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DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION

Job Performance Report

Project F-71-R-12

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

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By

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JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Title: Salmon Subregion Mountain Lake Investigations

Job No.: 6(SAL)-a

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Eight lakes in the Redfish Lake Creek drainage were surveyed for Sunapee trout (Salvelinus alpinus oquassa). Of these, Sunapee trout were documented only in Alpine Lake. All lakes contained brook trout (Salvelinus fontinalis) populations.

Six other lakes were surveyed to determine if a management change was necessary. Born Lakes #3 and #4 in the White Clouds will be stocked with cutthroat. Cathedral Lake will not be stocked due to natural reproduction. Management of the other lakes will not be changed at the present time.

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INTRODUCTION

The Salmon Subregion has approximately 900 mountain lakes. The majority of these lakes support reproducing populations of cutthroat, Salmo clarki; rainbow, Salmo gairdneri; golden trout, Salmo aquabonita; brook trout, Salvelinus fontinalis; Sunapee trout, Salvelinus alpinus oquassa; and artic grayling, Thymallus articus. Mountain lakes with no potential for natural reproduction are stocked on a three-year rotation.

Mountain lakes should be surveyed on the ground periodically to determine fish size, angler use, if natural reproduction and recruiting are occurring; if lake characteristics are suitable to support fish if the lake has winter-killed; or to determine species composition.

Mountain lake surveys this year concentrated on determining the presence of Sunapee trout in the Redfish Lake Creek drainage. Stocking records indicated that Sunapee trout were stocked in five lakes in the drainage in 1925 and which lakes were unknown.

OBJECTIVES

1. To determine the presence of Sunapee trout in the Redfish Lake Creek drainage.
2. To assess management plans for each mountain lake surveyed.

RECOMMENDATIONS

1. Continue Sunapee trout investigations on a less intensive level in isolated lakes within the Sawtooth National Recreation Area using gill nets.
2. Continue present management plan for Alpine Lake, Saddleback lakes, Middle and Lower Cramer lakes, Wilson Lake, Harbor Lake, and Deer Lake.
3. Begin stocking upper Cramer Lake with cutthroat due to heavy use.
4. Stock upper Redfish Lakes #1 and #2 one more time and assess success.
5. Discontinue stocking of Cathedral Lake and assess success of natural reproduction.
6. Do not stock Born Lake #3; stock Born Lake #4.

METHODS

Sunapee Trout Investigations

Lightweight mist gill nets were used to sample for Sunapee trout. The experimental gill nets were 38 m long, 2 m high, and composed of 7.6 m long panels of 19, 25, 38, 44, and 51 mm bar mesh. To adequately sample the lakes, two nets were tied together so the mesh sizes were 19 mm - 51 mm, 19 mm - 51 mm. The long net was then set, using a raft, in water 6 m deep and stretched to the deepest portion of the lake. A sounding rope was used to determine the deepest part of the lake. All fish collected were measured for total length. Scales were collected.

General Lake Surveys

Fish species composition in these lakes was determined by visual observation and angling. Lengths of all fish captured and catch rates were recorded. Various habitat conditions were determined by visual observation, including presence of aquatic insects, presence and abundance of aquatic vegetation, and the quality of spawning habitat in the inlet and outlet streams. Amount of use was estimated and noted.

Stocking

Three species of fish were stocked: rainbow trout, cutthroat trout, and artic grayling. The fry were placed into one gallon of water in 3 gallon capacity plastic dairy bags in densities from 250 - 1,000 fish per bag. Each bag was evacuated of air and then refilled with pure oxygen. The fish were transported to various locations and stocked aerially by helicopter. A flight plan was followed to minimize flight time. When a lake to be stocked was located, the helicopter would descend to 3 - 10 meters above the water and the fish were released into the lake.

RESULTS AND DISCUSSION

Sunapee Trout Investigation

A preliminary horseback trip was taken into Alice Lake, where a known population of Sunapee trout existed, to determine if Sunapee trout could be collected in deep water with a mist net during the months of July and August. This procedure proved to be very successful, and 49 Sunapee were collected, the most ever at one time. Fish lengths ranged 230 - 310 mm, with a mean of 260 mm. Previously, Sunapee trout were collected in early

October when they moved into the shore to spawn. During this time of year, weather may affect accessibility to the high lakes. The success of this summer procedure allowed for the planning and execution of a survey trip into the Redfish Lake Creek drainage.

Between July 24-30, 1987, six lakes were surveyed: Alpine Lake; upper Redfish Lakes #1 and #2; and lower, middle, and upper Cramer lakes. Upper Redfish Lakes #1 and #2 did not have any fish, even though they were stocked with cutthroat in 1985. The remainder of the lakes contained introduced and reproducing populations of brook trout (Table 1). The brook trout were stocked in the 1920s, 1930s, and 1940s by Forest Service personnel. Two of the lakes, upper Cramer Lake and Alpine Lake, were similar to Alice Lake which has a population of Sunapee trout. All three lakes had rubble shorelines adequate for spawning, similar maximum depths of 22 - 29 m, and reproducing populations of brook trout. Only Alpine Lake contained a population of Sunapee trout. One 290 mm Sunapee was collected. Because these fish were stocked in 1925, one Sunapee trout was adequate to indicate a viable population of Sunapee trout existing in Alpine Lake.

On September 8, 1987, a second trip into the drainage to survey the Saddleback Lakes #1 and #2 was conducted. No Sunapee were collected, only brook trout with an average length of 187 mm were found.

There are three known populations of Sunapee trout in Idaho: Sawtooth, Alice, and Alpine lakes. Because the Sunapee is a rare trout, the knowledge of the existance of these populations is valuable and could provide the only source of these fish in the future.

General Lake Survey

In addition to the lakes surveyed for Sunapee trout, five other lakes were surveyed to determine if the present management scheme required modification (Table 2).

Cathedral Lake (R16E, T21N, S25)

Located in the Bighorn Crags, this lake has been stocked on a three-year rotation. Both cutthroat and rainbow trout were present. The last time rainbow trout were stocked into the lake was 1964. The presence of rainbow trout indicated that natural reproduction is occurring. There was spawning habitat available in two of the inlets that reach the lake and some marginal habitat in the outlet. Stocking will be discontinued, and the natural reproduction will be monitored.

Table 1. Lakes surveyed for Sunapee trout, 1987.

Name/ location	Acres	Depth (m)	Vegetation	Substrate	Spawning		Use	Species	$\bar{L}$
					Inlet	Outlet			
Alpine Lake R12E, T9N, S35	26.5	29	None	Rocks, silt	Fair	None	Heavy	Brook trout Sunapee	193 290
Lower Cramer Lake R12E, T8, S7	5.5	3	Emergents Reeds	Silt, rocks	Good	Good	Moderate to Heavy	Brook trout	--
Middle Cramer Lake R12E, T8, S7	6.5	6	Emergents Reeds	Silt, rocks	None	Good	Heavy	Brook trout	167
Upper Cramer Lake R12E, T8, S7	31.0	24	None	Silt, rocks	Good	None	Heavy	Brook trout	195
Upper Redfish Lake #1 R12E, T9, S2	11.8	6	None	Rocks, silt	None	None	Light	None	--
Upper Redfish Lake #2 R12E, T9, S3	8.5	12	None	Rocks, silt	None	None	Light	None	--
Saddleback Lake #2 R13E, T9, S32	15.5	19	Sedges *Potamageton* sp.	Boulders	Good	Marginal	Light	Brook trout	187
Saddleback Lake #3 R13E, T9, S32	6.5	11	*Chara* sp.	Boulders	Good	None	Light	Brook trout	--

Table 2. Mountain lakes survey, 1987.

Name	Acres	Depth (m)	Vegetation	Substrate	Spawning		Use	Species	Catch rate
					Inlet	Outlet			
Born Lake #3	5+	-	None	Rocks, silt	Marginal	Good	Light	Cutthroat	3 fish/hr.
Born Lake #4	3+	-	None	Boulders	None	None	Light	None	--
Cathedral Lake	25	-	Pond lilies	Silt, rocks	Marginal	Marginal	Moderate	Cutthroat Rainbow	3 fish/hr.
Harbor Lake	40	-	None	Rubble	None	None	Moderate	Rainbow	25 fish/hr.
Wilson Lake	25	-	None	Rubble	None	None	Moderate	Cutthroat	2 fish/hr.

Harbor and Wilson Lake (R16E, T21N, S21)

These lakes are located at the head of Wilson Creek in the Bighorn Crags. The present management plan states that these lakes will be stocked on a three-year rotation. Harber Lake receives 3,000 rainbow trout and Wilson Lake receives 1,000 cutthroat. This plan will not be changed.

Born Lakes #3 and #4 (R16E, T9, S32)

The Born Lakes are located at the head of Warm Springs Creek in the White Clouds. Born Lake #3 has a population of cutthroat trout and does not need stocking. However, Born Lake #4 does require stocking and will receive 250 cutthroat in 1990. This represents no change in management for Born lake #3, but the management for Born Lake #4 will change.

Deer Lake (R26E, T16, S15)

This lake is located at the head of Deer Creek in the Lemhi Range. This lake is too shallow to support fish. Since this lake has never been planted, there is no change in the management plan.

A total of 24,250 fry were stocked into 42 lakes and streams in the White Cloud Range (Table 3). Twenty-three lakes in the Challis National Forest were stocked with 10,250 fry (Table 4). The lack of rain and low snowpack have resulted in low water levels in several mountain lakes. Some mountain lakes have dried completely. If the lack of rain continues until the lakes become ice covered, some of these lakes may winter-kill.

Table 3. White Clouds mountain lake fry plants, 1987.

Lake name		# fry stocked	Species stocked
East Basin Lake #1		500	Ct
East Basin Lake #2		500	Ct
Elk Lake		500	Ct
Garland Lake #1		500	Ct
Garland Lake #2		500	Ct
Warm Springs Creek		1,000	Ct
Swimm Lake		750	Ct
Ocalkens Lake #1		500	Ct
Ocalkens Lake #2		750	Rb
Crater Lake		500	Ct
Gunsight Lake		500	Ct
Tincup Lake		1,000	Gr
Slide Lake		500	Ct
Sheep Lake		500	Ct
Cirque Lake		750	Ct
Sapphire Lake		1,500	Ct
Snow Lake		250	Ct
Genetian Lake		250	Rb
Island Lake		750	Ct
Goat Lake		250	Ct
Dioxide Lake		250	Rb
Feldspar Lake		250	Gr
Big Frog Lake		1,500	Ct
Little Frog Lake		250	Ct
Little Redfish Lake		250	Ct
Castle Lake		500	Ct
Upwell Lake		500	Ct
Drift Lake		**too shallow**	
Glacier Lake		500	Ct
Hope Lake		250	Gr
Honey Lake		500	Ct
Heart Lake		500	Rb
Chamberlain Lake		500	Ct
Champion Lake #1		500	Ct
Champion Lake #2		500	Ct
Castleview Lake		250	Ct
Martha Lake		250	Ct
4th of July		1,000	Ct
Heart Lake (Six Lakes #1)		1,500	Ct
Six Lakes #3		**dry**	
Lightning Lake		1,000	Rb
Thunder Lake		250	Ct
Phyllis Lake		500	Rb
Blackrock Lake		500	Ct
TOTAL:	Rainbow	3,250	
	Cutthroat	19,500	
	Grayling	1,500	
		24,250	

Table 4. Challis National Forest mountain lake fry plants, 1987.

Lake name		# fry stocked	Species stocked
Challis Creek Lake #2		250	Ct
Challis Creek Lake #3		dry	
Martindale Lake #2		750	Ct
Martindale Lake #1		500	Gr
Woodtick Lake #2		250	Rb
Woodtick Lake #3		250	Gr
		500	Ct
W.F. Camas Creek Lake #1		500	Ct
W.F. Camas Creek Lake #3		250	Ct
		500	Rb
W.F. Camas Creek Lake #4		too shallow	
W.F. Camas Creek Lake #5		too shallow	
Cache Cr. Lake #5		250	Gr
Cache Cr. Lake #3		250	Ct
Cache Cr. Lake #1		250	Ct
Pole Lake		500	Ct
Liberty Lake #2		500	Ct
Liberty Lake #1		500	Rb
Rock Lake #2		500	Ct
Falconberry Lake		500	Ct
Kelly Lake		500	Ct
Nelson Lake #1		too shallow	
Nelson Lake #2		500	Gr
Mystery Lake #3		1,000	Ct
China Creek Lake #3		1,000	Ct
TOTAL:	Rainbow	1,250	
	Cutthroat	7,500	
	Grayling	1,500	
		10,250	

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: 6(SAL)-b[1]

Title: Lake and Reservoir Investigations--Williams Lake

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Catch rate during the Williams Lake ice fishery of 0.27 fish/hour in 1987 continues to decline.Technique and timing seem to be the main reasons for the low catch rate. The catch rate at the opening of the general season at 0.58 fish/hour was higher than in 1986 but lower than the seven-year average of 0.69 fish/hour.

Water quality seems to be a limiting factor. Dissolved oxygen levels were *very* low during ice cover and there is a possibility of a winterkill. During the summer months, DO levels reach 3 mg/l or less below 10 meters.

The majority of rainbow trout collected during the spawning run were male (57.3%). Most of the fish over 350 mm were female. The length-weight relationship was described by the equation,

$W = 0.000062 (L^{2.69})$

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INTRODUCTION

Williams Lake, a mesotrophic lake, is located in north-central Lemhi County at 1,600 m elevation. The surface area is 92.7 ha, the maximum depth is 56 m, with a mean depth of 23 m. The main source of water is Lake Creek, with some inflow from springs. Rainbow trout (Salmo garidneri) and bull trout (Salvelinus confluentus) are the only gamefish that occur in the lake. Information from anglers suggest that Williams Lake historically produced 2-3 kg rainbow trout. A combination of spawning habitat degradation, caused by logging and road building practices, and water quality degradation, caused by nutrient input from eroded sediments and leaching of septic systems, caused a reduction in the number and size of harvest from Williams Lake. In the early 1960s, the management of Williams Lake was a put-and-take and a put-grow-and-take fishery. The majority of the logging in the drainage ended in 1978. Since then, the spawning habitat in Lake Creek has improved and in 1983 large numbers of rainbow trout were observed in Lake Creek. These fish may be remnant of the original Lake Creek rainbow trout stock and/or Mt. Whitney rainbow stock, which was planted in 1979. In 1984, stocking was discontinued. Williams Lake is now being managed as a wild trout fishery.

Spawning ground counts, general season opening weekend creel survey, and ice fishery creel survey were the indicators used to assess the fishery. In addition, data on water quality was also collected.

OBJECTIVES

1. To monitor angler use and harvest rates on opening day fishing season.
2. To evaluate the ability of natural recruitment to sustain the fishery.

RECOMMENDATIONS

1. Continue to monitor the ice fishery and Memorial Day Weekend fishery by conducting creel surveys or angler interviews.
2. Collect age and length data on the lake population.

METHODS

Creel checks were made during the 1987 ice fishing season, January 15 - February 15, on Williams Lake. The number of anglers surveyed, total hours fished, and the number and lengths of fish harvested were recorded. Creel checks were also conducted during the opening weekend of the general season. Angler success rates were compared to previous years.

Fish collections were made using a backpack electroshocker in Lake Creek during the spawning run. Total length, weight, and sex were recorded. Scale samples were taken from five fish in each 20 mm length group. Each sample was wet mounted between two glass slides and read using a microprojector. The number of annuli was determined and linear distance measurements were taken from the scale focus to each annulus and the scale edge. The length-weight relationship, age frequencies, and growth rates were determined.

Two limnology stations were selected, one about 1/3 the distance from the inlet (Station 2) and the other 2/3 the distance from the inlet (Station 1). Limnological data collected included pH, Secchi disk depth, temperature, and dissolved oxygen. A Hach chemical kit was used to determine alkalinity and pH. A YSI Model 51 dissolved oxygen meter with a temperature probe was used to measure DO and temperature at 1-m intervals to a depth of 10 m, or 15 m, and 5-m intervals to a final depth of 30 m.

Plankton samples were taken using a 125 mm diameter, 60 micron mesh, plankton net lowered to 10 m and retrieved slowly. Plankton samples were stored in 70% isopropyl alcohol for analysis. Zooplankton were identified to family and counted. Organisms per liter were determined. Phytoplankton were identified to order, and relative abundance was estimated.

RESULTS

Creel Survey

During the 1987 ice fishing season, 53 anglers were interviewed (Table 1). They had fished for 168 hours and harvested 45 rainbow trout for a catch rate of 0.27 fish/hour. The mean total length of creeled fish was 335 mm, with a range of 260-480 mm.

Creel data was collected from 121 anglers during the 1987 opening weekend of the general fishing season (Table 2). They had caught 218 fish in 375 hours for catch rate of 0.58 fish/hour. Mean total length was 331 mm, with a range of 260-449 mm.

Table 1. Summary of angler interviews for Williams Lake ice fishery, 1981-1987.

Year	# anglers interviewed	Total hours fished	# fish harvested	Catch rate (fish/hr.)	Mean length
1981	148	333.5	114	0.34	284
1982	130	360.5	227	0.63	280
1983	89	275.5	156	1.2	286
1984	95	219.5	207	0.94	280
1985	212	691.0	283	0.41	290
1986	55	93.5	33	0.35	326
1987	53	168	45	0.27	335

Table 2. Opening weekend creel data summary for Williams Lake, 1981-1987.

Year	Number anglers	Effort (hour)	# rainbow harvested	# bull trout harvested	Catch rate (fish/hr.)	Mean length (mm)
1981	401	853.5	656	2	0.77	312
1982	317	822.5	273	8	0.34	333
1983	202	487.5	310	1	0.64	272
1984	204	419.5	499	6	1.2	284
1985	181	510.0	433	2	0.85	287
1986	141	404.0	170	5	0.43	364
1987	121	375.0	218	2	0.58	331

Limnology

Secchi disk measurement were taken April through November, except for July (Table 3). The shallowest measurement was 3 m and occurred in April and August; the deepest measurement occurred in November.

