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REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
SOUTHEAST REGION (Subprojects I-F, II-F, III-F)

SUBPROJECT I-F	SURVEYS AND INVENTORIES
Job b.	Southeast Region Lowland Lakes Investigations
Job c.	Southeast Region Rivers and Streams Investigations
SUBPROJECT II-F	TECHNICAL GUIDANCE
SUBPROJECT III-F	HABITAT MANAGEMENT

By

Richard Scully, Regional Fisheries Manager
James Mende, Regional Fisheries, Biologist
Marc Arms, Fishery Technician

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JOB PERFORMANCE REPORT

State of:	Idaho	Program:	F-71-R-18
Project I:	Surveys and Inventories	Subproject I-F:	Southeast Region
Job:	b	Title:	Lowland Lakes Investigations

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

ABSTRACT

We conducted year-round creel surveys on seven reservoirs as the second year of a 3-year investigation of performance of fingerling and catchable size hatchery rainbow trout *Oncorhynchus mykiss*. Drought conditions in 1992 prevented fingerlings stocked that fall from performing well in the 1993 fishery. Catchables stocked into full reservoirs in May 1993 performed well. Best return by weight came from the trout-only waters of Treasureton (321%) and Chesterfield (95%) reservoirs. Poorest returns came from the mixed species reservoirs of Twin Lakes (32%) and Winder (54%) reservoirs. The almost non-existent return (less than 0.1%) at Springfield Reservoir is likely due to avian predation. No yield was reported at the trophy management waters of Daniels and Twentyfour Mile reservoirs, due to the 20-in minimum size limit. Fastest growth occurred in the trout only waters with general regulations, i.e., Springfield, Chesterfield and Treasureton. Poorest trout growth occurred in the mixed trout and warmwater species reservoirs of Twin Lakes and Winder.

We conducted a creel survey at American Falls Reservoir from May through September 1993. Anglers fished 69,364 hours (3.1 h/ha) and caught 8,023 trout. This is about 2%, by number, of the fish stocked in American Falls Reservoir annually. About 35% of the trout stocked are catchable size with the remaining 65% stocked as fingerlings.

After 6 years of drought, in 1993 enough water entered the Highway Pond gravel pit to make fish stocking practical. To help determine stocking needs we estimated fish survival after two weeks of fishing during mid-summer. Snorkelers estimated that 69 of 900 (8%) rainbow trout stocked still remained after two weeks. If this high rate of exploitation continues, we will have to reduce the limit from six to two trout to maintain acceptable catch rates for anglers.

McTucker Ponds were renovated with rotenone in 1992. We restocked McTucker Pond #8 with rainbow trout monthly throughout 1993 and conducted a year-long creel survey in order to determine angler harvest. Of 5,118 fish stocked, anglers harvested 73% by number.

On Memorial Day weekend we conducted a fisheries check station at the Inkom Port-of-Entry on Interstate 15. Anglers provided information from 4,583 hours of fishing on 25 lakes, reservoirs and ponds. Hawkins and Twin Lakes reservoirs were the most commonly fished waters.

We conducted shoreline seining in Chesterfield Reservoir in order to assess the presence of non-game species in the recently renovated water. Seining efforts revealed the presence of only speckled dace *Rhinichthys osculus*. This is an indication that the targeted Utah suckers *Catostomus ardens*, common carp

Cyprinus carpio and Utah chubs *Gila atraria*, which had been in Chesterfield Reservoir prior to the 1992 rotenone renovation, have not reappeared.

We examined the largemouth bass *Micropterus salmoides* population in Condie Reservoir three years after changing from general (12-in minimum size) to trophy (20-in minimum size) bass regulations. Proportional stock density (PSD) indices in 1986, 1988, and 1993 were 40%, 31%, and 21%, respectively. A declining PSD would not be expected with a change from general to trophy size restrictions. In the case of Condie Reservoir the decline in PSD may have more to do with declining and irregular recruitment during the 1987-1992 drought. The presence of illegally introduced yellow perch (early 1980s) and their affect on largemouth bass growth/survival may have compounded the drought-caused problems.

We examined the largemouth bass population at Glendale Reservoir following a 1992 change in regulations from general (five bass, none under 12-in) to quality (two bass, none under 16-in). In 1988, sampled largemouth bass averaged 222 mm long and had a PSD of 9%. The 1993 sampled largemouth bass averaged 266 mm long and had a PSD of 22%. The trend appears to be a population response to the regulation change.

We examined the largemouth bass population at St. Johns Reservoir following a 1990 change in regulations from general (five bass, none under 12-in) to trophy (two bass, none under 20-in). The largemouth bass population PSD increased from 1991's 11% to 1993's 38%. The change was likely due to increased abundance of largemouth bass greater than 300 mm in the 1993 sample.

We stocked several regional waters with fish species other than rainbow trout. To maintain the walleye fishery in Oneida Reservoir we stocked 200,000 walleye *Stizostedion vitreum* fry brought from Osage River in Missouri. In an attempt to develop a crappie fishery in the region, we stocked 225 pre-spawn white crappie *Pomoxis annularis* in each of Alexander and Glendale reservoirs. The crappie were collected by electrofishing at Oxbow Reservoir and trucked to the receiving reservoirs. We stocked several waters with largemouth bass collected from Lamont (1,700 fish) and Deep Creek (50 fish) reservoirs. McTucker Ponds received 700 of the largemouth bass as well as 15 bluegill *Lepomis macrochirus*. Johnson and Foster reservoirs each received 250 largemouth bass, with the remaining fish transferred to Mud Lake in the Upper Snake Region following a chemical renovation. We also stocked channel catfish *Ictalurus punctatus* in both McTucker Ponds (2,000 fish) and Alexander Reservoir (16,000 fish). The channel catfish were obtained from a commercial supplier in Oklahoma.

Authors:

Richard Scully
Regional Fishery Manager

James Mende
Regional Fishery Biologist

Marc Arms
Fishery Technician

OBJECTIVES

1. Document return to the creel of spring-stocked catchable and fall-stocked fingerling size trout.

2. Document relative growth, survival, and persistence of catchable and fingerling size trout stocked in waters with and without competing species.

3. Document effects of special harvest restrictions on growth and survival of catchable and fingerling size stocked trout.

4. Document creel statistics on American Falls Reservoir throughout the open-water fishing season.

5. Document harvest mortality of fish stocked in the Highway Pond near Pocatello through the use of a snorkeling survey.

6. Document creel statistics on McTucker Pond #8 rainbow trout following the 1992 chemical renovation.

7. Conduct a Memorial Weekend check station on Interstate 15's Inkom Port-of-Entry as an annual indicator of fishing pressure and success region-wide.

8. Use littoral seine netting as a means to determine the status of warm-water/non-game fish reproduction in various waters of the region.

INTRODUCTION AND METHODS

Catchable and Fingerling Trout Evaluations in Reservoirs

We conducted creel surveys on seven Southeast Region reservoirs in 1993 as the second year of a 3-year investigation of hatchery rainbow trout *Oncorhynchus mykiss* performance (Table 1). Precipitation was abundant in 1993, a distinct contrast to drought conditions of 1992. Two of the seven evaluation reservoirs, Chesterfield and Treasureton, were drained during summer 1992 in an attempt to meet irrigation needs. Four others were drawn down to marginally low levels. Only Springfield Reservoir, which can feed irrigation canals only when full, was unaffected by the drought conditions. During the 1992-1993 winter, above normal precipitation filled the evaluation reservoirs and ensured adequate volume through the rest of 1993. Evaluation reservoirs ranged in size from 18 ha Twentyfour Mile Reservoir to 648 ha Chesterfield Reservoir. Reservoir elevations ranged from 1,452 m at Twin Lakes to near 1,801 m at Twentyfour Mile Reservoir. Six of the seven evaluation reservoirs were constructed to store water for irrigation. The exception (Springfield Reservoir), although also constructed for irrigation, functions by raising the water surface so water can flow into irrigation canals. Thus, Springfield Reservoir remains full, rather than being drafted during the irrigation season. Much of the inflow for the evaluation reservoirs passes through livestock-grazed pastures and croplands that add nutrients. The exceptions are Twin Lakes and Winder reservoirs, where most of the inflow comes from the headwaters of Mink Creek via canals.

Table 1. General characteristics of seven fingerling and catchable rainbow trout evaluation waters in the Southeast Region of Idaho.

Reservoir	County	Surface Area (ha)	Elevation (m)	Trout Only
Chesterfield	Caribou	648	1,645	Yes
Daniels	Oneida	152	1,573	Yes
Springfield	Bingham	27	1,341	No – Utah chubs, Utah suckers
Treasureton	Franklin	143	1,513	Yes
Twentyfour Mile	Caribou	18	1,801	No – mountain suckers
Twin Lakes	Franklin	181	1,435	No – largemouth bass, bluegill, carp
Winder	Franklin	38	1,486	No – largemouth bass, bluegill, yellow perch

The only game fish in Chesterfield, Daniels, Twentyfour Mile, Springfield, and Treasureton reservoirs are trout, almost all of which were stocked. In 1993, the quantity of non-game fish was insignificant in Chesterfield, Daniels, and Treasureton reservoirs. Twentyfour Mile reservoir contained mountain suckers *Catostomus platyrhynchus*. Mountain suckers are small, generally less than 20 cm, and probably do not compete significantly with trout for food or space. Springfield Reservoir contained Utah chubs *Gila atraria* and Utah suckers *C. ardens*. Twin Lakes and Winder reservoirs contained largemouth bass *Micropterus salmoides* and bluegill *Lepomis macrochirus*. Additionally, Twin Lakes Reservoir contained a mature population of common carp *Cyprinus carpio* and a small number of tiger muskies *Esox lucius* x *E. masquinongy*, and Winder Reservoir contained yellow perch *Perca flavescens* and green sunfish *L. cyanellus*.

Historically, the reservoirs have been stocked with catchable size (about 23 cm) rainbow trout in spring and summer. Prior to 1988, most reservoirs were closed to fishing from December 1 through late May, half of the year. Since 1988, all of the waters have been open to year-round fishing. Smaller trout, 10 to 15 cm long were stocked occasionally, but biologists questioned whether or not they contributed significantly to reservoir trout fisheries. The present evaluation was designed to determine the relative cost effectiveness of stocking spring-catchable or fall-fingerling size rainbow trout in irrigation storage reservoirs. The cost of stocking a 22.5 cm catchable size trout is about 3.375 times the cost of stocking a 15 cm fingerling size trout. By stocking both spring catchables and fall fingerlings, better use is made of hatchery space. When a cohort of trout grows to 15 cm in the fall, hatchery raceway space is filled. Stocking out three-quarters of these fish at this time and size frees up space to grow the remaining quarter of the fish to the 22.5 cm catchable size for release the following spring. However, there is a cost to feed and stock the fall fingerlings. By growing fish for release as both fingerlings and catchables together, they are at a much higher density in raceways until the fingerlings are stocked than if only catchables were grown. Disease and fin erosion can be high when densities in the hatchery are high. By stocking 15 cm fingerlings at 3.375 times the density of 22.5 cm catchables into the same water, the relative benefit of each release size can be determined by the relative number and/or weight of each release size that is caught or kept.

The study involved cooperation of hatcheries, research, management, and enforcement personnel. Hatcheries shifted their programs to ensure that the seven Southeast Region reservoirs received only Hayspur rainbow trout, reared only at Grace Hatchery, and to provide the requested number of the right size fish at the requested times. Research personnel estimated population size and growth of trout at several of the reservoirs twice annually throughout the study. Graduate student Ron Reardon conducted plankton composition and food habit studies. Management conducted creel surveys and enforcement participated in electrofishing surveys and enforced regulations.

To identify each release group in the three-year study, the 225 mm catchables released each spring have a unique mark (fin excision), and the 150 mm fall released fingerlings are unmarked. Catchable trout for release in the spring of 1992, 1993, and 1994, referred to as the C92, C93, and C94 cohorts, respectively, are assigned adipose fin, left maxillary, and right maxillary clips, respectively, as identifying marks. The logic of this marking plan was that the fall fingerlings released the first fall would be significantly smaller than the marked catchables released in the spring of the same year. The following year's spring-catchables would have a unique mark distinguishing them from the unmarked fingerling released the previous fall. By the time the second year's fall fingerlings were released, they would be easily identifiable from the previous year's fall fingerling release by size. The same separation method would distinguish fall and spring released trout through the three-year study.

For the creel survey, the 1993 calendar year was divided into thirteen 28-day intervals. Two randomly chosen weekdays and two weekend days were sampled in each interval. Sampling times as either AM or PM

were randomly chosen. During each survey, anglers were counted and samples of them were interviewed. Angler counts for boat, bank, float tube, and ice anglers were tallied separately. Anglers were asked whether or not they were Idaho residents and what type of gear they were using, either bait or artificial lure/fly. The determination of whether to count or interview first was determined by coin toss at the reservoir, as was the direction to go from the access point. Fish species, length, and identifying mark were recorded for each harvested fish. We entered creel survey data into the Idaho Department of Fish and Game's "Creel" computer program.

Periodically, fishery research personnel sampled fish populations on the evaluation reservoirs to determine zooplankton composition, trout stomach contents, and trout growth and condition. Fish were collected using boat-mounted electrofishing equipment. These surveys were essential to measure fish growth at the special regulation waters where trout could not be harvested until they were 508 mm.

Chesterfield Reservoir

Chesterfield Reservoir was drained June 20, 1992 and did not begin refilling until September 15, 1992. On September 29, 135,000 160 mm rainbow trout (F-92s) were stocked into Chesterfield Reservoir when it was at less than 1% of its full pool volume. This was followed by a release of 4,600 150 mm brown trout *Salmo trutta* on October 2, 1992. Deep snow covered thick ice on the reservoir that winter. No ice fishing occurred during the 1992-1993 winter. By June 1993, Chesterfield Reservoir had filled to its 18,000 acre-feet and 1,600 surface acre capacity. In May 1993, 40,000 225 mm rainbow trout (C-93) were stocked. In contrast to conditions the previous fall, there was now abundant habitat and food for newly stocked trout. We began the 1993 creel survey on Chesterfield Reservoir in April. In September 1993, 129,850 150 mm rainbow trout were stocked, followed by 1,020 150 mm brown trout in October 1993 (Table 2).

Treasureton Reservoir

Due to the continuing drought, Treasureton Reservoir only partially filled in the spring of 1992, and was drained for irrigation on August 10, 1992. This was the first time Treasureton Reservoir had been drained in well over a decade. Not enough water refilled the reservoir basin that fall to ensure overwinter survival; thus no fish were stocked until the spring of 1993. Abundant precipitation fell the winter of 1992-1993, filling Treasureton Reservoir to capacity by May 1993. On May 6, 1993, we stocked 16,002 22.5 cm rainbow trout (112/acre) (Table 3). This is at least 4.5 times the density stocked in all but Springfield Reservoir. The purpose of the high density was to determine density's effect on growth, fishing effort, and return to angler.

Springfield Reservoir

Springfield Reservoir (27 ha) maintained a full pool during the 1987-92 drought since its irrigation function is to maintain a water level high enough so natural spring flows can be directed into canals. Marked spring-stocked catchables and unmarked fall-stocked fingerlings from both 1992 and 1993 were present during the 1993 survey in addition to fish stocked prior to 1992. Numbers stocked in 1992 and 1993 are shown in Table 4. Springfield Reservoir received the highest density of trout of the seven evaluation reservoirs. Rather

Table 2. Number and weight of all cohorts of trout stocked into Chesterfield Reservoir, Idaho in 1993 and fall of 1992.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Fall 1992 (F92) Fingerling Rainbow Trout	09/29/92	134,995	6,226	46	161
Fall 1992 (BF92) Fingerling Brown Trout	10/02/92	4,596	178	39	152
Spring 1993 (C93) Catchable Rainbow Trout	05/04/93	39,995	4,491	112	225
Fall 1993 (F93) Fingerling Rainbow Trout	09/20/93	129,850	5,557	43	150
Fall 1993 (BF93) Fingerling Brown Trout	10/18/93	1,020	39	38	150

Table 3. Number and weight of all trout cohorts stocked into Treasureton Reservoir, Idaho in 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1993 (C93) Catchable Rainbow Trout	05/06/93	16,002	1,746	109	225
Fall 1993 (F93) Fingerling Rainbow Trout	09/21/93	54,060	2,043	38	150

Table 4. Number and weight of all trout cohorts stocked into Springfield Reservoir, Idaho in 1992 and 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1992 (C92) Catchable Rainbow Trout	02/18/92 05/22/92 06/04/92	3,070 2,001 1,680 6,754	634 303 272 1,209	206 151 162	265 239 244
Fall 1992 (F92) Fingerling Rainbow Trout	10/02/92	25,008	1,089	44	158
Spring 1993 (C93) Catchable Rainbow Trout	05/05/93	8,500	976	115	225
Fall 1993 (F93) Fingerling Rainbow Trout	09/21/93	28,885	1,202	42	165

than the standard density of 25/acre catchables and 84/acre of fingerlings, Springfield received 129/acre catchables and 435 fingerlings/acre. This high density was being stocked before the survey began. We wished to document how this large density of fish affected fishing effort and catch rate. Did the catchable plant attract a large number of anglers who quickly harvested most of the fish or did the harvest occur slowly throughout the season? Did the large density of fish inhibit growth? Did a higher than average percent of these fish die of natural mortality?

Twin Lakes Reservoir

Twin Lakes is a 180-ha storage reservoir owned by the Twin Lakes Canal Company. Its name comes from its figure-eight appearance with a narrow channel connecting two large round bays. In the 1960s and 1970s Twin Lakes was known for its clear water and bluegill fishery. There were also abundant large bass. However, prior to 1980, very few people in Idaho fished for bass (Reid 1989). In the late 1980s, common carp were accidentally introduced into Twin Lakes via canals from Treasureton Reservoir. Water clarity decreased and the bluegill fishery declined. The trout fishery is perceived to be mediocre. In 1992 and 1993 trout were stocked at the standard rate of 62/ha spring catchables and 208/ha fall fingerlings (Table 5). Twin Lakes Reservoir receives its water via canals from Mink Creek.

Winder Reservoir

Winder Reservoir is a 38-ha storage reservoir owned by the Twin Lakes Canal Company. It is managed with general fishing regulations; however, at the request of the Canal Company, anglers may not fish from boats. Most of the water is removed from Winder Reservoir for irrigation by mid-September. It refills with water diverted from Mink Creek during the non-irrigation season.

In 1992, nearly six times as many C92s (13,187) were stocked than planned (Table 6). Anglers caught 105% of this cohort by number and 139% by weight in 1992 (Scully et al. 1995). They harvested 47% by number and 58% by weight. This high density of catchable-size trout probably attracted anglers. The high catch rate for trout in 1992 (1.1/h) may have increased the percentage of trout released. The 1992 survey was discontinued in October 1992, and the 1993 survey did not begin until April. Abundant precipitation during the 1992-1993 winter closed the access road.

Daniels Reservoir

Daniels Reservoir is a 152-ha reservoir in Oneida County, owned by the St. Johns Irrigation Company. It is a relatively new project, completed in 1970. Funding sources included the irrigation company and US Bureau of Reclamation loan and grant money. Acceptance of the federal grant required that a minimum conservation and sediment storage pool be maintained and that the public would have access to the reservoir for recreation. As with all new reservoirs, it enjoyed high productivity during the first few years after construction. Anglers remember abundant, fast-growing trout caught in the 1970s. Non-game fish, notably Utah sucker, then colonized Daniels Reservoir. As reservoir productivity decreased and suckers occupied

Table 5. Number and weight of all trout cohorts stocked into Twin Lakes Reservoir, Idaho in 1992 and 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1992 (C92) Catchable Size Rainbow Trout	05/07/92	11,076	1769	160	244
Fall 1992 (F92) Fingerling Rainbow Trout	09/28/92	37,630	1,782	47	163
Spring 1993 (C93) Catchable Rainbow Trout	05/04/93	11,141	1,247	113	229
Fall 1993 (F93) Fingerling Rainbow Trout	09/21/93	37,637	1,388	38	152

Table 6. Number and weight of all trout cohorts stocked into Winder Reservoir, Idaho in 1992 and 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1992 (C92) Catchable Size Rainbow Trout	05/07/92	13,187	2,053	156	242
Fall 1992 (F92) Fingerling Rainbow Trout	09/29/92	9,944	450	45	162
Spring 1993 (C93) Catchable Rainbow Trout	05/08/93	2,349	263	112	229
Fall 1993 (F93) Fingerling Rainbow Trout	09/21/93	6,450	195	30	127[a]

[a] The F93s were stocked 25 mm smaller than planned and would have suffered higher than normal predation by largemouth bass.

much of the reservoir carrying capacity, the trout fishery deteriorated. Management chemically renovated Daniels Reservoir in 1988. Catchable size trout stocked in 1989 reportedly grew to 2-3 kg by 1991.

In 1990, a special regulation was established at Daniels Reservoir requiring that cutthroat trout must be 508 mm long before harvest, with no size limit on rainbow trout. Since 1992 the minimum legal size for harvest of all trout species has been 508 mm. The creel limit is two trout, use of live bait is prohibited and hooks must be barbless.

Since harvest of evaluation trout during the first two or more years after being stocked would be minimal, we stocked trout at a lower density than at general regulation waters. Our goal was to have enough fish to ensure satisfactory catch rates, but few enough fish so that competition for food would not significantly reduce their growth rate. We stocked spring catchables at 31/ha and fall fingerlings at 104/ha. We attempted to use only Hayspur rainbow trout, raised only at Grace Hatchery, at all seven evaluation reservoirs through the three years of the study. We also attempted to stock the spring catchables as close as possible to the first week of May at an average size of 229 mm and the fall fingerlings the third week of September at 152 mm. One significant deviation from this was the C92 trout stocked at Daniels Reservoir being of the Kamloops strain and were raised at Hagerman Hatchery. Size and times of stocking for Daniels Reservoir are shown in Table 7.

