. | Spawner (3+)[2] |
|---|---|---|---|---|---|---|---|
| | | Number of Hatchery Kokanee | | | | | |
| 1988 | 350,000 | 34,000 | 0 | 0 | | | |
| 1989 | 350,000 | 18,000 | 0 | 0 | | | |
| 1990 | 301,000 | 27,000 | 0 | 0 | | | |
| 1991 | 158,000 | ? | ? | 0 | | | |
| 1992 | 130,530 | 19,774(79%) | ? | ? | | | |
| 1993 | 125,400 | 11,444(98%) | 0 | 0 | | | |
| 1994 | 0 | na | 0 | | | | |
| | | Number of Wild/Natural Kokanee | | | | | |
| 1980 | | 100,000 | 73,000 | 16,000 | | 20,000 | |
| 1988 | | 74,800(40%) | <2,000(85%) | 9,000(88%) | ** | 22,800 | |
| 1989 | | 120,000(33%) | 21,000(33%) | 0 | ** | 14,500 | |
| 1990 | | 134,000(45%) | 26,000(45%) | 10,000(100%) | ** | 16,700 | |
| 1991 | | 128,000(28%) | 67,500[3] | 1,187 | ** | 18,000 | |
| 1992 | | 202,240(21%) | 30,887(41%) | 5,015(118%) | ** | 29,300 | |
| 1993 | | 301,744(104%) | 117,215(65%) | 7.271(83%) | ** | 59,310 | |
| 1994 | | 152,689(88%) | 46,974(54%) | 30,432(99%) | ** | 44,200 | |
| | | Mean Wild Kokanee Density (fish/ha) | | | | | |
| 1980 | | 58 | 43 | 9 | 10 | | |
| 1988 | | 44 | <2 | 5 | NA | 15.5 | |
| 1989 | | 70 | 12 | 0 | NA | 9.8 | |
| 1990 | | 78 | 15 | 6 | NA | 11.2 | 4.1 kg/ha |
| 1991 | | 75 | 39[4] | 0.69 | NA | 12.1 | 5.4 " |
| 1992 | | 118 | 18 | 3 | NA | 18.3 | 8.1 " |
| 1993 | | 176 | 68 | 4 | NA | 34.3 | 8.5 " |
| 1994 | | 89 | 27 | 18 | | 25.8 | 5.5 " |

[1] These fish spawned the following fall
[2] Based on corrected (Frost and Bennett, 1994)spawner escapement counts in N. Fork Payette River.
[3] Includes wild and stocked fish.
[4] Includes hatchery fish of which age is unknown
** Estimates not reliable because fish greater than 200 mm are not completely vulnerable to the trawl.

**Payette Lake Fish Survey**

We collected 907 fish in 14 gill net units of effort in Payette Lake. Largescale suckers and northern squawfish made up 68% of the total biomass of fish collected (Table 2). We collected 11 different species of fish: northern squawfish, largescale sucker, yellow perch, mountain whitefish, kokanee, lake trout, splake, redside shiner, brook trout, cutthroat X rainbow trout hybrids, and rainbow trout (Table 2). Of the game fish collected, kokanee were the most abundant, while lake trout had the greatest biomass.

We collected eight splake. These fish were adipose fin clipped and had emigrated from Upper Payette Lake, where they had been stocked in 1993.

Tables 3 and 4 present length and weight data by 10 mm length groups for each game fish species collected and age and growth data for yellow perch. Relative weights are given for those species where relative weight formulas exist.

Table 2. Percent frequency of occurrence and relative biomass of the different species of fish collected in 1994 in Payette Lake, in 14 gill net units of effort.

| Species | Number Caught | % of Catch by number | Total Biomass | % of Total by weight |
|---|---|---|---|---|
| Northern squawfish | 476 | 52 | 121.2 kg | 40.3 |
| Largescale Sucker | 182 | 20 | 83.2 | 27.7 |
| Lake trout | 19 | 2.1 | 67.7 | 22.5 |
| Whitefish | 44 | 4.8 | 9.1 | 3.0 |
| Kokanee | 42 | 4.6 | 7.6 | 2.5 |
| Yellow perch | 122 | 13.4 | 6.9 | 2.3 |
| Splake | 8 | .9 | 2.7 | .9 |
| Brook | 4 | .44 | .9 | .31 |
| Rainbow X Cutthroat | 3 | .33 | .80 | .27 |
| Rainbow | 1 | .11 | .42 | .14 |
| Redside shiner | 6 | | | |
| Total: | 901 | | 300.6 kg | |

Table 3. Total number of fish collected, percent of total by weight, average weight and relative weights (Wr) of fish in each 10 mm length group, collected in the standard survey gill netting of Payette Lake, 1994.

| | Y. Perch | | | | Kokanee | | | | Splake | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL LENGTH | # Col. | % of Total | Ave. Wgt. | Wr | # Col. | % of Total | Ave. Wgt. | Wr | # Col. | % of Total | Ave. Wgt. | Wr |
| 110 | 2 | .5 | 18.5 | 99.3 | | | | | | | | |
| 120 | | | | | | | | | | | | |
| 130 | 3 | 1.4 | 32.3 | 103.3 | | | | | | | | |
| 140 | 19 | 12.1 | 44 | 111.7 | | | | | | | | |
| 150 | 18 | 12.1 | 46.4 | 95.0 | | | | | | | | |
| 160 | 39 | 32.9 | 58.2 | 97.4 | 1 | .5 | 40 | NA | | | | |
| 170 | 18 | 16.7 | 64.6 | 89.3 | | | | | | | | |
| 180 | 8 | 8.1 | 69.8 | 80.7 | | | | | | | | |
| 190 | 1 | 1.3 | 95 | 92.7 | | | | | | | | |
| 200 | 5 | 7.4 | 102 | 84.6 | | | | | | | | |
| 210 | 3 | 4.9 | 112.5 | 80.0 | | | | | | | | |
| 220 | 1 | 2.4 | 165 | 101.4 | | | | | | | | |
| 230 | | | | | 1 | 1.3 | 100 | | | | | |
| 240 | | | | | 8 | 14.7 | 139 | | 2 | 10.6 | 142.5 | |
| 250 | | | | | 8 | 16.1 | 152 | | | | | |
| 260 | | | | | 6 | 14.0 | 176.5 | | | | | |
| 270 | | | | | 5 | 13.4 | 203.2 | | | | | |
| 280 | | | | | 6 | 17.7 | 222.8 | | | | | |
| 290 | | | | | 5 | 15.0 | 227.4 | | | | | |
| 300 | | | | | 1 | 3.0 | 232 | | 1 | 7.6 | 205 | NA |
| 310 | | | | | 1 | 4.1 | 310 | | | | | |
| 320 | | | | | | | | | 1 | 7.4 | 200 | |
| 340 | | | | | | | | | | | | |
| 350 | | | | | | | | | 1 | 14.3 | 385 | |
| 360 | | | | | | | | | | | | |
| 370 | | | | | | | | | | | | |
| 380 | | | | | | | | | | | | |
| 390 | | | | | | | | | | | | |
| 400 | | | | | | | | | | | | |
| 410 | | | | | | | | | 2 | 40.3 | 542.5 | |
| 420 | | | | | | | | | | | | |
| 430 | | | | | | | | | | | | |
| 440 | | | | | | | | | | | | |
| 450 | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | |
| 470 | | | | | | | | | | | | |
| 480 | | | | | | | | | 1 | 19.7 | 530 | |

Table 3 cont.

| TOTAL | Brook Trout # Col. | Brook Trout % of Total | Brook Trout Ave. Wgt. | Brook Trout Wr | Rainbow trout # Col. | Rainbow trout % of Total | Rainbow trout Ave. Wgt. |
|---|---|---|---|---|---|---|---|
| 250 | 1 | 16.4 | 155 | 74 | | | |
| 260 | | | | | 1 | 19.2 | 155 |
| 270 | 1 | 22.2 | 210 | 79.1 | 1 | 25.0 | 200 |
| 280 | | | | | | | |
| 290 | | | | | | | |
| 300 | 2 | 61.3 | 290 | 78.9 | | | |
| 310 | | | | | | | |
| 320 | | | | | | | |
| 330 | | | | | | | |
| 340 | | | | | | | |
| 350 | | | | | | | |
| 360 | 1 | 56 | 450 | | | | |
| 370 | | | | | | | |
| 380 | | | | | | | |
| | Lake Trout | | | | | | |
| 400 | 1 | .9 | 634 | NA | | | |
| 410 | 1 | .8 | 600 | | | | |
| 500 | 1 | 2.3 | 1600 | | | | |
| 520 | 1 | 1.8 | 1200 | | | | |
| 610 | 2 | 6.6 | 2250 | | | | |
| 620 | 1 | 10.2 | 2180 | | | | |
| 630 | 3 | 10.2 | 2310 | | | | |
| 640 | 1 | 3.3 | 2250 | | | | |
| 650 | 1 | 3.8 | 2600 | | | | |
| 680 | 1 | 4.2 | 2850 | | | | |
| 740 | 1 | 6.5 | 4400 | | | | |
| 750 | 3 | 23.2 | 5250 | | | | |
| 910 | 1 | 11.4 | 7700 | | | | |
| 990 | 1 | 21.4 | 14528 | | | | |

Table 4. Average back-calculated lengths(mm) for each year class of yellow perch collected from Payette Lake in 1994.

| Year Class | Age | N | Back-Calculated Length at Age 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1993 | 1 | 1 | 89 | | | | | | |
| 1982 | 2 | 9 | 76 | 120 | | | | | |
| 1981 | 3 | 26 | 74 | 130 | 157 | | | | |
| 1980 | 4 | 1 | 70 | 113 | 129 | 150 | | | |
| 1989 | 5 | 1 | 108 | 174 | 233 | 256 | 264 | | |
| All Classes | | 76 | 128 | 159 | 203 | 265 | | | |
| N | | 38 | 38 | 37 | 28 | 2 | 1 | | |

**Lake Trout Reward Tagging**

From September 16, 1993 through December 31, 1994, we placed reward tags in 35 lake trout. None of the lake trout we collected were recaptures with the exception of two fish that had been tagged during the original tagging study. One of these fish had been tagged in 1988 and measured 885 mm. When recaptured in 1994, this fish was 970 mm and 12.5 kg. As of January 1, 1995, we had no newly placed or previously placed reward tags returned by anglers in 1994.

**Lake Trout Sonar Tagging**

We sonar tagged three fish in the west basin of the lake on August 5, 1994. We also sonar tagged five lake trout in the east basin. Three of these fish were captured July 6, one was captured July 15, and one was captured on June 30, 1994.

Preliminary tracking results showed that fish moved a great deal within basins but not between basins. Most fish seemed to have three to four areas of the lake that they preferred. Most of these areas overlapped at sometime with other tagged fish areas in the basin.

The east and west basins appeared to be isolated while the lake was stratified. Once the lake had turned over and while it was isothermic, two fish emigrated from the east basin and entered the west basin. Both fish changed basins in late October or early November. Once these fish had switched basins they began using areas that overlapped with fish already present in that basin.

We detected a movement of many fish to locations very close to shore or structure from mid-September through mid-October. We assumed these movements were associated with the act of spawning.

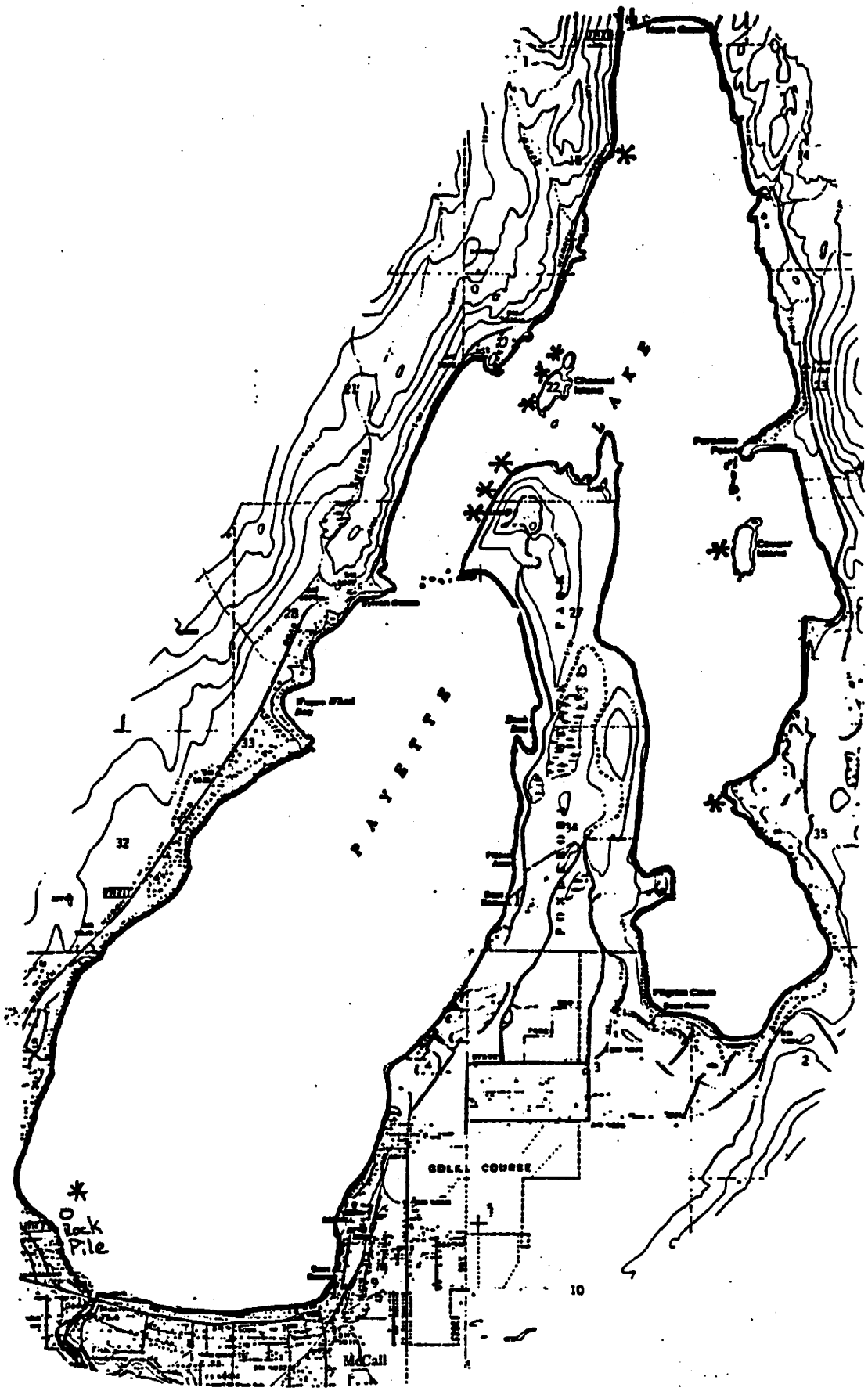


Figure 3. Locations (*) of 1994 collection points of ripe, mature lake trout in gill nets and location of sonar tagged fish suspected of spawning in Payette Lake, Idaho.

This was verified with the standard lake survey gill netting that we conducted at the same time. We collected mature, ripe, lake trout in gill nets on September 27, October 7, and 13, 1994. Figure 3 identifies areas where ripe lake trout were found with gill nets or were suspected spawning sites of sonar tagged fish.

As of December 31, 1994, all eight sonar tagged fish were alive.

## Little Payette Lake

We collected 186 fish in gill nets during the survey. This included 28 largescale suckers, 45 northern squawfish, 104 rainbow trout, 6 kokanee, 2 mountain whitefish and 1 redside shiner. Of the 104 rainbow trout collected we found a total of 24 with a left ventral fin clip. We also found six fish with a right maxillary clip.

Rainbow trout made up 39% of the biomass and 57% by number of all fish collected (Table 5). They ranged in total length from 240 to 530 mm. Quality sized (>16 inches) rainbow trout made up 15% of all rainbow trout collected (Table 6). Condition factors were low for all length groups. Average Ktl's were 0.85 and 0.90 for fish less than and greater than 16 inches, respectively (Table 7).

We found growth rates for rainbow trout stocked in 1993 and 1994 to be poor. Average daily growth rates were 0.24 and 0.38 mm for fish stocked in 1993 and 1994 respectively (Table 8).

Table 5. Numbers and biomass of all species of fish collected with gill nets on October 28, 1994 on Little Payette Lake.

| Species | N | % of total by Number | Total Weight (kg) | % of Total by Weight |
|---|---|---|---|---|
| rainbow trout | 104 | 57 | 38.5 | 39 |
| smallmouth bass | 0 | | | |
| kokanee | 6 | 3 | 2.4 | 2.5 |
| northern squawfish | 45 | 25 | 26.8 | 27.5 |
| largescale sucker | 28 | 15 | 30.2 | 31 |
| | 183 | | 97.9 | |

Table 6. Length frequencies of rainbow trout collected in Little Payette Lake in October 1994.

| Total Length | Total Number |
|---|---|
| 220 | 0 |
| 230 | 0 |
| 240 | 1 |
| 250 | 3 |
| 260 | 3 |
| 270 | 10 |
| 280 | 19 |
| 290 | 9 |
| 300 | 8 |
| 310 | 6 |
| 320 | 0 |
| 330 | 1 |
| 340 | 3 |
| 350 | 5 |
| 360 | 8 |
| 370 | 2 |
| 380 | 6 |
| 390 | 3 |
| 400 | 2 |
| 410 | 2 |
| 420 | 2 |
| 430 | 1 |
| 440 | 2 |
| 450 | 2 |
| 460 | 1 |
| 470 | 2 |
| 480 | 2 |
| 530 | 1 |
| | 104 |

Table 7. Average lengths, weights and condition factor (Ktl) of rainbow trout, by length groups, collected from Little Payette Lake on October 28, 1994.

| Length Increment | N | Average Length | Average Weight | Average Ktl |
|---|---|---|---|---|
| 0-406 | 88 | 314 | 293 | .90 |
| 407-550 | 16 | 450 | 794 | .85 |
| | 104 | | | |

Table 8. Length and weight comparisons of marked rainbow trout at time of stocking and at time of gill netting.

| Date | Clip | Action | Average Tot. Length | Average Weight(g) | Days in lake | Growth/ Day(mm) |
|---|---|---|---|---|---|---|
| 6/15/93 | R. Max | Stocked | 197 | 84 | 0 | |
| 10/28/94 | " " | gill nets | 314.5 | 292 | 498 | 0.24 |
| 5/6/94 | L. Vent. | Stocked | 227.25 | 134 | 0 | |
| 10/28/94 | " " | gill net | 295 | 215 | 176 | 0.38 |

## Horsethief Reservoir

We sampled 323 fish of four species gill netting and electrofishing during the standard lake survey. By number yellow perch, rainbow trout, brown trout *Salmo trutta* and splake made up 88%, 8.5%, 2% and 1.5% respectively. These four species made up 51.5%, 29.6%, 12.8%, and 6% in biomass respectively.

Yellow perch ranged in length from 65 to 235 mm with the largest number of fish found in the range of 65 to 90 mm (Table 9). From scale ageing analysis we determined that three age classes of yellow perch had been collected. The strongest age class in numbers was age 0 (Table 10).

