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DEPARTMENT OF FISH AND GAME

Jerry M. Conley, Director

FEDERAL AID IN FISH RESTORATION
Job Performance Report
Program F-71-R-18

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
SOUTHWEST REGION (Subprojects I-D, II-D, IV-D)

PROJECT I.	SURVEYS AND INVENTORIES
Job a.	Southwest Region Mountain Lakes Investigations
Job b.	Southwest Region Lowland Lakes and Reservoirs Investigations
Job c.	Southwest Region Rivers and Streams Investigations
Job d.	Southwest Region Salmon and Steelhead Investigations
PROJECT II.	TECHNICAL GUIDANCE
PROJECT IV.	POPULATION MANAGEMENT

By

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POPULATION MANAGEMENT

JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project I: Surveys and Inventories

Subproject I-D: Southwest Region

Job: a

Title: Mountain Lakes Investigations

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Eight lakes within the Baron Creek drainage (tributary to South Fork Payette River) within the Sawtooth Wilderness Area were surveyed between August 30 and September 4, 1993 to document fish populations present. Of the lakes surveyed, two appeared to be barren of fish, four contained only westslope cutthroat trout *Oncorhynchus clarki lewisi,* and two contained westslope cutthroat trout and brook trout *Salvelinus fontinalis.* No other species of fish were sampled.

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INTRODUCTION

Mountain lakes within the Sawtooth Wilderness Area have been planted with various species of trout to provide angling opportunity. Stocking occurred prior to designation as wilderness and is permitted under wilderness management.

Lakes within the Baron Creek drainage (tributary to South Fork Payette River) have been stocked historically. The purpose of this survey was to gather information to determine if lake stocking was providing fishable populations. Lakes selected for this survey included Baron #1, Baron #2, Baron #3, Baron #4, Baron #5, Baron #6, Braxon #1, and Braxon #2. Lake location, other names for lakes, lake elevation, and comments are included in Table 1.

Existing planting schedules call for Braxon #1 and Braxon #2 to be planted with 500 westslope cutthroat trout *Oncorhynchus dark/ /awls/* in odd years; Baron #3 to be planted with grayling *Thyma//us arcticus* every third year; and Baron #4 to be planted with westslope cutthroat trout in even years. No fish plants are identified for Baron #1, Baron #2, Baron #5, or Baron #6. Records indicate Baron #2, Baron #4, Baron #6, Braxon #1, and Braxon #2 received cutthroat trout and rainbow x cutthroat hybrids from 1972 through 1985. Additional searching needs to be done to better determine actual lake stocking history.

METHODS

Fish populations were either sampled visually or with gill nets. Gill nets were set from 2.2 to 24 hours. Table 2 identifies how lakes were sampled and length of gill net sets for each lake. All fish caught in gill nets were measured to the nearest mm and weighed to the nearest gram.

RESULTS

Baron #1

Baron #1 was surveyed visually. The lake is relatively shallow, and estimated maximum depth is 2 m. The lake had no inlet or outlet. No fish appeared to be present; none were observed and no fish rises were seen while at the lake. Fish are unlikely to successfully overwinter at this lake due to shallow depth. Lake area was estimated to be 3.2 ha. Salamanders were observed at this lake.

Baron #2

No fish were collected in gill nets, and no evidence of fish was observed. Water depth to 8 m was measured, however, much of the lake is less than 3 m. Four hundred meters of the outlet stream is available for spawning. Lake substrate was primarily sand-silt with little gravel. Adult

Table 1. Location, additional names, elevation, and comments about lakes surveyed in the Baron Creek drainage, 1994.

Lake Name	Other Name	Location (T, R, S)	Elevation	Comments
Baron #1		T9N,R12E,S22	7,625	NE of Baron #2
Baron #2		T9N,R12E,S22	7,976	SW of Baron #1
Baron #3	Little Baron	T9N,R12E,S23	8,141	
Baron #4	Baron Lake	T9N,R12E,526	8,312	NW of Baron #5
Baron #5	Upper Baron	T9N,R12E,S26	8,505	SE of Baron #4
Baron #6		T9N,R12E,S27	9,020	
Braxon #1	Lower Braxon	T9n,R12E,S24	8,232	
Braxon #2	Upper Braxon	T9N,R12E,S24	8,272	

Table 2. Lake survey method and length of gill net sets.

Lake Name	Survey Method	Gill Net Set Times
Baron #1	visual	
Baron #2	gill net	1100-1330
Baron #3	gill net	1500-1900
Baron #4	gill net	1100-0800
Baron #5	gill net	1200-1000
Baron #6	gill net	1330-1100
Lower Braxon	gill net	1800-0800
Upper Braxon	gill net	1700-0700

mayflies and grasshoppers were observed above and around the lake. Mayfly and caddis fly nymphs were observed in the lake, and tadpoles (1 in long) were observed near the lake outlet. Water temperature was 12°C at 1230 on August 31, and the lake area was calculated to be 2.1 ha. This lake appears suitable for fish survival.

Baron #3

Baron #3 is a relatively shallow bog lake. Substrate is primarily sand-silt with little gravel. Lake area was calculated to be 3.7 ha.

Numerous brook trout *Salvelinus fontinalis* up to 305 mm were observed in the lake. Rainbow or cutthroat fry were thought to have been in the lake, however, none have been planted recently. Further sampling needs to be done to confirm fish species present.

The gill net was set and pulled after 4 hours in an attempt to sample the fish population, but not load the net with excessive numbers of fish. Three brook trout were collected with lengths of 290, 290, and 110 mm.

The brook trout population is naturally reproducing. Spawning is likely occurring in the many small inlet streams, and possibly in the outlet stream.

Baron #4

Baron #4 is a relatively large lake that receives relatively heavy use. Several camp spots and campfire rings are located around the lake. Inlet streams from Baron #5 and Baron #6 appear capable of supporting limited spawning. The outlet stream is also suitable for spawning.

Depths up to 9.5 m were measured. Deeper areas likely exist in the lake. Water temperature was 12°C at 1200 on September 1, and the lake area was estimated to be 18-23 ha.

Two westslope cutthroat trout and 49 brook trout were collected in the gill net. Cutthroat trout length, weight, and condition factor were 308 mm, 225 g, and .77; and 200 mm, 54 g, and .68, respectively. Mean length, weight, and condition factor of brook trout collected was 233 mm (1.82), 117 g (3.59), and .86 (.01), respectively. Length frequency of brook trout collected is shown in Figure 1. Length plotted against condition factor for brook trout is shown in Figure 2.

Baron #5

Baron #5 also receives heavy use, as noted by the number of camp spots and campfire rings around the lake. During the evening very few fish were seen rising. Increased numbers of fish were seen rising the following morning.

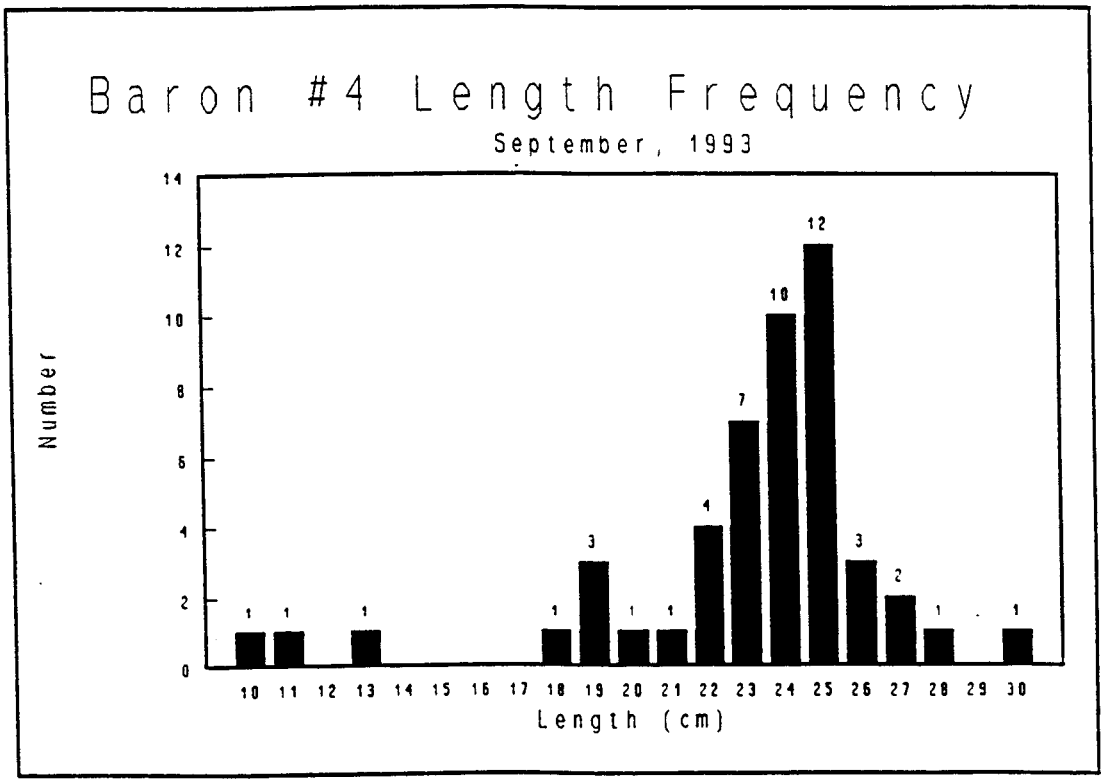

Figure 1. Length frequency of brook trout in Baron #4, September 1993.

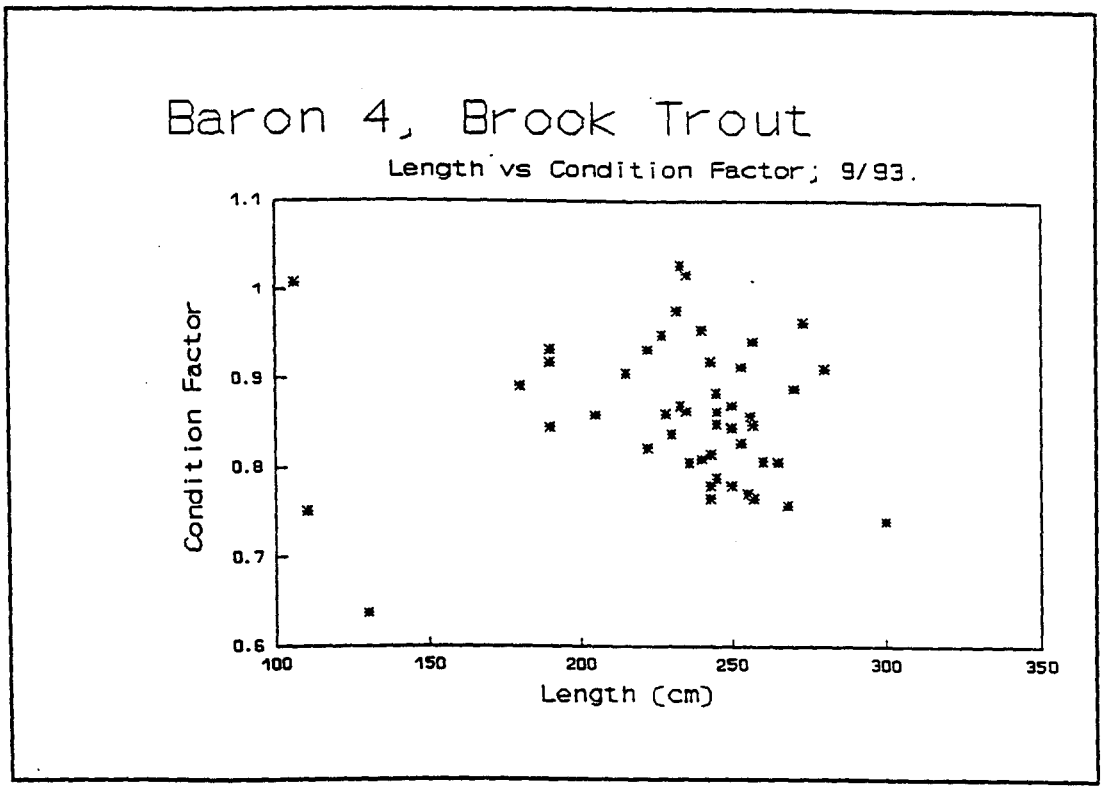

Figure 2. Length versus condition factor for brook trout in Baron #4 September 1993.

Inlet streams are small but may support limited spawning. The outlet stream is steep and likely is a barrier for fish moving from Baron #4 up to Baron #5. Any successful spawning in the inlet more likely contributes to the cutthroat fishery in Baron #4. Water temperature was 12°C at 1000 on September 1. Water depths up to 11 m were noted, however, deeper areas likely exist. Lake area was guessed to be 7 ha.

Ten westslope cutthroat trout were collected in the gill net. Mean length, weight, and condition factor were 289 mm (1 1.3), 221 g (23.6), and .89 (.03), respectively. Length, weight, and condition factor of individual westslope cutthroat are given in Table 3.

Baron #6

This is a cirque lake, nearly circular in shape. A snow field extends into the lake. Water temperature at 1300 on September 2 was 9°C. Two fish were seen to rise between 1300 and 1400. Three cutthroat trout were seen near the shore in the lake. Redds were observed in gravel areas near shore, with fish continuing to guard them. No inlet or outlet was available for spawning. Lake area was calculated to be 1.89 ha.

Human use at this lake is much less than Baron #4 or Baron #5. No camping activity was evident on the lake shore. Some human use was evident, however.

Ten westslope cutthroat were sampled in the gill net. Mean length, weight, and condition factor were 327 mm (6.4), 349 g (26.7), and .98 (.05), respectively. Length, weight, and condition factor of individual fish is given in Table 4.

Braxon #1

This lake is relatively shallow, with maximum depth estimated to be 5 to 6 m. Lake area was calculated to be .7 ha. Substrate is primarily sand-silt. Several fish were observed rising.

Inlet streams appear capable of supporting natural reproduction. Human use is moderate.

Four westslope cutthroat trout were sampled from the gill net, ranging in length from 138 to 180 mm. Mean length, weight, and condition factor were 157 mm (11 .3), 37 g (2.9), and .96 (.06), respectively. Cutthroat trout up to 300 mm were seen swimming in the lake.

Braxon #2

This lake is also mostly shallow with much littoral area. Maximum depth was guessed to be about 6 m. Lake area was calculated to be 1.8 ha. The lake substrate is primarily sand-silt. Several fish were seen rising in the late afternoon. Several small inlet streams exist and appear capable of supporting natural reproduction. The outlet stream exits to Braxon #1, but is probably

Table 3. Length, weight and condition factor of westslope cutthroat trout sampled from Baron #5, September 1993.

Length (mm)	Weight (g)	Condition Factor
232	110	.88
240	150	1.09
267	174	.91
280	205	.93
285	196	.85
297	190	.73
300	250	.93
305	240	.85
335	325	.86
352	370	.85

Table 4. Length, weight and condition factor of westslope cutthroat trout sampled in Baron #6, September 1993.

Length	Weight	Condition Factor
285	220	.95
305	225	.79
320	350	1.07
322	300	.90
322	425	1.27
332	300	.82
340	475	1.21
345	400	.97
345	350	.85
358	450	.98

not passable upstream from Braxon #1 to Braxon #2 due to migration barriers. Human use is moderate with camp spots located around the lake.

Seventeen westslope cutthroat trout ranging between 114 and 363 mm were sampled in the gill net. Mean length, weight, and condition factor were 188 mm (13.0), 91 g (9.8), and .86 (.08), respectively. Individual length, weight, and condition factor of cutthroat collected is given in Table 5.

DISCUSSION

Generally, all populations sampled had condition factors less than 1, indicating food availability may be limiting growth.

Self-sustaining brook trout populations exist in Baron #3 and Baron #4. Densities appear adequate to sustain existing fisheries. Brook trout predation would likely limit planting success of westslope cutthroat planted into these lakes. If the recent stocking history is accurate, westslope cutthroat in Baron #5 are self-sustaining, and westslope cutthroat in Baron #6 are either self-sustaining or relatively old survivors of hatchery plants in the mid-1980s.

RECOMMENDATIONS

1. Continue mountain lake surveys. Develop and use standard forms for recording information. Develop computer database and enter data to make information accessible.

2. Attempt to decipher stocking history of these and other wilderness area lakes. Questions regarding stocking history make management change recommendations of questionable value.

3. Stocking recommendations are shown in Table 6.

Table 5. Length, weight, and condition factor of westslope cutthroat collected from Braxon #2, September 1993.

Length	Weight	Condition factor
114	11	.74
114	12	.81
116	10	.64
118		
120	12	.69
122	12	.66
161	36	.86
172	49	.96
173	45	.87
174	52	.99
180	50	.86
188	64	.96
254	162	.99
255	196	1.18
277	200	.94
290	200	.82
363	350	.73

Table 6. Future stocking recommendations for lakes sampled in the Baron Creek drainage, September 1993.

Lake	Species	Number	Frequency	Comments
Baron #1		0		Remain barren
Baron #2	grayling	1,000	every 3rd yr	
Baron #3				natural production
Baron #4				natural production
Baron #5	wscutt	1,000	every 3rd year	
Baron #6	golden	500	every 3rd year	
Braxon #1	wscutt	500	odd years	
Braxon #2	wscutt	1,000	odd years	

JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project I: Surveys and Inventories

Subproject I-D: Southwest Region

Job: b

Title: Lowland Lakes and Reservoirs Investigations

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

A study was conducted on Deadwood Reservoir, partially funded by the Bureau of Reclamation, to assess the impacts of water released below the minimum pool on removal of fish from the reservoir. No impacts to numbers of fish in the reservoir could be documented. No increase in numbers of fish or fish species could be documented in the Deadwood River below the dam or 20 km downstream.

A lowland lake survey was conducted on Brownlee Reservoir in May 1993. The survey consisted of using several different gear types to capture all fish species; electrofishing, gill nets, and trap nets. A length frequency and length at age of all game species was produced based on a unit of effort basis. Species composition and relative biomass of all species captured was also produced. Relative weights of game fish species by length were developed.

A lowland lake survey was conducted on C.J. Strike Reservoir in late May 1993. Survey consisted of using several different gear types to capture all fish species; electrofishing, gill nets, and trap nets. A length frequency and length at age of all game species was produced based on a unit of effort basis. Species composition and relative biomass of all species captured was also produced. Relative weights of game fish species by length were developed.

Experimental gill nets and trap nets were used on Blue Creek, Little Blue Creek, and Shoofly Reservoirs in late May 1993. Lahontan trout were collected in Little Blue Creek and Shoofly Reservoirs. Blue Creek Reservoir only contained nongame species.

REPORT

Warmwater fish species were captured and transferred to eight small drought-affected lakes or reservoirs to rebuild fish populations. A total of 1,388 largemouth bass *Micropterus salmoides,* 4,235 bluegill *Lepomis macrochirus,* 3,000 channel catfish *Ictalurus punctatus,* 2,812 crappie *Pomoxis sp.,* and 5,000 yellow perch *Perca flavescens* were stocked.

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INTRODUCTION

A 50,000 acre-foot minimum conservation pool was administratively established for Deadwood Reservoir by the Bureau of Reclamation. The release of 20,000 acre-feet of storage from Deadwood Reservoir in the fall of 1992 for Snake River salmon flow augmentation and an additional 15,000 acre-feet of emergency water rentals for irrigation brought Deadwood Reservoir storage to approximately 39,000 acre-feet.

Since there was little information available on drawdown impacts to the resident fishery, a monitoring study was funded by the Bureau of Reclamation for Idaho Department of Fish and Game (IDFG) personnel to study the drawdown effects. The main objective was to determine the magnitude of game fish migration and mortality from the Deadwood Reservoir pool. Also, IDFG would conduct netting surveys to compare against previous surveys to discern if changes in the fish populations occurred. This data analysis would be used to determine if any restocking of Deadwood Reservoir was warranted because of this water release.

METHODS

Fish Population Monitoring

Spring and fall gillnetting was conducted in Deadwood Reservoir in 1993. Four 45.7 m experimental gill nets were set overnight on June 3 and September 9. The experimental type floating or sinking gill nets were composed of six panels of 1.9 cm, 2.5 cm, 3.2 cm, 3.8 cm, 5.1 cm, and 6.4 cm mesh. Fish were collected from the nets the following morning and measured to the nearest millimeter and weighed to the nearest gram. Scale samples were taken from at least five fish of each centimeter length range, where possible.

A small midwater trawl was used to collect kokanee *Oncorhynchus nerka kennerlyi* during July 19-20, 1993. A total of eight trawl transects were completed during the two nights. Densities of kokanee were calculated by methodologies of Rieman (1992).

Deadwood River fish populations were quantified during fall 1992 before and after the water release by conducting snorkeling surveys on transects 0.4 and 20 km below Deadwood Reservoir Dam. Snorkeling surveys were conducted with a two person crew moving upstream in individual counting lanes. Pre-release and post-release snorkel surveys were conducted on September 1 1 and September 29, respectively.

Limnoloaical Monitoring

Three limnological monitoring stations were established in Deadwood Reservoir; station 1 was below the mouth of the Deadwood River, station 2 was mid-reservoir, and station 3 was directly in front of the dam spillway (Figure 1). Water sampling was conducted monthly at all three stations from June until October 1993.

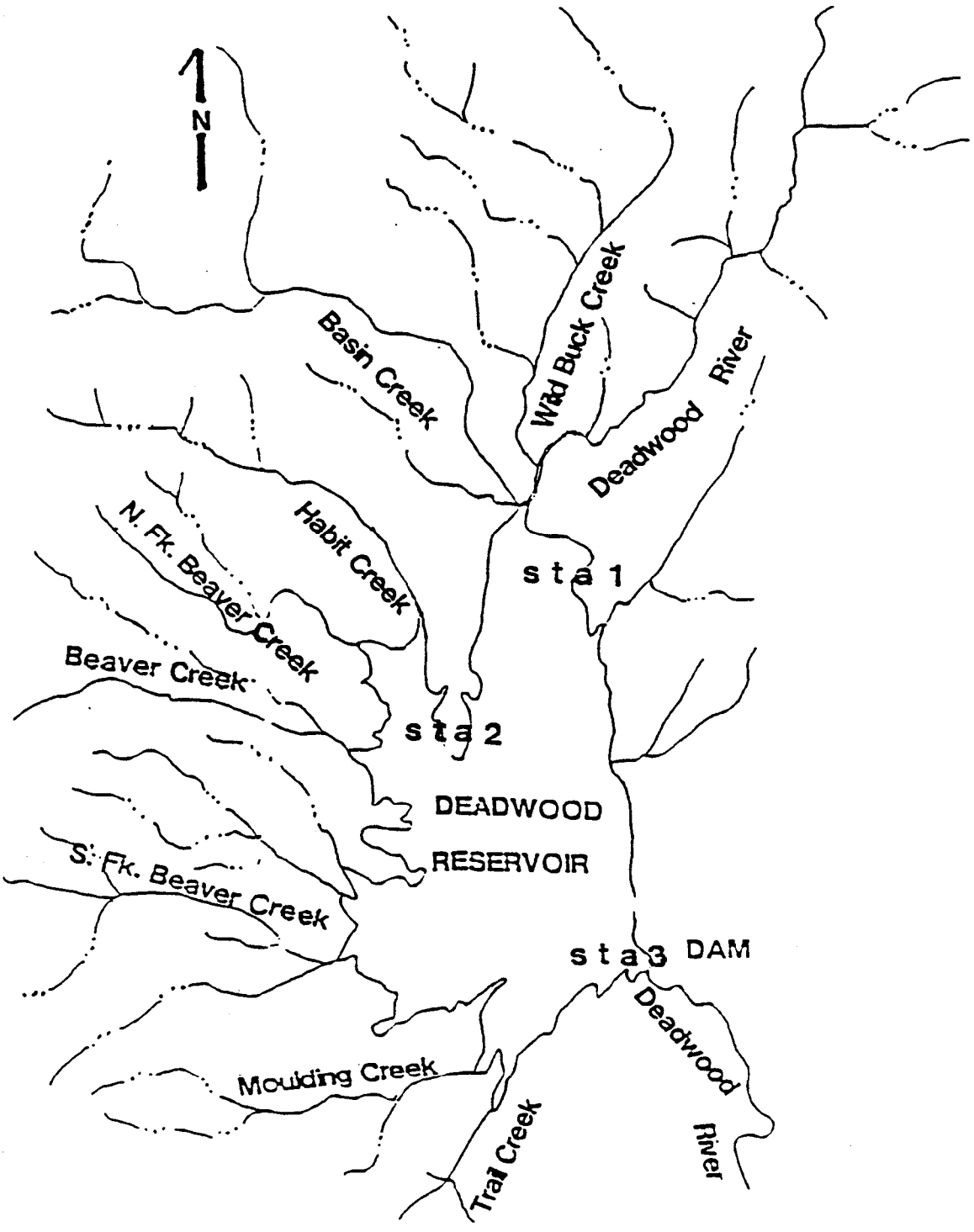


Figure 1. Locations of limnological sampling stations on Deadwood Reservoir, June through October 1993.

A depth-integrated water sample was taken at each station for nutrient analysis and chlorophyll 'a' measurements. The water sampler consisted of a 10-m-long, 1.3-cm-diameter piece of plastic tubing that was submerged to fill with water and the water transferred to sample bottles.

Conductivity, alkalinity, hardness, and pH measurements were taken on surface waters at each site. Dissolved oxygen and temperature profiles were taken at each station to at least 30.5 m (100 foot), the length of the probe. Secchi transparency (m) was determined at each station.

A vertical zooplankton haul was done at each station using a 0.5 m net. The net was lowered to just off the bottom, or 25 m. Zooplankton samples were preserved with 10% formalin.

Zooplankton samples were washed in the lab and a 2 ml subsample was taken for enumeration. Organisms were identified to genus, measured, and counted. Organisms were measured for carapace length only.

Water elevations were provided by the Bureau of Reclamation so that Water Year 1992 could be compared to other years. Water Year 1992 was compared against Water Year 1993, and a historical data set of 25 years for elevations on comparable dates.

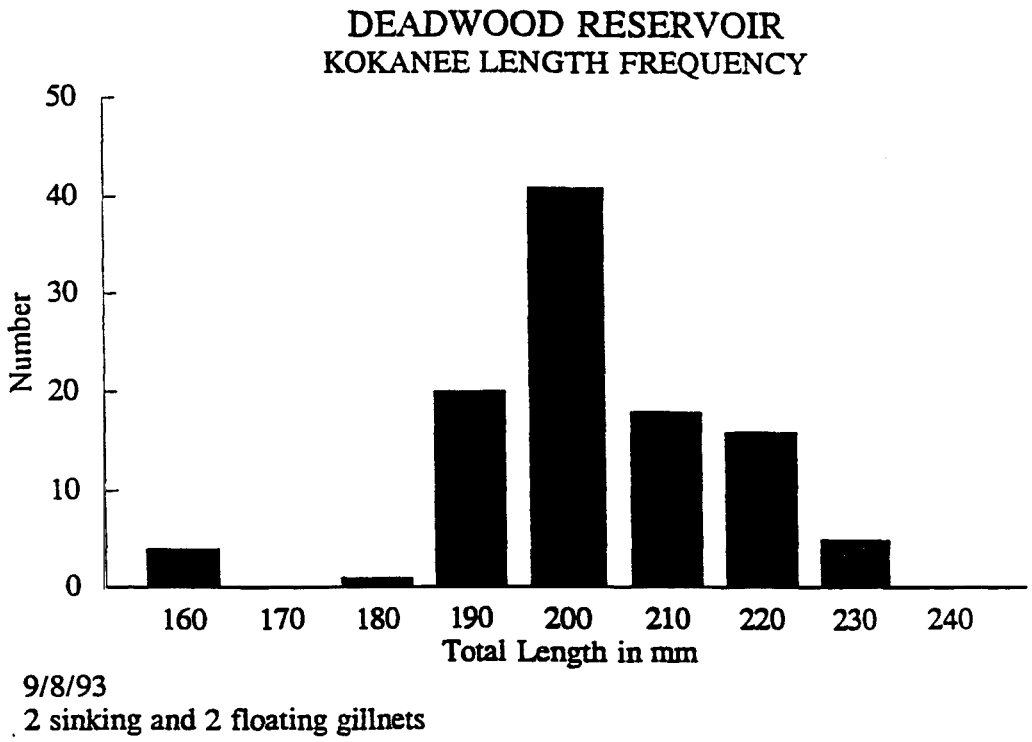
RESULTS AND DISCUSSION

Fish Sampling

Kokanee

Fall gill net kokanee length frequencies and length at age (Figure 2) document the small average size of the kokanee present in Deadwood Reservoir. No comparable spring gillnetting data sets were available. Fall gill net kokanee catch per linear meter of experimental gill net was: 1987 (0.56); 1988 (0.75); 1989 (0.66); 1990 (1.28); 1991 (0.62); 1992 (0.26); and 1993 (0.60). Kokanee catch was down in 1992, but rebounded in 1993. If there was an effect of the low water in 1992 we suspect the 1993 catch would not have rebounded as it did. The mean total length of spawning kokanee has steadily declined since 1986 (Figure 3). Spawning kokanee were mostly age 4 with a few age 3 spawners (Grunder et al. 1993). If the reduction in growth was related solely to kokanee densities, we would have expected growth to increase in 1992 and 1993 as densities declined. A combination of lake management factors are assumed to be interacting to create a large slow-growing kokanee population.

Density estimates derived from trawling dropped from 563 kokanee per ha in 1990 to 11 kokanee per ha in 1993. The 1993 trawling captured no young of the year kokanee. The 1989 and 1990 kokanee year class density was very high and may have suppressed these subsequent year classes.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n=9	AGE 2 n=8	AGE 3 n=8	AGE 4 n=3
L= 87.6	L= 126.1	L= 160.2	L= 181.6

Figure 2. Deadwood Reservoir fall 1993 length frequency and length at age of kokanee salmon captured in experimental gill nets.

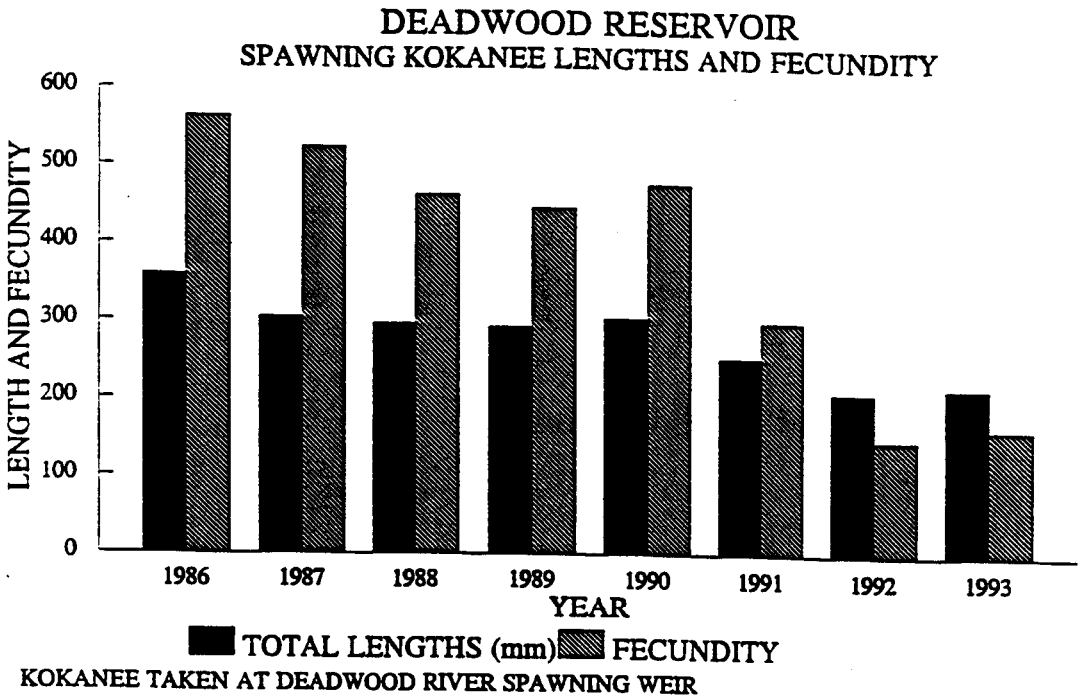


Figure 3. Deadwood Reservoir kokanee salmon spawning length and fecundity, 1986-1993.

Starting in 1991, the spawning runs in Basin and Wild Buck creeks were constricted with weirs. In 1992 and 1993, Trail Creek was also weired to prevent spawning. Known numbers of kokanee spawners were placed above these weirs. In 1992, rotenone treatments to remove spawning kokanee were applied to approximately 3.3 km of Trail Creek and 2.6 km of both Beaver Creek and South Fork Beaver Creek. The drought and low water levels may have reduced the kokanee population levels. Atlantic salmon *Salmo salar* have been stocked since 1991 and may have suppressed the 1991 and subsequent year class success of kokanee by predation on age 0, age 1, and age 2 kokanee. These factors, in conjunction with drought and lower water levels, likely impacted the kokanee population to some unknown degree.

Mountain Whitefish

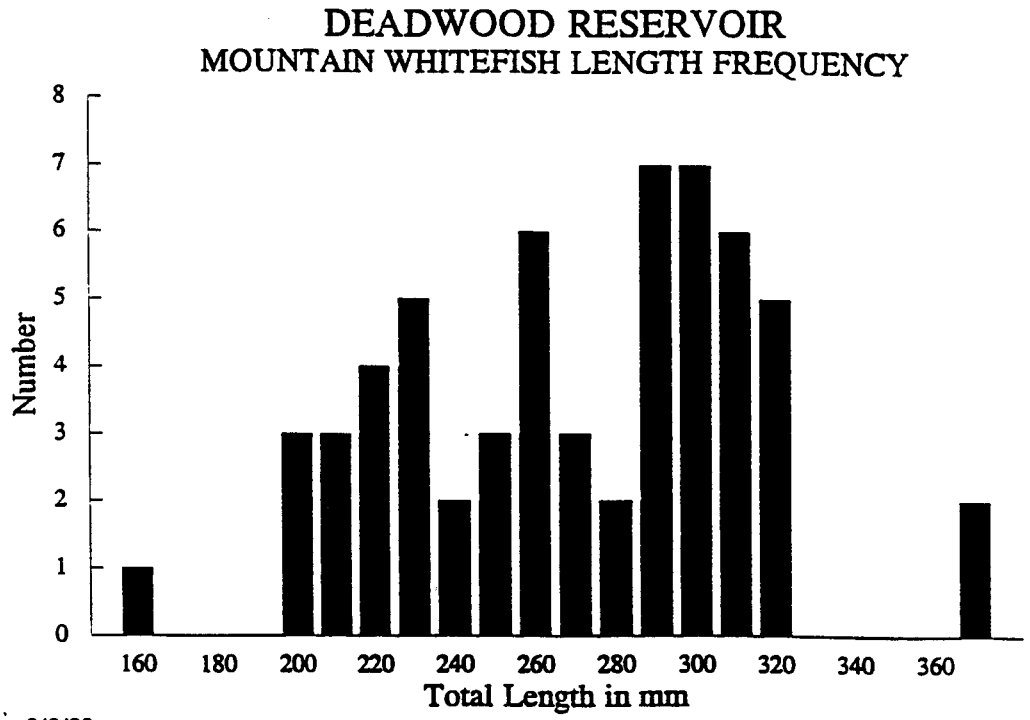
Fall mountain whitefish *Prosopium williamsoni* gillnetting length frequencies and length at age for 1993 are presented in Figure 4. Fall gill net trend data for mountain whitefish were similar from 1987 to 1993 on a fish per meter of gill net: 1987 (0.26); 1988 (0.46); 1989 (0.26); 1990 (0.26); 1992 (0.33); and 1993 (0.33). No population change can be deduced from lower water elevations experienced in 1992.

Cutthroat Trout

The westslope cutthroat trout *Oncorhynchus clarki lewisi* population in Deadwood Reservoir is of hatchery origin and has been supplemented annually with fingerling planting. There is also a self-reproducing population of westslope cutthroat trout and rainbow x cutthroat hybrids in the reservoir, thus fingerling planting has been suspended. Westslope cutthroat trout length frequency and length at age for fall gillnetting is presented in Figure 5. Fall gillnetting on a per meter basis varied for cutthroat from 1987 to 1993: 1987 (0.33); 1988 (0.66); 1989 (0.30); 1990 (0.26); 1991 (0.07); 1992 (0.10); and 1993 (0.10). The 1992 and 1993 data were within the range observed for available data, and no conclusions of effect of water released can be drawn.

Rainbow Trout

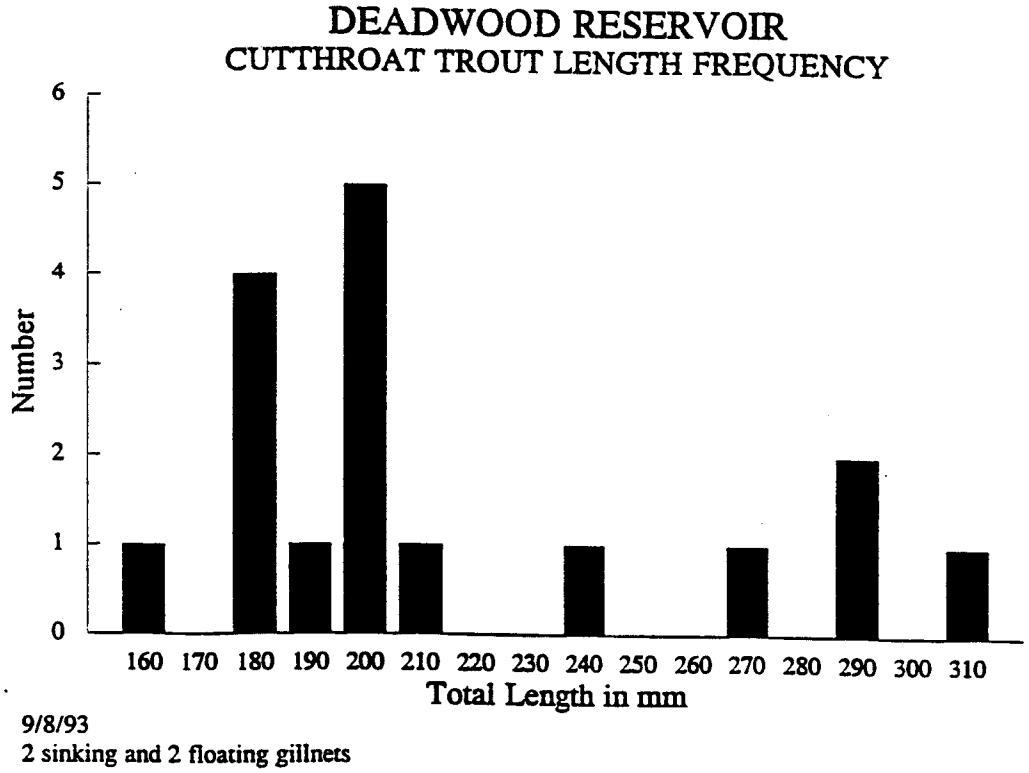
Rainbow trout O. *mykiss* are self-sustaining in Deadwood Reservoir. In 1993, hatchery F1 Gerrard strain Kamloops were stocked as an additional predator on kokanee. Length frequency and length at age of spring gill net captured rainbow trout are presented in Figure 6. Again, the catch per meter of net is variable: 1987 (0.07); 1988 (0.007); 1989 (0.007); 1990 (0.03); 1991 (0.26): 1992 (0.03); and 1993 (0.03). If the stocked Gerrard rainbow trout were added, the total 1993 per meter catch was 0.07. All Gerrard strain trout were marked with an adipose clip. Two additional plants of Gerrard strain trout will be made in the following years.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n=88	AGE 2 n=84	AGE 3 n=74	AGE 4 n=57	AGE 5 n=41
L= 109.1	L= 163.5	L=208.7	L= 237	L= 261.7
AGE 6 n=27	AGE 7 n=17	AGE 8 n=13	AGE 9 n=5	AGE 10 n=3
L= 280.1	L= 303.1	L= 345.1	L= 379.8	L= 379.8
AGE 11 n=2				
L=390.9				

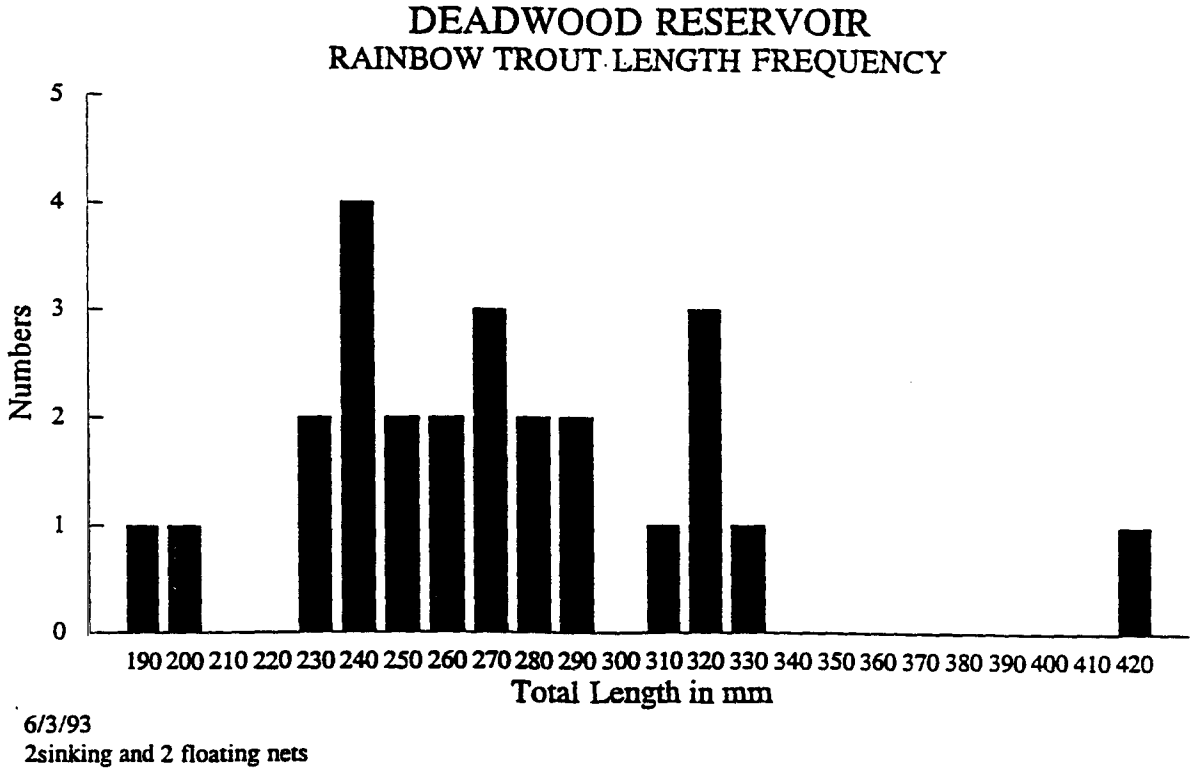
Figure 4. Deadwood Reservoir fall 1993 length frequency and length at age of mountain whitefish collected in experimental gill nets.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n= 15	AGE 2 n=15	AGE 3 n=9	AGE 4 n=7
L= 98.9	L= 158.4	L= 221.3	L= 259.2

Figure 5. Deadwood Reservoir fall 1993 length frequency and length at age of westslope cutthroat trout collected in experimental gill nets.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n=31	AGE 2 n=31	AGE 3 n=30	AGE 4 n=19
L= 94.1	L= 155.1	L= 208.7	L= 246.9
AGE 5 n=9	AGE 6 n=2	AGE 7 n=1	
L= 272.3	L= 364.9	L= 448.0	

Figure 6. Deadwood Reservoir spring 1993 length frequency and length at age of rainbow trout collected in experimental gill nets.