Twentyfour Mile Reservoir

Twentyfour Mile Reservoir is an 18-ha irrigation storage reservoir in Caribou County. It is situated in the upper Portneuf River drainage, near the head of Twentyfour Mile Creek at 1,801 m of elevation. It is drawn down, generally during mid-June through August, but is not completely drained. Although winter dissolved oxygen levels are low, winter die-offs have not been reported.

Twentyfour Mile Reservoir has been managed with a two trout, 20-in (508 mm) minimum size limit since 1990. Since most trout caught under this restriction must be released, we stocked a low density of trout to reduce competitive effects on growth. Spring catchables were to be stocked at 31/ha and fall fingerlings at 104/ha (Table 8).

American Falls Reservoir Summer Creel Survey

American Falls Reservoir is located on the Snake River in Bannock, Bingham, and Power counties. It is used for irrigation storage, flood control and hydropower production. The original dam was completed in 1927 and modified in 1979. The US Bureau of Reclamation manages the dam and reservoir, while Idaho Power Company manages the powerhouse. At full capacity, the reservoir is at 1,327 m of elevation, covers 22,663 ha, and contains 209,700 ha-meters of water. Refilling begins in October and continues through early spring. Drawdown begins as irrigation demand exceeds inflow, generally in June.

Large numbers of hatchery rainbow trout, both catchables and fingerlings, were stocked into the reservoir and into the Snake River between Shelley and the headwaters of American Falls Reservoir in 1993. Since 1991, the Department has stocked fingerling trout, mostly rainbows, in the Snake River upstream of American Falls Reservoir. Some of these fish will move downstream and enter the reservoir. This imprinting on the river should encourage trout to return to the upper river at spawning time or when water quality and

Table 7. Number and weight of all trout cohorts stocked into Daniels Reservoir, Idaho in 1992 and 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1992 (C92) Catchable Rainbow Trout	03/31/92	4,690	390	80	196
Fall 1992 (F92) Fingerling Rainbow Trout	09/28/92	15,829	742	50	163
Spring 1993 (C93) Catchable Rainbow Trout	05/07/93	4,688	511	110	229
Fall 1993 (F93) Fingerling Rainbow Trout	10/25/93	15,951	461	30	127

Table 8. Number and weight of all trout cohorts stocked into Twentyfour Mile Reservoir, Idaho in 1992 and 1993.

Cohort Name	Date Stocked	Number Stocked	Kilograms Stocked	Mean Weight (g)	Mean Length (mm)
Spring 1992 (C92) Catchable Rainbow Trout	05/07/92	1,136[a]	181	160	244
Fall 1992 (F92) Fingerling Rainbow Trout	09/28/92	1,859	87	47	160
Spring 1993 (C93) Catchable Rainbow Trout	05/12/93	550	59	113	229
Fall 1993 (F93) Fingerling Rainbow Trout	09/22/93	1860	68	38	152

[a] The C92 cohort was stocked at twice the planned number.

quantity is poor in the reservoir rather than move downstream through the dam. Additionally, all trout stocked into the reservoir are stocked at the upper end, as earlier research (Heimer 1978) determined that trout stocked near the head of the reservoir were caught at about twice the rate within the reservoir as were fish stocked nearer the dam. Most of the harvest of fish stocked nearer the dam, at Seagull Bay, occurred in the Snake River below American Falls Dam.

We conducted a creel survey on American Falls Reservoir, April through September 1993. Survey intervals were 28 days long and were stratified by weekends and weekdays. Four randomly selected days were sampled from both the weekend day and weekday strata per interval. We counted bank and boat anglers at least once each survey during daylight hours. Systematically selected sub-samples of anglers were interviewed during each survey day. Anglers were asked the number of hours they had fished and the number of fish they had caught. All kept fish were measured to the nearest millimeter.

Pocatello Highway Pond - Estimation of Fishing Mortality

When full, the Highway Pond, located 3 km south of Pocatello on the west side of Interstate Highway 15, covers about 16.5 ha. The pond resulted from gravel removal for Idaho Department of Transportation projects. This remains an active aggregate source for road construction, and the opportunity is there for pond depth to increase with each new highway project. Although the pond is within a few hundred meters of the Portneuf River, its water quality is considerably better than the river's. The pond is a window into the Portneuf valley aquifer and contains cool, clear water, excellent habitat for trout rearing. It is believed that a local landowner stocked 100 trout into the Highway Pond in the spring of 1974. In the fall of 1976, a 20-lb, 31-in rainbow trout was reported and numerous 5-10 lb. fish were caught the following spring (Heimer 1978).

Unfortunately in the recent drought years, the water table lowered so that only two low-lying areas of the basin contained water. The water was shallow and stagnant and could not support fish. The drought ended with heavy snowfall during the winter of 1992-1993 followed by a wet spring. Approximately 4 ha of the basin filled with water to a depth of 2 to 3 m, sufficient for the Department to stock catchable trout. On June 11, 900 rainbow trout were stocked. It had been six years since Pocatello, Idaho had a local fishing pond, and substantial fishing pressure occurred immediately. Within two weeks, anglers began reporting a lack of fish. To get an estimate of the number of trout remaining in the pond, a team of six snorkelers swam transects through the pond and counted the fish on June 23, 1993.

McTucker Pond #8 Rainbow Trout Creel Survey

McTucker Ponds are a series of eight ponds in the Snake River floodplain along McTucker Creek. They result from gravel excavation by Bingham County and the Idaho Department of Transportation. The ponds are small, the largest being 3.2-ha Pond #8. The ponds are on US Bureau of Reclamation property.

We chemically renovated McTucker Ponds with liquid rotenone in October 1992. Rainbow trout catchables were restocked into Pond #8 in mid-November 1992. Through the end of 1993, we stocked a total of 7,118 catchable size trout. Largemouth bass and bluegill brood fish stocked in the spring of 1993 into the remaining seven McTucker ponds are not expected to produce a fishery for three or four more years. Our goal

was to establish self-sustaining bass and bluegill communities in ponds 1-7. Channel catfish *Ictalurus punctatus* probably will have to be restocked periodically.

We conducted a creel survey at McTucker Pond #8 from January through December 1993. Survey techniques for bank anglers were the same as described for American Falls Reservoir in this report.

Opening Weekend Check Station at Interstate 15 Port of Entry

During the three-day Memorial Day weekend of May 29-31, 1993, we established a check station at the Department of Transportation's Port of Entry rest stop near Inkom, Idaho. We placed signs along the highway approaching from the south; they directed all travelers to stop at the station if they had been fishing. The purpose of the survey was to follow trends in catch rate and fish size distribution in the harvest, and relative use of a large number of Southeast Region's lakes and reservoirs. The sixth year of the drought cycle was 1992, and although fish numbers were depressed in 1992 because of the long drought, water was low and clear and remaining fish were concentrated and easy to catch. Weather during the spring of 1992 was generally dry, and warmer than normal. In contrast, rivers and streams were high and turbid in the spring of 1993. Fish numbers were still low as a result of several preceding years of drought and were spread out in full reservoirs.

Southeast Region fisheries personnel, several reservists, and volunteers operated the angler check station at the Idaho Department of Transportation's northbound Port of Entry along Interstate 15 near Inkom, Idaho during the Memorial Day holiday weekend. The station was operated from 10 a.m. until dusk.

Juvenile Fish Assessment with Shoreline Seining

An Idaho Angler Survey of Opinions and Preferences, conducted in 1987 by The Department, documented that "over three-fourths of the Idaho fishermen prefer fishing for cold water species" (Reid 1989). However the survey reported angler preference for warmwater species had increased from 7% to almost 23% from 1967 to 1987. The increasing interest in warmwater fish has likely continued since the 1987 survey. The Southeast Region has several waters with both trout and self-sustaining populations of warmwater species; primarily largemouth bass, bluegill, yellow perch, white crappie *Pomoxis annularis*, and walleye *Stizostedion vitreum*.

In waters containing largemouth bass and bluegill, we seined in the littoral zone to look for fry and age 1+ bass and bluegill. Presence of the species and cohorts are indications of the present year's spawning success as well as the previous year's spawning success and overwinter survival. Relative abundance of each group provides an indication of community balance. Schill and Heimer (1988) suggested late fall seining of age-0 bass to assess lengths of known age fish at time of first annulus formation. We seined through littoral areas in St. Johns Reservoir containing largemouth bass, bluegill, and yellow perch. We also seined Alexander Reservoir to determine if brood-sized crappie stocked in May 1993 had successfully spawned, and if so, to determine the size of the fry. We seined Chesterfield Reservoir to see if any of the non-game species, which we had attempted to eliminate with rotenone the previous year, had survived and spawned.

Warmwater Fish Population Assessments

Condie Reservoir

Condie Reservoir covers 47 ha and is at 1,469 m of elevation in Franklin County. It stores irrigation water for the Twin Lakes Canal Company. Condie Reservoir game fish include largemouth bass, bluegill, yellow perch, and annually-stocked rainbow trout. There is no perennial tributary for trout spawning.

Results from a 1987 Southeast Region questionnaire showed strong support for special bass regulations on one or two regional largemouth bass fisheries. Schill and LaBolle (1990) concluded from regional bass fishery investigations "implementation of restrictive regulations on Condie Reservoir would dramatically increase numbers of age-4+ and older bass." Age-4+ bass in 1987 averaged 287 mm.

Based on Schill and LaBolle's (1990) recommendations, harvest regulations at Condie Reservoir in 1990 were changed from "general" to "trophy" for largemouth bass. Additionally, the same trophy regulation was established for trout at Condie Reservoir. The trophy regulation allowed a harvest of two trout and two bass with a minimum size of 20-in. Slow growth of trout in Condie Reservoir resulted in removal of the trophy trout regulation in 1992. We believe that slow trout growth was at least partially caused by competition with a new and expanding yellow perch population resulting from an unauthorized introduction in the mid 1980s. We wished to assess the effectiveness of trophy largemouth bass management, particularly in the face of a rapidly increasing yellow perch population. We captured, marked, and recaptured fish in Condie Reservoir the nights of May 27 and June 6, 1993 to estimate population size following techniques described by Schill and LaBolle (1990).

Glendale Reservoir

Glendale Reservoir covers 93 ha and is at 1,509 m of elevation on Worm Creek in Franklin County. It stores water for the Preston-Whitney Canal Company. Glendale Reservoir receives most of its storage water from a Cub River diversion. A significant portion of the littoral habitat is dewatered annually for irrigation. Game fish present include largemouth bass, bluegill, annually-stocked rainbow trout, and an occasional cutthroat trout presumably entering from the Cub River drainage via the canal (Heimer 1980). In 1992, largemouth bass regulations changed from "general" to "quality" bass with a two fish limit and a 16-in (41 cm) minimum size. We collected fish with electrofishing equipment at Glendale Reservoir on June 6, 1993. Techniques used are outlined by Schill and Heimer (1988).

St. Johns Reservoir

St. Johns Reservoir covers 19 ha and is at 1,435 m of elevation in Oneida County. It stores irrigation water for the Malad Valley Irrigation Company. Game fish present in St. Johns Reservoir include largemouth bass, bluegill, yellow perch, white crappie, and annually stocked rainbow trout. There is no perennial tributary for trout spawning.

Results from a 1987 regional questionnaire showed strong support for special regulations involving one or two regional largemouth bass fisheries. Public support for such a water in the Oneida County area and biological data on the existing fishery in St. Johns Reservoir led to its selection as a special regulation water in 1989. Harvest regulations beginning in 1990 were changed from "general" to "trophy" for largemouth bass. The trophy regulation allowed a harvest of two bass with a minimum size of 20-in. We captured, marked, and recaptured largemouth bass to estimate population size in St. Johns Reservoir, the nights of May 26 and June 8, 1993, using techniques outlined by Schill and Heimer (1988).

RESULTS AND DISCUSSION

Catchable and Fingerling Trout Evaluations in Reservoirs

Chesterfield Reservoir

In 1993, there were three cohorts of hatchery stocked rainbow trout and two cohorts of hatchery stocked brown trout (Table 2) present in Chesterfield Reservoir. On April 28, 1993 we captured three of the F92 fingerlings in one experimental gill net set overnight. The fish averaged 206 mm and 83 grams when sampled. They were thin with a mean relative weight of 88%. Their stomachs contained corixids, liphid, and whirligig beetles, notonectids, girinids, and damsel and crane fly larvae. Zooplankton may not have become abundant yet.

Since there were no harvestable size trout in Chesterfield Reservoir during the 1992-1993 winter, Caribou County road crews let the road to the reservoir blow shut with deep snow. No fishing occurred until the snow melted in the spring of 1993. Initial angling occurred in the 28-day sampling interval 4 when anglers fished an estimated 104 hours. Sampled anglers caught no fish in intervals 4 and 5 (Table 9).

Anglers fished an estimated 28,589 hours at Chesterfield Reservoir in 1993 (44 hours/ha). Fishing effort was partitioned out as 31% from boats, 53% from shore, 4% from float tubes, and 12% ice fishing. Annual catch rate was 0.49 fish/hour. Anglers caught 14,040 fish of which they kept 9,124 (65%). Significant fishing effort began with the Memorial Day weekend early in interval 6. From that time on, catch rates were good except during interval 12 (0.06 fish/hour), which was the transition period between the open water and ice fisheries. Once the ice fishery began in interval 13, catch rates peaked at 1.07 trout/hour. Although only 12% of effort occurred during the ice-fishery interval 13, 26% of the annual catch and 10% of the harvest occurred then. The high catch rate and high rate of catch-and-release (61%) were in large part due to initial recruitment of the F93 fingerlings to the fishery during that interval. Peaks in fishing effort occurred in late July-early August and in October.

Return to the Angler-Individuals from the F92 cohort did not quite double their weight from September 1992 to April 1993 and their relative weight in April 1993 was only 88% of standard (Table 10). They grew rapidly through the 1993 summer and averaged 398 mm and 699 g by October 1993. The F92 cohort was not well represented in the catch. Only 845, or 0.6% of the number stocked, were harvested (Table 11). No members of the cohort were reported in intervals 12 and 13, thus it is unlikely that there will be significant additional contribution to the fishery from the F92 cohort. The cohort probably suffered high

Table 9. Basic creel survey statistics from Chesterfield Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	0	0	N.A.	0
2 [01/29-02/25]	0	0	N.A.	0
3 [02/26-03/25]	0	0	N.A.	0
4 [04/23-05/20]	104	0	N.A.	0
5 [04/30-05/20]	142	0	N.A.	0
6 [05/21-06/17]	2,064	1 ,444	0.70	680 (47%)
7 [06/18-07/15]	3,595	1,985	0.55	1,948 (98%)
8 [07/16-08/12]	5,750	2,566	0.45	1,810 (71%)
9 [08/13-09/09]	3,875	991	0.26	946 (95%)
10 [09/10-10/07]	3,912	1,774	0.45	1,179 (66%)
11 [10/08-11/04]	4,276	1,602	0.37	1,119 (70%)
12 [11/05-12/02]	1,539	87	0.06	36 (41%)
13 [12/03-12/30]	3,332	3,591	1.07	1,406 (39%)
Totals	**28,589 ± 19%**	**14,040 ± 32%**		**9,124 (65%)**
Mean			**0.49**	

Table 10. Growth in length and weight of rainbow trout stocked into Chesterfield Reservoir, Idaho in 1992 and 1993 from known age fish.

Interval and Mid-point[a]	F92 length (mm)	F92 weight (g)	C93 length (mm)	C93 weight (g)	F93 length (mm)	F93 weight (g)
Stocked 09/29/92	161	46				
5 (05/06/93)	206	83 [88% std wt]				
Stocked 05/04/93			225	112		
6 (06/03/93)			286	269		
7 (07/01/93)	302	305	313	358		
8 (07/29/93)	354	490 [97% std wt]	333	466 [112% std wt]		
9 (08/26/93)	351	481	359	516		
Stocked 09/20/93					165	43
10 (09/23/93)	381	608 [96% std wt]	382	710 [111% std wt]		
11 (10/21/93)	398	699	403	890		
12 (11/19/93)			415	789		
13 (12/16/93)			428	941 [104% std wt]	226	120 [96% std wt]

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Table 11. Yield of rainbow trout from Chesterfield Reservoir, Idaho in 1993.

Interval and Mid-point[a]	F92 Number	F92 wt. (kg)	C93 Number	C93 wt. (kg)	F93 Number	F93 wt. (kg)
6 (06/03/93)	197	53	483	130		
7 (07/01/93)	252	77	1,696	607		
8 (07/29/93)	279	137	1,531	713		
9 (08/26/93)	61	29	885	457		
10 (09/23/93)	27	16	1,152	818		
11 (10/21/93)	29	20	1,090	970		
12 (11/19/93)			36	28		
13 (12/16/93)			559	526	847	102
Totals	**845**	**332**	**7,432**	**4,249**	**847**	**102**
% Harvested of Amount Stocked	**0.6%**	**5.3%**	**18.6%**	**94.6%**	**0.7%**	**1.8%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

natural mortality during the fall after stocking due to small reservoir volume and vulnerability to avian predation and/or throughout the winter due to lack of food.

Although there was less than one-third the number of C93s stocked than the F92s, the C93s were stocked in May 1993 when a food chain was developing and benefiting from the "new land effect" after the reservoir was drained in 1992. The C93s grew from 225 mm and 112 g in May to 428 mm and 941 g by the end of 1993. Anglers harvested 7,432 C93s, or 18.6% of the number stocked. Due to the cohort's rapid growth, 94.6% of the weight stocked was harvested in 1993. The C93s were catchable from the time they were stocked shortly before large numbers of anglers arrived for the beginning of the summer fishing season. Natural mortality from avian predation may have also been significant. Ron Reardon observed in October 1993 that 10-20% of the C93s observed had healed slash marks on their sides, probably from cormorants and other piscivorous birds. These are the fish that escaped from the birds and survived the lacerations. The proportion of fish that die from bird attack is likely much higher.

The F93 cohort, stocked as fingerlings in September 1993, recruited to the fishery in December at an average length of 226 mm and 120 g, almost tripling their weight in the three-month period. Their relative weight was 96% of standard. Prior to the initial recruitment of the fall-stocked fingerlings, anglers kept 74% of their catch. In interval 13 as the F93 cohort began to recruit to the fishery, anglers kept only 39% of their catch (Table 9).

Under the unusual environmental conditions of 1992 and 1993, fall fingerlings from 1992 did very poorly. If such conditions arise again, available fingerlings should be planted elsewhere, and as many as possible should be held over until the following spring to be planted at catchable size under better water conditions. Spring catchable and fall fingerling performance may be better compared between long-term return of C93s and F93s.

Treasureton Reservoir

In 1993, there were only two cohorts of hatchery-stocked rainbow trout in Treasureton Reservoir (Table 3). Anglers fished only 368 hours in interval 5 and surveyed anglers caught no fish. Anglers fished a total of 23,836 hours at Treasureton Reservoir in 1993 (411 hours/ha) and caught 24,523 fish (Table 12), of which they kept 12,989 (53%). Fishing effort was partitioned as 20% from boats, 58% from shore, 8% from float tubes, and 14% ice fishing. Annual catch rate was 1.03 fish/h. Significant fishing effort began with the Memorial Day weekend early in interval 6. From that time on, catch rates were good to excellent. The lowest catch rate was 0.44 fish/h during interval 8. Once the ice fishery began in interval 13, catch rates peaked at 2.43 trout/h. During the ice fishery interval 13, 11% of the fishing effort and 26% of the catch occurred. The high catch rate and high rate of catch-and-release in interval 13 (78%) were in large part due to initial recruitment of the F93 fingerlings to the fishery during that interval. The peak in fishing effort occurred in late June/early July (interval 7).

Return to the Angler-During 1993, two cohorts of stocked trout were present in Treasureton Reservoir, having been stocked in the spring and fall of 1993 (Table 3). The C93s were stocked in May 1993 when a food chain was developing and they benefited from the "new land effect" after the reservoir was drained in 1992. The C93s grew from 225 mm and 109 g in May to 388 mm and 698 g by the end of 1933 (Table 13). Anglers harvested 12,744 C93s or 80% of the number stocked. Due to the cohort's good growth,

Table 12. Basic creel survey statistics from Treasureton Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught Per Hour	Number and % of Fish Kept
1 [01/01-01/28]	0	0	N.A.	0
2 [01/29-02/25]	0	0	N.A.	0
3 [02/26-03/25]	0	0	N.A.	0
4 [04/23-05/20]	0	0	N.A.	0
5 [04/30-05/20]	368	0	N.A.	N.A
6 [05/21-06/17]	2,042	1,339	0.66	1,243 (93%)
7 [06/18-07/15]	5,331	5,668	1.06	4,850 (86%)
8 [07/16-08/12]	3,606	1,595	0.44	1,595 (100%)
9 [08/13-09/09]	3,230	2,524	0.78	1,412 (56%)
10 [09/10-10/07]	3,386	3,991	1.18	1,452 (36%)
11 [10/08-11/04]	1,610	1,434	0.89	526 (37%)
12 [11/05-12/02]	1,605	1,523	0.95	470 (31%)
13 [12/03-12/30]	2,658 (11%)	6,449 (26%)	2.43	1,441 (22%)
Totals	**23,836 ± 21%**	**24,523 ± 31%**		**12,989 (53%)**
Mean			**1.03**	

Table 13. Growth in length and weight of rainbow trout stocked into Treasureton Reservoir, Idaho in 1993 from known age fish.