Table 9. Total number of fish collected, percent of total by weight, average weight and relative weights of individual fish for each 10 mm length group, collected in the standard survey of Horsethief Reservoir, 1994.

| TOTAL LENGTH MM | Y. Perch # | Y. Perch % of Total | Y. Perch Ave. Wgt. | Y. Perch Wr | Rainbow trout # | Rainbow trout % of Total | Rainbow trout Ave. Wgt. | Rainbow trout Wr | Splake # | Splake % of Total | Splake Ave. Wgt. | Splake Wr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 2 | .7 | 5 | NA | | | | | | | | |
| 70 | 93 | 33 | 5.6 | 126 | | | | | | | | |
| 80 | 94 | 32 | 7.6 | 108 | | | | | | | | |
| 90 | 17 | 6 | 10 | 99.5 | | | | | | | | |
| 100 | | | | | | | | | | | | |
| 110 | | | | | | | | | | | | |
| 120 | | | | | | | | | | | | |
| 130 | | | | | | | | | | | | |
| 140 | 8 | 3 | 45 | 114 | 4 | 15 | 38.5 | | | | | |
| 150 | 11 | 16 | 46.4 | 95 | 1 | 4 | 55 | | | | | |
| 160 | 14 | 5 | 58 | 97 | 2 | 7 | 57.5 | | | | | |
| 170 | 15 | 5 | 66.8 | 92 | | | | | | | | |
| 180 | 2 | .7 | 97 | 112 | | | | | | | | |
| 190 | 3 | 1 | 121.5 | 118 | | | | | | | | |
| 200 | 6 | 2 | 164.2 | 136 | | | | | | | | |
| 210 | 8 | 3 | 200.8 | 143 | 1 | 4 | 145 | | | | | |
| 220 | 6 | 2 | 235.8 | 144 | | | | | | | | |
| 230 | 5 | 2 | 231.5 | 124 | 1 | 4 | 165 | | | | | |
| 240 | | | | | 3 | 11 | 170 | | | | | |
| 250 | | | | | 2 | 7 | 197.5 | 3 | 60 | 185 | | |
| 260 | | | | | 5 | 18.5 | 193 | | 2 | 40 | 202.5 | |
| 270 | | | | | 4 | 15 | 243 | | | | | |
| 280 | | | | | 3 | 11 | 287 | | | | | |
| 290 | | | | | | | | | | | | |
| 300 | | | | | | | | | | | | |
| 310 | | | | | 1 | 4 | 331 | | | | | |
| 320 | | | | | | | | | | | | |
| **Brown Trout** | | | | | | | | | | | | |
| 260 | 0 | | | | | | | | | | | |
| 270 | 1 | 14 | 245 | | | | | | | | | |
| 280 | 0 | | | | | | | | | | | |
| 290 | 1 | 14 | 280 | | | | | | | | | |
| 300 | 1 | 14 | 300 | | | | | | | | | |
| 310 | 1 | 14 | 355 | | | | | | | | | |
| 320 | | | | | | | | | | | | |
| 330 | | | | | | | | | | | | |
| 340 | | | | | | | | | | | | |
| 350 | 2 | 28 | 420 | | | | | | | | | |
| 360 | 1 | 14 | na | | | | | | | | | |

Table 10. Average back-calculated lengths(mm) for each year class of yellow perch collected from Horsethief Reservoir in 1994.

| Year Class | Age | N | Back Calculated Lengths at Age 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1993 | 1 | 23 | 103 | | | | | | |
| 1992 | 2 | 2 | 111 | 178 | | | | | |
| All Classes | | 103 | 178 | | | | | | |
| N | | 25 | 25 | 2 | | | | | |

The 1994 creel survey revealed that 78,900 angler hours (285 angler hours/acre) were spent fishing to harvest 39,721 fish for an average catch rate of 0.503 fish/hour on Horsethief Reservoir (Tables 11 and 12).

Of the total catch, 32,216 or 81.1% were rainbow trout and 4,077 or 10.3% were yellow perch (Table 13). The remainder of fish harvested were trout of various species. We found that shore anglers spent 56,301 hours for 71.4% of the total pressure, catching 26,111 fish for 65.7% of the total catch (Table 14).

We found that 53% of the anglers interviewed were residents of Ada County. Canyon, Valley, and all other county residents made up 28, 6, and 7%, respectively, of angler residencies and 6% were from out of state.

Table 11. Monthly total estimated angling pressure, harvest, and catch rates for weekend days on Horsethief Reservoir, 1994 with 95% confidence intervals (+/-(%)).

| Month | Type | Total Angler hrs. | | Total Harvest | | Ave. Catch Rate |
|---|---|---|---|---|---|---|
| January-March | Ice | 659 | (62%) | 536 | (180%) | 0.814 |
| April | Shore | 2,045 | (94%) | 1,162 | (123%) | 0.568 |
| | Boat | 0 | | | | |
| May[a] | Shore | 6,040 | (28%) | 2,222 | (53%) | 0.368 |
| | Boat | 1,107 | (62%) | 359 | (418%) | 0.324 |
| Memorial Day | Shore | 2,145 | (29%) | 1,279 | (53%) | 0.596 |
| Weekend | Boat | 1,079 | (0%) | 462 | (322%) | 0.415 |
| June | Shore | 7,020 | (71%) | 2,284 | (99%) | 0.325 |
| | Boat | 875 | (74%) | 306 | (142%) | 0.350 |
| July | Shore | 4,588 | (76%) | 1,420 | (143%) | 0.309 |
| | Boat | 965 | (139%) | 337 | [a] | 0.349[c] |
| August | Shore | 3,560 | (97%) | 2,311 | (141%)` | 0.649 |
| | Boat | 2,232 | (142%) | 906 | (193%) | 0.406 |
| September | Shore | 3,528 | (38%) | 1,741 | (64%) | 0.494 |
| | Boat | 1,543 | (68%) | 386 | (200%) | 0.250 |
| October | Shore | 1,650 | (45%) | 596 | (134%) | 0.361 |
| | Boat | 0 | 0 | 0 | | |
| November | Shore | 263 | (128%) | 30 | (137%) | 0.115 |
| | Boat | 0 | 0 | 0 | | |
| December | Ice | 88 | (200%)[b] | 632 | (NA) | 7.2 |
| Totals | Ice | 747 | | 1,168 | | 1.56 |
| | Shore | 30,839 | | 13,045 | | 0.423 |
| | Boat | 7,801 | | 2,756 | | 0.353 |
| | Total | 39,387 | | 16,969 | | 0.431 |

[a] Does not include 3 day Memorial Day holiday weekend
[b] Only one interview
[c] Only two boat interviews made, used average catch rate for boat weekend anglers to calculate harvest estimate.

Table 12. Monthly total estimated angling pressure, harvest, and catch rates for weekday days on Horsethief Reservoir, 1994 with 95% confidence intervals (+/-(%)).

| Month | Type | Total Angler hours | | Total Harvest | | Average Catch Rate |
|---|---|---|---|---|---|---|
| January-Mar | Ice | 0 | | 0 | | 0 |
| April | | no weekday surveys completed | | | | |
| May[a] | Shore | 10,904 | (69%) | 5,547 | (63%) | 0.509 |
| | Boat | 5,274 | (44%) | 4,662 | (154%) | 0.884 |
| June | Shore | 3,861 | (15%) | 2,230 | (41%) | 0.578 |
| | Boat | 2,407 | (22%) | 1,374 | (72%) | 0.571 |
| July | Shore | 3,738 | (96%) | 2,422 | (74%) | 0.648 |
| | Boat | 3,218 | (127%) | 1,830 | [b] | 0.569 |
| August | Shore | 3,105 | (67%) | 616 | (433%) | 0.198 |
| | Boat | 1,863 | (67%) | 1,060 | [b] | 0.569 |
| September | Shore | 2,352 | (50%) | 1,401 | (60%) | 0.596 |
| | Boat | 1,058 | (100%) | 602 | [b] | 0.569 |
| October | Shore | 1,502 | (46%) | 850 | (86%) | 0.566 |
| | Boat | 231 | (200%) | 131 | [b] | 0.569 |
| November | Shore | 0 | | 0 | | 0 |
| | Boat | 0 | | 0 | | 0 |
| December | Ice | 0 | | 0 | | 0 |
| Totals | Ice | 0 | | 0 | | NA |
| | Shore | 25,462 | | 13,066 | | 0.513 |
| | Boat | 14,051 | | 9,659 | | 0.687 |
| | Total | 39,513 | | 22,725 | | 0.575 |

[a] Does not include Memorial Day (3 Days)

[b] No boat interviews completed, used average catch rate for boat and shore weekday anglers to calculate harvest estimate.

Table 13. Estimated total harvest and percent of total harvest by species and angler type (shore, boat or ice) on Horsethief Reservoir, 1994.

| Species | Number/percent harvested by shore anglers | Number/percent harvested by boat anglers | Number/percent harvested by ice anglers |
|---|---|---|---|
| Yellow Perch | 2,855 /7% | 733 /2% | 490/1% |
| Rainbow Trout | 20,885 / 53 | 10,801 / 27 | 531/ 1.3 |
| Brown Trout | 450 / 1.0 | 102 / 0.3 | 11/ 0.03 |
| Splake | 508 / 1.0 | 17 / 0.04 | 70/ 0.2 |
| Brook Trout | 1,282 / 3.2 | 465 / 1.0 | 67/ 0.2 |
| Cutthroat Trout | 73 / 0.2 | 216 / 0.5 | 0 |
| Unknown Trout | 57 / 0.1 | 43 / 0.1 | 0 |

Table 14. Average length, by month, of fish creeled by anglers in Horsethief Reservoir in 1994.

| | SPECIES | | | |
|---|---|---|---|---|
| Month | Yellow Perch | Rainbow Trout | Brown Trout | Splake |
| ICE 94 | -- | 234 | -- | 217.5 |
| May | -- | 262 | 315 | 237 |
| June | 242 | 271 | -- | -- |
| July | 234 | 272 | 375 | 270 |
| August | 166 | 212 | 420 | -- |
| September | 223 | 287 | 325 | 249 |
| October | -- | 305 | 280 | 242 |
| November | -- | 282 | -- | -- |
| December | 180 | 262 | -- | 270 |

## Cascade Reservoir

We fished gill nets a total of 366 net hours to collect 27 salmonids. We collected 15 kokanee, 11 rainbow trout, and 1 coho salmon. The kokanee averaged 376.5 mm and 564 g., They ranged in length from 300 mm to 458 mm and in weight from 225 g to 960 g. The rainbow trout ranged in length from 283 mm to 503 mm and in weight from 272 g to 1,400 g. The one coho was 495 mm and 1,210 g.

## Splake Introduction Evaluations

We collected 21 and 23 splake respectively from Granite Lake and Upper Payette Lake . The splake in Granite Lake averaged 281 mm, 220 g with a condition factor (Ktl) of .915. They ranged in length from 183 to 357 mm and in weight from 57 to 490 g. Condition factors ranged from .78 to 1.12.

We collected only one splake from the original 1992 stocking from Upper Payette Lake. This fish was in poor condition at 210 mm and 70 g and a Ktl of .75. The 22 splake collected from the second stocking in1993 averaged 341 mm, 387 g, with a Ktl of 0.90. Lengths ranged from 229 to 450 mm and weights ranged from 125 to 995 g. Condition factors ranged from 0.69 to 1.17.

We found that splake in Granite Lake were feeding primarily on Chironomidae larvae and zooplankton. However, two stomachs contained fish. In Upper Payette Lake the primary food item found in stomachs was small largescale suckers (7 of 8 stomachs examined that contained any food item).

## Lost Valley Reservoir

Upon inspection of the reservoir and tributaries by foot and canoe the day after the rotenone treatment, we observed dead perch and rainbow trout, and a small number of large bullheads *Ameiurus nebulosus* that were still alive. We observed no signs of any live yellow perch. Very few dead trout were observed.

It took approximately 12 hours for both treatments of Lost Creek and East Fork Lost Creek to reach the confluence. In the tributaries the day after the treatment, we found dead brook trout and yellow perch. No yellow perch were observed within approximately ½ mile of the upper drip stations on either Lost Creek or East Fork Lost Creek.

## Warm Lake Angler Survey

Total season angling effort at Warm Lake was estimated at 17,405 (± 3,138 95% CI) hours (Figure 4), and average catch rate for the season was 0.48 fish/h.

Warm Lake received two plantings of 230 mm Kamloops strain rainbow trout in 1994; 10,143 fish were stocked on May 12, and 5,000 fish were stocked on June 28. These hatchery trout dominated the catch and harvest composition (96%) at Warm Lake. An estimated 7,094 (± 2,579 95% CI) hatchery rainbow trout were harvested during the survey for a season exploitation of 47%. Only 1% of the rainbow in the creel were from the 1993 stocking.

An estimated 1,346 (± 1,927 95% CI) brook trout were harvested, and 40 (± 59 95% CI) kokanee were harvested. The wide confidence intervals for brook trout and kokanee harvest reveal the infrequency of these species in the catch. No other species were reported in the catch.

Ninety-four percent of anglers were split evenly between using boats vs. fishing from the bank, with the remaining 6% of anglers fishing from float tubes. Bait dominated the tackle type, being used 64% of the time. Lures were used 26% of the time, and flies were used 10% of the time. Ten percent of anglers harvested a limit of six trout. Ninety-five percent of anglers were residents of Idaho.

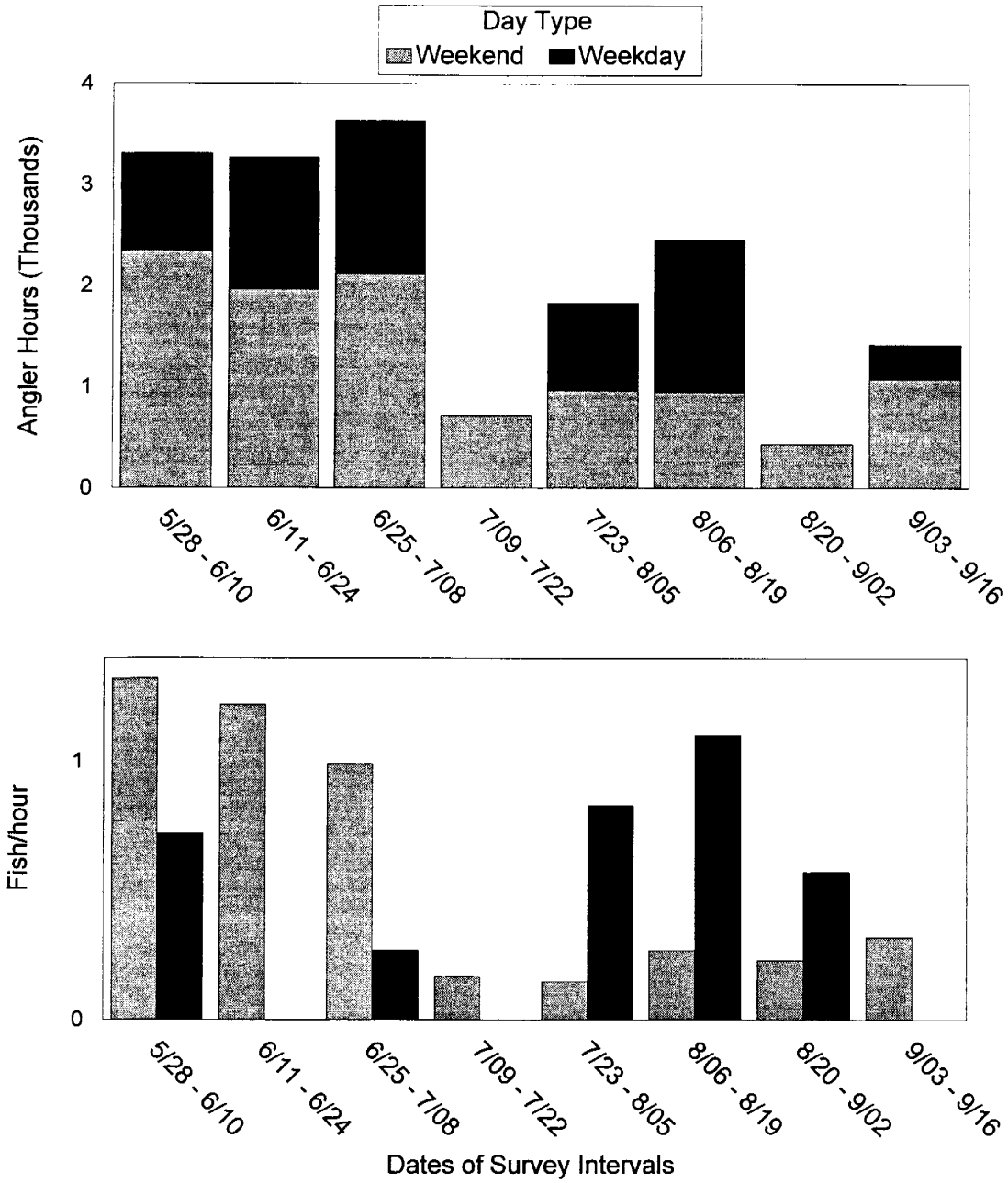


Figure 4. Angler effort and catch rate for all species combined, by two-week intervals, Warm Lake, Idaho, 1994.

## Warm Lake Inventory

Species sampled by gill nets included mountain sucker, rainbow trout, bull trout, brook trout, kokanee salmon, mountain whitefish, lake trout, rainbow x cutthroat trout hybrid, and redside shiner (Table 15). A representative subsample of the kokanee were all aged at 3+ years old.

Table 15. Gill net sample from Warm Lake, July 13, 1994.

| Species | Number | Total length (mm) | | Weight (g) | |
|---|---|---|---|---|---|
| | | Mean | Range | Mean | Range |
| Rainbow trout | 5 | --- | --- | --- | --- |
| Brook trout | 10 | 256 | 168-361 | 218 | 54-505 |
| Bull trout | 1 | 196 | --- | 65 | --- |
| Lake trout | 1 | 896 | --- | 865 | --- |
| Kokanee salmon | 21 | 205 | 192-228 | 71 | 56-104 |
| Rainbow x cutthroat | 1 | 332 | --- | 340 | --- |
| Mountain whitefish | 63 | --- | --- | 246 | --- |
| Mountain sucker | 53 | --- | --- | 146 | --- |
| Redside shiner | 1 | --- | --- | --- | — |

# DISCUSSION

## Horsethief Reservoir

Biologists felt that trout growth in the reservoir was about to experience major problems. Yellow perch, which are direct competitors of trout, were expected to increase greatly in numbers and biomass in 1995. At the time of this study, yellow perch, rainbow trout, brown trout, and splake made up 51.5%, 29.6%, 12.8%, and 6%, respectively, of the biomass collected. By the fall of 1995, this was expected to change to 75%, 15%, 6.4%, and 3% respectively for yellow perch, rainbow trout, brown

trout, and splake. This change was expected to severely reduce trout growth and angler harvest success. Therefore the reservoir was scheduled to be drained and treated with rotenone in the fall of 1995 to eliminate yellow perch from the system.

## Warm Lake

This was the first season-long angler survey conducted on Warm Lake. A partial survey was conducted in 1960, and opening weekend surveys were conducted in several years (IDFG files). Likewise, the only fish sampling conducted has been occasional gill netting since 1960 (IDFG files; Janssen and Anderson 1992, 1994) (Figure 5). In the past kokanee and brook trout comprised >50% of the fishery on opening day in late May or early June (Figure 5). We could identify no population trends from the gill net samples. Inconsistent information regarding location of sampling and type of nets used renders these data poor for comparison among years, but it is all of the information we have.

Catch rate on opening day in 1994 was the best ever recorded at 1.32 fish/h. Fishing pressure on the same day was 1,173 hours (Figure 6), not surprisingly much higher than 20 to 30 years prior.

The increasing contribution of rainbow trout in the fishery can be directly contributed to stocking trends. Annual stocking of catchable rainbow began in 1959 with 1,000 fish/y. In 1961, the number of fish stocked increased to 5,000; from 1977 through 1984 an average of 12,000 fish were stocked annually. Since 1985, however, 15,000 to 16,000 catchable rainbow have been stocked, distributed throughout the general fishing season. In 1994, 66% of the fish were stocked prior to Memorial Day weekend, and the remainder stocked just prior to the July 4 weekend, providing fish for the most active period of the year (Figure 4).

The north shore of Warm Lake provides an exceptional opportunity for bank anglers. Except for the north end, virtually all of the shoreline is private or inaccessible. Catch rates by bank anglers fishing with bait was exceptional for such a large lake. Stocking of trout should be concentrated in this area to provide a consistent fishery for bank anglers.

Exploitation of catchable rainbow exceeded the statewide goal of 40% for put-and-take fisheries. Rainbow from the 1994 stocking that were not harvested during the summer did survive to provide good ice fishing the following winter.