Measurements of pH ranged 8.5 to 9.9, the highest occurred in August and September and the lowest occurred in May (Table 3).

Dissolved oxygen and temperature measurements were taken January through November, except for July (Figure 1). The most critical period of DO levels occurred in March under ice cover. The highest surface temperature was 17°C and occurred in August. The thermocline began forming in June, was well established in August, and turnover occurred in November.

Plankton

Zooplankton samples were collected in May, August, September, October, and November. The highest number of organisms per liter was 1.1 (147 total), collected in May. The lowest number of organisms per liter was 0.05 (6 total) and was collected in October. Eucopepoda was the most abundant order of organisms collected in May; Cladocera was the most abundant order collected in the remaining months sampled.

Collected algae were identified as blue-green, mainly Anabaena, Phormidium; and green algae, mainly Oedogonium. Blue-green algae was most abundant in June and August. Various diatoms were abundant in September, October, and November.

Spawning Population

A total of 293 rainbow trout were collected between May 6 and May 26, 1987 in Lake Creek. The percent male, female, and immature fish collected were 57.3, 40.3, and 2.4, respectively. Overall mean length was 327 mm, mean weight was 407 g, and total lengths ranged 50 mm to 470 mm (Figure 2). The length-weight relationship was expressed as

$$W = 0.000062\ (L^{2.69}),\ r^2 = 0.98$$

(Figure 3). Mean length, mean weight, and incremental increases for aged fish is displayed in Table 4. Aged fish ranged 1 to 6 years (Figure 4). Ages 2, 3, 4, and 5 were the most dominant age groups in the spawning run. This is supported by the length frequency (Figure 2). Mean length at age is displayed in Figure 5.

Table 3. Water chemistry measurements for Williams Lake, 1987.

Month	pH		Secchi disk (m)	
	Station 1	Station 2	Station 1	Station 2
January	-	-	-	-
February	-	-	-	-
March	-	-	-	-
April	9	-	3	3.9
May	-	8.5	5.5	5.5
June	9.2	9.6	5.5	5.5
July	-	-	-	-
August	9.9	9.9	3	3
September	9.7	9.9	4.5	4.5
October	9.2	9.6	5	5
November	8.7	8.6	6	5.5

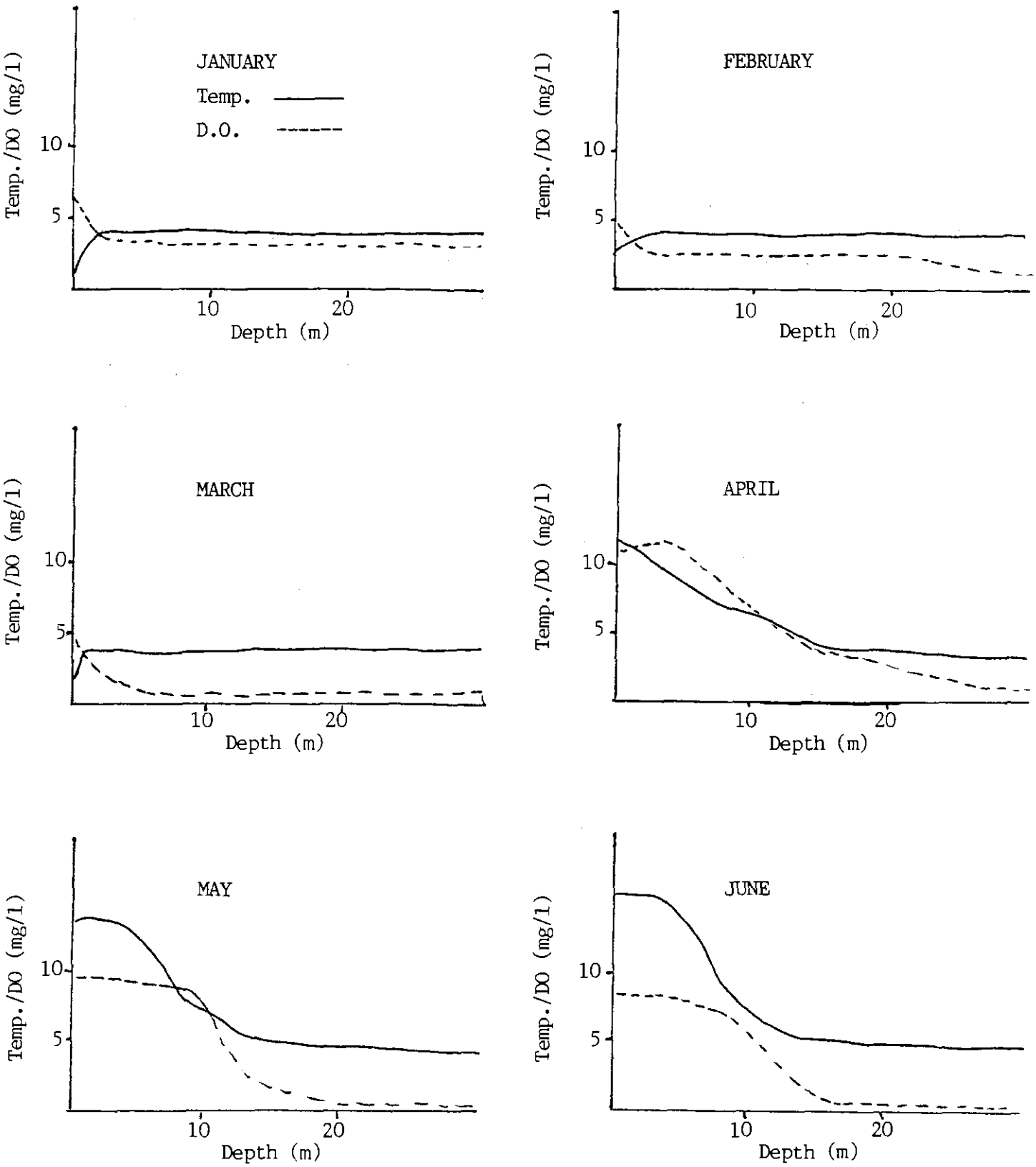

Figure 1. Monthly temperature and dissolved oxygen profiles for Williams Lake, 1987.

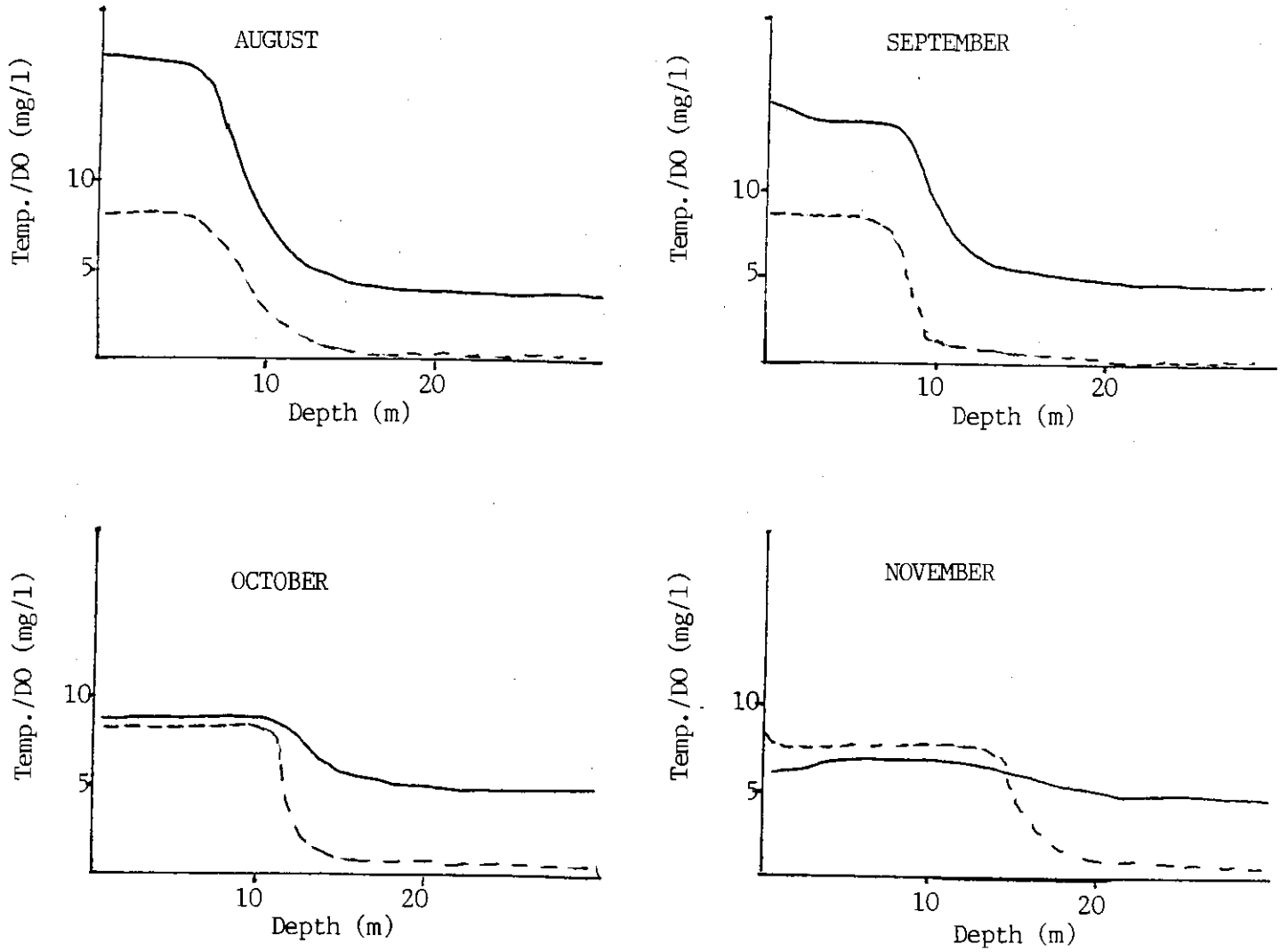

Figure 1. (continued)

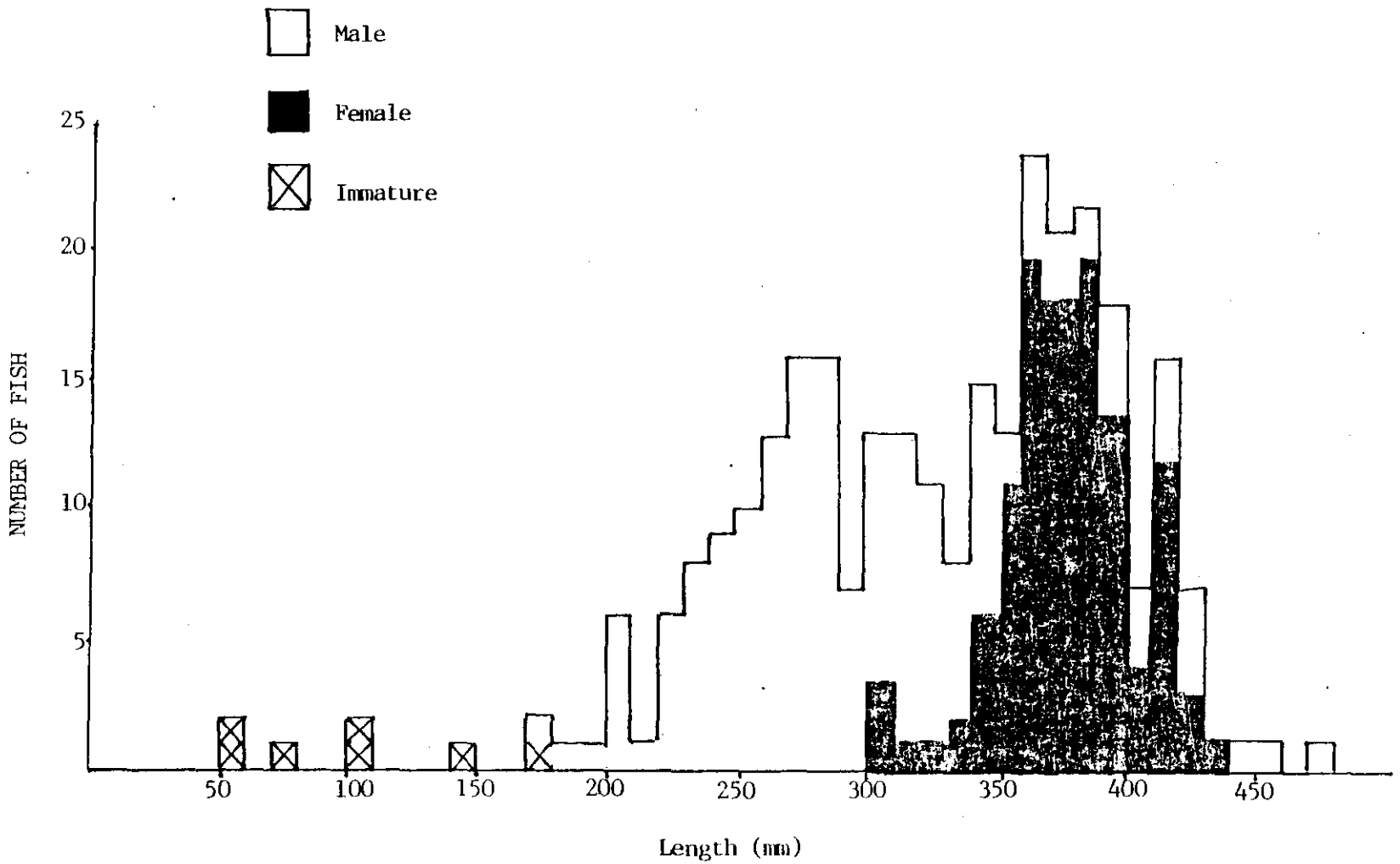

Figure 2. Length frequency of Williams Lake rainbow trout, collected during the spawning run, 1987.

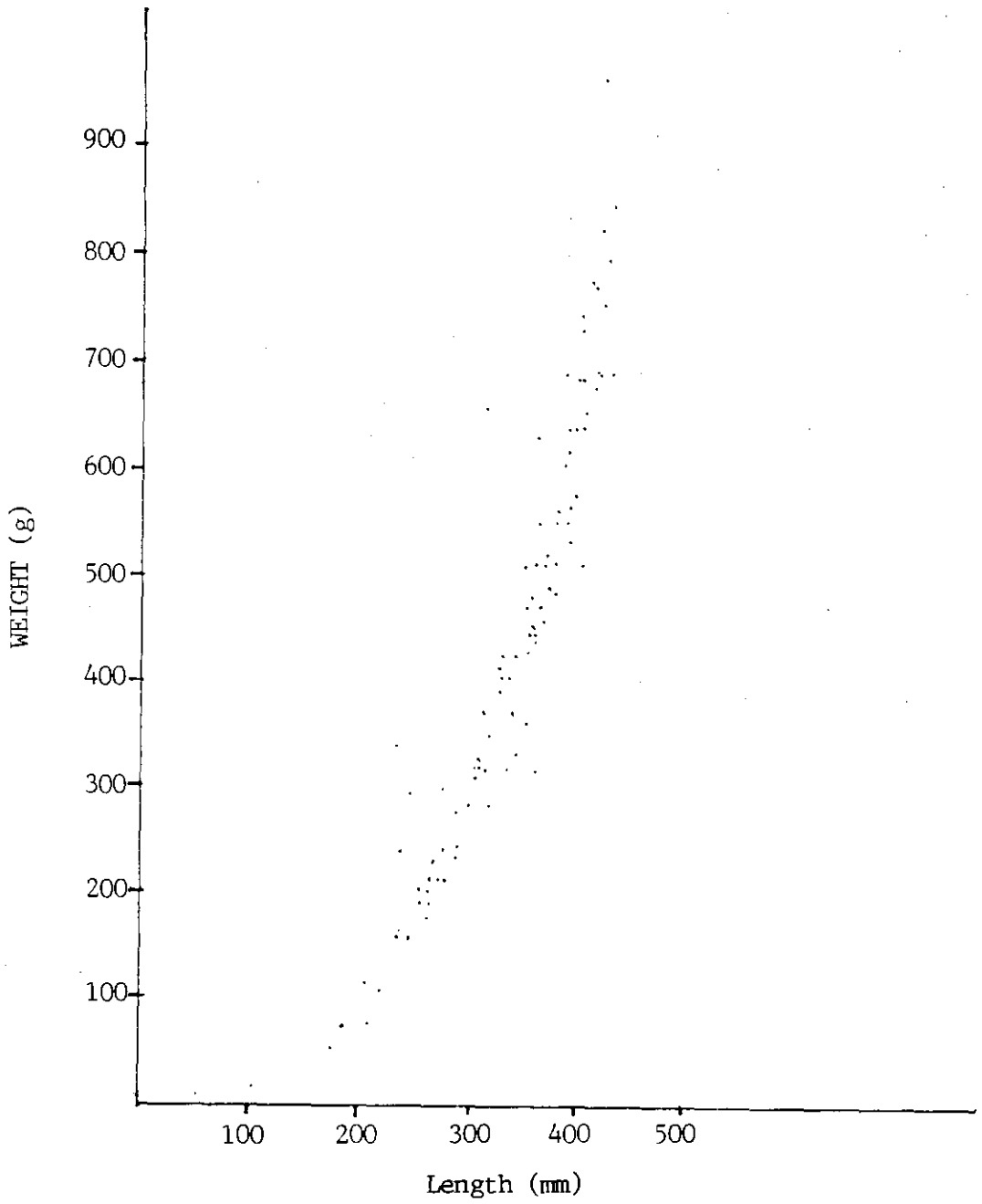

Figure 3. Length-weight relationship of Williams Lake rainbow trout, $W = 0.000062\ L^{2.69}$, 1987.

Table 4. Mean lengths, mean weights, and incremental increases for aged fish, 1987.