Bull Trout

Bull trout *Salvelinus confluentus* were present in gill net sampling both in recent and historical data sets. Spring 1993 catch per meter of gill net was 0.02; fall 1993, 0.005; and fall 1992 0.0. The bull trout adults were probably in the tributary streams during the fall sampling. Average size of captured bull trout in the 1993 spring gill nets was 353 mm and 475 g.

Atlantic Salmon

Atlantic salmon were first stocked into Deadwood Reservoir in 1990. These fish were from eggs supplied by the Oregon Department of Fish and Wildlife (ODFW) from a spawn take operation. Fall 1992 gill net catch was 0.03 fish/m of gill net with an average length of 457 mm and 907 gram. Fall 1993 gill net catch/m was 0.02 Atlantic salmon. Two size groups were present; the 1992 stocking at 257 mm and 142 g; and an earlier stocking that was 571 mm in length. Scale ageing was attempted and determined to be unreliable.

Deadwood River Survey

Wild salmonid densities (fish/100 m^2 surface area) were low in both sections snorkel surveyed and also variable between pre- versus post-water release on the lower section (Table 1). The release of 20,000 acre-feet of storage to approximately 39,000 acre-feet storage pool did not cause fish migrations into the Deadwood River, at least at the flows released (Reid et al. 1993).

Limnological Monitoring

Samples for nutrient analysis and chlorophyll 'a' were held too long for accurate analysis. Water quality measurements for Secchi disc, pH, conductivity, alkalinity, and hardness are presented in Table 2. All parameters fall within the ranges documented by Webb (1965) for Deadwood Reservoir.

Dissolved oxygen and temperature profiles for stations 2 and 3 show that there is some slight deep water (> 1 5 m) oxygen depletion late in the year in the lower reservoir (Figures 7-9). This oxygen depletion was not documented in 1963 (Webb 1965). Overall dissolved oxygen and temperature were not limiting for salmonid growth and survival. Also, it is extremely unlikely that late season removal of 20,000 acre-feet of storage would impact oxygen levels.

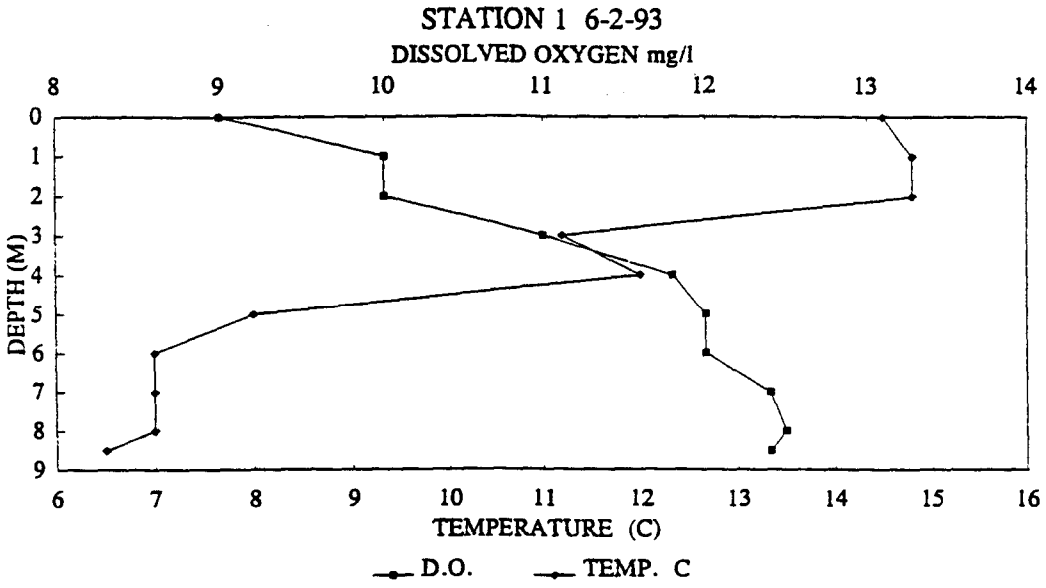
Zooplankton sampling in 1992 and 1993 indicates some evidence of predator cropping of larger zooplankters (Dillinger et al. 1993) (Table 3). The 1993 data during July captured high numbers of Bosmina versus the July 1992 sampling. July densities of other species were similar in number to previous data. Water removal could have a direct effect on zooplankton

Table 1. Densities of game fish species (no/100 m^2) observed by IDFG personnel using snorkeling techniques in two sections of the Deadwood River below Deadwood Dam, September 1992.

Section	Area (m^2)	Wild rainbow trout density (no/100 m^2) by length range (mm)				
		0-76	77-153	154-203	204-304	Total
Upper	640					
9-1 1-92		0	0	0	0	0
9-29-92		0	0	0	0	0
Lower	1,246					
9-11-92		0.08	0.32	0.24	0.32	0.96
9-29-92		0.16	0.48	0.16	0.08	0.88
Mountain whitefish density						
9-1 1-92						2.9
9-29-92						0.7
Adapted from Reid et al. 1993.						

Table 2. Select water quality parameters for Deadwood Reservoir during 1993.

Date/Station	Secchi Disc (m)	pH	Contuctivity uS/cm[3]	Alkalinity mg/l as $CaCO_3$	Hardness mg/l as $CaCO_3$
6-2-93 STA 1	3.5	7.5	22.1	20.0	20.0
STA 2	3.0	7.5	24.7	20.0	20.0
STA 3	3.0	7.5	25.6	20.0	20.0
6-30-93 STA 1	5.2	7.5	22.8	20.0	20.0
STA 2	4.8		23.6		
STA 3	4.8		23.2		
7-20-93 STA 1	3.4	7.5	24.4	20.0	20.0
STA 2	4.0		24.6		
STA 3	4.3		24.8		
10-14-93 STA 1	7.0	7.3	30.0	40.0	20.0
STA 2	7.2	7.0	29.6		
STA 3	6.3		29.9		



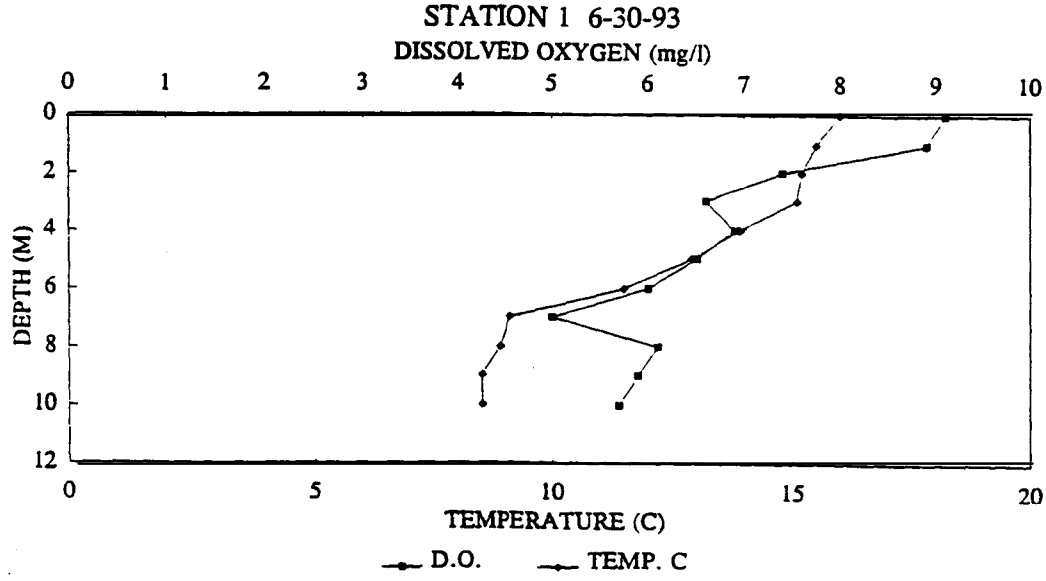
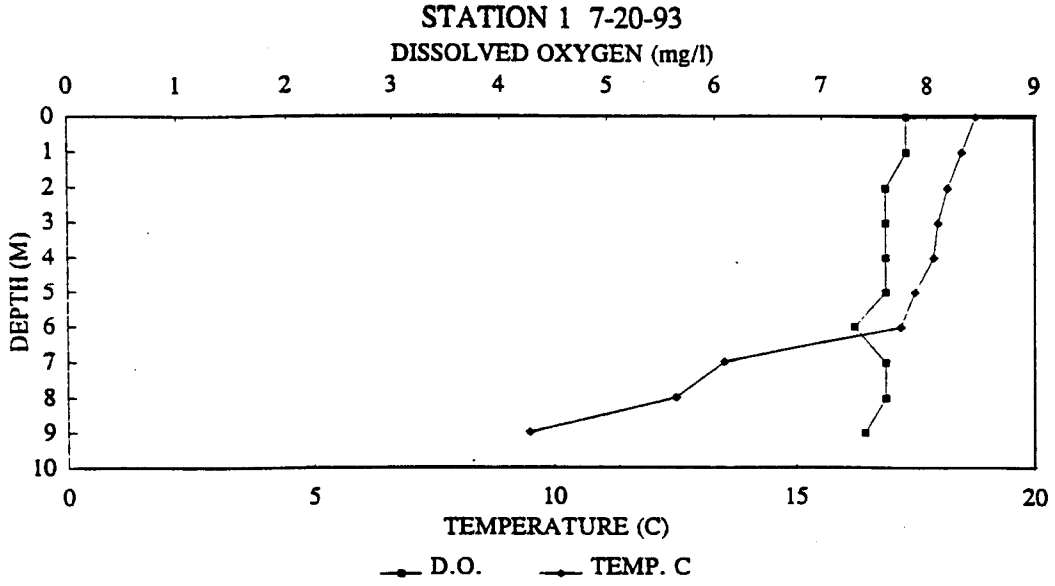


Figure 7. Deadwood Reservoir 1993 temperature and dissolved oxygen depth profiles at sampling station 1.



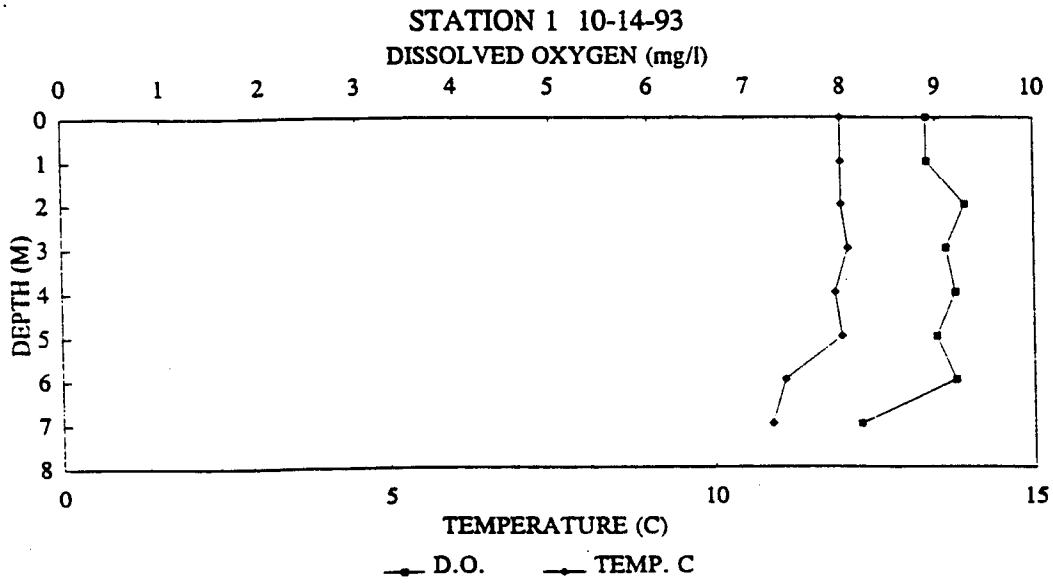


Figure 7. Continued.

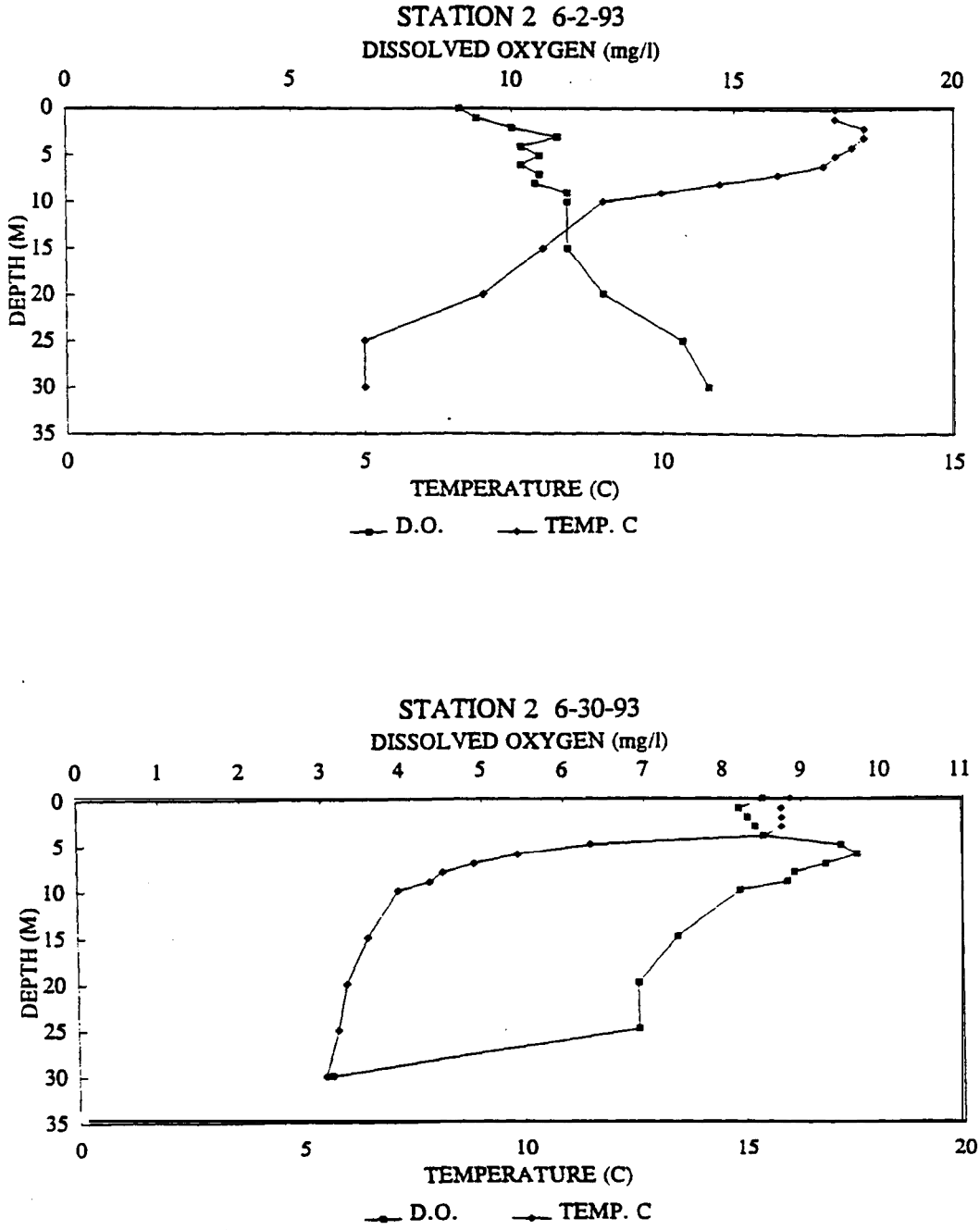
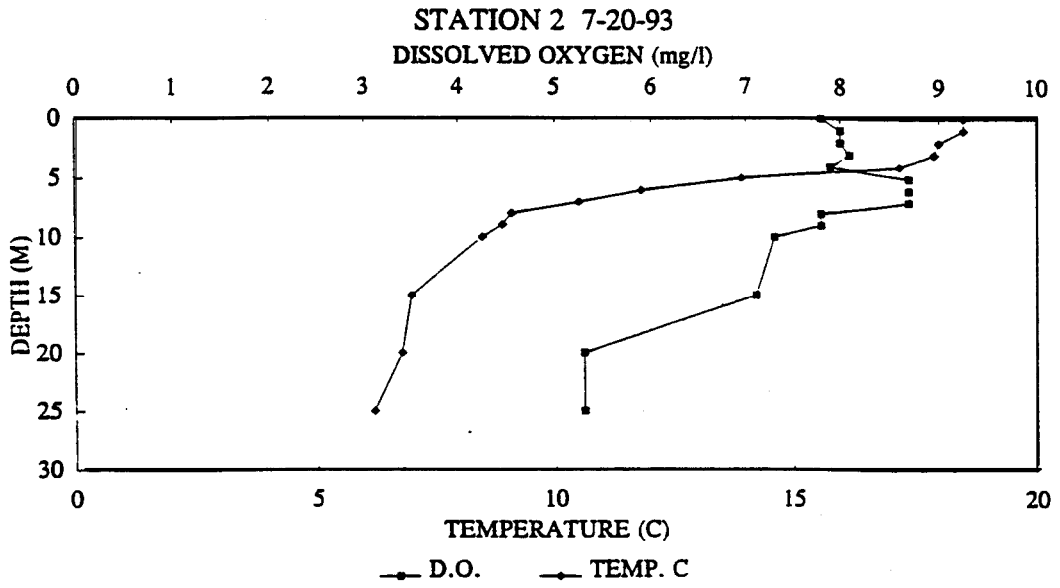
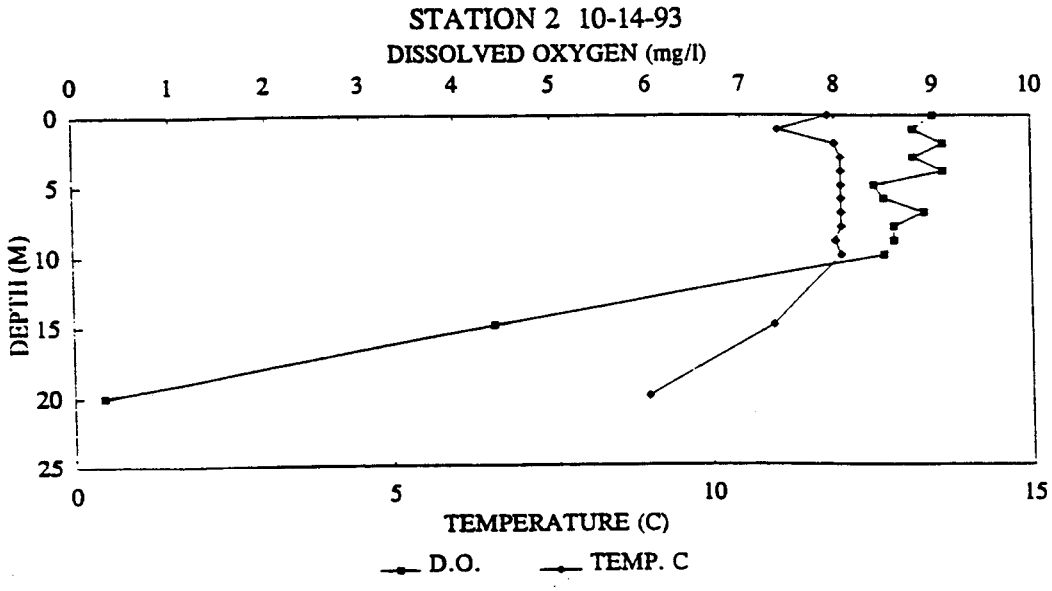


Figure 8. Deadwood Reservoir 1993 temperature and dissolved oxygen depth profiles at sampling station 2.





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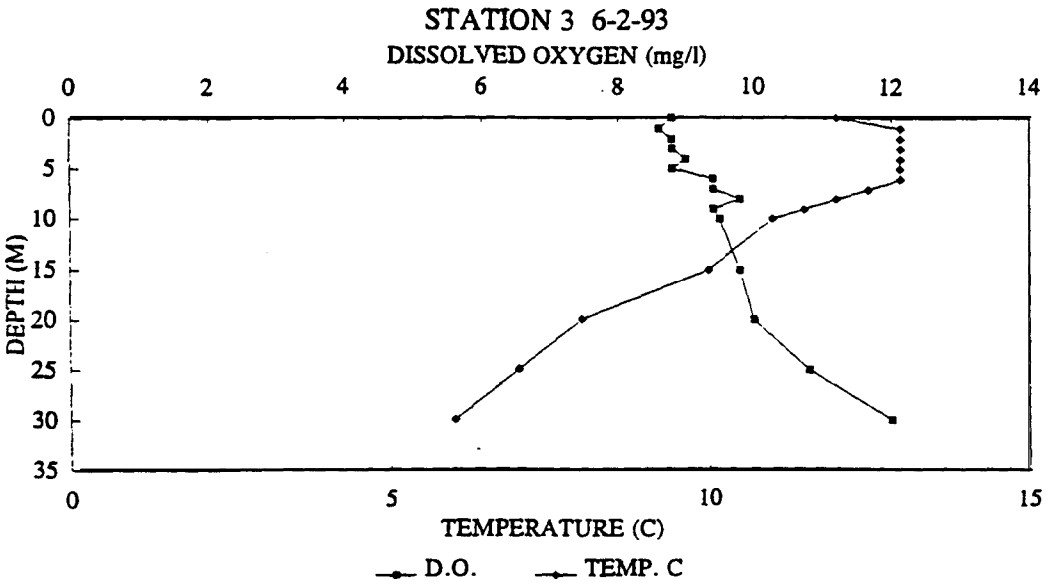


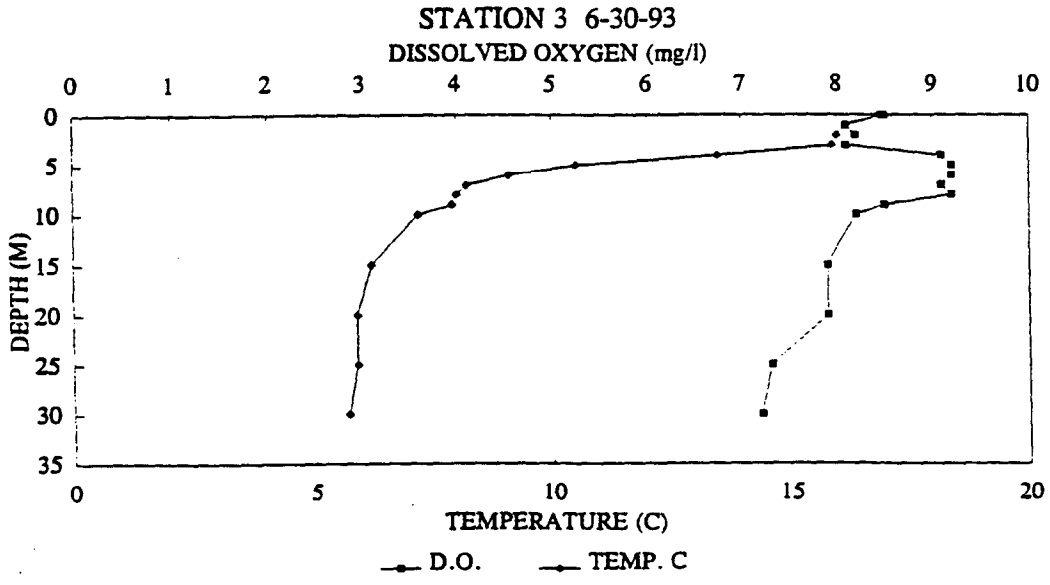
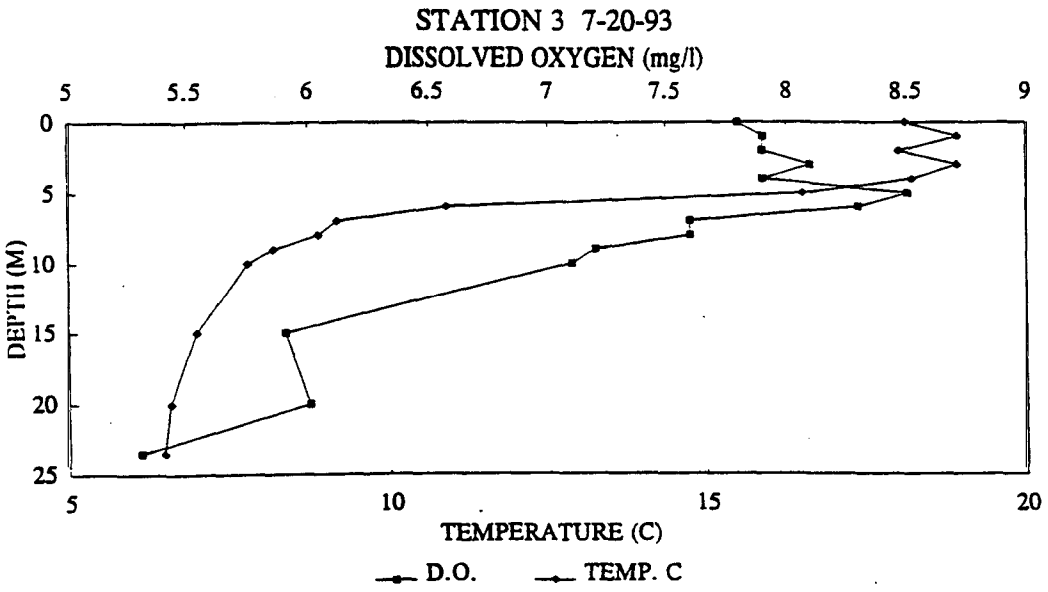


Figure 9. Deadwood Reservoir 1993 temperature and dissolved oxygen depth profiles at sampling station 3.



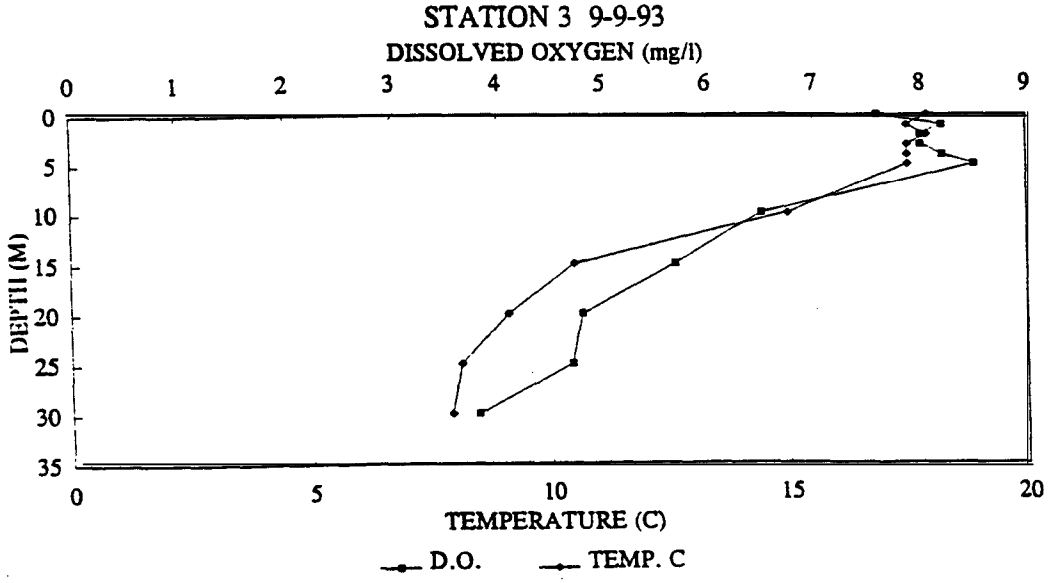


Figure 9. Continued.

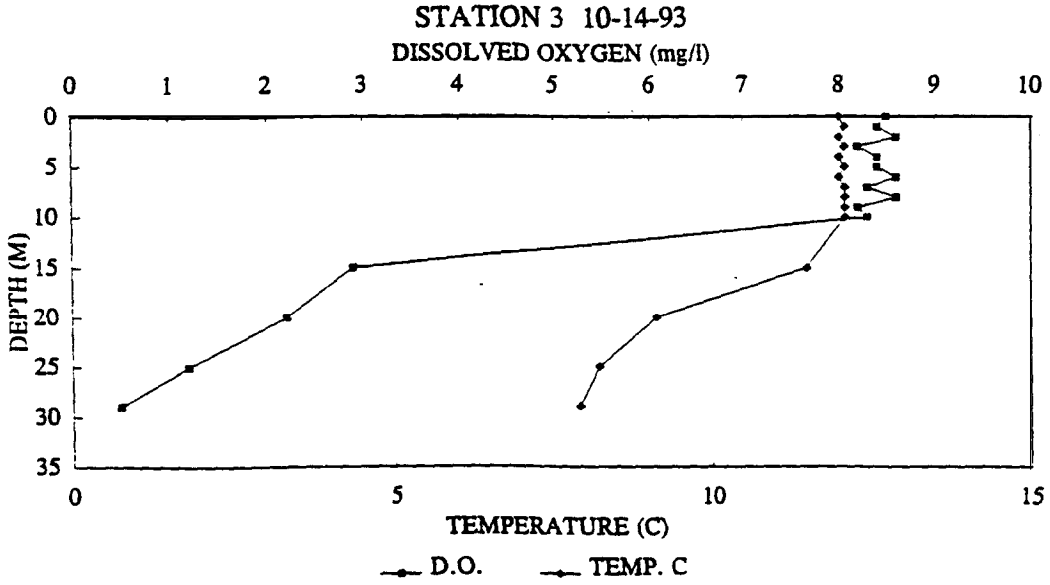


Figure 9. Continued.

Table 3. Zooplankton species, composition, and size structure in Deadwood Reservoir in 1993.

Date/ Station	Organism	0.25 mm	0.50 mm	0.75 mm	1.00 mm	1.25 mm	1.50 mm	1.75 mm
6-2-93 STA 1	Bosmina	1						
	Copepods	1	2					
	Daphnia							
	Rotifer	1	3					
6-30-93 STA 1	Bosmina	81	75					
	Copepods		8	1				
	Daphnia		1	2	1			
7-20-93 STA 1	Bosmina	161	159					
	Copepods	3	13	7				
	Daphnia		4	4	4			
8-25-93 STA 1	Bosmina		8					
	Copepods	3	16	11	4	1		
	Daphnia	2	128	207	18			
10-14 STA 1	Bosmina							
	Copepods				1			
	Daphnia	1	14	14	8	2		
6-2-93 STA 2	Bosmina	1						

	Copepods	1	5					
	Daphnia							
	Rotifer	5	11	8				
6-30-93 STA 2	Bosmina	9	31					
	Copepods		3	3	2			
	Daphnia							
7-20-93 STA 2	Bosmina	479	251					
	Copepods		19	12	1			
	Daphnia		4					
8-25-93 STA 2	Bosmina	50	96					
	Copepods	2	28	37	7			
	Daphnia		200	245	57	1		
	Lepto-dora	4.5 mm 1						
	Hydra-carina		1					
10-14 STA 2	Bosmina							
	Copepods		4	6	30	6	4	
	Daphnia	3	84	36	55	41	2	1
6-2-93 STA 3	Bosmina							
	Copepods		2	2				

	Daphnia				1			
6-30-93 STA 3	Bosmina		9					
	Copepods	1	3	4				
	Daphnia		1					
7-20-93 STA 3	Bosmina	379	23					
	Copepods	16	20	2				
	Daphnia	2	5	2				
8-25-93 STA 3	Bosmina	26	50					
	Copepods	6	25	36	7			
	Daphnia	1	108	251	70			
10-14 STA 3	Bosmina	6	21					
	Copepods		3	10	9	2	1	
	Daphnia	7	57	90	143	178	9	
	Lepto-dora	11.25 mm 1						

removal from the reservoir by directly passing the zooplankton through the dam. Growth in all age classes of kokanee was strongly influenced by reservoir productivity (Rieman and Meyers 1990). In Lake Pend Oreille, a significant ($p<0.05$) positive relationship has been found between kokanee growth and zooplankton abundance for age 3 kokanee (Vaughn Paragamian, IDFG, personal communication). Kokanee populations will be affected in Deadwood Reservoir by water operations that reduce production of zooplankton.

Water Management

Long-term beginning and ending water elevations from 1964 to 1993 were similar except for a few years (Figure 10). Ending water level elevations for Water Year 1992 were not the lowest on record. Water Year 1992 was a low water storage year which the reservoir did not fill and the peak elevation was approximately 5.8 m below spillway crest after spring run-off (Figure 11). The following year, 1993, had excess water and a spring run-off spill (Figure 12). Deadwood Reservoir outflows were not extreme in 1993, up to an excess of 800 cfs. We assume that a typical outflow year will not displace a significant amount of fish into the Deadwood River. There was not evidence of loss of fish from the reservoir documented by reduction in catch by the gill net in relation to the evacuation of 20,000 acre-feet of storage in 1992.

Conclusions

We find little evidence game fish populations in Deadwood Reservoir were directly impacted by reducing water levels to below the minimum pool level. We did not document any fish released to impact the recreational fishery in the reservoir. There is no need for additional fish stocking in association with the 20,000 acre-feet of water released.

The minimum pool of 50,000 acre-feet has maintained a resident fish population that is self-sustaining. We believe continued releases of storage below 50,000 acre-feet may have a detrimental effect on the fish populations because of lost fish food production and likelihood of not refilling the reservoir the following spring. The conservation pool elevation of 5,289 feet was selected because at this elevation the reservoir generally drops into a steep sloped granitic basin. Above this conservation pool elevation, shallow littoral areas necessary for fish food production exist. It was assumed that fish food production, aquatic insects and zooplankton, would likely be significantly reduced when the reservoir is lowered below this elevation.

We also suggest that fishery and recreational benefits will be enhanced by maintaining lake elevation above 5,289 as late in the season as possible to maximize fish food production. This shift would allow maximum food production to take place on the upper shallow flats of the reservoir and thus benefit the fish populations and the fishermen.

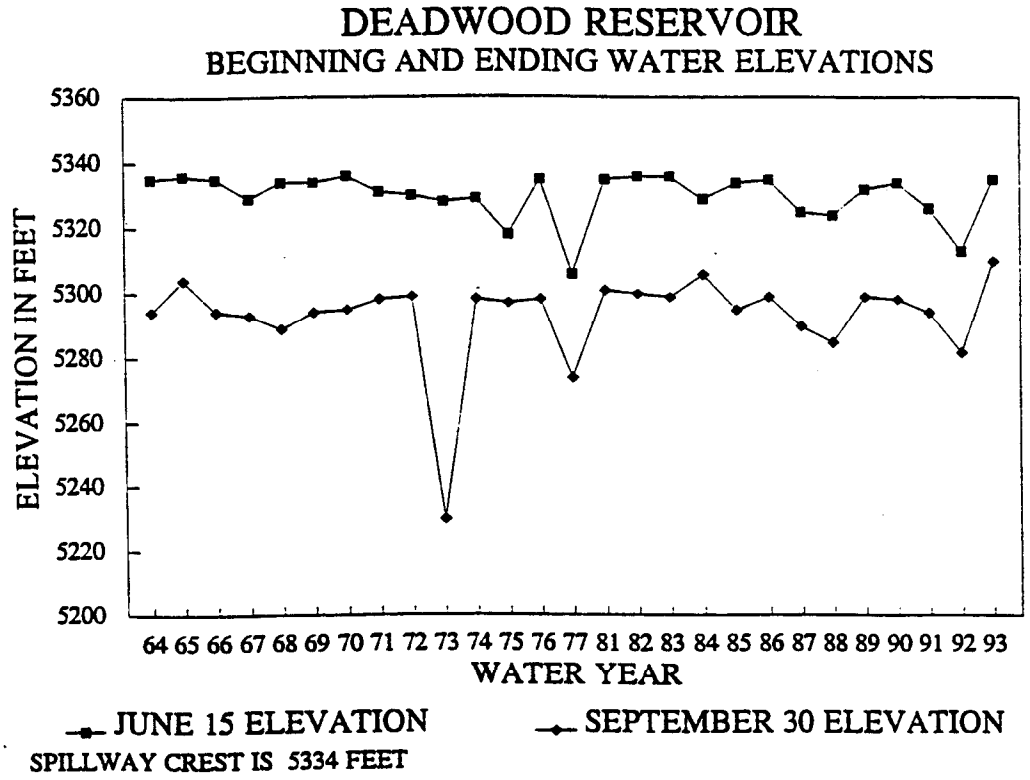


Figure 10. Deadwood Reservoir average June 15 and September 30 reservoir pool elevations, water years 1964 to 1993.

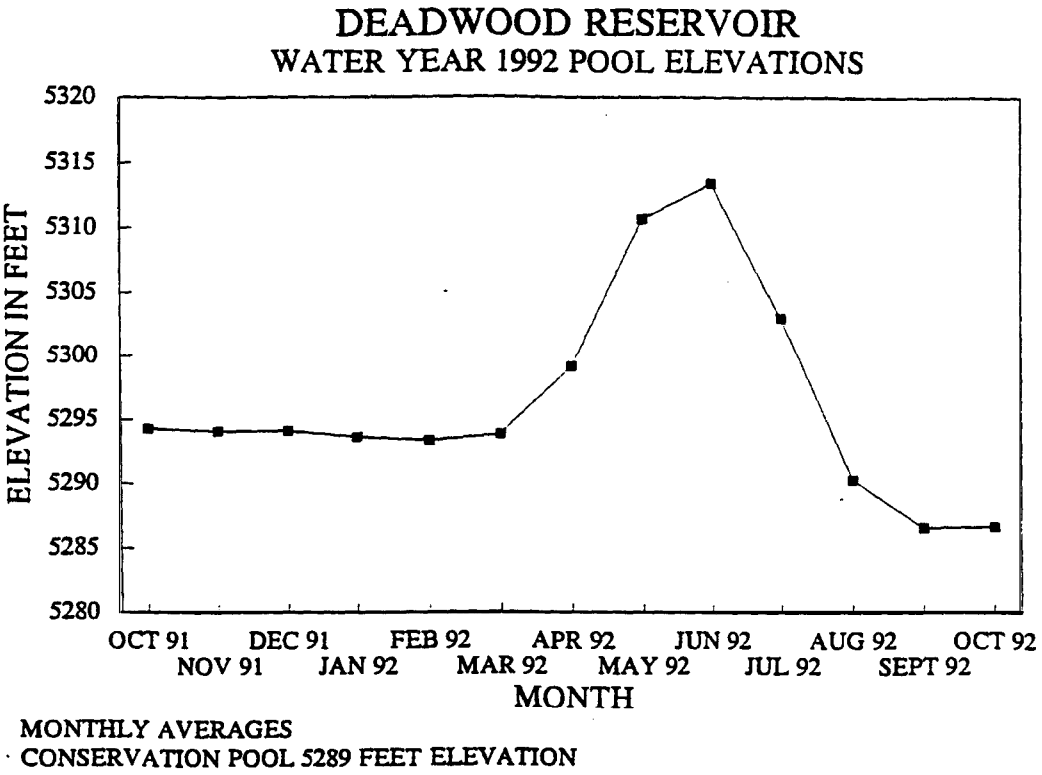


Figure 11. Deadwood Reservoir water year 1992 pool elevations monthly averages.