During the survey, few anglers were observed targeting species other than rainbow trout or kokanee. We may succeed in diversifying the fishery if we provide information regarding how and where to fish for lake trout and mountain whitefish.

Kokanee in the harvest and gill net sample were ≤228 mm (9 inches). The small size of kokanee did discourage some anglers that otherwise preferred fishing for kokanee vs. rainbow trout. Trawling conducted in 1991 showed kokanee densities and growth rates consistent with other populations in lakes of intermediate productivity (memo from Bruce Rieman, IDFG files). Kokanee year class strength is highly variable, so an inconsistent fishery is to be expected. Past stocking of kokanee fingerlings did not appear to improve the fishery and the endemic kokanee stock is genetically unique (Janssen and Anderson 1992). Therefore we recommend no future supplementation of kokanee.

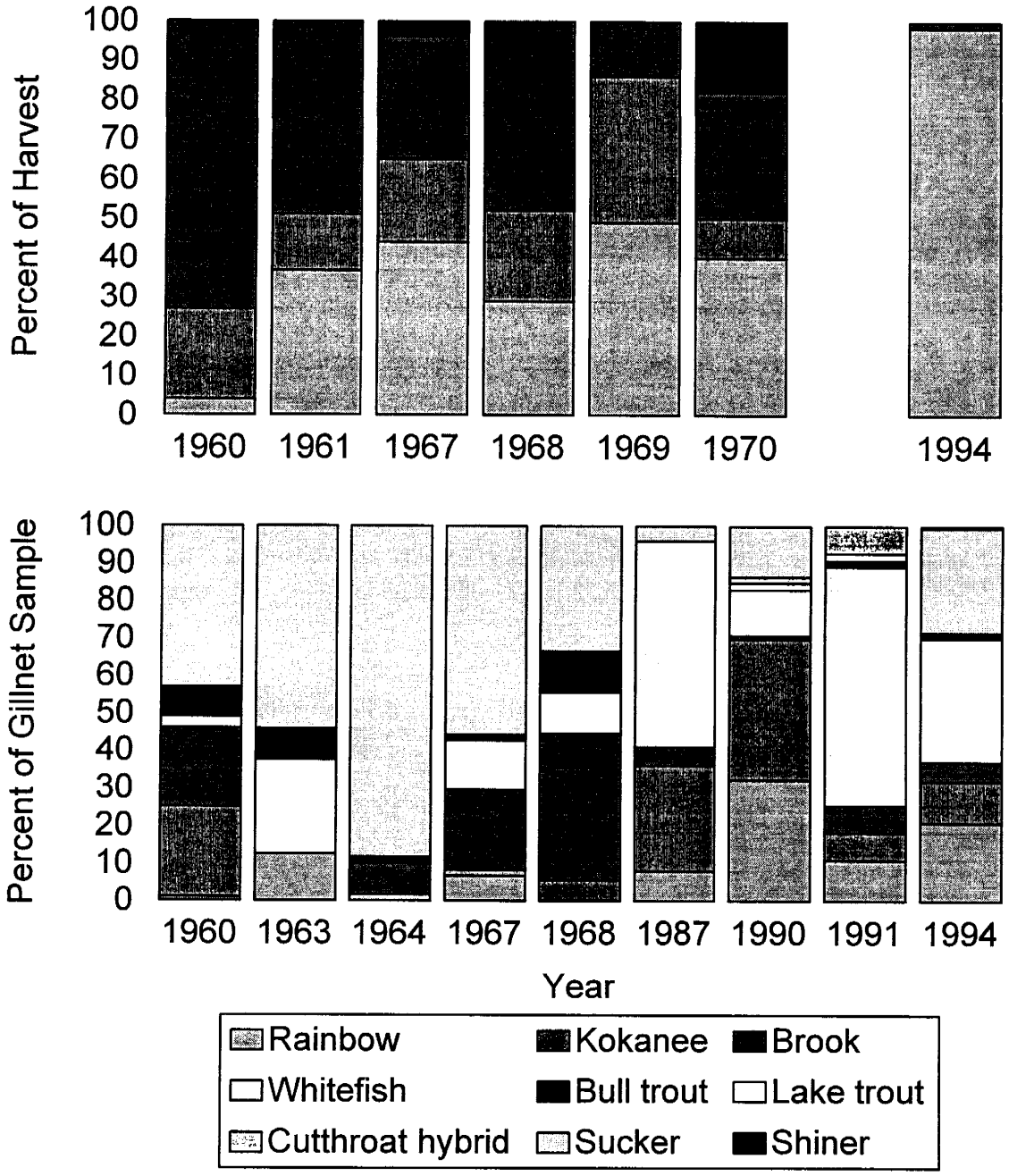


Figure 5. Relative species contribution to the harvest during the traditional "opening day" in late May or early June (top); and relative species abundance in gill net samples (bottom), Warm Lake, Idaho.

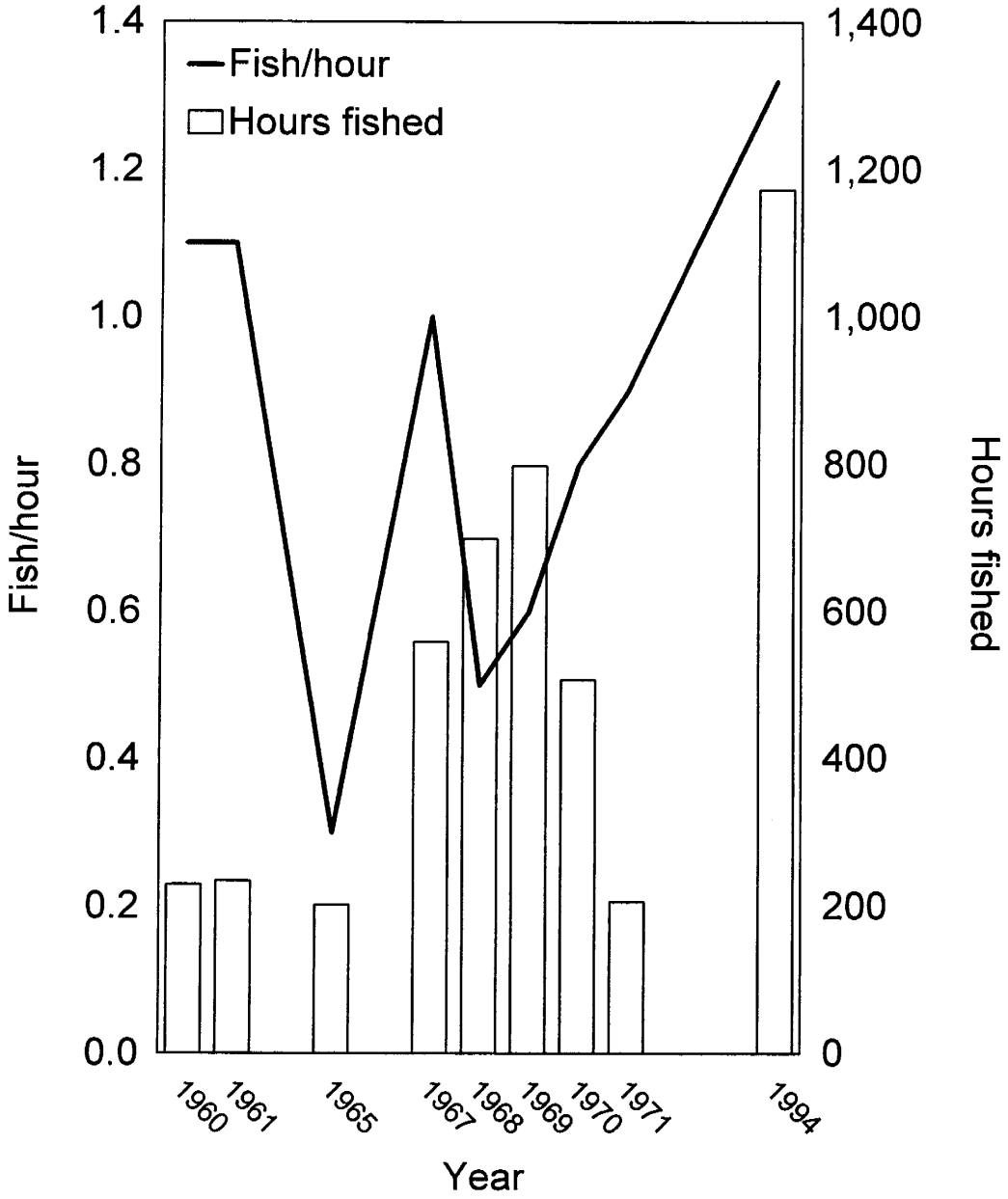


Figure 6. History of traditional "opening day" angling effort and success on Warm Lake, Idaho.

## RECOMMENDATIONS

1. Continue kokanee trawling in Payette Lake to monitor kokanee age class strengths.

2. Continue lake trout investigations in Payette Lake, including harvest rates, population structure, age and growth rates, and location of spawning areas.

3. Continue to monitor nongame fish populations and their effects on game fish in Little Payette Lake.

4. Rotenone Horsethief Reservoir in fall of 1995 to eliminate yellow perch.

5. Examine splake in Granite Lake and Upper Payette Lake again in 1996.

6. Stocking of catchable rainbow trout into Warm Lake should continue at the same, or slightly higher, rate. Two-thirds of the annual plant of 15,000 fish should occur just prior to Memorial Day weekend, with the remaining fish stocked in late June, prior to Fourth of July weekend. The majority of fish should be stocked at the North Shore Lodge boat ramp for maximum return to the creel and to provide more opportunity for bank anglers.

7. Anglers should be made aware of alternate fishing opportunities in Warm Lake for lake trout and mountain whitefish.

8. Fall gill net samples should be conducted annually to obtain trend information on relative abundance, growth, and condition of all fish species in Warm Lake. Net locations used in 1991 and 1994 should be used as permanent sample sites.

9. Discontinue stocking of kokanee in Warm Lake.

## LITERATURE CITED


Bowles, E.C., V.L. Ellis, D. Hatch, and D. Irving. 1986. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. Annual Progress Report FY 1985. Agreement No. DE-A179-85BP22493. Project. 85-339.

Bowles, E.C., V.L. Ellis, D. Hatch, and D. Irving. 1987. Kokanee stock status and contribution of Cabinet Gorge Hatchery, Lake Pend Oreille, Idaho. Annual Progress Report FY 1986. Agreement No. DE-A179-85BP22493. Project No. 85-339.

Grunder, S.A., J.D. Linman, and D.R. Anderson. 1990. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-13. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1992. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-14. Idaho Department of Fish and Game, Boise.

Janssen, P.J. and D.R. Anderson. 1994. Federal Aid in Fish Restoration. Regional Fisheries Management Investigations. Job Performance Report, Project F-71-R-16. Idaho Department of Fish and Game, Boise.

McArthur, T.S., T. Reece, and N. Boydstun. 1994. Creel census system 2.3 release 0. Idaho Department of Fish and Game, Boise.

# APPENDIX

Appendix A.

## APPLICATION FOR SHORT-TERM ACTIVITY EXEMPTION

**Applicant:** Idaho Department of Fish and Game (IDFG)

**Contact Person:** Don Anderson, 634-8137

**Body of Water:** Lost Valley Reservoir

**Tributary To:** Weiser River

**Objective:** To chemically eradicate stunted yellow perch and restock with rainbow trout

**Date:** October 20, 1994

**Evidence of protection or promotion of public interest**

Lost Valley Reservoir has a history of overpopulation by yellow perch and subsequent chemical rehabilitation by the Idaho Department of Fish and Game (IDFG). It was rehabilitated in 1959, 1964, 1985, and 1991 using rotenone and in 1971 using Antimycin (Fintrol). Each treatment resulted in greatly improved fishing for rainbow trout for the following 4-8 years.

Incomplete kills and illegal reintroduction allowed the yellow perch populations to rebuild to the point of overpopulation and stunting. The perch reduce survival and growth of rainbow trout and become a nuisance to anglers. The overpopulated perch average 6-7" and are unacceptable to anglers.

Following the 1985 eradication, catchable-size rainbow trout plants produced excellent fishing in 1986 through 1989. This resultant fishing was very popular and 59,000 angler hours of fishing was documented from May through September 1987. Natural spawning by the Eagle Lake strain demonstrated good growth and survival of the fingerling plants.

In 1989 perch began to enter the fishery. By 1990 juvenile perch were so numerous they seriously impacted trout growth and survival and interfered with angling. Many anglers complained of the decline in fishing quality to IDFG and Payette National Forest (PNF) personnel. A joint IDFG/PNF rotenone treatment was planned for October 1990, but was postponed when the irrigation district elected to store more water than usual as a hedge against another drought year.

A rotenone application was completed September 26, 1991. Gill net sampling the next spring demonstrated that a total kill had not been achieved. A relatively strong year-class of juvenile perch resulted from the 1992 spawn. Yellow perch comprised an increasingly large portion of the fish harvested in 1993 and 1994. Although anglers caught acceptably large perch, most anglers expressed concern that the perch had reestablished and expected subsequent overpopulation.

A late September inspection of the reservoir found the reservoir virtually drained.

Appendix A. Continued.

Communication with the Lost Valley Reservoir Irrigation Co. reconfirmed their earlier prediction that the reservoir would be essentially drained for a necessary outlet works inspection. They also stated the reservoir would remain empty until the inspection occurred on or about October 18, 1994.

The combination of the extremely low water year and the required drawdown affords the best opportunity to date for an effective chemical rehabilitation of the reservoir. Emergent aquatic vegetation mats coupled with upwelling springs in the reservoir prevented thorough mixing of the chemical in past attempts. The vegetative mats are dry and the springs are identifiable at the observed drawdown level.

Both agencies will solicit public input on the proposed project with news releases and personal contacts. The PNF initiated a formal NEPA process. Past comments show strong support for the rehabilitation effort and maintenance of a trout fishery.

**Prevention of long-term injury to beneficial use**

The IDFG plans to restock Lost Valley Reservoir in the spring of 1995 with catchable size rainbow trout to provide an immediate fishery. Additionally, we will stock fingerling rainbows in the summer of 1995.

Past surveys have documented yellow perch in Lost Creek upstream of the slackwater. As in past treatments, we will apply rotenone at the culvert near the mouth of the East Fork Lost Creek and treat the two miles of stream to the reservoir. Flow measurements will be taken three days of the treatment to calculate the minimum amount of rotenone needed. We will use a calibrated drip applicator for this part of the treatment. Rainbow and brook trout also occupy this reach of stream, but are expected to repopulate from untreated areas upstream of the culvert which is a passage barrier to perch, but not the salmonid species.

The main body of the reservoir is expected to contain about 100 acre feet of stored water at the time of treatment. The irrigation company plans on releasing water to attain the minimum pool prior to the treatment. Within three days of treatment we will calculate an accurate estimate of water to be treated using the formula as described in Fisheries Techniques - Nielsen & Johnson, 1983.

$$V_s = \frac{h}{3}(A_1 + A_2 + \sqrt{(A_1)+(A_2)})$$

We will conduct in situ, serial dilution bio assays at 1.0, 0.75, 0.50, 0.25 and 0.0 ppm of Roussel Biocorp Noxvish, a 5.0% formulation. We will treat at the lowest effective concentration as determined by a 4-hour exposure.

We plan to use a helicopter fitted with standard agricultural spray equipment to apply the rotenone to the entire perimeter, areas less than 0.3 m deep, and to "potholes." Small boats will apply rotenone to the deeper areas of the reservoir using venturi-type boat bailers. The lake will be sectioned by buoy lines. Each section will contain a known volume of water and will be assigned to one boat. Each boat will apply the amount of rotenone needed to attain the selected concentration.

Appendix A. Continued.

The irrigation company has agreed to close the outlet valve at the dam when we begin to apply . the rotenone,. Therefore, Lost Creek will be essentially dewatered except for leakage. The leakage, however, will have toxic levels of rotenone. The local chapter of Trout Unlimited has agreed to have a five-person crew available to salvage game fish from Lost Creek and transport them to a waiting IDFG hatchery truck containing a weak (1 ppm) potassium permanganate solution to neutralize the rotenone. These fish will be relocated to the Weiser River. Fish remaining in Lost Creek from the dam downstream about four and one-half miles to the confluence with Bear Gulch will be killed.

Hypothetical situation:

Assuming:
1) Lost Creek Q above reservoir is 10 cfs (approximately 1985).
2) Volume of storage in reservoir is 200 AF.
3) 1.0 ppm concentration rotenone needed.

We would:
1) Apply 5.0 gallons from drip station.
2) Apply 10.0 gallons by boat application
3) Apply 25. gallons by helicopter.

# 1994 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-19

Project I: Surveys and Inventories

Subproject I-C: McCall Subregion

Job: c

Title: Rivers and Streams Investigations

Contract Period: July 1, 1994 to June 30, 1994

## ABSTRACT


We completed two standard stream surveys on the Lake fork Drainage, one on the North Fork Lake Fork and one on the South Fork Lake Fork.

We conducted a creel survey on the Salmon River between Corn Creek and Wind River from June 17 through September 8, 1994. We interviewed 1,143 people of which 191 had fished and harvested 16 trout.

Spawning run counts of kokanee *Onchorhynchus nerka* from Payette Lake into the North Fork Payette River revealed a run size of 44,201 fish. We set thermographs in six locations in the North Fork Payette River drainage above Payette Lake.

An angler survey and population estimate indicated exploitation of steelhead *Oncorhynchus mykiss* parr was 11% with a bound on the estimate of 5% to 19%. Densities of steelhead parr appeared to be higher than in 1984 and 1985, though physical conditions for snorkeling and sites sampled were not consistent among years.

Anglers were guided by Wapiti Ranch Outfitters in a three mile section of the South Fork Salmon River below the confluence with the East Fork. All fishing was catch-and-release. Catch rate for cutthroat *Oncorhynchus clarki,* rainbow/steelhead, bull trout *Salvelinus confluentus,* and whitefish *Prosopium williamsoni* combined was 2.27 fish/hr. Cutthroat dominated the fishery. Snorkeling indicated average densities of cutthroat at 0.15 fish/ 100 m2.

Temperature recorders monitored the upper Little Salmon River throughout the summer. July and August temperatures in 1994 averaged from 15 to 22 ° C and were often higher than temperatures tolerated by rainbow trout.



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## OBJECTIVE

To maintain information for fishery management activities and decisions for rivers and streams.

## INTRODUCTION

### North Fork Lake Fork

The North Fork Lake Fork (NFLF) drainage was involved in the Blackwell forest fire during the summer of 1994. To collect baseline data to monitor any possible future effects of the fire on the stream, we conducted standard stream surveys on two streams. We completed one survey on the North Fork Lake Fork (NFLF) which flows directly through the burn area, and one on the South Fork North Fork Lake (SFNFLF) which was not effected by any of the fires, as a control.

### Salmon River Creel Survey

Very little was known about summer angling pressure and catch on the Salmon River between Corn Creek and Wind River. The primary users of this area in the summer are river rafters (both private parties and commercial guides). Also, smallmouth bass *Micropterus dolomieu* are known to have expanded their range and numbers up the Salmon River, but the extent of this expansion was unknown. The potential listing of wild steelhead *Oncorhynchus mykiss* under the Endangered Species Act raised some concerns about the level of steelhead smolt harvest in waters where they are present. Therefore, we conducted a creel survey on this section of the Salmon River from June 17 through September 8, 1994.

We designed the survey to examine angling pressure and fish catches in the main Salmon River, in the mouths of tributaries, and in the tributaries themselves, by people who float the Salmon River from Corn Creek downstream to Wind River. This covers approximately 81 river miles.

### North Fork Payette River above Payette Lake

The spawning run of kokanee *Oncorhynchus nerka kennerlyi* in the North Fork Payette River (NFPR) from Payette Lake has been monitored since 1988 to assess spawning escapement and to serve as a method of validating kokanee population/density estimates and survival estimates from trawling (Janssen et al. 1995).

The NFPR and its tributaries above Payette Lake are of great interest to many people in the McCall area, both as a fishery and also as a watershed to protect water quality in Payette Lake. Timber in this drainage was being harvested at a significant rate by both the U.S. Forest Service (USFS) and the Idaho Department of State Lands. We set thermographs in the drainage to monitor water tempertures.