Age	N	$\bar{L}$ (mm)	Increase (mm)	$\bar{W}$ (g)	Increase (g)
1	4	93	93	15	15
2	18	230	137	136	121
3	17	289	59	288	152
4	22	353	64	473	185
5	11	395	42	664	191
6	1	450	55	790	126

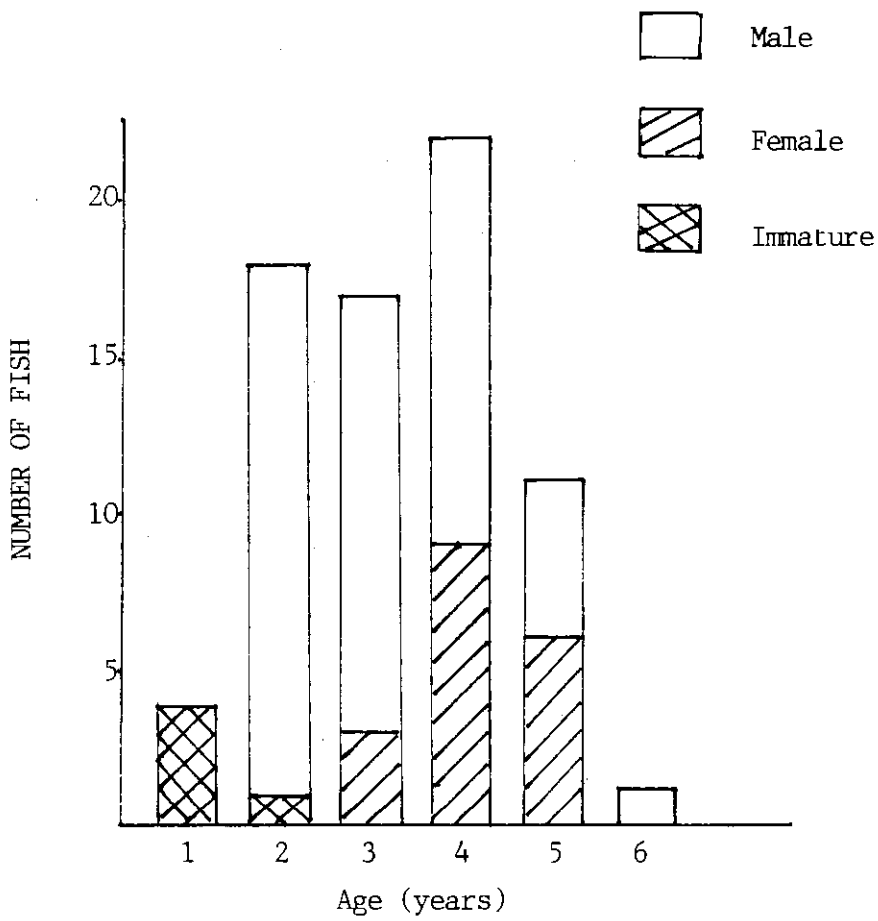

Figure 4. Age frequency of Williams Lake rainbow trout collected during the spawning run, 1987.

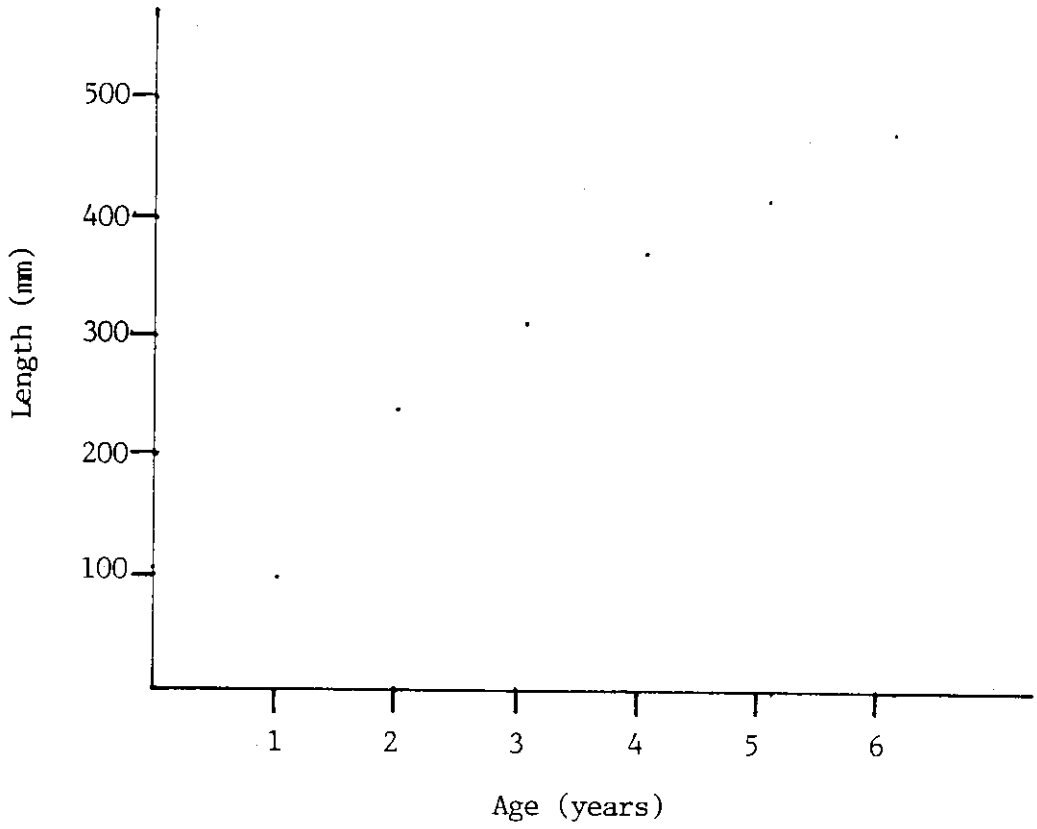

Figure 5. Mean length at age for rainbow trout in Williams Lake, 1987.

DISCUSSION

Creel Survey

The 1987 ice fishery produced the lowest catch rate in the past 7 years, 0.27 fish/hour (Table 1). However, this statistic is somewhat misleading. General observations made during the ice fishery indicated that technique and timing were two aspects that, if altered, could improve the catch rate. The majority of anglers interviewed were fishing near the bottom of the lake in water with dissolved oxygen levels below 2 mg/l. Most fish were caught 1 to 2 m below the ice, where DO levels were higher. Also, most fish were caught in the morning prior to 1,100 hours and late in the afternoon after 1,500 hours when shadow reached the ice. On several occasions, anglers said they caught their limit of trout within 30 minutes, often when shadow reached their location. This type of success also suggests that the fish may congregate and swim around the lake.

The catch rate for the 1987 opening weekend of the general fishing season was higher than in 1986 (Table 2). This catch rate, .58 fish/hour, exceeds our management goal of 0.5 fish/hour, but is lower than the 7-year average of 0.69 fish/hour.

In 1983, fry and fingerling rainbow were stocked in Williams Lake. The catch rates in 1984 and 1985, as well as mean lengths (Table 2), indicated that the planted fish contributed heavily to the fishery. In 1986, there were probably still a few planted fish available, but the majority of the creeled fish were naturally recruited. In 1987, the fishery was most likely supported entirely by natural reproduction. During the next few years, the rainbow population will be adjusting to the carrying capacity of the lake and we will be better able to determine the effect on the fishery.

Limnology

The carrying capacity of the lake is directly related to the water quality. Since the 1950s, there has been a rapid influx of nutrients from several sources. Logging practices in the upper drainage, which ended in 1978, provided a source of sediment that created a large delta at the mouth of Lake Creek. Cattle grazing in the upper drainage provided a source of nutrients. The septic systems of the surrounding private residences have also provided a source of nutrients. All of these sources of sediment and nutrients have led to the present water quality problem. DO levels become critical (less than 3 mg/l) below 10 m during the summer months (Figure 1), which was the same as in 1965 (Bjornn 1967). The most critical period was during ice cover, January through March (Figure 1). In 1965, DO levels became critical below 8 m. In 1987, DO levels became critical below 2 m, effectively reducing the amount of trout habitat available. The change in DO levels between 1965 and 1987 is an indication

that oxidation of plant material is increasing, with increasing of eutrophication of the lake. Williams Lake, because of the critical DO levels under the ice, has the potential for a winterkill, especially if ice cover were to last an extended period of time.

Plankton

The abundance of blue-green algae was an indication that phosphorus had entered the nutrient cycle in amounts that promote blue-green algae growth. The source of the phosphorous is unknown at the present time.

The number of zooplankton per liter (1.1 was the highest) is indicative of an oligotrophic type lake. Zooplankton per liter in Ashton Reservoir was 8 (Melo Maiolie, Idaho Department of Fish and Game, personal communication), and Ashton Reservoir is classified as an oligotrophic reservoir.

Spawning Population

The majority of fish collected were 2, 3, 4, and 5 years of age. Most male rainbow trout mature at 2 years of age and females mature at 3 years of age (Carlander 1969). The majority of fish over 340 mm were female (Figure 2). This indicates that females mature at an older age and that the mortality rate for male first time spawners is high.

The fastest growth takes place during the first two years and then declines as more energy is used for gonad development (Table 4). The length-weight relationship for this population of rainbow trout describes allometric growth ($W = aL^b$). Isometric growth is described by $W = CL^3$.

LITERATURE CITED

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JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: 6(SAL)-b[2]

Title: Lake and Reservoir Investigations --Stanley Basin Lakes

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

The sport fishery harvest was surveyed in Redfish and Alturas lakes to evaluate changes in catchable trout stockings. A total of 860 anglers were interviewed at Redfish Lake. They fished for 1,567 hours, caught 1, 065 fish, for a catch rate of 0.7 fish/hour. Estimated total angler hours was 12,523, estimated total fish caught was 8,671. Percent return to the creel for catchable trout was 22%, up from 142 in 1986.

A total of 767 anglers were interviewed at Alturas Lake. They had fished for 1,539 hours, caught 625 fish, for a catch rate of 0.4 fish/hour. Estimated total angler hours was 10,126; estimated total fish caught was 4, 074. Percent return to the creel for catchable trout was 282, down from 39% in 1986.

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INTRODUCTION

Several large, glacial, moraine lakes are located in the Sawtooth Valley, the headwaters of the Salmon River (Figure 1). These lakes provide over one million recreation visitor days a year. In 1986, creel surveys were conducted on Stanley, Redfish, and Alturas lakes to determine fishing pressure and return to the creel for catchable rainbow trout (Salmo gairdneri) (Reingold and Davis 1987). Recommendations developed from this data included changes in the number of catchable trout planted and changes in the stocking schedule for Alturas and Redfish lakes. In 1987, creel surveys were conducted on these lakes to evaluate the changes.

OBJECTIVES

1. To evaluate the changes in stocking procedures in Redfish and Alturas lakes.

2. To evaluate the contribution of kokanee salmon (Oncorhynchus nerka kennerli) to the fishery.

RECOMMENDATIONS

1. Increase the number of catchable rainbow trout planted in Redfish Lake to 5,000 fish in May and August and to 6,000 fish in June and July.

2. Increase the number of catchable rainbow trout planted in Alturas Lake to 7,500 in June and July and 5,000 in August.

METHODS

To evaluate the affect of changes in trout stocking on the sport fishery, a creel survey was conducted on Redfish and Alturas lakes between May 23 and September 7, 1987. The creel survey method was similar to the one described by Reingold and Davis (1987). Starting times for the first instantaneous count varied, 6:00 a.m. to 9:30 a.m. Each of the three remaining daily instantaneous counts was made at 3-hour intervals.

Information collected during angler interviews included number of anglers in each party, total number of hours fished, if the trip was completed, total fish caught, total fish released, and number of each species harvested. Total length for each fish caught was also recorded.

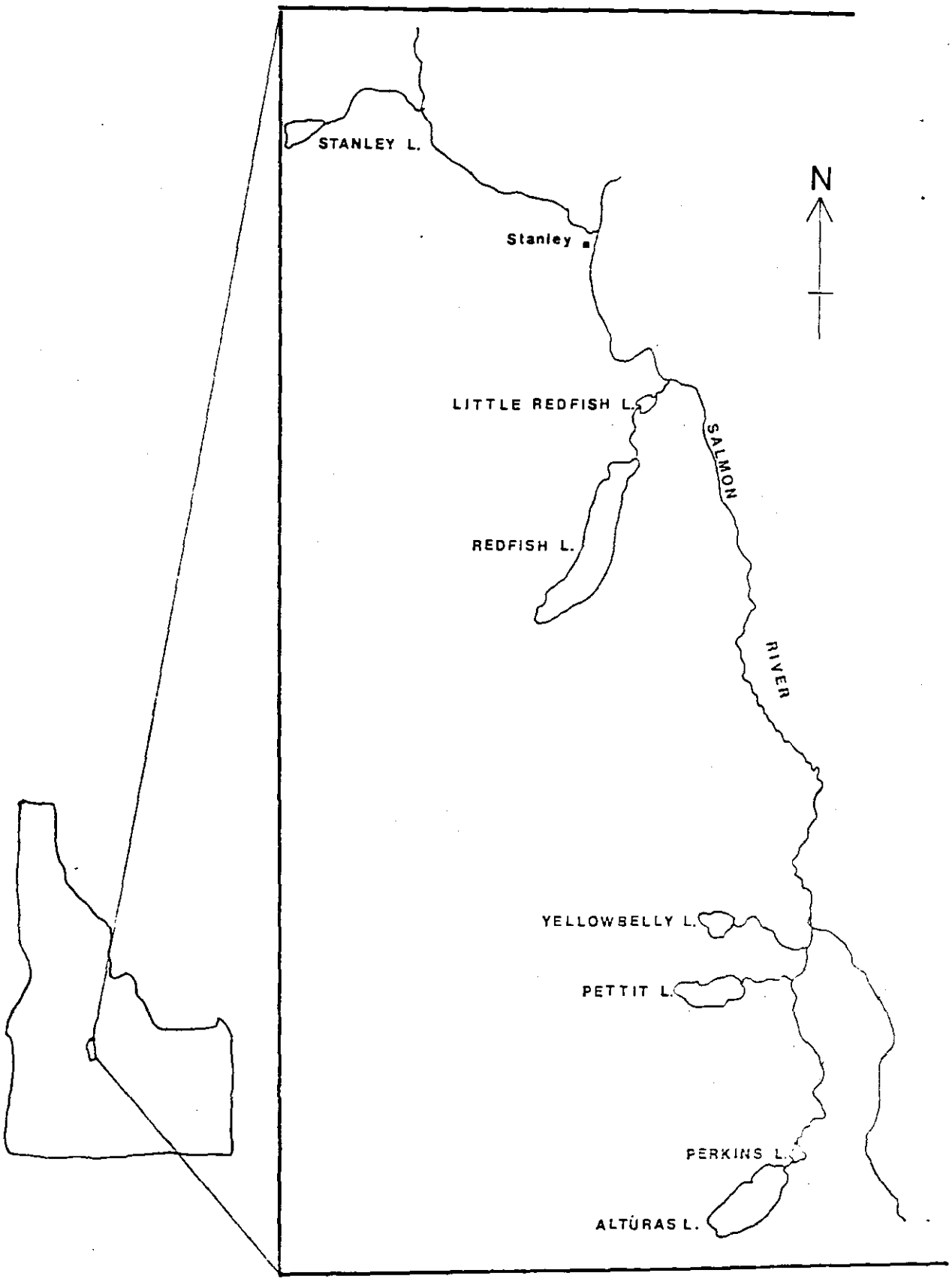

FIGURE 1. Sawtooth Valley lakes in the Sawtooth National Recreation Area.

RESULTS

Redfish Lake

A total of 860 anglers were interviewed between 23 May and 7 September, 1987 (Table 1). They fished for 1,567 hours and caught 1,065 fish for a catch rate of 0.7 fish/hour. Of the 1,065 total fish caught, 72% were harvested and 28% were released. The catch rate for catchable trout, bull trout, (Salvelinus confluentus), and kokanee salmon was 0.3, 0.01, and 0.1 fish/hour, respectively (Table 1). Catchable trout comprised 69% of the harvest and kokanee, 28%.

Estimated total angler hours was 12,523 (Table 2). Estimated number of fish caught was 8,671 (14 fish/ha). Anglers harvested 4,702 catchable rainbow trout for a return to the creel of 22%. An estimated 1,897 kokanee salmon and 150 bull trout were harvested (Table 2). The highest catch rate occurred in June at 1.2 fish/hour. August had the lowest at 0.3 fish/hour. July had the highest number of angler hours with 4,305 followed by August, 3,509 hours, and June, 3,170 hours. The mean length of a completed fishing trip for shore anglers was 1.4 hours and for boat anglers it was 2.3 hours.

The average total lengths for harvested catchable rainbow trout, kokanee salmon, and bull trout were 264 mm, 238 mm, and 325 mm, respectively.

Alturas Lake

A total of 767 anglers were contacted between 23 May and 7 September, 1987 (Table 3). They fished 1,539 hours and caught 625 fish for a catch rate of 0.4 fish/hour. Eighty-four percent of the fish caught were harvested and 16% were released. Catchable rainbow trout supplied 78% of the total harvest (Table 3). Catch rates for catchable rainbow trout, bull trout, and kokanee salmon were 0.3, 0.006, and 0.01 fish/hour, respectively (Table 4).

The estimated total angler hours for the creel survey period was 10,126 hours (Table 4). Estimated number of fish caught was 4,074 (12 fish/ha). Anglers harvested 3,158 catchable rainbow trout for a return to the creel of 28%. There were an estimated 150 kokanee salmon, 89 bull trout, and 70 wild rainbow trout harvested in 1987. Catch rates for June, July, and August were 0.6, 0.4, and 0.5 fish/hour, respectively. The highest fishing pressure occurred in July (4,350 hours), followed by August (2,394 hours), and June (1,970 hours). Mean length of a completed trip for boat anglers was 2.5 hours and for shore anglers it was 2.1 hours.