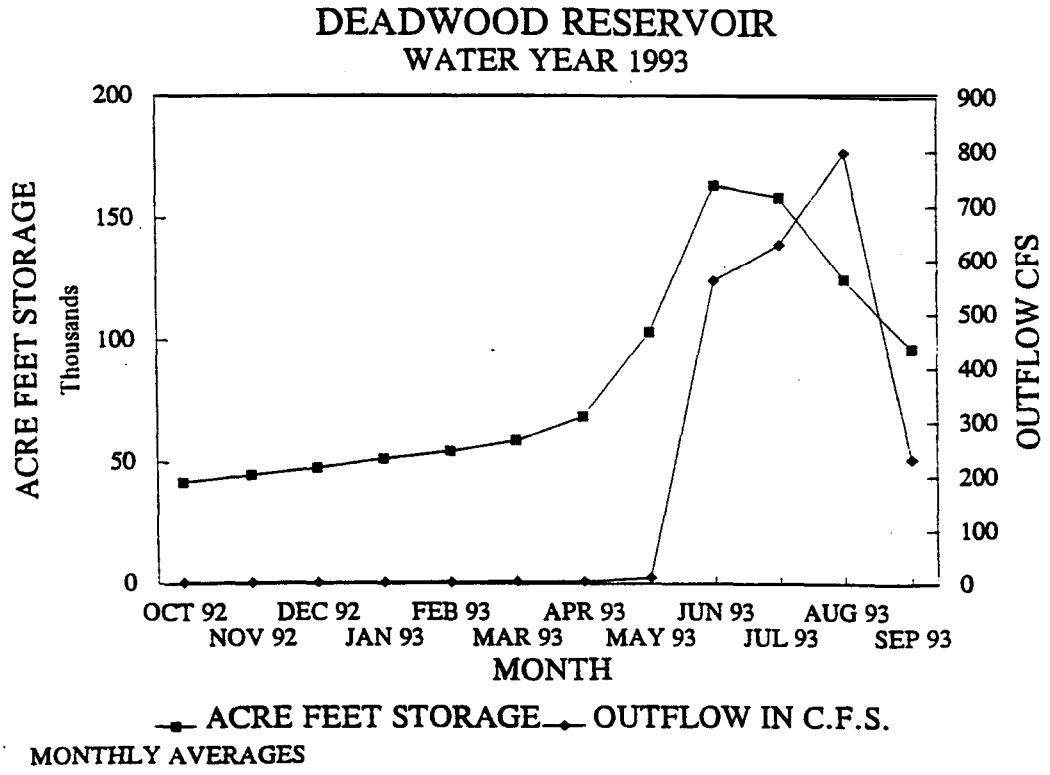


Figure 12. Deadwood Reservoir water year 1993 acre-feet storage and outflow monthly averages.

RECOMMENDATIONS

1. Investigate feasibility of water management change to begin irrigation water releases later in the summer (i.e. August) to maximize zooplankton production. We also recommend that flows into the Deadwood River match inflow to the reservoir from mid-June until August. This change would rely on using Cascade Reservoir waters for irrigation earlier in the summer.

2. Maintain 50 cfs minimum flows in the Deadwood River at all times.

3. Conduct midwater trawling for kokanee densities yearly in July.

4. Conduct spring and fall gillnetting for fish population, and especially kokanee trend information.

5. Reduce the number of tributary weirs on Deadwood Reservoir tributaries placed during the kokanee spawning run. Utilize predator fish to attempt to control the kokanee population.

6. Maintain a goal of taking 2,000,000 kokanee salmon eggs per year for hatchery supplies. Accomplish this goal by maintaining a productive reservoir and larger kokanee.

7. Monitor the westslope cutthroat trout population trends and spawning success. Utilize fingerling stockings to supplement weak cutthroat trout year classes only.

8. Monitor tributary bull trout populations in the fall to document if low reservoir levels inhibit movement from Deadwood Reservoir in to the spawning tributaries.

1993 BROWNLEE RESERVOIR LOWLAND LAKE SURVEY

Methods

On May 2, 1993, electrofishing crews from IDFG and ODFW conducted sampling on transects at the following stations: Sturgill Creek, Sheep Creek, Robinette Creek, first cove downstream of Powder River Arm on Idaho side, First Island, and Brownlee Creek. Department personnel also set two sets of 45.7 m experimental gill nets (1 floating and 1 sinking gill net) and 4 trap nets which were collected on May 3. On May 17, IDFG electrofished a section of Rock Creek and placed 2 sets of gill nets and trap nets, 2 of each type, upstream and downstream of Rock Creek.

All fish were collected from all gears and measured for total length; weights were collected on a subset of fish. Scale samples were collected for up to 5 fish per centimeter length group for game fish species encountered. Pectoral fin spines were collected from channel catfish. Data for each species is presented by a combined unit of effort: 1 unit of

effort equals 1 hour of electrofishing energized time, 1 trap net set overnight, and 1 floating and 1 sinking 45.7 m experimental gill nets set overnight. Oregon Department of Fish and Wildlife electrofishing data was not used in this data analysis.

Results

Species Composition and Relative Biomass

Smallmouth bass *Micropterus dolomieu* comprised over 46% of numbers of fish captured on a per unit of effort basis (Figure 13). White crappie *Pomoxis annularis,* bluegill *Lepomis macrochirus,* and black crappie *Pomoxis nigromaculatus* combined comprised 43.5% of the catch. Interestingly, non-game species account for slightly over 3% of the combined unit of effort catch.

Smallmouth bass dominate the relative biomass with 113 kg captured per unit of effort (Figure 14). This is over twice the weight of smallmouth bass collected in similar surveys in Oxbow Reservoir. Channel catfish *Ictalurus punctatus* and largescale sucker *Catostomus macrocheilus* increased in proportion of biomass due to their greater average size. Common carp *Cyprinus carpio* were not sampled by the gear, although they are common in the reservoir. Nongame species were in very low abundance in this sampling. Netting bias may be present with electrofishing netters tending to select for game fish over nongame fish.

Smallmouth Bass

The length frequency and length at age of smallmouth bass for 1 unit of effort is depicted in Figure 15. The numbers of fish quickly drop upon reaching the minimum length limit of 12 inches (305 mm). Relative weight of smallmouth bass is lower than optimal at a mean relative weight of 90 (Figure 16). Fish greater than minimum length tend to have better condition, but the data are limited.

Two main factors may contribute to the size structure of this smallmouth bass population: the harvest of over 31,000 legal bass per year (Mabbott and Holubetz 1990) which may easily be over one-quarter of the legal bass (119,024) as estimated by Schrader 1993; and secondly, the low relative weights of smallmouth bass also point to a possible forage availability bottleneck.

White Crappie

White and black crappie account for an estimated catch of over 2 million fish per year in Brownlee Reservoir (Mabbott and Holubetz 1990). A strong year class provided an excellent fishery in 1993, and hopefully will sustain the 1994 crappie fishery (Figure 17). Relative weight of white crappie is near 100 but drops slightly with larger fish (Figure 18).

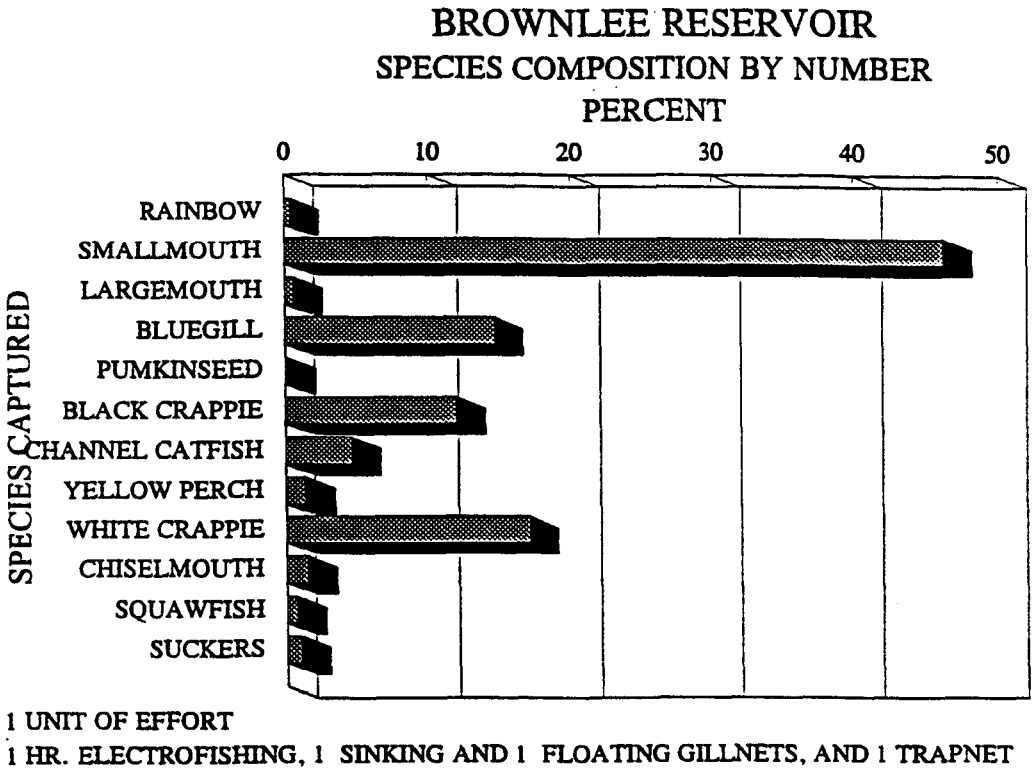


Figure 13. Species composition of Brownlee Reservoir in 1993 based on unit per effort basis.

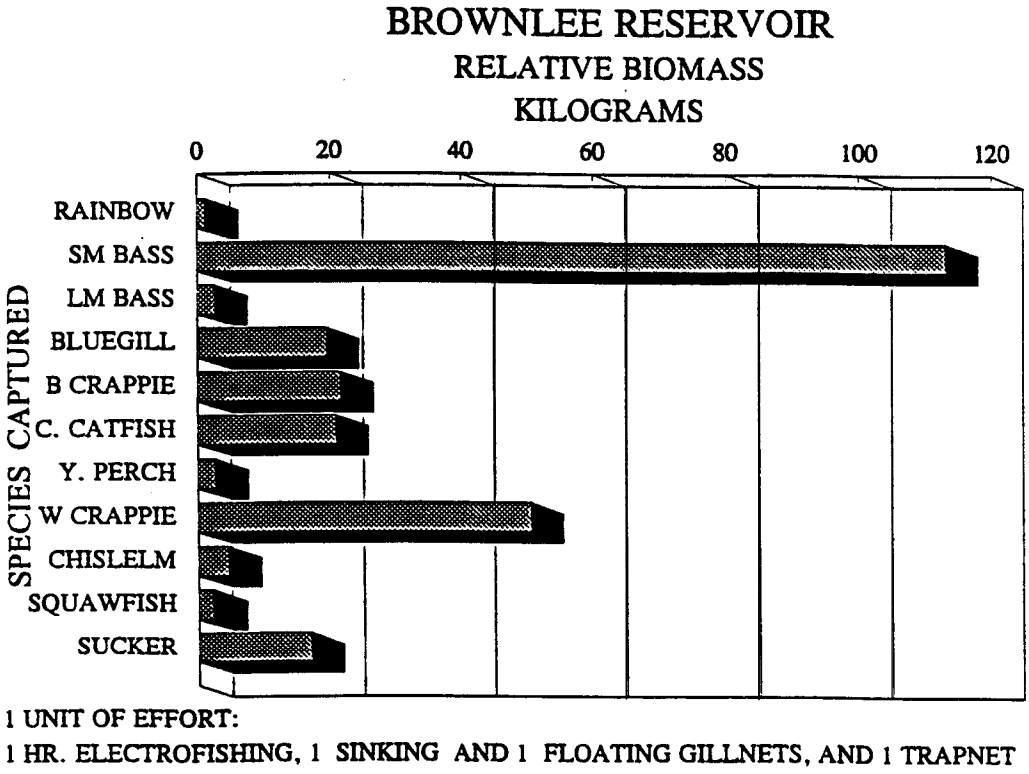
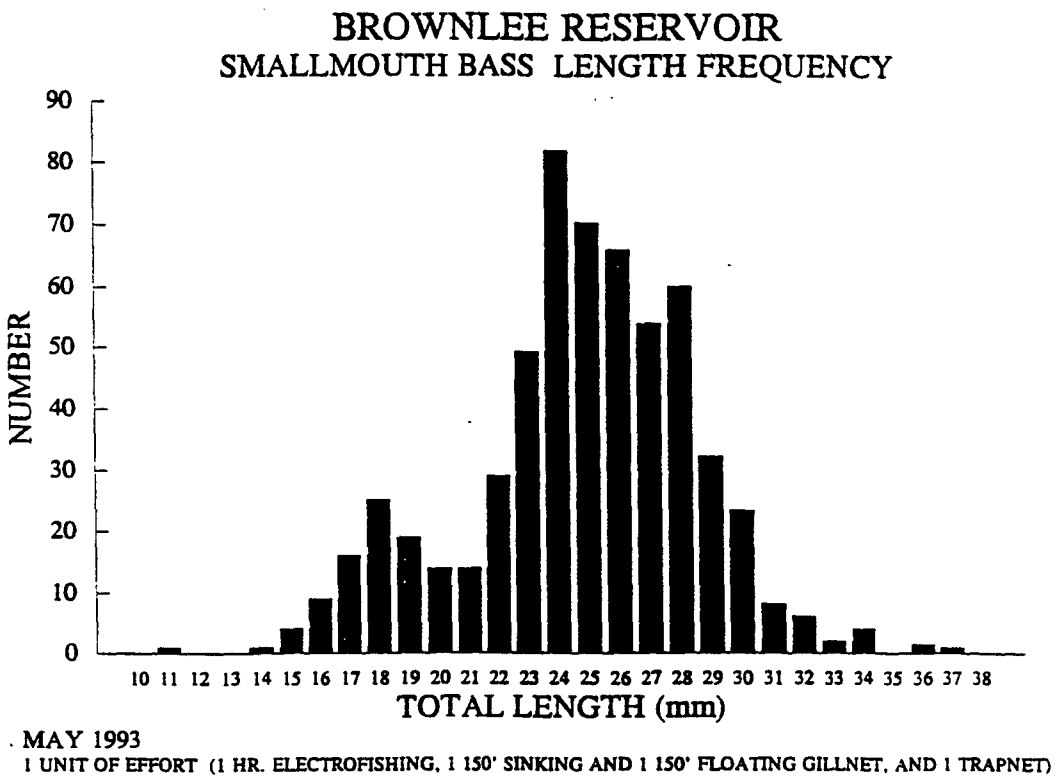


Figure 14. Relative biomass of fish species in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 67	Age 2 n = 61	Age 3 n = 41	Age 4 n = 29	Age 5 n = 19	Age 6 n = 14	Age 7 n = 3	Age 8 n = 1
L = 90.7	L = 159.8	L = 209.4	L = 239.2	L = 268.7	L = 291.2	L = 312.3	L = 340.1

Figure 15. Length frequency and length at age of smallmouth bass in Brownlee Reservoir, 1993.

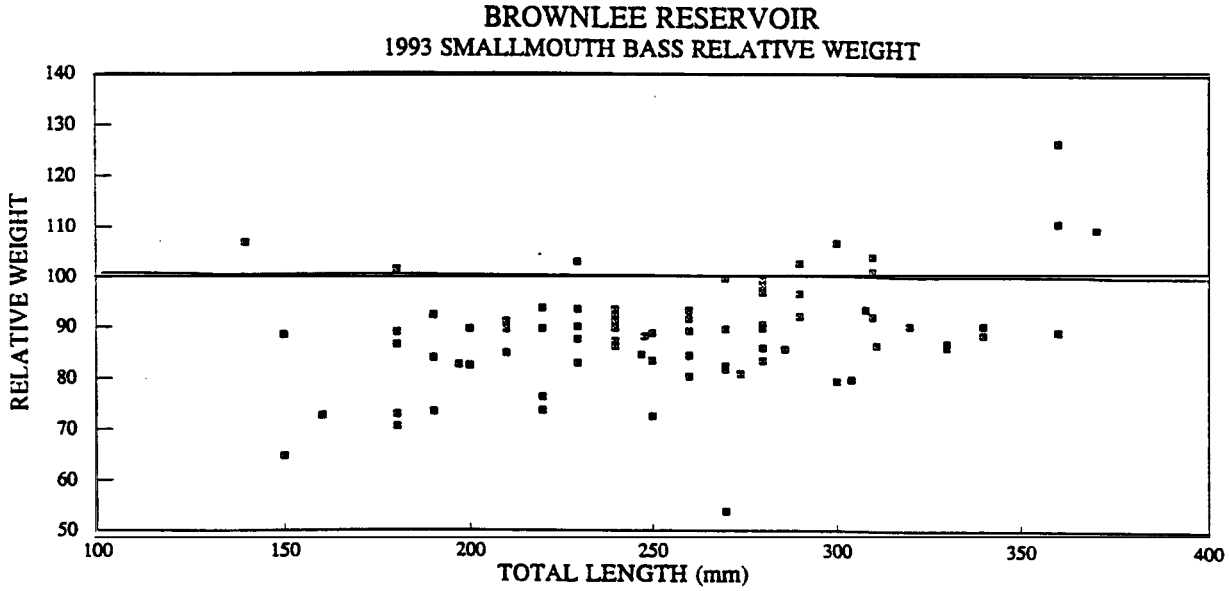
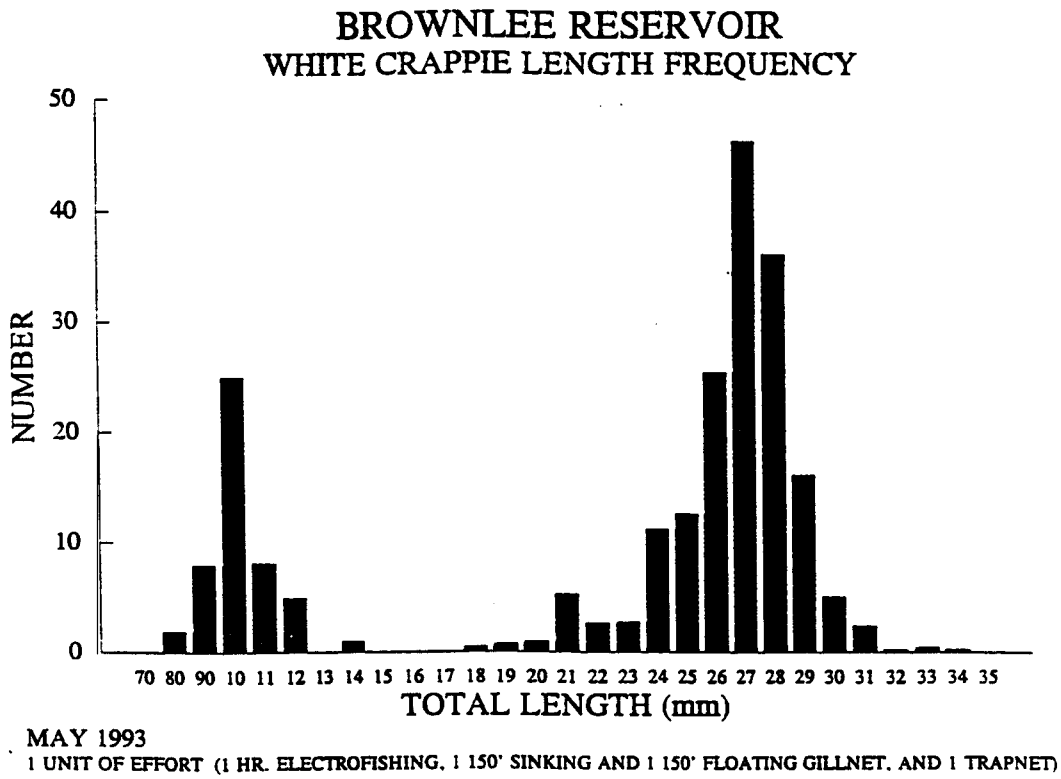


Figure 16. Relative weight of smallmouth bass in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n= 67	Age 2 n= 66	Age 3 n= 65	Age 4 n= 57	Age 5 n= 49	Age 6 n= 29	Age 7 n= 15	Age 8 n= 7	Age 9 n= 2
L = 91.6	L = 164.6	L = 201.9	L = 225.9	L = 249.3	L = 268.8	L = 284.0	L = 297.6	L = 316.0

Figure 17. Length frequency and length at age of white crappie in Brownlee Reservoir, 1993.

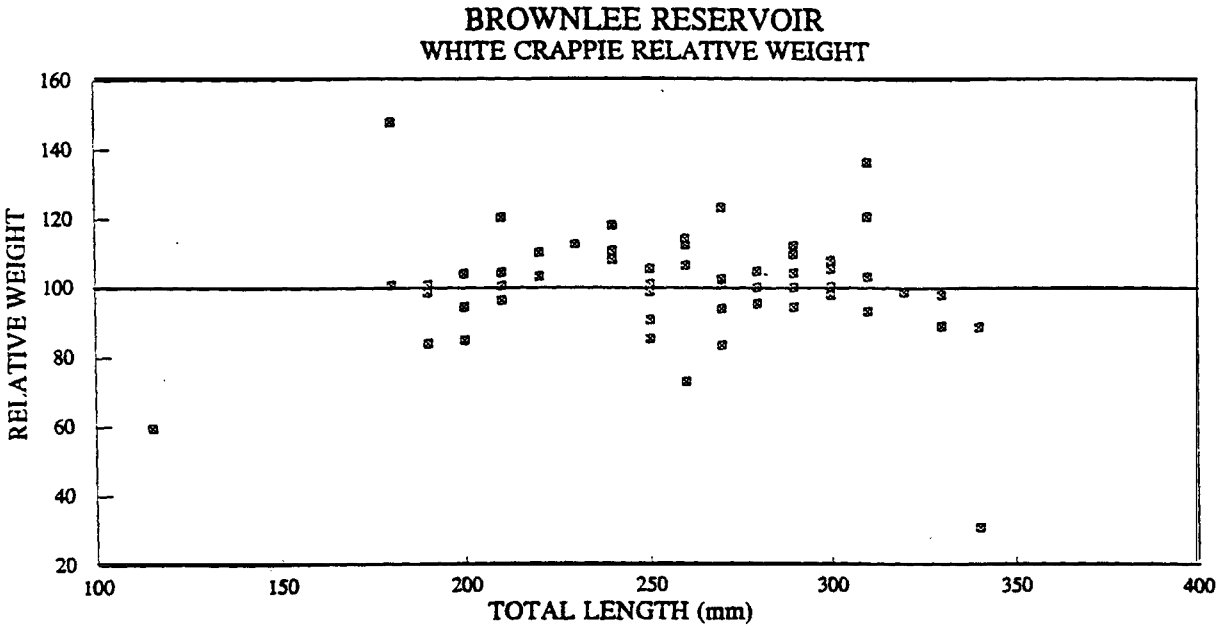


Figure 18. Relative weight of white crappie in Brownlee Reservoir, 1993.

Black Crappie

Black crappie tend to be smaller in Brownlee Reservoir than white crappie. The length frequencies of white crappie and black crappie are similar (Figures 17 and 19). As with white crappie, relative weights are good with a small drop in condition for the largest fish (Figure 20). Large black crappie should carry into the 1994 fishery.

Channel Catfish

Channel catfish estimated catch was 63,622 in 1990, ranking the catfish as the fourth most captured species. Channel catfish are the preferred target species by anglers; approximately 12% of the time in the summer months and 27% of the time in the winter months (Mabbott and Holubetz 1990). Catfish are abundant in the reservoir with many sizes available to the angler. The length frequency suggests angler cropping beginning at 10 inches, or it may be a very strong year class (Figure 21). Growth has slowed down as the reservoir has aged. Relative weights are generally poor (Figure 22).

Bluegill

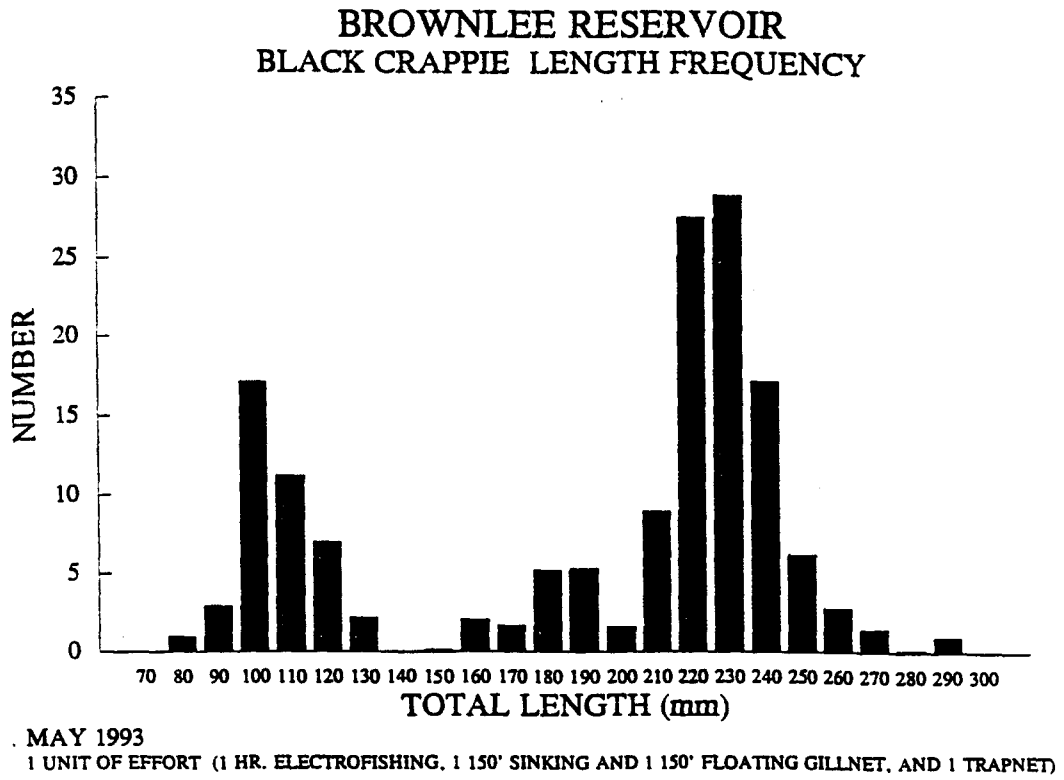
Bluegill were as numerous as black crappie during sampling, but were not equally represented in the creel, with only an estimated catch of 18,000 (Mabbott and Holubetz 1990). The length frequency shows a fairly strong 1989 year class at 180 mm (Figure 23). Relative weight of bluegill is generally very good (Figure 24).

Yellow Perch

The 1989 creel documents that yellow perch *Perca flavescens* were the third highest catch in the reservoir. Data shows yellow perch as only 1.4% by number of the sample in 1993. Length frequency and length at age of yellow perch sampled is presented in Figure 25. Relative weights of yellow perch are low, suggesting some type of competition (Figure 26).

Largemouth Bass

Largemouth bass are relatively rare and were less than 1 % of the sample catch. The length frequency shows that several year classes were present (Figure 27).



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 53	Age 2 n = 47	Age 3 n = 40	Age 4 n = 38	Age 5 n = 31	Age 6 n = 23	Age 7 n = 9	Age 8 n = 3
L = 72.1	L = 121.0	L = 166.8	L = 191.6	L = 209.8	L = 224.9	L = 240.0	L = 252.1

Figure 19. Length frequency and length at age of black crappie in Brownlee Reservoir, 1993.

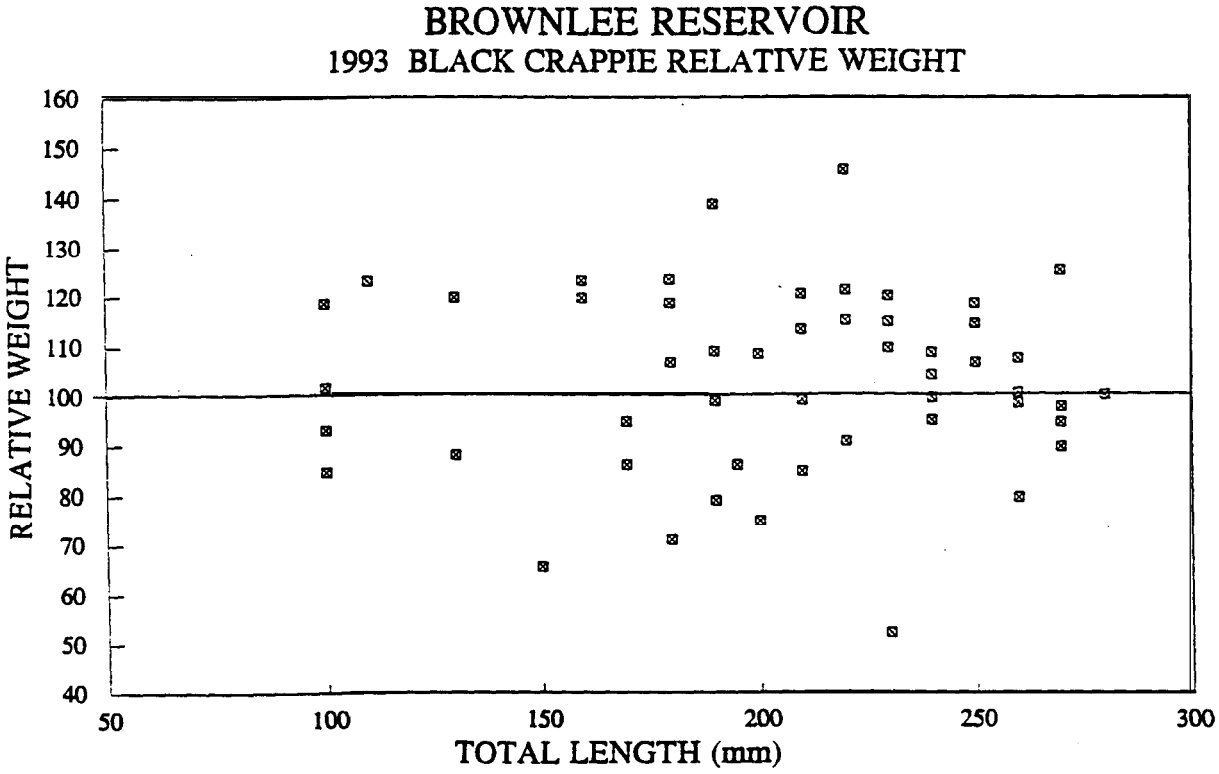
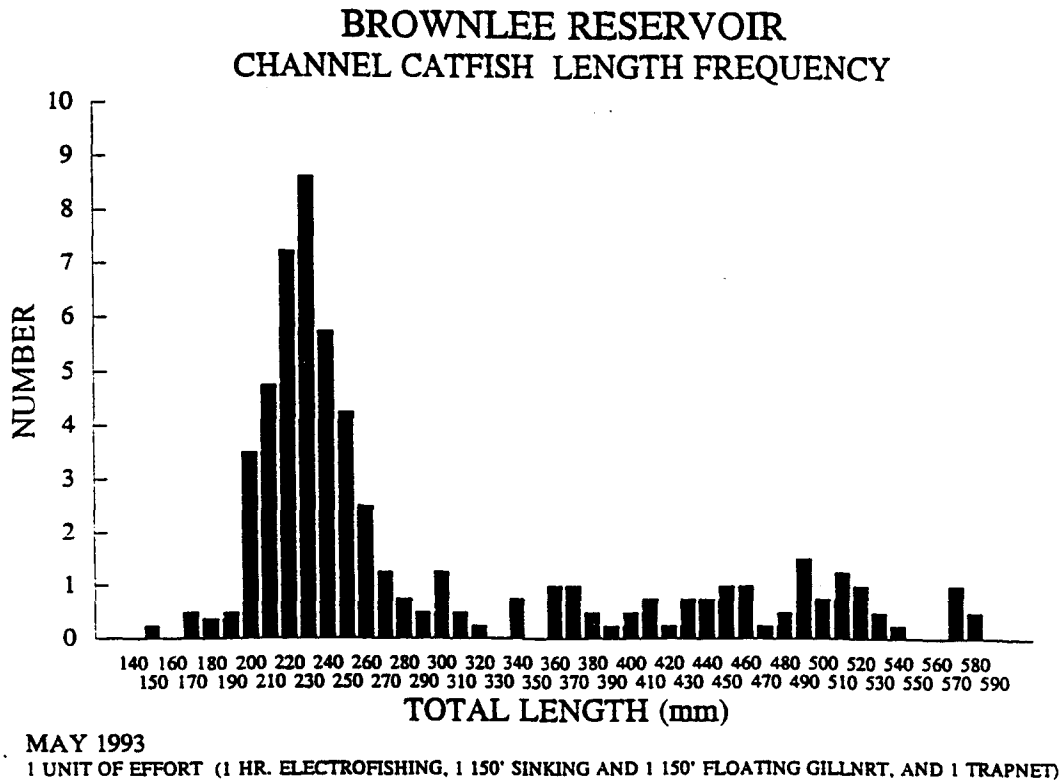


Figure 20. Relative weight of black crappie in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 69	Age 2 n = 68	Age 3 n = 49	Age 4 n = 43	Age 5 n = 37	Age 6 n = 35
L= 113.3	L= 164.4	L= 223.6	L= 283.2	L= 332.8	L= 375.9
Age 7 n = 29	Age 8 n = 23	Age 9 n = 9	Age 10 n = 4	Age 11 n = 2	Age 12 n = 1
L= 418.7	L= 448.9	L= 453.8	L= 458.5	L= 449.5	L= 470.5

Figure 21. Length frequency and length at age of channel catfish in Bownlee Reservoir, 1993.

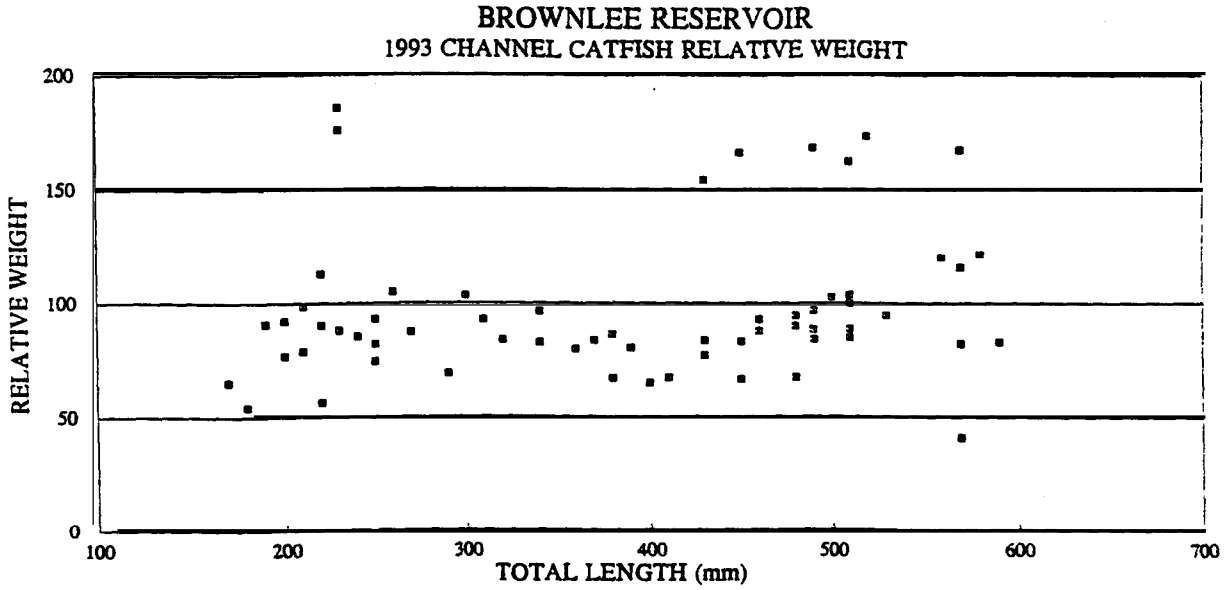
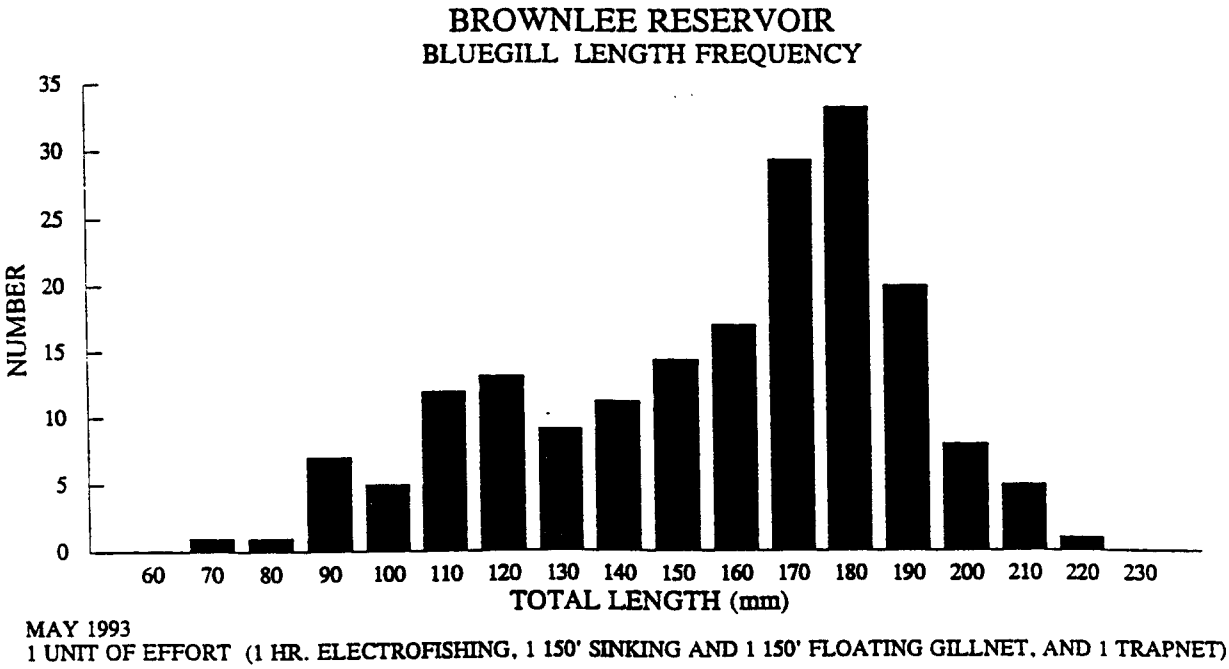


Figure 22. Relative weight of channel catfish in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 49	Age 2 n = 49	Age 3 n = 43	Age 4 n = 34	Age 5 n = 23	Age 6 n = 15	Age 7 n = 6	Age 8 n = 2
L = 48.1	L = 101.3	L = 131.2	L = 150.8	L = 162.3	L = 175.5	L = 184.5	L = 195.4

Figure 23. Length frequency and length at age of bluegill in Brownlee Reservoir, 1993.

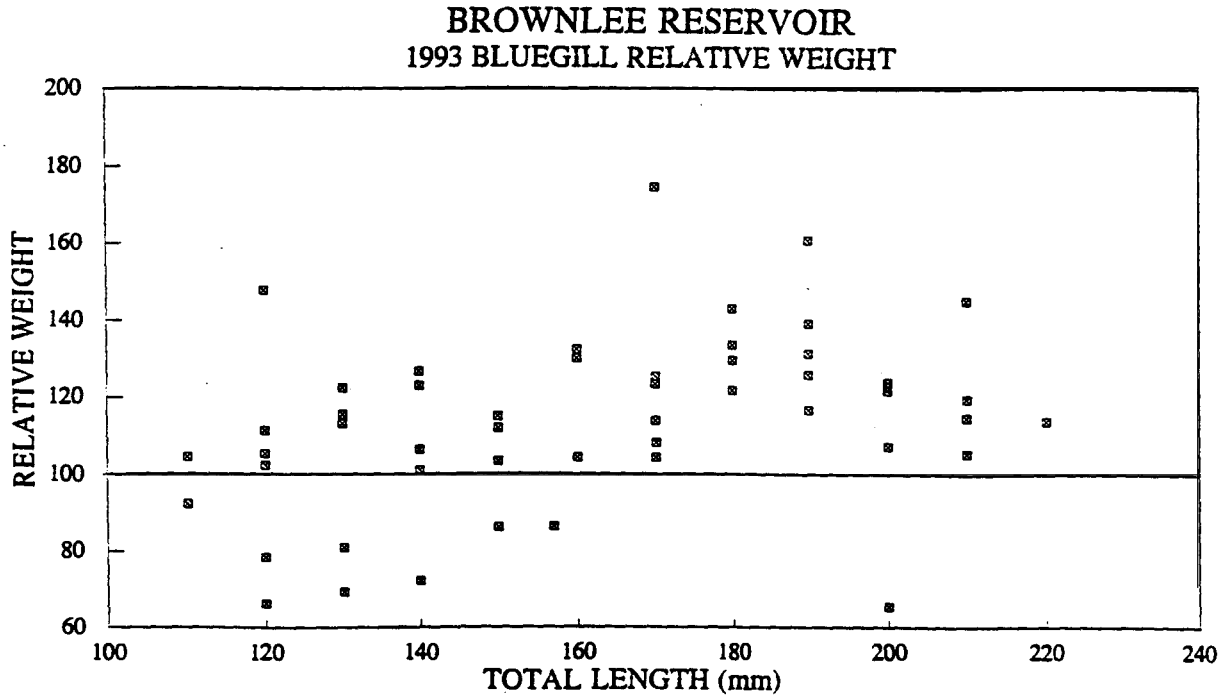
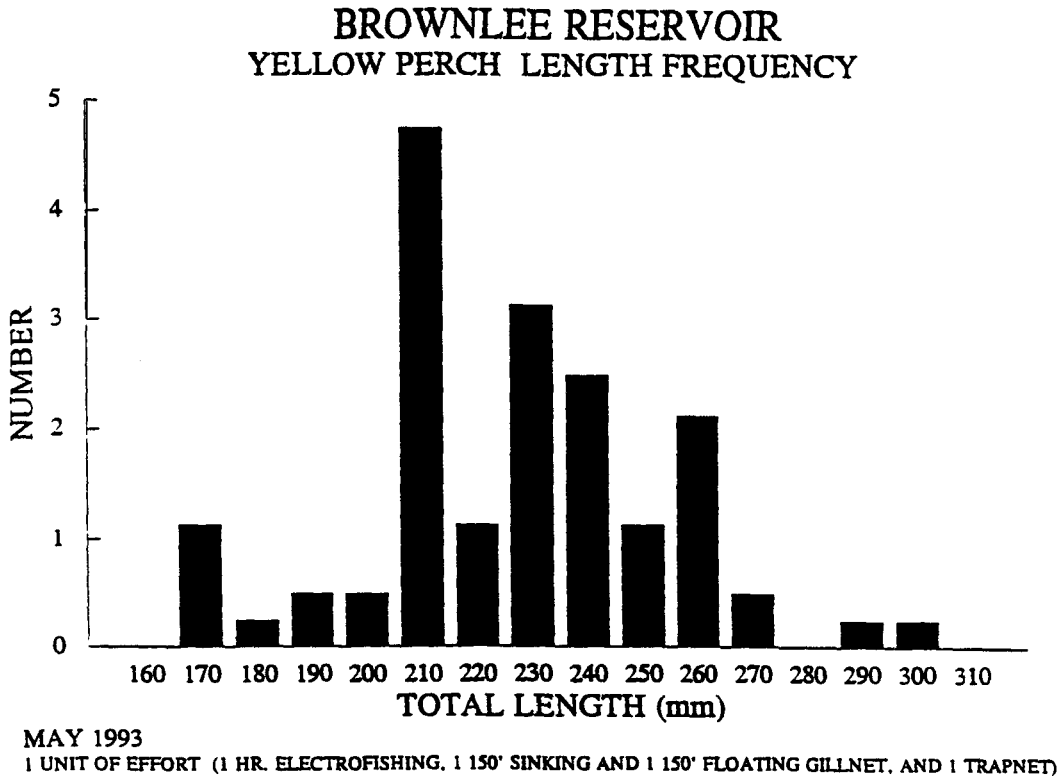


Figure 24. Relative weight of bluegill in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n= 40	Age 2 n= 40	Age 3 n= 35	Age 4 n= 31	Age 5 n= 22	Age 6 n= 16	Age 7 n= 11	Age 8 n= 6	Age 9 n= 2
L = 83.7	L = 153.2	L = 180.4	L = 198.9	L = 214.1	L = 225.7	L = 230.9	L = 241.2	L = 238.4

Figure 25. Length frequency and length at age of yellow perch in Brownlee Reservoir, 1993.