## East Fork South Fork Salmon River and Lower Johnson Creek Angler Survey and Inventory

The South Fork Salmon River drainage supports wild, primarily B-run, steelhead trout. This study was prompted by concern that sport angling may be exploiting steelhead parr at an unacceptable level. Ten years had passed since the last angler survey and intensive fish population survey were conducted in the drainage (Thurow 1987). Management changes made since Thurow's study include implementation of catch-and-release regulations for westslope cutthroat trout *Oncorhynchus clarki lewisi* and bull trout *Salvelinus confluentus* in 1988 and 1994, respectively, and cessation of stocking catchable rainbow trout since 1993.

To determine how these changes in management affected angler effort, harvest, and the fish community, we repeated both an angler survey and intensive snorkeling survey throughout the East Fork South Fork Salmon River (EFSFSR) and lower Johnson Creek.

## South Fork Salmon River Guided Fishery

In 1994, Wapiti Ranch Outfitters was granted a permit to guide fishing on a section of the South Fork Salmon River below the confluence of the EFSFSR from Hamilton Creek to Threemile Creek. This study was an effort to track that fishery.

## Upper Little Salmon River Temperature Monitoring

The upper Little Salmon River (LSR) drainage has recently been the focus of limited riparian habitat improvement and some improvements in agricultural land use practices. Debate has risen over identifying what specific factors are limiting salmonid populations in the drainage. The effect of high summer water temperature as a factor limiting salmonid abundance and distribution in the LSR is unknown. The recent availability of affordable temperature recorders made it possible to monitor summer temperatures throughout the upper LSR.

# METHODS

## North Fork Lake Fork

On October 29, 1994, we completed two standard stream surveys. Methods used for conducting an Idaho Department of Fish and Game (IDFG) Standard Stream Survey are described in the August 15, 1994 intradepartment memorandum entitled: Standard Stream Survey From: Bill Horton.

We completed one stream survey on North Fork Lake Fork (NFLF). The station was located approximately 0.1 miles upstream from the bridge (approximately 1.5 miles north of the USFS, Lake Fork

Campground). A map and detailed sketch of the transect are found in Appendix A.

We completed a second stream survey on South Fork Lake Fork (SFLF). The transect was located approximately 0.1 miles upstream of the confluence of the North and South Forks. A map and detailed sketch of the transect are found in Appendix A.

In both transects, we used electrofishing gear to collect fish from the transect. We made a one-pass collection. We used fluorescein dye to measure stream velocity.

## Salmon River Creel Survey

We conducted a creel survey on the Salmon River from June 17 through September 8, 1994. A creel clerk was stationed at the Wind River boat ramp for 25 randomly chosen days. All float parties encountered on those days were interviewed for angling information. This information was recorded for the main Salmon River, the mouths of tributaries, and the tributaries themselves.

In addition to where on the river people fished, interview questions included; number of people in the party, number of anglers in the party, hours fished on the trip, if they fished from boat or shore, total number and size of fish harvested by species, total number and size of fish released by species, and what type of gear they used (lure, fly, or bait). We had to rely on anglers and guides themselves to identify fish to species as no fish were brought out.

## North Fork Payette River above Payette Lake

We visually counted all spawning kokanee on seven different dates throughout the spawning run. We made counts by walking the stream visually counting all live fish. A total spawning run estimate was then made by multiplying the largest daily live spawner count by 1.73 (Frost and Bennett 1995). We also examined all accessible dead fish for an adipose fin clip. Adipose clipped fish were stocked as fingerlings in Payette Lake in 1992 and 1993.

We placed electronic temperature loggers in several locations in the North Fork Payette River (NFPR) drainage above Payette Lake. The exact locations are presented in Figure 1. We placed the temperature recorders on August 5, 1993 and ran them continuously through September 25, 1994, with the exception of Pearl Creek which ran through May 14, 1994, when it malfunctioned.

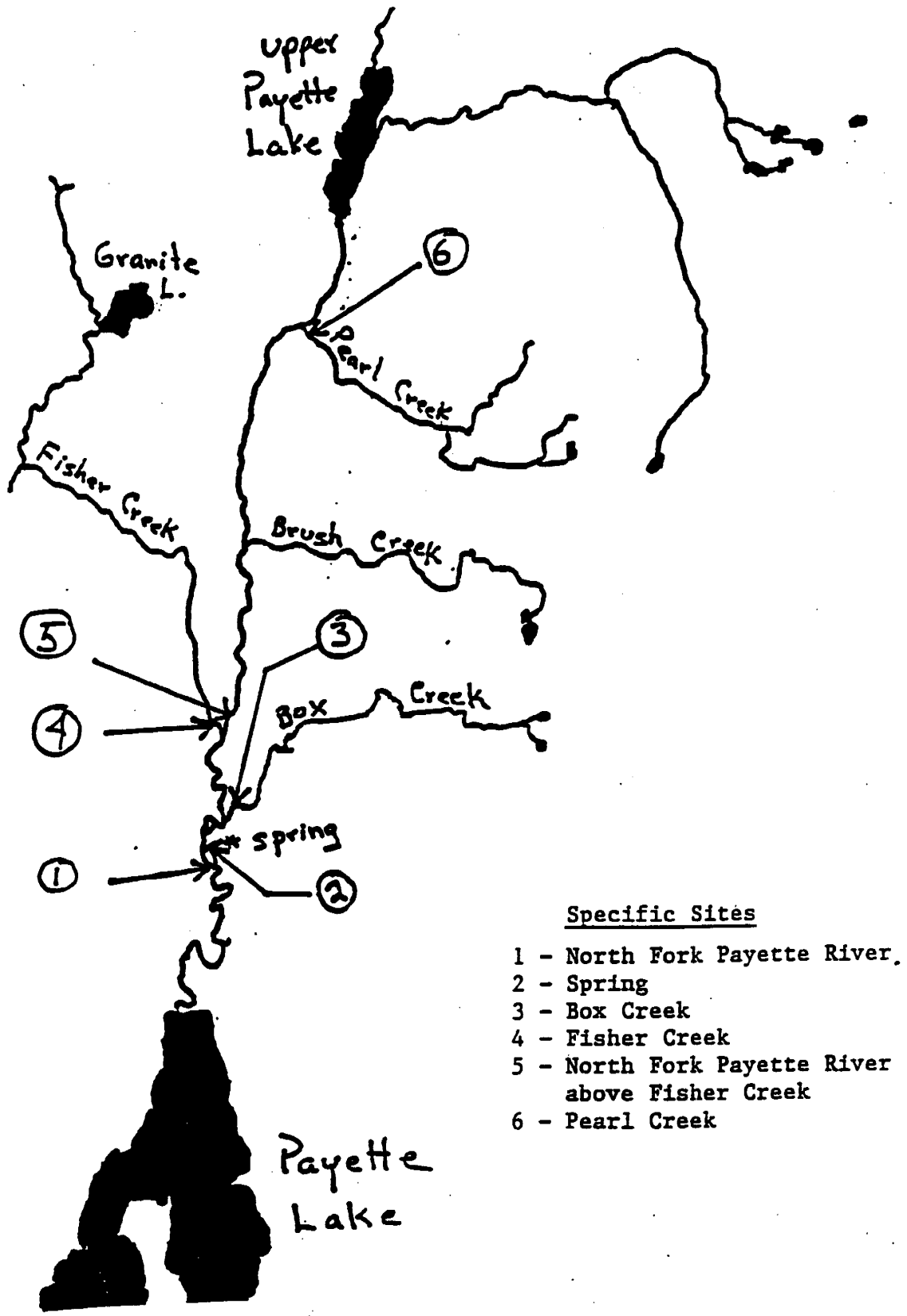



Figure 1. Locations of temperature recorders placed in the North Fork Payette River, Idaho drainage.

## East Fork South Fork Salmon River and Lower Johnson Creek Angler Survey and Inventory

A stratified random roving survey (McArthur et al. 1994) was designed to estimate angler effort, methods of angling, catch, and harvest on the entire EFSFSR and lower Johnson Creek, its major tributary. The survey boundary was at Ice Hole on Johnson Creek, where a summer seasonal fishing closure protects spawning chinook salmon *Oncorhynchus tshawytscha*.

Angler counts and interviews were conducted on two week days and two weekend days during each of seven two-week intervals from May 28 through September 2. Two angler counts were made by motor vehicle, on each day, at randomly chosen times at least four hours apart. The surveyed reach, a distance of 51 km, was partitioned into three sections: EFSFSR, mouth to Johnson Creek (24 km); EFSFSR, Johnson Creek to Sugar Creek (18 km); and Johnson Creek, mouth to restricted fishery at Ice Hole (9 km).

Because of the length of the surveyed reach and relative paucity of anglers, we conducted interviews during each angler count. Information collected during interviews included method of angling (bait, lure, or fly), hours fished during current trip, trip completed (yes or no), county of residence, species targeted, number and length of each species caught, released, or harvested.

The EFSFSR and lower Johnson Creek were intensively snorkeled during mid-July, 1994, following established methods (Bowles and Leitzinger 1991). We attempted to sample habitats in representative proportions to their frequency of occurrence, and to distribute sites throughout the study area. Habitat types identified included pools, runs, riffles, and pocketwater.

## South Fork Salmon River Guided Fishery

We provided the Wapiti Meadow Ranch with angler diaries made specifically for surveying this fishery. Guides were asked to have clients record time fished, length to the nearest inch and species of each fish caught for each day. There was also space provided in the diary for comments, and an opportunity for the angler to have his or her diary returned after analyses.

We established three snorkel sites within the permitted reach of the South Fork. Each site was snorkeled on July 18 with a crew of nine people following established methods (Bowles and Leitzinger 1991).

## Upper Little Salmon River Temperature Monitoring

Three temperature recorders (Hobo model HTI -5 to +35° C) monitored water temperature continuously, taking a measurement every 2.4 hours in the upper Little Salmon River from May 16 through September 14, 1994. The upstream recorder (Station 1) was placed under the bridge on Hubbard Lane approximately 500 m above the irrigation diversion. Station 2 was approximately 50 m downstream from the Meadow Creek subdivision bridge, adjacent to Highway 95 road mile 163.4 and at 45° N. Station 3

was adjacent to road mile 166.7 on Highway 95. All recorders were in water tight ABS containers and secured to a four foot rebar driven into the substrate to hold the recorder at the middle of the water column.

## RESULTS

### North Fork Lake Fork

The data collected from the two surveys is presented in tables 1 through 4. We found the North Fork Lake Fork (NFLF) transect to be a medium gradient B channel with some deposition areas in the transect (Table 1). Bank stability in the transect was very good. Salmonid cover was limited. Biologists did not observe any impacts to the stream as a result of the fire. In the NFLF transect we collected 48 brook trout *Salvelinus fontinalis*, two wild rainbow *Oncorhynchus mykiss* and noted numerous sculpin *Cottus sp.*(Table 2).

The SFLF transect was a high gradient, confined, flushing channel. Boulder and bedrock were the predominant bottom substrates (Table 3). Bank stability was excellent in the transect. In the SFLF transect we again found both rainbow and brook trout. We collected two brook trout and four rainbow trout. No other species were observed (Table 4).

Table 1. Habitat data collected from the North Fork Lake Fork standard stream survey.

| | | | |
|---|---|---|---|
| Date: | 10/29/94 | Transect Name: | NFLF |
| EPA Reach: | 1705012302803202 | | |
| Total Length: | 410.2 ft | Water Temp.: | 36°F. |
| Conductivity: | 40 umhos | Water vel.(Dye Time): | 750 seconds |
| Ave. width: | 37.6 ft | Ave. depth: | 0.5 ft |
| Gradient %: | 1.8 | Flow : | 10.3 $ft^3$/sec. |
| Channel Type: | B | Visibility (m): | NA |

Habitat Type (%): Pool: 10 Riffle: 0 Run: 86 Pocket Water: 4

| Transect length from bottom (ft) | Width (ft) | L to R | Depth (ft) | Sand (%) | Gravel (%) | Rubble (%) | Boulder (%) | Bedrock (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | 29.5 | ¼ | 0.36 | -- | 5 | 95 | -- | -- |
| | | ½ | 0.43 | 20 | 40 | 40 | -- | -- |
| | | ¾ | 0.43 | -- | 20 | 80 | -- | -- |
| 67.5 | 38.5 | ¼ | 0.46 | 5 | 10 | 85 | -- | -- |
| | | ½ | 0.46 | -- | 20 | 80 | -- | -- |
| | | ¾ | 0.43 | 15 | 30 | 55 | -- | -- |
| 167 | 39.5 | ¼ | 0.75 | -- | 40 | 60 | -- | -- |
| | | ½ | 0.72 | 20 | 10 | 70 | -- | -- |
| | | ¾ | 0.66 | 10 | 30 | 60 | -- | -- |
| 410.2 | 43.1 | ¼ | 0.33 | -- | 80 | 20 | -- | -- |
| | | ½ | 0.56 | -- | 60 | 40 | -- | -- |
| | | ¾ | 0.46 | 15 | 30 | 55 | -- | -- |

Table 2. Total number of fish by species collected, percent of total, average weight and relative weights (Wr) or condition factors (Ktl) of individual fish in each 10 mm length group collected in the standard survey of North Fork Lake Fork in October 1994.

| SPECIES: Brook trout | | | | | SPECIES: rainbow trout (wild) | | | |
|---|---|---|---|---|---|---|---|---|
| Length range | # coll. | % of Total | Ave. Wgt | Wr | # coll. | % of total | Ave. Wgt. | Ktl |
| 50-59 | 3 | 6 | NA | NA | 1-40mm | 50 | | NA |
| 60-69 | 17 | 36 | NA | NA | | | | |
| 70-79 | 10 | 21 | NA | NA | | | | |
| 80-89 | 3 | 6 | NA | NA | | | | |
| 90-99 | 2 | 4 | NA | NA | | | | |
| 100-109 | 5 | 11 | 6.5 | 51 | | | | |
| 110-119 | 4 | 9 | 9.5 | 56 | | | | |
| 120-129 | | | | | | | | |
| 130-139 | | | | | | | | |
| 140-149 | | | | | | | | |
| 150-159 | 2 | 4 | 32.5 | 75 | | | | |
| 160-169 | | | | | | | | |
| 170-179 | | | | | | | | |
| 180-189 | | | | | | | | |
| 190-199 | 1 | 2 | 69 | 77 | | | | |
| 200-209 | | | | | | | | |
| 210-219 | | | | | | | | |
| 220-229 | | | | | | | | |
| 230-239 | | | | | | | | |
| 240-249 | | | | | | | | |
| 250-259 | | | | | | | | |
| 260-269 | | | | | 1 | 50 | 180 | 0.97 |
| 270-279 | | | | | | | | |
| 280-289 | | | | | | | | |
| 290-299 | | | | | | | | |
| 300-309 | | | | | | | | |
| 310-319 | | | | | | | | |
| 320-329 | | | | | | | | |
| 330-339 | | | | | | | | |
| 340-349 | | | | | | | | |
| 350-359 | | | | | | | | |

Table 3. Habitat data collected from the South Fork Lake Fork stream survey.

| | | | |
|---|---|---|---|
| Date: | 10/29/94 | Transect Name: | South Fork Lake Fork |
| EPA Reach: | 170501230280320? | | |
| Total Length: | 116.5 | Water Temp.: | 36° F |
| Conductivity: | 40 mhos | Water vel.(Dye Time): | 127 seconds |
| Ave. width: | 19.25 | Ave. depth: | 0.98 ft |
| Gradient %: | 2.8 | Flow: | 32.7 $ft^3$/second |
| Channel Type: | B | Visibility (m): | NA |

Habitat Type (%): Pool: Riffle: Run: Pocket Water: 100

| Transect length from bottom (ft) | Width (ft) | L to R | Depth (ft) | Sand (%) | Gravel (%) | Rubble (%) | Boulder (%) | Bedrock (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | 25.8 | ¼ | 1.3 | -- | 15 | -- | 85 | -- |
| | | ½ | 1.25 | 10 | -- | -- | 90 | -- |
| | | ¾ | 0.98 | 10 | 20 | -- | 70 | -- |
| 57 | 14.4 | ¼ | 0.66 | -- | -- | -- | 100 | -- |
| | | ½ | 1.1 | -- | -- | -- | -- | 100 |
| | | ¾ | 0.82 | -- | -- | -- | 100 | -- |
| 90.5 | 18.3 | ¼ | 0.82 | -- | -- | -- | -- | 100 |
| | | ½ | 1.25 | -- | -- | -- | -- | 100 |
| | | ¾ | 0.82 | -- | -- | -- | -- | 100 |
| 116.5 | 18.5 | ¼ | 1.0 | -- | -- | -- | 100 | -- |
| | | ½ | 0.72 | -- | -- | -- | 100 | -- |
| | | ¾ | 0.98 | -- | 30 | 70 | -- | -- |

Table 4. Total number of fish by species collected, percent of total, average weight and relative weights (Wr) or condition factors (Ktl) of individual fish in each 10 mm length group, collected in the standard survey of South Fork Lake Fork in October 1994.

| SPECIES: rainbow trout | | | | | SPECIES: brook trout | | | |
|---|---|---|---|---|---|---|---|---|
| Length range | number coll. | % of Total | Ave. Wgt | Ktl | number coll. | % of Total | Ave. Wgt | Wr |
| 50-59 | | | | | | | | |
| 60-69 | | | | | 1 | 50 | NA | NA |
| 70-79 | | | | | | | | |
| 80-89 | | | | | | | | |
| 90-99 | | | | | | | | |
| 100-109 | | | | | | | | |
| 110-119 | | | | | | | | |
| 120-129 | | | | | | | | |
| 130-139 | | | | | | | | |
| 140-149 | 1 | 25 | 25 | 0.82 | 1 | 50 | 25 | 71 |
| 150-159 | 1 | 25 | 35 | 0.94 | | | | |
| 160-169 | | | | | | | | |
| 170-179 | | | | | | | | |
| 180-189 | 1 | 25 | 65 | 1.03 | | | | |
| 190-199 | | | | | | | | |
| 200-209 | | | | | | | | |
| 210-219 | | | | | | | | |
| 220-229 | | | | | | | | |
| 230-239 | 1[a] | 25 | 142 | 1.09 | | | | |
| 240-249 | | | | | | | | |
| 250-259 | | | | | | | | |
| 260-269 | | | | | | | | |
| 270-279 | | | | | | | | |
| 280-289 | | | | | | | | |
| 290-299 | | | | | | | | |
| 300-309 | | | | | | | | |
| 310-319 | | | | | | | | |
| 320-329 | | | | | | | | |
| 330-339 | | | | | | | | |
| 340-349 | | | | | | | | |
| 350-359 | | | | | | | | |

## Salmon River Creel Survey

During the creel survey, we conducted interviews on 25 days and interviewed a total of 125 groups representing 1,143 people (Table 5). Of the 1,143 people interviewed, 191 had fished at some time during their float trip down the river. Those 191 people fished a total of 1,441.5 hours for an average of 7.5 hours/angler. We found that anglers caught a total of 527 fish of which only 16 were harvested (unexpanded data). The species harvested by number included; 8 rainbow trout, 2 cutthroat trout, 2 bull trout, and 4 smallmouth bass. It is important to note that fish identification and measurements were made entirely by anglers and guides, no fish were observed by the creel clerk. The number and species of fish caught near on in the mouths of tributary streams is given in Table 6.