Mean lengths of harvested catchable rainbow trout, bull trout, and kokanee salmon were 266 mm, 443 mm, and 197 mm, respectively.

Table 1. Redfish Lake creel survey data summary, 1987. [CR = catch rate (fish/hour)].

Month	# anglers interviewed	Total hours	# fish kept	# fish released	Total fish caught #	Total fish caught CR	Wild rainbow #	Wild rainbow CR	Hatchery rainbow #	Hatchery rainbow CR	Bull trout #	Bull trout CR	Kokanee salmon #	Kokanee salmon CR
May														
Weekend														
Boat	40	74.5	31	2	33	0.4	0	0	2	0.3	2	0.02	7	0.1
Shore	6	5.5	0	0	0	0	0	0	0	0	0	0	0	0
Weekday														
Boat	28	59	29	3	32	0.5	0	0	12	0.2	4	0.07	13	0.2
Shore	11	12	0	0	0	0	0	0	0	0	0	0	0	0
June														
Weekend														
Boat	76	157	97	48	145	0.9	0	0	45	0.3	3	0.02	49	0.3
Shore	42	69.5	30	10	40	0.6	0	0	30	0.4	0	0	0	0
Weekday														
Boat	56	143	144	105	246	1.7	0	0	62	0.4	7	0.05	100	0.7
Shore	22	29.5	28	9	37	1.3	0	0	28	0.9	0	0	0	0
July														
Weekend														
Boat	90	178	93	47	140	0.8	0	0	86	0.5	0	0	6	0.03
Shore	51	59	34	15	49	0.8	0	0	34	0.6	0	0	0	0
Weekday														
Boat	88	164	96	24	120	0.7	2	0.01	60	0.4	1	0.01	33	0.2
Shore	57	81	54	20	74	0.9	0	0	53	0.7	0	0	2	0.01
August														
Weekend														
Boat	67	133.5	43	3	46	0.3	0	0	40	0.3	2	0.01	2	0.01
Shore	44	74	19	4	23	0.3	1	0.01	8	0.2	0	0	0	0
Weekday														
Boat	63	113	41	2	43	0.4	0	0	41	0.4	0	0	0	0
Shore	58	84.5	10	2	12	0.1	0	0	10	0.1	0	0	0	0

Table 1. Continued.

Month	# anglers interviewed	Total hours	# fish kept	# fish released	Total fish caught #	Total fish caught CR	Wild rainbow #	Wild rainbow CR	Hatchery rainbow #	Hatchery rainbow CR	Bull trout #	Bull trout CR	Kokanee salmon #	Kokanee salmon CR
September														
Weekend														
Boat	30	63	8	0	8	0.1	0	0	5	0.08	1	0.02	2	0.03
Shore	11	20	2	0	2	0.1	0	0	2	0.1	0	0	0	0
Weekday														
Boat	10	38	7	0	7	0.2	0	0	5	0.1	0	0	2	0.05
Shore	8	5.5	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL														
Weekend														
Boat	305	609	275	105	380	0.6	0	0	200	0.3	9	0.01	65	0.1
Shore	154	228	85	29	114	0.5	1	0.004	76	0.3	0	0	0	0
Weekday														
Boat	245	517	317	131	448	0.9	2	0.003	168	0.3	12	0.02	146	0.3
Shore	156	212.5	92	31	123	0.6	0		88	0.4	0	0	1	0.005
GRAND TOTAL	860	1,566.5	769	296	1,065	0.7	3	0.002	532	0.3	21	0.01	212	0.1

Table 2. Redfish Lake estimated total angler hours and total fish caught, 1987.

Month	Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	# of days	Total hours/ month	Total fish caught CR	Total fish caught #	Total wild rainbow CR	Total wild rainbow #	Total hatchery rainbow CR	Total hatchery rainbow #	Total bull trout CR	Total bull trout #	Total kokanee salmon CR	Total kokanee salmon #
May																	
Weekend																	
Boat	2.0	2.8	5.6	15	84	5	420	0.4	168	0	0	0.3	126	0.02	8	0.1	42
Shore			2.3	15	35	5	175	0	0	0	0	0	0	0	0	0	0
Weekday																	
Boat	2.4	1.7	4.0	15	60	4	240	0.5	120	0	0	0.2	48	0.07	17	0.2	48
Shore			1.2	15	18	4	72	0	0	0	0	0	0	0	0	0	0
June																	
Weekend																	
Boat	3.7	2.4	8.9	16	142	8	1,136	0.9	1,022	0	0	0.3	341	0.02	23	0.3	341
Shore			3.0	16	48	8	384	0.6	230	0	0	0.4	154	0	0	0	0
Weekday																	
Boat	1.9	2.0	3.8	16	61	22	1,342	1.7	2,281	0	0	0.4	537	0.05	67	0.7	939
Shore			0.9	16	14	22	308	1.3	400	0	0	0.9	277	0	0	0	0
July																	
Weekend																	
Boat	2.7	2.5	6.7	15	101	9	909	0.8	727	0	0	0.5	455	0	0	0.03	27
Shore			1.7	15	26	9	234	0.8	187	0	0	0.6	140	0	0	0	0
Weekday																	
Boat	2.5	2.7	6.7	15	101	22	2,222	0.7	1,555	0.01	22	0.4	889	0.01	22	0.2	444
Shore			2.8	15	42	22	924	0.9	832	0	0	0.7	647	0	0	0.01	9

Table 2. Continued.

Month	Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	# of days	Total hours/ month	Total fish caught CR	Total fish caught #	Total wild rainbow CR	Total wild rainbow #	Total hatchery rainbow CR	Total hatchery rainbow #	Total bull trout CR	Total bull trout #	Total kokanee salmon CR	Total kokanee salmon #
August																	
Weekend																	
Boat	2.4	2.2	5.3	14	74	10	740	0.3	222	0	0	0.3	222	0.01	7	0.01	7
Shore			1.9	14	27	10	270	0.3	81	0.01	3	0.2	54	0	0	0	0
Weekday																	
Boat	2.6	2.2	5.7	14	80	21	1,680	0.4	672	0	0	0.4	672	0	0	0	0
Shore			2.8	14	39	21	819	0.1	82	0	0	0.1	82	0	0	0	0
September																	
Weekend																	
Boat	3.3	2.1	6.9	13	90	3	270	0.1	27	0	0	0.08	22	0.02	5	0.03	8
Shore			1.7	13	22	3	66	0.1	7	0	0	0.1	7	0	0	0	0
Weekday																	
Boat	2.5	2.0	5.0	13	65	4	260	0.2	52	0	0	0.1	27	0	0	0.05	13
Shore			0.2	13	9	4	36	0	0	0	0	0	0	0	0	0	0
TOTAL																	
Weekend																	
Boat							3,374	0.6	2,166	0	0	0.3	1,165	0.01	43	0.1	425
Shore							1,103	0.5	505	0.003	3	0.3	355	0	0	0	0
Weekday																	
Boat							5,845	0.8	4,680	0.004	22	0.4	2,172	0.02	106	0.3	1,444
Shore							2,201	0.6	1,314	0	0	0.5	1,006	0	0	0.005	9
GRAND TOTAL							12,523	0.7	8,665	0.004	45	0.4	4,699	0.01	149	0.2	1,878

Table 3. Alturas Lake creel survey data summary, 1987. CR = Catch Rate (fish/hour).

Month	# anglers interviewed	Total hours	# fish kept	# fish released	Total fish caught #	Total fish caught CR	Wild rainbow #	Wild rainbow CR	Hatchery rainbow #	Hatchery rainbow CR	Bull trout #	Bull trout CR	Kokanee salmon #	Kokanee salmon CR	Cutthroat #	Cutthroat CR
May																
Weekend																
Boat	22	42	1	0	1	.02	0	0	0	0	1	.02	0	0	0	0
Shore	25	37	4	7	11	0.3	0	0	4	0.1	0	0	0	0	0	0
Weekday																
Boat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shore	4	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
June																
Weekend																
Boat	30	95.5	25	14	39	0.4	1	0.01	22	0.2	1	0.01	1	0.01	0	0
Shore	68	135	63	14	77	0.6	0	0	62	0.5	1	0.01	0	0	0	0
Weekday																
Boat	21	53.5	30	14	44	0.8	0	0	28	0.5	0	0	2	0.04	0	0
Shore	55	63.0	29	5	34	0.5	0	0	27	0.4	1	0.02	0	0	1	0.02
July																
Weekend																
Boat	61	131	20	16	36	0.3	0	0	12	0.09	1	0.01	7	0.05	0	0
Shore	62	108	46	1	47	0.4	3	0.03	42	0.4	0	0	1	0.01	0	0
Weekday																
Boat	72	194	48	13	61	0.3	1	0.01	44	0.2	0	0	3	0.02	0	0
Shore	100	172	64	9	73	0.4	2	0.01	54	0.3	5	0.03	3	0.02	0	0
August																
Weekend																
Boat	38	78.5	23	3	26	0.3	0	0	22	0.3	0	0	1	0.01	0	0
Shore	52	70.5	43	2	45	0.6	0	0	42	0.6	0	0	1	0.01	0	0
Weekday																
Boat	28	56	4	1	5	0.09	0	0	4	0.07	0	0	0	0	0	0
Shore	70	150.5	84	4	88	0.6	1	0.01	80	0.5	0	0	3	0.02	0	0

Table 3. Continued.

Month	# anglers interviewed	Total hours	# fish kept	# fish released	Total fish caught #	Total fish caught CR	Wild rainbow #	Wild rainbow CR	Hatchery rainbow #	Hatchery rainbow CR	Bull trout #	Bull trout CR	Kokanee salmon #	Kokanee salmon CR	Cutthroat #	Cutthroat CR
September																
Weekend																
Boat	21	47.5	2	0	2	0.04	0	0	2	0.04	0	0	0	0	0	0
Shore	23	73	26	0	26	0.4	0	0	26	0.4	0	0	0	0	0	0
Weekday																
Boat	7	11	3	0	3	0.3	0	0	3	0.3	0	0	0	0	0	0
Shore	8	17	7	0	7	0.4	0	0	7	0.4	0	0	0	0	0	0
TOTAL																
Weekend																
Boat	172	394.5	71	33	104	0.3	1	0.003	58	0.2	3	0.008	9	0.02	0	0
Shore	230	423.5	182	24	206	0.5	3	0.007	176	0.4	1	0.002	2	0.005	0	0
Weekday																
Boat	128	314.5	85	28	113	0.4	1	0.003	79	0.3	0	0	5	0.02	0	0
Shore	237	406.0	184	18	202	0.5	3	0.007	168	0.4	6	0.01	6	0.01	1	0.002
GRAND TOTAL	767	1,538.5	522	103	625	0.4	8	0.005	481	0.3	10	0.006	22	0.01	1	0.0006

Table 4. Alturas Lake estimated total hours and total fish caught, 1987.

Month	Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	# of days	Total hours/ month	Total fish caught		Total wild rainbow		Total hatchery rainbow		Total bull trout		Total kokanee salmon		Total cutthroat	
								CR	#	CR	#	CR	#	CR	#	CR	#	CR	#
May																			
Weekend																			
Boat	2.0	3.1	6.2	15	93	5	465	0.02	9	0	0	0	0	0.02	9	0	0	0	0
Shore	-	-	2.4	15	36	5	180	0.3	54	0	0	0.1	18	0	0	0	0	0	0
Weekday																			
Boat	0	0	0	15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Shore	-	-	0.3	15	5	4	20	0	0	0	0	0	0	0	0	0	0	0	0
June																			
Weekend																			
Boat	1.1	1.9	2.1	16	34	8	272	0.4	109	0.01	3	0.2	54	0.01	3	0.01	3	0	0
Shore	-	-	3.1	16	50	8	400	0.6	240	0	0	0.5	200	0.01	4	0	0	0	0
Weekday																			
Boat	0.5	1.9	1.0	16	16	22	352	0.8	282	0	0	0.5	176	0	0	0.04	14	0	0
Shore	-	-	2.7	16	43	22	946	0.5	473	0	0	0.4	378	0.02	19	0	0	0.02	19
July																			
Weekend																			
Boat	2.1	2.1	4.4	15	66	9	594	0.3	178	0	0	0.09	54	0.01	6	0.05	30	0	0
Shore	-	-	5.3	15	80	9	720	0.4	288	0.03	22	0.4	288	0	0	0.01	7	0	0
Weekday																			
Boat	1.9	2.3	4.4	15	66	22	1,452	0.3	436	0.01	15	0.2	290	0	0	0.02	29	0	0
Shore	-	-	4.8	15	72	22	1,584	0.4	634	0.01	16	0.3	475	0.03	48	0.02	32	0	0
August																			
Weekend																			
Boat	0.7	2.5	1.8	14	25	10	250	0.3	75	0	0	0.3	75	0	0	0.01	3	0	0
Shore	-	-	2.7	14	38	10	380	0.6	228	0	0	0.6	228	0	0	0.01	4	0	0
Weekday																			
Boat	0.5	2.5	1.3	14	18	21	378	0.09	34	0	0	0.07	26	0	0	0	0	0	0
Shore	-	-	4.7	14	66	21	1,386	0.6	832	0.01	14	0.5	693	0	0	0.02	28	0	0

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Table 4. Continued.

Month	Mean boats/ hour	Mean anglers/ boat	Mean anglers/ hour	Day length	Total hours/ day	# of days	Total hours/ month	Total fish caught CR	Total fish caught #	Total wild rainbow CR	Total wild rainbow #	Total hatchery rainbow CR	Total hatchery rainbow #	Total bull trout CR	Total bull trout #	Total kokanee salmon CR	Total kokanee salmon #	Total cutthroat CR	Total cutthroat #
September																			
Weekend																			
Boat	2.5	2.6	6.5	13	85	3	255	0.04	10	0	0	0.04	10	0	0	0	0	0	0
Shore	-	-	8	13	104	3	312	0.4	125	0	0	0.4	125	0	0	0	0	0	0
Weekday																			
Boat	0.5	1.7	0.9	13	12	4	48	0.3	14	0	0	0.3	15	0	0	0	0	0	0
Shore	-	-	2.5	13	33	4	132	0.4	53	0	0	0.4	53	0	0	0	0	0	0
TOTAL																			
Weekend																			
Boat							1,836	0.2	381	0.002	3	0.1	193	0.01	18	0.02	36	0	0
Shore							1,992	0.5	935	0.01	22	0.4	859	0.002	4	0.006	11	0	0
Weekday																			
Boat							2,230	0.3	766	0.007	15	0.2	507	0	0	0.02	43	0	0
Shore							4,068	0.5	1,992	0.007	30	0.4	1,599	0.02	67	0.01	60	0.005	19
GRAND TOTAL							10,126	0.4	4,074	0.007	70	0.3	3,158	0.009	89	0.01	150	0.002	19

DISCUSSION

Redfish Lake

In 1986, 35,000 catchable rainbow trout were planted in Redfish Lake; this number was reduced to 20,000 in 1987. In 1987, there was a 19% decrease in angler hours of Redfish Lake compared to 1986 (Table 5). There was a slight increase in total number of fish caught, and the catch rate improved by 0.1 fish/hour to 0.7 fish/hour (Table 5). There was a large increase in the estimated number of kokanee salmon harvested in 1987 (Table 5). The number of catchable trout harvested was lower in 1987 than in 1986 (Table 5).

This decrease is misleading. The actual catch rate for stocked rainbow trout increased over 1986 (Table 5), and the percent returned to the creel also increased from 14% in 1986 (a revised percentage due to a correction in numbers stocked) to 22% in 1987 (Table 6). The increase in the percent returned to the creel was directly affected by the reduction in total number of fish stocked and the changes in the date and number of fish stocked each month. In previous years, the number of fish being stocked was in excess of the number necessary to reach acceptable levels of percent return to the creel for the amount of fishing pressure expended at Redfish Lake (20% or greater). In this situation, higher numbers of stocked fish do not lead to higher catch rates or higher percentage returns to the creel. Higher catch rates can be achieved by adjusting the stocking dates to correspond to the greatest fishing pressure.

Alturas Lake

In 1987, changes were made in stocking to determine the effect on catch rates and percent return to the creel for catchable trout. The changes were reduction of the number of fish stocked from 20,000 to approximately 15,000 fish and adjustment of the monthly stocking schedule (Table 7). These modifications adversely affected the fishery in Alturas Lake. Declines occurred in total number of fish caught, total number of catchables harvested, and catch rate (Table 8). Percent return to the creel declined from 39% in 1986 to 28% in 1987.

For kokanee, the number of fish harvested doubled from 64 in 1986 to 150 in 1987. Catch rates showed a corresponding increase. However, these values are low when compared to other Idaho kokanee populations. The differences indicate that the kokanee population in Alturas Lake fluctuates yearly and there is need for improvement.

Table 5. Redfish Lake estimated angler hours, fish caught, and catch rates for 1986 and 1987.

	1986		1987	
	#	CR	#	CR
Total hours	15,449		12,523	
Total fish	8,524	0.6	8,665	0.7
Total hatchery rainbow	5,173	0.3	4,699	0.4
Total bull trout	202	0.01	149	0.01
Total kokanee salmon	921	0.06	1,878	0.2

Table 6. Catchable trout stocking history of Redfish Lake, 1986 and 1987.

1986		1987	
Date stocked	Number	Date stocked	Number
May 17	3,000	May 12	10,005
May 22	3,105		
June 24	12,000	June 5	5,100
July 24	12,000	July 16	4,030
August 28	6,000	August 5	2,228
Total stocked	36,105		21,363
Total harvested	5,173		4,699
Percent return	14%		22%

Table 7. Catchable trout stocking history of Alturas Lake, 1986 and 1987.