Interval and Mid-point[a]	C93 length (mm)	C93 weight (g)	F93 length (mm)	F93 weight (g)
Stocked 05/06/93	225	109		
6 (06/03/93)	271	235		
7 (07/01/93)	299	310		
8 (07/29/93)	324	406		
9 (08/26/93)	345	501		
Stocked 09/20/93			150	38
10 (09/23/93)	373	647		
11 (10/21/93)	373	663	212	110
12 (11/19/93)	382	685	218	109[b]
13 (12/16/93)	388	698	214	108

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

[b] Interpolated from interval 11 and 13 values.

321% of the weight stocked was harvested in 1993. The C93s were catchable from the time they were stocked shortly before large numbers of anglers arrived for the beginning of the summer fishing season.

The F93 cohort recruited to the fishery in December at an average length of 214 mm and 108 g, a 2.8 fold increase in weight in a three-month period. The mean relative weight of F93s in interval 13 was 102% of standard. Anglers harvested 0.4% and 1.3% of the F93s by number and weight stocked, respectively (Table 14). However, since the cohort did not recruit to the fishery until the last interval in 1993, most of the harvest of F93s will take place in coming years. Prior to the initial recruitment of the fall-stocked fingerlings, anglers kept 55% of their catch. In interval 13, percent of fish kept that were caught decreased to 22%.

The C93 cohort was extremely successful, demonstrating good growth and excellent survival and catchability. Based on catch rates and size and condition of fish in interval 13, the F93s should provide an excellent fishery in 1994. However, with the regulation change to a two trout slot limit, fish density and survival may be so high that growth will be poor for the cohort in 1994.

Springfield Reservoir

Anglers fished an estimated 16,895 hours at Springfield Reservoir in 1993 (626 hours/ha). Fishing effort was partitioned as 9% from boats, 77% from shore, 2% from float tubes, and 11% ice fishing. Most anglers (93%) fished with bait while the remaining 7% of anglers fished with flies and lures. Annual catch rate was 0.53 fish/h. Anglers caught 8,963 fish of which they kept 4,596 (51%).

A significant mid-winter fishery existed at the beginning of 1993 and anglers enjoyed good catch rates (0.5 to 2.9 fish/h) from then through interval 4 (Table 15). The high catch rate and high rate of catch-and-release during the winter intervals were in large part due to initial recruitment of the F92 fingerlings to the fishery during the winter. Good winter fishing may have drawn anglers to Springfield Reservoir in the early summer, but they experienced poor catch rates during late-spring/summer and effort declined.

Catch rate dropped precipitously in interval 5, and no catch was recorded in the mid-summer intervals (6 through 8). Angling pressure was still high in interval 6 but fell two-thirds by interval 8 and continued to drop through interval 11 prior to recruitment of the F93 fingerlings. Although 8,500 catchable size rainbow trout were stocked in interval 5, three weeks prior to the traditional fishing season opener of Memorial Day weekend, none of the fish were observed in the survey until a single fish was recorded in interval 13. Much of the winter fishing occurred in a small spring-fed bay where fall-stocked fingerlings concentrate at that time of year. The fishery could be described as "boom followed by bust" with very high catch rates in the winter and little or no catch at all recorded in the late spring through mid-fall season.

Return to the Angler-During 1993, spring-stocked catchable and fall-stocked fingerling rainbow trout from both 1992 and 1993 were present in Springfield Reservoir. We sampled the fishery monthly to obtain data on growth in length and weight of each cohort (Table 16).

Although poorly represented in the catch, the C92 cohort grew rapidly with a 525 mm C92 captured in June 1993. Most of the catch of F92s occurred from January through March 1993 when their size was relatively small (226 to 234 mm). Individuals from the F92 cohort had grown to about the same size as the C93s when the C93s were stocked in May 1993 (Table 16). Relative weight was higher for F92s than C93s.

Table 14. Yield of rainbow trout from Treasureton Reservoir, Idaho in 1993.

Interval and Mid-point[a]	C93 Number	C93 wt. (kg)	F93 Number	F93 wt. (kg)
6 (06/03/93)	1,243	292		
7 (07/01/93)	4,850	1,504		
8 (07/29/93)	1,595	648		
9 (08/26/93)	1,412	707		
10 (09/23/93)	1,452	939		
11 (10/21/93)	506	335	20	2
12 (11/19/93)	414	284	55	6
13 (12/16/93)	1,272	888	168	18
Totals	**12,744**	**5,597**	**243**	**26**
% Harvested of Amount Stocked	**80%**	**321%**	**0.4%**	**1.3%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Table 15. Fishing effort, catch, catch rate, and harvest of trout from Springfield Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	2,097	1,097	0.52	954 (87%)
2 [01/29-02/25]	728	2,130	2.93	428 (20%)[a]
3 [02/26-03/25]	1,859	3,731	2.04	1,729 (46%)[b]
4 [03/26-04/22]	1,529	887	0.52	783 (89%)
5 [04/23-05/20]	3,509	309	0.09	206 (67%)
6 [05/21-06/17]	2,965	0	0	0 (NA)
7 [06/18-07/15]	1,834	0	0	0 (NA)
8 [07/16-08/12]	989	0	0	0 (NA)
9 [08/13-09/09]	425	63	0.15	0 (0%)
10 [09/10-10/07]	242	44	0.18	0 (0%)
11 [10/08-11/04]	58	0	0	0 (0%)
12 [11/05-12/02]	156	218	1.40	126 (55%)
13 [12/03-12/30]	504	484	0.96	376 (78%)
Totals	**16,895 ± 17%**	**8,963 ± 61%**		**4,596 (51%)[c]**
Mean			**0.53**	

[a] Includes 11 trout stocked prior to 1992.
[b] Includes 52 trout stocked prior to 1992.
[c] The actual number of trout kept from the 1992 and 1993 cohorts is 4,533, i.e., 4,596 less the 63 trout that had been in Springfield Reservoir prior to 1992.

Table 16. Growth in length and weight of rainbow trout stocked into Springfield Reservoir, Idaho in 1992 and 1993 from known age fish.

Interval and Mid-point[a]	C92 Length (mm)	C92 Weight (g)	F92 Length (mm)	F92 Weight (g)	C93 Length (mm)	C93 Weight (g)	F93 Length (mm)	F93 Weight (g)
Stocked 02/18-06/04/92	249	173						
Stocked 10/02/92			158	44				
1 (01/14)	454	1,250	226	115				
2 (02/11)	334	412	234	153				
3 (03/11)			231	107				
4 (04/08)			222	121				
Stocked 05/05/93					225	115		
5 (05/06)	525	1,360	290	274	255	182		
6 (06/03)								
7 (07/01)								
8 (07/29)	510	1,480			348	525		
9 (08/26)								
Stocked 09/21/93							165	42
10 (09/23)								
11 (10/21)								
12 (11/19)							232	139
13 (12/16)					432	935	244	186

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Only one C93 was observed in the catch and that was in interval 13. It had grown from 225 mm in May to 432 mm in December, demonstrating an excellent growth rate. The F93 fingerlings stocked in interval 9 recruited to the fishery in interval 11 at 232 mm. By interval 13, the average F93 caught was 244 mm long and weighed 186 g, a 4.4 fold increase in weight from when stocked three months earlier. The C93s were virtually absent from the catch at Springfield Reservoir (Table 17). Only one was observed. Of the C93s, only eight, or less than 1/10 of 1% of those stocked, were estimated to have been caught in 1993.

At this point we can only speculate on the fate of the 8,500 catchables stocked in the spring of 1993 (C93s). Perhaps they were incubating a bacteria or virus when stocked and became sick and died, but no dead fish were reported by anglers, and this same cohort of fish was stocked in the other six evaluation reservoirs with much better return to the creel documented. Perhaps an insecticide or herbicide sprayed on adjacent cropland drifted over the reservoir and killed the fish, but as mentioned above, dead fish were never seen. Perhaps the C93s emigrated downstream, but few anglers fished the outlet stream and there was no indication of exceptional fishing there. Perhaps anglers caught most of the fish in a short period of time, but fishing was poor when creel clerks conducted surveys. No one reported good fishing during the weeks following release of the C93s. Perhaps birds ate them. Springfield Reservoir is a designated bird sanctuary. No hunting is allowed around the reservoir, most of the shoreline is private land with little public use, and there is extensive bulrush and cattail habitat attractive to water birds. The reservoir is shallow with most of it less than 10 feet deep. Springfield Reservoir is about five miles from 22,660-ha American Falls Reservoir, where thousands of piscivorous birds live during spring and summer. A high density of naive hatchery trout in clear, shallow water may have attracted a large number of white pelicans *Pelecanus erythrorynchos*, double-crested cormorants *Phalacrocorax auritus*, and great blue herons *Ardea herodias*.

The F93 cohort, stocked in September, recruited to the fishery in November (interval 12) at 232 mm. Weight had increased 4.4 fold in two months to 186 g. Their mean relative weight was 102% of standard. Prior to the initial recruitment of the fall-stocked fingerlings, anglers had not reported any catch for several months at Springfield Reservoir. Anglers kept 55% of the F93s they caught in interval 12 and 78% in interval 13 when they had grown to 244 mm.

Total yield from Springfield Reservoir in 1993 was 707 kg or 26 kg/ha. Numerically, almost all (97%) of the 1993 harvest in Springfield Reservoir was fall fingerlings. By weight 81%, of the harvest was fall fingerlings.

The C92s were caught through February 1993 and F92s were caught through May 1993. None of the 1992 stocked trout were recorded in the catch later in the year. It is likely that little additional contribution to the Springfield Reservoir catch will come from 1992 stocked trout.

During a summer creel survey from May through mid-September 1992 (Scully et al. 1995), anglers caught 1,253 C92s, of which they kept 747 that together weighed 219 kg. Catch of C92s ended by mid-July in the 1992 survey. There was no survey during November and December 1992 when the F92s probably first recruited to the fishery.

Total yield of the C92 cohort including both 1992 and 1993 data is 864 fish weighing a total of 346 kg. The harvest is 13% by number and 29% by weight of that stocked. This is a minimum estimate since some of the C92s were stocked three months before the 1992 survey began and there was no survey in the fall of 1992. If similar numbers and weight of the F92s were caught in November and December 1992 as F93s were caught in November and December 1993, then total return to the angler of the F92 cohort would have been near 18% by number and 53% by weight.

Table 17. Yield of rainbow trout from Springfield Reservoir, Idaho in 1993.

Interval and Mid-point[a]	C92 Number	C92 Wt. (Kg)	F92 Number	F92 Wt. (Kg)	C93 Number	C93 Wt. (Kg)	F93 Number	F93 Wt. (Kg)
1 (01/14)	94	118	858	99				
2 (02/11)	23	9	394	60				
3 (03/11)			1,729	185				
4 (04/08)			731	88				
5 (05/06)			206	56				
6 (06/03)								
7 (07/01)								
8 (07/29)								
9 (08/26)								
10 (09/23)								
11 (10/12)								
12 (11/19)							120	17
13 (12/16)					8	7	368	68
Totals	**117**	**127**	**3,918**	**488**	**8**	**7**	**488**	**85**
% Harvested of that Stocked	**1.7%**	**10.5%**	**15.7%**	**44.8%**	**0.1%**	**0.7%**	**1.7%**	**7.1%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

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Twin Lakes Reservoir

Anglers fished an estimated 39,312 hours or 218 h/ha and caught 22,871 fish for a catch rate of 0.6 fish/h (Table 18). Anglers kept 67% of the fish they caught. Fishing effort was highest from May through July, while catch rates were highest during the January through March ice fishery.

Trout growth was relatively slow in Twin Lakes Reservoir (Table 19). In early May 1993, a year after they were stocked, the C92s had grown from 244 mm to 341 mm, and by the end of 1993 they were only 360 mm. The F92 fall fingerlings, although approximately 110 mm shorter than the C92s in September 1992, had become the same length or slightly larger than the C92s by December 1993. The C93 cohort grew as much or more from May to December 1993 than the C92s did with an additional year to grow. This may reflect the poor growing conditions in 1992, which was the last year of a 6-year drought. In contrast, Twin Lakes easily filled with water in the spring of 1993, and water was cool and abundant through most of the summer.

Anglers harvested 3,575 C92 rainbow trout weighing 868 kg during the 1992 creel survey at Twin Lakes (Scully et al. 1995). The cohort continued to contribute to the fishery through mid-June of 1993. Total yield of C92s by number and weight for both 1992 and 1993 were 6,232 fish and 1,793 kg. This is a return rate to the angler of 56% by number and 101% by weight.

Only 8% of the F92s were harvested in 1993, however this was a 57% return by weight. The cohort should contribute significantly to the 1994 fishery as well. Only 11% (32% by weight) of the C93 cohort returned to the angler in 1993, and the F93 cohort just barely began recruiting to the fishery during the last sampling interval of 1993.

In addition to the 1993 catch of trout stocked in 1992 and 1993, anglers harvested an additional 4,625 trout weighing 1,946 kg that had been stocked prior to 1992. The pre-1992 harvest was 39% by number and 45% by weight of the total trout harvest in Twin Lakes in 1993 (Table 20). Mean lengths by month of pre-1992 trout harvested in 1993 ranged from 319 mm to 365 mm. The largest trout observed in the survey was stocked prior to 1992 and was 410 mm. Overall trout survival from year to year was high in Twin Lakes, but growth was slow.

In contrast to the Winder Reservoir mixed species fishery, warmwater fish made a minor contribution, only 10%, to the Twin Lakes catch (Table 21). Anglers caught 2,202 bluegill and 19 largemouth bass. They harvested 66% of the bluegill catch and 37% of the largemouth bass catch. Brown bullhead *Ameiurus nebulosus* were also present, but rarely caught in Twin Lakes Reservoir. Two brown bullhead were observed in the 1993 survey. They were similar in size and weight and averaged 248 mm and 220 g.

Several factors may have caused the decline in the Twin Lakes bluegill fishery. The first factor is the changing popularity of bass angling. Bass fishing became popular in the 1980s. When the drought began in 1987, largemouth bass were concentrated and easy to catch. The popularity of catch-and-release fishing for bass came slow to southern Idaho. A significant decline in predators in a bass/bluegill community can cause an imbalance that favors survival of young bluegill, which greatly decreases their ability to grow to harvestable size. The second factor was the drought years of 1987 through 1992 decreasing spawning success for both bass and bluegill. And the third factor, a carp population developed in Twin Lakes in the mid to late 1980s. Carp disturbed the mud substrate, decreasing water clarity. Zooplankton as a fish food source would have diminished and survival of bass and bluegill eggs would have decreased as sediment settled on their nests. The

Table 18. Basic creel survey statistics from Twin Lakes Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	1,711	2,243	1.3	1,678 (98%)
2 [01/29-02/25]	1,855	1,187	0.6	994 (64%)
3 [02/26-03/25]	1,804	2,143	1.2	1,681 (78%)
4 [04/23-05/20]	2,576	1,121	0.4	1,013 (90%)
5 [04/30-05/20]	7,933	5,560	0.7	2,197 (40%)
6 [05/21-06/17]	5,953	3,706	0.6	2,685 (72%)
7 [06/18-07/15]	8,858	3,464	0.4	3,464 (100%)
8 [07/16-08/12]	2,413	546	0.2	213 (39%)
9 [08/13-09/09]	3,109	1,951	0.6	748 (38%)
10 [09/10-10/07]	1,080	161	0.1	22 (14%)
11 [10/08-11/04]	669	129	0.2	43 (33%)
12 [11/05-12/02]	539	405	0.8	395 (98%)
13 [12/03-12/30]	812	255	0.3	255 (100%)
Totals	**39,312 ± 20%**	**22,871 ± 28%**		**15,388± 30%**
Mean			**0.6**	

Table 19. Growth in length and weight of rainbow trout stocked into Twin Lakes Reservoir, Idaho in 1992 and 1993 from known age fish.

Interval and mid-point[a]	C92 Length (mm)	C92 Weight (g)	F92 Length (mm)	F92 Weight (g)	C93 Length (mm)	C93 Weight (g)	F93 Length (mm)	F93 Weight (g)
Stocked 05/07/92	244	160						
05/09/92	250	215						
05/22/92	256	186						
06/05/92	262	200						
06/19/92	270	218						
07/03/92	279	250						
07/17/92	298	273						
08/02/92	279	236						
Stocked 09/28/92			163	47				
Int 1 [01/14/93]	315	290						
Int 2 [02/11/93]	304	312						
Int 3 [03/11/93]	330	353	243	159				
Int 4 [04/08/93]	333	354	230	135				
Stocked 05/04/93					229	113		
Int 5 [05/06/93]	341	386	266	208	294	295		
Int 6 [06/03/93]	347	431	290	270	272	215		
Int 7 [07/01/96]			304	311	293	221		
Int 8 [07/29/93]			303	308	309	302		
Int 9 [08/26/93]			318	356	308	319		
Stocked 09/21/93							152	38
Int 10 [09/23/93]			350	475				
Int 11 [10/21/93]	356	499	370	452				
Int 12 [11/18/93]	360	517	374	580	358	556		
Int 13 [12/16/93]			380	608	392	660	258	199

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

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Table 20. Yield of 1992 and 1993 stocked rainbow trout from Twin Lakes Reservoir, Idaho in 1993.

Interval and Mid-Point[a]	C92 Number	C92 Wt. (Kg)	F92 Number	F92 Wt. (Kg)	C93 Number	C93 Wt. (Kg)	F93 Number	F93 Wt. (Kg)
Int 1 [01/14/93]	582	169						
Int 2 [02/11/93]	65	20						
Int 3 [03/11/93]	927	327	79	13				
Int 4 [04/08/93]	466	165	46	6				
Int 5 [05/06/93]	541	209	535	111	292	86		
Int 6 [06/03/93]	48	21	64	17	234	50		
Int 7 [07/01/93]			1,624	505	277	61		
Int 8 [07/29/93]			82	25	52	16		
Int 9 [08/26/93]			378	135	190	61		
Int 10 [09/23/93]			22	10				
Int 11 [10/21/93]	14	7	29	16				
Int 12 [11/19/93]	14	7	227	132	145	81		
Int 13 [12/16/93]			95	58	63	42	96	19
Totals	**2,657**	**925**	**3,181**	**1,028**	**1,253**	**397**	**96**	**19**
% Harvested of that Stocked	**23%**	**52%**	**8%**	**57%**	**11%**	**32%**	**0.3%**	**1.4%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

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Table 21. Yield of all species from Twin Lakes Reservoir, Idaho in 1993.

	Trout stocked prior to 1992	**Trout stocked in 1992 & 1993**	**Bluegill**	**Largemouth Bass**	**Totals**
Number	4,625	7,187	1,453	7	13,272
% by number	35%	54%	11%	<0.1%	
Weight (kg)	1,946	2,369	112	3	4,430
% by weight	44%	53%	3%	<0.1%	

Twin Lakes fishery will be chemically renovated in 1994. The reservoir will be restocked with rainbow trout, largemouth bass, and bluegill.

Winder Reservoir

Anglers fished an estimated 11,056 hours or 291 h/ha and caught 52,689 fish for a catch rate of 5.8 fish/h at Winder Reservoir in 1993 (Table 22). Anglers kept 26% of their catch. Half of the catch occurred in one 28-day interval from June 18 through July 15. The only interval in which catch rate was low (0.2 fish/h) was when water was transforming from open to ice-covered in November.

Winder Reservoir was drawn down early for irrigation in the 1992 drought year. Ice came early the following winter and the reservoir was covered with deep snow for several months. The C92 cohort grew less than 30 mm through the summer of 1992. At the end of August 1992, their condition was adequate, indicated by a mean relative weight of 107%. No C92 trout were observed in the 1993 survey. Apparently, none survived the 1992-1993 winter.

Individuals from the F92 cohort survived the 1992-1993 winter and grew to 252 mm by May 1993 (Table 23). This is adequate growth, meaning the fall-stocked fingerlings had grown to catchable size by the spring following their release. Although some F92 trout survived the 1992-1993 winter to be caught early in 1993, none were recorded after July 1993. Most were released, probably because they were too small to be considered harvestable. Many of the F93 trout were captured in interval 13 when they first recruited to the fishery. However, they were generally considered to be too small for harvest and 88% were released (Table 24).

The C93 cohort grew about 80 mm from May 1993 through the end of the year. This is fair growth. Relative weight at the end of December was 99%. The F93 cohort stocked in September 1993 at 127 mm recruited to the fishery in December with an average length of 208 mm and a relative weight of 97%.

Although none of the C92s were caught in 1993, over 100% were caught by number and 47% were harvested in 1992 (Scully et al. 1995). By the time the F92 fingerlings would have grown large enough to recruit to the fishery, the reservoir was covered with ice and snow and the access road was drifted in. Only 0.7% of the number stocked was harvested and the total number caught, including those released, was 1.7% (Table 25). Anglers caught 32% of the stocked C93 cohort and kept 25%. The F93 cohort had just begun to recruit to the fishery in December 1993 with 7% of the cohort caught and 1% harvested.

Data from the F92 and F93 cohorts suggest that fall fingerling plants do poorly and contribute very little to Winder Reservoir's catch and harvest. Spring-stocked catchables contribute immediately to the fishery, and good returns occur in the summer and fall months immediately following release. Very few of the spring-stocked catchables are expected to survive their first winter in Winder Reservoir to contribute to the next year's fishery. The stocking density of 25 catchables per acre is adequate to get fair to good returns to the angler. Stocking almost six times this many in 1992 produced almost twice the return rate. Stocking of spring catchable-size trout should be continued at 25/acre. Stocking of fall fingerlings should be discontinued.