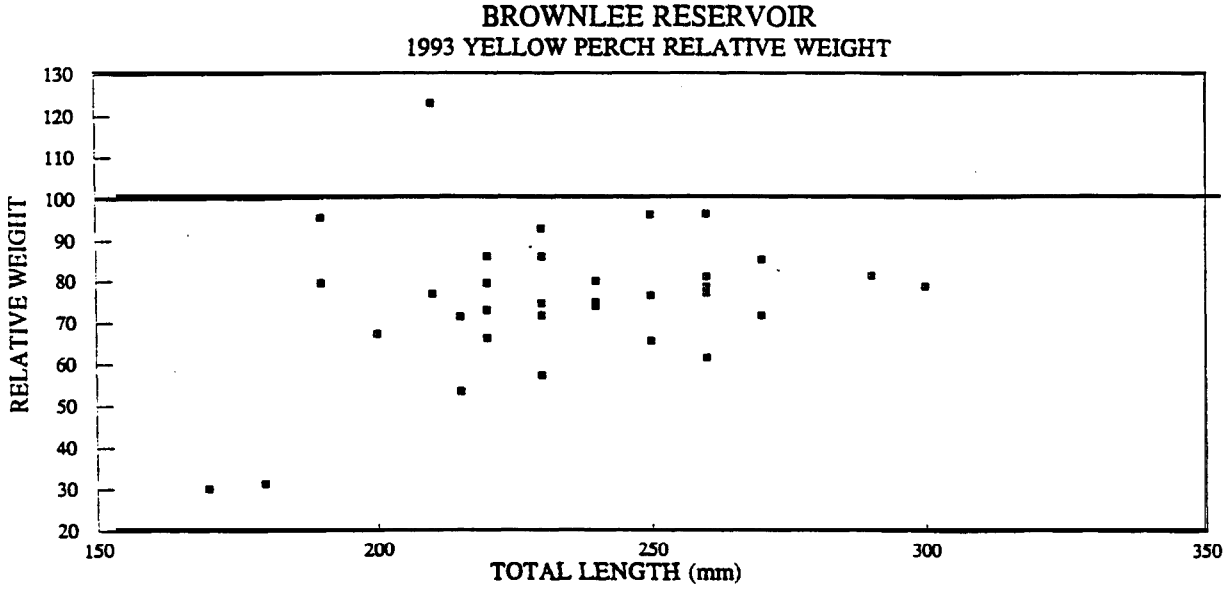
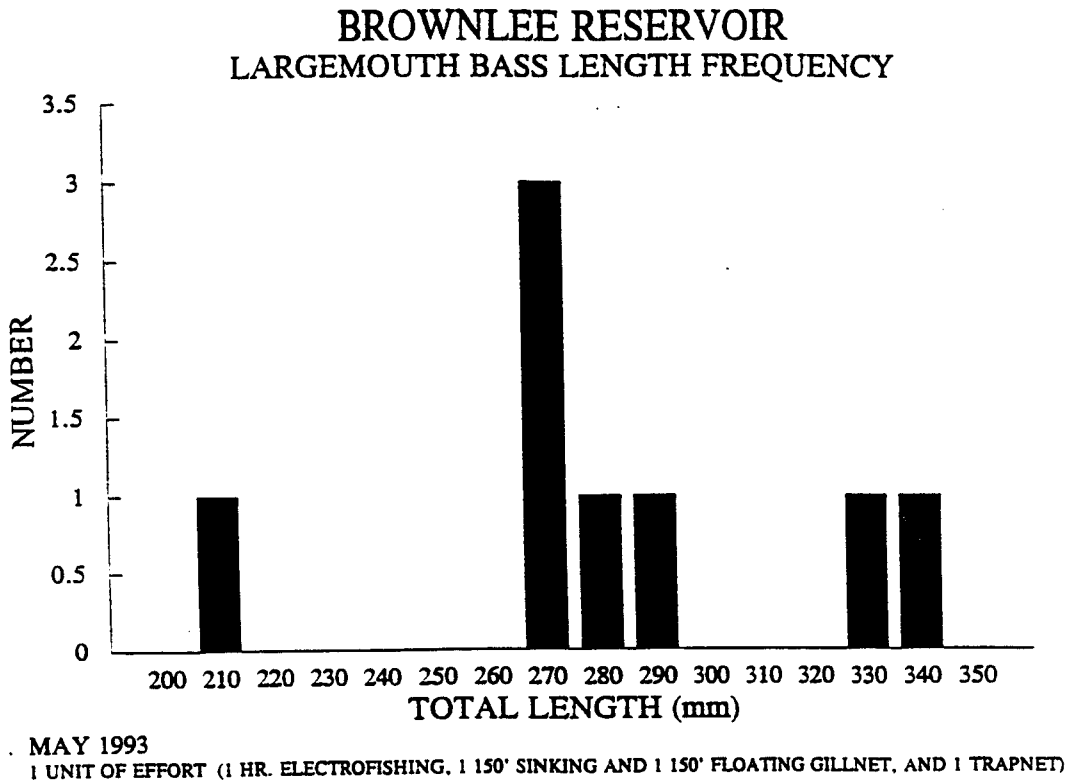


Figure 26. Relative weight of yellow perch in Brownlee Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 8	Age 2 n = 8	Age 3 n = 8	Age 4 n = 6	Age 5 n = 4	Age 6 n = 1	Age 7 n = 1
L = 109.2	L = 168.4	L = 208.7	L = 253.9	L = 277.5	L = 265.1	L = 280.1

Figure 27. Length frequency and length at age of largemouth bass in Brownlee Reservoir, 1993.

Rainbow Trout

Trout were a preferred target species of 44% of the anglers for the winter period (Mabbott and Holubetz 1990), but catch was only 6.9% of the total catch. The 1993 sampling captured very few rainbow trout. Trout were probably underrepresented in the sample because trout tend to concentrate near the dam pool while fishery sampling was reservoir-wide.

Estimates of returns of rainbow trout are low. From 1988 and 1989 fingerling stockings, ODFW estimated return to the creel of 3.5% to 5.4% by number.

Water Quality

The upper one-third of the reservoir is affected by poor water quality in the late summer. The Snake River supplies large amounts of particulates and nutrients. A large fish kill was observed in August 1990 where 28 white sturgeon *Acipenser transmontanus* died (Grunder et al. 1993). Typically, large blue-green algae blooms occur in August and September in the upper riverine section downstream to about Rock Creek. Low dissolved oxygen is associated with the downstream edge of these blooms; the upper end of the reservoir has enough vertical mixing from inflow to maintain adequate dissolved oxygen (Worth and Braun 1993). Brownlee Reservoir will likely have increasing water quality problems in the future.

Recommendations

1. IDFG and ODFW continue early May electrofishing efforts to document trends in fish populations.

2. IDFG and ODFW conduct a joint channel catfish study. The study should focus on life-history of the fish in the reservoir.

C.J. STRIKE RESERVOIR SURVEY

Methods

C.J. Strike Reservoir was sampled during May 25-28, 1993 using a lowland lakes sampling scheme. The sampling used 8 trap nets, 4 settings of 45.7 m floating experimental nets, 4 settings of 45.7 m sinking experimental nets, and 1.7 hours of energized electrofishing time. All data is reported on a per unit effort basis; 1 unit of effort is one trap net overnight, one floating and one sinking gill net set overnight, and one hour of energized electrofishing time. C.J. Strike Reservoir has three basins which are comprised of the Bruneau arm, Dam pool, and the Snake River arm, and all sections were sampled. Data from all sections were

pooled to calculate relative numbers and biomass of the reservoir as a whole. All fish were weighed to the nearest g, measured to the nearest mm, and scale samples were removed from approximately five fish from each centimeter group.

Results

Species Composition and Relative Biomass

Smallmouth bass were the species captured the most per unit effort. Bluegill were the second most numerous fish species followed by yellow perch and bridgelip sucker *Catostomus columbianus* (Figure 28). Creel survey information collected in 1992 documented yellow perch, rainbow trout, bluegill, and smalimouth bass as the top four species harvested by anglers (Allen et al., in press). Rainbow trout accounted for only 3.5% of the species composition per unit of effort, but over 29% of the harvest. Channel catfish were the fifth most numerous fish in the sample, but accounted for only 1.2% of the reservoirs harvest.

Bridgelip suckers accounted for 33.6% of biomass, followed by smallmouth bass with 16.9% of the biomass (Figure 29). Channel catfish, bluegill, and carp were the third, fourth, and fifth species by weight. Forty-four percent of the sample biomass was composed of nongame fish species.

Smallmouth Bass

Smallmouth bass were the most common fish by number and second by weight in our survey (Figures 28 and 29). As in other Snake River Reservoirs, the smailmouth bass was abundant but somewhat small (Figure 30). A legal 305 mm smalimouth bass is on average 5 years old. Relative weight varies slightly around 100, which is better than the relative weight of Brownlee smailmouth bass (Figure 31). Anglers had a harvest catch rate of 0.07 bass per hour and a 0.93 bass per hour catch rate on released fish in 1992 (Allen et at., 1995). Slightly over 11.3% of annual harvest is composed of smailmouth bass.

Channel Catfish

Channel catfish were the fifth most numerous species captured and, due to their relatively large size, the third ranked fish in total sample weight. Length frequency and length at age is presented in Figure 32. The catfish are a relatively young and fast growing population. Compared to Brownlee Reservoir catfish, age 5 catfish in C.J. Strike Reservoir are approximately 120 mm longer at age. Relative weight (Figure 33) is excellent in C.J. Strike Reservoir. The 1992 creel documented rather low harvest for catfish, only 1.2% of total harvest. Less than 10% of anglers were targeting catfish during any season in 1992.

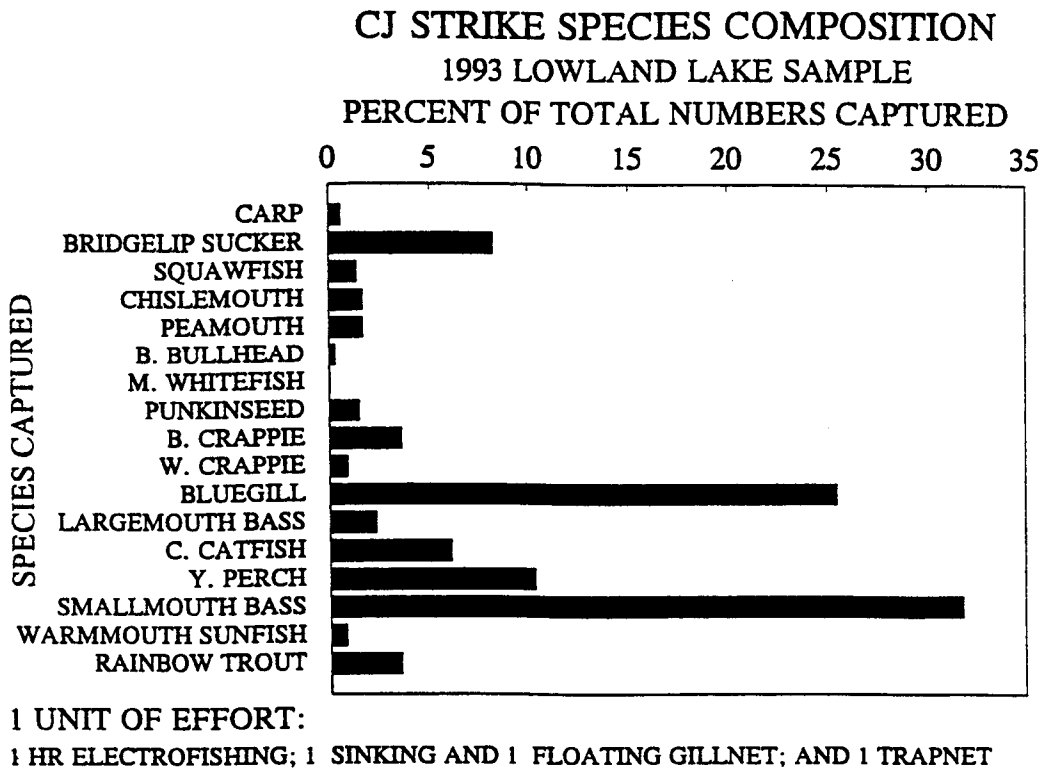


Figure 28. Species composition of C.J. Strike Reservoir in 1993.

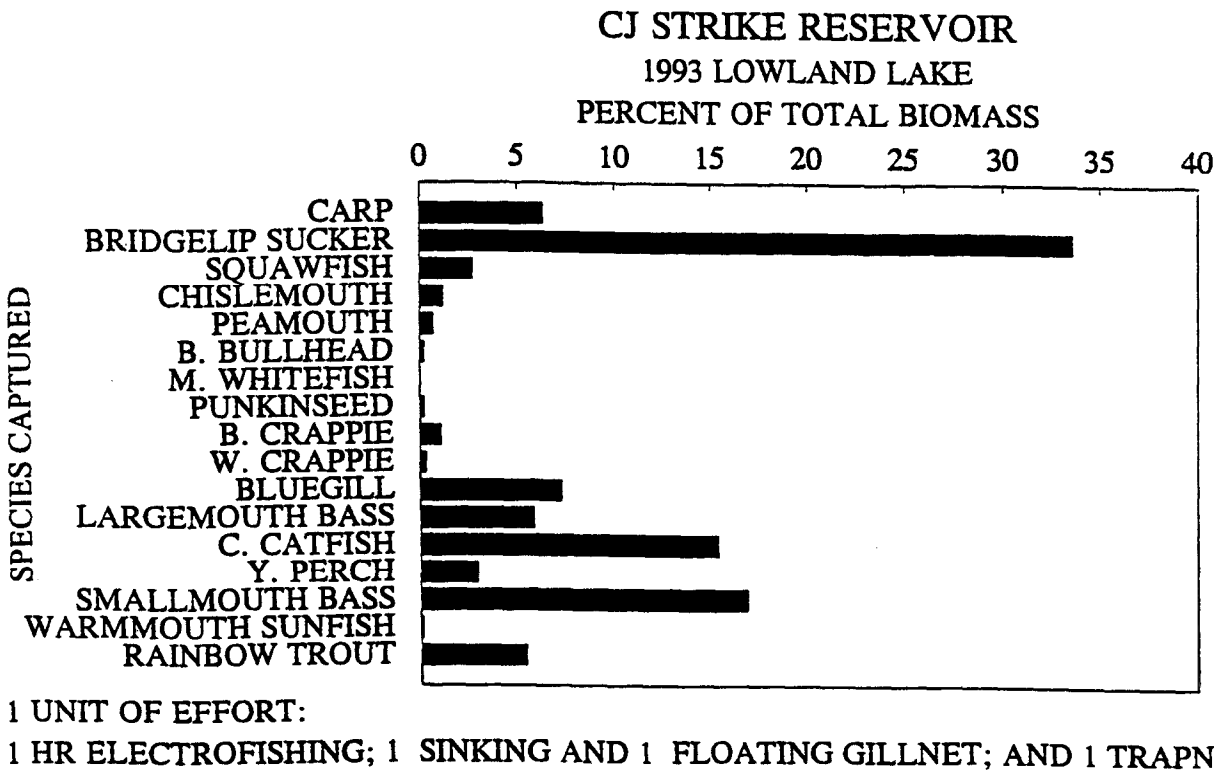
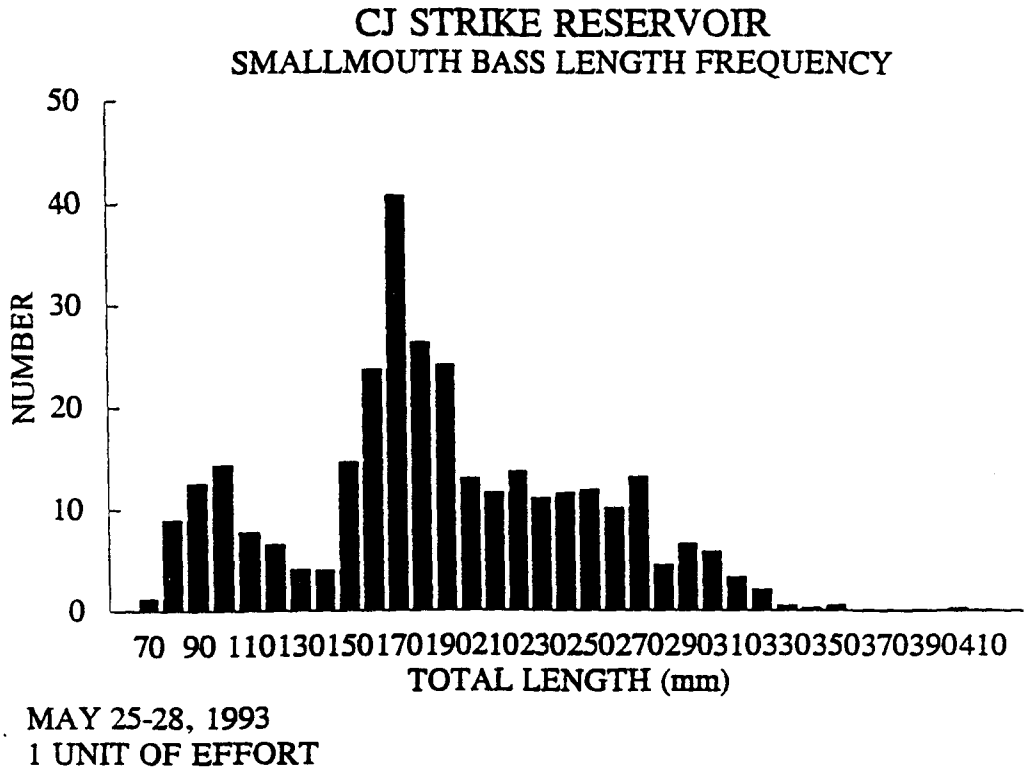


Figure 29. Relative percent of biomass of fish species in C.J. Strike Reservoir.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 107	AGE 2 n = 99	AGE 3 n = 68	AGE 4 n = 37	AGE 5 n = 14	AGE 6 n = 2
L = 99.1	L = 151.9	L = 204.3	L = 250.1	L = 297.0	L =336.8

Figure 30. Length frequency and length at age of smallmouth bass in C.J. Strike Reservoir, 1993.

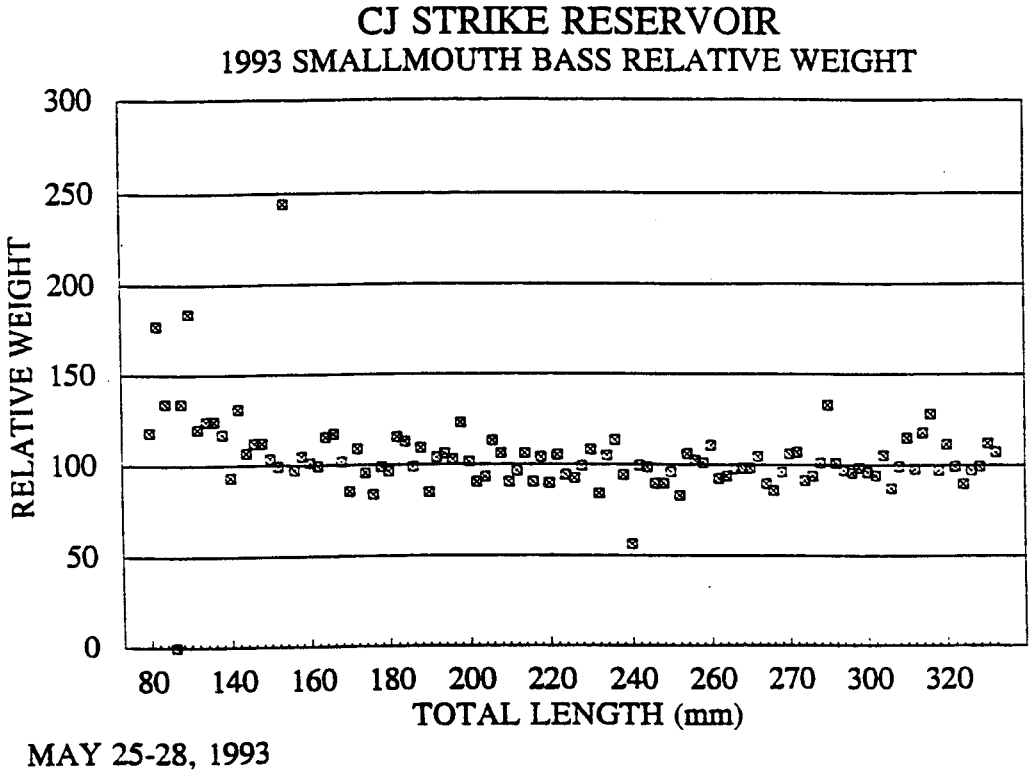
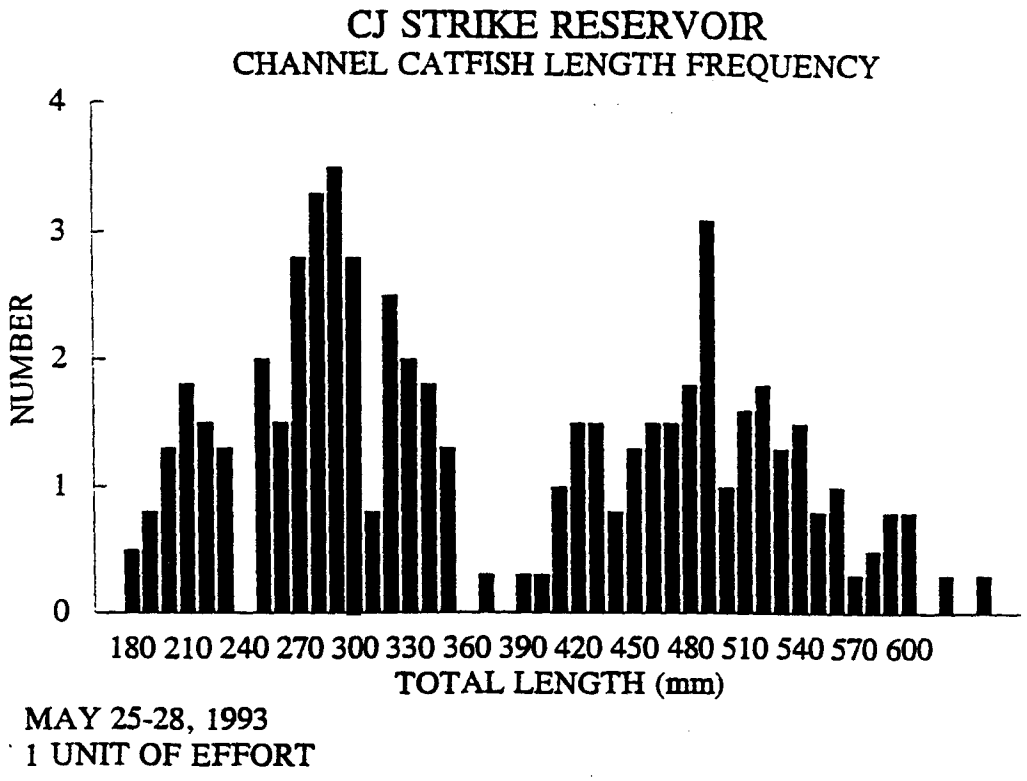


Figure 31. Relative weight of smallmouth bass in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 56	AGE 2 n = 46	AGE 3 n = 29	AGE 4 n = 24	AGE 5 n = 11	AGE 6 n = 2
L= 113.8	L= 180.1	L= 265.9	L= 372.9	L= 451.6	L= 478.6

Figure 32. Length frequency and length at age of channel catfish in C.J. Strike Reservoir, 1993.

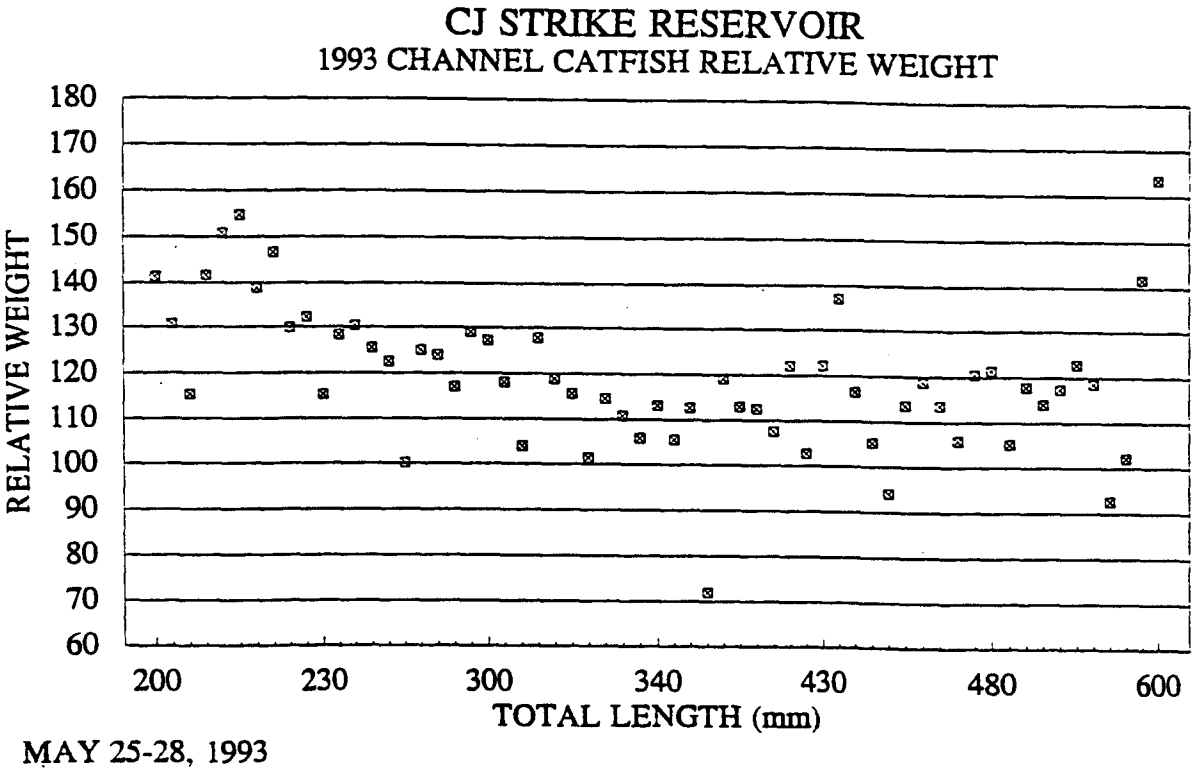


Figure 33. Relative weight of channel catfish in C.J. Strike Reservoir, 1993.

Bluegill

Bluegill population in the reservoir is strong, with bluegill the second most numerous fish species captured. Length frequency and length at age is presented in Figure 34. Total catch rates from 1992 was 1.82 bluegill per hour of effort. The relative weight of bluegill is exceptional (Figure 35). The sampling was conducted just before the bluegill spawned in 1993, and was thus a little inflated.

Yellow Perch

Yellow perch was the third most numerous fish sampled in 1993. The 1992 creel documented yellow perch at 39.6% of total reservoir harvest and as the most numerous fish harvested. Total catch rate was 0.57 perch per hour. Figure 36 shows a large year class of 5 year old fish that should create a good fishery in 1994. Relative weight (Figure 37) was very good with a slight dip with the larger fish.

Largemouth Bass

Length frequency and length at age is presented in Figure 38. Although not common in C.J. Strike Reservoir, largemouth bass tend to be larger than smallmouth bass. Marked legal sized bass that were stocked by IDFG in 1991 accounted for 20.5% of the 38 largemouth bass that were sampled. Relative weight was generally good in the reservoir (Figure 39).

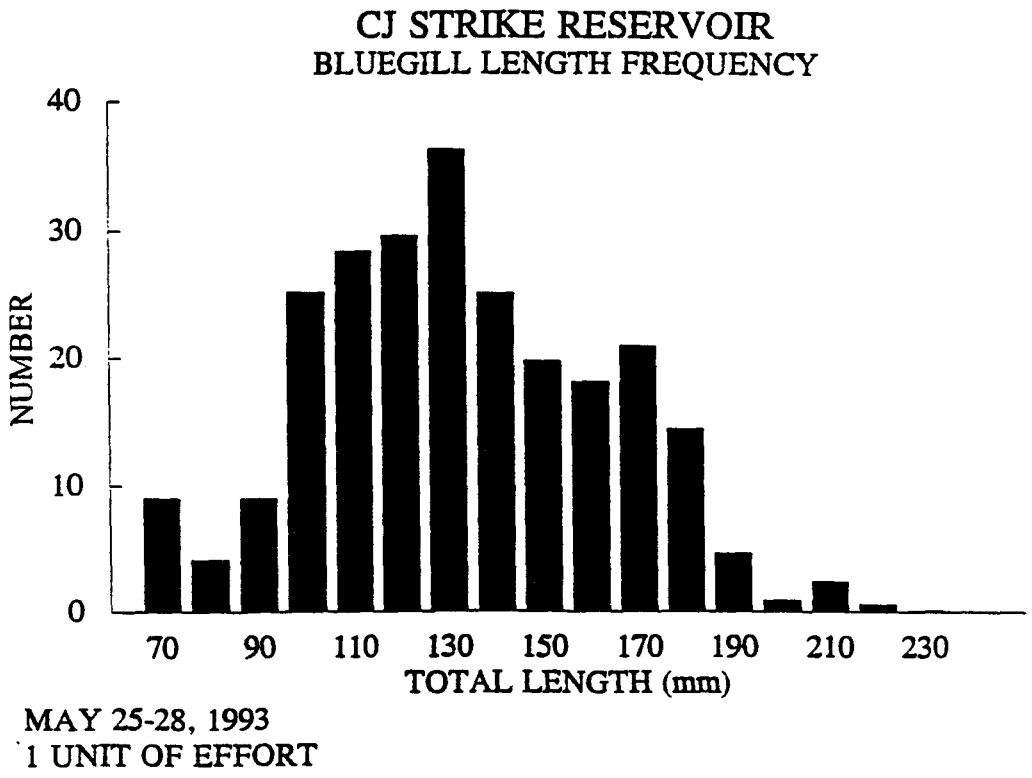
Rainbow Trout

Rainbow trout are stocked into the reservoir in excess of 200,000 fall fingerlings per year. These fingerling return to the angler at age 2 and 3. The length frequency and length at age of sampled trout is presented in Figure 40. The 1992 total catch rate for trout was 0.38 fish per hour. Thirty percent of the reservoir harvest is provided by rainbow trout. The winter fishery in C.J. Strike is over 80% targeted towards trout. The trout tend to be in good condition with some of the larger fish dropping in relative weight (Figure 41).

Black and White Crappie

Both black and white crappie are present in the reservoir, with black crappie being slightly more numerous. The length frequencies of black and white crappie are presented in Figures 42 and 44. Relative weights of both species are very good (Figures 43 and 45). Combined angler total catch rates for crappies in 1992 was less than 0.01 per hour with less than 10% of spring anglers targeting crappies.

REPORT



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 62	AGE 2 n = 60	AGE 3 n = 39	AGE 4 n = 28	AGE 5 n = 21	AGE 6 n = 9	AGE 7 n = 3
L= 52.6	L= 96.7	L=127.8	L=154.5	L=177.5	L=192.3	L=210.8

Figure 34. Length frequency and length at age of bluegill sunfish in C.J. Strike Reservoir, 1993.

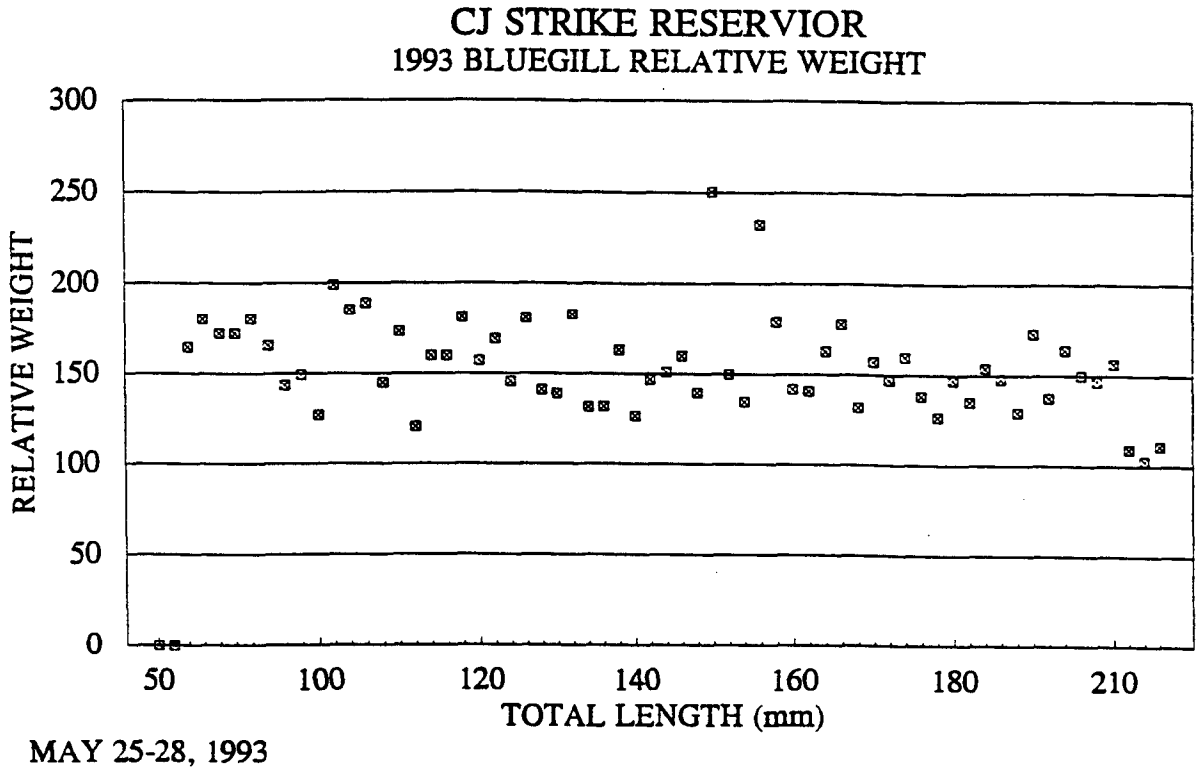
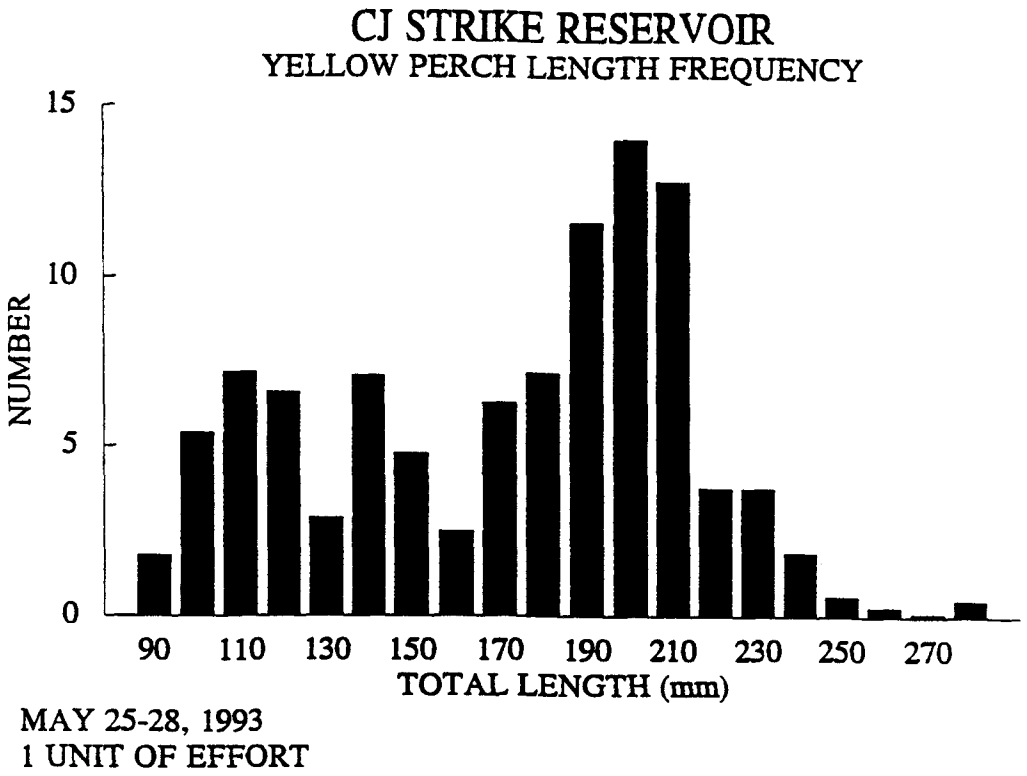


Figure 35. Relative weight of bluegill sunfish in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 71	AGE 2 n = 71	AGE 3 n = 46	AGE 4 n = 21	AGE 5 n = 15	AGE 6 n = 5
L = 85.5	L = 121.2	L = 162.3	L = 184.5	L = 216.3	L =239.8

Figure 36. Length frequency and length at age of yellow perch in C.J. Strike Reservoir, 1993.

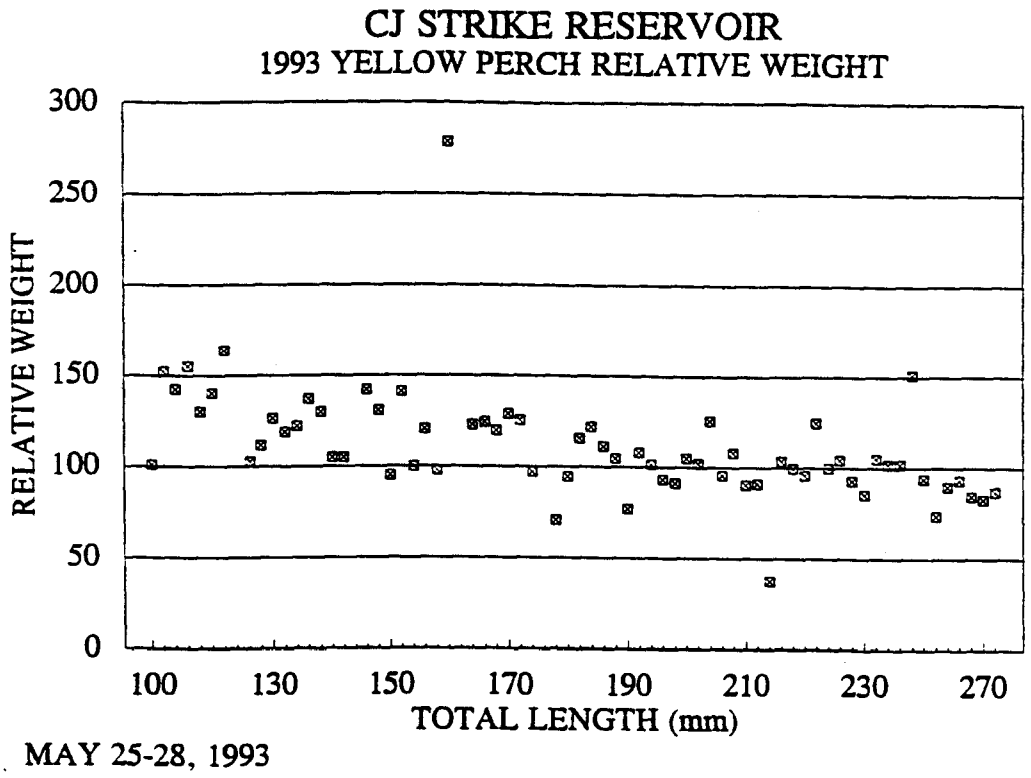
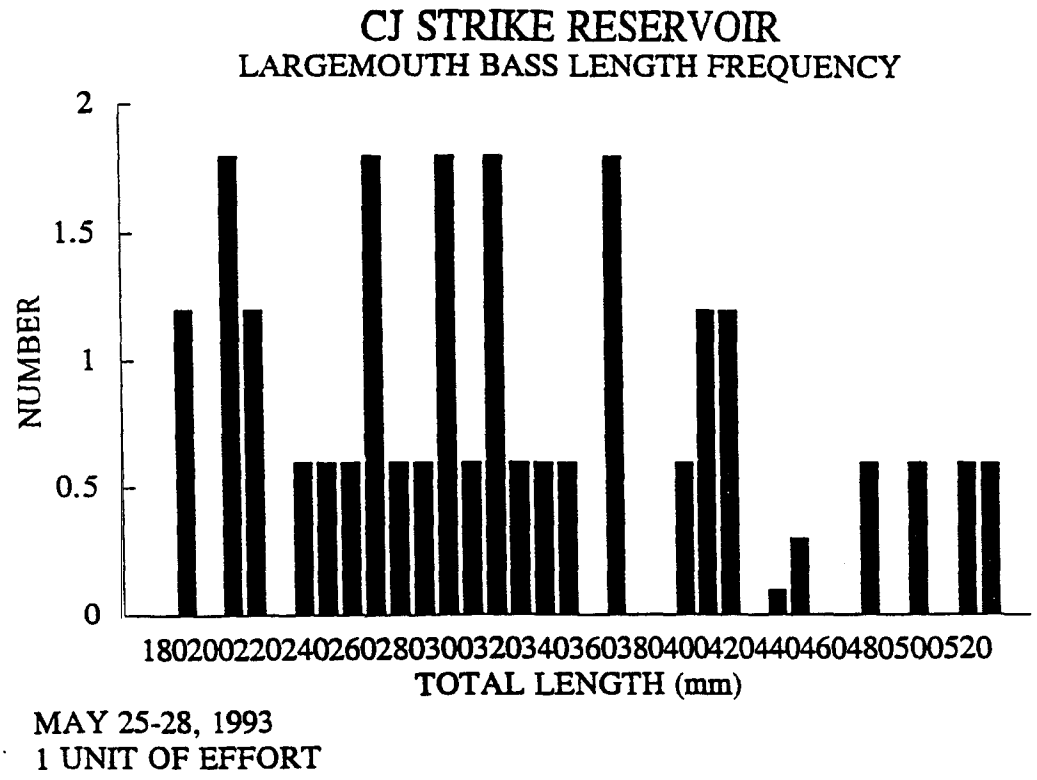


Figure 37. Relative weight of yellow perch in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n= 35	AGE 2 n= 35	AGE 3 n= 32	AGE 4 n= 23	AGE 5 n= 13	AGE 6 n= 9	AGE 7 n= 1	AGE 8 n= 1	AGE 9 n= 1
L = 99.1	L = 162.9	L = 215.3	L = 271.3	L = 325.1	L = 375.8	L = 401.5	L = 443.3	L = 480.6

Figure 38. Length frequency and length at age of largemouth bass in C.J. Strike Reservoir, 1993.