1986		1987	
Date stocked	Number	Date stocked	Number
June 25	10,000	June 3	8,160
July 22	10,000	July 16	4,030
		August 5	2,227
Total stocked	20,000		14,417
Total harvested	7,790		4,097
Percent return	39%		28%

Table 8. Alturas Lake estimated angler hours, fish caught, and catch rate for 1986 and 1987.

	1986		1987	
	#	CR	#	CR
Total hours	12,557		10,126	
Total fish	10,705	0.9	4,074	0.4
Total hatchery rainbow	7,790	0.6	3,158	0.3
Total bull trout	212	0.02	89	0.009
Total kokanee salmon	64	0.005	150	0.01

LITERATURE CITED

Reingold, M., and J. Davis. 1987. Idaho Department of Fish and Game, Federal Aid in Fish and Wildlife Restoration, Job Performance Report, Project F-71-R-11. Boise, Idaho.

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: 6(SAL)-c

Title: Salmon Subregion Rivers and Streams Investigations

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Two trips were taken down the Middle Fork Salmon River (MFSR), one in early June and one in late August, to determine the best time for assessing juvenile salmonid densities. It appears that the best time for collecting density data is between the second week in July and the third week in August.

Mean densities for cutthroat trout were 30Z lower in August than in June, 1.0 and 0.7 fish/100 m^2, respectively. Juvenile steelhead densities were also lower in August than in June, 0.3 and 0.4 fish/100 m^2, respectively. All 1987 densities were lower than in 1986, which is an indicator that the surveys were not completed within the optimum period, or that the actual number of fish was lower.

Mean juvenile steelhead densities in the MFSR tributaries for June and August were 5.2 and 2.3 fish/100 m^2, respectively. These were lower than the 1986 density of 9.5 fish/100 m^2. Mean cutthroat trout densities were 0.8 and 1.4 fish/100 m^2 in June and August, respectively. Both were lower than the 3.7 fish/100 m^2 in July 1986. Juvenile chinook densities were higher in August 1987 than July 1986, 3.7 and 3.2 fish/100 m^2, respectively.

The mean densities for the Salmon River tributaries were higher in 1987 than in 1986. Juvenile steelhead densities were 18.7 and 27.9 fish/100 m^2 in 1986 and 1987, respectively. Juvenile chinook densities were 2.6 and 4.7 fish/100 m^2 in 1986 and 1987, respectively.

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INTRODUCTION

The Middle Fork Salmon River (MFSR), part of the Wild and Scenic Rivers System, flows through a remote area in central Idaho. Most of its length is contained within the Frank Church River of No Return Wilderness Area. The headwaters of the Middle Fork originate at the confluence of Bear Valley and Marsh creeks near Cape Horn Mountain. The river flows 171 km to its confluence with the main stem Salmon River 92 km below Salmon, Idaho (Figure 1).

Road access exists to Dagger Falls and at the confluence with the Salmon River. A few of the tributary headwaters are accessible via primitive roads. The lower 156 km of the Middle Fork is accessible only by air, float craft, or trail. The MFSR is a major recreational river that offers a wide variety of outdoor and backcountry opportunities. The number of people floating the river has increased 179% since 1973 (8,500 in 1986).

In 1971, a study was initiated to monitor the westslope cutthroat trout (Salmo clarki lewisi) population in the MFSR and the following year (1972), a catch-and-release regulation was established in the Middle Fork. Similar regulations were enacted on the lower portions of major tributaries in the early and mid-1980s.

Snorkel transects were established and surveyed periodically to monitor the cutthroat trout population (Corley 1972; Jeppson and Ball 1977, 1979). In 1981, a wild steelhead trout (Salmo gairdneri) project was initiated on the Middle Fork (Thurow 1982, 1983, 1985). Beginning in 1985, another study was initiated to determine juvenile steelhead and chinook salmon (O. tshawytscha) densities in the Middle Fork and its tributaries (Reingold and Davis 1987[a]).

This report discusses data collected in June and August 1987 on cutthroat trout and juvenile steelhead and chinook salmon densities in the Middle Fork and its tributaries and five tributaries of the main Salmon River downstream of the Middle Fork.

OBJECTIVES

1. To monitor juvenile steelhead trout and chinook salmon densities within the Middle Fork, its tributaries, and Salmon River tributaries.

2. To monitor the effects of catch-and-release regulations on cutthroat, rainbow, and bull trout (Salvelinus confluentus) populations.

3. To evaluate the best time (month) to collect data on salmonid densities.

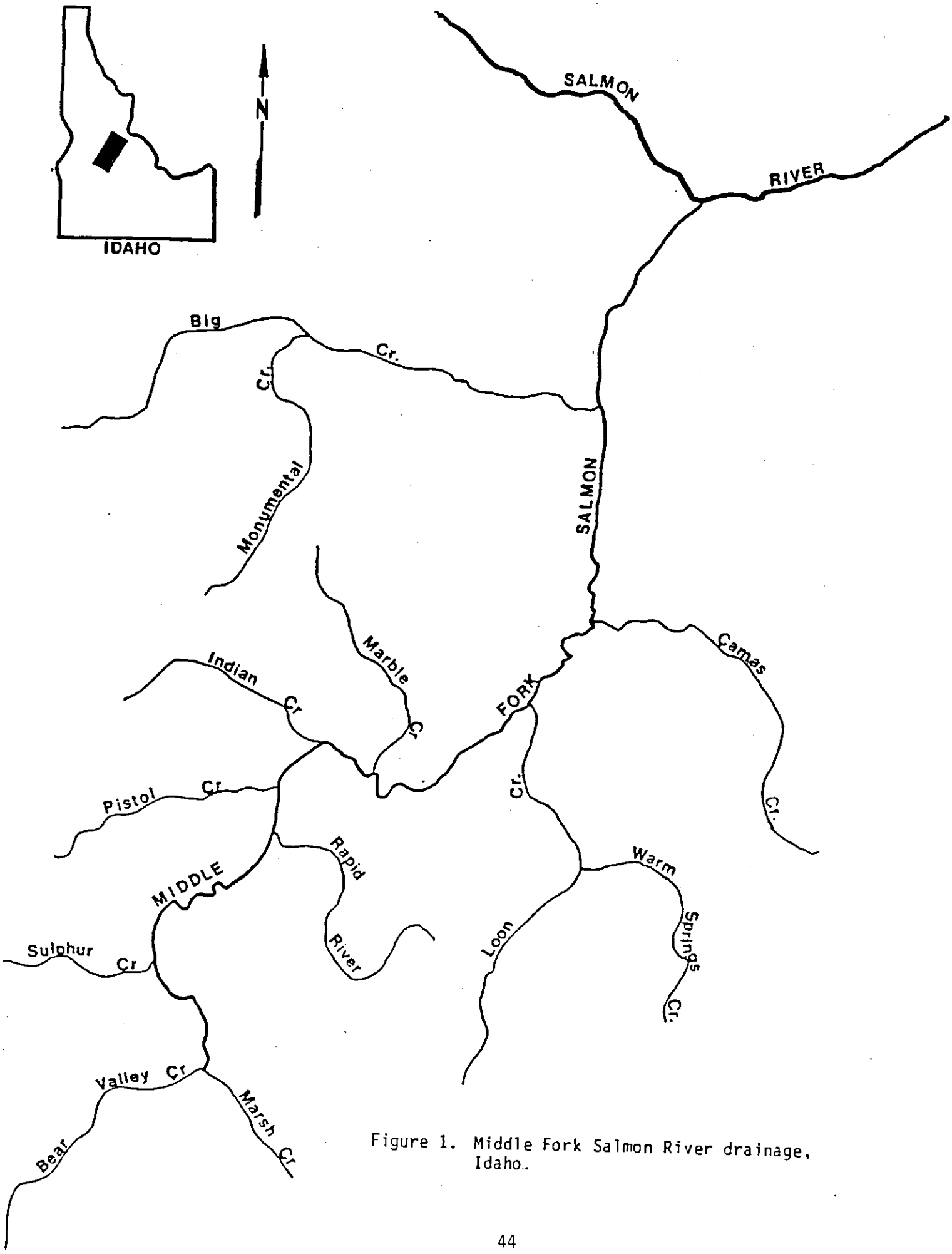

Figure 1. Middle Fork Salmon River drainage, Idaho.

RECOMMENDATIONS

1. Monitor densities of juvenile steelhead, cutthroat trout, and chinook salmon in the MFSR via snorkeling between the second week of July and the third week of August.

2. Make two field trips per year to collect accurate data.

METHODS

In 1987, two field trips were made down the MFSR to determine fish densities via snorkeling. Twenty-nine transects on MFSR (Table 1), 7 transects on 5 tributaries (Table 2), and 10 transects on 5 tributaries on the main Salmon River (Table 3) were surveyed. The first field trip on the MFSR was June 9-16 and started at Boundary Creek. All main stem and tributary transects were surveyed. The second field trip was August 24-30 and started at Indian Creek. Only 12 of the main stem transects and 4 of the tributary transects were surveyed on the second survey. A blowout occurred in Marble Creek that eliminated visibility for two days. The transects above Indian Creek were surveyed August 4-6. The transects on the Salmon River tributaries were surveyed July 5 and 6.

The method used to survey these transects was similar to one presented by Johnson (1985) and described by Reingold and Davis (1987[a], 1987[b]). The area surveyed was measured and fish seen were recorded in various length groups. Changes in densities/area (fish/100 m^2) were evaluated using paired statistics test for each transect with data between years (1986 vs. 1987) and between months (June vs. August). The null hypothesis was densities between years or months were the same, with $p = 0.05$.

Habitat data for each tributary transect was collected and recorded. Data included average depth, width, substrate composition, and gradient (records on file, Salmon Subregional Office).

RESULTS

Middle Fork Salmon River Transects

The total numbers of cutthroat trout, juvenile chinook salmon, and juvenile steelhead counted in June were 375, 4, and 98, respectively (Table 4). In August, the totals were 175, 70, and 57 for cutthroat, juvenile chinook salmon, and juvenile steelhead, respectively (Table 5). Mean cutthroat trout densities declined from June to August by 30%, mean juvenile steelhead densities declined by 25%, and mean juvenile chinook salmon densities increased 5,000% (Tables 6 and 7).

Table 1. Middle Fork snorkel transects, 1987.

Type	Transect name	SH #[a]	CT #[b]
SH	Boundary	1	
Ct/Ck	Gardell's Hole		A[c]
Ct/Ck	Velvet		B[c]
SH	Elkhorn	3	
SH	Sheepeater	4	
Ct/Ck	Greyhound		C[c]
SH	Rapid River	5	
SH	Indian	6	
Ct/Ck	Pungo		1
Ct/Ck	Marble Pool		3
SH	Ski-jump	7	
Ct/Ck	Lower Jackass		5
SH	Cougar	9	
Ct/Ck	Whitey Cox		7
SH	Rock Island	10	
Ct/Ck	Hospital Pool		9
SH	Hospital Run	11	
Ct/Ck	Tappan Pool		10
SH	Lower Tappan Run	12	
Ct/Ck	Flying B		11
SH	Airstrip	14	
SH	Survey	16	
Ct/Ck	Big Creek Bridge		15
SH	Love Bar	17	
Ct/Ck	Ship Island		17
SH	Little Ouzel	19	
Ct/Ck	Otter Bar		19
Ct/Ck	Goat Creek Pool		21
SH	Goat Creek Run	20	

[a]Numbers correspond to 1982 transects.
[b]Numbers correspond to 1971 transects.
[c]Established in 1985.

Table 2. Middle Fork tributary transects, 1987.

Transect name	Description
Pistol Creek #1	At mile marker 16
Pistol Creek #2	Above mile marker 16
Marble Creek #1 (mouth)	Above pack bridge
Loon Creek #1 (bridge)	Below pack bridge
Loon Creek #2 (run)	400 yards above pack bridge
Camas Creek #1 (mouth)	From pack bridge downstream
Big Creek #1 (mouth)	400 yards above mouth

Table 3. Main stem Salmon River tributary transects, 1987.

Transect name	Description
Horse Creek #1 (bridge)	50 yards above bridge
Horse Creek #2	150 yards above bridge
Chamberlain Creek #1 (mouth)	400 yards above mouth
Chamberlain Creek #2 (run)	500 yards above mouth
Bargamin Creek #1	1/4 mile above mouth
Bargamin Creek #2	At trail flat above #1
Sheep Creek #1	Below pack bridge
Sheep Creek #2	300 yards above pack bridge
Pahsimeroi R. #1 (lower)	100 yards below Dowton Lane Bridge
Pahsimeroi R. #2 (Dowton Ln.)	Run above + pool below Dowton Bridge

Table 4. Total number and species of fish counted in Middle Fork Salmon River transects, June 1987.

Location	Type	Cutthroat				Rainbow steelhead				Chinook salmon		Bull trout	White-fish	Other
		75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	Age 0	Age I			
Boundary	SH	-	-	-	-	-	-	-	-	-	-	-	3	-
Gardell's Hole	Ct/Ck	-	-	-	-	-	1	-	-	-	-	-	1	4
Velvet	Ct/Ck	-	-	-	5	4	8	-	-	-	-	-	-	-
Elkhorn	SH	-	-	2	2	2	1	-	-	-	-	-	-	-
Sheepeater	SH	-	-	-	-	-	-	-	-	-	-	-	1	-
Greyhound	Ct/Ck	-	-	3	2	-	1	-	-	-	-	-	3	-
Rapid River	SH	-	-	4	3	4	3	-	-	-	-	-	7	-
Indian	SH	-	-	12	3	-	1	-	-	-	-	-	45	-
Pungo	Ct/Ck	-	1	7	9	-	-	-	-	-	-	-	8	-
Marble Pool	Ct/Ck	-	2	30	48	-	4	-	-	-	-	1	11	-
Ski-jump	SH	-	-	4	1	-	1	-	-	-	-	-	6	-
Lower Jackass	Ct/Ck	-	-	15	21	2	2	-	-	-	-	-	6	-
Cougar	SH	-	-	-	2	-	-	-	-	-	-	-	2	-
Whitey Cox	Ct/Ck	-	-	10	25	2	3	-	-	-	-	-	-	-
Rock Island	SH	-	-	3	1	-	2	1	-	-	-	1	1	-
Hospital Pool	Ct/Ck	3	6	15	19	-	1	-	-	-	-	-	4	-
Hospital Run	SH	-	12	-	-	-	-	4	4	-	-	-	9	-
Tappan Pool	Ct/Ck	-	1	24	3	-	2	-	-	-	-	1	6	25
L. Tappan Run	SH	-	-	-	-	2	3	-	-	-	-	-	5	15
Flying B	Ct/Ck	-	-	4	-	-	-	-	-	-	-	-	5	-
Airstrip	SH	-	2	1	1	-	3	-	-	-	-	-	6	-
Survey	SH	-	-	14	6	-	6	-	-	-	-	-	6	30
Big Creek Bridge	Ct/Ck	-	1	4	1	3	3	-	-	-	-	-	4	-
Love Bar	SH	-	-	2	-	-	2	-	-	-	-	1	8	15
Ship Island	Ct/Ck	-	-	12	1	-	4	1	-	-	-	-	18	40
Little Ouzel	SH	-	-	5	1	-	3	1	-	-	-	-	1	13
Otter Bar	Ct/Ck	-	5	11	-	-	4	-	-	3	-	-	4	28
Goat Cr. Pool	Ct/Ck	-	-	6	-	1	2	-	-	1	-	-	11	36
Goat Cr. Run	SH	-	-	-	-	-	6	1	-	-	-	-	10	25
COLUMN TOTAL		3	30	188	154	20	66	8	4	4	0	4	191	231
GRAND TOTAL		375				98				4		4	191	231

Table 5. Total number and species of fish counted in Middle Fork Salmon River transects, August 1987.

Location	Type	Cutthroat				Rainbow steelhead				Chinook salmon		Bull trout	White-fish	Other
		75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	Age 0	Age I			
Boundary	SH	-	-	1	4	-	-	-	-	-	-	-	13	-
Gardell's Hole	Ct/Ck	-	-	-	2	-	-	-	-	5	-	-	6	-
Velvet	Ct/Ck	1	2	2	3	4	4	-	-	1	-	-	6	-
Elkhorn	SH	-	-	2	8	-	1	-	-	19	-	-	29	-
Sheepeater	SH	-	1	-	-	10	6	2	-	2	-	-	5	-
Greyhound	Ct/Ck	-	-	-	7	2	4	1	-	38	-	-	6	-
Rapid River	SH	-	-	-	2	-	6	-	-	4	-	-	11	-
Indian	SH	-	1	2	6	-	-	-	-	-	-	-	33	-
Pungo	Ct/Ck	-	2	4	8	-	-	-	-	-	-	-	23	-
Marble Pool	Ct/Ck	-	36	26	16	-	-	-	-	-	-	-	73	3
Ski-jump	SH	No visibility												
Lower Jackass	Ct/Ck	No visibility												
Cougar	SH	No visibility												
Whitey Cox	Ct/Ck	No visibility												
Rock Island	SH	No visibility												
Hospital Pool	Ct/Ck	No visibility												
Hospital Run	SH	No visibility												
Tappan Pool	Ct/Ck	No visibility												
L. Tappan Run	SH	No visibility												
Flying B	Ct/Ck	No visibility												
Airstrip	SH	-	-	-	-	2	4	-	-	-	-	-	3	-
Survey	SH	-	1	-	-	-	-	-	-	-	-	-	-	1
Big Creek Bridge	Ct/Ck	-	-	-	-	-	-	-	-	-	-	-	-	1
Love Bar	SH	-	-	-	-	-	-	-	-	-	-	-	1	-
Ship Island	Ct/Ck	-	1	4	2	-	1	-	-	-	-	-	5	2
Little Ouzel	SH	-	1	2	1	-	-	-	-	-	-	-	6	-
Otter Bar	Ct/Ck	-	9	9	3	-	8	-	-	-	-	-	8	2
Goat Cr. Pool	Ct/Ck	-	1	1	-	-	-	-	-	-	-	-	1	-
Goat Cr. Run	SH	-	1	2	1	-	2	-	-	1	-	-	1	-
COLUMN TOTAL		1	56	55	63	18	36	3	0	70	0	0	101	9
GRAND TOTAL		175				57				70		0	101	9

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Table 6. Fish densities in the Middle Fork Salmon River transects, June 1987.