Winder Reservoir also contains bluegill, largemouth bass, and yellow perch. These species comprised 94.5% of the fish caught in Winder Reservoir in 1993, with trout making up the remaining 5.5%. Anglers kept

Table 22. Basic creel survey statistics from Winder Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	Snowed-in			
2 [01/29-02/25]	Snowed-in			
3 [02/26-03/25]	Snowed-in			
4 [04/23-05/20]	104	0	NA	NA
5 [04/30-05/20]	707	2,712	3.8	2,591 (96%)
6 [05/21-06/17]	2,713	7,541	2.8	571 (8%)
7 [06/18-07/15]	2,217	25,704	11.6	2,777 (11%)
8 [07/16-08/12]	1,384	3,719	2.7	1,089 (29%)
9 [08/13-09/09]	1,656	6,027	3.6	3,753 (62%)
10 [09/10-10/07]	987	3,007	3.0	201 (7%)
11 [10/08-11/04]	312	1,052	3.4	490 (47%)
12 [11/05-12/02]	43	7	0.2	7 (100%)
13 [12/03-12/30]	933	2,920	3.1	1,965 (67%)
Totals	**11,056 ± 19%**	**52,689 ± 72%**		**13,444 (26%)**
Mean			**5.77**	

Table 23. Growth in length and weight of rainbow trout stocked into Winder Reservoir, Idaho in 1992 and 1993 from known age fish.

Interval and mid-point[a]	C92 Length (mm)	C92 Weight (g)	F92 Length (mm)	F92 Weight (g)	C93 Length (mm)	C93 Weight (g)	F93 Length (mm)	F93 Weight (g)
Stocked 05/07/92	242	156						
Int 1 [05/22/92]	280	243						
Int 2 [06/19/92]	254	181						
Int 3 [07/17/92]	259	192						
Int 4 [08/29/92]	250	184						
Stocked 09/29/92			162	45				
Int 5 [05/06/93]			252	177				
Stocked 05/05/93					229	112		
Int 6 [06/03/93]					248	169		
Int 7 [07/01/96]			285	257	266	208		
Int 8 07/29/93					279	240		
Int 9 [08/26/93]					308	323		
Stocked 09/29/93							127	30
Int 10 [09/23/93]					325	380		
Int 11 [10/21/93]					298	293		
Int 13 [12/16/93]					308	323	208	99

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

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Table 24. Rainbow trout kept and released at Winder Reservoir, Idaho in 1993.

Interval and Mid-point[a]	F92 # Kept	F92 # Released	C93 # Kept	C93 # Released	F93 # Kept	F93 # Released
Int 5 05/06/93	30	100				
Int 6 06/03/93			126			
Int 7 07/01/93	35		70			
Int 8 07/29/93			282	53		
Int 9 08/26/93			14	45		
Int 10 09/23/93			23	56		
Int 11 10/21/93			42			
Int 12 11/19/93						
Int 13 12/16/93			36		65	468
Totals	**65**	**100**	**593**	**154**	**65**	**468**
% of That Stocked	**0.7%**	**1.0%**	**25.2%**	**6.6%**	**1.0%**	**7.3%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Table 25. Yield of rainbow trout from Winder Reservoir, Idaho in 1993.

Interval and Mid-Point[a]	C92 Number	C92 Wt. (Kg)	F92 Number	F92 Wt. (Kg)	C93 Number	C93 Wt. (Kg)	F93 Number	F93 Wt. (Kg)
Int 5 05/06/93			30	5				
Int 6 06/03/93					126	21		
Int 7 07/01/93			30	9	70	15		
Int 8 07/29/93					282	68		
Int 9 08/26/93					14	5		
Int 10 09/23/93					23	9		
Int 11 10/21/93					42	12		
Int 12 11/19/93								
Int 13 12/16/93					36	12	65	6
Totals	**0**	**0**	**65**	**14**	**593**	**142**	**65**	**6**
% of That Stocked	**0%[a]**	**0%[a]**	**0.7%[a]**	**3.0%[b]**	**25%**	**54%**	**1.0%**	**3.1%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.
[b] Some fish from the C92 and F92 cohorts were caught and harvested in 1992, before the present survey.

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about one-fourth of the bluegill they caught (Table 26) and nearly two-thirds of the Winder Reservoir catch in 1993 were bluegill (Table 27). Almost 9,000 largemouth bass were caught, but few were harvested because they were smaller than the 12-in legal minimum size for harvest. Anglers harvested 83% of the yellow perch caught. Mean length and weight of harvested bluegill were 152 mm and 83 g. Monthly mean bluegill lengths ranged from 133 mm to 187 mm. Mean length and weight of harvested yellow perch were 191 mm and 75 grams. Monthly mean yellow perch lengths ranged from 181 mm to 214 mm. Only one near-legal size bass was recorded in the catch and that fish was 302 mm, just shy of the 305 mm minimum harvest size. It weighed 385 g. Total yield of fish from 38 ha Winder Reservoir was 1,228 kg or 32 kg/h (Table 27). Trout made up only 15.5% of the catch, with warmwater fish species making up the rest (84.5%).

It may not be necessary to stock trout in Winder Reservoir. Trout have to compete with a high density of warmwater fish, and most anglers come to Winder Reservoir to catch warmwater fish (personal observation). Trout do not live long or grow large in Winder Reservoir. The only justification for stocking trout is to provide fishing diversity within the reservoir.

Most of the catch and harvest at Winder Reservoir is warmwater prey species. With the large amount of littoral spawning and fry rearing area relative to the amount of open, deep water, it is necessary to maintain a high density of predators to thin abundant fry. Much of the littoral area is overgrown with submerged vegetation that provides hiding places for fry. However, during the mid to late summer drawdown period, water recedes away from the submerged vegetation, concentrating prey and exposing them to efficient predation. This has reduced prey fry sufficiently to allow the prey species to grow to harvestable size. Harvest of nearly 20 kg/ha of adult bluegill and 7 kg/ha of adult perch provides space and food for younger fish to grow. Also, this harvest rate may remove most adult bluegill and perch before they reach their maximum size potential.

Return to the Angler--The only trout that significantly contributed to the 1993 Winder Reservoir fishery were the C93s. Relative to the number and weight of this cohort that was stocked, anglers harvested 25% by number and 54% by weight.

Recommendations based on the 1992 and 1993 survey results would be that stocking 225 mm trout in the spring and discontinuing the stocking of fall fingerlings would result in the best return to the angler rates. Stocking even larger trout, perhaps 250 mm to 300 mm long, would reduce potential bass predation and increase catchability. The mainstay of the Winder Reservoir fishery will continue to be bluegill and yellow perch. Trout should be stocked in the spring at density levels only high enough to add diversity to the spring and summer fishery. Electrofishing surveys have documented largemouth bass in excess of 400 mm in Winder Reservoir, but they were not seen in the survey. Perhaps the no-boat regulation and abundant submerged vegetation limits their vulnerability to angling. There are other, easier to fish, bass waters within a few miles of Winder Reservoir. Poaching may also be a significant factor.

Daniels Reservoir

Anglers fished an estimated 34,005 hours and caught 19,866 trout at Daniels Reservoir in 1993 for an average catch rate of 0.6 fish/h. Only 0.1% of the fish caught were kept (Table 28). The low harvest rate was mainly due to the 508 mm minimum size, as very few fish in the reservoir exceed that length.

Table 26. Warmwater fish catch and harvest from Winder Reservoir, Idaho in 1993.

Interval and Mid-point[a]	Bluegill		Largemouth Bass		Yellow Perch	
	Caught	Kept	Caught	Kept	Caught	Kept
Int 5 05/06/93	1,695	1,695	20	0	836	836
Int 6 06/03/93	3,067	0	3,834	0	513	443
Int 7 07/01/93	22,695	1,833	2,063	0	945	945
Int 8 07/29/93	2,632	633	447	0	308	176
Int 9 08/26/93	4,576	3,189	682	0	732	550
Int 10 09/23/93	1,178	112	1,487	0	262	66
Int 11 10/21/93	847	448	163	0	0	0
Int 12 11/19/93	0	0	0	0	7	7
Int 13 12/16/93	1,304	1,208	207	6	882	691
Totals	**37,994**	**9,118**	**8,903**	**6**	**4,485**	**3,714**
% Kept		**24%**		**0.1%**		**83%**

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Table 27. Yield of all species from Winder Reservoir, Idaho in 1993.

	Trout stocked prior to 1992	Trout stocked in 1992 & 1993	Bluegill	Yellow Perch	Largemouth Bass	Totals
Number	30	723	9,118	3,714	6	13,591
% by Number	0.2%	5.3%	67.1%	27.3%	<0.1%	100%
Weight (kg)	28	162	757	279	2	1,228
% by weight	2.3%	13.2%	61.6%	22.7%	0.2%	100%

Table 28. Fishing effort, catch, catch rate, and harvest of trout from Daniels Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	no data	no data	---	---
2 [01/29-02/25]	168	333	2.0	0
3 [02/26-03/25]	no data	no data	---	---
4 [03/26-04/22]	5,247	1,755	0.2	0
5 [04/23-05/20]	4,660	844	0.2	0
6 [05/21-06/17]	4,194	0	0	0
7 [06/18-07/15]	5,615	3,616	0.6	0
8 [07/16-08/12]	3,315	2,681	0.8	0
9 [08/13-09/09]	2,467	1,642	0.7	0
10 [09/10-10/07]	3,014	2,883	1.0	6 (0.2%)
11 [10/08-11/04]	3,1729	2,773	0.9	0
12 [11/05-12/02]	689	1,160	1.4	17 (1.5%)
13 [12/03-12/30]	1,464	1,236	0.8	0
Totals	**34,005 ± 19%**	**19,866 ± 25%**		**23±135%**
Mean			**0.6**	

Fishing effort was low at the beginning of 1993, probably due to access difficulties caused by above average snowfall. Angling effort was high during most of the open water period from early April (interval 4) through early November (interval 11) 1993. Angling effort in the icefishing interval 13 was about one-half to one-third of that in most open water intervals. Catch rates for icefishing were generally higher than for open water fishing.

The 508 mm minimum size limit prevented anglers from legally harvesting any of the trout stocked in 1992 and 1993. Average size by mid-October 1993 of the first cohort stocked (C92s) was only slightly greater than 400 mm. The survey estimate results indicated that only 23 trout were harvested from Daniels Reservoir in 1993 and all should have been stocked in 1991 or earlier. The lengths of trout legally harvested and measured by survey clerks in 1993 were 516 and 520 mm, just slightly larger than the minimum legal length. Conservation officers regularly encountered illegal harvest of undersized trout at Daniels Reservoir. However, the number of fish taken illegally is small relative to the number that would be harvested if Daniels Reservoir were managed under general regulations.

Since all trout stocked in 1992 and 1993 caught by anglers were released, we do not have mean lengths and weights by sampling interval. Research personnel, with assistance from other department personnel, collected fish samples by electrofishing Daniels Reservoir May 17 and September 20, 1993 to examine the evaluation cohorts (Table 29). In May, they captured a large sample (459) of trout from Daniels Reservoir for evaluation (Table 30). Of the sampled fish, 42% were of quality size (>400 mm). Trout partially recruit to the fishery at 200 mm and are fully recruited at 250 mm. The quality size component of the ≥ 200 mm group is 44%, and 53% of the ≥ 250 mm group.

Only 15, or 3% of the sample, were C92 trout, even though the cohort was at a size highly susceptible to electrofishing (310 to 360 mm) and would have been subjected to little if any harvest since being stocked 14 months earlier. The F92 cohort made up 20% of the sample and ranged from 190 to 270 mm. Most of the catch (75%) of fish at least 200 mm long in May 1993 had been in Daniels Reservoir prior to 1992. The fish would have been a mix of individuals stocked or naturally produced since 1988 (the year of the most recent chemical renovation).

Comparison of actual weights to standard weights demonstrated that trout in Daniels Reservoir were relatively thin with relative weights in May and September averaging 88% and 94%, respectively. We anticipated that the 508 mm minimum size regulation would result in stockpiling of fish, and that this could cause increased food competition and thus decreased condition. We decreased fish stocking density at the special regulation water for this reason. We could further decrease stocking density, but we do not want to reduce density to a point where catch rates are unsatisfactory. Additionally, there is a trend in the scatter diagrams (Figure 1) of decreasing condition as length increases. This is especially obvious in the September sample. It is possible that trout in Daniels Reservoir are highly dependent on zooplankton, and as their gill rakers become farther apart with size, they become less effective at filtering the small food organisms.

In May 1993, Dillon and Jarcek (1994) estimated population size of the 1992 stocked cohorts at Daniels Reservoir by marking and recapturing trout with a boat mounted electrofishing unit. Fish were collected from the littoral zone along the perimeter of the reservoir. We assumed that the littoral zone fish randomly mixed with fish in the open water areas. In addition to marking and recapturing fish a week later as a means of estimating population size, we also used the recently stocked C93 cohort as a marked group. We assumed that the percentage of this marked group that we caught electrofishing would be the same percentage for all cohorts we sampled.

Table 29. Growth in length and weight of rainbow trout stocked into Daniels Reservoir, Idaho in 1992 and 1993 from known age fish.

Interval and Date Sampled[a]	C92 Length (mm)	C92 Weight (g)	F92 Length (mm)	F92 Weight (g)	C93 Length (mm)	C93 Weight (g)	F93 Length (mm)	F93 Weight (g)
Stocked 03/31/92	196	80						
Stocked 09/28/92			163	47				
11/03/92	338		188	N.A.				
5 [05/06/93]	333							
Stocked 5 [05/07/93]					229	110		
5 [05/18/93]	328	398	223	115	243	N.A.		
7 [06/21/93]	373	530	288	250	281	245		
8 [07/19/93]	375	545	304	368	296	291		
9 [08/16/93]	382	N.A.	332					
10[09/20/93]	405	N.A.	364	N.A.	365	N.A.		
11[10/17/93]	401	507	384	619	361	549		
Stocked 11[10/25/93]							127	30

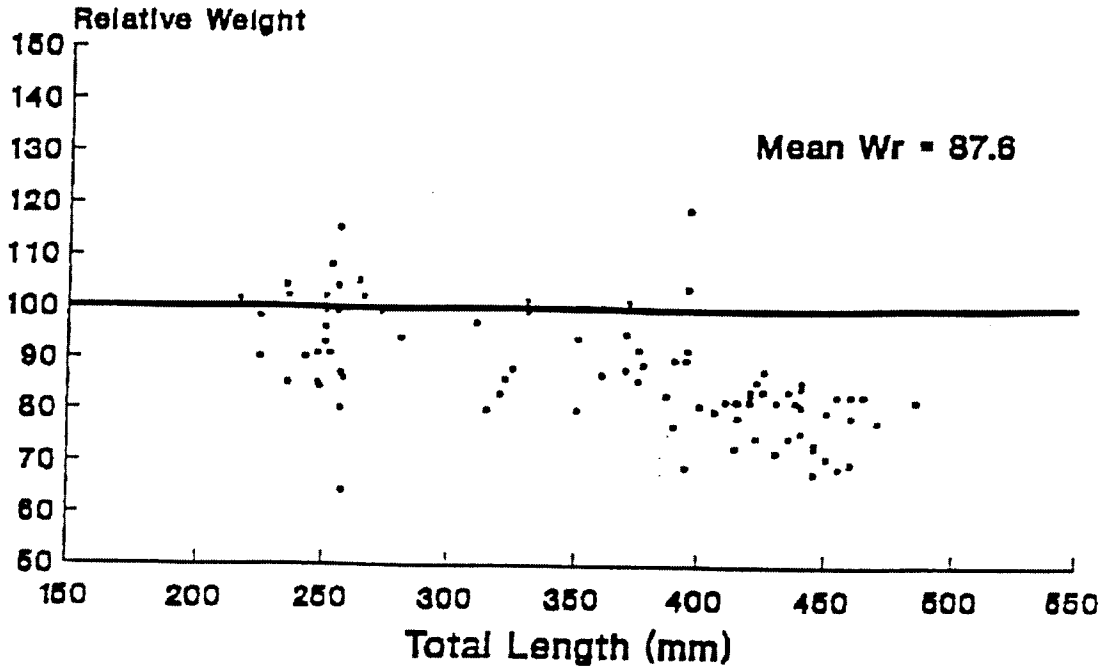
[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

Table 30. Species and size composition of 459 trout electrofished at Daniels Reservoir, Idaho in May 1993.

Length Groups (mm)	C92 - Rainbow Catchables	Unmarked Rainbow Trout	Rainbow x Cutthroat Hybrids	Cutthroat Trout	Totals
≤190	0	11	0	4	**15**
200-290	0	96[a]	2	0	**98**
300-390	15	132	3	2	**152**
400-490	0	139	24	29	**192**
≥ 500	0	0	0	2	**2**
Totals	**15**	**378**	**29**	**37**	**459**

[a] This cell is mostly composed of the F92 cohort.

May



September

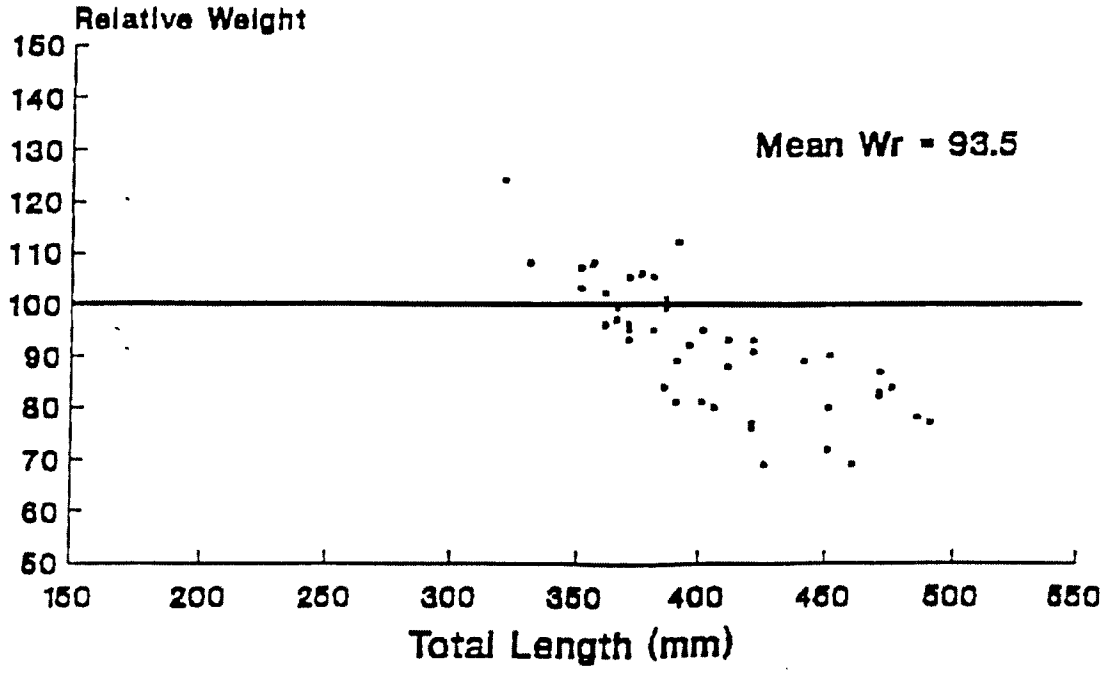


Figure 1. Scatter-plot diagrams for relative weight of hatchery rainbow trout captured from Daniels Reservoir, Idaho on May 17 and September 20, 1993.

Of the 4,690 C92s stocked March 31, 1992, the two methods provide similar population estimates of 224 and 279 (Table 31). The average of these two estimates, 252, is 5% of the number stocked 14 months earlier. The fish were stocked 5 weeks earlier in the spring than planned and at a length 33 mm smaller than planned. These factors may have contributed to the estimated 95% mortality, little or none of which would have been from angler harvest.

The two population estimates for the F92 cohort averaged 1,882 fish or 12% of the number of fish stocked eight months prior. The cohort was stocked the third week of September as planned but were 11 mm longer than planned. The increased length should have increased survival.

Twentyfour Mile Reservoir

Anglers fished an estimated 7,627 hours (428 h/ha) and caught 2,832 trout for a catch rate of 0.4 fish/h at Twentyfour Mile Reservoir in 1993 (Table 32). Catch rates ranged from 0.2 fish/h in June to 1.2 fish/h in September. Due to abundant snowfall in early 1993, little or no ice fishing effort was anticipated, and no ice fishing survey was conducted. The survey began with the open water fishery in April.

Twentyfour Mile Reservoir is managed with a 508 mm minimum size limit for trout. There was no legal harvest documented in the 1993 survey at Twentyfour Mile Reservoir. However, creel clerks occasionally encountered anglers who had kept undersized trout.

Trout growth at Twentyfour Mile reservoir was moderate (Table 33). After two summers, the C92 cohort averaged 399 mm. This is only 54 mm and 30 mm longer than the F92 and C93 cohorts, which had been in Twentyfour Mile reservoir for only one summer. Growth slowed considerably as fish approached 400 mm. Rainbow trout generally weighed less than standard weights (Table 33), with the exception of the October 19, 1993 sample of F92 cohort trout which averaged 106% of standard weight. Trout sampled at Twentyfour Mile Reservoir in May 1993 had relative weights near the standard (98%). When sampled again in September 1993, relative weight had decreased to 87%; trout >400 mm had the lowest values (Figure 2).

In a June 21, 1993 electrofishing sample, the majority of the 70 trout sampled had been stocked prior to 1992, even when including the C93 cohort, which was stocked less than two months earlier. The 1992 cohorts, C92 and F92, contributed only 4% and 3% to the sample, respectively. The 1992 cohorts were 100 to 200 mm smaller than the legal harvestable size and probably would have been of little interest for illegal harvest. The C93 cohort made up 26% of the sample. The remaining 67% of the fish in the sample had been stocked in Twentyfour Mile Reservoir prior to 1992.