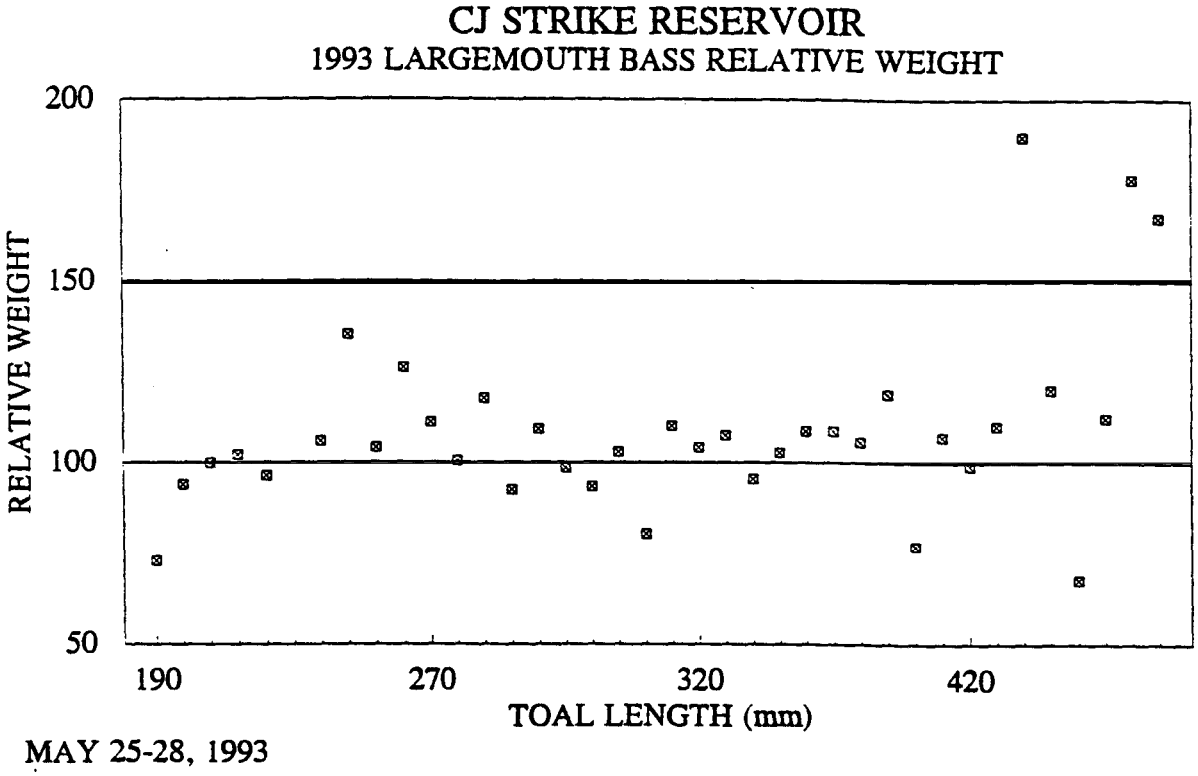
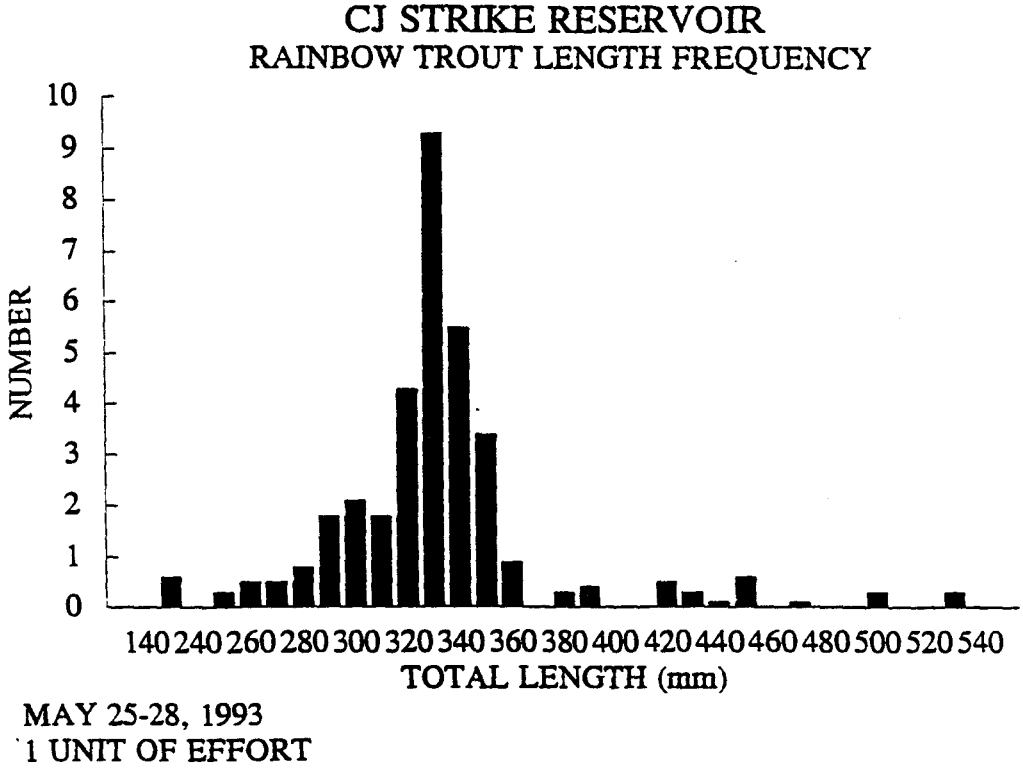


Figure 39. Relative weight of largemouth bass in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 38	AGE 2 n = 28	AGE 3 n = 4	AGE 4 n = 1
L = 161.6	L = 273.3	L = 391.0	L = 461.0

Figure 40. Length frequency and length at age of rainbow trout in C.J. Strike Reservoir, 1993.

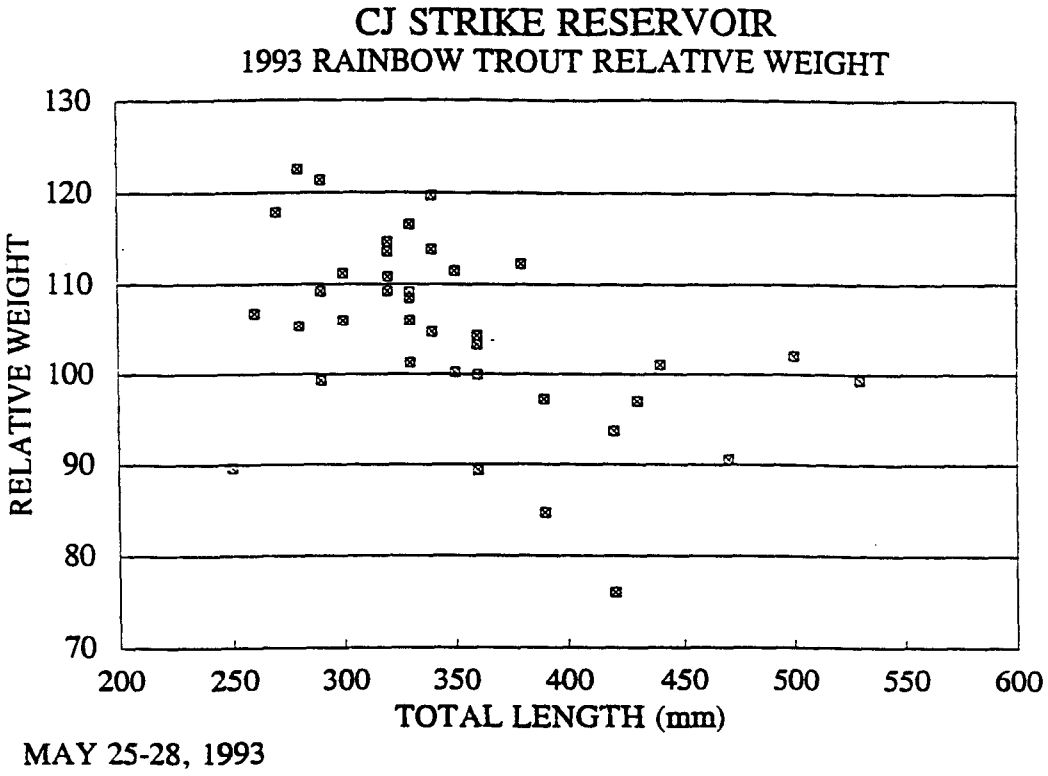
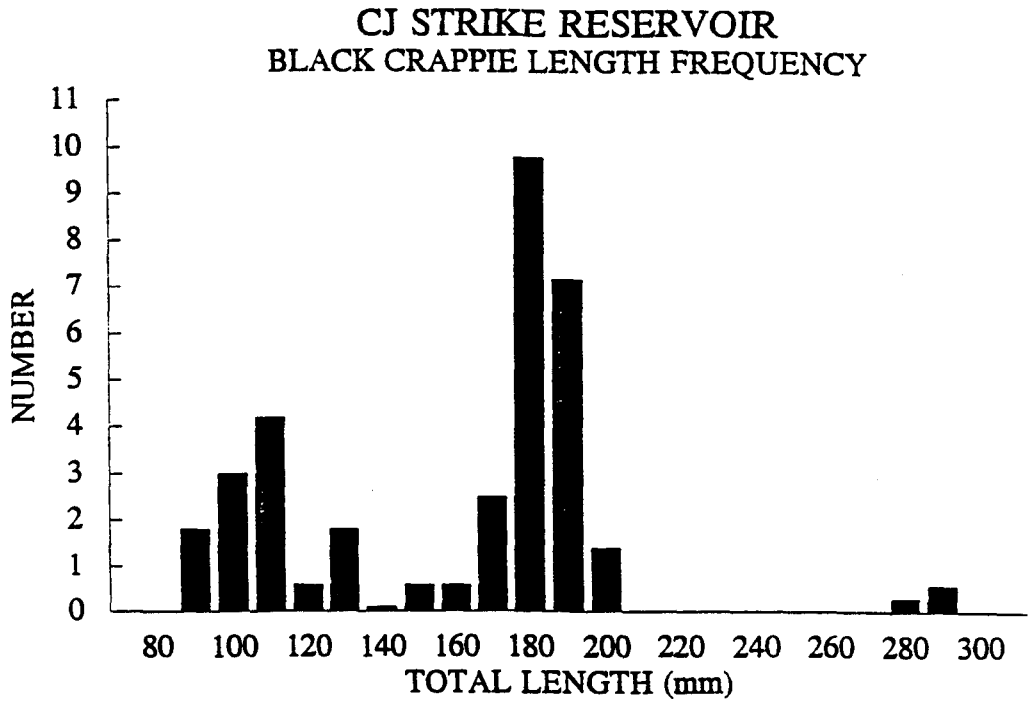


Figure 41. Relative weight of rainbow trout in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

Age 1 n = 34	Age 2 n = 34	Age 3 n = 17	Age 4 n = 1	Age 5 n = 1	Age 6 n = 1	Age 7 n = 1
L = 82.4	L = 119.6	L = 177.7	L = 218.0	L = 238.0	L = 267.9	L = 282.0

Figure 42. Length frequency and length at age of black crappie in C.J. Strike Reservoir, 1993.

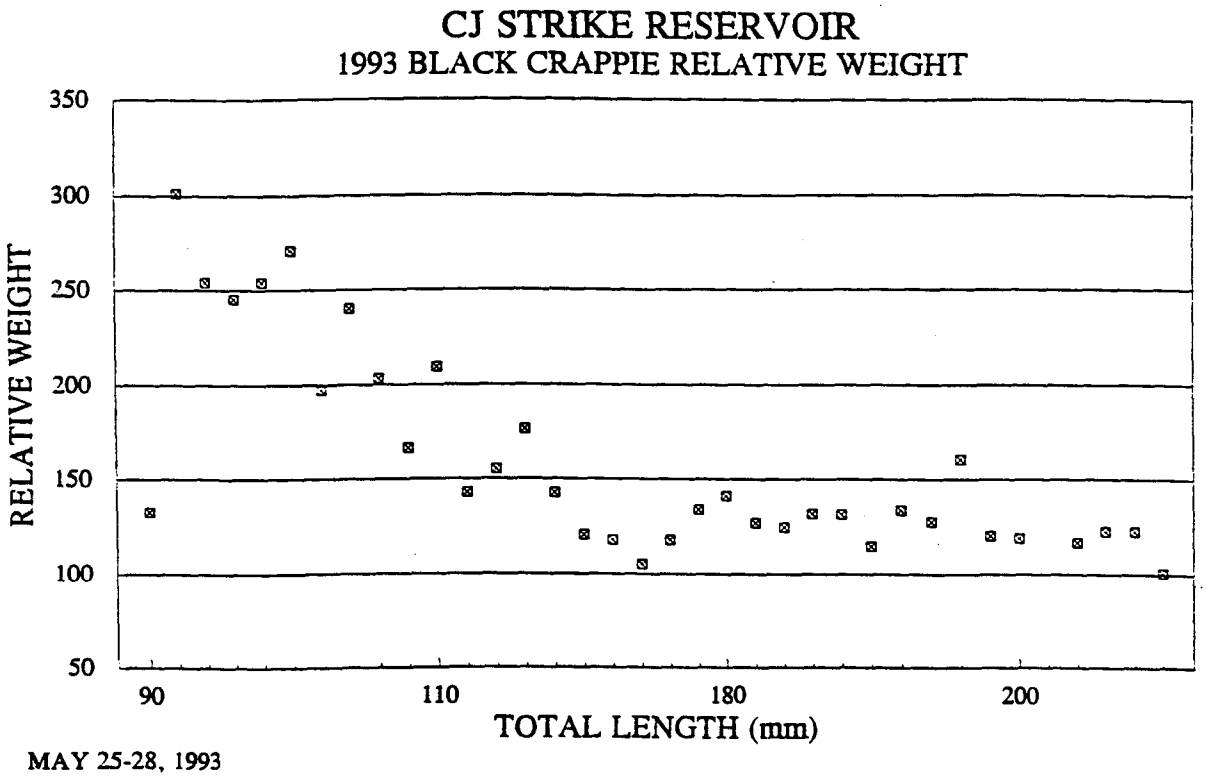
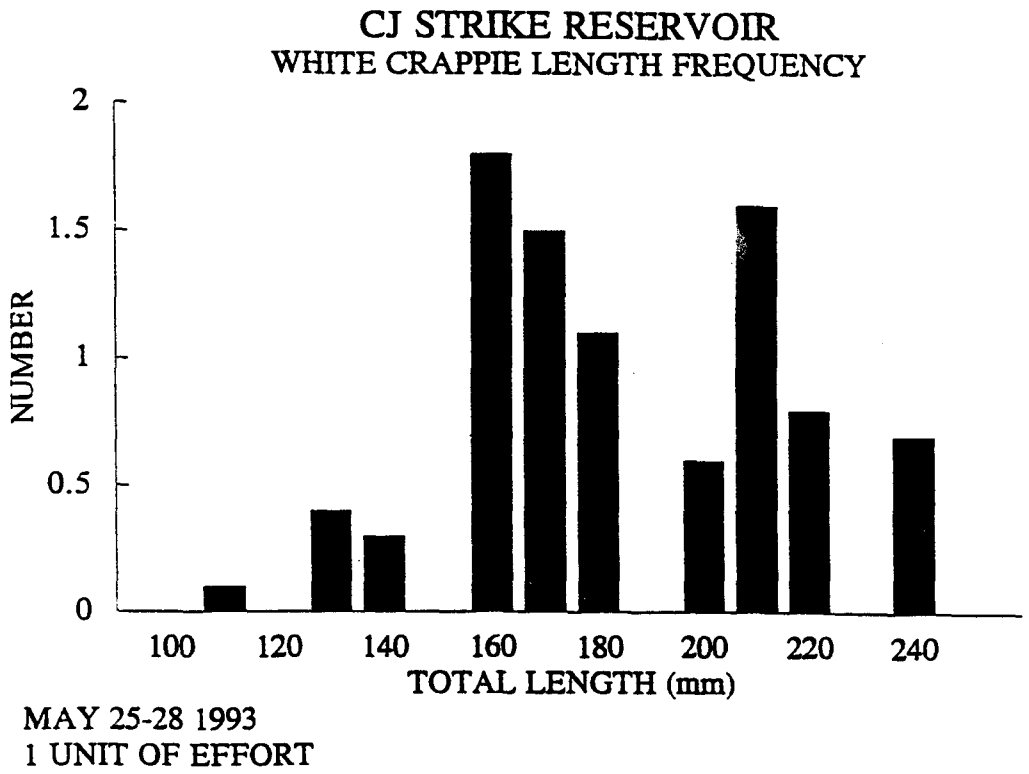


Figure 43. Relative weight of black crappie in C.J. Strike Reservoir, 1993.



Average Back-calculated Lengths for each Age Class in mm.

AGE 1 n = 19	AGE 2 n = 19	AGE 3 n = 13	AGE 4 n = 5	AGE 5 n = 1	AGE 6 n = 1
L= 87.0	L= 134.1	L= 176.0	L= 208.4	L= 208.3	L= 227.0

Figure 44. Length frequency and length at age of white crappie in C.J. Strike Reservoir, 1993.

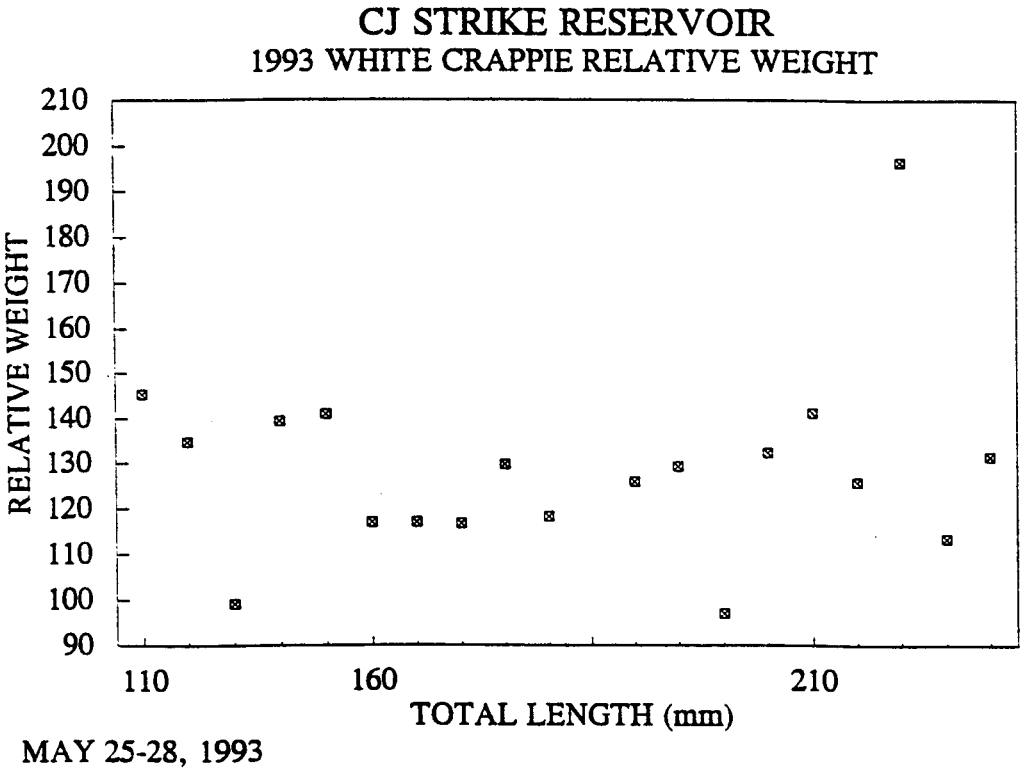


Figure 45. Relative weight of white crappie in C.J. Strike Reservoir, 1993.

Recommendations

1. Conduct complete lowland survey every five years.
2. Conduct electrofishing and gillnetting every other year as time allows.
3. Maintain 12 inch minimum length limit on bass.
4. Monitor bass tournaments as time allows.

OWYHEE COUNTY LAKES

Methods

One floating and one sinking gill net (six 7.6 m panels composed of 1.9, 2.5, 3.2, 3.8, 5.1, and 6.4 cm mesh) and 2 trap nets (two 0.9 m x 1.8 m frames with 1.9 cm bar mesh with 22.9 m lead) were set overnight in Blue Creek (T13S, R2E, S2 and Si 1), Little Blue Creek (T13S, R3E, S16) (May 30), and Shoofly (T13S, R1 E, 26) (May 31) reservoirs in Owyhee County. Water temperature and Secchi disk measurements were also recorded. Trout, bluegill, squawfish, and redside shiners were identified and counted. Suckers (mountain and largescale) were lumped and counted. All fish collected were measured to the nearest millimeter, except bluegill in Shoofly Reservoir where a sample was measured. A sample of trout was weighed to the nearest gram. Scales were collected from a sample of trout.

Results and Discussion

Water temperature and Secchi disk readings at Blue Creek Reservoir at 9 a.m. were 15.5°C and 1.5 m; at Little Blue Creek at 1 p.m. were 16°C and 1.0 m; and Shoofly at 8 a.m. were 15.5°C and 1.0 m, respectively, on May 30 and 31. In addition, clouds of zooplankton were observed in Shoofly Reservoir.

Numbers and mean length of fish collected by floating and sinking gill nets and 2 trap nets is reported in Table 4.

Lahontan cutthroat trout planted in Little Blue Creek and Shoofly Reservoir from late October to mid-November in 1990, 1991, and 1992 averaged 86, 105, and 91 mm, respectively. The largest Lahontan cutthroat trout collected in 1993 were 446 mm and 455 mm from Little Blue Creek and Shoofly Reservoir, respectively. The length frequency of Lahontan cutthroat collected is shown in Figure 46.

Scales were collected and analyzed to determine age from a sample of 17 Lahontan cutthroat trout. Mean length of each age class and back-calculated length at annulus formation

Table 4. Number[a] and mean length of fish collected from Blue Creek, Little Blue Creek, and Shoofly reservoirs, Owyhee County, 1993.

Water	Gear Type[b]	Lahontan cutthroat		Bluegill		Sucker		Squawfish	
		No.	Length	No.	Length	No.	Length	No.	Length
Blue Creek	F					37	295(14)		
	S					5	242(14)	3	184(8)
	T					21	260(17)	6	180(11)
Total						63	279(10)	9	181(8)
Little Blue	F	5	369(25)						
	S	2	179(1)			13	203(9)		
	T	6	185(5)			15	192(8)		
Total		13	255(28)			28	197(6)		
Shoofly	F	15	242(22)						
	S	16	180(3)	2	132(15)				
	T	7	253(24)	206	149(7)				
Total		38	217(11)	208	149(7)				

[a]In addition, 1 redside shiner was collected from the sinking net in Little Blue Creek Reservoir, and 1 brown trout was collected in the floating gill net from Shoofly Reservoir.

[b]Gear Type - F = floating gill net; S = sinking gill net; T = 2 trap nets.

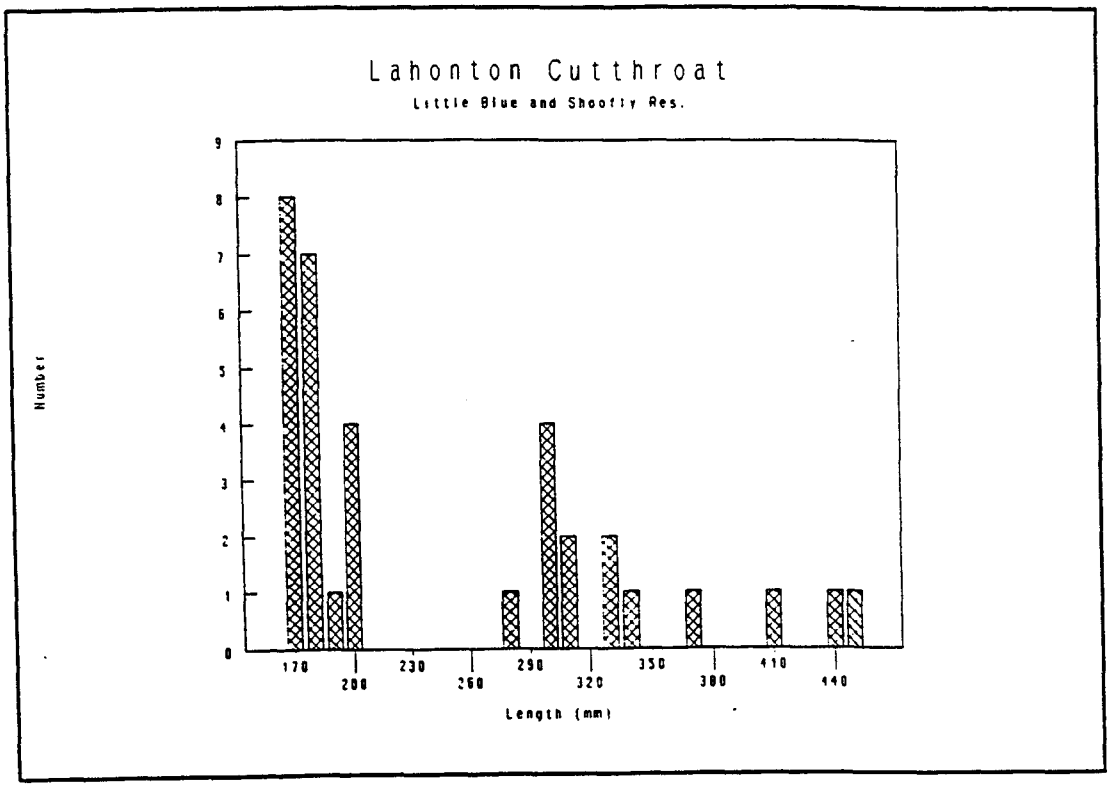


Figure 46. Length frequency of Lahontan cutthroat trout collected in Little Blue and Shoofly reservoirs collected in gill nets, 1993.

information is contained in Table 5. Lahontan cutthroat determined to be age 1 + from the 1992 release ranged from 172 to 207 mm (n = 8); age 2 + from the 1991 release ranged from 304 to 340 mm (n=6); and age 3+ from the 1990 release ranged from 375 to 446 mm (n=3).

The condition factor of a sample of 15 Lahontan cutthroat trout collected from Shoofly Reservoir was 1.18 with a standard error of .082.

No trout were collected from Blue Creek Reservoir. Conditions in the reservoir were suitable for good trout growth and survival at the time of sampling. However, discussions with local ranch personnel indicated very little water remained in Blue Creek Reservoir following the irrigation season and over winter. Until a minimum conservation pool can be arranged for and left in the reservoir over winter, no trout should be planted in this reservoir and no further sampling should be conducted.

Thirteen Lahontan cutthroat trout were collected in Little Blue Creek Reservoir, ranging in size from 176 to 446 mm. The presence of large fish indicates adequate water remains in the reservoir to allow for some overwinter survival. Small numbers of trout collected may indicate overwinter survival is low. Discussions with local ranch personnel indicate in many years adequate water remains in Little Blue Creek Reservoir for trout survival. In 1992, it was extremely dry, however, and less water than normal was in the reservoir over the 1992-1993 winter. Overwinter survival may have been less than normal as a result.

There were no indications that fishermen fished in Little Blue Creek Reservoir. There was no evidence of camping, litter, bait cans, or any other indications of fishermen presence.

Adequate overwinter survival appears to exist to justify continued stocking with Lahontan cutthroat. Growth of planted trout is good. Advertisement of this lake as a potential fishery is necessary to stimulate angler use.

Thirty-six Lahontan cutthroat trout and one brown trout were collected from Shoofly reservoir, ranging in size from 172 to 446 mm. Multiple year classes were present indicating successful overwinter survival.

Discussions with ranch personnel indicate Shoofly Reservoir carries the most water through the winter of the reservoirs netted.

Two anglers were contacted at the reservoir indicating some angling occurs. Use appears to be light.

Shoofly Reservoir also has a population of stunted bluegill. The largest bluegill sampled was 175 mm. High densities of bluegill may negatively impact trout survival. No other species were observed in this lake.

Continued monitoring of fish populations in Shoofly reservoir is recommended to determine the potential of the lake to produce trophy Lahontan cutthroat trout. If impacts from bluegill appear to be negatively impacting trout populations, consider rotenone treatment of the reservoir. Investigate bluegill growth rates to determine potential to develop a bluegill fishery capable of producing bluegill large enough to be desirable to anglers.

Table 5. Length at annulus and mean length of Lahontan cutthroat collected from Little Blue Creek and Shoofly reservoirs, May 1993.

Year Planted	Sample Size	Length at annulus			Mean Length May 1993
		1 +	2+	3+	
1992	8	107			185
1991	6	123	253		321
1992	3	111	226	360	414

WARMWATER FISH TRANSFERS

A considerable amount of personnel time was devoted to collecting warmwater fish species and transferring these fish to lakes and reservoirs that had been impacted by low waters or renovations in 1992 (Table 61. lists the numbers, species, receiving water, and sources of fish.

Table 6. Warmwater fish stocking in Southwest Region (Nampa), 1993.

Receiving Water	Fish Species	Numbers	Source of Fish
Beaches Pond	LMB	140	Purchase
	BLG	701	Purchase
Indian Creek R	LMB	330	Purchase
	CC	3000	Oklahoma purchase
	BLG	1312	Purchase & Private Pond
Star Lane Emmett	LMB	111	Purchase
	BLG	423	Purchase
Crane Creek R	WHITE CRAPPIE	1000	Oxbow Res
Paddock Valley	LMB	432	Purchase
	BLG	1168	Purchase
	BLACK CRAPPIE	1400	Brownlee Res
Mountain Home Res	LMB	100	Crane Falls
	BLG	212	Crane Falls
Park Center Pond	YELLOW PERCH	5000	Cascade Res
Lake Lowell	LMB	275	Eagle Island State Park & Private Ponds
	BLG	419	Same
	BULLHEAD	30	Eagle Island
	BLACK CRAPPIE	12	Private Pond

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JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project I: Surveys and Inventories

Subproject I-D: Southwest Region

Job: c

Title: Rivers and Streams Investigations

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Owyhee County Streams

Sixteen stream segments were sampled for redband trout *Oncornynchus mykiss gairdneri* populations in Owyhee County, Idaho in 1993. Stream segments in the Jordan Creek, Red Canyon Creek, and Deep Creek drainages were sampled. Ten of the 1 6 stream segments contained redband trout in the 1993 survey, with densities ranging from 0.3 to 102 redband trout/100 m^2.

Stream riparian habitat data were collected at all survey sites. Habitat variables measured included stream transect lengths, widths, depths, gradient, bank stability, instream fish cover, greenline, and percent shading.

Several water quality variables were collected at each site. Water temperature ranged from 6.5°C to 22.0°C, dissolved oxygen ranged from 7.7 to 11.4 mg/I, and water conductivity ranged from 34.1 to > 1000 uS/cm^3.

Ten of the stream segments sampled had been previously sampled in 1976, 1977, or 1991. In three transects, populations had increased over previous samples, one had remained the same, and six had decreased. It is recommended that the redband trout stream and habitat surveys be continued until stream segments in all drainages are sampled.

South Fork Boise River

The rainbow trout *O. mykiss* population in a 9.6 km section of the South Fork Boise River below Anderson Ranch Dam was estimated to be 4,540 trout greater than 249 mm. Estimates were made using Peterson mark-recapture methods. Trout were collected using electrofishing equipment.

Mean length, weight, and condition of rainbow trout collected was 341 -nm, 468 g, and 1.03, respectively.

In addition to rainbow trout, nine bull trout *Salvelinus confluentus* between 320 and 480 mm total length were collected.

Back-calculated length at age estimates based on scale analysis estimated age 1 to 6 year old rainbows average 104, 192, 289, 351, 381, and 408 mm when respective annuli were formed.

Middle Fork Boise River

Fourteen snorkeling transects were repeated that were originally established in 1988. Average wild rainbow trout densities were slightly increased from 0.92/100 m^2 in 1988 to 0.98/100 m^2 in 1993. Larger wild rainbow trout (> 300 mm) increased over 10-fold in average density from 0.004/100 m^2 in 1988 to 0.05/100 m^2 in 1993.

Sulphur Creek

Sixteen snorkeling transects were repeated in August 1993.

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OWYHEE COUNTY STREAMS

Introduction

This report presents fish population and stream habitat data collected on the Owyhee and Bruneau Resource Areas of the Bureau of Land Management (BLM) lands in Owyhee County, Idaho. Data was collected by Idaho Department of Fish and Game (IDFG) Southwest Region Fisheries Management staff under a Challenge Cost Share Project with the Boise District BLM.

Redband trout *Oncorhynchus mykiss* populations historically occupied perennial drainages in Owyhee County, Idaho (Behnke 1992). Sampling of these redband trout populations from 1976 to 1991 documented fragmented populations composed of small numbers of redband trout. Drought conditions experienced from 1987 to 1992 likely negatively impacted these redband trout populations. The main objectives of this survey were:

1. To determine redband trout density estimates for previously sampled stream segments.

2. To establish trout density estimates for unsurveyed stream segments.

3. To measure stream substrate, bank stability, instream fish cover, solar input, composition of greenline plant communities, and water quality.

Study Area

All stream surveys were conducted in Owyhee County, Idaho on BLM lands in the Bruneau and Owyhee Resource Areas of the Boise District. Seven stream segments were sampled in the Jordan Creek drainage. Of these sites, six had been sampled in previous surveys (Figure 1). Three sample sites, two previously sampled, were on Red Canyon Creek, a tributary to the Owyhee River (Figure 2). The third grouping of nine stream segments, one previously sampled, were on Deep Creek and its tributaries (Figure 3). The Deep Creek group of stream segments were in the area of the proposed Idaho Training Range (U.S. Air Force 19931.

Methods

Fish Populations

On streams with previously established transects, transects were located using historic transect information (BLM data, unpublished). New transects were established with identifiable boundaries when necessary. Descriptions of all transect locations are presented in Appendix A.

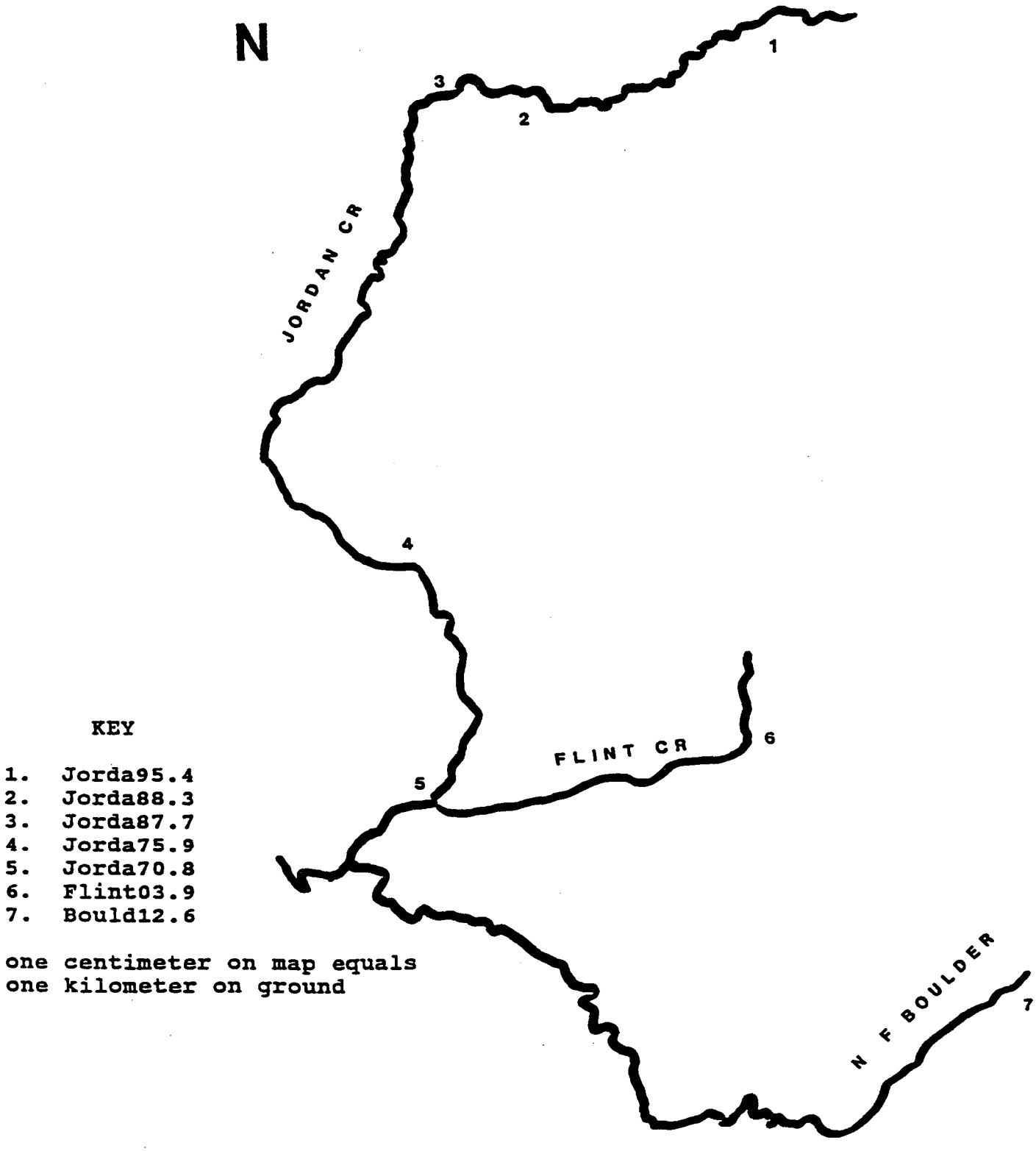


Figure 1. Stream sample sites on Jordan Creek drainage in Owyhee County, Idaho, 1993.