Location	Cutthroat		Rainbow		Chinook		Total fish[a]	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	0	0	0	0	0.0	0.0	5.5	0.9
Gardell's Hole	0	0	1.3	0.2	0.0	0.0	8.0	1.4
Velvet	10.9	1.6	26.0	3.8	0.0	0.0	37.0	5.3
Elkhorn	3.1	0.5	2.3	0.4	0.0	0.0	5.4	0.8
Sheepeater	0.0	0	0	0	0.0	0.0	0.6	0.1
Greyhound	6.6	0.9	0	0	0.0	0.0	10.5	1.4
Rapid River	2.7	0.3	2.7	0.3	0.0	0.0	8.2	1.0
Indian	9.4	1.0	0.6	0.1	0.0	0.0	38.0	4.0
Pungo	24.3	1.3	0	0	0.0	0.0	35.7	1.9
Marble Pool	44.2	3.1	2.2	0.2	0.0	0.0	53.0	3.7
Ski-jump	5.7	0.5	1.1	0.1	0.0	0.0	13.6	1.1
Lower Jackass	14.2	0.9	1.6	0.1	0.0	0.0	18.3	1.1
Cougar	1.9	0.2	0	0	0.0	0.0	3.8	0.5
Whitey Cox	33.0	4.2	4.7	0.6	0.0	0.0	37.7	4.8
Rock Island	3.6	0.5	2.7	0.3	0.0	0.0	8.2	1.0
Hospital Pool	31.9	4.8	0.7	0.1	0.0	0.0	35.6	5.3
Hospital Run	4.8	0.7	7.3	1.1	0.0	0.0	17.6	2.6
Tappan Pool	1.8	1.4	25.5	0.1	0.0	0.0	56.4	1.9
L. Tappan Run	0	0	3.4	0.4	0.0	0.0	17.2	0.8
Flying B	3.1	0.3	0	0	0.0	0.0	6.9	0.7
Airstrip	4.4	0.4	3.3	0.3	0.0	0.0	14.3	1.5
Survey	15.4	2.3	4.6	0.7	0.0	0.0	47.7	3.9
Big Cr. Bridge	5.8	0.8	5.8	0.8	0.0	0.0	15.5	2.2
Love Bar	2.4	0.2	2.4	0.2	0.0	0.0	32.9	1.6
Ship Island	10.0	0.7	3.8	0.3	0.0	0.0	30.0	2.0
Little Ouzel	5.5	0.7	3.6	0.5	0.0	0.0	21.8	2.7
Otter Bar	7.8	0.5	1.9	0.1	1.5	0.1	26.7	1.7
Goat Cr. Pool	5.9	0.4	2.9	0.2	0.1	0.1	55.9	3.5
Goat Cr. Run	0	0	7.0	0.9	0.0	0.0	42.0	5.3
AVERAGE	8.9	1.0	4.0	0.4	0.06	0.01	24.3	2.2
AVERAGE FOR STEELHEAD TRANSECTS	3.9	0.5	2.3	0.4	0.0	0.0	18.5	1.9
AVERAGE FOR CUTTHROAT TRANSECTS	14.3	1.5	5.5	0.5	0.1	0.01	30.5	2.6

[a]Total fish includes suckers, shiners, squawfish, whitefish, cutthroat, rainbow, and bull trout.

Table 7. Fish densities in the Middle Fork Salmon River transects, August 1987.

Location	Cutthroat		Rainbow		Chinook		Total fish[a]	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	10.4	0.6	0	0	0	0	37.5	2.3
Gardell's Hole	3.4	0.2	0	0	8.6	0.5	22.4	1.4
Velvet	21.6	1.3	21.6	1.3	2.7	0.3	62.2	3.8
Elkhorn	8.8	0.5	0.9	0.06	16.7	1.1	51.8	3.4
Sheepeater	1.1	0.1	18.9	2.1	2.1	0.2	29.5	3.0
Greyhound	12.1	1.3	12.1	1.3	65.5	6.8	100.0	10.4
Rapid River	1.1	0.09	3.3	0.3	2.2	0.2	12.6	1.0
Indian	5.6	0.7	0.0	0.0	0.0	0.0	26.3	3.2
Pungo	15.0	0.8	0.0	0.0	0.0	0.0	39.7	2.2
Marble Pool	43.1	2.9	0.0	0.0	0.0	0.0	85.1	5.7
Ski-jump	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Lower Jackass	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Cougar	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Whitey Cox	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Rock Island	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Hospital Pool	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Hospital Run	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Tappan Pool	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
L. Tappan Run	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Flying B	- - - - - - - - - - - - No visibility - - - - - - - - - - - -							
Airstrip	0	0	5.3	1.3	0.0	0.0	7.9	2.0
Survey	0.6	0.2	0	0	0.0	0.0	1.3	0.3
Big Cr. Bridge	0	0	0	0	0.0	0.0	0.9	0.2
Love Bar	0	0	0	0	0.0	0.0	1.1	0.3
Ship Island	5.5	0.6	0.8	0.1	0.0	0.0	11.7	1.2
Little Ouzel	4.2	0.9	0	0	0.0	0.0	10.4	2.1
Otter Bar	10.2	1.0	3.9	0.4	0.0	0.0	18.9	1.9
Goat Cr. Pool	1.2	0.1	0.6	0.1	0.0	0.0	2.4	0.3
Goat Cr. Run	6.5	1.1	3.2	0.5	1.6	0.3	12.9	2.1
AVERAGE	7.9	0.7	3.7	0.4	5.2	0.5	28.1	2.5
AVERAGE FOR STEELHEAD TRANSECTS	3.8	0.4	3.2	0.4	2.3	0.2	19.1	2.0
AVERAGE FOR CUTTHROAT TRANSECTS	12.5	0.9	4.3	0.4	8.5	0.8	38.1	3.0

[a]Total fish includes suckers, shiners, squawfish, whitefish, cutthroat, rainbow and bull trout.

Mean lengths of cutthroat trout caught and released in June and August were 297 mm (N=82) and 249 mm (N=11), respectively. Mean lengths of juvenile steelhead caught and released in June and August were 176 mm (N=29) and 185 mm (N=12), respectively.

Middle Fork Tributary Transects

In June, all established tributary transects were surveyed. The density of juvenile steelhead ranged 0.8 fish/100 m^2 in Marble Creek to 16.4 fish/100 m^2 in Big Creek (Table 8). Only one transect had juvenile chinook salmon, Loon Creek #1 (Table 8). In August, Marble Creek transect was not surveyed due to water clarity. The range in densities of juvenile steelhead in the remainder of the transects was 0 fish/100 m^2 in Camas Creek to 7.1 fish/100 m^2 in Pistol Creek #1 (Table 9). Juvenile chinook salmon densities varied 0 to 10.3 fish/100 m^2 (Table 9).

Salmon River Tributary Transects

Juvenile steelhead densities ranged 2.3 fish/100 m^2 in Sheep Creek #1 to 86.4 fish/100 m^2 in Pahsimeroi River #1 (Table 10). Excluding the Pahsimeroi River transects, mean density of juvenile steelhead was 20.1 fish/100 m^2.

Juvenile chinook densities ranged 0 to 20 fish/100 m^2 (Table 10). Mean density observed, excluding the Pahsimeroi River transects, was 2.6 fish/100 m^2.

DISCUSSION

Middle Fork Salmon River Transects

Differences Between June and August 1987 Surveys

Two survey trips were taken in 1987 to determine if there was a significant difference in fish densities between an early June and a late August survey time. The early June survey date was selected because the water flow had reached 2.85 feet on the Middle Fork Lodge measuring device. This date was prior to the "biological window" that was recommended and provided an excellent opportunity to evaluate the sampling time frame and will be discussed later.

For the transects sampled in both June and August, mean density declined significantly (at the 0.05 level) from 0.8 fish/100 m^2 in June to 0.6 in August. Comparisons of the length frequency percentages (Table 11) indicated that fewer fish from the 150-230 mm length group were counted in June than in August. The lack of this length group in June was because this length group had yet to migrate out of the tributaries.

Table 8. Middle Fork tributary transects, species counts and densities, June 1987.

Location	Lengths (mm)	Rainbow steelhead						Cutthroat						Chinook					
		<75	75-150	150-230	230-300	>300	Rb/ 100 m^2	<75	75-150	150-230	230-300	>300	Ct/ 100 m^2	Age 0	Age 1	Ck/ 100 m^2	Bk	Wf	Bt
Pistol Cr. #1 (lower)		-	1	2	-	-	2.1	-	-	-	-	-	-	-	-	-	-	1	-
Pistol Cr. #2 (upper)		-	-	3	-	-	1.0	-	-	-	2	10	3.9	-	-	-	-	5	-
Marble Creek #1 (lower)		-	4	1	-	-	0.8	-	-	-	-	-	-	-	-	-	-	2	-
Loon Cr. #1 (lower)		-	7	14	5	-	14.3	-	-	-	-	1	0.5	9	-	4.9	-	2	-
Loon Creek #2 (upper)		-	4	4	-	-	1.8	-	-	1	-	-	0.2	-	-	-	-	2	1
Camas Cr. #1 (lower)		-	11	-	-	-	3.3	-	-	-	1	7	2.1	-	-	-	-	11	-
Big Creek #1 (lower)		-	25	24	1	-	16.4	-	-	-	-	1	0.3	-	-	-	-	12	1
AVERAGE							5.7						1.0			0.7			

Table 9. Middle Fork tributary transects, species counts and densities, August 1987.

Location	Lengths (mm)	Rainbow steelhead						Cutthroat						Chinook					
		<75	75-150	150-230	230-300	>300	Rb/ 100 m^2	<75	75-150	150-230	230-300	>300	Ct/ 100 m^2	Age 0	Age I	Ck/ 100 m^2	Bk	Wf	Bt
Pistol Cr. #1 (lower)		2	4	6	-	-	7.1	-	-	2	-	-	1.2	14	-	8.3	-	4	-
Pistol Cr. #2 (upper)		-	4	6	2	-	2.9	-	-	3	2	4	2.3	44	-	10.3	-	7	-
Marble Creek #1 (lower)		No visibility																	
Loon Cr. #1 (lower)		-	-	1	-	-	0.5	-	-	-	2	2	2.2	-	-	-	-	12	-
Loon Creek #2 (upper)		-	1	4	-	-	1.1	-	-	-	-	-	-	-	-	-	-	6	-
Camas Cr. #1 (lower)		-	-	-	-	-	-	-	-	-	2	3	1.2	-	-	-	-	-	-
Big Creek #1 (lower)		-	1	3	-	-	0.9	-	-	1	1	-	0.4	9	-	2.0	-	21	-
AVERAGE							2.1						1.2			3.4			

Table 10. Salmon River tributaries transects, species counts and densities, June 1987.

Location	Lengths (mm)	Rainbow steelhead						Cutthroat						Chinook					
		<75	75-150	150-230	230-300	>300	Rb/ 100 m^2	<75	75-150	150-230	230-300	>300	Ct/ 100 m^2	Age 0	Age 1	Ck/ 100 m^2	Bk	Wf	Bt
Horse Cr. #1 (Bridge)		-	11	15	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	10
Horse Creek #2		3	14	27	2	-	21.3	-	-	-	1	-	0.5	4	-	1.9	-	-	14
Chamberlain Cr. #1 (mouth)		-	21	22	3	-	32.4	-	-	-	-	-	-	11	1	8.5	-	-	37
Chamberlain Cr. #2 (run)		6	29	33	4	-	39.1	-	-	-	2	1	1.6	16	3	10.3	-	-	45
Bargamin Cr. #1		-	22	15	1	-	15.3	-	-	-	-	-	-	-	-	-	-	-	4
Bargamin Cr. #2		-	24	34	2	-	14.9	-	-	-	-	2	0.5	-	-	-	-	-	11
Sheep Cr. #1		-	-	6	-	-	2.3	-	-	-	-	-	-	1	-	0.4	-	-	13
Sheep Cr. #2		-	10	17	-	-	29.3	-	-	-	-	-	-	-	-	-	-	-	3
Pahsimeroi River #2 (Dowton Lane)		-	36	24	16	34	31.6	-	-	-	-	-	-	20	-	-	5.7	-	70
Pahsimeroi River #1		-	50	50	5	3	86.4	-	-	-	-	-	-	25	-	20.0	1	-	82
AVERAGE							27.9									4.7			

Table 11. Total number of cutthroat trout counted in Middle Fork Salmon River transects, July and August 1986, and June and August 1987.

Location	July 1986 Cutthroat				August 1986 Cutthroat				June 1987 Cutthroat				August 1987 Cutthroat			
	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300
Boundary	-	-	-	41	- - - - Not surveyed - - - -				-	-	-	-	-	-	1	4
Gardell's Hole	-	-	-	3	- - - - Not surveyed - - - -				-	-	-	-	-	-	-	2
Velvet	-	-	1	5	- - - - Not surveyed - - - -				-	-	-	5	1	2	2	3
Elkhorn	-	-	-	1	- - - - Not surveyed - - - -				-	-	2	2	-	-	2	8
Sheepeater	-	-	-	-	- - - - Not surveyed - - - -				-	-	-	-	-	1	-	-
Greyhound	-	-	1	4	- - - - Not surveyed - - - -				-	-	3	2	-	-	-	7
Rapid River	-	-	3	6	- - - - Not surveyed - - - -				-	-	4	3	-	-	-	2
Indian	-	-	4	1	-	3	2	-	-	-	12	3	-	1	2	6
Pungo	-	2	9	33	-	4	7	14	-	1	7	9	-	2	4	8
Marble Pool	-	33	42	24	-	1	25	41	-	2	30	48	-	36	26	16
Ski-jump	-	3	4	3	-	1	2	1	-	-	4	1	- - - No visibility - - -			
Lower Jackass	-	5	11	2	-	-	2	-	-	-	15	21	- - - No visibility - - -			
Cougar	-	6	4	1	-	-	4	5	-	-	-	21	- - - No visibility - - -			
Whitey Cox	-	2	18	4	-	13	9	3	-	-	10	25	- - - No visibility - - -			
Rock Island	-	-	-	-	-	-	-	-	-	-	3	1	- - - No visibility - - -			
Hospital Pool	-	4	8	7	-	25	12	4	3	6	15	19	- - - No visibility - - -			
Hospital Run	-	3	6	-	-	1	-	-	-	12	-	-	- - - No visibility - - -			
Tappan Pool	-	7	4	1	-	2	10	1	-	1	24	3	- - - No visibility - - -			
L. Tappan Run	-	-	1	1	-	-	3	-	-	-	-	-	- - - No visibility - - -			
Flying B	-	-	11	3	-	7	7	6	-	-	4	-	- - - No visibility - - -			
Airstrip	-	-	-	1	-	1	4	2	-	2	1	1	-	-	-	-
Survey	-	1	5	1	-	3	4	-	-	-	14	6	-	1	-	-
Big Cr. Bridge	-	1	4	4	-	4	6	3	-	1	4	1	-	-	-	-
Love Bar	-	-	3	1	-	-	-	-	-	-	2	-	-	-	-	-
Ship Island	-	1	7	1	-	6	12	2	-	-	12	1	-	1	4	2
Little Ouzel	-	-	3	1	-	1	-	-	-	-	5	1	-	1	2	1
Otter Bar	-	8	20	4	-	5	5	2	-	5	11	-	-	9	9	3
Goat Cr. Pool	-	-	9	-	-	3	5	2	-	-	6	-	-	1	1	-
Goat Cr. Run	-	1	2	-	-	-	1	1	-	-	-	-	-	1	2	1
COLUMN TOTAL	0	77	180	116	0	80	120	87	3	30	188	154	1	56	55	63
GRAND TOTAL		373				287				375				175		
PERCENTAGES	0	21	48	31	0	28	42	30	0.8	8.0	50	41	0.6	32	31	36

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The mean densities of juvenile steelhead for transects surveyed in both June and August, 0.5 and 0.4 fish/100 m^2, are not significantly different (at the 0.05 level). Examination of length group percentages (Table 12) indicated that the length groups were similar in June and August. The increase in the percentage of 75-150 mm size group from June to August can probably be attributed to migration of these fish out of the tributaries to better winter habitat.

The increase in numbers of chinook salmon counted in August was a function of outmigration of presmolts from tributaries and was similar to 1986 data (Table 13).

Differences Between 1986 and 1987 Surveys

In 1987, a low flow year, the June survey occurred outside of the recommended "biological window" of July 15-August 30, but took place at the recommended river flow of 2.85 feet that was established in 1981 to keep habitat area constant. Several indicators support the recommended "biological window" over the "hydrological window." Significantly lower densities of juvenile steelhead were counted in June 1987 (0.4 fish/100 m^2) than in July 1986 (0.7 fish/100 m^2), but length group percentages were similar (Table 12). Length group percentages for cutthroat trout differed in 1987 from 1986 (Table 11). The total number of cutthroat were similar in both years, but there were fewer fish in the 150-230 length group in June 1987 than in July 1986 (Table 11). This difference occurred because this length group had not migrated out of the tributaries. The earlier survey date was most evident in the tributaries where most of the transects showed a decline in juvenile steelhead densities (Table 14). The average density declined 40% in June 1987 when compared to July 1986. The decline in juvenile chinook salmon was 78%.

Although 1987 was an atypically low water year, it was apparent that the "biological window" should be the most important factor as opposed to the "hydrological window" for determining survey timing.