Prior to the commencement of the fingerling/catchable evaluation in 1992, rainbow trout catchables had been stocked at 106/ha and fingerlings at 450/ha. Catchables were stocked at 64/ha in 1992 and 31/ha in 1993. Fingerlings were stocked at 106/ha in both 1992 and 1993. In an experiment to add diversity to the Twentyfour Mile Reservoir fishery, 4,000 small rainbow x cutthroat trout *O. mykiss x O. clarki* fingerlings (132/kg) were stocked in October 1989 and 1,000 brook trout *Salvelinus fontinalis* fry (373/kg) were stocked in June 1990. Even though the non-rainbows had been stocked at a small size, they made a contribution to the fishery. Of the June 21 sample, 7% and 4% were hybrids and brook trout, respectively, and they were quality size. Hybrids averaged 469 mm and 890 g; brook trout averaged 405 mm and 673 g.

Table 31. May 1993 population estimates for trout stocked into Daniels Reservoir, Idaho in spring and fall 1992.

Size and cohort stocked	Date stocked	Number stocked	Mark-recapture population estimate	% C93 recapture population estimate	Mark-recapture survival rate	% C93 recapture survival rate
196 mm C92 cohort	03/31/92	4,690	224±194	279±135	4.8±4.1	5.9±2.9
162 mm F92 cohort	09/28/92	15,829	2,392 ±2,309	1,372± 225	15.1±14.6	8.7 ±1.5

Table 32. Fishing effort, catch, catch rate, and harvest of trout from Twentyfour Mile Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	no data	no data	---	---
2 [01/29-02/25]	no data	no data	---	---
3 [02/26-03/25]	no data	no data	---	---
4 [03/26-04/22]	no data	no data	---	---
5 [04/23-05/20]	1,339	340	0.3	0
6 [05/21-06/17]	1,659	281	0.2	0
7 [06/18-07/15]	2,733	1,357	0.5	0
8 [07/16-08/12]	1,047	269	0.3	0
9 [08/13-09/09]	287	156	0.5	0
10 [09/10-10/07]	202	235	1.2	0
11 [10/08-11/04]	no data	no data	---	---
12 [11/05-12/02]	no data	no data	---	---
13 [12/03-12/30]	360	194	0.5	0
Totals	**7,627 ±30%**	**2,832 ± 42%**		**0**
Mean			**0.4**	

Table 33. Growth in length and weight (means) of known age rainbow trout stocked into Twentyfour Mile Reservoir, Idaho in 1992 and 1993.

Interval and date Sampled[a]	C92 Length (mm)	C92 Weight (g)	F92 Length (mm)	F92 Weight (g)	C93 Length (mm)	C93 Weight (g)	F93 Length (mm)	F93 Weight (g)
Stocked 05/07/92	224	160						
Stocked 09/28/92			160	47				
Stocked 05/12/93					229	113		
6 [05/22/93]	341				216			
7 [06/29/93]					257			
8 [07/21/93]	389	630 [93% std wt]	312	280 [82% std wt]	295	279 [98% std wt]		
9 [08/18/93]					321			
Stocked 09/22/93							152	37
11[10/19/93]	399	665 [91% std wt]	345	492 [106% std wt]	369	545 [95% std wt]	178	

[a] Creel survey samples collected over 28 day time intervals. The mean weight/length for each interval is used as the estimated fish size at the mid-point date of each interval.

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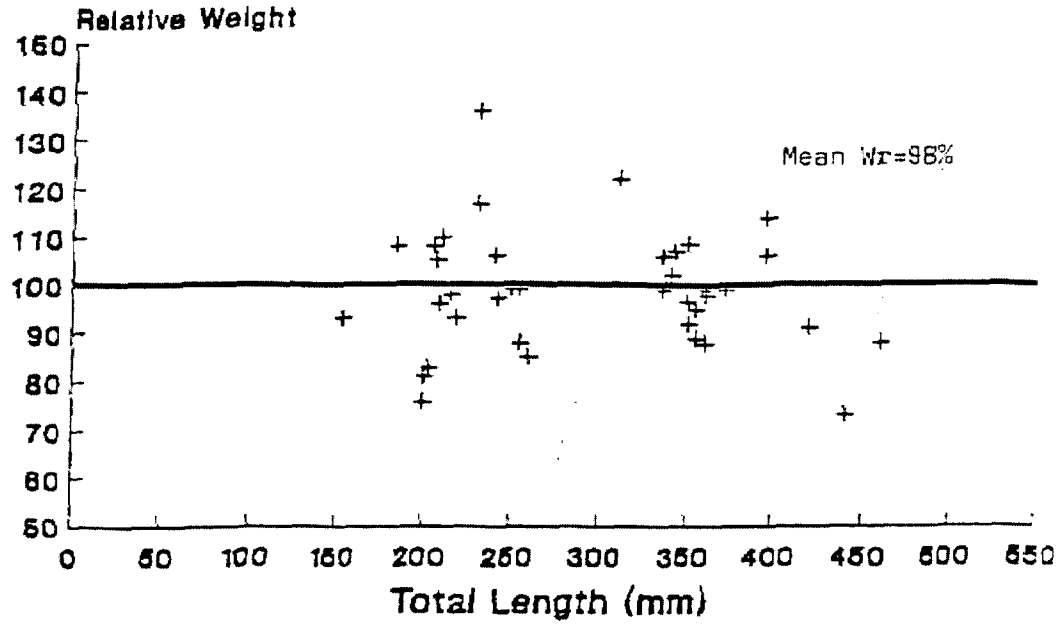
May



September

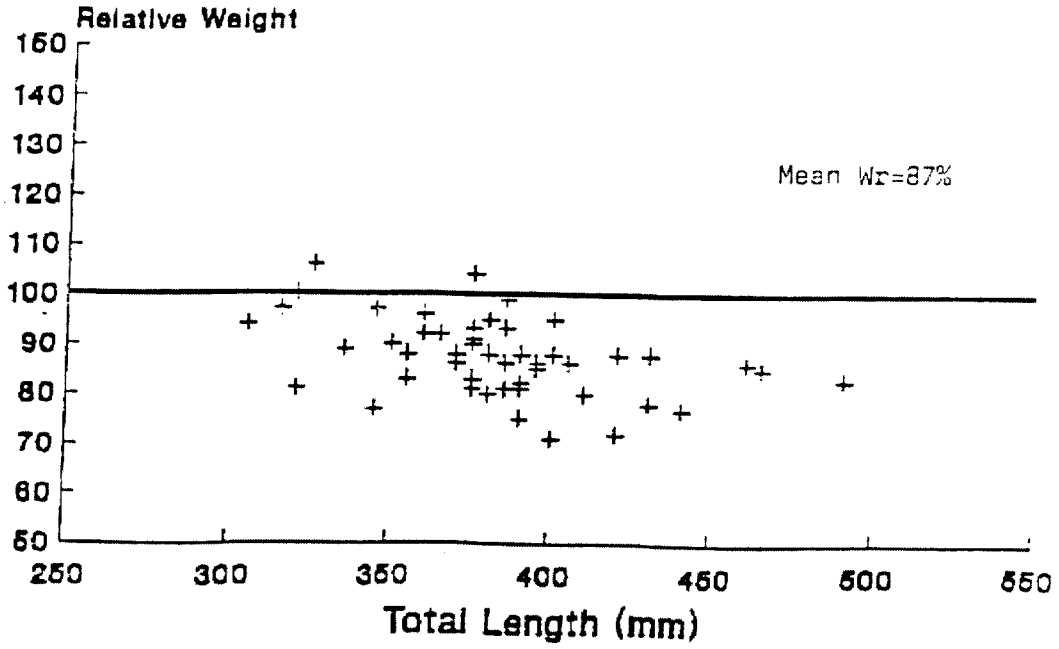


Figure 2. Scatter-plot diagrams for relative weight of hatchery rainbow trout captured from Twentyfour Mile Reservoir, Idaho on May 22 and September 22, 1993.

An electrofishing sample taken October 19, 1993 had increased percentages of 1992 cohorts (C92 = 11% and F92 = 9%). The C93 cohort made up 19% of the sample. Pre-1992 stocked trout were still the majority (60%) of the sampled catch in Twentyfour Mile Reservoir. Older age fish were being "stockpiled" under the 508 mm minimum size regulation.

Summary of the 1993 Fingerling-Catchable Evaluation

A comparative evaluation of fish performance from the seven reservoirs can best be done with the C93 cohort from the time they were stocked the first week of May 1993 through the end of that year. This provides information through one complete growing season and 1993 was a year of good growing conditions, beginning with full reservoirs in the spring and adequate volume at the end of the irrigation season. On all but the special regulation waters of Daniels and Twentyfour Mile reservoirs, we have lengths and weights of fish in December 1993 (Table 34). Since no evaluation fish were harvested at the special regulation waters, we were dependent on electrofishing samples for data at Daniels and Twentyfour Mile reservoirs. The last electrofishing sample in 1993 was collected in late October. We have comparative information for this time period on three reservoirs in addition to the special regulation waters (Tables 35 and 36).

Highest growth rates occurred at Chesterfield and Springfield reservoirs. Springfield Reservoir had fish growth equal to that of Chesterfield, even though stocking density was five times greater at Springfield Reservoir. However, while 18.6% of the C93s were harvested at Chesterfield Reservoir, only 0.1% of the C93s were harvested at Springfield. It was as if there were hardly any C93s in Springfield Reservoir, and if this was the case, then low density rather than high density would have affected the growth rate. In 1994, we will try to determine what happens to spring-stocked catchables in Springfield Reservoir that prevents them from being harvested.

Trout were stocked into Twin Lakes and Winder at the same density (62/ha) as was stocked into Chesterfield Reservoir. Trout growth was intermediate (2.4 g/d) at Twin Lakes Reservoir and slow (0.9 g/d) at Winder Reservoir. The decreased growth rates probably reflect the influence of warmwater species. Of Twin Lakes Reservoir's yield, 3% was bluegill. In contrast, 62% and 23% of the yield from Winder Reservoir were bluegill and yellow perch, respectively. Only 15.5% of the yield at Winder Reservoir was composed of trout. Bluegill and yellow perch competition is the likely reason for slow trout growth in Winder Reservoir. Flick and Webster (1992) state "Fishery managers have long recognized the inability of brook trout to compete successfully with many non-trout species, particularly yellow perch, in ponds and lakes." Eschmyer (1938) noted that in Michigan lakes, brook trout survived poorly in waters with yellow perch but often survived and grew well when yellow perch were absent. Similar conclusions with respect to yellow perch as a competitor were drawn by Fraser (1978), who noted that angling yielded approximately 3 pounds of brook trout for every pound of brook trout stocked in the absence of perch, but only 0.4 pounds of brook trout for every pound of brook trout stocked after yellow perch became established. Although rainbow and brook trout have different niches, there is enough overlap and similarities, that similar conclusions concerning the effect of yellow perch on brook trout can be drawn for the effect of yellow perch on rainbow trout. Our comparison of rainbow trout growth in Southeast Idaho reservoirs with yellow perch and in those without yellow perch would lead to the same conclusion drawn by the above authors.

There will be additional harvest of the C93 and F93 cohorts in 1994. The additional harvest from the F92 cohort will probably be small as none were recorded in intervals 12 and 13 of the 1993 survey. Since Chesterfield Reservoir was drained June 20, 1992, the only harvest from the C92 cohort is reported in 1992. The F92 cohort most likely suffered very high mortality during the fall and winter of 1992-93 due to low water.

Table 34. Comparative mean daily growth of the C93 cohort from the time of stocking (May 4-5, 1993) until end of the year (December 16, 1993) at five evaluation reservoirs in Southeast Idaho.[a]

Reservoir	Days of growth	Total growth (mm)	Daily growth (mm)	Total growth (g)	Daily growth (g)	Number/ha Stocked
Chesterfield	226	203	0.90	829	3.7	62
Springfield	225	207	0.92	820	3.6	315
Treasureton	224	163	0.73	589	2.6	276
Twin Lakes	226	163	0.72	547	2.4	62
Winder	225	79	0.35	211	0.9	62

[a] Initial lengths were 225-229 mm. Initial weights were 109-115 g.

Table 35. Comparative mean daily growth of the C93 cohort from the time of stocking (May 4 - 12, 1993) until late fall (October 17 - 21, 1993) at five evaluation reservoirs in Southeast Idaho.[a]

Reservoir	Days of growth	Total growth (mm)	Daily Growth (mm)	Total growth (g)	Daily growth (g)	Number/ha stocked
Chesterfield	170	178	1.05	778	4.6	62
Daniels	163	132	0.81	439	2.7	31
Treasureton	168	148	0.88	554	3.3	276
Twentyfour Mile	160	140	0.88	432	2.7	31
Winder	169	69	0.41	181	1.1	62

[a] Initial lengths were 225-229 mm. Initial weights were 109-115 g.

Table 36. Preliminary returns to the angler of 1992 and 1993 rainbow trout cohorts from five reservoirs in Southeast Idaho.

Reservoir		C92	F92	C93	F93
Chesterfield	1992 numbers	2,097	0	NA	NA
	1993 numbers	drained 6/92	845	7,432	847
	Totals	**2,097**	**845**	**7,432**	**847**
	% return	10.5%	0.6%	18.6%	0.6%
	1992 kg	655	0	NA	NA
	1993 kg	drained 6/92	332	4,249	102
	Totals	**655**	**332**	**4,249**	**102**
	% return	41.2%	5.3%	94.6%	1.8%
Springfield	1992 numbers	747	0	NA	NA
	1993 numbers	117	3,918	8	488
	Totals	**847**	**3,918**	**8**	**488**
	% return	12.5%	15.7%	0.1%	1.7%
	1992 kg	219	0	NA	NA
	1993 kg	127	488	7	85
	Totals	**346**	**488**	**7**	**85**
	% return	28.6%	44.8%	0.7%	7.1%
Treasureton	1992 numbers	5,651	NA	NA	NA
	1993 numbers	drained 8/92	NA	12,744	243
	Totals	**5,651**	**NA**	**12,744**	**243**
	% return	35.4%	NA	80.0%	0.4%
	1992 kg	1,438	NA	NA	NA
	1993 kg	drained 8/92	NA	5,597	26
	Totals	**1,438**	**NA**	**5,597**	**26**
	% return	60.4%	NA	274%	1.3%
Twin Lakes	1992 numbers	3,575	no late survey	NA	NA
	1993 numbers	2,657	3,181	1,253	96
	Totals	**6,232**	**3,181**	**1,253**	**96**
	% return	56.3%	8.5%	11.2%	0.2%
	1992 kg	868	no late survey	NA	NA
	1993 kg	925	1,028	397	19
	Totals	**1,793**	**1,028**	**397**	**19**
	% return	101%	57.7%	31.8%	1.4%
Winder	1992 numbers	6,205	no late survey	NA	NA
	1993 numbers	0	65	593	65
	Totals	**6,205**	**65**	**593**	**65**
	% return	47.0%	0.7%	25.0%	1.0%
	1992 kg	1,190	no late survey	NA	NA
	1993 kg	0	14	142	6
	Totals	**1,190**	**14**	**142**	**6**
	% return	58.0%	3.0%	54.0%	3.1%

A smaller number of spring catchables were stocked into Springfield Reservoir in 1992 (6,754) than in 1993 (8,500). The return rate between the two years was dramatically different. In 1992, 747 or 11.1% of the C92s were harvested. In 1993, only eight, or 0.1%, of the C93s were harvested. Besides stocking about 20% fewer catchables in the spring of 1992 than in 1993, which if anything should have attracted more anglers, the stocking scenario differed noticeably. In 1992, 45%, 30%, and 25% of the catchables were released February 18, May 22, and June 4, respectively. In 1993, all the catchables were released on May 5. The release in February 1992 responded to angler complaints of no fish in Springfield Reservoir. Unseasonably warm and dry weather had brought anglers out early. Stocking catchables at multiple times and beginning early in the year, as soon as ice goes off, may be a way to improve return rates to anglers. The best return rates at Springfield Reservoir came from the F92 cohort, released in the fall. The fish grew to 200 mm quickly and were harvested throughout the winter of 1992-1993. Most of the total return occurred during this time interval. By May 1993, catch of the F92 cohort declined dramatically.

Treasureton Reservoir was stocked at the relatively high density of 276 catchables/ha in May 1992. By mid-June, the Strongarm Irrigation Company informed us that Treasureton Reservoir would be drained for irrigation. Salvage regulations were permitted from that time until Treasureton Reservoir was drained on August 10, 1992. Fish were concentrated and the limits were lifted. These factors contributed to the 35% return to the angler in a three-month period. There were no competing cohorts in Treasureton Reservoir when the C93 cohort was planted in May 1993. The trout were again stocked at the 276/ha rate, which attracted anglers. Food was abundant and the fish grew fast. In eight months, anglers harvested 80% of the cohort for a return of 274% by weight. The F93 cohort began to recruit in December 1993, but most fish were released as anglers sought the much larger C93 trout.

The intermediate growth of trout in Twin Lakes Reservoir may have been caused by interactions with carp, bluegill, and bass. Few trout reached a length of 400 mm even after two summers in the reservoir. However, survival appears to have been good, with almost as many of the C92 trout harvested in 1993 as in 1992. There was good overwinter survival of the F92 cohort and they were captured throughout the 1993 survey. Even more yield from the F92 cohort should occur in 1994.

At Winder Reservoir there was no carryover of the C92 cohort to the 1993 fishery. The cohort had been stocked at the exceptionally high density of 347/ha (five times the number planned). Anglers responded with heavy fishing pressure, harvesting 47% of the cohort in 1992. The C92 cohort appeared not to have survived the 1992-1993 winter. There were no C92s recorded in the 1993 survey from Winder Reservoir. Some, but very few, of the F92s survived their first winter to contribute to the 1993 fishery. Only 0.7% of the 9,944 stocked in September 1992 were harvested in the 1993 fishery (Tables 37 and 38). With a smaller density (62/ha) of catchables stocked in 1993, anglers harvested a smaller percentage (25% by number). However, this seems to be a more reasonable density to stock, especially since the main fishery at Winder Reservoir is for warmwater fish.

Chesterfield Reservoir is 3.6 times larger than the next smaller reservoir in the seven-reservoir evaluation and over 10 times larger than four of the reservoirs. Approximately one-fourth of Chesterfield Reservoir lies on the Fort Hall Indian Reservation, where non-tribal anglers are not permitted to fish. Much of the perimeter of Chesterfield Reservoir is accessible only by boat or a long walk. Additionally, during the drought, fishing at Chesterfield was poor and many people had stopped fishing there. Only 225-250 mm trout were present in Chesterfield Reservoir when fishing began in May 1993, and it was not until fall that anglers began to consider Chesterfield Reservoir a quality fishery again. Previous drought conditions and small fish were the likely reasons for low angling hours per ha at Chesterfield Reservoir in 1993. There should be a substantial increase in 1994.

Table 37. Summary 1993 creel survey statistics from seven Southeast Idaho evaluation reservoirs.

Reservoir	Full pool surface area (ha)	Total hours fished	Hours/ha	Fish caught/ha (all species)	Trout yield (kg) from 1992-1993 cohorts/ ha	Percent of fish caught that were kept
Chesterfield	648	28,589	44	22	7.2	65%
Treasureton	58	23,836	411	423	97.0	53%
Springfield	27	16,895	626	332	4.9	51%
Twin Lakes	181	39,312	217	126	13.1[a]	30%
Winder	38	11,056	291	1,387	4.3[b]	26%
Daniels	152	34,005	224	131	0	0%
Twentyfour Mile	18	7,627	424	157	0	0%

[a] An additional 10.8 kg/ha of trout stocked prior to 1992 and 0.7 kg of warm water fish were harvested at Twin Lakes in 1993.
[b] An additional 0.7 kg/ha of trout stocked prior to 1992 and 27.3 kg of warm water fish were harvested at Winder in 1993.

Table 38. Angler characteristics at seven Southeast Idaho reservoirs in 1993.

	Chesterfield	Treasureton	Springfield	Twin Lakes	Winder	Daniels	Twentyfour Mile
Origin							
Resident	93%	59%	99%	61%	85%	25%	85%
Non-resident	7%	41%	1%	39%	15%	75%	15%
Success level							
Catching zero fish	35%	31%	66%	39%	29%	33%	40%
Keeping ≥ 4 fish	26%	31%	10%	18%	33%	0%[a]	0%[a]
Fishing from:							
Boat	17%	15%	9%	25%	2%	18%	8%
Shore	59%	57%	77%	52%	57%	13%	17%
Float tube	0%	9%	2%	4%	26%	64%	64%
Ice	20%	19%	11%	20%	15%	5%	11%
Fishing method:							
Bait	76%	87%	93%	89%	79%	<1%[b]	12%[b]
Fly or lure	24%	13%	7%	11%	21%	99%	88%
Mean # hrs fishing	4.4	3.6	2.0	3.3	2.9	4.4	2.7

[a] Due to the 20-in minimum size and the 2-fish limit at Daniels and Twentyfour Mile reservoirs, no anglers kept 4 fish or more. Thirty-eight percent and 25% of anglers at Daniels and Twentyfour Mile reservoirs, respectively, caught-and-released at least 4 trout.

[b] Bait fishing at Daniels and Twentyfour Mile reservoirs is illegal. Nevertheless, creel clerks encountered the above listed percent of anglers who did use bait.

A large percentage of surveyed anglers caught no fish. The reservoir with the greatest percent of unsuccessful anglers was Springfield, the reservoir with the highest trout-stocking rate. Winder and Treasureton had the smallest percent of unsuccessful anglers. At Treasureton and Chesterfield reservoirs, 31% and 26%, respectively, of anglers harvested at least 4 trout. If there were 3-trout limits on these waters, two-thirds to three-quarters of anglers would not be impacted. The reduction in overall harvest under such a regulation would be 31% at Chesterfield Reservoir (Table 39) based on percentage of anglers who kept 0 through 6 fish in 1993. However, reduced-number regulations often cause harvest-oriented anglers to fish there less often or fish other places, and attract more anglers who generally keep few if any fish.