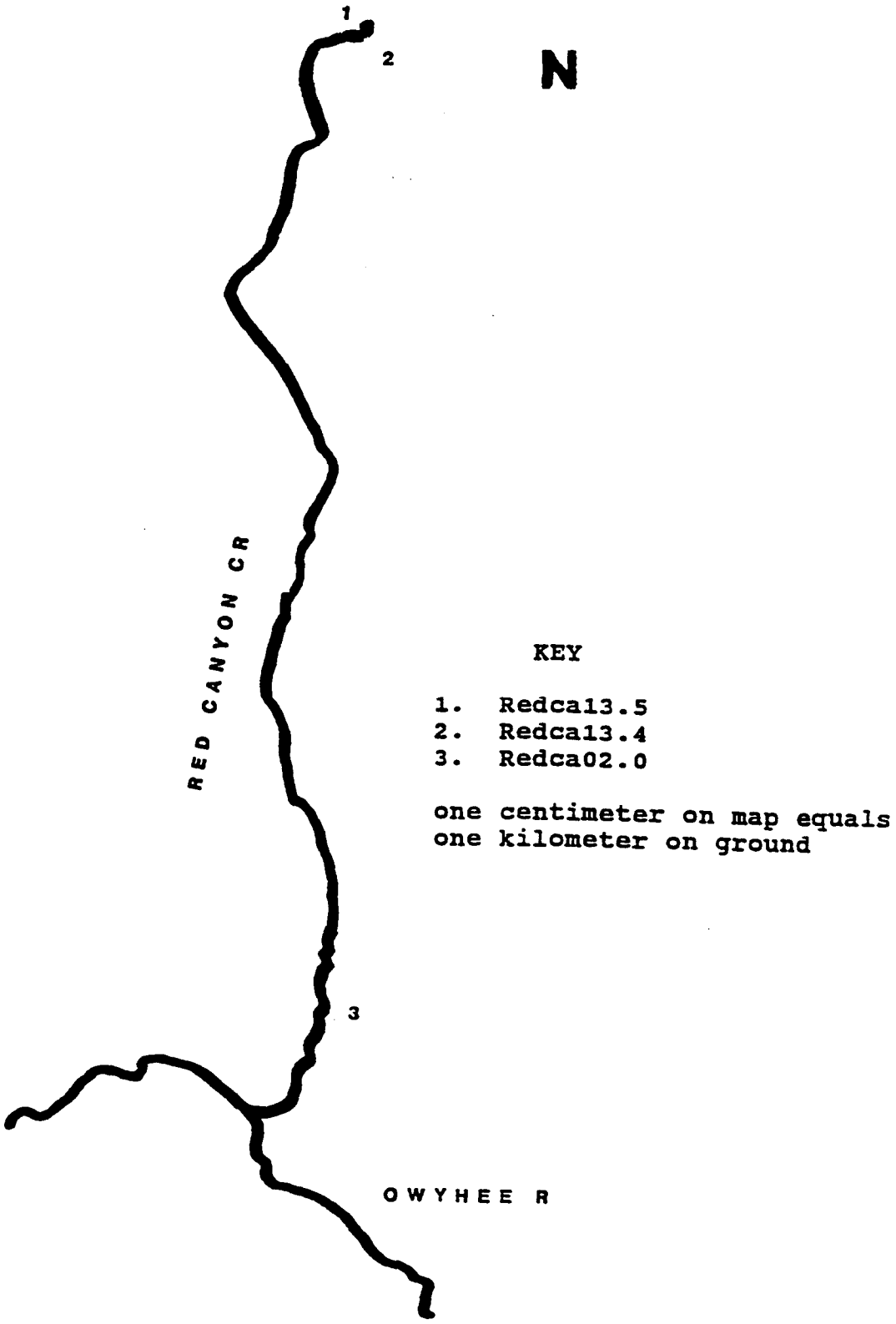


Figure 2. Stream sample sites on Red Canyon Creek drainage in Owyhee County, Idaho, 1993.

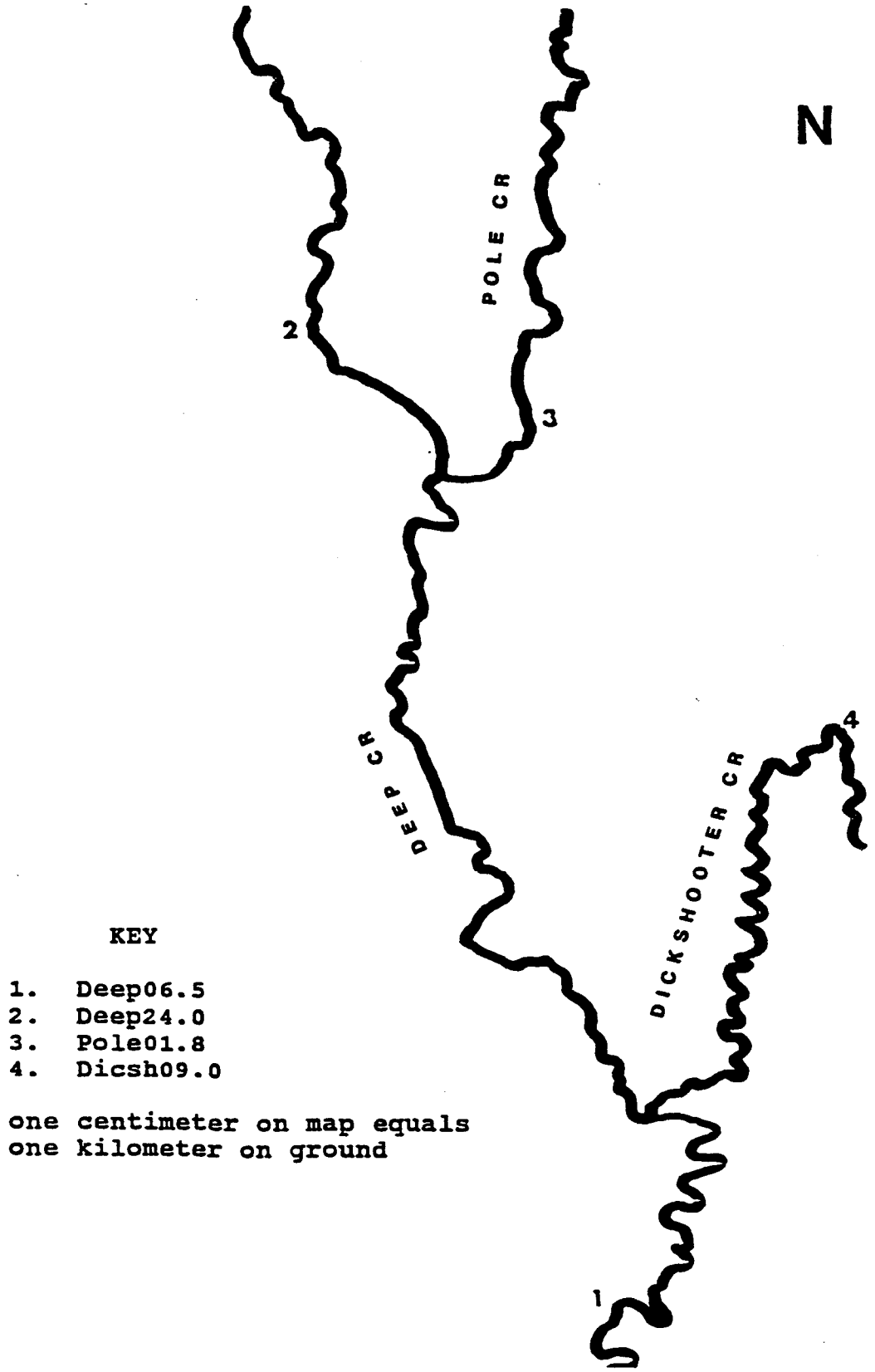
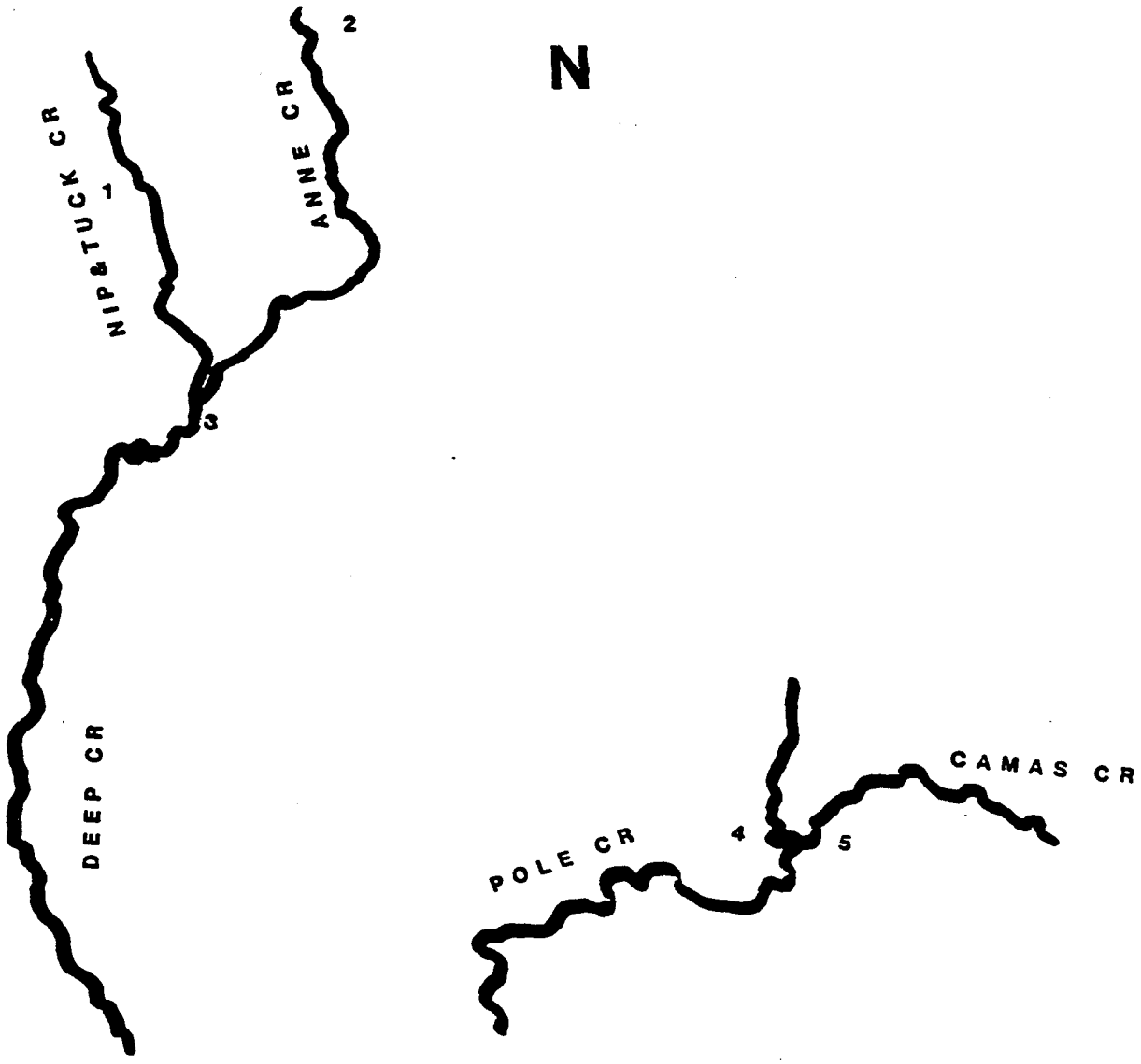


Figure 3. Stream sample sites on Deep Creek drainage in Owyhee County, Idaho, 1993.



KEY

1. Nip&Tuck03.0
2. Anne02.5
3. Deep38.0
4. Pole14.5
5. Camas0.5

one centimeter on map equals
one kilometer on ground

Figure 3. Continued.

Transects were greater than 61 m in length. Upper and downstream transect boundaries were located at stream constrictions to minimize fish migration during electrofishing.

A Smith-Root Model 15-B backpack electrofishing unit was utilized by two people electrofishing from the lower to the upper transect boundaries. All fish species encountered were netted and placed in buckets which were kept cool in the stream. We made three electrofishing passes, removing and segregating the fish from each pass. If no redband trout were encountered on the first pass and collection conditions were considered good, no further electrofishing passes were completed. All fish collected were measured to the nearest mm, weighted to the nearest g, and a scale sample was collected from at least five fish per centimeter group, and then released.

Collected trout scales were mounted on acetate sheets and pressed with a Carver Heat Press to create a readable impression in the acetate. The acetate impressions were then used in a microfiche reader where the focus, annuli, and margin were identified and marked on a slip of paper. The annuli marks were entered on a digitizing pad and the DisBCal 89 V1.0 Program in the Fishery Analysis Tools software of the Missouri Department of Conservation. This program produced average back-calculated lengths for each age class of trout.

Redband trout population estimates and confidence intervals were calculated by the removal method of Deventer and Platts (1987). Trout densities were calculated by dividing the population estimate by sampled area and reporting as trout/100 m^2. All trout captured, including young of the year trout, were used in calculating densities.

Stream Habitat

Within each stream transect a 61.0 m habitat transect was established. Ten stream widths were measured at 6.1 m intervals beginning 6.1 m (20 feet) from the bottom of the transect. At each cross section, depth measurements were taken at 1/4, 1/2, and 3/4 points across the channel. Substrate composition was determined with standard IDFG methods utilizing a view box and categorizing the substrate by size class (Petrosky and Holubetz 1988).

Instream fish cover was a subjective visual assessment of several parameters and was recorded for each cross-section as the percentage of the stream width defined as cover. For this study cover was defined as areas where redband trout were likely to be found: 1) pools > 0.45 m (> 1.5 feet) in depth, 2) overhanging bank vegetation, 3) instream vegetation, 4) near large instream rocks, 5) velocity breaks, i.e. broken water surface, 6) pocket water behind or beside large rocks, and 7) near large woody debris.

Stream gradient was measured using an ocular hand level and a stadia rod. Gradient is the vertical drop between the upstream and downstream transect boundaries divided by the stream segment length and reported as a percentage.

Streambank stability measurements were a visual assessment to determine the vulnerability of the bank slopes to erosion (Platts et al. 1983). Four classes were used to rate the stability of the streambanks. Covered and Stable: over 50% of banks in healthy vegetation and/or anchoring rocks. The banks did not show signs of erosion. Covered and Unstable:

more than 50% of streambank covered by vegetation but signs of erosion were present. Uncovered and Stable: less than 50% of stream bank covered by vegetation or anchoring rock. Does not show signs of erosion, i.e. banks were bare but not vertical or slumped. Uncovered and Unstable: less than 50% covered with vegetation. Banks show some erosion, i.e. slumped or vertical bare banks.

Thermal input to the stream waters was measured using a Solar Pathfinder" following Platts et al. (1987). Percent stream shading was reported as the average percent of shading on the stream surface during June through September at 10 points along the transect.

The "greenline" is the first continuous cover of perennial vegetation above the stable low water level (USDA 1992). We determined the composition of plant communities along the greenline on both banks for each stream transect. Streambank distances were summed for each community type and the percentage of the total greenline made up by each community type was calculated for each transect.

Water Quality

Several water quality parameters were measured at each stream segment. Dissolved oxygen was measured with a YSI Model 57 meter and probe. Conductivity measurements were taken with a Hanna Instruments hand-held meter. Alkalinity and hardness measurements were taken with Hach Company field titration kits, and pH was measured with a pH pocket pen. Water and air temperature were recorded with a pocket thermometer at each site. Time of day was also recorded when the measurements were taken.

Results and Discussion

Fish Populations

Population estimates and fish per 100 m^2 for stream transects sampled in 1993, along with historical population estimates are presented in Table 1. Of the ten sites resampled in 1993, six sites had reduced densities from the previous sample date, three revisited sites had increased densities, and one site had the same density.

Observations and the data support that the presence of redband trout decreases downstream in the Jordan Creek drainage. Trout densities for the uppermost site (Jorda95.4) were higher than the downstream sites for both sample years (Table 1). The tributary streams Flint and Boulder also support viable populations of redbands (Table 1).

Of the three sites resampled on Red Canyon Creek, one site had a higher density in 1993, one the same, and one site had a lower density than when it was previously sampled. Stream segment Redca 13.5, which was inside the Trout Springs exclosure, contained no trout in 1993 versus a trout density of 23/100 m^2 measured in 1991. Because of the stream's small size at this location, the drought may have affected the trout population in this stream segment.

Table 1. Population estimates and densities of redband trout in 1993 and historical sampling in selected streams in Owyhee County, Idaho.

Site	Location	Date	Population	Density Trout/100 m^2
JORDA95.4	T4S R3W S31	7/93	54 (4.9)	15.5
		6/77	86 (16.2)	10.2
JORDA88.3	T4S R4W S31	8/93	4 (0.6)	0.9
		8/76	29 (0.0)	13.9
JORDA87.7	T5S R4W S6	9/93	1 (0.0)	0.3
		6/77	5 (1.0)	1.2
JORDA75.9	T6S R5W Si	8/93	4 (0.0)	1.2
		8/77	6 (0.9)	3.2
JORDA70.8	T6S R4W S19	8/93	1 (0.0)	0.3
		8/76	7 (0.0)	2.2
FLINT03.9	T6S R4W S22	9/93	70 (0.9)	40.0
		7/77	62 (46.3)	11.7
BOULD14.8	T6S R3W S28	8/77	80 (594)	38.6
BOULD12.6	T7S R3W S5	9/93	19 (13.4)	7.8
REDCA13.5	T11S R5W S25	10/93	0	0
		9/91	69 (0.2)	23.0
REDCA13.4	T11S R5W S25	10/93	1 (0.0)	1.2
		9/91	1 (0.0)	1.3
REDCA02.0	T12S R4W S18	10/93	91 (7.3)	29.4
		9/91	13 (0.6)	9.0
DEEP06.5 *	T13S R2W S7	10/93	0	0
DEEP24.0*	T11S R3W S22	10/93	0	0
DEEP38.0*	T10S R3W S3	10/93	0	0
		10/76	10 (0.0)	23.0
NIP&TUC3.0*	T9S R3W S27	10/93	112 (8.9)	102.0

Table 1. Continued.

POLE1.8*	T11S R3W S24	10/93	0	0
ANNE02.5 *	T9S R3W S23	10/93	DRY	DRY
POLE14.5*	T10S R2W S28	10/93	0	0
CAMAS0.50*	T10S R2W S28	10/93	0	0
DICSH9.0*	T11S R2W S9	10/93	0	DRY

* Indicates segments within or near the Idaho Training Range, (U.S. Air Force, 1993).
( ) indicate ± 95% confidence interval.

Eight of the nine transects sampled in the Deep Creek drainage, contained no trout, the ninth (Nip&Tuck3.0) contained the highest densities of the 16 sections sampled. Historical BLM data (1970s) document low densities at several sites on Deep Creek (BLM, unpublished data). Based on nine sampled transects in 1993, trout populations appear to be reduced.

Several additional fish species were collected during the 1993 surveys. Species observed were longnose dace *Rhinichthys cataractae,* leopard dace *R. falcatus,* speckled dace *R. oscu/as,* redside shiner *Richardsonius balteatus,* mountain sucker *Catostomus platyrhynchus,* chiselmouth Acrocheilus *alutaceus,* northern squawfish *Ptychocheilus oregonensis,* smallmouth bass *Micropterus dolomieu,* and sculpin species *Cottus* sp.

Age and Growth

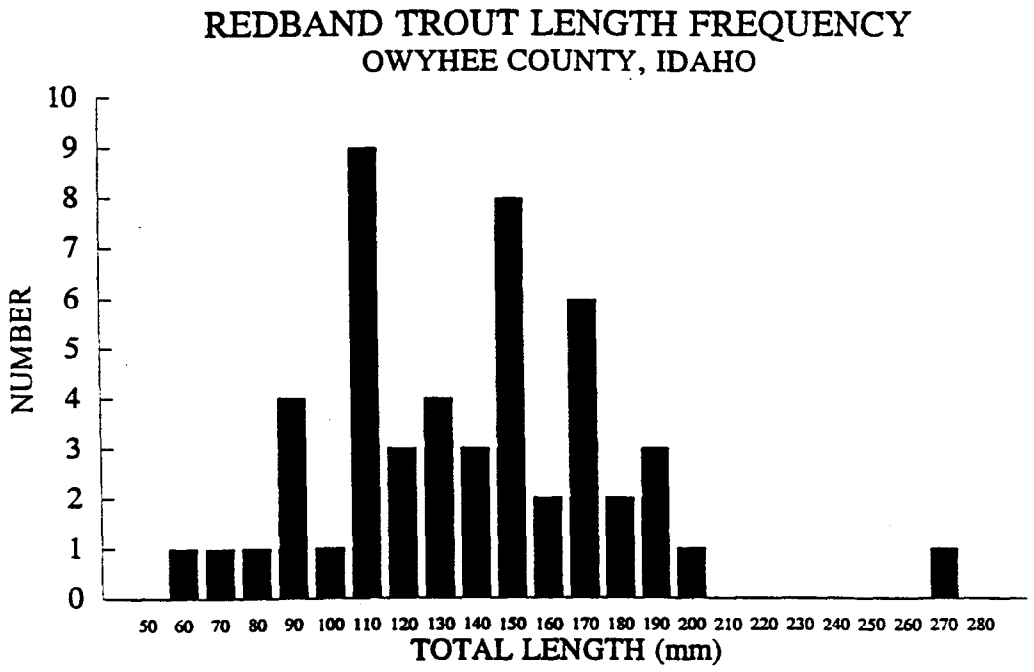
Accurate age determination for different redband populations was difficult because of the large percentage of regenerated scales encountered per fish. Generally, the different redband populations had similar growth rates. The stream section Jorda95.4 was the only population sampled that had age 4+ fish present (Figure 4). Most trout populations sampled were small and did not contain all year classes (Figures 5-9). Stream sections Jorda95.4 and Nip&Tuck03.0 (Figures 4 and 10) length frequency and age data may be the best representations of redband populations due to the larger number of fish collected.

Ten of the 16 stream segments sampled contained redband trout (Table 1), and of these, only 2 had a "healthy" population density and age structure (Figures 4 and 10). These data indicate that redband trout populations in the areas sampled were fragmented and were composed of generally a few individuals. The sampled populations had missing year classes, were highly variable in year class strength, and were generally short lived.

Comparisons with previous data sets for age and growth were not possible because of lack of historical data.

Habitat

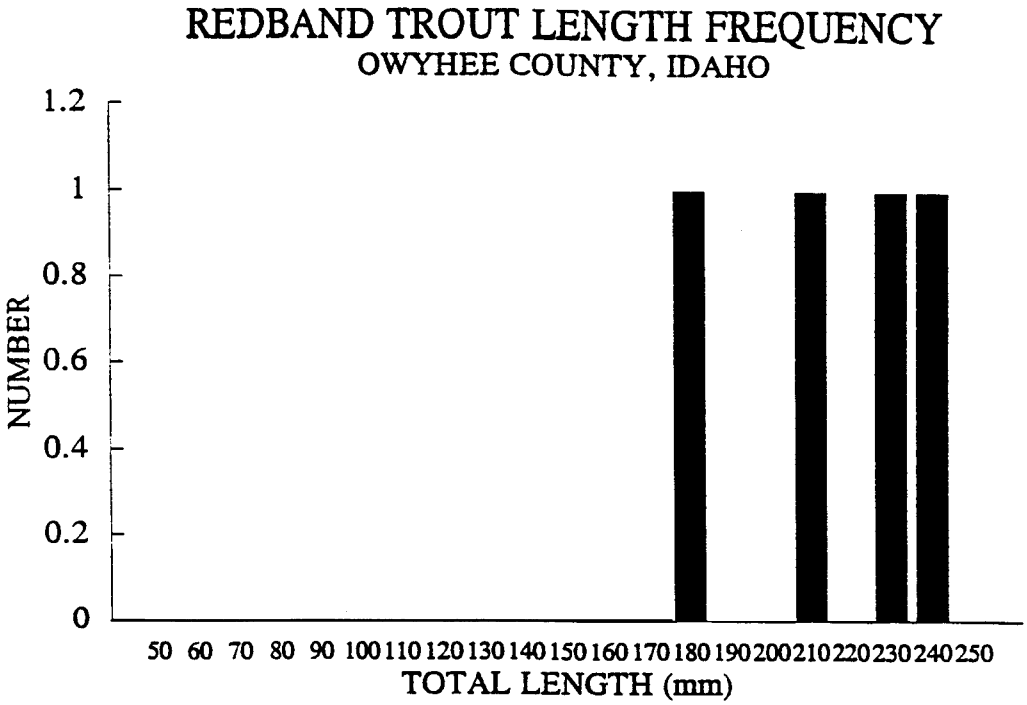
Several habitat variables were collected in 1993. Data were collected to document baseline stream riparian habitat conditions. Stream habitat variables average width, average depth, gradient, and percent substrate composition are presented in Table 2. Percent of streambank cover and streambank stability are presented in Table 3. Percent shade quality, derived from the Solar Pathfinder'"', percent instream fish cover, and percent of vegetative community types, derived from the "greenline" data collection are summarized by stream segment in Appendix A.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculation Age			
Year Class	Age	N	1	2	3	4
1992	1	20	78.20			
1991	2	17	91.60	133.03		
1990	3	9	78.99	118.50	150.13	
1989	4	3	85.70	121.00	152.15	180.54
ALL CLASSES			83.45	127.28	150.63	180.54
N		50	49	29	12	3

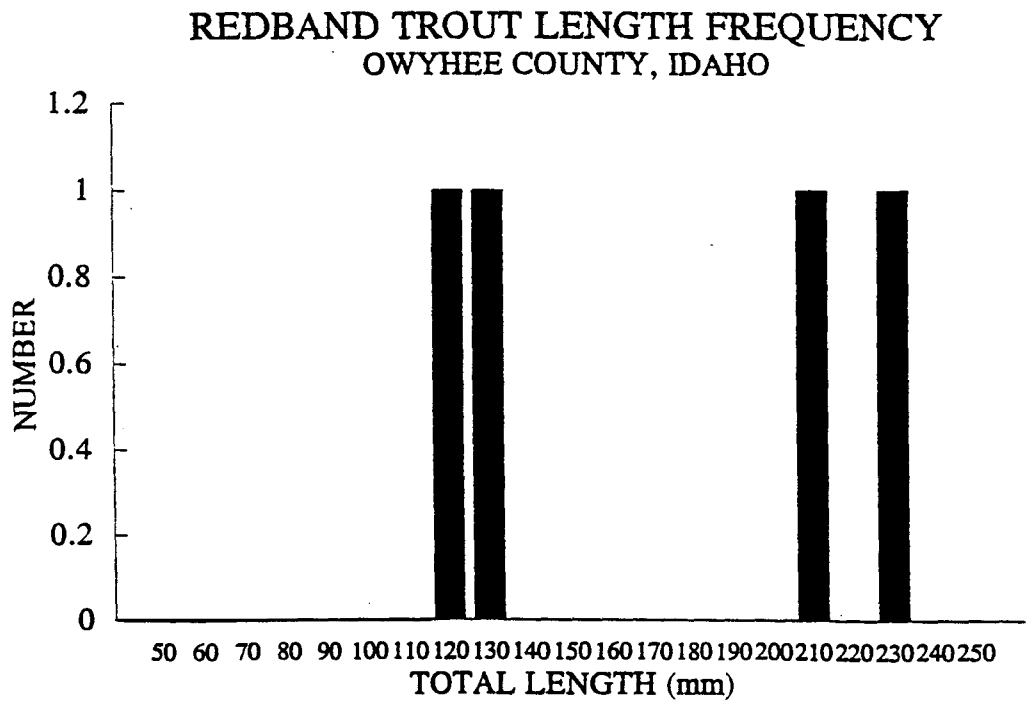
Figure 4. Length frequency and average back-calculated length at age class for redband trout on stream segment Jorda95.4 collected in Owyhee County, Idaho.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculation Age		
Year Class	Age	N	1	2	3
1992	1	0	0.00		
1991	2	0	0.00	0.00	
1990	3	4	91.84	137.78	197.00
ALL CLASSES			91.84	137.78	197.00
N		4	4	4	4

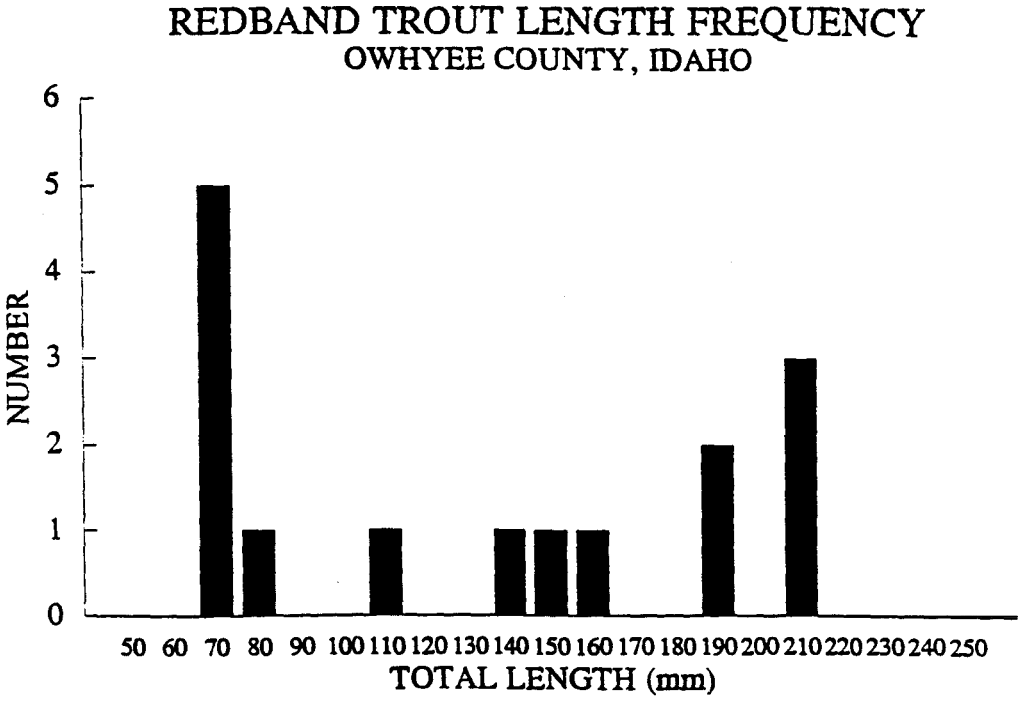
Figure 5. Length frequency and average back-calculated length at age class for redband trout on stream segment Jorda88.3 collected in Owyhee County, Idaho.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculated Age		
Year Class	Age	N	1	2	3
1992	1	2	72.69		
1991	2	0	0.00	0.00	
1990	3	2	94.09	133.61	175.48
ALL CLASSES			83.39	133.61	175.48
N		4	4	2	2

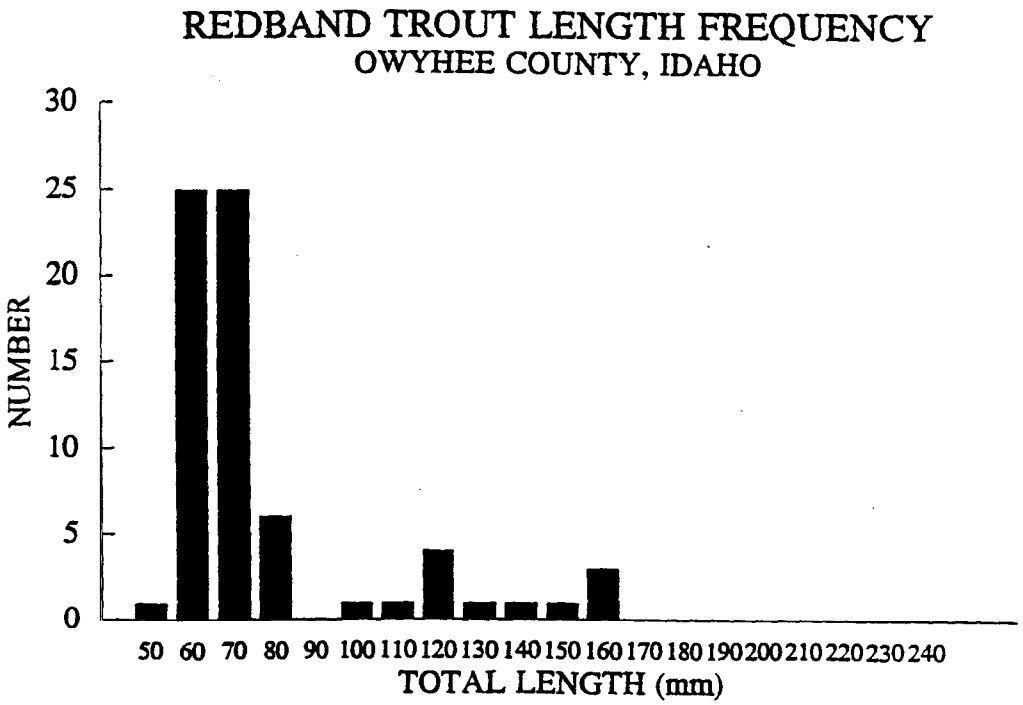
Figure 6. Length frequency and average back-calculated length at age class for redband trout on stream segment Jorda75.9 collected in Owyhee County, Idaho.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculation Age		
Year Class	Age	N	1	2	3
1992	1	2	80.61		
1991	2	3	90.15	134.12	
1990	3	4	84.29	142.63	186.38
All Classes			85.43	138.99	186.38
N		15	9	7	4

Figure 7. Length frequency and average back-calculated length at age class for redband trout on stream segment Bould12.6 collected in Owyhee County, Idaho.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculation Age		
Year Class	Age	N	1	2	3
1992	1	5	79.67		
1991	2	6	83.30	116.17	
1990	3	1	63.90	92.04	109.53
ALL CLASSES			80.17	112.72	109.53
N		24	12	7	1

Figure 8. Length frequency and average back-calculated length at age class for redband trout on stream segment Flint03.9 collected in Owyhee County, Idaho.

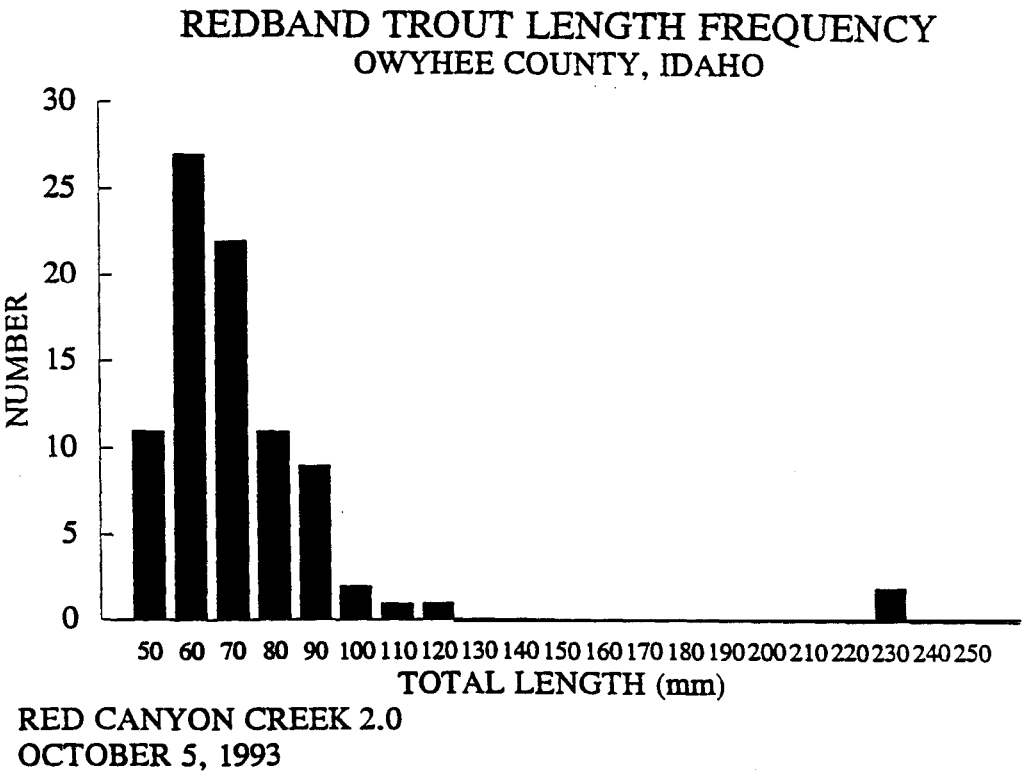
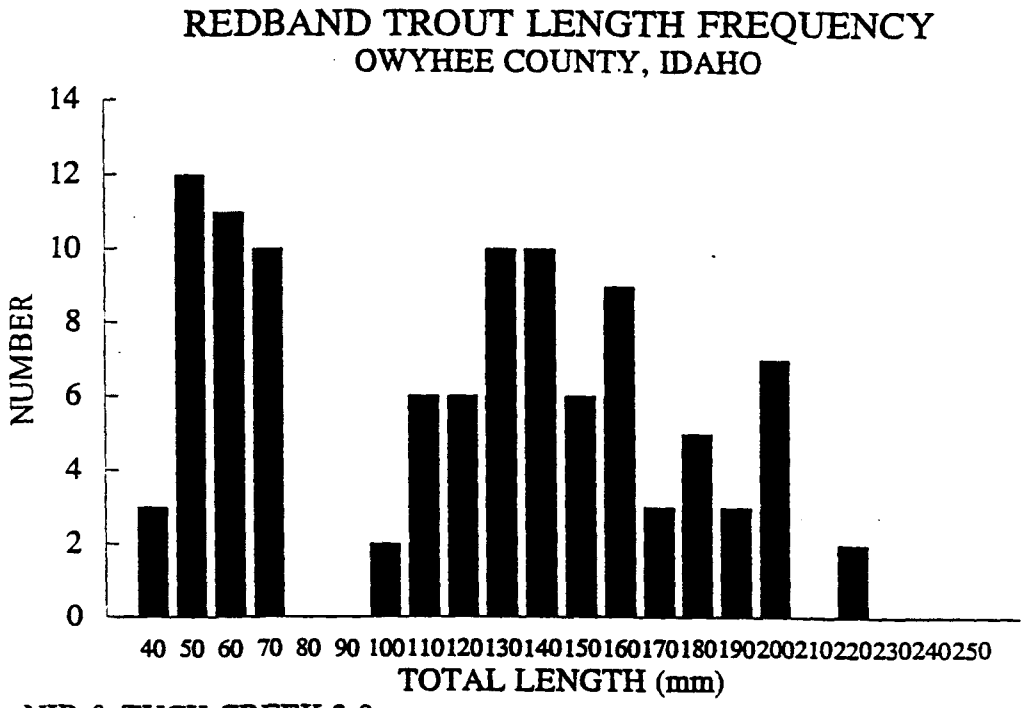


Figure 9. Length frequency for redband trout on stream segment Redca02.0 collected in Owyhee County, Idaho.



AVERAGE BACK-CALCULATED LENGTHS (mm) FOR EACH AGE CLASS

			Back-calculated Age		
Year Class	Age	N	1	2	3
1992	1	22	81.78		
1991	2	16	89.11	129.12	
1990	3	8	87.01	137.89	179.28
ALL CLASSES			85.24	132.04	179.28
N		54	46	24	8

Figure 10. Length frequency and average back-calculated length at age class for redband trout on stream segment Nip&Tuck03.0 collected in Owyhee County, Idaho.

Table 2. Habitat variables of stream lengths, average width, gradient, and percent composition of substrate collected during July through October 1993 on selected stream sections in Owyhee County, Idaho. (* indicates in or near the proposed Idaho Training Range, U.S. Air Force, 1993.)

Site	Location	Length (m)	Ave Width (m)	Mean Depth (m)	% Gradient	% Sand	% Gravel	% Rubble	% Boulder	% Bedrock
JORD95.4	T4SR3WS31	81.0	4.3	0.16	N/A	30.8	22.8	35.3	7.7	3.3
JORD88.3	T4SR4WS31	77.3	5.6	0.23	1.4	22.7	25.6	45.9	5.6	0.0
JORD87.7	T5SR4WS6	85.0	4.3	0.12	0.35	9.0	13.5	57.2	20.3	0.0
JORD75.9	T6SR5WS1	71.3	4.6	0.18	0.79	28.0	34.8	24.2	13.0	0.0
JORD70.8	T6SR4WS19	70.1	4.7	0.36	0.71	25.0	30.5	41.0	3.5	0.0
FLINT3.9	T6SR4WS22	64.9	2.7	0.07	0.69	11.7	15.0	73.3	0.0	0.0
BOUD12.6	T7SR3WS5	80.8	3.0	0.13	N/A	19.5	26.2	51.3	3.0	0.0
RDCA13.5	T11SR5WS25	61.0	0.8	0.07	N/A	4.3	17.7	62.0	16.0	0.0
RDCA13.4	T11SR5WS25	61.0	1.4	0.05	3.45	21.3	24.2	42.5	12.0	0.0
RDCA02.0	T12SR4WS18	64.6	4.8	0.2	0.85	31.3	28.0	39.0	1.7	0.0
DEP06.5*	T13SR2WS7	61.0	6.7	0.19	0.74	12.0	3.3	76.3	8.4	0.0
DEP24.0*	T11SR3WS22	61.0	4.7	0.16	1.8	37.5	14.2	37.3	7.7	3.3
DEP38.0*	T10SR3WS3	61.0	3.8	0.16	0.66	84.8	14.5	0.0	0.7	0.0
NP&T3.0*	T9SR3WS27	61.0	1.8	0.14	1.72	14.5	6.5	15.3	3.0	60.7
POLE1.8*	T11SR3WS24	61.0	3.4	0.2	1.5	19.0	6.0	41.2	24.2	9.6
POL14.5*	T10SR2WS28	61.0	4.8	0.47	0.25	55.8	13.3	4.5	6.3	20.0
CAM0.50*	T10SR2WS28	61.0	4.5	0.44	0.9	13.0	24.8	55.0	0.8	6.3

Table 3. Percent of streambank cover and streambank stability of selected stream transects in Owyhee County, Idaho. (* indicates within or near the proposed Idaho Training Range, U.S. Air Force, 1993.)

Site	Location	Percent Covered/ Stable	Percent Covered/ Unstable	Percent Uncovered/ Stable	Percent Uncovered/ Unstable
JORD95.4	T4SR3WS31	53.25	11.5	30.25	5.0
JORD88.3	T4SR4WS31	20.5	6.5	64.5	8.5
JORD87.7	T5SR4WS6	67.75	9.0	10.0	13.25
JORD75.9	T6SR5WS1	30.75	3.0	44.25	22.0
JORD7O.8	T6SR4WS19	43.5	0	6.5	50.0
FLINT3.9	T6SR4WS22	**52.5**	1.0	34.25	12.25
BOULD12.6	T7SR3WS5	72.5	11.75	0	15.75
REDCA13.5	T11SR5WS25	88.25	6.25	5.5	0
REDCA13.4	T11SR5WS25	40.75	35.25	6.0	18.0
REDCA02.0	T12SR4WS18	88.25	0.75	1.0	10.0
DEEP06.5*	T13SR2WS7	100.0	0	0	0
DEEP24.0*	T11SR3WS22	97.0	0	3.0	0
DEEP38.0*	T10SR3WS3	45.75	33.0	0	21.25
NIP&T3.0*	T9SR3WS27	**19.5**	6.25	64.5	9.75
POLE1.8*	T11SR3WS24	49.5	0	50.5	0
POLE14.5*	T10SR2WS28	47.75	3.0	49.25	0
CAMAS0.5*	T10SR2WS28	57.0	22.5	20.5	0

Water Quality

Measurements of sampled water quality parameters are provided in Table 4. Water quality conditions observed in all sampled transects were adequate for trout survival. Water temperatures may be elevated to lethal levels for trout during some years in some of these streams. We did not observe this condition in 1993, however, the summer was the coolest on record for southwestern Idaho.