It was difficult to compare the 1986 and 1987 August surveys because 18 out of the 29 transects did not have data for both years. The upper seven transects and the Pistol Creek transects were surveyed in early August and may have been very different in late August when the remainder of the transects were surveyed. Also, all the transects surveyed in August 1987 below Marble Creek had reduced visibility. Comparisons of transects with two years of data revealed that cutthroat trout densities were similar, 0.8 and 0.7 fish/100 m^2 in 1986 and 1987, respectively (Table 15). Juvenile steelhead densities were not significantly different, 0.1 and 0.2 fish/100 m^2 in 1986 and 1987, respectively (Table 16). The largest difference occurred in juvenile chinook densities. In 1986 and 1987, the densities were 1.3 and 0.03 fish/100 m^2, respectively (Table 17). This apparent 98% decrease in chinook densities could be due to the outmigration of presmolts. The 1987 August survey was one week later than the 1986 August survey. The one week delay and the atypically low water levels in 1987 may have caused the presmolts to move out earlier than expected. The lack of juvenile chinook in the late August 1987 survey could also indicate that the biological window for the MFSR might be narrower than the recommended window of July 15-August 30.

Table 12. Total number of juvenile steelhead counted in Middle Fork Salmon River transects, July and August 1986, and June and August, 1987.

Location	July 1986 Rainbow steelhead				August 1986 Rainbow steelhead				June 1987 Rainbow steelhead				August 1987 Rainbow steelhead			
	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300	75-150	150-230	230-300	>300
Boundary	-	4	3	-	- - - - Not surveyed - - - -				-	-	-	-	-	-	-	-
Gardell's Hole	-	-	-	-	- - - - Not surveyed - - - -				-	1	-	-	-	-	-	-
Velvet	3	26	4	-	- - - - Not surveyed - - - -				4	8	-	-	4	4	-	-
Elkhorn	3	1	-	-	- - - - Not surveyed - - - -				2	1	-	-	-	1	-	-
Sheepeater	-	1	-	-	- - - - Not surveyed - - - -				-	-	-	-	10	6	2	-
Greyhound	-	1	-	-	- - - - Not surveyed - - - -				-	1	-	-	2	4	1	-
Rapid River	4	10	2	-	- - - - Not surveyed - - - -				4	3	-	-	-	6	-	-
Indian	-	4	2	-	-	2	-	-	-	1	-	-	-	-	-	-
Pungo	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-
Marble Pool	-	-	-	-	2	1	-	-	-	4	-	-	-	-	-	-
Ski-jump	-	1	-	-	-	2	-	-	-	1	-	-	- - - No visibility - - -			
Lower Jackass	-	2	-	-	-	5	-	-	2	2	-	-	- - - No visibility - - -			
Cougar	-	-	-	-	-	-	-	-	-	-	-	-	- - - No visibility - - -			
Whitey Cox	-	2	-	-	-	2	-	-	2	3	-	-	- - - No visibility - - -			
Rock Island	-	1	-	-	-	-	-	-	-	2	1	-	- - - No visibility - - -			
Hospital Pool	-	2	-	-	-	3	-	-	-	1	-	-	- - - No visibility - - -			
Hospital Run	3	4	1	-	-	3	-	-	-	-	4	4	- - - No visibility - - -			
Tappan Pool	3	4	4	1	2	14	1	-	-	2	-	-	- - - No visibility - - -			
L. Tappan Run	-	1	2	-	-	-	-	-	2	3	-	-	- - - No visibility - - -			
Flying B	-	-	-	-	-	-	-	-	-	-	-	-	- - - No visibility - - -			
Airstrip	1	1	-	-	1	1	-	-	-	3	-	-	-	-	-	-
Survey	1	4	-	-	2	-	-	-	-	6	-	-	2	4	-	-
Big Cr. Bridge	-	1	-	-	-	-	-	-	3	3	-	-	-	-	-	-
Love Bar	5	4	-	-	-	1	1	-	-	2	-	-	-	-	-	-
Ship Island	3	6	1	1	-	-	-	-	-	4	-	-	-	1	-	-
Little Ouzel	4	3	-	-	-	-	-	-	-	3	1	-	-	-	-	-
Otter Bar	6	4	-	-	1	4	-	-	-	4	-	-	-	8	-	-
Goat Cr. Pool	2	2	-	-	-	-	-	-	1	2	-	-	-	-	-	-
Goat Cr. Run	1	-	-	-	-	2	-	-	-	6	1	-	-	2	-	-
COLUMN TOTAL	39	92	19	2	9	40	3	0	20	66	7	4	18	36	3	0
GRAND TOTAL	152				52				97				57			
PERCENTAGES	26	61	48	1	17	77	6	0	21	68	7	41	32	63	5	0

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Table 13. Total number of juvenile chinook salmon counted in Middle Fork Salmon River transects, July and August 1986, and June and August, 1987.

Location	July 1986				August 1986				June 1987				August 1987			
	Chinook salmon		Bull	White-	Chinook salmon		Bull	White-	Chinook salmon		Bull	White-	Chinook salmon		Bull	White-
	Age 0	Age I	trout	fish	Age 0	Age 1	trout	fish	Age 0	Age I	trout	fish	Age 0	Age I	trout	fish
Boundary	-	-	-	7	- - - - Not surveyed - - - -				-	-	-	3	-	-	-	13
Gardell's Hole	-	-	1	5	- - - - Not surveyed - - - -				-	-	-	1	5	-	-	6
Velvet	-	-	1	5	- - - - Not surveyed - - - -				-	-	-	-	1	-	-	6
Elkhorn	-	-	-	9	- - - - Not surveyed - - - -				-	-	-	-	19	-	-	29
Sheepeater	-	-	-	6	- - - - Not surveyed - - - -				-	-	-	1	2	-	-	5
Greyhound	-	-	-	8	- - - - Not surveyed - - - -				-	-	-	3	38	-	-	6
Rapid River	-	-	2	22	- - - - Not surveyed - - - -				-	-	-	7	4	-	-	11
Indian	-	-	-	10	-	-	2	12	-	-	-	45	-	-	-	33
Pungo	-	-	-	14	181	-	-	5	-	-	-	8	-	-	-	23
Marble Pool	1	-	-	26	103	-	-	29	-	-	1	11	-	-	-	73
Ski-jump	-	-	-	16	12	-	-	6	-	-	-	6	- - - No visibility - - -			
Lower Jackass	-	-	-	46	3	-	-	1	-	-	-	6	- - - No visibility - - -			
Cougar	-	-	-	5	5	-	-	2	-	-	-	2	- - - No visibility - - -			
Whitey Cox	-	-	-	12	20	-	-	7	-	-	-	-	- - - No visibility - - -			
Rock Island	-	-	-	6	-	-	-	2	-	-	1	1	- - - No visibility - - -			
Hospital Pool	-	-	-	1	13	-	-	3	-	-	-	4	- - - No visibility - - -			
Hospital Run	-	-	-	21	-	-	-	2	-	-	-	9	- - - No visibility - - -			
Tappan Pool	2	-	-	31	29	-	-	9	-	-	1	6	- - - No visibility - - -			
L. Tappan Run	-	-	-	4	1	-	-	4	-	-	-	5	- - - No visibility - - -			
Flying B	-	-	-	4	-	-	-	2	-	-	-	5	- - - No visibility - - -			
Airstrip	-	-	-	17	-	-	-	15	-	-	-	6	-	-	-	3
Survey	-	-	-	11	-	-	-	8	-	-	-	6	-	-	-	-
Big Cr. Bridge	-	-	-	17	-	-	-	12	-	-	-	4	-	-	-	-
Love Bar	6	-	-	6	-	-	-	1	-	-	1	8	-	-	-	1
Ship Island	1	-	-	11	-	-	-	5	-	-	-	18	-	-	-	5
Little Ouzel	-	-	-	5	-	-	-	2	-	-	-	1	-	-	-	6
Otter Bar	3	-	-	11	2	-	-	9	3	-	-	4	-	-	-	8
Goat Cr. Pool	-	-	-	43	-	-	-	9	1	-	-	11	-	-	-	1
Goat Cr. Run	-	-	-	15	-	-	-	13	-	-	-	10	1	-	-	1
TOTAL	13	0	4	394	369	0	2	158	4	0	4	191	70	0	0	230

Table 14. Fish densities (#/100 m^2) for Middle Fork Salmon River tributary transects, 1986 and 1987.

Transect	Juvenile steelhead			Juvenile chinook			Cutthroat		
	July 1986	June 1987	Aug. 1987	July 1986	June 1987	Aug. 1987	July 1986	June 1987	Aug. 1987
Pistol Creek #1	13.0	1.9	7.1	3.4	0	8.3	5.5	0	1.2
Pistol Creek #2	7.2	0.6	2.9	8.2	0	10.3	6.8	2.5	2.3
Marble Creek #1	0.5	0.5	-	0	0	-	4.8	0	-
Loon Creek #1	21.4	14.3	0.6	7.7	4.9	0	4.1	0.5	2.5
Loon Creek #2	5.1	2.2	1.5	0.9	0	0	0	0.3	0
Camas Creek #1	2.7	3.4	0	0	0	0	1.4	2.2	1.6
Big Creek #1	16.8	16.4	1.5	2.2	0	3.3	2.3	0.3	0.7
AVERAGE	9.5	5.2	2.3	3.2	0.7	3.7	3.6	0.8	1.4

Table 15. Cutthroat trout densities in Middle Fork Salmon River, July 1985, July and August 1986, and June and August 1987.

Location	July 1985		July 1986		Aug. 1986		June 1987		Aug. 1987	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	21.1	2.4	7.3	0.9	Not surveyed		0.0	0.0	10.4	0.6
Gardell's Hole	10.1	0.6	4.3	0.5	Not surveyed		0.0	0.0	3.4	0.2
Velvet	5.4	0.6	16.2	1.9	Not surveyed		10.9	1.6	21.6	1.3
Elkhorn	5.3	0.6	0.7	0.1	Not surveyed		3.1	0.5	8.8	0.5
Sheepeater	0.0	0.0	0.0	0.0	Not surveyed		0.0	0.0	1.1	0.1
Greyhound	10.3	0.6	7.4	0.8	Not surveyed		6.6	0.9	12.2	1.3
Rapid River	Not Surveyed		4.9	0.5	Not surveyed		2.7	0.3	1.1	0.09
Indian	1.3	0.3	3.1	0.3	3.1	0.3	9.4	1.0	5.6	0.7
Pungo	4.3	0.4	62.9	3.4	35.7	1.7	24.3	1.3	15.0	0.8
Marble Pool	Not Surveyed		54.7	3.0	37.0	1.9	44.2	3.1	43.1	2.9
Ski-jump	4.5	0.4	11.4	1.0	4.5	0.5	5.7	0.5	No visibility	
Lower Jackass	1.2	0.1	7.1	0.5	0.8	0.1	14.2	0.9	No visibility	
Cougar	3.5	0.4	10.4	1.1	8.5	0.9	1.9	0.2	No visibility	
Whitey Cox	7.5	0.3	22.6	1.2	23.6	2.4	33.0	4.2	No visibility	
Rock Island	Not surveyed		0.0	0.0	0.0	0.0	3.6	0.5	No visibility	
Hospital Pool	11.9	1.4	26.8	3.1	51.7	5.6	31.9	4.8	No visibility	
Hospital Run	3.7	0.6	3.7	0.4	0.4	0.04	4.8	0.7	No visibility	
Tappan Pool	2.7	0.2	10.9	0.6	11.8	0.7	1.8	0.4	No visibility	
L. Tappan Run	1.3	0.2	2.6	0.3	3.9	0.5	0.0	0.0	No visibility	
Flying B	8.6	0.5	16.3	1.7	23.3	2.2	3.1	0.3	No visibility	
Airstrip	3.5	0.5	0.9	0.1	6.1	0.6	4.4	0.4	0.0	0.0
Survey	4.5	0.6	4.5	0.5	4.5	0.6	15.4	2.3	0.6	0.2
Big Cr. Bridge	Not surveyed		8.2	0.8	11.8	1.5	5.8	0.8	0.0	0.0
Love Bar	5.6	0.2	4.4	0.5	0.0	0.0	2.4	0.2	0.0	0.0
Ship Island	4.7	0.3	7.0	0.5	10.9	1.1	10.0	0.7	5.5	0.6
Little Ouzel	1.0	0.1	4.2	0.6	1.0	0.2	5.5	0.7	5.5	0.6
Otter Bar	5.8	0.4	15.5	2.3	4.9	0.8	7.8	0.5	10.2	1.0
Goat Cr. Pool	2.2	0.2	5.5	0.4	6.1	0.4	5.9	0.4	1.2	0.1
Goat Cr. Run	4.8	0.8	4.8	0.7	3.2	0.2	0.0	0.0	6.5	1.1
AVERAGE	5.4	0.5	11.3	1.0	11.3	1.0	8.9	1.0	7.9	0.7

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Table 16. Juvenile steelhead densities in Middle Fork Salmon River, July 1985, July and August 1986, and June and August 1987.

Location	July 1985		July 1986		Aug. 1986		June 1987		Aug. 1987	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	33.7	3.9	12.7	1.5	Not surveyed		0.0	0.0	0.0	0.0
Gardell's Hole	4.3	0.3	0.0	0.0	Not surveyed		1.3	0.2	0.0	0.0
Velvet	40.5	4.8	89.2	10.5	Not surveyed		26.0	3.8	21.6	1.3
Elkhorn	11.4	1.2	3.5	0.4	Not surveyed		2.3	0.4	0.9	0.06
Sheepeater	12.6	0.7	1.1	0.1	Not surveyed		0.0	0.0	18.9	2.1
Greyhound	3.4	0.2	1.5	0.2	Not surveyed		0.0	0.0	12.1	1.3
Rapid River	Not surveyed		8.7	1.0	Not surveyed		2.7	0.3	3.3	0.3
Indian	1.3	0.3	3.8	0.5	1.3	0.1	0.6	0.1	0.0	0.0
Pungo	2.9	0.3	0.0	0.0	7.9	0.1	0.0	0.0	0.0	0.0
Marble Pool	Not surveyed		0.0	0.0	1.7	0.08	2.2	0.2	0.0	0.0
Ski-jump	0.0	0.0	1.1	0.1	2.3	0.3	1.1	0.1	No visibility	
Lower Jackass	0.4	0.03	0.8	0.05	2.0	0.2	1.6	0.1	No visibility	
Cougar	2.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	No visibility	
Whitey Cox	0.0	0.0	1.9	0.1	1.9	0.2	4.7	0.6	No visibility	
Rock Island	Not surveyed		0.9	0.1	0.0	0.0	2.7	0.3	No visibility	
Hospital Pool	2.8	0.2	2.8	0.3	4.2	0.4	0.7	0.1	No visibility	
Hospital Run	1.2	0.2	3.3	0.4	1.2	0.1	7.3	1.1	No visibility	
Tappan Pool	0.0	0.0	10.9	0.6	15.5	1.0	25.5	0.1	No visibility	
L. Tappan Run	0.0	0.0	3.9	0.5	0.0	0.0	3.4	0.4	No visibility	
Flying B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No visibility	
Airstrip	1.8	0.2	1.8	0.2	1.8	0.08	3.3	0.3	5.3	1.3
Survey	0.6	0.1	0.9	0.3	1.3	0.2	4.6	0.7	0.0	0.0
Big Cr. Bridge	Not surveyed		8.6	0.1	0.0	0.0	5.8	0.8	0.0	0.0
Love Bar	2.2	0.3	9.9	1.1	2.2	0.2	2.4	0.2	0.0	0.0
Ship Island	3.1	0.2	8.6	0.5	0.0	0.0	3.8	0.3	0.8	0.1
Little Ouzel	0.0	0.0	7.3	1.1	0.0	0.0	3.6	0.5	0.0	0.0
Otter Bar	4.4	0.3	4.8	0.7	2.0	0.3	1.9	0.1	3.9	0.4
Goat Cr. Pool	0.5	0.05	2.4	0.2	0.0	0.0	2.9	0.2	0.6	0.1
Goat Cr. Run	4.8	0.8	1.6	0.2	3.2	0.4	7.0	0.9	3.2	0.5
AVERAGE	5.4	0.6	6.4	0.7	2.0	0.2	4.0	0.4	4.2	0.4

R9R7047DK

Table 17. Juvenile chinook salmon densities in Middle Fork Salmon River, July 1985, July and August 1986, and June and August 1987.

Location	July 1985		July 1986		Aug. 1986		June 1987		Aug. 1987	
	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Boundary	0.0	0.0	0.05	0.0	Not surveyed		0.0	0.0	0.0	0.0
Gardell's Hole	0.0	0.0	0.0	0.0	Not surveyed		0.0	0.0	8.6	0.5
Velvet	2.7	0.003	0.0	0.0	Not surveyed		0.0	0.0	2.7	0.3
Elkhorn	0.0	0.0	0.0	0.0	Not surveyed		0.0	0.0	16.7	1.1
Sheepeater	0.0	0.0	0.0	0.0	Not surveyed		0.0	0.0	2.1	0.2
Greyhound	0.0	0.0	0.0	0.0	Not surveyed		0.0	0.0	65.5	6.8
Rapid River	Not surveyed		0.0	0.0	Not surveyed		0.0	0.0	2.2	0.2
Indian	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pungo	0.0	0.0	0.0	0.0	259.0	12.4	0.0	0.0	0.0	0.0
Marble Pool	Not surveyed		0.6	0.03	57.0	2.9	0.0	0.0	0.0	0.0
Ski-jump	0.0	0.0	0.0	0.0	13.6	1.6	0.0	0.0	No visibility	
Lower Jackass	0.0	0.0	0.0	0.0	1.2	0.1	0.0	0.0	No visibility	
Cougar	0.0	0.0	0.0	0.0	4.7	0.5	0.0	0.0	No visibility	
Whitey Cox	0.0	0.0	0.0	0.0	18.7	1.9	0.0	0.0	No visibility	
Rock Island	Not surveyed		0.0	0.0	0.0	0.0	0.0	0.0	No visibility	
Hospital Pool	0.0	0.0	0.0	0.0	18.3	1.8	0.0	0.0	No visibility	
Hospital Run	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No visibility	
Tappan Pool	0.0	0.0	1.8	0.1	76.4	1.8	0.0	0.0	No visibility	
L. Tappan Run	2.6	0.4	0.0	0.0	1.3	0.2	0.0	0.0	No visibility	
Flying B	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	No visibility	
Airstrip	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Survey	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Big Cr. Bridge	Not surveyed		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Love Bar	0.0	0.0	6.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Ship Island	0.0	0.0	0.8	0.05	0.0	0.0	0.0	0.0	0.0	0.0
Little Ouzel	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.1	0.0	0.0
Otter Bar	0.0	0.0	1.5	0.2	0.8	0.1	0.1	0.1	0.0	0.0
Goat Cr. Pool	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
Goat Cr. Run	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	1.6	0.3
AVERAGE	0.2	0.02	0.4	0.02	18.2	1.1	0.06	0.01	5.2	0.5

Middle Fork Salmon River Tributary Transects

In 1987, the tributary transects were surveyed twice. The area for each transect varied in each count (Table 18). In general, the smaller area surveyed in August was due to lower water levels. Except for Pistol Creek, juvenile steelhead densities were lower in August than in June at 0.9 fish/100 m^2 and 6.7 fish/100 m^2, respectively. The lower mean density was a result of presmolt migration, which indicated that the late August survey date was too late for an accurate estimate. Pistol Creek surveys were conducted August 5, versus August 27-28 for all other tributaries. The mean density for all tributaries for June 1987 was 40% lower than the mean density for July 1986 (Table 14). This decline could be twofold. First, the early survey date in 1987 could account for the difference. Second, the difference could be attributed to a decline in the juvenile population, or a combination of both. Because the June 1987 and the July 1986 surveys did not correspond, it is difficult to speculate on the reason for the difference.