Table 5. Unexpanded data collected from the Salmon River Creel Survey conducted from June 17 through September 8, 1994.

| Item | PERIOD[a] 1 | 2 | 3 | Total |
|---|---|---|---|---|
| Total # of days interviewed: | 13 | 8 | 4 | 25 |
| Total # of groups interviewed: | 59 | 53 | 13 | 125 |
| Total # of floaters: | 550 | 518 | 75 | 1,143 |
| Average # of floaters/group: | 9.3 | 9.8 | 5.8 | 9.1 |
| Total # of anglers: | 96 | 71 | 24 | 191 |
| Average # of anglers/group: | 1.6 | 1.3 | 1.8 | 1.53 |
| Total # hours fished: | 790.5 | 381 | 270 | 1,441.5 |
| Average # of hours fished/angler: | 8.2 | 5.4 | 11.25 | 7.5 |
| Total # of fish caught: | 212 | 259 | 56 | 527 |
| Total # of gamefish harvested: | 5 | 4 | 7 | 16 |
| Total # of rainbow trout caught: | 72 | 79 | 42 | 193 |
| Total # of rainbow trout killed: | 2 | 1 | 5 | 8 |
| Total # of cutthroat trout caught: | 89 | 37 | 0 | 126 |
| Total # of cutthroat trout killed: | 1 | 1 | 0 | 2 |
| Total # of bull trout caught: | 19 | 4 | 2 | 25 |
| Total # of bull trout killed: | 2 | 0 | 0 | 2 |
| Total # of brook trout caught: | 4 | 11 | 1 | 16 |
| Total # of brook trout killed: | 0 | 0 | 0 | 0 |
| Total # of smallmouth bass caught: | 10 | 22 | 4 | 36 |
| Total # of smallmouth bass killed: | 0 | 2 | 2 | 4 |
| **Other species reported caught:** | | | | |
| Juvenile salmon: | 0 | 1 | 0 | 1 |
| Whitefish: | 52 | 11 | 37 | 4 |
| Unknown trout: | 0 | 3 | 0 | 3 |
| Unknown nongame fish: | 0 | 65 | 0 | 65 |
| Unknown fish: | 7 | 0 | 3 | 10 |

[a]Period 1: June 17-July 17, 1994
Period 2: July 18-August 17,1994
Period 3: August 18-September 8, 1994

Table 6. Locations and species of fish reported caught in or at the mouths of the Salmon River tributaries from Corn Creek downstream to Wind River from June 17 through September 8, 1994 (does not include fish caught in main river away from tributaries).

| | Number Caught by Species | | | | | |
|---|---|---|---|---|---|---|
| Location | Rbt | Cutthroat | Bull | Brook | Smallmouth Bass | Whitefish |
| Mouth of: | | | | | | |
| Chamberlain Cr. | | 3 | | | 4 | 1 |
| Sabe Cr. | 2 | 6 | 2 | | | |
| Bargamin Cr. | 2 | 2 | | | | |
| 5 Mile Creek | 2 | | | | | |
| SFSR | 7 | 5 | | | 1 | |
| Crooked Cr. | 8 | | | | | |
| Rabbit Cr. | 6 | 3 | 1 | | 1 | |
| Basin Cr. | | 1 | | | | |
| Bull Cr. | 2 | | | | | |
| T-Bone Cr. | | | | | 2 | |
| Sheephorn Cr. | | 1 | | | | |
| Total | 29 | 21 | 3 | | 8 | 1 |
| In Tributary: | | | | | | |
| Chamberlain Cr. | | 2 | | 1 | | |
| Harrington Cr. | | 2 RC | | | | |
| Sabe Cr. | 3 | | | | | |
| Magpie Cr. | 3 | | | | | |
| Bargamin Cr. | 1 | 14 | | | | |
| 5 Mile Cr. | | | | 1 | | |
| Mann Cr. | 3 | | | | | |
| Warren Cr. | 5 | | | | | |
| Sheep Cr. | 3 | | | 3 | | |
| Bull Cr. | 5 | | | | | |
| Sheephorn Cr. | | | | | 2 | |
| Total | 23 | 18 | | 7 | | |

We found that size of fish caught was typically small. Cutthroat trout ranged in reported size from 203 mm to 508 mm, with an average of 251 mm. Rainbow trout ranged in reported length from 127 mm to 508 mm, with an average of 196 mm. Bull trout ranged in reported length from 152 mm to 508 mm, with an average of 299 mm. Smallmouth bass ranged in reported length from 127 mm to 381mm, with an average of 249 mm.

## North Fork Payette River above Payette Lake

The kokanee spawning run began approximately September 1, 1994 and ran through mid-October. We made the peak count of 25,550 live fish on September 19, 1994. The total spawning run estimate for 1994 was 44,201 fish (Table 7).

We found that 15% of the dead spawners examined had an adipose fin clip. We multiplied the total spawning run estimate (44,201) by the peak percentage of marked, dead fish observed (15%) to get a total run size estimate of spawning marked fish of 6,630.

Table 7. Summary of peak spawner counts, total spawner estimates, and biomass estimates for spawning kokanee in the North Fork Payette River above Payette Lake from 1988 through 1994.

| Year | Peak Count | Est. # Spawners[a] | KG/HA[b] | #/HA[b] | Average Wgt/Fish (g) |
|---|---|---|---|---|---|
| 1988 | 13,200 | 22,800 | 4.6 | 13.3 | 346 |
| 1989 | 8,400 | 14,500 | 3.0 | 8.4 | 349 |
| 1990 | 9,642 | 16,700 | 3.5 | 9.7 | 358 |
| 1991 | 10,400 | 18,000 | 5.3 | 10.5 | 505 |
| 1992 | 16,945 | 29,300 | 6.4 | 17.1 | 377 |
| 1993 | 34,994 | 59,310[c] | 8.5 | 34.6 | 245 |
| 1994 | 25,550 | 44,200 | 5.5 | 25.8 | 214[d] |

[a] Peak spawner count multiplied by 1.73 (Frost and Bennett, 1994).
[b] Number of hectares greater than 40 feet deep (useable kokanee habitat) in Payette Lake = 1,715.
[c] Estimate made from both shore counts and weir (Frost and Bennett, 1994)
[d] From gillnet data of captured spawners in Payette Lake during lake survey.

We found no obvious problems with temperature profiles in the North Fork Payette River and its tributaries (Figures 2-7). Average daily temperatures in the NFPR itself peaked on July 26 and 27, 1994 at 20.5° C (Figure 3) at location number 1 (Figure 1). We found Box and Fisher Creeks were the two warmest tributaries. Box Creek peaked on July 28, 1994 at a mean daily temperature of 18.5°C (Figure 4). Fisher Creek temperatures peaked on August 11, 1994 at an average mean daily temperature of 18.5°C (Figure 5 and 6). Both Box Creek and Fisher Creek have irrigation storage reservoirs which presumably account for the higher water temperature.

## East Fork South Fork Salmon River and Lower Johnson Creek Angler Survey and Inventory

An estimated 2,023 (± 894 95% CI) rainbow/steelhead trout were harvested in 4,388 (± 998 95% CI) angler hours (54 h/ha) during the survey. Ninety-eight percent of the rainbow/steelhead examined in the creel were 150 mm to 260 mm (Figure 8). An estimated 6,815 (± 1,870 95% CI) rainbow/steelhead trout were caught and released by anglers.

We obtained the smallest bound on the population estimate when we stratified snorkeling samples by the three stream reaches and blocked on the four habitat types (Table 8). The population estimate for rainbow/steelhead, age 2 and 3, approximately 150 mm to 265 mm was 18,714 (± 3,413 95% CI) fish, for an overall exploitation estimate of 11%. Using the 95% confidence intervals for both population and harvest estimates, we get a range for exploitation of 5% to 19% on age 2 and age 3 rainbow/steelhead.

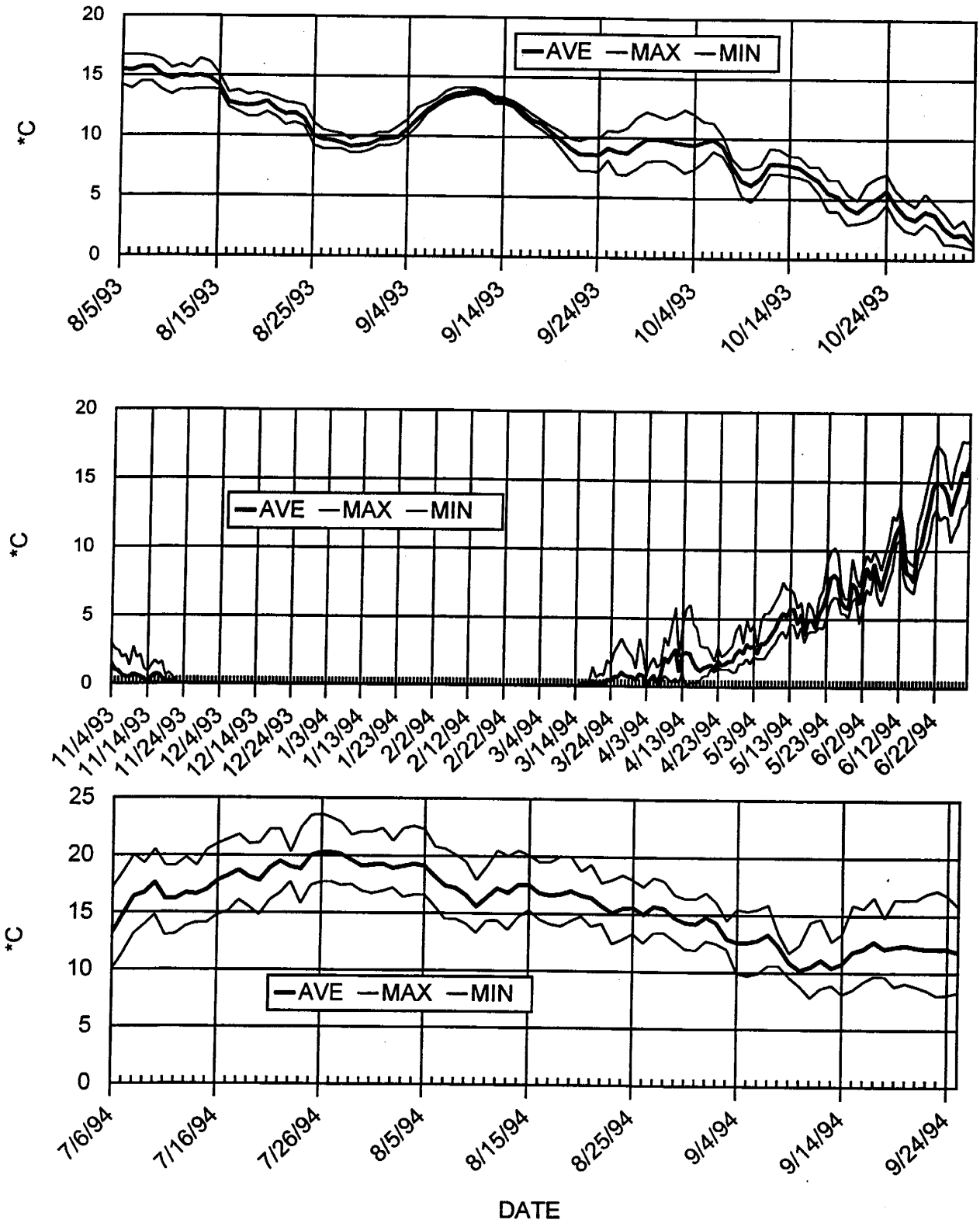



Figure 2. Daily average, minimum, and maximum temperatures recorded at location 1 (Figure 1) in the North Fork Payette River from August 5, 1993 through September 25, 1994.

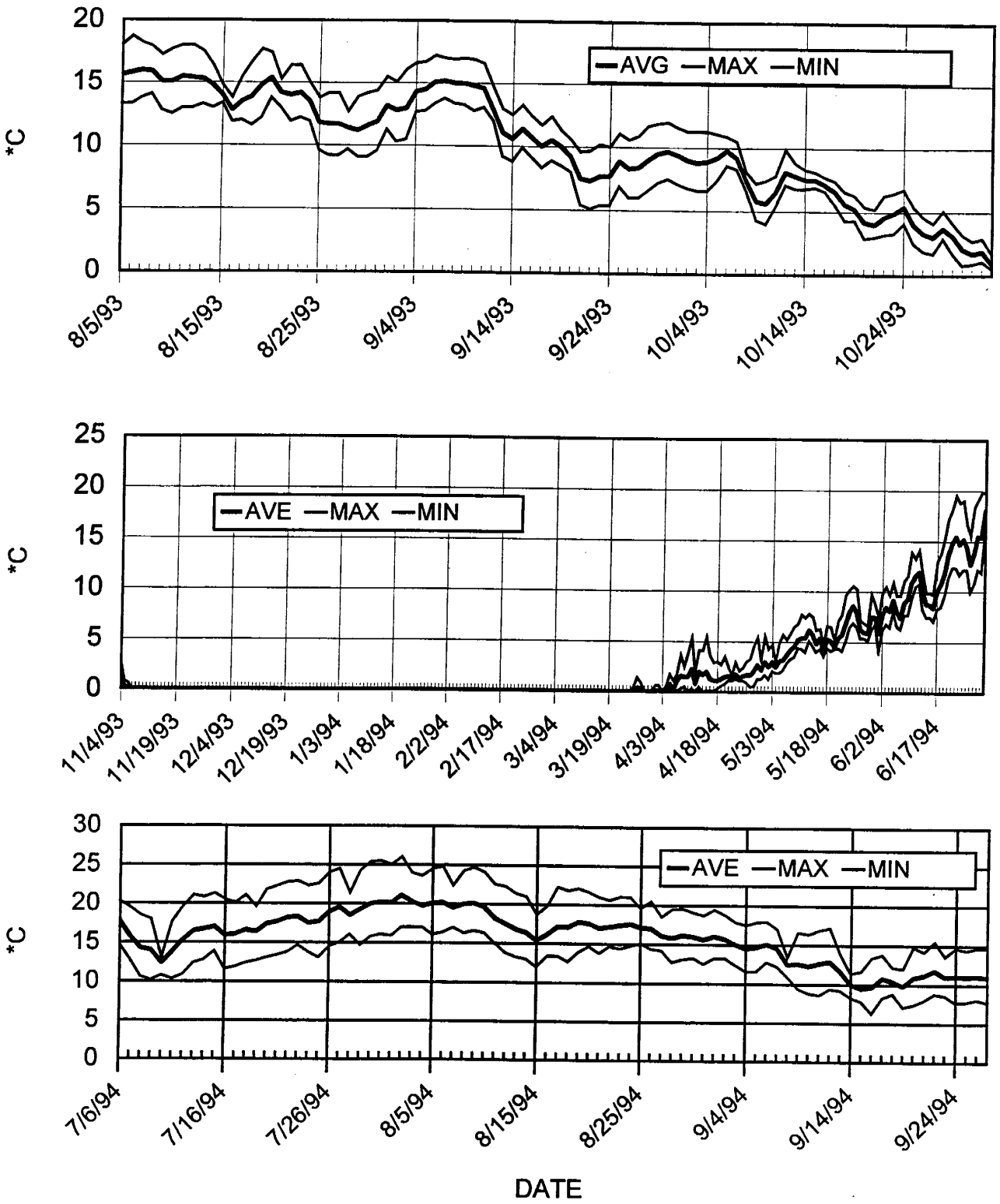



Figure 3. Daily average, minimum, and maximum temperatures recorded at location 5 (Figure 1) in the North Fork Payette River above Fisher Creek from August 5, 1993 through September 27, 1994.

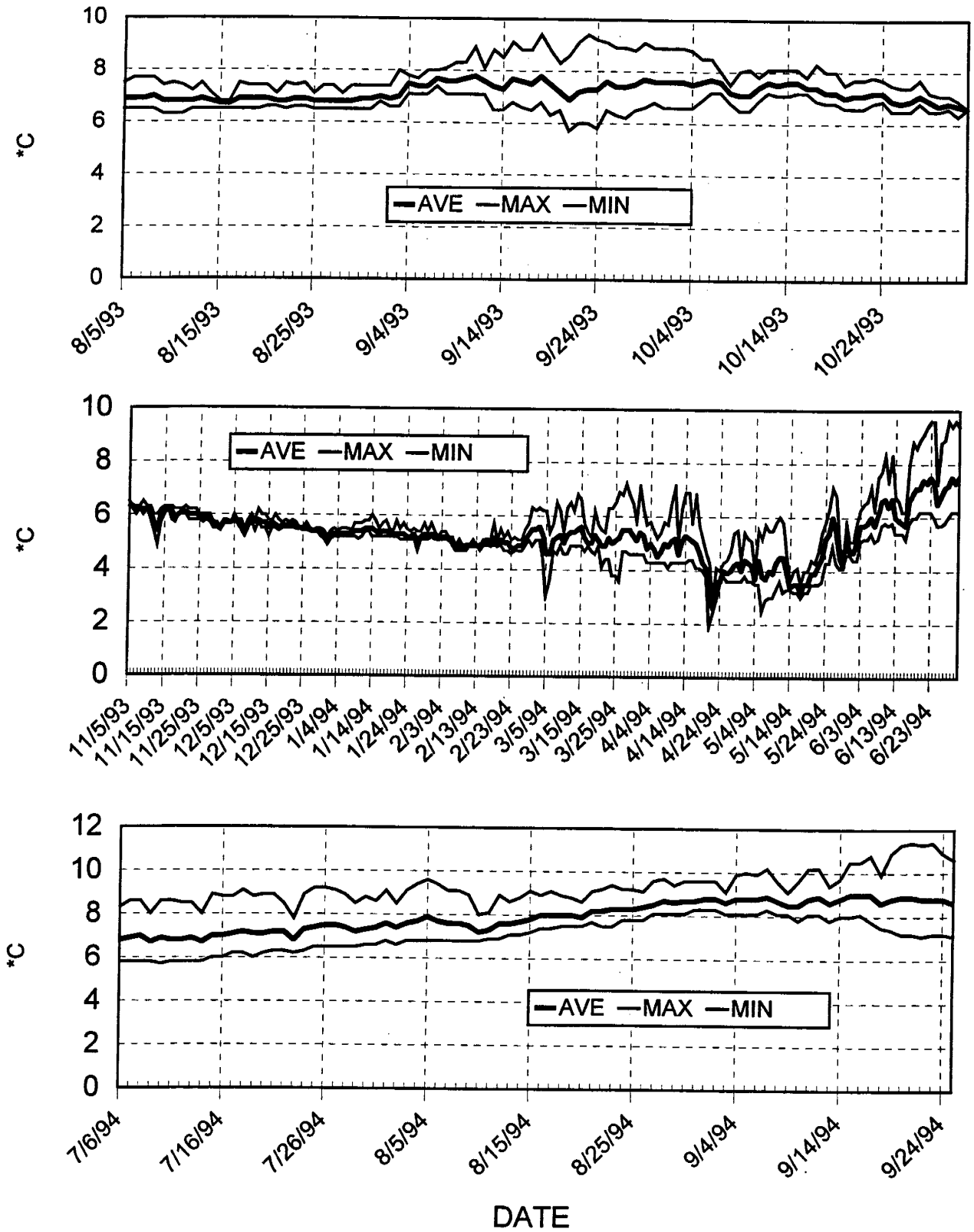



Figure 4. Daily, average, and maximum temperatures recorded at location 2 (Figure 1) in the big spring adjacent to the North Fork Payette River from August 5, 1993 through September 25, 1994.