Conclusion

The surveys completed in 1993 documented fragmented populations of redband trout in central Owyhee County. These redband populations usually consist of small numbers of individuals with probable missing year classes. Overall the numbers of redband trout seem to have declined from previously documented trout densities from the 1970s. Unfortunately, no undisturbed watershed and associated stream and riparian areas remain to provide a baseline of what characterizes a "healthy" redband trout habitat. In our opinion, large fenced exclosures must be constructed to allow reestablishment of natural watersheds with excellent stream and riparian conditions and these exclosures should be monitored to document the habitat and population parameters of a "typical" redband trout population.

Recommendations

1. Complete survey of major Owyhee County stream drainages. Increase intensity of sampling to positively identify the presence/absence of redband trout populations on a drainage basis county wide.

2. Reduce the number of stream cross-section measurements at each sample segment to five.

3. Monitor forage utilization in riparian areas.

4. Collect and analyze trout tissue samples to determine the genetic purity of Owyhee County redband trout populations.

5. Monitor seasonal stream temperatures with recording thermograph placed into stream segments to be sampled.

6. Establish several large watershed stream and riparian exclosures and monitor the changes to the riparian area, stream channel, and fish populations over time.

Table 4. Water quality measurements collected on selected streams in Owyhee County, Idaho, July through October, 1993. (* indicates in or near proposed Idaho Training Range, U.S. Air Force, 1993.)

Site	Location	Date	Water Temp (C)	Air Temp (C)	Dis. Oxygen mg/l	pH	Conductivity Us/cm	Hardness mg/l	Alkalinity mg/l
JORD95.4	T4SR3WS31	7/28/93	17.0	n/a	7.7	7.3	n/a	20	90
JORD88.3	T4SR4WS31	8/3/93	20.0	n/a	n/a	7.3	n/a	60	30
JORD87.7	T5SR4WS6	9/24/93	7.7	11.0	10.7	7.8		80	25
JORD75.9	T6SR5WS1	8/3/93	22.0	30.0	n/a	7.5	n/a	40	60
JORD70.8	T6SR4WS19	8/4/93	17.2	32.2	n/a	7.0	n/a	20	45
FLINT3.9	T6SR4WS22	9/23/93	14.0	19.0	8.6	7.8		60	80
BOULD12.6	T7SR3WS5	9/22/93	11.5	12.0	8.8	8.0		20	25
REDCA13.5	T11SR5WS25	10/4/93	17.5	22.0	7.7	7.5		20	40
REDCA13.4	T11SR5WS25	10/4/93	18.0	24.0	7.6	7.0		20	40
REDCA02.0	T12SR4WS18	10/5/93	18.0	n/a	10.4	8.5	116.0	20	60
DEEP06.5*	T13SR2WS7	10/6/93	11.0	8.0	8.2	7.7	130.0	60	80
DEEP24.0*	T11SR3WS22	10/6/93	17.6	18.0	11.4	8.9	1	20	45
DEEP38.0*	T10SR3WS3	10/7/93	12.0	11.0	9.0	8.3		20	40
NIP&T3.0*	T9SR3WS27	10/18/93	10.6	11.0	7.8	7.8	>1000	20	60
POLE1.8*	T11SR3WS24	10/19/93	6.5	7.0	8.8	8.0	n/a	40	80
POLE14.5*	T10SR2WS28	10/8/93	8.5	7.5	9.8	7.2		60	100
CAMAS0.5*	T10SR2WS28	10/8/93	11.0	9.0	9.2	7.2	1	60	120

SOUTH FORK BOISE RIVER

Introduction

A 9.6 km section of the South Fork Boise River was electrofished to determine trout standing stock and to collect scales to determine trout growth rates.

Methods

The section of river electrofished extended from the Village access area (T1 S, R8E, S15) approximately 4.0 km below Anderson Ranch Dam downstream 9.6 km (Ti N., R8E, S31). The lower boundary was approximately 1.6 km below the mouth of Cow Creek.

Equipment used included a 4.6 m raft and Coffelt model VVP-1 5 and VVP-2E. Anodes were mounted on booms attached to both sides of the raft and extended 1.8 to 2.4 m in front of the raft. The anode on each boom consisted of a 76 cm ring from which 8 dropper electrodes were suspended. Electrodes consisted of 20.3 cm pieces of 1.2 cm stainless steel conduit suspended 12 to 24 cm below the water surface.

The cathode consisted of three 2.4 m pieces of 0.95 cm diameter stainless steel cable suspended from each side of the raft.

Electrofishing occurred in a downstream direction. Attempts were made to collect all trout shocked. Following collection, trout were placed in a live car and transported downstream for up to one mile for processing. Processing included measuring, weighing, collecting scales, and marking. All trout were measured. Scales and weights were collected from 10 rainbow from each cm size group where possible. Marking consisted of removal of a small piece of the bottom or top of the caudal fin during the mark and recapture runs, respectively.

Population estimates and standard errors were made using the modified Petersen population and variance estimators (Seber 1973).

Scales were magnified using a standard microfiche reader. Annuli were identified and distance from the focus marked on a slip of paper. Slips of paper with distance marks were later digitized, and back calculated length-at-age estimates were made using DisBCal 89 V 1.0 program in the Fishery Analysis Tools software developed by the Missouri Department of Conservation.

Selected water chemistry parameters were measured following electrofishing.

Results and Discussion

Bull trout and rainbow trout (and rainbow/cutthroat hybrids) were the only trout collected during electrofishing. In addition to trout, numerous whitefish *Prosopium williamsoni* and sucker were present. Sculpin, northern squawfish *Ptychocheilus oregonensis,* redside shiners *Richardsonius balteaus,* and dace were also present.

A total of 791 rainbow trout from 65 to 515 mm were collected and measured during electrofishing. The length frequency of rainbow trout collected is shown in Figure 11.

Nine bull trout were collected during electrofishing. Bull trout represented 1.1 % of the trout collected. Mean length of bull trout collected was 411 mm. Length of bull trout collected ranged from 320 to 480 mm.

During processing, many rainbow trout were observed to have hook scars from being caught and released. A large percentage of this population is being recaught after being released.

The mean length, weight, and condition factor of rainbows were 341 mm, 468 g, and 1.03, respectively. The length-weight relationship is shown in Figure 12. The length-weight relationship is described by log (wt) = -4.92 + 2.97 *log(l).

Figure 13 shows the relationship between length and condition factor. The linear regression coefficient (slope) for the relationship between length and condition factor was -.00027. The negative regression coefficient supports the visual observation that many large trout seemed to be in relatively poor condition. The existing 305 to 508 mm slot limit regulation has allowed trout to become older and larger. Declining condition with increasing size may suggest that the trout population has reached equilibrium and future increases in the number of 508 mm + trout should not be expected.

A total of 351 and 441 rainbow trout were collected and marked or examined for marks during the mark and recapture runs, respectively. Seven rainbows were recorded as having died during mark run processing and were not included in population estimates. Twenty-two recaptures of marked rainbows were represented in the recapture run. The length distribution of rainbows collected during mark and recapture runs and of recaptures is shown in Table 5.

Population estimates for rainbow trout less than 249 mm were not made because no recaptures were obtained.

Mark run, recapture run, and recapture data were pooled for rainbow trout greater than 240 mm to estimate population size. The pooled population estimate and standard error was 4,540 (861), respectively, for the 9.6 km section, or 473/km. Mean weight of rainbow trout collected greater than 240 mm was 525 g. Biomass of rainbow trout greater than 240 mm was 247 kg/km.

During initial mark runs, electrofishing mortality of trout, whitefish, and suckers was noted. The number of trout that died is unknown. However, this mortality likely affected the

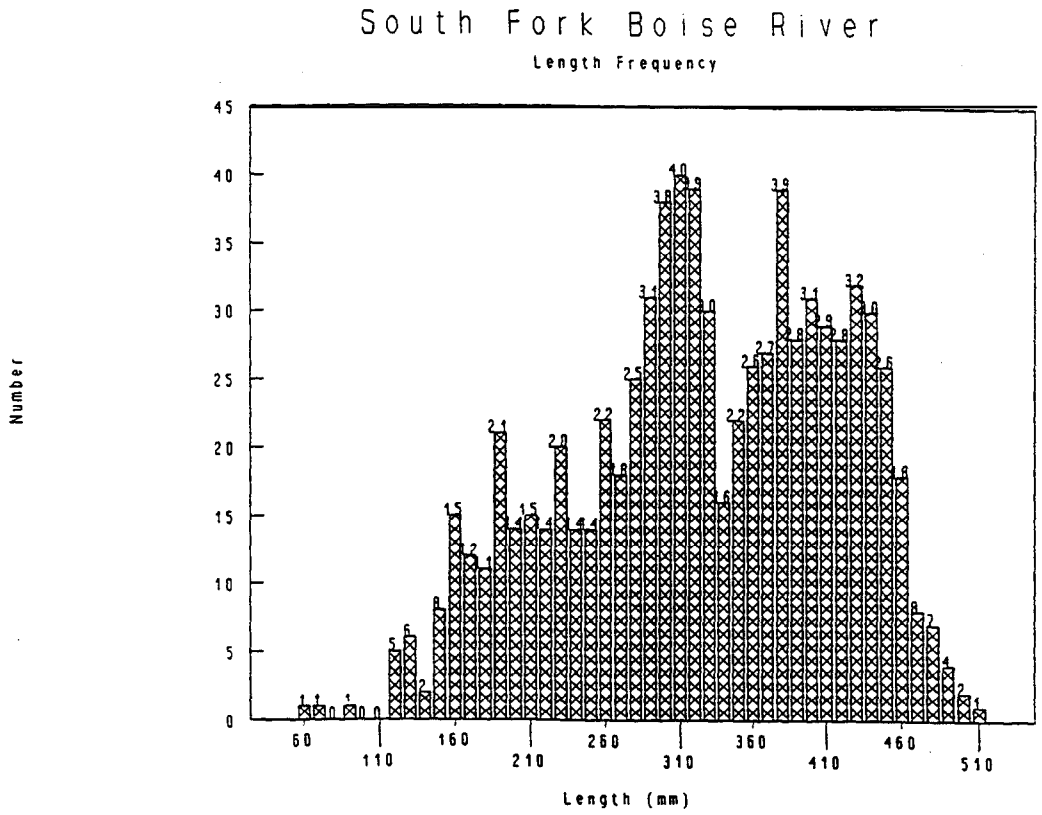


Figure 11. South Fork Boise River below Anderson Ranch Dam, rainbow trout length frequency, 1993.

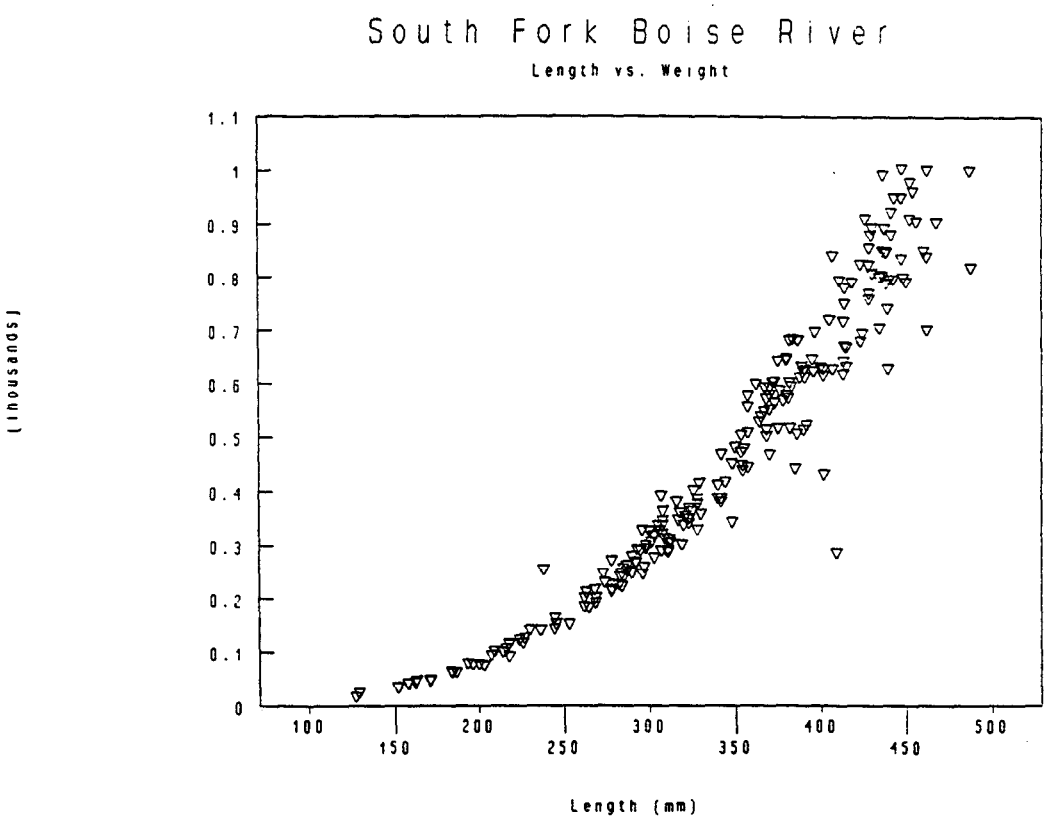


Figure 12. South Fork Boise River below Anderson Ranch Dam, rainbow trout length versus weight relationship, September 1993.

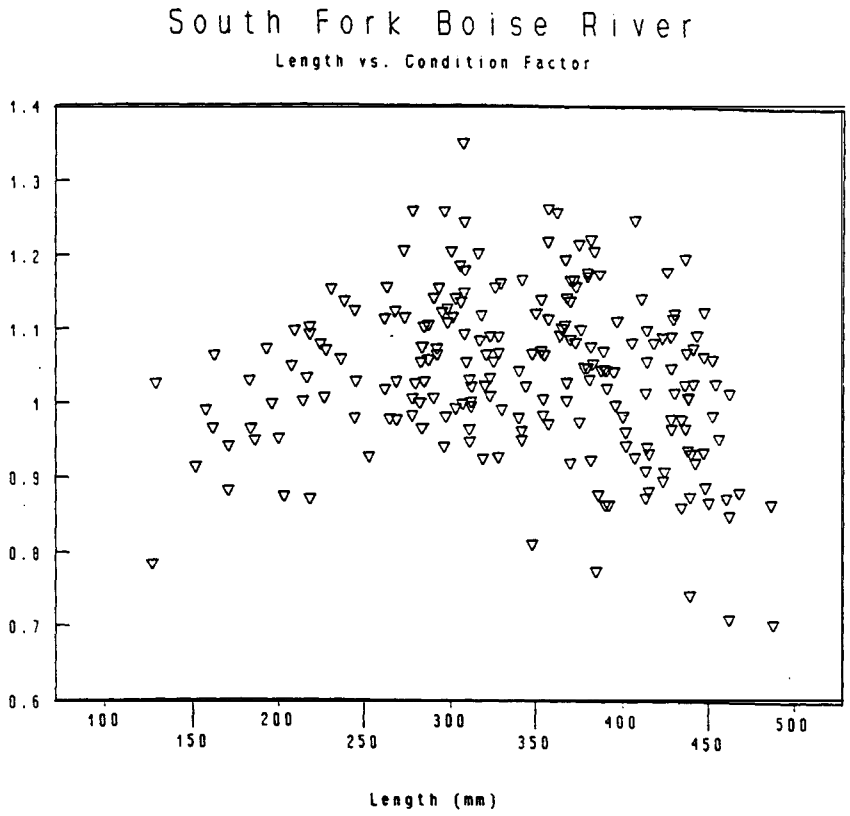


Figure 13. South Fork Boise River below Anderson Ranch Dam, rainbow trout length versus condition factor, September 1993.

Table 5. Length distribution of rainbow trout collected during the mark run, recapture run, and recaptures, South Fork Boise River below Anderson Ranch Dam, September, 1993.

Size class	Mark run	Recapture run	Recaptures
120	2	3	
130	3	4	
140	0	1	
150	4	4	
160	7	9	
170	3	9	
180	6	5	
190	8	10	
200	4	12	
210	5	8	
220	5	10	
230	6	13	
240	4	10	
250	3	15	1
260	7	15	
270	10	14	
280	13	16	
290	15	17	
300	19	19	
310	18	21	
320	17	20	1
330	5	27	1
340	11	6	
350	12	12	
360	11	12	1
370	19	11	2
380	20	21	3
390	12	15	1
400	12	20	2
410	14	14	2
420	16	14	1
430	21	17	3
440	14	16	1
450	11	11	2
460	8	7	
470	1	6	
480	4	2	1
490	1	3	
500		1	
510		1	

number of marked rainbows at large in the population during the recapture run. Mortality of marked trout likely caused the population estimate to be inflated by an unknown amount.

The Coffelt model VVP-2E was in use when mortality was detected. Mortality of trout was reduced by reducing voltage and amperage output and by decreasing the pulse frequency. However, decreasing voltage greatly reduced the numbers of trout collected. Generally, voltage settings of 680 v and a frequency of 60 pulses per second were required to collect trout. At these settings, whitefish, suckers, and some trout died. Mortality increased as voltage increased. Trout catch greatly decreased at reduced voltage settings.

Further experimentation was done in an attempt to increase trout catch and reduce whitefish, sucker, and trout mortality. A Coffelt model VVP-1 5 was used on two days during the recapture run. Fish collections were made using maximum voltage direct current (about 450 v). An immediate reduction in mortality of all species was noted, and trout netted and placed in the live car recovered much quicker relative to trout shocked with the VVP-2E. It was also noted that trout were drawn to the positive electrodes much better with the VVP-1 5 and they were much easier to net. We felt that mortality was reduced to a negligible level with the VVP-15.

Average daily catch for the VVP-2E and VVP-1 5 was compared. The VVP-2E was used during the first four days and the VVP-1 5 was used the last 2 days of electrofishing. The average number of rainbow trout caught per day was 105.5 (s.e. = 11.3) and 183.5 (s.e. = 20.5) for the VVP-2E and VVP-15, respectively. This difference in average daily catch was significant ($P<.05$).

Bull trout catch was also enhanced with the VVP-15. VVP-1 5 bull trout catch per day was 3 as compared to VVP-2E catch per day of 0.75.

Figure 14 shows a comparison of average daily catch for the VVP-15 and VVP-2E. Advantage of the VVP-1 5 is in increasing catch of small trout. Catch of trout less than 340 mm appears much greater for the VVP-15, while catch of trout greater than 340 mm is about equal for both VVPs. Figure 14 implies care must be taken when comparing length frequency data collected using different sampling equipment.

Scales were read and age determined for 228 rainbow trout. Mean back-calculated length at age for all year classes represented was 104, 192, 289, 351, 381, and 408 mm. Back-calculated length at age for each year class is given in Table 6.

Based on estimated age from scale analysis at the time of sampling, age 1 to age 6 rainbow trout averaged 201, 302, 376, 410, 413, and 433 mm, respectively. Minimum, maximum, and mean length at capture are given in Table 7.

Bull trout scales were provided. to Fish Research and will be analyzed and reported separately.

Water chemistry parameters are presented in Table 8.

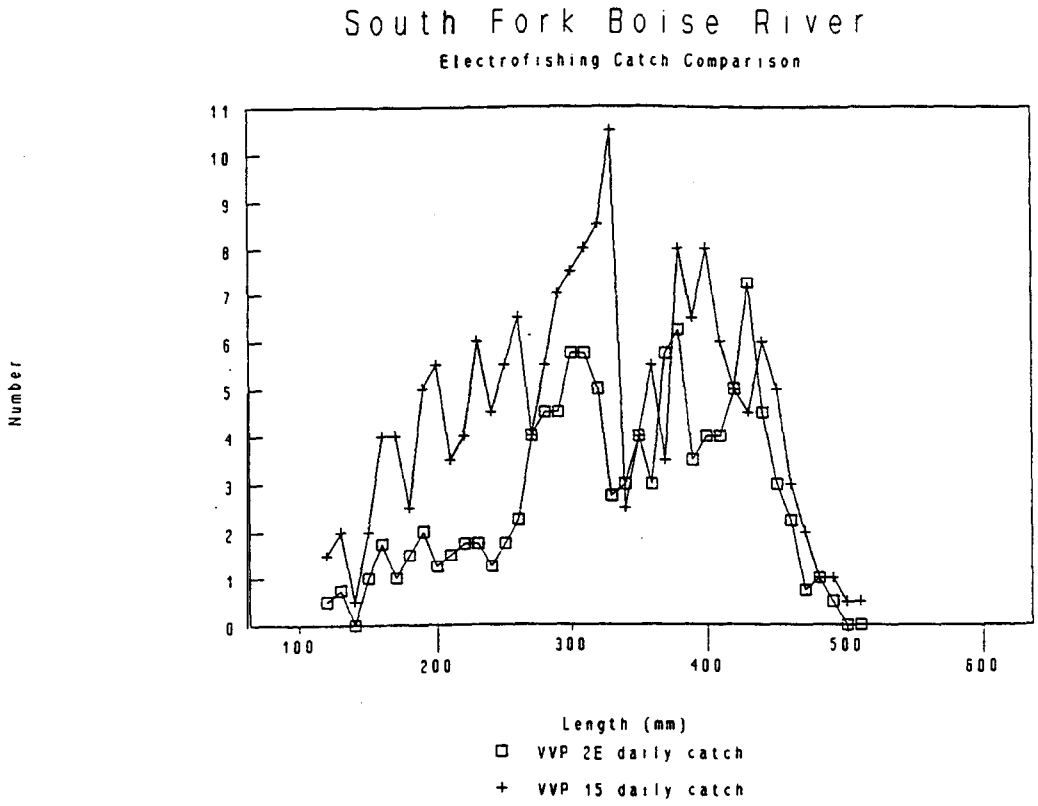


Figure 14. South Fork Boise River below Anderson Ranch Dam, comparison of average daily electrofishing catch using the VVP-2E and VVP-15, September 1993.

Table 6. Average back-calculated length at age for rainbow trout in the South Fork Boise River below Anderson Ranch Dam, September 1993.

Year Class	Age	N	1	2	3	4	5	6
1992	1	35	111					
1991	2	87	102	197				
1990	3	34	106	198	302			
1989	4	39	105	189	296	364		
1988	5	21	98	181	275	342	385	
1987	6	12	92	166	254	324	373	408
All			104	192	289	351	381	408
N		228	228	193	106	72	33	12

Table 7. Minimum, maximum, and mean length at capture by age for rainbow trout in the South Fork Boise River below Anderson Ranch Dam, September 1993.

Year Class	Age	N	Mean Length	Minimum Length	Maximum Length	Standard Error
1992	1	35	201	127	269	6.2
1991	2	87	302	183	452	4.6
1990	3	34	377	218	473	8.8
1989	4	39	410	308	487	6.4
1988	5	21	413	308	485	8.9
1987	6	12	432	388	498	9.7

Table 8. Water chemistry parameter measurements for the South Fork Boise River below Anderson Ranch Dam, September 30, 1993.

Conductivity	35 microS Us/cm^3
Hardness	20 mg/l $CaCO_3$
pH	7.0
M.O. alkalynity	40 mg/l $CaCO_3$
Flow	600 CFS
Temperature	10.5 C @ 10:30 a.m. 12.0 C @ 4:00 p.m.

Recommendations

1. Discontinue use of VVP-2E for electrofishing this river section. Excessive mortality of large trout must be avoided. VVP-2E may continue to be of use in other streams where water quality allows nonlethal fish collection.

2. Conduct fall population estimates for three additional years. Three additional years are recommended to determine year-to-year variability in population size without the problems caused this year by mortality of marked trout. Collect scales and evaluate growth all three years.

MIDDLE FORK BOISE RIVER

Introduction

Transects were snorkeled on the Middle Fork Boise River (MFBR) during August 17-19, 1993 by regional staff. All snorkel transects were repeats of snorkel transects done by Rohrer (1989).

Methods

All transects were completed with two snorkelers and a data recorder who walked along the stream edge. Fourteen transects were snorkeled from the confluence of the North Fork Boise River upstream to the town of Atlanta. Snorkelers identified fish species encountered, estimated sizes of fish, and relayed the data to the data recorder. Physical habitat measurements of transect length, three or more width measurements, three cross channel depth and substrate composition measurements, and stream gradient were taken at 11 of 14 transects. The three sites not measured were either too deep or swift of current to take the physical measurements.

Results

Six of 14 transects had higher wild rainbow trout densities than 1988; 8 of 14 transects had lower densities in 1993 (Table 9). Eight of 14 transects had higher densities of large (> 300 mm) wild rainbow trout, and in 6 transects, the larger rainbow were absent. None of the transects had the larger rainbow trout in 1988 (Rohrer 1989). Density of wild rainbow trout in 1993 was 0.98 trout/100 m^2 versus a density of 0.92 trout/100 m^2 in 1988 in these 14 transects. Densities for trout greater than 300 mm was 0.05/100 m^2 in 1993 versus 0.004/100 m^2 in 1988 in the transects sampled.

Table 9. Densites of rainbow trout and bull trout observed by Idaho Department of Fish and Game personnel using snorkeling techniques in the Middle Fork Boise River (from North Fork confluence to Atlanta) August 1993. Densities in perentheses (l from 1988.

Section	Area (m^2)	Wild rainbow trout densities (no/100 m^2)				Total wild rainbow trout	Hatchery rainbow trout	Bull trout
		0-101 mm	102-203 mm	204-304 mm	>304 mm			
9	4.031	0.10 (0.07)	0.07 (0.56)	0.05 (0.17)	0 (0)	0.22 (0.87)	0.07 (1.10)	0 (0)
11	2.030	0.34 (0)	0.89 (0.84)	0.83 (0.06)	0.05 (0)	2.11 (0.90)	0.10 (0.28)	0 (0)
14	1.513	0.59 (0.14)	0.93 (0.79)	0.66 (0.07)	0.20 (0)	2.38 (1.00)	0.13 (0.14)	0.07 (0)
15	3.377	0.15 (0.32)	0.53 (0.48)	0.27 (0.23)	0 (0)	0.95 (1.03)	0 (0)	0 (0)
17	2.930	0.17 (0.0)	0.17 (0.38)	0.07 (0.38)	0 (0)	0.41 (0.76)	0 (0)	0.03 (0)
18	2.130	0.70 (0.05)	1.31 (0.38)	0.14 (0.28)	0.14 (0.05)	2.29 (0.76)	0.05 (1.09)	0.05 (0)
22	1.552	0.90 (0)	0.84 (0.05)	0.19 (0.05)	0 (0)	1.93 (0.10)	0.19 (0.16)	0 (0)
23	2.568	0 (0)	0.03 (0.06)	0.08 (0.93)	0.08 (0)	0.19 (0.99)	0 (0.81)	0 (0)
24	2.396	0 (0)	0.33 (0.08)	0.04 (0.20)	0.08 (0)	0.45 (0.28)	0.17 (0.04)	 (0)
25	1.630	0.06 (0)	0.31 (0.32)	0.18 (0.06)	0.06 (0)	0.61 (0.38)	0.06 (0.20)	0 (0.06)
26	5.161	0.06 (0.03)	0.16 (0.10)	0.06 (0.51)	0.02 (0)	0.30 (0.64)	0.12 (0.07)	0 (0.07)
27	1.962	0 (0)	0.25 (0.31)	0.10 (0.87)	0.05 (0)	0.41 (1.18)	0.25 (6.53)	0.05 (0)
30	1.242	0.08 (0.18)	0.08 (0.55)	0.16 (1.28)	0 (0)	0.32 (2.01)	0.08 (0.27)	0 (0.09)
35	1.805	0.32 (0.05)	0.58 (1.03)	0.21 (0.89)	0 (0)	1.12 (1.99)	3.56 (2.48)	0.05 (0)

Overall, densities of hatchery rainbow trout declined from a 1988 density of 0.94/100 m^2 to a 1993 density of 0.34/100 m^2. Management stocking in this section of the river was discontinued and this section was converted to a wild trout stream with no stocking except above Atlanta in 1991.

Bull trout were observed in 8 of 14 transects; 5 transects were higher in densities, the other 3 were lower (Table 9). Sightings of bull trout were generally rare, usually with only one fish observed per transect.

Mountain whitefish densities increased in 1993 over densities observed in 1988. In 1993, whitefish densities were an average of 1.51/100 m^2 versus 1.25/100 m^2 in 1988 (Table 10).

Table 11 summarizes habitat variables measured in 1993.

Recommendations

Repeat at least these 14 transects in the summer of 1996 or 1997.

SULPHUR CREEK

Introduction

Sulphur Creek, a tributary to the Middle Fork Salmon River, was surveyed utilizing snorkeling techniques for resident and anadromous fish species densities during August 10-12, 1993 by regional staff. Anadromous fish densities are reported elsewhere.

Methods

A combination of snorkeling sites have been established over time in Sulphur Creek, and the sites completed in 1993 were a combination of chinook monitoring and chinook supplementation sites. Two snorkelers moving upstream identified, enumerated, and estimated sizes of all fish species encountered in each transect. Physical habitat variables (length, average width, average depth, gradient, and percent substrate class) were measured on five transects. A data recorder walked the shoreline mapping the stream channel and location of fish species as observed by the snorkelers.

Table 10. Densities of mountain whitefish, westslope cutthroat trout, northern squawfish, and largescale suckers in the Middle Fork Boise River (from North Fork confluence to Atlanta) observed by Idaho Department of Fish and Game personnel using snorkeling techniques in August 1993. Density estimates in parentheses ( ) from 1988.

Section	Area (m^2)	Mountain whitefish densities (no/100 m^2)				Total Densities			
		0-101 mm	102-203 mm	204-304 mm	305-406 mm	whitefish	cutthroat	squawfish	largescale sucker
9	4,031	0	0.40	0.74	0	1.14 (0.97)	0	0.05	0.74
1	2,030	0	0.25	1.97	0.10	2.32 (2.13)	0.05	0.15	0.89
14	1,513	0	0.26	1.26	0.07	1.59 (0.86)	0.07	0.20	0.13
15	3,377	0	0.36	1.16	0	1.52 (1.68)	0	0.15	0
17	2,930	0	0.10	0.17	0	0.27 (0.46)	0.03	0	0.14
18	2,130	0	0.42	1.13	0.05	1.60 (1.38)	0	0.05	0
22	1,552	0	0.39	2.51	0.39	3.29 (1.72)	0	0.13	0
23	2,568	0.04	0.08	0.08	0.23	0.43 (1.51)	0	0.04	0
24	2,396	0.67	0	0.38	1.00	2.05 (0.52)	0	0.25	0
25	1,630	0	0.67	1.23	0.43	2.33 (1.86)	0.18	0	0
26	5,161	0	0.04	1.09	0.10	1.23 (1.51)	0	0	0
27	1,962	0	0.46	1.02	0.31	1.78 (1.12)	0.05	0	0
30	1,242	0	0.08	1.37	0.16	1.61 (1.82)	0	0	0
35	1,805	0	0	0	0	0 (0)	0	0	0

Table 11. Summary of physical habitat data collected in sections of the Middle Fork Boise River in August 1993 by Idaho Department of Fish and Game personnel.

Section*	Channel type	Length (m)	Ave. width (m)	Surface area (m^2)	Ave. depth (m)	Gradient percent	Percent Substrate Class				
							sand	gravel	rubble	boulder	bedrock
9	(B)	125.0	32.3	4031	0.58	0.46	8	22	43	27	0
11	(B)	93.0	21.8	2030	1.22	0.7	25	9	25	41	0
14	(B)	61.0	24.8	1513	0.96	0.16	17	22	23	39	0
15	(B)	130.0	26.0	3377	0.57	0.19	4	16	57	23	0
17	(B)	100.0	29.3	2930	0.58	0.75	2	20	35	18	25
23	(B)	96.0	26.8	2568	0.64	0.93	6	**35**	48	8	3
24	(C)	95.0	25.2	2396	0.90	0.47	10	37	40	5	8
26	(B)	205.0	25.2	5161	0.87	0.29	2	16	56	19	7
27	(B)	98.0	20.1	1962	0.64	0.76	5	10	42	35	8
30	(B)	100.0	12.4	1242	0.69	0.98	1	15	57	27	0
35	(B)	122.0	14.8	1805.6	0.51	0.82	5	36	34	25	0

*Section locations are presented in Table 28.

Results

Tables 12-14 summarize the densities (no/100 m^2) of resident fish species. Table 15 summarizes the physical habitat information recorded.

Recommendations

Repeat all transects yearly with two snorkelers

Table 12. Densities of wild cutthroat trout (no/100 m^2) observed by Idaho Department of Fish and Game personnel using snorkeling techniques in Sulphur Creek, tributary to the Middle Fork Salmon River, August 10-13, 1993.

Section	H_2O Temp (C)	Wild cutthroat trout density (no/100 m2) by length range (mm)					
		0-76	77-153	154-228	229-304	>305	Total
Silver Moon Creek*	8.9	0	0	0	0	0.23	0.23
Upper Split*	11.1	0	0	0	0	0	0
Upper Blue Moon Creek*	12.8	0	0	0	0	0	0
Lower Blue Moon Creek*	14.5	0	0	0	0	0.25	0.25
Monitoring Section A	14.5	0	0	0	0.07	0.21	0.28
Long Run by Trail*	14.6	0	0	0	0.14	0.14	0.28
Braided Channel*	14.2	0	0	0	0	0.31	0.31
R3*	14.0	0	0	0	0	0.34	0.34
Above Diversion Ditch*	14.5	0	0	0	0.16	0	0.16
Morgan Diversion*	14.5	0	0	0	0	0	0
Morgan Ranch Bridge*	14.0	0	0	0	0	0	0
STRATA 2, 3A, A Monitoring	14.0	0	0	0	0	0	0
Trail Crossing*	8.9	0	0	0	0	0	0
Footbridge*	10.0	0	0	0	0	0	0
Morehead Creek*	10.6	0	0	0	0	0	0
Rock Slide*	11.1	0	0	0	0	0.18	0.18

* Chinook supplimentation site

Table 13. Densities of mountain whitefish (no/100 m^2) observed by Idaho Department of Fish and Game personnel using snorkeling techniques in Sulphur Creek, tributary to the Middle Fork Salmon River, August 10-13, 1993.

Section	Area (m^2)	mountain whitefish density (no/100 m^2) by length range (mm)						
		0-76	77-153	154-228	229-304	305-380	>381	Total
Silver Moon Creek*	427.2	0	0	0	0	0	0	0
Upper Split*	246.2	0	0	0	0	0	0	0
Upper Blue Moon Creek*	448.0	0	0	0	0	0	0	0
Lower Blue Moon Creek*	395.6	0	0	0	0	0	0	0
Monitoring Section A	1,435.0	0	0	0	0	0	0	0
Long Run by Trail*	706.7	.28	0.28	0.14	0.42	0	0	1.12
Braided Channel*	318.4	0.63	0	0	0	0	0	.63
R3*	582.8	0	0.17	0	0	0	0	0.17
Above Diversion Ditch*	625.0	1.44	0.48	0	0.64	0	0	2.56
Morgan Diversion*	645.2	4.65	0.15	0.30	0.47	0	0	5.57
Morgan Ranch Bridge*	573.3	0	0	0.35	0	0	0	0.35
STRATA 2, 3A, A Monitoring	582.0	0	0	0.34	0.17	0	0	0.51
Trail Crossing	618.0	0	0.49	0	0	0	0	0.49
Footbridge	271.9	0	0	0	18.40	0	0	18.40
Morehead Creek*	891.0	0	0	0	0.11	0.11	0	0.22
Rock Slide*	564.0	0	0	0	0	0	0	0

* Chinook supplementation site

Table 14. Densities of wild rainbow/steelhead (no/100 m^2) observed by Idaho Department of Fish and Game personnel using snorkeling techniques in Sulphur Creek, tributary to the Middle Fork Salmon River, August 10-13, 1993.

Section	Area (m^2)	wild rainbow/steelhead density (no/100 m^2) by length range (mm)					
		0-76	77-153	154-228	229-304	>305	Total
Silver Moon Creek*	427.2	0	0	0	0	0	0
Upper Split*	246.2	0	0	0	0	0	0
Upper Blue Moon Creek*	448.0	0.89	0	0	0	0	0.89
Lower Blue Moon Creek*	395.6	0	0	0	0	0	0
Monitoring Section A	1,435.0	0	0	0	0	0	0
Long Run by Trail*	706.7	0.14	0	0	0	0	0.14
Braided Channel*	318.4	0	0.63	0	0	0	0.63
R3*	582.8	0.51	0.67	0	0	0	1.18
Above Diversion Ditch*	625.0	0.16	0	0	0	0	0.16
Morgan Diversion*	645.2	0.15	0.15	0	0	0	0.30
Morgan Ranch Bridge*	573.3	0.70	0.52	0.17	0	0	1.39
STRATA 2, 3A, A Monitoring	582.0	0	1.03	0.17	0	0	1.20
Trail Crossing *	618.0	0.32	0	0	0	0	0.32
Footbridge*	271.9	0	0	0	0	0	0
Morehead Creek*	891.0	0	0	0	0	0	0
Rock Slide*	564.0	0	0	0	0	0	0

* Chinook supplementation site

Table 15. Summary of physical habitat data collected in sections of Sulphur Creek, tributary of Middle Fork Salmon River by Idaho Department of Fish and Game personnel, August 1993.

Section*	Area (m^2)	Length (m	Average width (m)	Average depth (ml	Gradient **percent**	Percent Substrate Class					
						sand	gravel	**pebble**	**rubble**	boulder	bedrock
Monitoring	1,435.0	140.0	10.25	0.49	0.6	35.6	44.4	0.0	20.0	0.0	0.0
R3	582.8	52.5	11.1	0.40	1.2	18.9	15.0	0.0	55.6	10.5	0.0
Morgan	645.2	56.1	11.5	0.44	2.6	15.0	16.7	2.2	48.9	16.7	0.0
3A, A	582.0	40.7	14.3	0.36	3.25	12.5	**8.5**	0.0	22.1	22.1	34.6
Trail Crossing	618.0	52.6	11.8	0.41	1.05	16.1	**8.3**	0.0	65.6	10.0	0.0

* All sections were Channel Type (B).

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JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project I: Surveys and Inventories,

Subproject I-D: Southwest Region

Job: d

Title: Salmon and Steelhead Investigations

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Salmon spawning ground surveys were conducted in Bear Valley, Elk, and Sulphur creek trend areas in 1993. Redds numbered 148, 242, and 25 in Bear Valley, Elk, and Sulphur creek trend areas, respectively. Redd count trend areas in 1993 were 361%, 425%, and 500% of trend data area counts in 1992.

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REPORT

METHODS

Redds were enumerated according to criteria described in the draft Idaho Redd Counting Manual. Carcasses encountered were identified as to sex and measured (fork length) where possible. Scales were collected from a sample of carcasses and aged. Live fish observed were visually classified as to sex and ocean age (jacks, 2, or 3).

RESULTS

Salmon redds were counted in trend areas (Hassemer 1993) in Bear Valley, Elk, and Sulphur creeks on August 25-27, 1993. Redds were also counted in Sulphur Creek's "other" area (Hassemer 1993). Redds counted, dates of counts, live fish observed, and carcasses encountered by area are reported in Table 1.

Counts in 1993 in Bear Valley, Elk, and Sulphur creek trend areas were 148, 242, and 25, respectively (Table 2). Counts in 1993 in all streams were much greater than in 1992. Recent counts are also shown in Table 2.

Salmon carcasses in Bear Valley, Elk, and Sulphur creeks were determined to be 68.2% (n =66), 84.6% (n =81), and 63.3% (n =13) female, respectively.

Analysis of scales indicated spawners were 6.1 % age 4 (2-ocean) and 93.9% age 5 (3-ocean) in Bear Valley Creek; 5.1% age 4 and 94.9% age 5 in Elk Creek; and 100% age 5 in Sulphur Creek (Cannamela, IDFG, personal communication). Length frequency of salmon carcasses from Bear Valley, Elk, and Sulphur creeks by age and sex is shown in Table 3.

RECOMMENDATIONS

Continue annual redd counts in established trend areas and collect scales and fork lengths from carcasses.

Table 1. Redd counts and enumeration of salmon spawners and carcasses in Bear Valley, Elk, and Sulphur creeks, 1993.

Section*	Date	Redds	2/m[2]	2/f[2]	3/m	3/f	unk[2]	male carcass	female carcass
WS-9a	8/27	13	0	0	0	0	0	0	2
WS-9B	8/27	8	0	0	0	0	0	0	0
WS-9C	8/27	27	0	1	0	4	0	4	5
WS-9D	8/27	59	1	1	0	3	1	4	10
WS-10A	8/26	37	0	0	0	0	21	7	10
WS-10B	8/26	4	0	0	0	0	0	3	2
WS-11A	8/25	164	0	7	8	5	4	22	60
WS-11B	8/25	63	0	1	0	2	0	13	11
WS-11C	8/26	15	0	0	0	3	0	2	1
WS-12	8/26	25	0	0	0	0	0	0	0
OS-4	8/26	36	0	0	0	4	0	0	7

*WS-9A-Bear Valley Creek - mine exclosure area. WS-9B-Bear Valley Creek - mine to Cub Creek. WS-9C-Bear Valley Creek - Cub Creek to Sack Creek. WS-9d-Bear Valley Creek - Sack Creek to Elk Creek. WS-10A-Bear Valley Creek - Elk Creek to Poker Bridge. WS-10B-Bear Valley Creek - Poker Bridge to Fir Creek. WS-11A-Elk Creek - West Fork to Twin Bridges. WS-11B-Elk Creek - Twin Bridges to Guard Station. WS-11C-Elk Creek - Guard Station to Bear Valley Creek. WS-12-Sulphur Creek - From ranch downstream of Bluemoon Creek downstream approximately 3 miles to point where stream meanders to hillside on north edge of meadow. OS-4-Sulphur Creek - From 1.5 miles above ranch (where trail meets Sulphur Creek) downstream to Sulphur Creek Ranch.