Mean juvenile chinook salmon densities were higher in August 1987 than in June 1987 and similar to the July 1986 density (Table 14). The lack of fish in the transects surveyed in late August was attributed to presmolt migration.

Salmon River Tributary Transects

The tributary transects were surveyed July 3-4, 1987. The area of each transect surveyed was the same as in 1986 (Table 19). The 1987 average juvenile steelhead density increased 49% over 1986 (Table 20). Excluding the Pahsimeroi River, the mean juvenile steelhead densities for all transects, in 1986 and 1987 were 15.7 and 20.1 fish/100 m^2, respectively, an increase of 28%.

The mean density of juvenile chinook salmon in Horse Creek, Bargamin Creek, Chamberlain Creek, and Sheep Creek in 1987 was 2.6 fish/100 m^2 and 0.8 fish/100 m^2 in 1986, a 200% increase. This increase is probably related to the improved passage at downriver dams.

Table 18. Middle Fork Salmon River tributary transect description and area surveyed, June 1987 and August 1987.

Location	Description	June Length (m)	June Width (m)	June Area (m^2)	August Length (m)	August Width (m)	August Area (m^2)
Pistol Cr. #1	at mile marker 16	12	13.5	162	15	12.7	168
Pistol Cr. #2	above mile marker 16	30	15.8	474	30	13.6	410
Marble Cr. mouth	above Pack Bridge	75	12.9	968	- - No visibility - -		
Loon Cr. Bridge	below Pack Bridge	17	10.7	182	17	9.7	165
Loon Cr. Run	400 yd. above Pack Bridge	30	12.2	366	30	11	330
Camas Creek	Pack Bridge downstream	25	13.0	325	30	11.7	351
Big Creek mouth	400 yd. above mouth	30.5	10.0	305	30.5	9.0	275

Table 19. Salmon River tributary transect description and area surveyed, July 1987.

Location	Description	Length (m)	Width (m)	Area (m^2)
Horse Creek Bridge	50 yds. above bridge	48	8.8	422
Horse Creek #2	150 yds. above bridge	19.8	10.9	216
Chamberlain Cr. #1	400 yds. above mouth	24	5.9	142
Chamberlain Cr. #2	500 yds. above mouth	23	8.0	184
Bargamin Cr. #1	1/4 mile above mouth	25	9.9	248
Bargamin Cr. #2	at Trail Flat above #1	37	10.9	403
Sheep Cr. #1	Pack bridge downstream	35.7	7.2	257
Sheep Cr. #2	300 yds. above pack bridge	12.2	7.5	92
Pahsimeroi R. Dowton Lane	run above, plus pool below Dowton Bridge	30	11.6	348
Pahsimeroi R. Lower	200 yd. below Dowton Bridge	19	6.6	125

Table 20. Salmon River tributary transect densities, fish/100 m^2, for 1986 and 1987.

	Juvenile steelhead		Juvenile chinook	
	1986	1987	1986	1987
Horse Creek #1	22.5	6.2	0	0
Horse Creek #2	14.8	21.3	0	1.9
Chamberlain #1	17.6	32.4	0.7	8.5
Chamberlain #2	17.9	39.1	1.1	10.3
Bargamin Cr. #1	10.9	15.3	0	0
Bargamin Cr. #2	9.4	14.9	0	0
Sheep Creek #1	4.3	2.3	0	0.4
Sheep Creek #2	28.4	29.3	0	0
Pahsimeroi R. #1	17.6	31.6	18.4	5.7
Pahsimeroi R. #2	44.0	86.4	5.6	20.0
Mean	18.7	27.9	2.6	4.7

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Appendix A. Area snorkeled in Middle Fork Salmon River transects, 1987.

Location	Length (m)		Visibility (m)		Visible corridor		Area m^2	
	July	Aug.	July	Aug.	July	Aug.	July	Aug.
Boundary	54.9	48.0	3.1	8.2	6.2	16.4	341.5	787.0
Gardell's Hole	75.0	58.0	2.8	8.2	5.7	16.4	425.3	951.0
Velvet	46.0	37.0	3.5	8.2	6.95	16.4	319.7	607.0
Elkhorn	130.0	114.0	3.2	7.6	6.4	15.2	832.0	1,733.0
Sheepeater	165.0	95.0	3.8	4.6	7.62	9.2	1,257.3	874.0
Greyhound	76.0	58.0	3.8	4.8	7.62	9.6	579.1	557.0
Rapid River	255.0	183.0	3.97	6.3	7.93	12.6	2,022.2	2,306.0
Indian	160.0	160.0	4.73	4.1	9.45	8.2	1,512.0	1,312.0
Pungo	70.0	98.3	4.73	4.6	18.9	18.3	1,323.0	1,707.4
Marble Pool	181.0	181.0	3.6	3.8	14.4	15.0	2,606.4	2,715.0
Ski-jump	88.0	--	6.1	--	12.2	--	1,073.6	--
Lower Jackass	252.0	--	3.97	--	15.9	--	4,006.8	--
Cougar	106.0	--	3.97	--	7.9	--	837.4	--
Whitey Cox	106.0	--	3.97	--	7.9	--	837.4	--
Rock Island	110.0	--	3.97	--	7.9	--	869.0	--
Hospital Pool	135.0	--	3.35	--	6.7	--	904.5	--
Hospital Run	165.0	--	3.35	--	6.7	--	1,105.5	--
Tappan Pool	110.0	--	4.75	--	18.3	--	2,013.0	--
L. Tappan Run	145.0	--	4.75	--	9.2	--	1,334.0	--
Flying B	130.0	--	4.9	--	9.8	--	1,274.0	--
Airstrip	91.0	114.0	4.9	2.0	9.8	4.0	891.8	456.0
Survey	130.0	155.0	3.35	1.85	6.7	3.7	871.0	573.5
Big Cr. Bridge	103.0	110.0	3.5	2.15	7.0	4.3	721.0	473.0
Love Bar	85.0	91.0	5.2	2.15	10.4	4.3	884.0	391.0
Ship Island	130.0	128.0	3.8	2.45	15.2	9.8	1,976.0	1,254.0
Little Ouzel	110.0	96.0	4.0	2.45	8.0	4.9	880.0	470.0
Otter Bar	206.0	206.0	3.97	2.45	15.9	9.8	3,275.4	2,019.0
Goat Cr. Pool	102.0	165.0	4.0	2.2	8.0	8.8	1,632.0	1,452.0
Goat Cr. Run	100.0	62.0	3.97	3.05	7.9	6.1	790.0	378.2
Total	--	--	--	--	--	--	37,394.4	21,016.1

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: 6(SAL)-d

Title: Salmon Subregion Technical Guidance

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

During 1987, technical assistance was provided to all state and federal agencies upon request. Comments were submitted to various agencies and private entities concerning stream alterations, bank stabilization, mining operations and reclamation plans, fish rearing proposals, private ponds, water withdrawal applications, gravel removal projects, highway reconstruction, bridge replacement and hydropower-related matters. On-site inspections of proposed, ongoing and completed projects were conducted.

Also, we responded to the general public both in person and by telephone and mail to inquiries about fishing opportunities, techniques, regulations and area specifics.

Author:

Melvin Reingold
Regional Fishery Manager

OBJECTIVES

1. To assist the Department of Water Resources, the Department of Lands, the U.S. Army Corps of Engineers and other state, federal, local and private entities in evaluating the effects of habitat manipulation on fish and fish habitat.

2. To recommend procedures that minimize adverse effects of stream course alterations on aquatic habitat and fish.

3. To provide information on all aspects of fisheries and aquatic habitat as requested.

TECHNIQUES

We responded to all requests for data, expertise and recommendations from individuals, government agencies and corporations. Meetings were attended, field inspections conducted and responses generated as appropriate.

RESULTS

During 1987, we responded in writing to requests for technical assistance or comments on various water and fishery-related matters as follows:

Agency	Number of requests
U.S. Forest Service	6
Idaho Department of Water Resources	11
U.S. Fish and Wildlife Service	4
Idaho Department of Lands	7
Idaho Department of Transportation	3
U.S. Bureau of Land Management	4
U.S. Army Corps of Engineers	8
U.S. Environmental Protection Agency	2
Shoshone-Bannock Tribes	3
Private and Miscellaneous	14

Communication by telephone conversation was the greatest portion of contact with other agencies. Commonly, we respond to a request for information on stream alteration proposals by meeting with the applicant on-site, determining the nature of the situation and communicating with the appropriate agency either by letter, or more often, by telephone. The

remoteness of the Salmon Subregion usually precludes representatives from agencies based in distant population centers from conducting on-site inspections on routine or minor applications. On these types, we normally function as direct observers for the outside agencies on an informal basis.

We advised three individuals on questions and proposals concerning fish ponds.

We responded to a myriad of inquiries from the public (by telephone, letter and in person) about when, where and how to participate in various fisheries in the region, ranging from steelhead angling to high mountain lake fishing.

An agreement to repair a number of destructive, unauthorized and illegal stream alterations on the Lemhi River was reached with the perpetrators and the Idaho Department of Water Resources, the U.S. Army Corps of Engineers and the Idaho Fish and Game Department. We initiated the investigation of these alterations and worked with all parties concerned to resolve the problems. The final resolution of the situation in favor of the habitat is viewed as an important step toward diminishing what has been a perpetual and serious habitat degradation problem on the Lemhi River.

JOB PERFORMANCE REPORT

State of: Idaho

Name: REGIONAL FISHERY MANAGEMENT INVESTIGATIONS

Project No.: F-71-R-12

Job No.: 6(SAL)-e

Title: Salmon Subregion Salmon and Steelhead Investigations

Period Covered: July 1, 1987 to June 30, 1988

ABSTRACT

Steelhead Angler Creel Checks:

In the spring and fall of 1987, we used a jet boat to collect angler and creel data in the roadless portion of the Salmon River canyon below Corn Creek within the River of No Return Wilderness Area.

The spring season commenced in late February in 1987. Prior to the second week in March, hours per fish landed averaged less than 3 in Section 14 (Middle Fork to South Fork), and hatchery fish comprised the majority of the catch (73 - 55%). By late March, the hatchery fish moved upstream out of the area and wild steelhead comprised 100% of the sport catch.

Record low flows diminished angler participation in the fall 1987 sport fishery in Salmon River Section 14 by preventing safe access by power boaters. Low, warm flows also adversely affected survival of hatchery steelhead into the Salmon River and total catch of steelhead diminished compared to past years. The proportion of wild steelhead in the catch was- the highest seen in recent years. While lack of hatchery fish contributed to the higher ratio of wild fish seen in the catch, there were indications that regulations initiated in 1982 to protect wild steelhead may also be a contributing factor.

Marked steelhead carrying coded wire tags were recovered from the fishery as part of other ongoing research projects.

Author:

Melvin Reingold
Regional Fishery Manager

OBJECTIVES

1. To monitor the steelhead sport fishery in the roadless portion of the Salmon River canyon below Corn Creek within the River of No Return Wilderness Area.

2. To collect information on catch rates, hatchery-wild composition, angler participation and to recover marked (coded wire tagged) steelhead in the fishery.

3. To provide data to be used with information gathered from other operating projects to estimate harvest levels and return of marked experimental groups of steelhead to the river.

4. To work with commercial steelhead jet boat outfitters and guides to promote understanding of the steelhead resources targeted by them. To foster acceptance and compliance of special regulations and programs to enhance wild steelhead survival.

RECOMMENDATION

Monitor the canyon steelhead fishery and collect harvest data.

METHODS

In the spring and fall of 1987, we collected data on numbers of anglers, hours fished, and fish caught in the 80-mile long Salmon River roadless (wilderness) canyon from Corn Creek (river mile 191) to Vinegar Creek (river mile 112). A jet boat was used to contact anglers, of which the majority were customers of commercial jet boat outfitters and guides.

We inspected fish in the anglers possession for sex, length, and the presence of marks or tags. Snouts were collected from steelhead flagged by a left-ventral clip for eventual recovery of coded wire tags. Information was also collected on the number of wild steelhead caught and released.

Sampling dates were randomly selected for the fall steelhead season. Data collected was also used to provide timely fishing information to answer inquiries received at the local Fish and Game office.

RESULTS AND DISCUSSION

When the ice left the river and the spring commercial jet boat fishery commenced in late February, hatchery fish that wintered in the canyon area comprised nearly three-quarters of the catch (Table 1). By the third week of March, those fish had moved up out of Section 14 (Middle Fork to South Fork) and angler activity in the canyon area diminished proportionately. Prior to mid-March, the catch rate averaged less than 3 hours per steelhead landed.

Table 1. Creel survey for Salmon River, Section 14, spring 1987.

			Steelhead				
Dates	Anglers	Hours	Hatch.	Wild	Total	Hrs./fish	% Wild
2/21-23	51	392	105	39	144	2.7	27
3/1	19	150	28	23	51	2.9	45
3/6-8	50	336	10	13	23	14.6	57
3/14-16	27	135	0	5	5	27.0	100
3/25-27	2	12	0	3	3	4.0	100
COMB.	149	1,025	143	83	226	4.5	37%

Due to record low flows, the fall steelhead fishery began late in Salmon River Section 14 in 1987. Most commercial jet boat outfitters did not begin taking anglers down river until the third week in October. Private boaters trying to go down below Corn Creek (the end-of-road launch site) were damaging their boats in record numbers.

The hatchery steelhead component entering the Salmon River in the fall of 1987 was lower in numbers than past years (Table 2). Also, low, warm water slowed upstream migration. Consequently, numbers of fish caught and angler participation was down from past years. Wild/natural steelhead provided the majority of the fish caught in Section 14 (Table 3).

Table 2. Hatchery and wild/natural components of the summer steelhead escapement at Bonneville and Lower Granite dams, 1984-1987.

	Bonneville Dam				Lower Granite Dam			
	Wild/natural		Hatchery		Wild/natural		Hatchery	
Years	Number	%	Number	%	Number	%	Number	%
1984-1985	68,700	22	245,800	78	24,400	23	80,000	77
1985-1986	68,600	20	273,700	80	26,700	23	89,000	77
1986-1987	72,000	19	303,900	81	26,500	20	103,000	80
1987-1988	128,000	43	173,100	57	25,900	37	44,650	63
AVERAGE		26		74		26		74

Table 3. Creel survey in Salmon River Section 14, fall 1987.

			Steelhead				
Dates	Anglers	Hours	Hatch.	Wild	Total	Hrs./fish	% Wild
10/20	35	250	5	20	25	10	80
10/30-11/1	110	523	8	31	39	13	79
11/5	43	183	4	7	11	17	64
11/14-16	49	214	5	10	15	14	66
11/21-22	17	92	6	7	13	7	54
11/25	7	30	0	1	1	30	100
COMB.	261	1,292	28	76	104	12	73%

The percent of wild-natural steelhead over Snake River dams was up considerably in the 1987 run over prior years. This reflected the reduction in the hatchery component more so than an increase in wild stocks. This increase was also refelected in the creel information (Tables 2 and 4).

Table 4. Creel survey data from Section 14, 1983-1987.

Year	Anglers	Hours	Steelhead			Hrs./fish	% Wild
			Hatch.	Wild	Total		
1983	563	3,836	114	105	219	17.5	48
1984	551	3,794	79	112	191	20.0	65
1985	457	2,901	150	115	265	11.0	44
1986	595	3,581	138	104	242	14.8	43
1987	261	1,292	28	76	104	12.4	73

Wild steelhead are not harvested in the Salmon River (by regulation), so lengths of wild fish caught are not normally available. Most commercial fishing outfitters and guides, however, are familiar enough with the resource to recognize the general category of I-ocean and II-ocean fish. In the fall of 1987, a number of guides and outfitters commented on what they perceived as a higher proportion of I-ocean wild steelhead in their catch than they have noted over the past few years. The first mandatory release of wild steelhead in the Salmon River went into effect in the fall of 1982. This would have increased survival to the spawning grounds in the spring of 1983. Most steelhead spend three summers rearing in the cold, infertile headwaters of the Salmon River before migrating to sea as smolts. The first (I-ocean) returning adults from the spring 1983 production would be expected to return to the Salmon River in the fall of 1987. Possibly, this perceived increase in I-ocean wild steelhead is at least partially the result of the special regulations to protect wild steelhead.

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