Anglers expect abundant catchable size fish at the "general fishing season opener" associated with Memorial Day Weekend. When reservoirs were closed in the winter, that request was easy to satisfy. Fish carried over from the year before were naive, and catchables could be stocked a few weeks prior to the opener to acclimate and grow a little before being exploited. With year-around fishing, carryovers are few unless they are small and beginning to recruit to the fishery as with fall stocked fingerlings. Large fish have been exploited all winter and spring, are wary, and have been thinned out. Fishing often is poor to fair on the Memorial Day Weekend at Southeast Idaho reservoirs, not only due to fish numbers and size, but also because of cold water/weather and abundant fish forage and space (e.g., full reservoirs make fish less dense).

Hatcheries collected fin condition and pyloric fat index data on trout prior to stocking into the evaluation reservoirs. Fin lengths on the C92s measured in the spring of 1992 were 48% at Grace Hatchery and 42% at American Falls Hatchery. The values estimate the percent of fin length as would appear on wild trout that is on the sampled hatchery trout. Fins measured were the pectorals and dorsal. We do not know what the effect is of this amount (>50%) of fin length reduction on a fish's ability to feed, fight (on a fishing line), and avoid predation. When conditions are right, fish with this amount of fin reduction survive and grow well and are caught in good numbers by anglers. There were no serious complaints by anglers about the amount of fin erosion.

On a scale of 0 to 4, fat index was 0.9 at Grace Hatchery and 2.0 at American Falls Hatchery. The value was low at Grace Hatchery because feeding was cut back to slow growth so the fish would not be larger than requested at the requested stocking time. This may have affected their survival once stocked, probably more so in reservoirs with competing species such as Winder Reservoir. We did not collect fat index data for all release groups, and with all the environmental differences between reservoirs and between years, it is unlikely that we would have been able to document a fat index effect. The goal should be to raise fish to as near the requested length at the requested time, but to not let this goal cause starvation of the fish. It would be most desirable to have fat conditions between 2 and 3 for all fish stocked.

American Falls Reservoir Summer Creel Survey

During the 1993 survey at American Falls Reservoir, anglers fished an estimated 69,364 hours (95% CI 55,266; 83,462) (3.1 h/ha) and caught 8,023 trout (95% CI 5,393; 10,635) for an average catch rate of 0.12 fish/h (Table 40). It took the average American Falls Reservoir angler 8 hours to catch a trout.

Of the anglers surveyed on American Falls Reservoir, 97% were Idaho residents. Boat and shore anglers accounted for 45% and 55% of fishing hours, respectively. This was the first year after the six year

Table 39. Percent of anglers harvesting 0 through 6 trout at Chesterfield Reservoir, Idaho in 1993 and prediction of relative harvest reduction if the limit were reduced from 6 to 3 trout (estimations based upon total anticipated harvest of 100 anglers – 195 harvested fish).

With the 6-fish limit in 1993	**% of anglers harvesting that amount:**	**Estimated harvest with a 6-fish limit**	**Estimated harvest with a 3-fish limit**	**Reduction in harvest with a 3-fish limit**
0 Trout	40.76%[a]	0	0	0
1 Trout	16.36%	16.36	16.36	0
2 Trout	11.52%	23.04	23.04	0
3 Trout	5.76%	17.28	17.28	0
4 Trout	5.45%	21.80	16.35	5.45
5 Trout	4.55%	22.75	13.65	9.10
6 Trout	15.61%	93.66	46.83	46.83
Totals:	**100.00%**	**195 fish**	**134 fish**	**61 or 31%**

[a] Includes both anglers who caught no fish (35.15%) and those who caught fish but chose not to keep any (5.61%).

Table 40. Basic creel survey statistics from American Falls Reservoir, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	no survey			
2 [01/29-02/25]	no survey			
3 [02/26-03/25]	no survey			
4 [04/23-05/20]	no survey			
5 [04/30-05/20]	5,957	431	0.06	431 (100%)
6 [05/21-06/17]	16,594	2,721	0.16	2,721 (100%)
7 [06/18-07/15]	11,539	1,051	0.09	1,016 (97%)
8 [07/16-08/12]	10,786	1,984	0.18	1,984 (100%)
9 [08/13-09/09]	13,767	1,433	0.10	1,433 (100%)
10 [09/10-10/07]	9,721	403	0.04	403 (100%)
11 [10/08-11/04]	no survey			
12 [11/05-12/02]	no survey			
13 [12/03-12/30]	no survey			
Totals	**69,364±20%**	**8,023±33%**		**7,988 (99%)**
Mean			**0.12**	

drought, thus few of the fish stocked prior to 1993 would have survived and been available to anglers in 1993. Highest catch rates per interval occurred from mid-July through mid-August at 0.18 fish/h.

The majority of fish examined in the survey were rainbow trout (94%) and almost all fish caught (93%) were kept. Small numbers of other salmonids were also caught, including wild rainbow trout (3%), coho salmon (2.3%), and cutthroat trout (1.1%). From January through early September 1993, there were 131,657 catchable or sub-catchable size rainbow trout stocked in American Falls Reservoir. Catch during the survey was 6% of catchables stocked. Additionally, in 1992 the Department stocked 370,267 fingerling trout in the Snake River reach above American Falls Reservoir from Shelley to McTucker. The fingerlings would have recruited to the fishery of the river and reservoir in 1993. Thus return rate to the angler was very low and probably was greatly influenced by lack of water quantity, which negatively affected water quality from 1987 through 1992.

The first year of abundant precipitation after six consecutive drought years was 1993. American Falls Reservoir was completely drained in 1990, and was drained to less than 8% of capacity in both 1991 and 1992. This contrasts with the end of the 1993 irrigation season when 37% of capacity remained. Trout survival and retention in the reservoir are likely directly proportional to the amount of water left in the reservoir at the end of the irrigation season. During 1993, there were probably very few trout in the reservoir that had been stocked prior to 1993. Additionally, most anglers stopped fishing American Falls Reservoir during the drought. On the Saturday of the Memorial Day weekend in 1991, only 12 boats were seen in an aerial survey and most of the boaters did not appear to be fishing. It will require at least two consecutive years of good carryover water to rebuild a population of trout attractive to anglers, especially at the low densities that trout are stocked (American Falls Reservoir is too large to economically increase stocking density).

Recommendations

Continue stocking trout in the upper reaches of the reservoir and in the Snake River above, with emphasis on the 16-km reach between Tilden Bridge and McTucker Creek, immediately upriver from American Falls Reservoir. By following a marked subgroup of stocked fish, determine if the upstream stockings are benefiting the reservoir fishery.

Pocatello Highway Pond – Estimation of Fishing Mortality

There was little aquatic vegetation and no large debris present to provide cover for fish from snorkeling observers. Visibility was at least 6 m and the pond's long narrow shape allowed the crew to cover it entirely in one pass. Snorkelers moved along the long axis of the pond, counting all fish that passed between themselves and the adjacent snorkeler to their right side. The snorkeler nearest each shore also counted the fish between himself and the shore. Fish appeared to move little as the snorkelers moved past and did not move out ahead. Two passes were made; the second did not include a small section that was too shallow to effectively snorkel.

A total of 69 fish were counted on the first pass and 57 on the second. Adding the 12 fish that were counted in the excluded shallow area on the first pass to the second pass total makes both counts the same at 69

trout. This is 8% of the 900 catchables stocked in the pond two weeks earlier. This level of harvest is too high to provide a reasonable fishery without repeated stocking during the summer.

Recommendations

Reduce the creel limit to two trout. This should maintain reasonable catch rates at this urban fishery without stocking extremely large numbers of fish. When water depth is adequate, stock the Highway Pond with catchable rainbow trout on a regular basis (possibly biweekly) to provide an urban fishery in Bannock County.

McTucker Pond #8 Rainbow Trout Creel Survey

Following the October 1992 chemical renovation of the McTucker Ponds, Pond #8 was restocked with 2,578 catchable size (4.5/kg) rainbow trout on November 18, 1992. Winter storms limited fishing and fishing access to the ponds until February 1993. Catchable size trout were stocked in Pond #8 three times in 1993: 1,040 on April 15, 1,500 on October 5, and 1,040 on December 28. Anglers fished an estimated 10,459 hrs $\pm$ 22% (95% CI) hours at McTucker Pond #8 in 1993 (3,280 h/ha) (Table 41). Anglers caught 5,703 $\pm$ 52% (95% CI) fish of which they kept 3,732 (65%). Mean catch rate was 0.54 fish/h. Largest catches occurred in March, April, and May of fish that had been stocked the previous November.

Total catch and catch rates were low from June through October. Catch rates increased in November and stayed high through the end of the year, however fishing effort stayed low. Approximately half (47%) the anglers caught no fish; 29% caught one, and 12% caught more than six fish. More than one-half of the fish caught (59%) were harvested. Most anglers fished from shore (83%) using bait (90%).

The 1,040 trout stocked on December 28, 1993 would have contributed very little to the 1993 catch. Of the 5,118 trout stocked prior to the December date, anglers in 1993 harvested 73% of the fish stocked and caught (both kept and released) 111% of the number stocked.

Recommendations

Continue stocking McTucker Pond #8 with hatchery rainbow trout. Stock smaller batches of trout (about 250 fish) monthly in all ice-free months. Determine how long stocked fish persist in the pond and adjust stocking frequency to maintain acceptable catch rates. Investigate potential fish losses to several species of piscivorous birds common to the area.

Table 41. Basic creel survey statistics from McTucker Pond #8, Idaho in 1993.

1993 Sampling Intervals	Angling Effort (Hours)	Number of Fish Caught	Fish Caught per Hour	Number and % of Fish Kept
1 [01/01-01/28]	0	N.A.	N.A.	N.A.
2 [01/29-02/25]	84	0	0	N.A.
3 [02/26-03/25]	1,007	805	0.80	614 (76%)
4 [04/23-05/20]	1,394	2,605	1.87	1,326 (51%)
5 [04/30-05/20]	2,142	1,021	0.48	986 (96%)
6 [05/21-06/17]	1,082	116	0.11	116 (100%)
7 [06/18-07/15]	1,287	141	0.11	141 (100%)
8 [07/16-08/12]	1,454	209	0.14	34 (16%)
9 [08/13-09/09]	1,171	207	0.18	0 (0%)
10 [09/10-10/07]	250	37	0.15	0 (0%)
11 [10/08-11/04]	203	166	0.82	166 (100%)
12 [11/05-12/02]	198	288	1.45	241 (84%)
13 [12/03-12/30]	185	108	0.58	108 (100%)
Totals	**10,459±22%**	**5,703±52%**		**3,732(65%)**
Mean			**0.54**	

Opening Weekend Check Station at Interstate 15 Port of Entry

At the Memorial Day weekend check station, we obtained interviews representing 1,164 anglers who had fished a total of 5,701 hours. About three-fourths (77%) of the interviewed anglers had been fishing reservoirs, accounting for 80% of the total fishing effort.

Surveyed lake and reservoir anglers fished 4,583 hours and caught 2,334 fish (0.57 fish/h). The survey obtained information from 25 lakes, reservoirs, and ponds. Waters with the highest percentage of anglers interviewed were Hawkins and Twin Lakes reservoirs at 20% and 12%, respectively. Three waters, Hawkins, St. Johns, and Treasureton reservoirs, shared the highest trout catch rates at 0.6 fish/h. Best catch rates for warmwater species were at Twin Lakes Reservoir (0.7 fish/h) for largemouth bass and at Glendale Reservoir (0.6 fish/h) for bluegill. Poorest trout catch rates were at Condie and Glendale reservoirs at 0.0 fish/h. Mean rainbow trout length varied little, ranging from 251 mm at Winder Reservoir to 358 mm at Weston Reservoir.

Juvenile Fish Assessment with Shoreline Seining

St. Johns is a small (19 ha) moderate elevation (about 1,450 m) reservoir in Oneida County. Small fish were abundant in the littoral zone. We collected 603 fish, of which 76% were bluegill averaging 25 mm, 18% were largemouth bass averaging 134 mm, and 8% were yellow perch averaging 113 mm. Schill and LaBolle (1990) determined that the length at age-1 for largemouth bass in Condie and Twin Lakes reservoirs ranged from 93 to 130 mm. We believe the bass collected in 1993 were age-1+. Across their range, average length at annulus formation for age-1 bluegill is 43 mm (Scott and Crossman 1973). The ratio of age-0+ bluegill to age-1+ largemouth bass in the 1993 St. Johns Reservoir sample was roughly 5:1.

Few fish were collected from Alexander and Chesterfield reservoirs. The ten fish collected from Alexander Reservoir included five white crappie, three yellow perch and two speckled dace *Rhinichthys osculus*. We are trying to establish a crappie population in Alexander Reservoir, and the crappie fry demonstrate that the adult crappie stocked in May 1993 successfully spawned. However, the limiting factor for crappie at this high elevation, poor water quality, and short retention time reservoir may be overwinter survival of age-0 fish. Future sampling will be needed to determine if crappie can complete all stages of their life cycle in Alexander Reservoir.

The entire catch at Chesterfield Reservoir from three seine hauls was 11 speckled dace. We view the results as positive because we chemically renovated the remaining impounded water and lower two miles of tributaries after the reservoir was drained in 1992. The eradication killed Utah chubs, Utah suckers, and common carp. If fry from any of those species had been captured in the seine samples, then a quick population rebound of the troublesome non-game species would have followed.

Recommendations

Monitor bass-bluegill population ratios with shoreline seines to determine year-to-year changes in spawning success and recruitment of bass and bluegill.

Warmwater Fish Population Assessments

Condie Reservoir

We collected 203 largemouth bass, 124 bluegill, 29 yellow perch, and 10 rainbow trout at Condie Reservoir on May 27, 1993. An additional 119 largemouth bass, 40 bluegill, 3 yellow perch, and 3 rainbow trout were collected on June 6, 1993. Of the 322 total largemouth bass collected, 80% were ≥200 mm total length. We took scale samples from all bass ≥200 mm. Largemouth bass proportional stock density (PSD) was 21% (95% CI 15,26). Approximate PSD confidence intervals were calculated as suggested by Gustafson (1988). We recaptured 34 largemouth bass on June 6 and estimated a population of 617 (95% CI of 478-871) largemouth bass ≥200 mm. The mean sampled lengths by species were; largemouth bass 262 mm, bluegill 145 mm, yellow perch 197 mm, and hatchery rainbow trout 324 mm. Results of scale analysis of largemouth bass are provided in Appendix A.

We collected 91 largemouth bass in August 1986 and 476 in May 1988 at Condie Reservoir. Mean length and PSD were 223 mm and 40% in 1986, and 287 mm and 31% (95% CI 26,35) (Gustafson 1988) in 1988. The 1986 data did not meet the normal approximation requirement necessary to calculate a PSD confidence interval. Analysis of the 1988 data using only bass greater than 200 mm resulted in a population estimate of 1,000 (95% CI of 169-1,100).

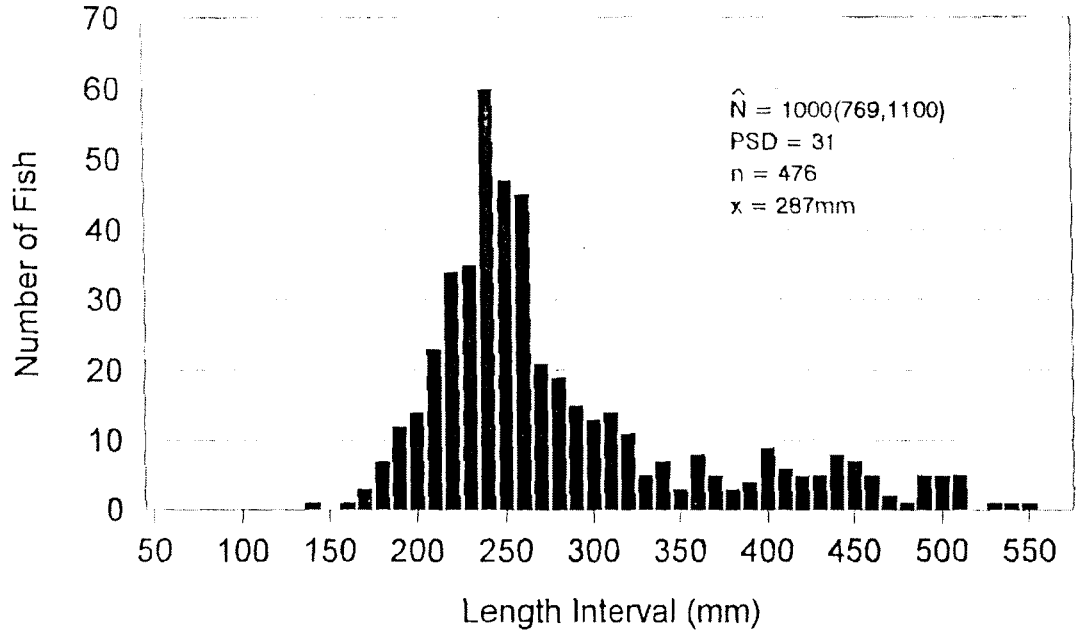
Comparison of the 1988 and 1993 length frequencies (Figure 3) show a larger proportion of bass ≥200 mm total length in 1988 (95%) than in 1993 (80%). In 1993 there were notable gaps in the length frequency between 150-240 mm and again at 310-360 mm. The gaps may indicate erratic recruitment from year class failures. Mean bass length in 1993 (262 mm) was 18% larger than in 1986 (223 mm).

Mean back-calculated lengths at age from 1993 scale analysis shows growth rate declining after age-4 (Appendix A). Growth in 1986 was the fastest of the three sampling years from age-3+ to age-8+ (Figure 4). Among the three years' analyses, 1993 has the slowest growth, 1986 the fastest, and 1988 had intermediate growth. Growth of age-9+ bass was very similar for the three sample years. After age-9+, growth is slow and our ability to accurately age scales diminishes.

Neither population estimates nor PSDs for largemouth bass differed significantly ($\alpha = .05$) between the two years sampled. Carline (1984) cautions that large fluctuations in PSD may have more to do with changes in recruitment patterns than growth or survival. Condie Reservoir is subject to rapid irrigation drawdowns, often during largemouth bass spawning and nest guarding season. This may cause spawners to abandon nests. Drawdown activity, along with a relatively short growing season, could result in erratic recruitment patterns. Significant drawdowns during the largemouth bass spawning season were more likely to occur during the 1987-1992 droughts than during the 1982-1986 period of abundant precipitation.

We collected 144 bluegill that had a mean length of 145 mm. Growth for all ages was considerably slower than reported for Twin Lakes in 1987 (Schill and Heimer 1988). This is still faster growth than for Hagerman National Wildlife Refuge populations. Schill and Heimer (1988) suggest that bluegill may fail to form annuli at age-1 in slow-growing populations, and this may account for the apparent rapid growth noted in the age-1+ class.

1988



1993

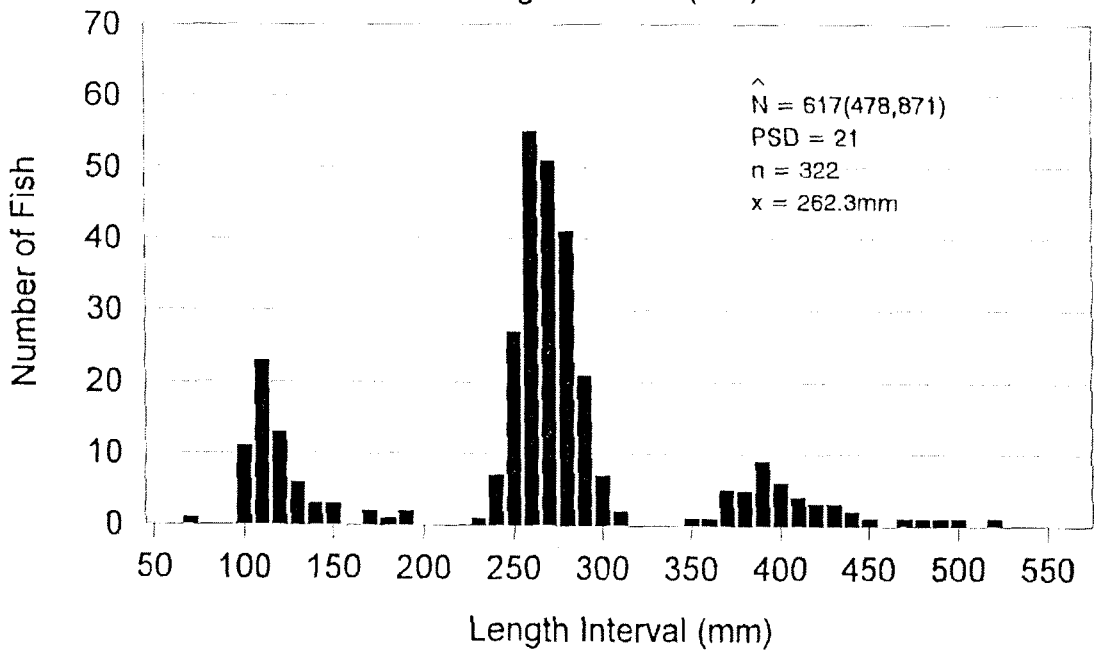


Figure 3. Comparison of length frequency distributions of largemouth bass sampled from Condie Reservoir, Idaho, in 1988 and 1993.