Table 2. Recent redd counts in Bear Valley, Elk, and Sulphur creeks.

Year	Bear Valley Creek	Elk Creek	Sulphur Creek
1993	148	242	25
1992	41	57	5
1991	47	54	26
1990	62	42	22
1989	15	35	2
1988	**283**	330	41

Table 3. Fork length, age, and sex of salmon carcasses collected from Bear Valley, Elk, and Sulphur creeks, 1993.

Bear Valley Creek			Elk Creek			Sulphur Creek		
FL	Sex	Age	FL	Sex	Age	FL	Sex	Age
775	f	4	690	f	4	760	f	
820	f	4	770	f	4	820	f	
686	m	4	720	m	4	830	f	
724	m	4	750	m	4	850	f	
750	f	5	750	f	5	880	f	
810	f	5	760	f	5	890	f	
830	f	5	840	f	5	890	f	
830	f	5	850	f	5	900	f	
838	f	5	850	f	5	910	f	
840	f	5	850	f	5	930	f	
850	f	5	850	f	5	870	m	
850	f	5	860	f	5	900	m	
850	f	5	860	f	5			
860	f	5	860	f	5			
860	f	5	860	f	5			
870	f	5	860	f	5			
880	f	5	860	f	5			
880	f	5	860	f	5			
889	f	5	870	f	5			
890	f	5	870	f	5			
900	f	5	880	f	5			
900	f	5	880	f	5			
900	f	5	880	f	5			
900	f	5	880	f	5			
900	f	5	880	f	5			
910	f	5	880	f	5			
910	f	5	880	f	5			
910	f	5	880	f	5			
910	f	5	890	f	5			
914	f	5	890	f	5			
914	f	5	890	f	5			
914	f	5	890	f	5			
920	f	5	890	f	5			
920	f	5	900	f	5			
920	f	5	900	f	5			
920	f	5	910	f	5			
930	f	5	910	f	5			

940	f	5	910	f	5			
950	f	5	910	f	5			
850	m	5	920	f	5			
850	m	5	920	f	5			
970	m	5	920	f	5			
889	m	5	930	f	5			
900	m	5	930	f	5			
910	m	5	930	f	5			
914	m	5	950	f	5			
930	m	5	950	f	5			
930	m	5	960	f	5			
950	m	5	970	f	5			
950	m	5	970	f	5			
950	m	5	870	m	5			
950	m	5	880	m	5			
953	m	5	880	m	5			
960	m	5	900	m	5			
970	m	5	900	m	5			
980	m	5	910	m	5			
1000	m	5	930	m	5			
1040	m	5	940	m	5			
			940	m	5			
			950	m	5			
			960	m	5			
			960	m	5			
			960	m	5			
			960	m	5			
			970	m	5			
			970	m	5			
			970	m	5			
			970	m	5			
			980	m	5			
			990	m	5			
			990	m	5			
			990	m	5			
			1,010	m	5			
			1,030	m	5			
			1,060	m	5			
			1,060	m	5			
			1,080	m	5			

JOB PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-18

Project II: Technical Guidance Subproject II-D: Southwest Region

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Regional staff reviewed the Environmental Impact Statement for the Idaho Training Range and provided comments on fish and habitat concerns. Fisheries staff continue to provide a large amount of general information to the public about local and statewide fisheries. The Regional Fisheries Manager devoted approximately two months of time contributing to the development of "State Conservation Agreement For The Protection of Bull Trout." Approximately ten landowners were assisted with construction of private ponds by regional fishery staff with on-site visits or information provided.

A database was developed to store and process random creel checks collected by fisheries staff and conservation officers. This database will be able to provide information on average catch rates on regional bodies of water in the future.

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APPENDICES

Appendix A. Brownlee Reservoir Lowland Survey data.

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Largemouth Bass LAKE/RESERVOIR: Brownlee Reservoir

DATE: PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	1	12.5	572				
50-59								350-359							
60-69								360-369					-		
70-79								370-379							
80-89								380-389							
90-99								390-399							
100-109								400-409							
110-119								410-419							
120-129								420-429							
130-139								430-439							
140-149								440-449							
150-159								450-459							
160-169								460-469							
170-179								470-479							
180-189								480-439							
190-199								490 499							
200-209								500-509							
210-219	1	12.5	136					510-519							
220-229								520-529							
230-239								530-539							
240-249								540-549							
250-259								550-559							
260-269								560-569							
270-279	3	37.5	247.3					570-579							
280-289	1	12.5	362					580-589							
290-299	1	12.5						590-599							
300-309								600-609							
310-319								610-619							
320-329			-					620-629							
330-339	1	12.5	662					TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET 1 ELECTROFISHING 1 hr. TRAP NET 1

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF: (species) Bluegill LAKE/RESERVOIR: Brownlee Reservoir

DATE: PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369					-		
70-79	1	0.5						370-379							
80-89	1	0.5						380-389							
90-99	7	3.7						390-399							
100-109	5	2.7						400-409							
110-119	12	6.4	24.5	99				410-419							
120-129	13.1	7	33.8	102.1				420-429							
130-139	9.1	4.8	43.4	100.4				430-439							
140-149	11.3	6	58.6	106				440-449							
150-159	14.4	7.7	72	100.8				450-459							
160-169	17	9.1	105.3	122.3				460-469							
170-179	29.4	15.7	129.1	122.7				470-479							
180-189	33.3	17.7	107.5	132.3				480-489							
190-199	20.1	10.7	205.4	134.8				490-499							
200-209	8	4.3	216.4	110.8				500-509							
210-219	5	2.7	257.5	121.5				510-519							
220-229	1	0.5	282	114				520-529							
230-239								530-539							
240-249								540-549							
250-259								550-559							
260-269								560-569							
270-279								570-579							
280-289								580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329			-					620-629							
330-339								TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET 1 ELECTROFISHING 1 hr. TRAP NET 1

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) White Crappie LAKE/RESERVOIR: Brownlee Reservoir

DATE: PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	0.3	0.1	550	89			
50-59								350-359	0						
60-69								360-369	0				-		
70-79								370-379							
80-89	2	0.9						380-389							
90-99	8	3.6						390-399							
100-109	25	11.4						400-409							
110-119	8.1	3.7	10	60				410-419							
120-129	5	2.3						420-429							
130-139	0	0	0					430-439							
140-149	1	0.5						440-449							
150-159	0	0	0					450-459							
160-169	0	0	0					460-469							
170-179	0	0	0					470-479							
180-189	0.5	0.2	92.5	124.5				480-489							
190-199	0.8	0.4	84.3	94.7				490-499							
200-209	1	0.5	100	96.2				500-509							
210-219	5.4	2.5	131	104.8				510-519							
220-229	2.8	1.3	155	101.5				520-529							
230-239	2.9	1.3	190	113				530-539							
240-249	11.3	5.2	216.3	111.3				540-549							
250-259	12.6	5.6	214.4	96.2				550-559							
260-269	25.5	11.6	260	102.2				560-569							
270-279	46.3	21.1	290	100.6				570-579							
280-289	36.1	16.5	325	100				580-589							
290-299	16.1	7.4	380	103.8				590-599							
300-309	5.1	2.3	416	101.8				600-609							
310-319	2.5	1.1	516.8	113.3				610-619							
320-329	0.3	0.1	500	1 99				620-629							
330-339	0.5	0.2	525	93.5				TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET 1 ELECTROFISHING 1 hr. TRAP NET 1

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Channel Catfish LAKE/RESERVOIR: Brownlee Reservoir

DATE: _____ PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	0.8	1.4	325	89.5			
50-59								350-359	0	0	0				
60-69								360-369	1	1.7	350	80	-		
70-79								370-379	1	1.7	400	84			
80-89								380-389	0.5	0.9	400	76.5			
90-99								390-399	0.3	0.5	456	80			
100-109								400-409	0.5	0.9	400	65			
110-119								410-419	0.8	1.4	450	67			
120-129								420-429	0.3	0.5					
130-139								430-439	0.8	1.4	816.7	104.7			
140-149								440-449	0.8	1.4					
150-159	0.3	0.5						450-459	1	1.7	950	105			
160-169								460-469	1	1.7	875	90.5			
170-179	0.5	0.9	25	65				470-479	0.3	0.5					
180-189	0.4	0.7	25	54				480-489	0.5	0.9	933.3	83.7			
190-199	0.5	0.9	50	91				490-499	1.5	2.5	1366.7	114.8			
200-209	3.5	6.0	55	84.5				500-509	0.8	1.4	1300	102			
210-219	4.8	8.2	71.3	93.3				510-519	1.3	2.2	1428.6	105.6			
220-229	7.3	12.4	76.7	86.3				520-529	1	1.7	2500	173			
230-239	8.6	14.6	83.3	150				530-539	0.5	0.9	1450	95			
240-249	5.8	9.7	100	85				540-549	0.3	0.5					
250-259	4.3	7.3	108.7	81.3				550-559	0	0					
260-269	2.5	4.2	160	105				560-569	0	0					
270-279	1.3	2.2	150	87				570-579	1	1.7	2366.7	101.5			
280-289	0.8	1.4	150					580-589	0.5	0.9	2500	122			
290-299	0.5	0.9	150	69				590-599							
300-309	1.3	2.2	250	103				600-609							
310-319	0.5	0.9	250	93				610-619							
320-329	0.3	0.5	250	84				620-629							
330-339	0	0						TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET _____ ELECTROFISHING _____ TRAP NET _____

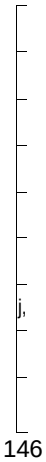
LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Smallmouth Bass LAKE/RESERVOIR: Brownlee REservoir

DATE: PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	4	0.7	505	90			
50-59								350-359	0						
60-69								360-369	1.5	0.3	731.3	.09	-		
70-79								370-379	1	0.2	800	110			
80-89								380-389							
90-99								390-399							
100-109								400-409							
110-119	1	0.2						410-419							
120-129								420-429							
130-139								430-439							
140-149	1	0.2	40	107				440-449							
150-159	4	0.7	35.5	77				450-459							
160-169	9	1.5	41	73				460-469							
170-179	16	2.7	44					470-479							
180-189	25.1	4.2	68	84.4				480-489							
190-199	19	3.2	81.5	83.3				490-499							
200-209	14	2.4	96	86.5				500-509							
210-219	14	2.4	114.7	88.7				510-519							
220-229	29	4.9	126.4	85				520-529							
230-239	49.3	8.3	156.4	91.6				530-539							
240-249	82	13.8	177	89.1				540-549							
250-259	70.5	11.9	184	83.8				550-559							
260-269	66.3	11.2	218.4	88				560-569							
270-279	54	9.1	244.4	81.7				570-579							
280-289	60.3	10.2	286.6	91.5				580-589							
290-299	32.4	5.5	337	97.3				590-599							
300-309	23.5	3.9	356.5	90.3				600-609							
310-319	8.3	1.4	409	96				610-619							
320-329	6	1.0	424	91				620-629							
330-339	2	0.3	446	86.5				TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET 1 ELECTROFISHING 1 hr. TRAP NET 1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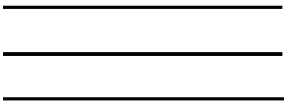
LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Yellow Perch LAKE/RESERVOIR: Brownlee Reservoir

DATE: _____ PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369					-		
70-79								370-379							
80-89								380-389							
90-99								390-399							
100-109								400-409							
110-119								410-419							
120-129								420-429							
130-139								430-439							
140-149								440-449							
150-159								450-459							
160-169								460-469							
170-179	1.1	6.0	20	30				470-479							
180-189	0.3	1.6	25	32				480-489							
190-199	0.5	2.7	80	85				490-499							
200-209	0.5	2.7	75	67				500-509							
210-219	4.8	26.4	107	79				510-519							
220-229	1.1	6.0	112	74				520-529							
230-239	3.1	17.0	133.4	76.4				530-539							
240-249	2.5	13.7	154.5	77.3				540-549							
250-259	1.1	6.0	180	79				550-559							
260-269	2.1	11.5	204.8	79				560-569							
270-279	0.5	2.7	230	78.5				570-579							
280-289	0	0	0					580-589							
290-299	0.3	1.6	300	81				590-599							
300-309	0.3	1.6	325	79				600-609							
310-319								610-619							
320-329		-						620-629							
330-339								TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET _____ ELECTROFISHING _____ TRAP NET _____



LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Black Crappie LAKE/RESERVOIR: Brownlee Reservoir

DATE: PERIOD: May 1993

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79								370-379							
80-89	1	0.6						380-389							
90-99	3	2						390-399							
100-109	17.1	11.2	11.8	100.2				400-409							
110-119	11.3	7.4	20	123				410-419							
120-129	7	4.6						420-429							
130-139	2.3	1.5	29.5	104				430-439							
140-149	0	0						440-449							
150-159	0.1	0.06	30	65				450-459							
160-169	2.1	1.4	69	121.5				460-469							
170-179	1.8	1.2	62	89				470-479							
180-189	5.3	3.5	102.8	98.2				480-489							
190-199	5.4	3.5	105	102.4				490-499							
200-209	1.6	1.0	110	91.5				500-509							
210-219	9	5.9	147.5	104.3				510-519							
220-229	27.6	18.1	195	118				520-529							
230-239	29	19.0	196	102.4				530-539							
240-249	17.3	11.3	224	101.6				540-549							
250-259	6.3	4.1	286.7	113.7				550-559							
260-269	2.9	1.9	280.8	97.4				560-569							
270-279	1.5	1.0	333.5	102				570-579							
280-289	0.1	0.06	370	100				580-589							
290-299	1	0.6						590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL							

TOTAL CATCH PER EFFORT OF: GILL NET 1 ELECTROFISHING 1 hr. TRAP NET 1

Appendix B. C.J. Strike Reservoir Lowland Survey data.

REPORT

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) White Crappie LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79								370-379							
80-89								380-389							
90-99								390-399							
100-109								400-409							
110-119	0.1	1.1	21	145				410-419							
120-129	0							420-429							
130-139	0.4	4.5	34	134				430-439							
140-149	0.3	3.4	39	119				440-449							
150-159	0							450-459							
160-169	1.8	20.2	63	125				460-469							
170-179	1.5	16.9	75	121				470-479							
180-189	1.1	12.4	94	124				480-489							
190-199	0							490-499							
200-209	0.6	6.7	137	129				500-509							
210-219	1.6	18.0	155	124				510-519							
220-229	0.8	9.0						520-529							
230-239	0							530-539							
240-249	0.7	7.9	239	122				540-549							
250-259								550-559							
260-269								560-569							
270-279								570-579							
280-289								580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	8.9						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Black Crappie LAKE/RESERVOIR: C.J. Strike

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79								370-379							
80-89								380-389							
90-99	1.8	5.2	18					390-399							
100-109	3.0	8.6	30	256				400-409							
110-119	4.2	12.1	33	203				410-419							
120-129	0.6	1.7	31	142				420-429							
130-139	1.8	5.2	47	165				430-439							
140-149	0.1	0.3						440-449							
150-159	0.6	1.7						450-459							
160-169	0.6	1.7						460-469							
170-179	2.5	7.2	80	115				470-479							
180-189	9.8	28.2	111	131				480-489							
190-199	7.2	20.7	135	133				490-499							
200-209	1.4	4.0	144	119				500-509							
210-219	0.3	0.9	173	122				510-519							
220-229	0							520-529							
230-239	0							530-539							
240-249	0							540-549							
250-259	0							550-559							
260-269	0							560-569							
270-279	0							570-579							
280-289	0.3	0.9						580-589							
290-299	0.6	1.7	418	101				590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	34.8						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Bluegill LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79	9.0	3.6						370-379							
80-89	4.2	1.7						380-389							
90-99	9.0	3.6	22	174				390-399							
100-109	25.2	10.1	28	156				400-409							
110-119	28.5	11.4	40	162				410-419							
120-129	29.7	11.9	55	164				420-429							
130-139	36.4	14.6	68	157				430-439							
140-149	25.1	10.1	77	138				440-449							
150-159	19.8	7.9	118	169				450-459							
160-169	18.2	7.3	144	167				460-469							
170-179	21.0	8.4	162	153				470-479							
180-189	14.5	5.8	183	143				480-489							
190-199	4.7	1.9	225	147				490-499							
200-209	0.9	0.3	272	150				500-509							
210-219	2.5	1.0	298	140				510-519							
220-229	0.6	0.2	255	103				520-529							
230-239	0.1	.04	320	112				530-539							
240-249								540-549							
250-259								550-559							
260-269								560-569							
270-279								570-579							
280-289								580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	249.4						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Largemouth Bass LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	0.6	2.6	594	103			
50-59								350-359	0.6	2.6	689	109			
60-69								360-369	0	0					
70-79								370-379	1.8	8.0	841	110			
80-89								380-389	0	0					
90-99								390-399	0	0					
100-109								400-409	0.6	2.6	750	77			
110-119								410-419	1.2	5.3	1125	107			
120-129								420-429	1.2	5.3	1187	105			
130-139								430-439	0	0					
140-149								440-449	0.1	0.4	2500				
150-159								450-459	0.3	1.3	1700	120			
160-169								460-469	0	0					
170-179								470-479	0	0					
180-189								480-489	0.6	2.6					
190-199	1.2	5.3	76	84				490-499	0	0					
200-209	0	0						500-509	0.6	2.6	2225				
210-219	1.8	8.0	124	99				510-519	0	0					
220-229	1.2	5.3	153	106				520-529	0.6	2.6	4000				
230-239	0	0						530-539	0.6	2.6	4000				
240-249	0.6	2.6	257	135				540-549							
250-259	0.6	2.6	226	104				550-559							
260-269	0.6	2.6	310	126				560-569							
270-279	1.8	8.0	304	109				570-579							
280-289	0.6	2.6	288	92				580-589							
290-299	0.6	2.6	380	109				590-599							
300-309	1.8	8.0	381	98				600-609							
310-319	0.6	2.6	347	80				610-619							
320-329	1.8	8.0	511	107				620-629							
330-339	0.6	2.6	502	96				TOTAL	22.6						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF: (species) _____Camel Catfish LAKE/RESERVOIR:_ C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	7.	mn wt. (gms)	Wr	Age(s)	Maturity J I/M	4 I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity d I/M	4 I/M
								340-349	1.8	3.1	396	108			
50-59								**350-359**	1.3	2.2	450	112			
60-69								**360-369**	0	0					
70-79								370-379	0.3	0.5	315	72			
80-89								**380-389**	0	0					
90-99								290-399	0.3	0.5	676	119			
100-109								**400-409**	0.3	0.5,					
110-119								410-419	1.0	1.7	752	113			
120-129								**420-429**	1.5	2.6	776				
130-139 ,								430-439	1.5	2.6	900				
140-149								**.:40-449**	0.8	1.4	1150	.37			
150-159								450-459	1.3	2.2	950	105			
160-169								**-50-469** 170	1.5	2.6	1117	115			
								_73-479	1.5	2.6	1175	113			
180-189	0.5	0.9						-=0-489	1.8	3.1	1350	121			
190-199	0.8	1.4					1	_;0-499	3.1	5.3	1325	1111			
200-209	1.3	2.2	84	129				1500-509	1.0	1.7					
210-219	1.8	3.1	114	148				1510-519	1.6	2.7					
220-229	1.5	2.6	121	106				520-529	1.8	3.1					
230-239	1.3	2.2	118	115				534-53g	1.3	2.2	1775	116			
240-249	0	0	0					5:3_549	1.5	2.6	2000	123			
250-259	2.0	3.4	174	129				5=-!-559	0.8	1.4	2050	118			
260-269	1.5	2.6					1	5EO-569	1.0	1.7	1700	93			
270-279	2.8	4.8	214	124				570-579	0.3	0.5					
290-259	3.3	5.6	225	116				550-5599	0.5	0.8	2100	102			
290-299	3.5	6.0	267	123				**=971-599**	0.8	1.4					
300-309	12.8	4.8	282	116				5=0-609	0.8	1.4	3500	153			
310-319	~0.8	1.4	344	127				**610-619**	0	0					
320-329	2.5	4.3	350	117				**620-629**	0.3	0.5					
330-3391	2.0	3.4	357	108					10.3	0.5					

TOTAL CATCH PER EFFORT

OF: GILL NET _____ 4 ____ ~=LECTROFISHING 1.7 hrs. TRAP NET _ 8

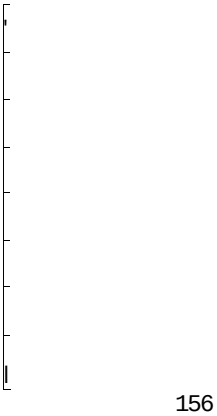
LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Yellow Perch LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79								370-379							
80-89								380-389							
90-99	1.8	1.8						390-399							
100-109	5.4	5.3	15	126				400-409							
110-119	7.2	7.1	23	142				410-419							
120-129	6.6	6.5	29	135				420-429							
130-139	2.9	2.9	35	124				430-439							
140-149	7.1	7.0	43	120				440-449							
150-159	4.8	4.7	50	114				450-459							
160-169	2.5	2.5		98				460-469							
170-179	6.3	6.2	82	124				470-479							
180-189	7.2	7.0	75	94				480-489							
190-199	11.6	11.4	99	104				490-499							
200-209	14.0	13.7	110	98				500-509							
210-219	12.8	12.5	133	102				510-519							
220-229	3.8	3.7	160	105				520-529							
230-239	3.8	3.7	171	97				530-539							
240-249	1.9	1.8	225	112				540-549							
250-259	0.6	0.6	188	82				550-559							
260-269	0.3	0.3	232	89				560-569							
270-279	0.1	.09	243	82				570-579							
280-289	0.5	0.5	287	87				580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	101.2						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8


156

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Smallmouth Bass LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	0.3	0.1	631	112			
50-59								350-359	0.6	0.2	661	107			
60-69								360-369	0	0					
70-79	1.2	0.4						370-379	0	0					
80-89	9.0	2.9	10	148				380-389	0	0					
90-99	12.6	4.0	13	133				390-399	0	0					
100-109	14.4	4.6						400-409	0.3	0.1					
110-119	7.8	2.5	29					410-419	0.1	.03					
120-129	6.6	2.1	29	122				420-429							
130-139	4.2	1.3	35	117				430-439							
140-149	4.1	1.3	42	111				440-449							
150-159	14.7	4.7	63	98				450-459							
160-169	23.8	7.6	61	107				460-469							
170-179	40.9	13.1	65	95				470-479							
180-189	26.5	8.5	84	104				480-489							
190-199	24.3	7.8	100	105				490-499							
200-209	13.1	4.2	112	100				500-509							
210-219	11.7	3.8	124	96				510-519							
220-229	13.8	4.4	145	97				520-529							
230-239	11.2	3.6	174	102				530-539							
240-249	11.7	3.7	172	94				540-549							
250-259	12.0	3.9	216	98				550-559							
260-269	10.2	3.3	245	98				560-569							
270-279	13.3	4.3	270	98				570-579							
280-289	4.6	1.5	304	97				580-589							
290-299	6.7	2.2	366	105				590-599							
300-309	5.9	1.9	371	96				600-609							
310-319	3.4	1.1	464	109				610-619							
320-329	2.1	0.7	469	100				620-629							
330-339	0.5	0.2	506	98				TOTAL	311.6						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Warmmouth Sunfish LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79								370-379							
80-89								380-389							
90-99	0.6	7.5						390-399							
100-109	0	0						400-409							
110-119	1.5	18.8						410-419							
120-129	1.2	15.0						420-429							
130-139	0	0						430-439							
140-149	1.2	15.0						440-449							
150-159	0.1	1.3						450-459							
160-169	1.2	15.0						460-469							
170-179	1.0	12.5						470-479							
180-189	0.6	7.5						480-489							
190-199	0.6	7.5						490-499							
200-209								500-509							
210-219								510-519							
220-229								520-529							
230-239								530-539							
240-249								540-549							
250-259								550-559							
260-269								560-569							
270-279								570-579							
280-289								580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	8.0						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Rainbow Trout LAKE/RESERVOIR: C.J. Strike Res.

DATE: May 1993 PERIOD:

Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349	5.5	15.9	502	112			
50-59								350-359	3.4	9.8	516	106			
60-69								360-369	0.9	2.6	527	99			
70-79								370-379	0	0					
80-89								380-389	0.3	0.9	705	112			
90-99								390-399	0.4	1.1	619	91			
100-109								400-409	0	0					
110-119								410-419	0	0					
120-129								420-429	0.5	1.4	728	85			
130-139								430-439	0.3	0.9	894	97			
140-149								440-449	0.1	0.3	1000	101			
150-159	0.6	1.7						450-459	0.6	1.7					
160-169	0							460-469	0	0					
170-179	0							470-479	0.1	0.3	1100	90			
180-189	0							480-489	0	0					
190-199	0							490-499	0	0					
200-209	0							500-509	0.3	0.9	1500	102			
210-219	0							510-519	0	0					
220-229	0							520-529	0	0					
230-239	0							530-539	0.3	0.9	1750	99			
240-249	0							540-549							
250-259	0.3	0.9	154	89				550-559							
260-269	0.5	1.4	207	107				560-569							
270-279	0.5	1.4	257	118				570-579							
280-289	0.8	2.3	278	114				580-589							
290-299	1.8	5.2	299	110				590-599							
300-309	2.1	6.1	328	108				600-609							
310-319	1.8	5.2						610-619							
320-329	4.3	12.4	414	112				620-629							
330-339	9.3	26.8	439	108				TOTAL	34.7						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs TRAP NET 8

LOWLAND LAKES AND RESERVOIRS FISH SURVEY
SPECIES SUMMARY SHEET

CATCH COMPOSITION OF:(species) Punkinseed Sunfish LAKE/RESERVOIR: C.J. Strike Res.

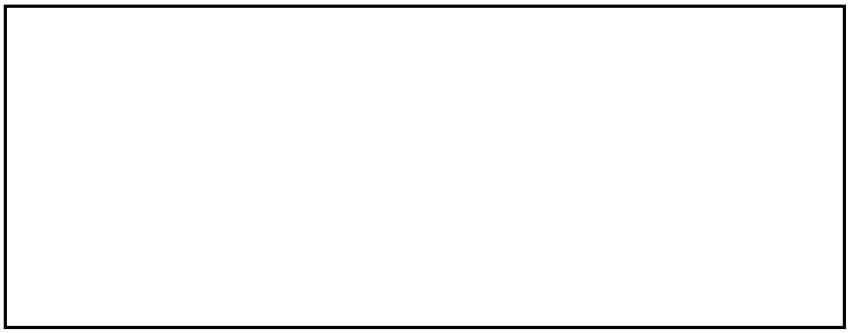
DATE: May 1993 PERIOD:

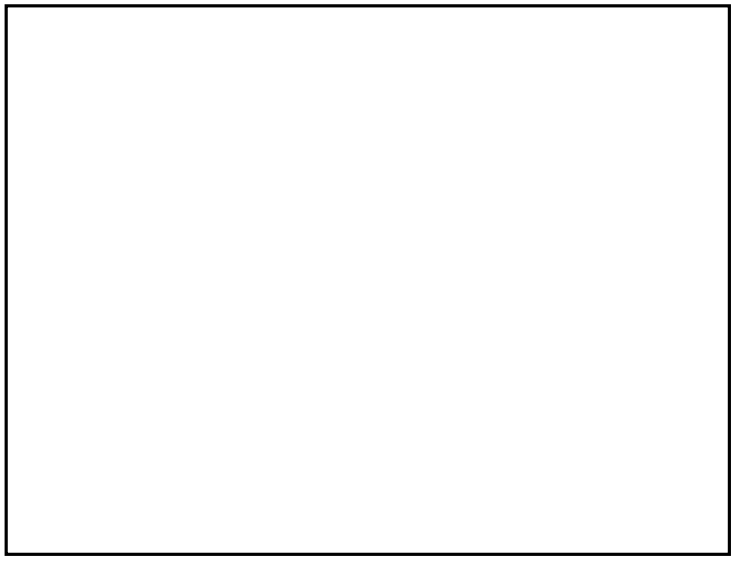
Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M	Length range (mm)	No. per unit effort	%	mn wt. (gms)	Wr	Age(s)	Maturity ♂ I/M	Maturity ♀ I/M
								340-349							
50-59								350-359							
60-69								360-369							
70-79	0.6	4.2						370-379							
80-89	0	0						380-389							
90-99	1.2	8.3						390-399							
100-109	6.0	41.7						400-409							
110-119	2.4	16.7						410-419							
120-129	3.0	20.8						420-429							
130-139	1.2	8.3						430-439							
140-149								440-449							
150-159								450-459							
160-169								460-469							
170-179								470-479							
180-189								480-489							
190-199								490-499							
200-209								500-509							
210-219								510-519							
220-229								520-529							
230-239								530-539							
240-249								540-549							
250-259								550-559							
260-269								560-569							
270-279								570-579							
280-289								580-589							
290-299								590-599							
300-309								600-609							
310-319								610-619							
320-329								620-629							
330-339								TOTAL	14.4						

TOTAL CATCH PER EFFORT OF: GILL NET 4 ELECTROFISHING 1.7 hrs. TRAP NET 8

Appendix C. Southwest Regional Random Angler Contact Database.

REPORT





Apendice C. Southwest random creel contacts.

From January 1 through December 31, 1993, 1536 anglers were interviewed while fishing Southwest Region (Nampa) waters. Those anglers had fished 3238 hours and reported catching 2008 fish. Of the anglers contacted, 80 were fishing with flies, 307 were fishing with lures, and 1273 were fishing with bait. Summary angling information for individual waters is contained in Table 1.

Table 1. Summary of angling characteristics from Southwest Region (Nampa) waters, 1993.

Angler Creel Checks,	1993			
			CATCH	NO.
	NO.OF	HOURS	PER	FISHING
WATER	ANGLERS	FISHED	EFFORT	W/FLIES
BLACK CANYON RES	12	8		0
BLACKS CREEK RES	2	2		0
BOISE R	133	228		8
BROWNLEE RES	30	107		0
BULL TROUT LAKE	7	48		3
CALDWELL PONDS	84	116		0
C.J. STRIKE RES	107	330		0
CLEAR CREEK	5	2		3
CROOKED R	6	11		1
DEADWOOD R	33	23		1
DEADWOOD RES	13	14		0
DUFF LANE POND	14	26		0
GRASSMERE RES	3	14		0
GRIMES CREEK	1	3		0
HORSESHOE BEND MILL	85	144		0
INDIAN CREEK RES	3	8		0
LAKE LOWELL	24	34		0

LOWLINE CANAL	27	2		0
MFK BOISE R	35	94		1
MFK PAYETTE R	87	120		1
MANNS CREEK	4	7		0
MANNS CREEK RES	31	60		0
MARSING POND	15	19		0
MARTIN LAKE	7	13		0
MORES CREEK	3	3		0
NFK PAYETTE R	19	55		0
NFK BOISE R	38	112		8
PAYETTE R	18	59		0
RIVERSIDE POND	9	12		3
ROARING RIVER	2	3		2
SF PAYETTE R	48	74		8
SAGEHEN RES	133	375		2
SAGEHEN CREEK	5	8		1
SAWYERS POND	19	25		0
SHOOFLY RES	2	1		1
SILVER CREEK	21	52		0
SMITH CREEK	2	1		0
SNAKE R	238	466		0
SQUAW CREEK,THIRD FK	11	32		0
SWAN FALLS RES	160	441		0
TRIPOD RES	28	56		0
VETERANS POND	11	8		0
WILSON CREEK	1	2		0
TOTAL	1536	3238		80

Table 1 (continued)

Angler Creel Checks,	1993			
	NO.	NO.	WILD	HATCHERY
	FISHING	FISHING	RAINBOW	RAINBOW
WATER	W/ LURES	W/BAIT	CAUGHT	CAUGHT
BLACK CANYON RES	0	12	0	0
BLACKS CREEK RES	0	2	0	0
BOISE R	48	115	0	75
BROWNLEE RES	0	30	0	0
BULL TROUT LAKE	2	4	0	0
CALDWELL PONDS	10	74	0	17
C.J. STRIKE RES	47	51	0	4
CLEAR CREEK	3	5	7	0
CROOKED R	0	6	0	22
DEADWOOD R	11	32	17	45
DEADWOOD RES	5	6	0	0
DUFF LANE POND	2	12	0	0
GRASSMERE RES	0	3	0	0
GRIMES CREEK	0	1	0	1
HORSESHOE BEND MILL	18	71	0	24
INDIAN CREEK RES	0	3	0	0
LAKE LOWELL	0	24	0	0
LOWLINE CANAL	0	31	0	0
MFK BOISE R	10	18	73	52
MFK PAYETTE R	20	70	39	11
MANNS CREEK	0	1	1	0
MANNS CREEK RES	2	3	0	11
MARSING POND	2	13	0	14

MARTIN LAKE	0	7	0	2
MORES CREEK	1	2	0	0
NFK PAYETTE R	6	13	16	3
NFK BOISE R	5	26	18	47
PAYETTE R	4	18	3	0
RIVERSIDE POND	0	6	0	2
ROARING RIVER	0	0	0	20
SF PAYETTE R	14	55	28	9
SAGEHEN RES	37	104	38	79
SAGEHEN CREEK	0	3	1	24
SAWYERS POND	0	18	0	5
SHOOFLY RES	0	2	0	0
SILVER CREEK	3	18	0	16
SMITH CREEK	0	2	0	0
SNAKE R	9	234	0	0
SQUAW CREEK,THIRD FK	0	10	44	0
SWAN FALLS RES	48	140	0	0
TRIPOD RES	0	16	5	12
VETERANS POND	0	11	0	2
WILSON CREEK	0	1	0	3
	307	1273		

Table 1 (continued)

Angler Creel Checks, 1993				
	BROWN	WHITEFSH	BULL	CUTHROAT
	TROUT		TROUT	
WATER	CAUGHT	CAUGHT	CAUGHT	CAUGHT
BLACK CANYON RES				
BLACKS CREEK RES				
BOISE R	1	4		
BROWNLEE RES				
BULL TROUT LAKE				
CALDWELL PONDS				
C.J. STRIKE RES				
CLEAR CREEK				
CROOKED R				
DEADWOOD R		21		25
DEADWOOD RES				5
DUFF LANE POND				
GRASSMERE RES				
GRIMES CREEK				
HORSESHOE BEND MILL				
INDIAN CREEK RES				
LAKE LOWELL				
LOWLINE CANAL				
MFK BOISE R		4	???	
MFK PAYETTE R		12	5	
MANNS CREEK				
MANNS CREEK RES				
MARSING POND				

MARTIN LAKE				
MORES CREEK				
NFK PAYETTE R				
NFK BOISE R			10	
PAYETTE R		1		
RIVERSIDE POND				
ROARING RIVER				
SF PAYETTE R		7		
SAGEHEN RES				
SAGEHEN CREEK				
SAWYERS POND				
SHOOFLY RES				
SILVER CREEK		6		
SMITH CREEK				
SNAKE R				
SQUAW CREEK,THIRD FK				
SWAN FALLS RES				
TRIPOD RES				
VETERANS POND				
WILSON CREEK				
	1	55	15	30

Table 1 (continued)

Angler Creel Checks, 1993				
	RBxCT	BROOK	ATLANTIC	KOKANEE
		TROUT	SALMON	
WATER	CAUGHT	CAUGHT	CAUGHT	CAUGHT
BLACK CANYON RES				
BLACKS CREEK RES				
BOISE R				
BROWNLEE RES				
BULL TROUT LAKE		33		
CALDWELL PONDS				
C.J. STRIKE RES				
CLEAR CREEK				
CROOKED R		2		
DEADWOOD R	13		1	4
DEADWOOD RES	2		1	8
DUFF LANE POND				
GRASSMERE RES				
GRIMES CREEK				
HORSESHOE BEND MILL				
INDIAN CREEK RES				
LAKE LOWELL				
LOWLINE CANAL				
MFK BOISE R				
MFK PAYETTE R				
MANNS CREEK				
MANNS CREEK RES				
MARSING POND				

MARTIN LAKE				
MORES CREEK				
NFK PAYETTE R		2		
NFK BOISE R				
PAYETTE R				1
RIVERSIDE POND				
ROARING RIVER				
SF PAYETTE R.	1			
SAGEHEN RES				
SAGEHEN CREEK				
SAWYERS POND				
SHOOFLY RES				
SILVER CREEK		3		
SMITH CREEK				
SNAKE R				
SQUAW CREEK,THIRD FK				
SWAN FALLS RES				
TRIPOD RES				
VETERANS POND				
WILSON CREEK				
	16	40	2	13

Table 1 (continued)

Angler Creel Checks,	1993			
	LAHONTON	SMOUTH	CHANNEL	LMOUTH
	CUTHROAT	BASS	CATFISH	BASS
WATER	CAUGHT	CAUGHT	CAUGHT	CAUGHT
BLACK CANYON RES				
BLACKS CREEK RES				
BOISE R		7	2	
BROWNLEE RES		12	60	
BULL TROUT LAKE				
CALDWELL PONDS			2	1
C.J. STRIKE RES		255	1	
CLEAR CREEK				
CROOKED R				
DEADWOOD R				
DEADWOOD RES				
DUFF LANE POND				
GRASSMERE RES	1			
GRIMES CREEK				
HORSESHOE BEND MILL				15
INDIAN CREEK RES				
LAKE LOWELL				
LOWLINE CANAL			2	
MFK BOISE R				
MFK PAYETTE R				
MANNS CREEK				
MANNS CREEK RES				32
MARSING POND				

MARTIN LAKE				
MORES CREEK				
NFK PAYETTE R				
NFK BOISE R				
PAYETTE R		9	6	
RIVERSIDE POND				
ROARING RIVER				
SF PAYETTE R				
SAGEHEN RES				
SAGEHEN CREEK				
SAWYERS POND				4
SHOOFLY RES				
SILVER CREEK				
SMITH CREEK				
SNAKE R		11	186	
SQUAW CREEK,THIRD FK				
SWAN FALLS RES		201	42	1
TRIPOD RES				
VETERANS POND				
WILSON CREEK				
	1	495	301	53

Table 1 (continued)

Angler Creel Checks,	1993			
	PUMPKIN-	BROWN	BLUEGILL	YELLOW
	SEED	BULLHD		PERCH
WATER	CAUGHT	CAUGHT	CAUGHT	CAUGHT
BLACK CANYON RES		2		
BLACKS CREEK RES				
BOISE R				
BROWNLEE RES				
BULL TROUT LAKE				
CALDWELL PONDS	1	1	38	
C.J. STRIKE RES			9	6
CLEAR CREEK				
CROOKED R				
DEADWOOD R				
DEADWOOD RES				
DUFF LANE POND				
GRASSMERE RES				
GRIMES CREEK				
HORSESHOE BEND MILL	2	4	32	1
INDIAN CREEK RES				
LAKE LOWELL				
LOWLINE CANAL		???		
MFK BOISE R				
MFK PAYETTE R				
MANNS CREEK				
MANNS CREEK RES				
MARSING POND				

MARTIN LAKE				
MORES CREEK				
NFK PAYETTE R				
NFK BOISE R				
PAYETTE R				
RIVERSIDE POND				
ROARING RIVER				
SF PAYETTE R				
SAGEHEN RES				
SAGEHEN CREEK				
SAWYERS POND		2	17	11
SHOOFLY RES				
SILVER CREEK				
SMITH CREEK				
SNAKE R				
SQUAW CREEK,THIRD FK				
SWAN FALLS RES		6	3	
TRIPOD RES				
VETERANS POND				
WILSON CREEK				
	3	15	99	18

Table 1 (continued)

Angler Creel Checks, 1993			
	BLACK	STURGEON	OTHER
	CRAPPIE		
WATER	CAUGHT	CAUGHT	CAUGHT
BLACK CANYON RES			7
BLACKS CREEK RES			
BOISE R			
BROWNLEE RES			
BULL TROUT LAKE			
CALDWELL PONDS			
C.J. STRIKE RES	23	10	
CLEAR CREEK			
CROOKED R			
DEADWOOD R			
DEADWOOD RES			
DUFF LANE POND			
GRASSMERE RES			
GRIMES CREEK			
HORSESHOE BEND MILL			
INDIAN CREEK RES			
LAKE LOWELL			
LOWLINE CANAL			
MFK BOISE R			
MFK PAYETTE R			
MANNS CREEK			
MANNS CREEK RES	21		
MARSING POND			

MARTIN LAKE			
MORES CREEK			
NFK PAYETTE R			
NFK BOISE R			
PAYETTE R			
RIVERSIDE POND			
ROARING RIVER			
SF PAYETTE R			
SAGEHEN RES			
SAGEHEN CREEK			
SAWYERS POND			
SHOOFLY RES			
SILVER CREEK			
SMITH CREEK			
SNAKE R			
SQUAW CREEK,THIRD FK			
SWAN FALLS RES			
TRIPOD RES			
VETERANS POND			
WILSON CREEK			
	44	10	7

JOB PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-18

Project IV: Population Management

Subproject IV-D: Southwest Region

Contract Period: July 1, 1993 to June 30, 1994

ABSTRACT

Warmwater fish species were captured and transferred to eight small drought-affected lakes or reservoirs to rebuild fish populations. A total of 1,388 largemouth bass *Micropterus salmoides,* 4,235 bluegill *Lepomis macrochirus,* 3,000 channel catfish *Ictaurus punctatus,* 2,812 crappie *Pomoxis* sp., and 5,000 yellow perch *Perca flavescens* were stocked.

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Brian J. Flatter
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Bill Hutchinson
State Fisheries Manager