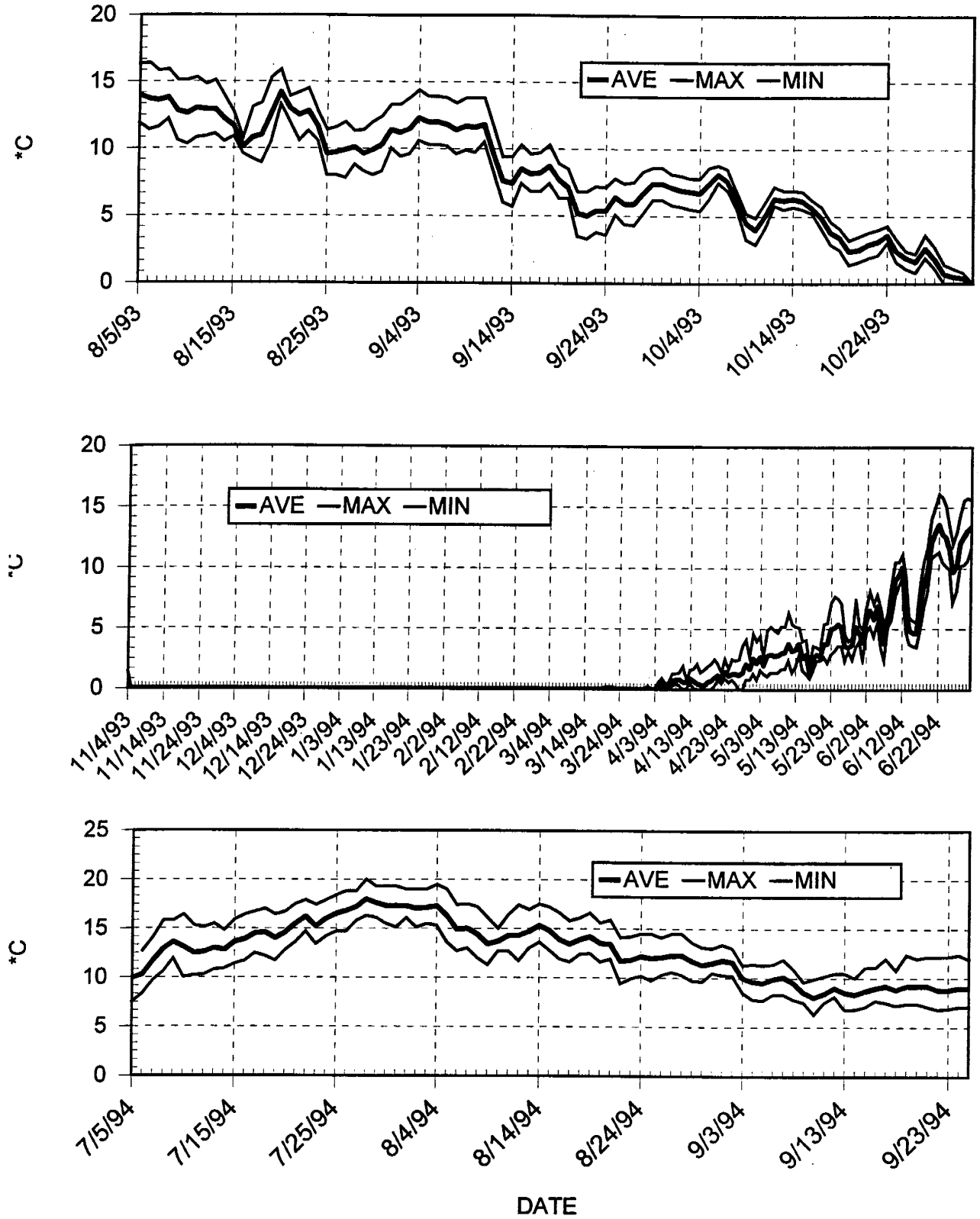



Figure 5. Daily average, minimum, and maximum temperatures recorded in Box Creek (Figure 1) from August 5, 1993 through September 24, 1994.

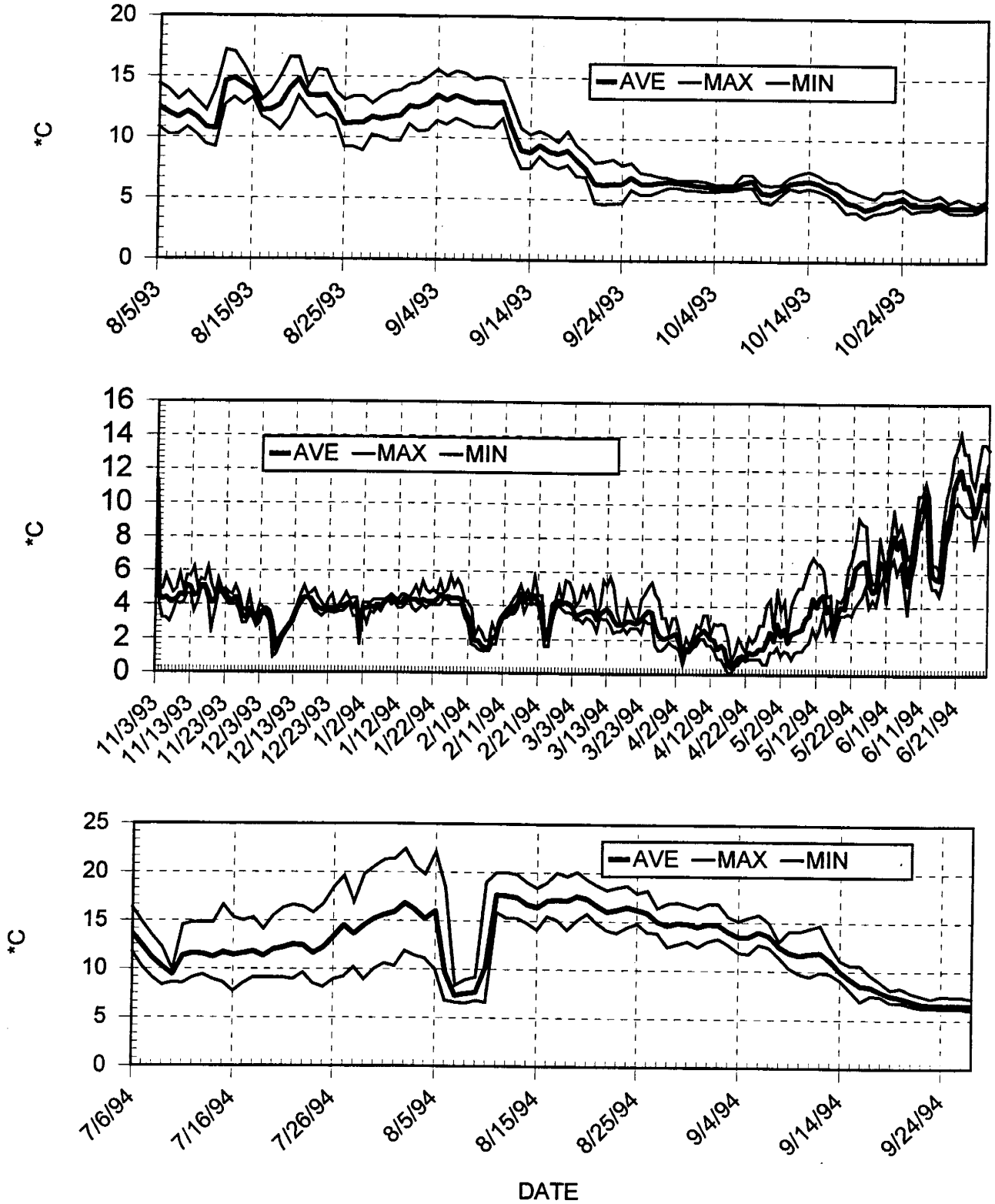
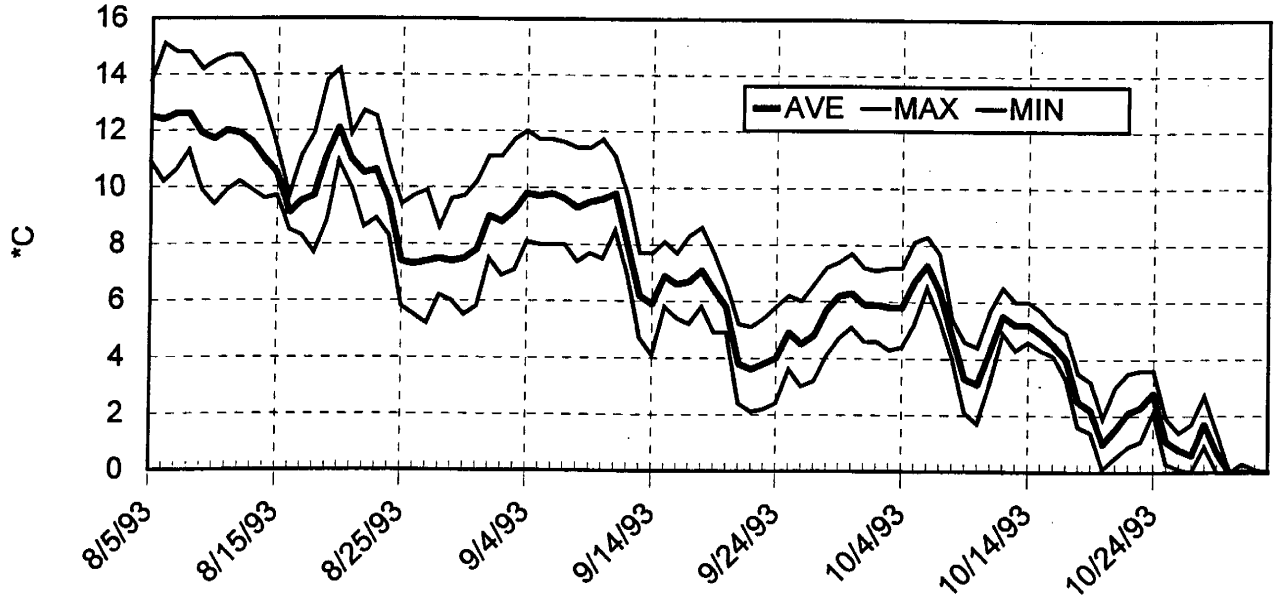



Figure 6. Daily average, minimum, and maximum temperatures recorded in Fisher Creek (Figure 1) from August 5, 1993 through September 27, 1994.



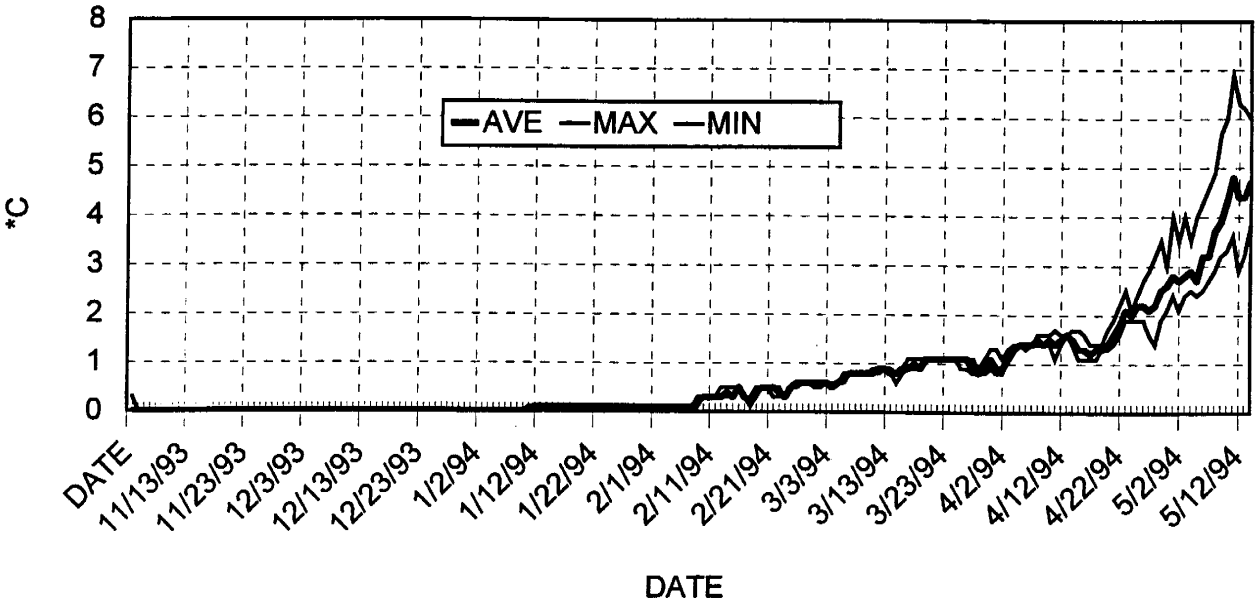




Figure 7. Daily average, minimum, and maximum temeratures recorded in Pearl Creek (Figure 1) from August 5 through June 21, 1994.

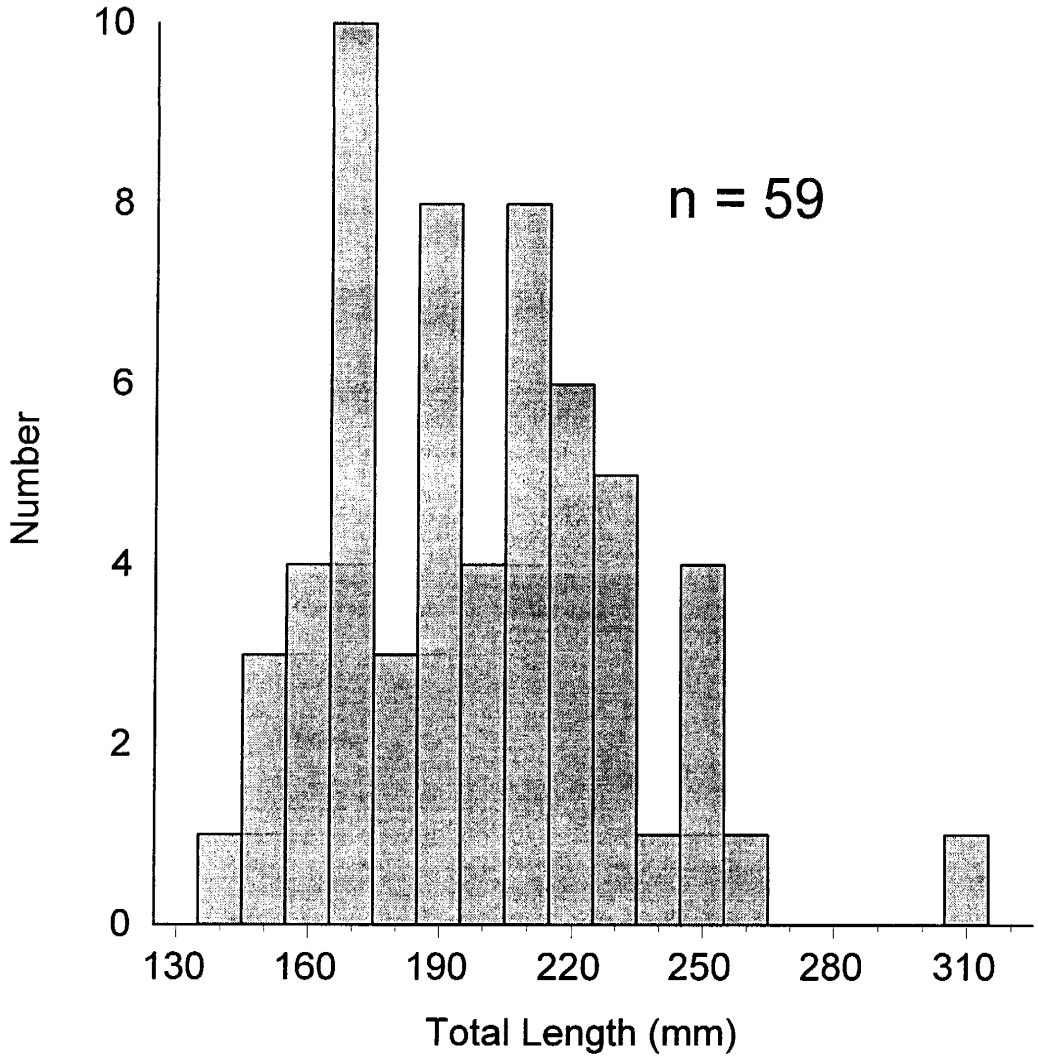



Figure 8. Length frequency of steelhead/rainbow trout harvested from the East Fork South Fork Salmon River and lower Johnson Creek, Idaho, 1994.

Table 8. Population estimate for rainbow/steelhead trout in the East Fork South Fork Salmon River and lower Johnson Creek, Idaho, 1994.

| Age | Length mm (inches) | Population estimate | Bound on the estimate (2 √N) |
|---|---|---|---|
| 0 | ≤64 (≤2) | 7,940 | 2,568 |
| 1 | 65 - 150 (3 - 5) | 18,690 | 3,383 |
| 2 | 150 - 215 (6 - 8) | 14,047 | 2,936 |
| 3 | 215 - 265 (9 -10) | 4,837 | 1,395 |
| 1+2 | 65 -215 (3 - 8) | 31,137 | 5,250 |
| 2+3 | 150 - 265 (6 - 10) | 18,714 | 3,413 |

An estimated five (± 10 95% CI) cutthroat trout were harvested. Three illegally harvested cutthroat trout were found in creels during the survey. No bull trout were found in the creel, therefore the harvest estimate was zero. However, remains of three harvested adult bull trout were found in the study area during snorkel surveys. Bull trout were targeted for catch-and-release by approximately 4% of anglers. We found no evidence of harvest of mountain whitefish *Prosopium williamsoni*, or of anglers targeting mountain whitefish. Anglers reported only three incidences of catching and releasing chinook salmon parr.

## South Fork Salmon River Guided Fishery

We received information from six guided fishing trips that took place between July 19 and September 5. Information from approximately eight trips were not recorded (Barry Bryant, Manager, Wapiti Meadow Ranch, personal communication). Cutthroat trout, rainbow/steelhead trout, and mountain whitefish were caught and released by anglers (Figure 9). Overall catch rate was 2.27 fish/h. Cutthroat trout >300 mm dominated the catch. Densities of rainbow/steelhead trout, cutthroat trout, and bull trout in the South Fork Salmon River were lower than in the EFSFSR during July (Tables 9 and 10).

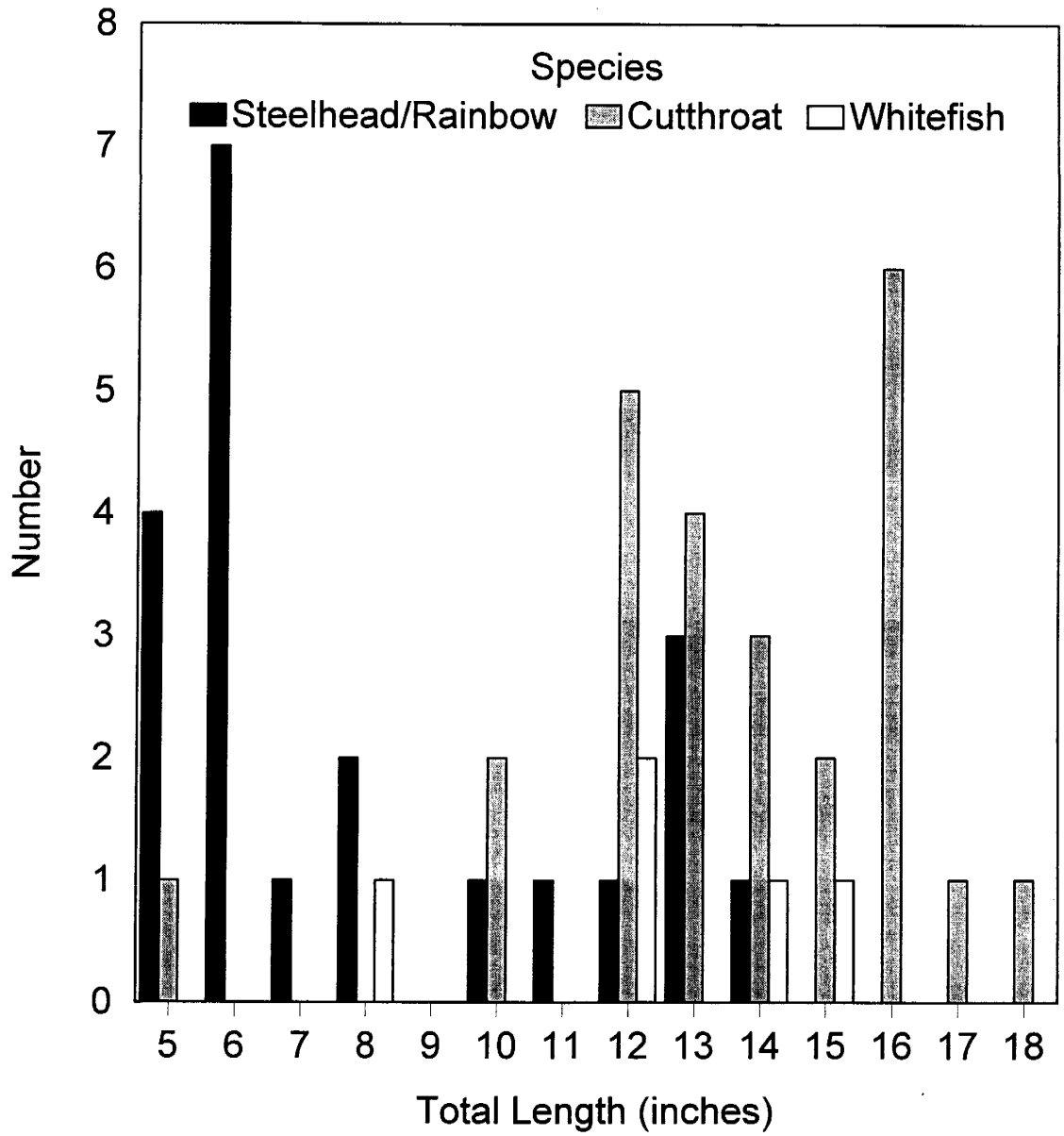



Figure 9. Fish caught and released by anglers guided by Wapiti Meadow Ranch on the South Fork Salmon River between Hamilton Creek and Threemile Creek, 1994.