64

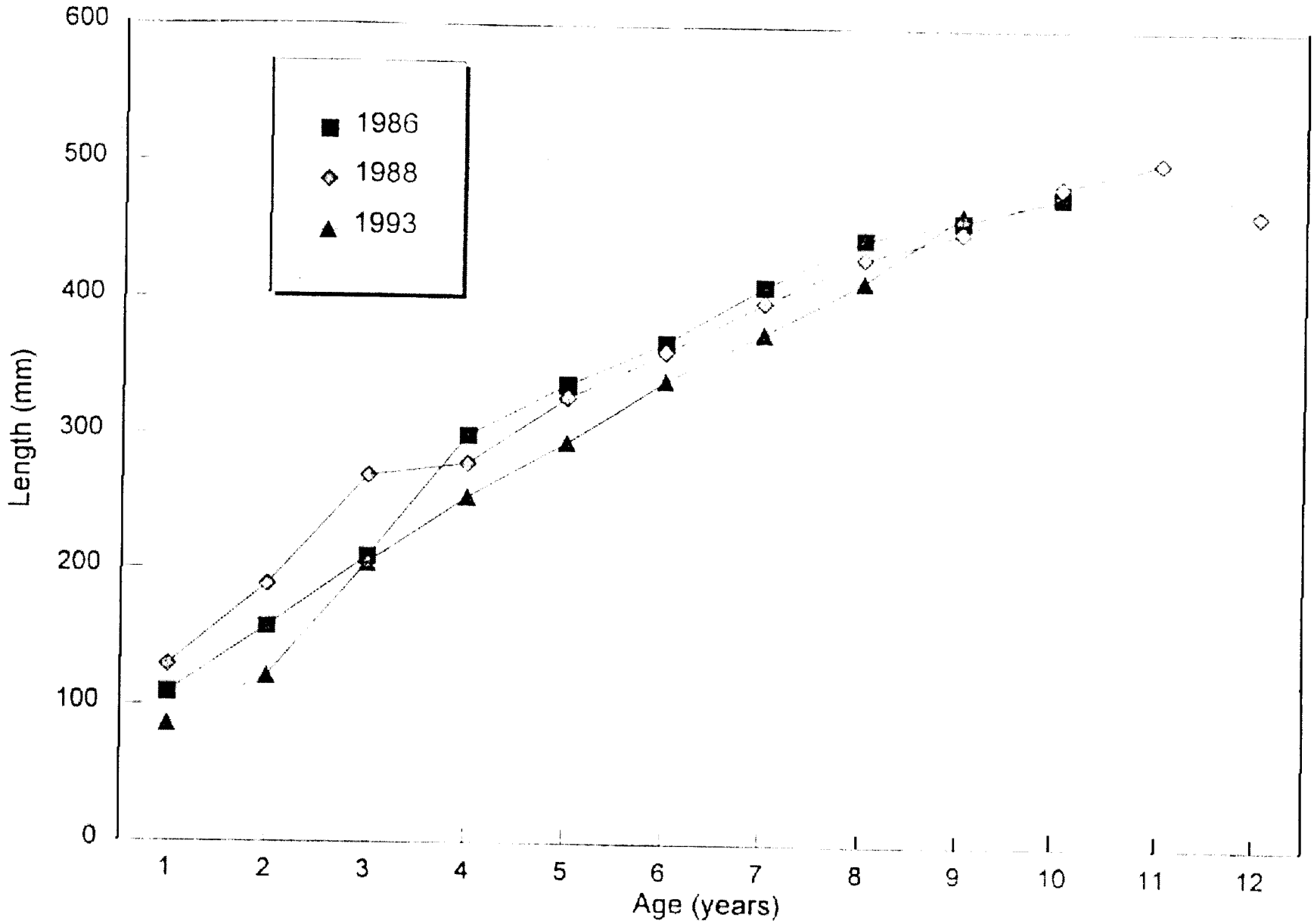


Figure 4. Back-calculated means of largemouth bass lengths at age from Condie Reservoir, Idaho.

65

We collected 32 yellow perch that had a mean length of 197 mm. Yellow perch were illegally introduced into Condie Reservoir sometime during the mid 1980s (Scully et al. 1993). Age-1+ perch in Condie Reservoir in 1993 were larger than those reported by Janssen and Anderson (1994) for Cascade Reservoir, but growth slows for all remaining ages. However, our sample collected by electrofishing may have a positive size bias.

Yellow perch spawn at water temperatures of 7°C to 12°C and largemouth bass spawn at 17°C to 18°C (Scott & Crossman 1973). Young of the year (YOY) yellow perch would be larger than YOY bass and would have competitive advantage over the smaller-sized bass hatching later in the summer. Bass fry would not be able to feed on the larger yellow perch fry. Instead, the fry of both species would feed on the same invertebrate prey base. Competition for food, theorized by Schill and LaBolle (1990) in Lamont Reservoir between Utah sucker and bass, may apply in Condie Reservoir between bass and perch. Replacement of bluegill, which spawn later in the spring than bass, with the less desirable yellow perch may negatively affect growth and survival of young bass.

Recommendations-Continue monitoring largemouth bass in Condie Reservoir with particular emphasis on younger age classes, possibly with fall seining in littoral areas. Sampling should show the effects of slow growth from competition with yellow perch. Attempt to estimate size of the yellow perch population. Determine if the bluegill population is also being negatively affected by yellow perch.

Glendale Reservoir

We collected 40 largemouth bass, 20 hatchery rainbow trout, and 2 bluegill. The largemouth bass averaged 266 mm and had a PSD of 22% (95% CI 7,37) (Gustafson 1988). Of the 40 bass sampled, 39 exceeded 200 mm in length. Lengths of hatchery rainbow trout and bluegill averaged 335 mm and 198 mm, respectively. For comparison, on May 26, 1988, Department personnel collected 222 largemouth bass at Glendale Reservoir using similar techniques. Average sampled length and PSD were 232 mm and 9% (95% CI 5,13), respectively. The 1988 and 1993 PSDs were not significantly different ($\alpha = .05$).

St. Johns Reservoir

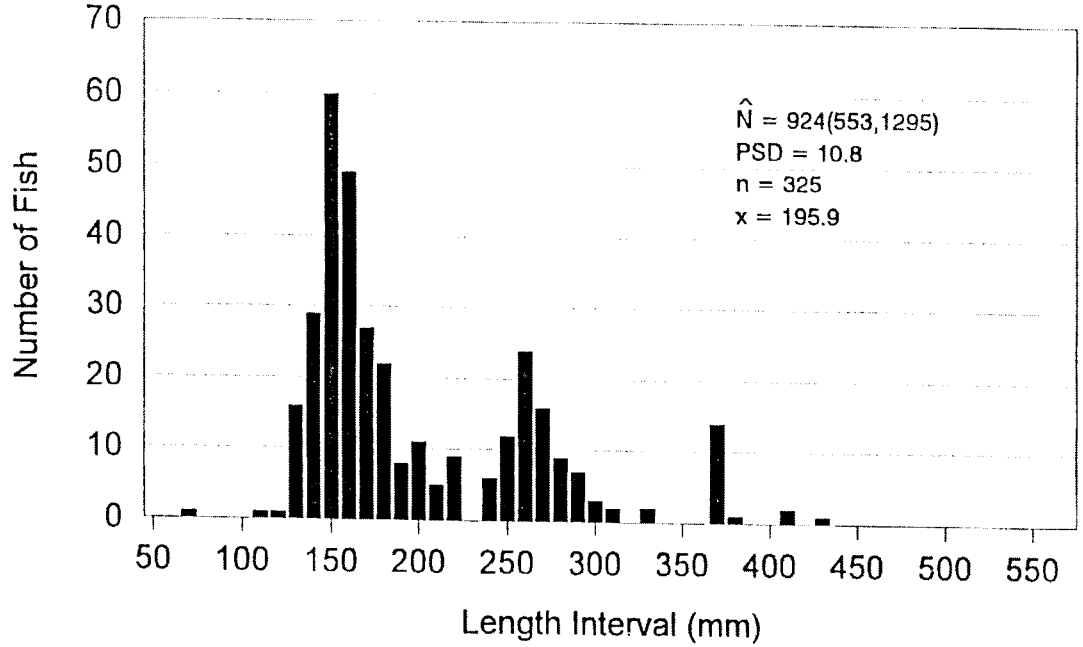
We collected 187 largemouth bass, 208 bluegill, 37 yellow perch, and 20 rainbow trout on May 27, 1993. On June 8, we collected an additional 304 largemouth bass, 149 bluegill, and 60 yellow perch. Of the 491 largemouth bass collected, 191 (39%) were equal to or greater than 200 mm total length. Largemouth bass PSD was 37% (95% CI 29,45) (Gustafson 1988). Of the June 8 catch, 6 bass were recaptures and the estimated population was 448 (95% CI of 324-728) for bass ≥200 mm. Results of scale analysis of largemouth bass, bluegill, and yellow perch are provided in the Appendices.

Similar techniques were used in sampling St. Johns Reservoir in late May/June of 1991. At that time the population estimate was 924 (95% CI of 553-1,295) largemouth bass in the ≥200 mm range. There is little change in the portion of the population in excess of 200 mm total length between 1991 (37%) and 1993 (39%).

The respective length frequencies show few gaps in the age structure (Figure 5). The mean length for all bass collected declined slightly from 196 mm in 1991 to 192 mm in 1993. Conversely, the PSD increased from 11% in 1991 to 37% in 1993. Comparison of the calculated confidence intervals for the respective PSDs (Gustafson Ibid.) showed that they were significantly different at the 95% level. The dramatic increase in the PSD of some 245% may be explained by examining the respective length frequencies. Schill and Heimer (1988) reported average size of 2-year-old bass from five Southeast Region reservoirs to be approximately 162 mm (range 141-182 mm). Two years later, the fish would average approximately 277 mm (range 236-299 mm). The respective length frequencies show that the large group centered at 160 mm in 1991 is seen again in 1993 centered at 280 mm. Additionally there were significant numbers of bass >300 mm in the 1993 sample, whereas there were very few of the larger fish in 1991. Carline (1984) cautions that large fluctuations in PSD may have more to do with changes in recruitment patterns than growth or survival. St. Johns Reservoir is subject to rapid irrigation drawdowns, often during largemouth bass spawning and nest guarding season. The drawdowns may cause bass spawners to abandon nests. Draw down activity along with the relatively short growing season could cause erratic recruitment patterns. Significant drawdowns during the bass spawning season were more likely to occur during the 1987-1992 droughts than during the 1982-1986 period of abundant precipitation.

Recommendations-Continue monitoring largemouth bass in St. Johns Reservoir with particular emphasis on younger age classes, possibly with fall seining in littoral areas. Relative species composition of young fish should show the effects of competition, predation, and spawning conditions.

1991



1993

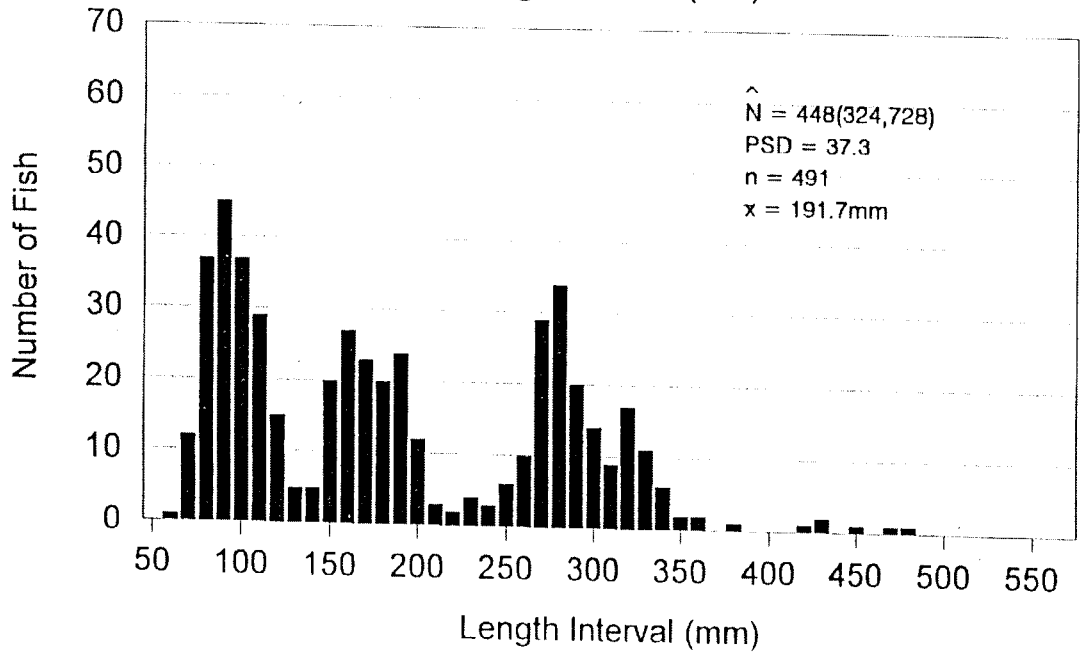


Figure 5. Comparison of length frequency distributions of largemouth bass sampled from St. Johns Reservoir, Idaho, in 1991 and 1993.

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APPENDICES

Appendix A. Estimated mean lengths at age (mm) and average annual growth increments (mm) for largemouth bass from Condie Reservoir, Idaho in 1986, 1988, and 1993.

	Age Class											
Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
_ lengths												
1986	109.3	157.0	209.8	299.0	337.2	368.4	410.9	445.3	459.3	477.0		
1988	129.0	188.0	239.0	278.0	327.0	361.0	398.0	431.0	450.0	485.0	503.0	465.0
1993	85.9	120.6	203.8	253.0	293.7	339.5	375.1	413.6	464.2			
_ growth increments												
1986	109.3	45.9	47.2	49.2	39.6	32.9	42.5	35.7	40.7	18.1		
1988	129.0	59.0	52.0	36.0	31.0	26.0	33.0	22.0	20.0	17.0	22.0	15.0
1993	85.9	34.8	82.6	50.6	49.0	48.0	43.4	32.0	25.8			

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Appendix B. Estimated mean[a] lengths (mm) at age and average annual growth increments (mm) for bluegill from St. Johns Reservoir, Idaho in 1993.

Age			
1	2	3	4
Mean lengths			
68	115	163	175
Mean growth increments			
68	53	54	25

[a] Means are weighted based on the sample size in each year class.
$Y = 20.1778 + 0.8928x$; $R^2 = .9612$

Appendix C. Estimated mean[a] lengths (mm) at age and average annual growth increments (mm) for largemouth bass from St. Johns Reservoir, Idaho in 1993.

Age					
1	2	3	4	5	6
Mean lengths					
81	135	190	266	306	388
Mean growth increments					
81	56	57	75	41	27

[a] Means are weighted based on the sample size in each year class.
$Y = 20.0695 + 1.5398X$; $R^2 = .9576$

Appendix D. Estimated mean[a] lengths (mm) at age and average annual growth increments (mm) for yellow perch from St. Johns Reservoir, Idaho in 1993.

Age			
1	2	3	4
Mean lengths			
75	114	153	204
Mean growth increments			
75	40	40	52

[a] Means are weighted based on the sample size in each year class.
$Y = 32.9143 + 1.1939X$; $R^2 = .969$

JOB PERFORMANCE REPORT

State of:	Idaho	Program:	F-71-R-18
Project I:	Surveys and Inventories	Subproject I-F:	Southeast Region
Job:	c	Title:	Rivers and Streams Investigations
Contract Period:	July 1, 1993 to June 30, 1994		

ABSTRACT

We electrofished several reaches of the Bear River to document species composition and size distribution of game fish. In the reach below Soda Dam, we also compared trout population statistics from before and after initiation of a 150 cfs minimum stream flow in 1991. The percent of rainbow trout *Oncorhynchus mykiss* in sampled populations which had survived at least one winter, increased from 5% in 1990 to 26% in 1993 in the Soda reach. Overall trout density was low in both sample years. A slight increase in minimum flow and slower ramping rates are measures that might increase trout carrying capacity. Brown trout *Salmo trutta* were initially stocked in the Bear River reach below Soda Dam in 1993. The 100 mm fingerlings stocked in June averaged 210 mm by the following October. Mountain whitefish *Prosopium williamsoni* were abundant in the Soda reach.

In the Oneida reach of the Bear River, brown trout fingerlings stocked in June had grown to an average of 230 mm by the following October. Of the brown trout sampled, 38% exceeded 300 mm and 10% exceeded 400 mm. In contrast, we were unable to collect any rainbow trout, even though they had been stocked at catchable size as recently as five months prior to the October sampling. We collected only one wild cutthroat trout *O. clarki*. Most tributaries on this river reach, where spawning should occur, are blocked by irrigation dams.

Bear River sample reaches containing the most cutthroat trout were Pegram and Nounan. Several large tributaries likely provide spawning and juvenile rearing habitat for wild cutthroat trout in the Nounan reach.

Bonneville cutthroat trout *O. clarki utah* parr densities in tributaries of the Thomas Fork of the Bear River have been sampled since 1979. Highest densities occurred from 1985 through 1987, peaking near 18/100 m^2. Samples in 1990, 1991, and 1993 produced a trend of serious decline, with average density in 1993 being only 1.8/100 m^2. Excessive livestock grazing in riparian areas, and decreased water flows during the drought are the likely causes of the decline.

Colorado State University ichthyologists examined specimens of cutthroat trout collected in 1993 from 11 Bear River tributaries. The streams had not been sampled in the past for Bonneville cutthroat trout purity. The researchers concluded that all samples were predominated by a phenotype that exemplifies the native cutthroat trout, and that samples from North Canyon and Pearl creeks were essentially pure Bonneville cutthroat trout.

We collected 713 fish from five sections of Crow Creek in order to determine relative species composition. The results were 10% finespot cutthroat trout *O. clarki ssp.*, 3% brown trout, and 87% sculpins *Cottus sp.*

We collected creel survey data from river and stream anglers at the Inkom Port of Entry check station on Interstate 15. Twenty percent of angling effort was expended on rivers and streams during the weekend. Average catch rate for streams/rivers was 0.4 fish/h, slightly less than the 0.5 fish/h recorded in 1992. The most popular moving-water fisheries were the upper Portneuf River and its larger tributaries. Most harvested fish were hatchery rainbow trout.

In 1993, we sampled substrate sediment at three locations on the upper Portneuf River in order to make comparisons with samples from 1987. No change was detected at two sites, while at the third site percent fines decreased from 58% to 44%. Even at this lowered value, spawning potential for trout would be considered poor due to excessive sediment.

Authors:

Richard Scully
Regional Fisheries Manager

James Mende
Regional Fisheries Biologist

Marc Arms
Fishery Technician

OBJECTIVES

1. Document species composition and sizes of native and introduced game fishes in several reaches of the Bear River.

2. Document the status of Bonneville cutthroat trout populations within both tributaries to the Thomas Fork of the Bear and other tributaries connected to the main stem of the Bear River.

3. Document the status of salmonid populations in Crow Creek, a tributary to the Salt River.

4. Collect angler information over Memorial Day weekend concerning angling pressure and success.

5. Document status of sediment in upper Portneuf River and compare information to data collected immediately following a large depositional event.

INTRODUCTION AND METHODS

Bear River Fish Population Surveys

In October 1993, we sampled Bear River fish populations near Pegram, Nounan, below Soda Dam, and at three locations below Oneida Dam. We also wished to estimate population densities In the tailwater reaches below Soda and Oneida dams. Additionally, in the reach below Soda Dam, we wished to compare fishery status in 1993 with that in 1990, prior to initiation of a 150-cfs minimum flow in 1991.

We electrofished reaches of the Bear River using a drift boat mounted Coffelt Variable Voltage Pulsator powered by a 5 kW generator. We floated through study reaches and collected as many game fish as possible on the first run. The fish were anesthetized with MS-222 (tricaine methanesulfonate) then measured and weighed. A caudal fin tip was removed as a mark, and the fish were returned to the river. One week later, fish were again collected with electrofishing in the same reaches. The number of fish captured in both runs and the ratio of marked to unmarked fish in the second sample were used to estimate population size (Everhart et al. 1975).

Below Soda Dam

During the fall of 1993, the Idaho Department of Fish and Game (Department) conducted a fish population study in the tailwater reach below Soda Dam to document what changes, if any, had taken place in the salmonid populations since the more stable (150 cfs minimum) flows had begun in early 1991. Rainbow trout *Oncorhynchus mykiss* are stocked several times per year near Soda Dam. There is no road access to the Bear River for several miles downstream from the access site. Because of the heavy use by anglers of the area immediately downstream from the dam, we sampled fish at least 1,000 feet downstream of the dam.

Ecosystem Research Institute (ERI) sampling in this lower reach in 1990 demonstrated that less than 5% of the rainbow trout population was comprised of individuals which had survived past the year they were stocked i.e., less than 5% of the trout exceeded 350 mm in length (Figure 1). We attempted to document any changes in the percent of the population that survived at least one winter in the sample reach.

Bonneville Cutthroat Trout

Wallace (1978 and 1980) determined that essentially pure Bonneville cutthroat trout *Oncorhynchus clarki utah* populations, but with a trace of hybrid contamination from other salmonid species, inhabited upper Giraffe, Preuss, and Dry creeks, tributaries to the Thomas Fork of the Bear River in Southeast Idaho. The discovery of Idaho populations followed discovery by Behnke (1979) of Bonneville cutthroat trout within Wyoming's reach of the Thomas Fork system. In 1993, the Department, with assistance from Caribou National Forest personnel, collected trout from 11 streams scattered throughout Idaho's reach of the Bear River drainage. The trout were sent to Colorado State University for meristic analysis to determine their level of purity as Bonneville cutthroat trout.