## Upper Little Salmon River Temperature Monitoring

Recorders successfully monitored stream temperatures in the upper LSR from May 17 through September 13. The recorder at Station 1 did get wet and ceased functioning on August 28 (Figure 10). The average temperature for the last 15 days of May ranged from 10.7 to 13.8°C; June average ranged from 15.9°C to 17.6°C; the July average ranged from 19.6°C to 22.1°C; and the August average ranged from 15.2°C to 19.5°C. Maximum temperatures exceeded 20°C for >6 hours on 69/100 days at Station 1; on 49/120 days at Station 2; and on 79/120 days at Station 3.

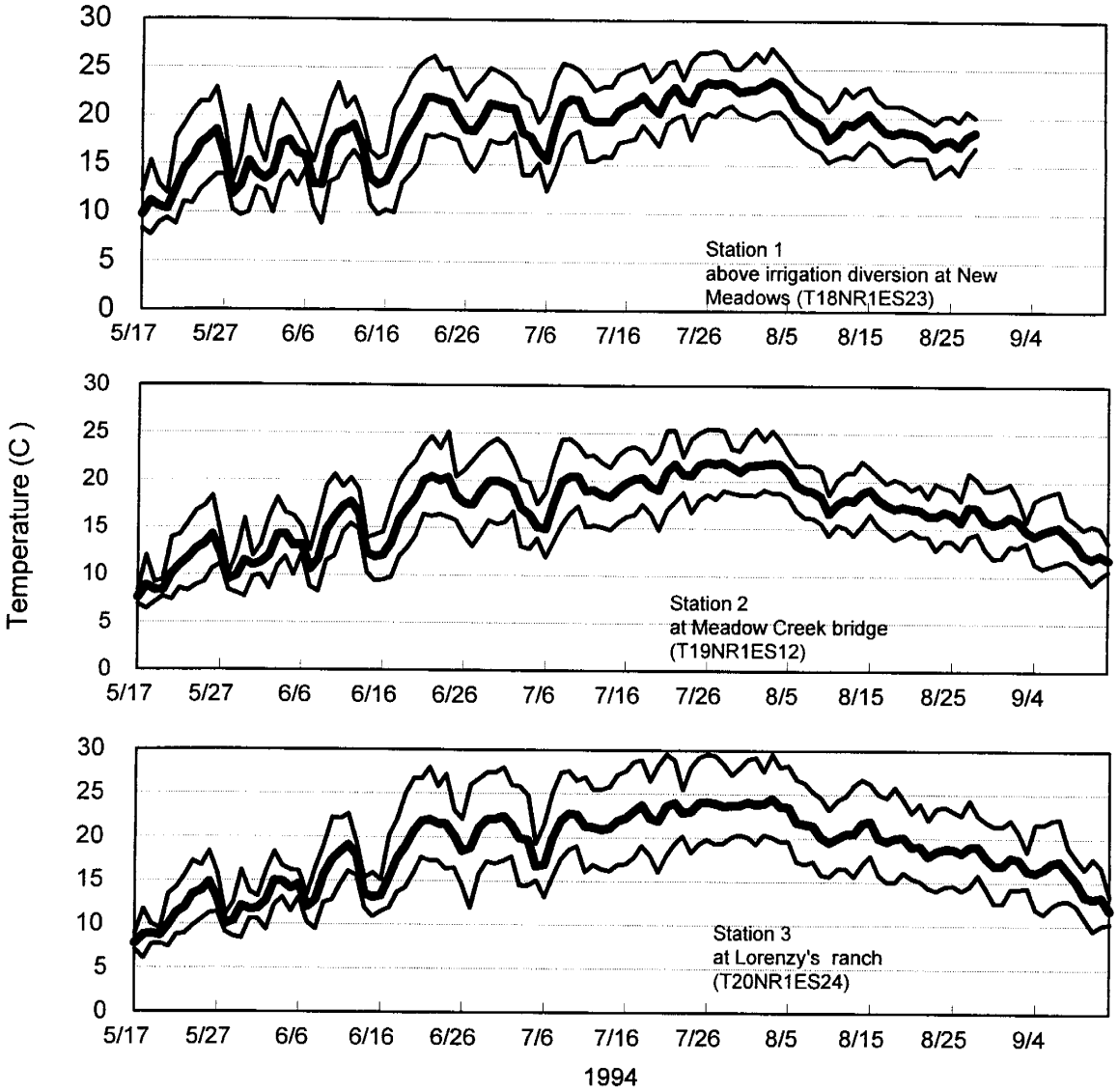



Figure 10. Daily mean, minimum, and maximum water temperatures in the Little Salmon River, Idaho, 1994.

Table 9. Number, size, and densities of salmonids observed by snorkeling the South Fork Salmon River between Hamilton and Threemile Creeks, July 1994.

| Site | Habitat type | Area sampled ($m^2$) | Number of fish observed | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Chinook YOY[a] | Steelhead ≤11 in. | Cutthroat trout ≤11 in. | Cutthroat trout ≥12 in. | Bull trout ≥12 in. | Mountain whitefish ≤17 in. |
| 0.4 miles below Hamilton Creek | Run | 2,247 | 71 | 3 | 0 | 1 | 0 | 45 |
| | Pocket | 2,219 | 338 | 10 | 0 | 1 | 1 | 81 |
| 0.1 miles below Tailholt Creek | Run | 7,019 | 118 | 5 | 0 | 1 | 1 | 131 |
| At Threemile Creek | Pool | 2,357 | 152 | 58 | 12 | 5 | 0 | 40 |
| Total | | 13,842 | 679 | 76 | 12 | 8 | 2 | 297 |
| Average density (number/100 $m^2$) | | | 4.91 | 0.55 | 0.09 | 0.06 | 0.01 | 2.15 |

[a] YOY = Young of year

Table 10. Comparison of average densities in July 1994, of rainbow/steelhead trout, cutthroat trout, and bull trout in the East Fork South Fork Salmon River and lower Johnson Creek to densities found by Thurow (1987).

| Stream | Year | Average density (fish/100 m$^2$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | Rainbow/Steelhead trout | | | | Cutthroat trout | Bull trout |
| | | Age 1 | Age 2 | Age 3 | Total | | |
| East Fork South Fork Salmon River | 1984 | 0.64 | 1.25 | 0.35 | 2.24 | 0.39 | 0.15 |
| | 1985 | 0.62 | 0.94 | 0.22 | 1.77 | 0.20 | 0.11 |
| | 1994 | 2.05 | 1.78 | 0.37 | 4.20 | 0.27 | 0.15 |
| Lower Johnson Creek | 1984 | 1.68 | 1.54 | 0.15 | 3.37 | 0.04 | 0.04 |
| | 1985 | 1.20 | 2.07 | 0.19 | 3.46 | 0.05 | 0.02 |
| | 1994 | 2.53 | 1.16 | 0.23 | 3.92 | 0.02 | 0.04 |

## DISCUSSION

### Salmon River Creel Survey

During the summer of 1994, we found angling pressure and harvest on this section of the Salmon River and its tributaries to be minimal. Through the study area and period only 0.7 angler hours/river mile/day (1,441.5 h/81 mi./25 creel days) were spent fishing.

We had smallmouth bass reported caught as far upstream as the mouth of Chamberlain Creek. However, based on the numbers of bass reportedly caught, we feel numbers of bass are low and the population as a whole is not well established.

We found that angling impacts on steelhead smolts (rainbow trout) in the study area were minimal. Of the small number of rainbow trout reported caught (198) only 8 were killed. This equals 1 rainbow trout killed for every 180 angler hours.

### North Fork Payette River (NFPR)

Since 1992, kokanee spawner counts and estimates of kokanee biomass increased dramatically (Table 7). Kokanee survival appeared to have increased in recent years. Beginning in 1992, we were able to follow

a cohorts survival rate by tracking numbers of spawners and numbers of resulting progeny spawners (assuming the majority of spawners are 4 years old). For the 1988, 1989, and 1990 cohorts we estimated that 1.4, 4.1, and 2.7 progeny survived to spawn in 1992, 1993 and 1994, respectively.

## East Fork South Fork Salmon River and Lower Johnson Creek Angler Survey and Inventory

Thurow (1987) considered *O. mykiss* ≤250 mm as steelhead in the South Fork Salmon River drainage. If that is true, then virtually all of the legal harvest in the EFSFSR was comprised of steelhead trout in 1994. The overall exploitation does not seem high. With an expected natural annual mortality on parr of 60% (Chilcote et al. 1984; Shepard 1983; Slaney 1981), the impact of angling mortality on the population is effectively lessened. Native redband/rainbow trout *O. m. gairdneri* are known to exist in the EFSFSR (Richard Wallace, personal communication, 1980) and it is difficult to differentiate these subspecies in the field. The proportion of redband/rainbow trout in the drainage will vary with steelhead recruitment.

We have considered different fish management programs in an effort to protect native rainbow/redband/steelhead trout. Proposals have included a catch-and-release regulation, an 8" (200 mm) minimum length restriction, and a two fish bag limit. Imposition of a minimum length restriction may result in higher exploitation of the steelhead population by forcing anglers to target older and less abundant parr that otherwise have a better chance to reach adulthood than younger fish. In 1994, half of the harvest of parr was comprised of fish >8". We recommend that steelhead/rainbow parr 150 to 260 mm in the drainage be PIT tagged and aged to determine at what size fish are residualized. Eighty-eight percent of anglers in the EFSFSR and Johnson Creek harvested two fish or less during a fishing trip, therefore a reduced bag restriction would have little effect on the current rate of exploitation.

Angler effort in 1994 was only 60% of fishing effort in 1985 for the same time period (Thurow 1987). Number of steelhead harvested was slightly more in 1994 than in 1985 (4,388 vs. 3,816 fish); however in 1985, 1,590 hatchery-reared rainbow trout were also harvested for 20% of the total harvest that year. Catch rate in 1985 was approximately double the catch rate in 1994. Our survey was intended to extend through September 16, but forest fires limited angler access and forced us to terminate it on September 2. Road construction on the South Fork Salmon River road also limited access to the EFSFSR intermittently throughout the season.

We compared average densities of fish from snorkel surveys conducted during the prior study (Thurow 1987) and in 1994 (Table 10). Trends in densities of rainbow trout/steelhead parr, cutthroat trout, and bull trout were not as expected. Overall density of steelhead parr in 1994 was almost double the densities observed in 1984 and 1985. This is surprising given the recent declines in wild steelhead escapement (Figure 11). We expected densities of cutthroat trout to increase in response to the closure to harvest in 1988. We suspect that harvest on bull trout was substantial prior to closure in 1994, therefore we expected densities to be more depressed than found ten years ago.

Though we can compare the snorkeling data Thurow collected to our 1994 data, our survey was more extensive than Thurow's. We snorkeled 4.5 times, and 8 times more area in the EFSFSR and lower Johnson Creek, respectively, than was sampled in 1984 or 1985. We attempted to sample habitats (pool, riffle, run, and pocketwater) in proportion to their frequency, and to distribute sites throughout the study area. Within each section (reach of stream) Thurow established five transects of similar length at sites

considered good steelhead habitat and one transect in a pool habitat type. Snorkeling conditions were quite different among years. Extreme low flows and high water temperatures in 1994 may have concentrated fish into the study area from tributaries and allowed for easier observation.

We recommend that fish populations in the EFSFSR be monitored comparable to 1994 every two or three years to obtain better trend information. The recent improvement of the South Fork Salmon River road will make the EFSFSR much more accessible to anglers. We recommend that an angler survey on the South Fork, EFSFSR, and Johnson Creek be conducted within the next five years to identify changes in this fishery.

## South Fork Salmon River Guided Fishery

Reporting from Wapiti Ranch was poor in 1994. Information from 8 of 14 angler trips was not reported, though mandatory reporting was a stipulation of the permit. We did not observe many large cutthroat trout or bull trout in the area during July. Most of the angling reported occurred in August and September. Either anglers are repeatedly catching and releasing a few large fish, or fish are moving into this area later in

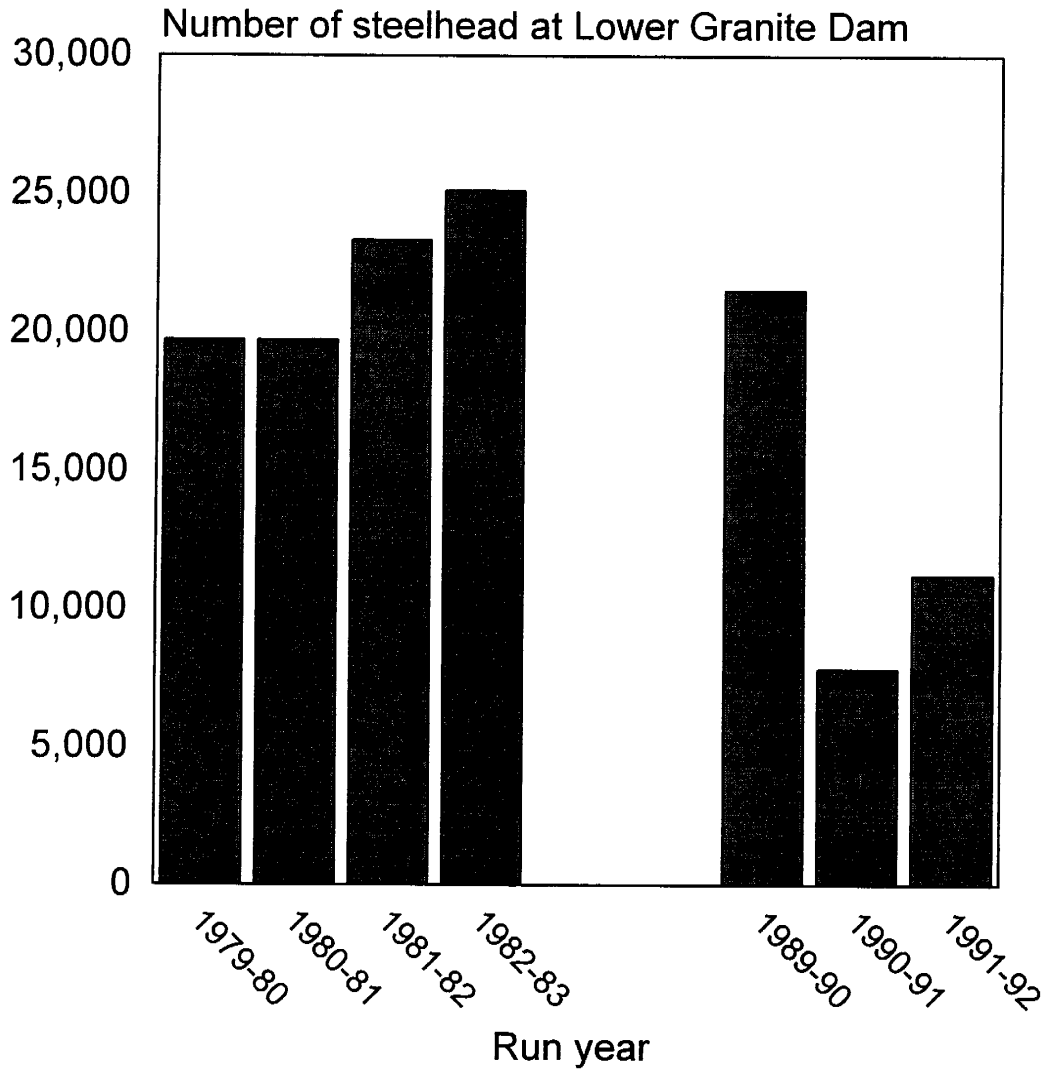



Figure 11. Estimated total (A and B) run size of wild steelhead at Lower Granite Dam for years that contributed parr when snorkel estimates were conducted in the East Fork South Fork Salmon River (IDFG files).

the summer. This fishery and fish population will be tracked annually, assuming the permit is renewed.

## Upper Little Salmon River Temperature Monitoring

Rainbow trout are most successful in water temperatures less than 21 °C (Scott and Crossman 1979). With the addition of data from three temperature recording stations maintained by the U.S. Bureau of Land Management (BLM), we can track water temperatures in the LSR to its mouth (Figure 12). Station 4 is located at the Highway 95 bridge near Smokey Boulder road; station 5 is at the bridge upstream from Denny Creek; and station 6 is at the US Geological Survey discharge station near the mouth of LSR. July and August temperatures in the upper LSR (above the falls) were poor for trout. Temperatures are cooled downstream by Hazard and Boulder creeks, removing thermal limits for salmonids (Craig Johnson, BLM, personal communication).

The warmest station was ours (Station 3) at Highway 95 road mile 166.7, approximately 4 road miles above Smokey Boulder road. That recorder was placed in the outside bend of a pool that became almost stagnate by July. We believe this station was recording the highest temperatures in the reach, and cooler, more aerated habitat was probably available. Our stations 1 and 2 were well placed, and provide a more accurate record of temperatures available throughout those reaches. It should be noted that 1994 was unusually warm and dry.

In addition to having elevated summer stream temperatures, the upper LSR is the primary source of fine sediments in the drainage, causing sediment loading in the lower reaches during high flows (Craig Johnson, BLM, personal communication). Riparian rehabilitation throughout the upper LSR should reduce both temperature and sediment loading problems. The Natural Resources Conservation Service is attempting to expand a current watershed project to include the entire LSR.

Temperature monitoring will continue in 1995.

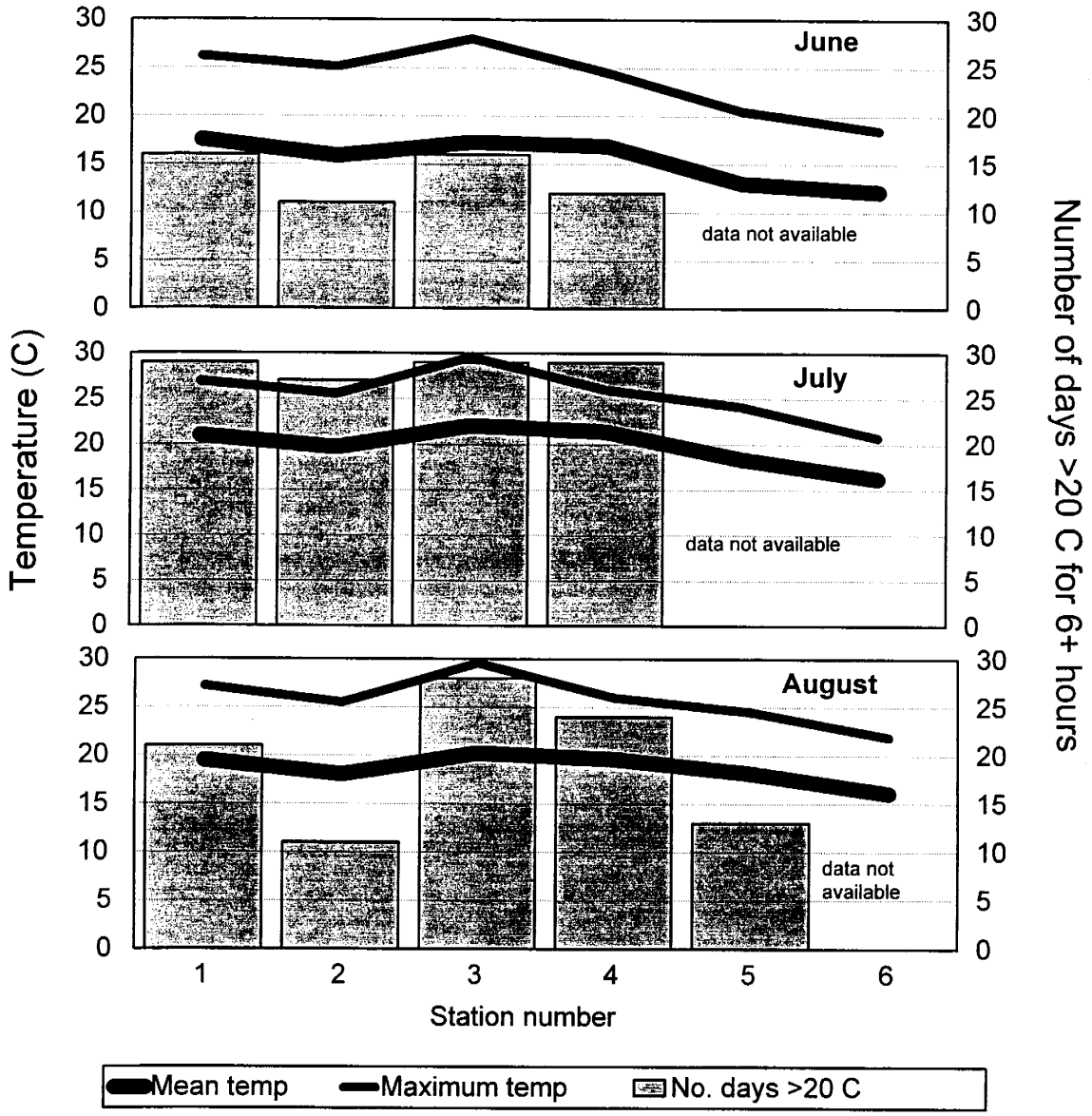



Figure 12. Monthly mean and maximum temperatures in the Little Salmon River, Idaho, 1994, from upstream to downstream stations.

## RECOMMENDATIONS

1. Continue kokanee spawner counts in the North Fork Payette River to monitor Payette Lake kokanee stocks and to help calibrate kokanee trawling work.

2. Repeat North Fork Lake Fork and South Fork Lake Fork stream surveys in three to five years.

3. Salmonid populations in the East Fork South Fork Salmon River and Johnson Creek should be monitored every two to three years, using 1994 procedures and sites. The fishery should be evaluated within the next five years.

4. The guided fishery in the South Fork Salmon River should be monitored annually. Snorkel sites should also be surveyed annually.

5. Summer stream temperatures in the Little Salmon River should be monitored annually to develop baseline data over several years.

6. We should continue involvement with the Natural Resources Conservation Service in pursuit of improved land use practices and riparian habitat rehabilitation in the upper Little Salmon River.

## LITERATURE CITED


Bowles, E.C. and E.J. Leitzinger. 1991. Salmon supplementation studies in Idaho rivers. Experimental design. U.S. Department of Energy, Bonneville Power Administration. Contract No. DE-B179-89BP01466. Portland, Oregon.

Chilcote, M.W., S.A. Leider, and J.J. Loch. 1984. Kalama River salmonid studies. 1983 Progress Report. Washington Department of Game, Olympia.

Frost, F.O. and D.H. Bennett. 1994. Determination of kokanee incubation success, potential egg deposition, and fry production from the North Fork Payette River, Idaho. Annual Report. Deptartment of Fish and Wildlife Resources. College of Forestry, Wildlife and Range Sciences. University of Idaho. Moscow, Idaho

Janssen, P.J., D.R. Anderson and J. Patterson. 1995. Federal Aid in Fish Restoration. Regional Fishery Management Investigations. Job Performance Report, Project F-71-R-18. Idaho Department of Fish and Game, Boise, Idaho.

McArthur, T., S.T. Reece, and N. Boydstun. 1994. Creel census system 2.3 release 0. Idaho Department of Fish and Game, Boise.

Scott, W.B. and E.J. Crossman. 1979. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa.

Shepard, B.B. 1983. Evaluation of a combined methodology for estimating fish abundance and lotic habitat in mountain streams in Idaho. Masters Thesis, University of Idaho, Moscow.

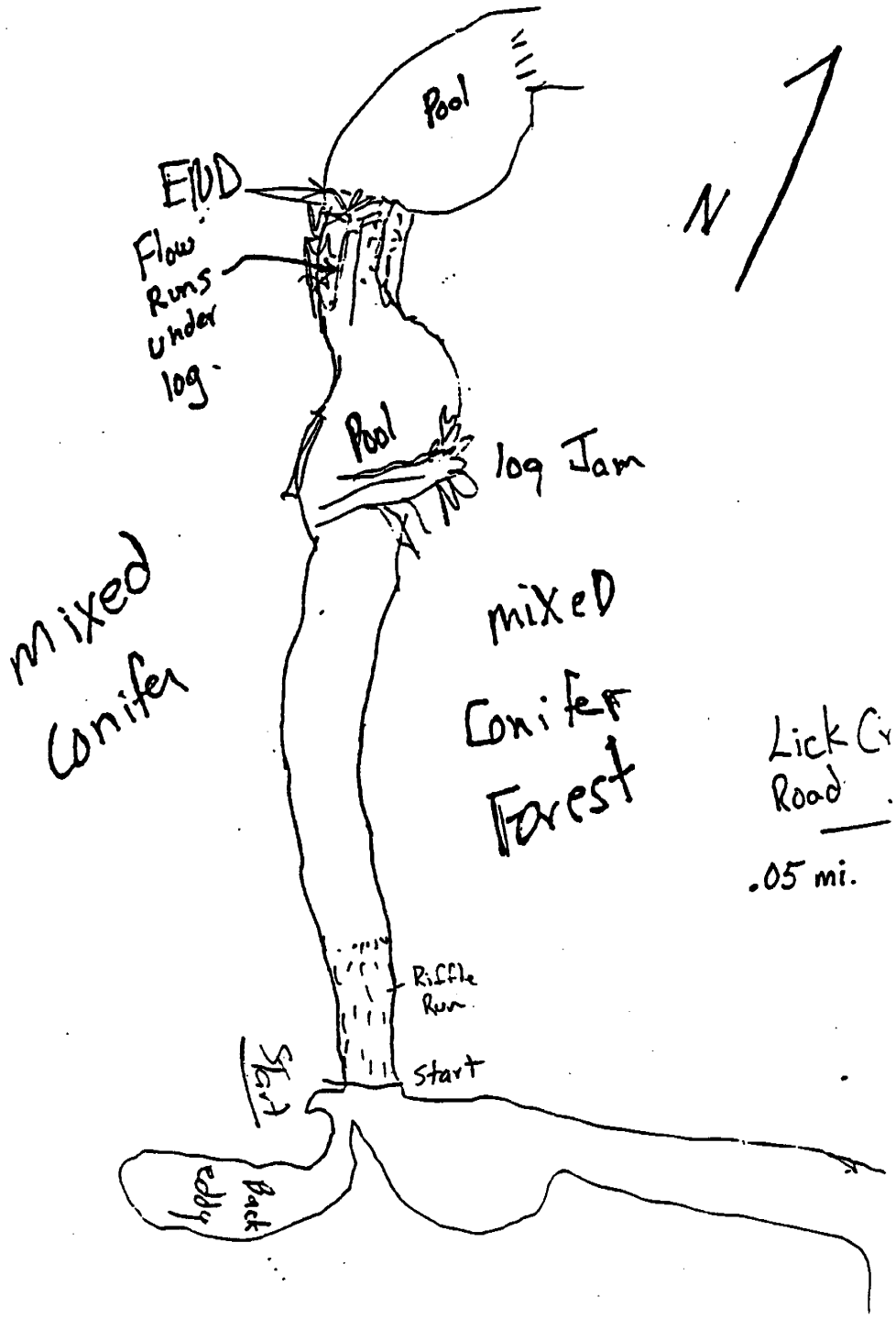
Slaney, P.A. 1981. An imperical model for estimating steelhead trout production capability of streams. British Columbia Fish and Wildlife Branch, University of British Columbia, Vancouver, Canada.

Thurow, R. 1987. Evaluation of the South Fork Salmon River steelhead trout fishery restoration program. Completion Report. Performed for US Department of Interior, Fish and Wildlife Service, Lower Snake River Fish and Wildlife Compensation Plan. Contract No. 14-16-0001-86505. Idaho Department of Fish and Game, Boise.

# Appendices

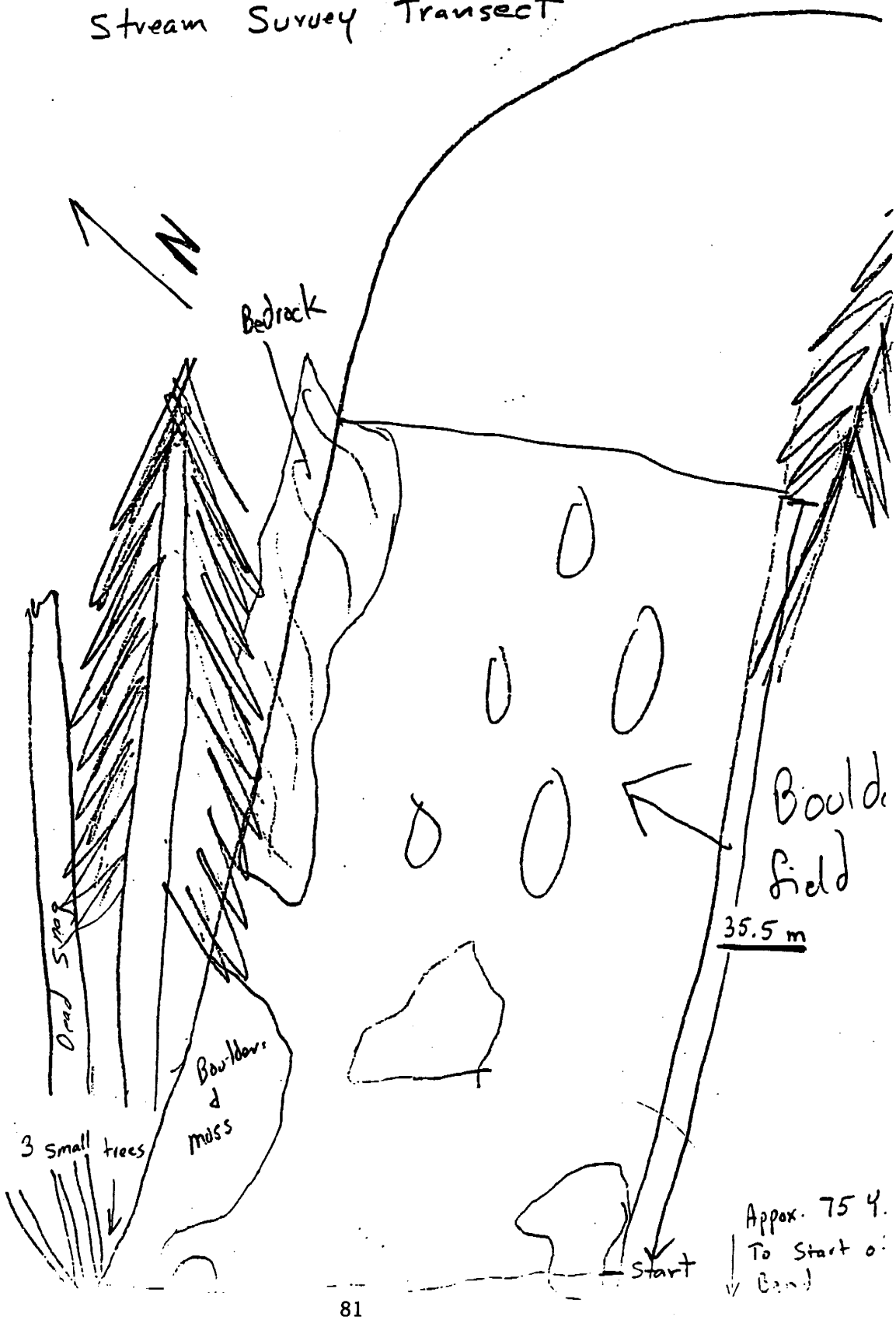
Appendix A.

North Fork Lake Fork
Stream Survey Transect



Appendix A. Continued.

South Fork Lake Fork
Stream Survey Transect



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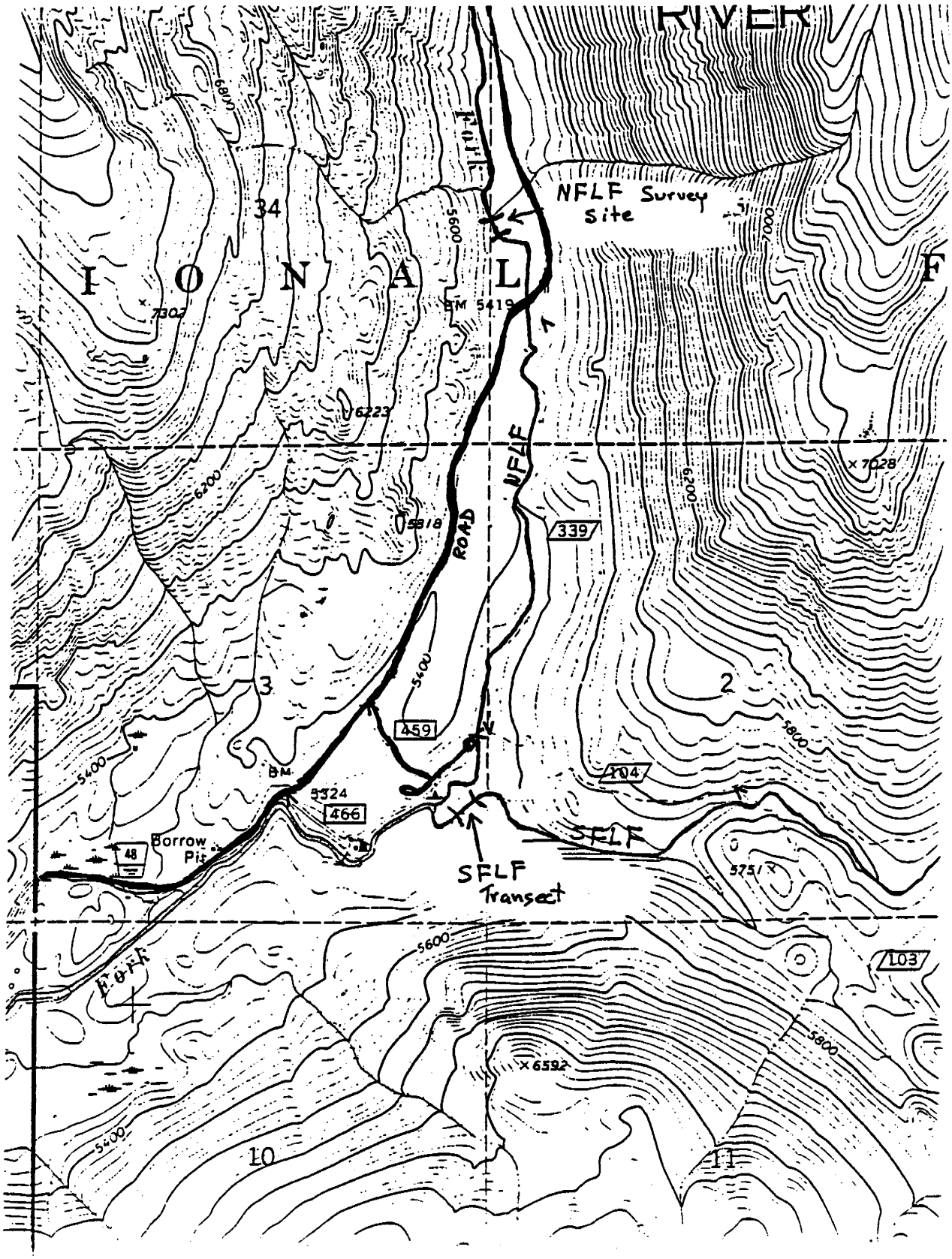

# 1994 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fishery Management F-71-R-19

Project 1: Surveys and Inventories

Subproject 1-C: McCall Subregion Investigation

Job: d Title: Salmon and Steelhead

Contract Period: July 1,1994 to June 30,1995

## ABSTRACT

McCall Subregion salmon and steelhead investigations are incorporated in separate statewide reports. These reports include: "Salmon and Steelhead Investigations," "Salmon Spawning Ground Surveys," "Idaho Supplementation Studies," and "Idaho Habitat/Natural Production Monitoring."

Author:

Don Anderson
Regional Fishery Manager

1994 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-19

Project II: Technical Guidance

Subproject II-C: McCall Subregion

Contract Period: July 1, 1994 to June 30, 1995

## ABSTRACT

McCall Subregion fishery management personnel responded to 227 requests and opportunities for technical input. Comments were provided to state and federal agencies on proposed activities for which they have regulatory authority. Advice and technical assistance were provided for private businesses and the public on activities associated with fish, or having impacts on fish populations or fish habitat. The major topics of involvement included stream channel alterations, mining, and land management planning.

We also gave presentations to schools, sports groups, and civic organizations. We answered many questions from the angling public on fishing opportunities, regulations, techniques, and specific waters.

Author:

Don Anderson
Regional Fishery Manager

## OBJECTIVES

1. To protect or minimize impacts to McCall area fisheries by providing technical fisheries input to government agencies with regulatory or land management authority.

2. To provide technical fisheries input, guidance, and advice to private entities and the general public.

3. To promote understanding of the environmental requirements of fish populations and appreciation of their values.

## RESULTS

The following (Table 1) lists the public and private entities and number of contracts and responses made for each during 1994.

Table 1. Summary of technical guidance responses and activities by McCall subregion fisheries management personnel in 1994.

| Agency or individuals | Number of responses |
|---|---|
| S. Forest Service | 41 |
| U.S. Bureau of Land Management | 1 |
| U.S. Environmental Protection Agency | 6 |
| U.S. Army Corps of Engineers | 3 |
| U.S. Natural Resources Conservation Service | 9 |
| U.S. Bureau of Reclamation | 8 |
| U.S. Fish & Wildlife Service | 6 |
| Idaho Department of Water Resources | 8 |
| Idaho Department of Lands | 24 |
| Idaho Department of Health and Welfare/Environmental Quality | 6 |
| Idaho Department of Parks and Recreation | 3 |
| Idaho Department of Transportation | 1 |
| Idaho Outfitters & Guides Board | 9 |
| Health Districts | 3 |
| Hydroelectric developers | 4 |
| Private fish pond owners | 24 |
| Public meetings and presentations | 15 |
| Mining | 4 |
| County Commissions | 4 |
| Nez Perce Tribe | 10 |
| National Marine Fisheries Service | 4 |
| Municipalities | 4 |
| Trout Unlimited | 4 |
| Big Payette Lake Water Quality Council and Technical Advisory Committee | 3 |
| Columbia River Indian Tribe Fisheries Council | 2 |
| Idaho State Legislators | 2 |
| Cascade Reservoir Restoration Technical Advisory Committee | 5 |
| Boise Cascade Corporation | 4 |
| **Total** | **217** |

## RECOMMENDATIONS

1. Continue to provide technical fisheries input to the entities which most affect fish populations.
2. Continue to provide technical guidance and advice to private interests and the general public.
3. Expand efforts to educate the public in the environmental requirements for fish.

**Submitted by:**

Don Anderson
Regional Fishery Manager

Paul Janssen
Regional Fishery Biologist

Kim Apperson
Regional Fishery Biologist

**Approved by:**

IDAHO DEPARTMENT OF FISH AND GAME

Tracey Trent
Regional Supervisor
for