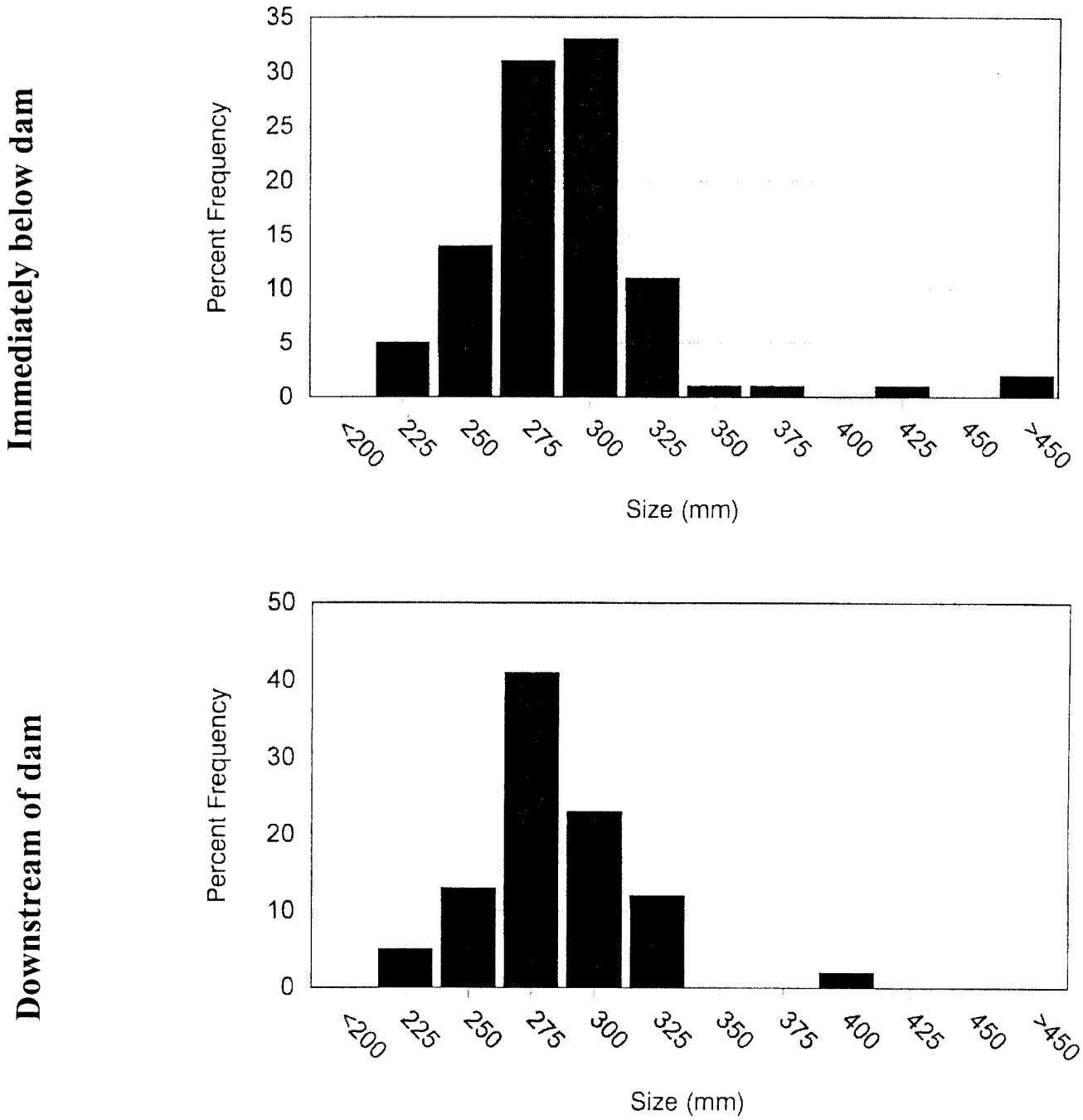

Figure 1. Length frequency distributions of rainbow trout sampled from the Bear River, Idaho immediately below and downstream of the Soda Dam during 1990.

Department personnel have monitored fry (≤75 mm) and parr (>75 mm) densities of Bonneville cutthroat trout in the Thomas Fork tributaries since 1979. In recent years, sampling has been done in alternate years. Cutthroat trout have been collected with backpack shocking units in measured stream sections using either the Seber two-pass removal technique or the Peterson mark and recapture technique (Everhart et al. 1975). After trout from the two consecutive electrofishing passes were counted and measured in a given section, they were released to the stream near the site of capture.

Finespot Cutthroat Trout

Crow Creek, in Caribou County, drains into the Salt River in Wyoming. Along with a few other smaller tributaries (Stump, Tincup, Jackknife, and McCoy creeks), Crow Creek is the only location in the region with a population of finespot cutthroat trout *O. clarki ssp.* We backpack electrofished five sections of upper Crow Creek and one section on the Crow Creek tributary of Deer Creek to estimate salmonid densities. Densities were determined using a multiple pass depletion method. The uppermost section was 300 m above the Crow Creek road on private and ungrazed land. The stream is small at that location, averaging 1.54 m wide.

Opening Weekend Check Station at the Interstate 15 Port-of-Entry

Southeast Region fishery personnel, several reservists, and volunteers operated an angler check station at the Idaho Department of Transportation's northbound Port of Entry along Interstate 15 near Inkom, Idaho during the 3-day Memorial Day holiday weekend. The station was operated from 10 AM until approximately 10 PM. We set up signs along the highway approaching from the south advising anglers to stop at the station, whether they had caught fish or not. The anglers were questioned about where and how long they had fished. They were asked how many fish of each species they had caught, and harvested fish were measured for total length.

Upper Portneuf River - Sediment Status

As recently as the early 1980s, the upper Portneuf River was considered one of Idaho's "blue ribbon" trout streams. Events in 1984 and 1986 resulted in the deposition of vast amounts of sediment in the upper Portneuf River. Scully et al. (1993) describes recent history of upper Portneuf River problems and attempts at restoration. We collected substrate samples using MacNeil cores in late December 1993 to compare substrate conditions with that documented by Mende (1989) in 1987 shortly after the major sediment events occurred. We took the 1993 samples at or near those taken by Mende in 1987.

RESULTS AND DISCUSSION

Bear River Fish Population Surveys

Below Soda Dam

In fall 1993, three growing seasons after implementation of the 150 cfs minimum flow, longterm rainbow trout survival had improved markedly. We caught 70 rainbow trout, ranging from 240 to 510 mm, during the two sampling sessions. Of those caught, 26% were at least 400 mm long (Figure 2). The larger trout would have had to survive at least one winter in the river. This is a substantial improvement in rainbow trout overwinter survival from that estimated in this reach by ERI in 1990.

Despite the increased number of winter survivors, the density of rainbow trout still remains relatively low (Table 1), a problem that could possibly be remedied with an increase in the minimum flow to a level recommended by Tennant's (1975) instream flow criteria. Thirty percent (30%) of average flow is recommended to sustain good survival habitat for most aquatic life forms. Widths, depths, and velocities would generally be satisfactory. The majority of substrate would be covered with water, except for very wide, shallow riffle or shoal areas. Tennant (1975) also displayed in tabular form that a 20% average flow during October through March, followed by 40% average from April through September, also would be considered "good" flows for fish, wildlife, recreation, and related environmental resources. Irrigation releases and spring runoff flows probably already provide the 40% of mean annual flow during the April through September period.

The mean flow at the Alexander Gage, 185 m downstream from the Soda Dam, over the past 82 years is 803 cfs (Brennan et al. 1996). A 150 cfs minimum flow is only 19% of the average. If this flow can be maintained through the non-irrigation months of October through March, it would be below, but very close to, Tennant's lower flow recommendation. Twenty percent of mean annual flow in the Alexander reach would be 161 cfs.

Additionally, at present there are no FERC articles in Bear River hydropower licenses establishing ramping rates. Flows may increase and decrease several hundred percent within short time intervals. This not only causes great disturbance to aquatic plant and animal communities; it is offensive and at times dangerous to the public. Tennant recommends that flow releases to a stream should not exceed a vertical drop of 6 inches in 6 hours (equal to 2 feet in 24 hours). Fluctuations greater than this may significantly degrade aquatic resources (Tennant 1975).

In April 1993, the Department began stocking brown trout *Salmo trutta* fingerlings at 75-100 mm in addition to the catchable size (225-275 mm) rainbow trout in the Bear River reach below Soda Dam. The brown trout introduction provides a more diverse fishery and increases salmonid biomass by utilizing an additional niche. Brown trout also enhance trophy fish potential. By October 1993, the first brown trout cohort had grown to an average size of 210 mm (Figure 3).

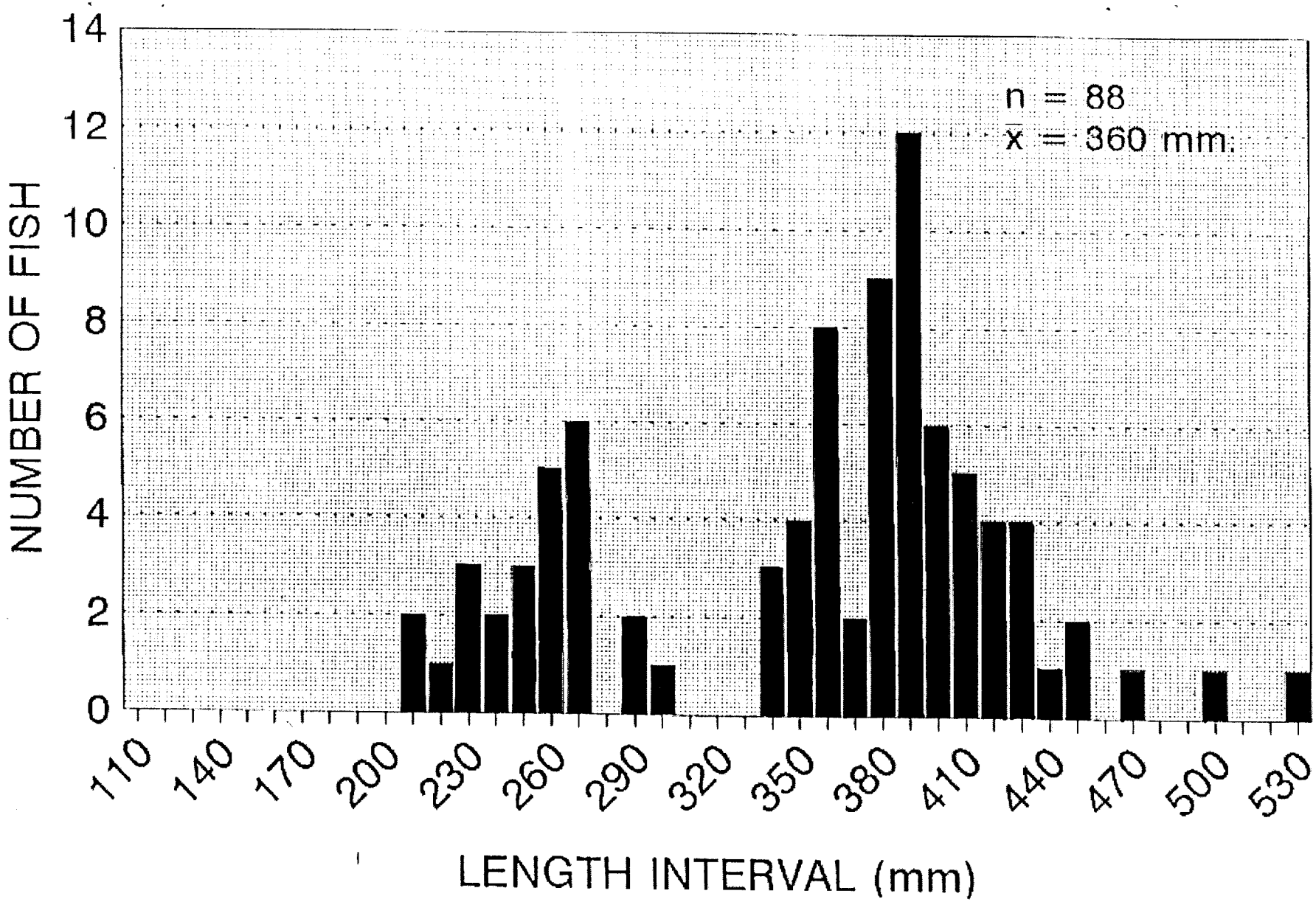

Figure 2. Length frequency distribution of rainbow trout sampled by electrofishing the Bear River, Idaho, at least 1000 feet downstream of the Soda Dam in October, 1993.

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Table 1. Game fish population size and density in the Bear River, Idaho, below Soda Dam based on samples from October 24 and 31, 1993. The reach sampled was 3,466 m long, had an average width of 43 m and a surface area of 149,038 m^2.

Species	Population estimate	95% C. I.	Number/100 m^2
Brown Trout	397	257 to 819	0.27
Rainbow Trout	160	107 to 321	0.11
Mountain Whitefish	341	185 to 2,109	0.23

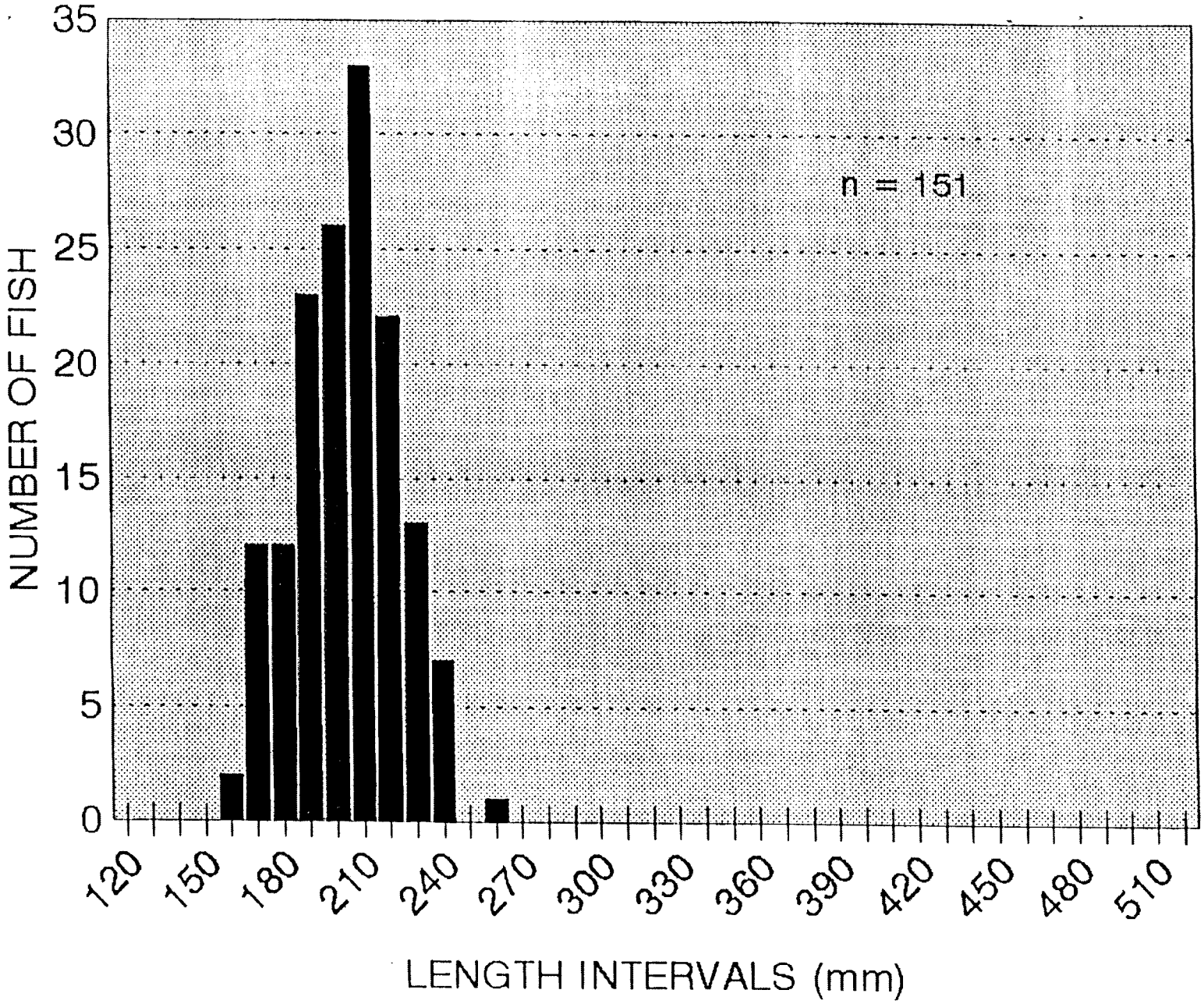

Figure 3. Length frequency distribution of brown trout sampled by electrofishing the Bear River, Idaho, at least 600 feet downstream of the Soda Dam in October, 1993.

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Native mountain whitefish *Prosopium williamsoni* were abundant in the Soda reach of the Bear River. We captured whitefish ranging from 150 to 400 mm in length. An abundance of 150-180 mm whitefish indicates that ample natural reproduction is occurring.

We captured no cutthroat trout, which are the native trout of the Bear River. However, there are no tributaries entering the Bear River between Soda and Last Chance dams and the substrate in the reach is probably not typical of cutthroat trout spawning habitat. Neither of the dams is equipped with fish passage facilities. Additionally, frequent flow fluctuations in the reach created by hydropower management would decrease the chance for trout egg or fry survival.

Below Oneida Dam

On October 16 and 27, 1993, we sampled fish in the Bear River reach below Oneida Dam from the Red Point camping area downstream 1.7 km (Table 2). Mean width of the river at low-flow (about 150 cfs) was 24.7 m, which is 71% of the width measured (34.7 m) during the time interval when flows were increased for power production. Low-flow surface area of the reach was 41,990 m^2.

Annual stocking of brown trout below Oneida Dam began in 1990, although irregular stocking probably occurred in earlier years. Brown trout were stocked in April 1993 at 75-100 mm in length. When sampled in late October, they averaged 230 mm or longer. Brown trout up to 300 mm overlapped with the 1993 cohort size distribution. Some of the larger fish may be part of the 1993 cohort.

No rainbow trout were captured in the October 16 sample. The last time rainbow trout had been stocked in this reach was in May 1993. Five months after stocking catchable size rainbow trout in the reach, few if any remained. This contrasts sharply with the Soda Dam reach where 26% of the sample exceeded 400 mm and would have carried over for one year or more. There is a road along the entire length of the Oneida reach, while access in the Soda reach is by foot along a boulder-strewn riparian corridor. In contrast to the rainbow trout survival in the Oneida reach, enough brown trout survived from year to year such that brown trout three years or older were still present in the population. Of the brown trout sampled in the Oneida reach, 38% exceeded 300 mm and thus had survived in the river for 15 months or more. Additionally, 10% exceeded 400 mm in length.

We captured one cutthroat trout, which measured 470 mm in length. Frequent flow fluctuations in the river, coupled with irrigation diversion dams which block upstream migration on the tributaries, greatly reduced wild cutthroat trout production in the reach. In order to provide a trout fishery, the Department regularly stocks rainbow trout and brown trout. The introduced species compete with native cutthroat trout; rainbow trout may interbreed with them and both, especially brown trout, may prey on cutthroat trout fingerlings. Wild trout will continue to be numerically insignificant in the Oneida reach unless major changes in resource management occur.

Other Bear River Reaches

We sampled four additional reaches to document size and relative composition of game fish species. The reach locations were Pegram upriver from Montpelier towards the Wyoming border, Nounan near

Table 2. Game fish population size and density in the Bear River, Idaho, below Oneida Dam in the Red Point reach of the Oneida Narrows based on samples collected October 16 and 27, 1993. The reach sampled was 1,700 m long, had an average width of 24.7 m, and a surface area of 41,990 m^2.

Species	Population estimate	95% C. I.	Number/100 m^2
Brown Trout	750	407 to 4,764	1.77
Rainbow Trout	NA[a]	NA	NA
Mountain Whitefish	1,112	663 to 3,451	2.65

[a]We captured no rainbow trout on the October 16 mark-run in this reach.

Georgetown, and Station Creek and Riverdale downstream from the Oneida Narrows near Preston. Statistics from the samples and those from the Soda and Oneida reaches are combined in Table 3 for comparison.

The Pegram, Nounan, and Soda reaches had been stocked with 250-300 mm rainbow trout on October 12, a few days before sampling. Rainbow trout in the reaches comprised 15%, 11%, and 41% of the game fish catch, respectively, in electrofishing samples. The Red Point, Station Creek, and Riverdale reaches had not been stocked with rainbow trout since May 10, 1993. Rainbow trout in these reaches comprised 0%, 3%, and 7%, respectively. The Red Point reach, which has the most fishing effort, had the lowest percent of rainbow trout in the October electrofishing sample. Unlike the Soda reach sample, which contained numerous fish that had survived in the river for more than a year, apparently few if any rainbow trout had survived in the Red Point reach for five months. The difference is probably due to the relative degree of difficulty in accessing each of the reaches, and the effect that has on fishing pressure.

Few whitefish were caught in the Riverdale reach. This may be the lower end of whitefish habitat; at least during the time of year samples were taken. During early fall/late summer river velocity decreases, water turbidity increases, and substrate composition is dominated more by sediment.

The reaches with the highest percent of cutthroat trout in the game fish community (8%) were Pegram and Nounan. However, even though sampling effort was similar in the two reaches, many more fish were caught in the Nounan reach lying between Montpelier and Soda Springs. Several creeks enter the Nounan reach, which provide spawning and rearing habitat for wild cutthroat trout. Also, during fall and winter, water in the reach is relatively clear since the entire Bear River is diverted upriver from Montpelier at Stewart Dam. During this time, water in the Nounan reach comes mainly from tributaries and springs. These factors have allowed the wild Bonneville cutthroat trout to maintain a small but viable population in the reach. Angling access in the reach is limited to a road crossing every few miles. Almost all riverbanks in the Nounan reach are privately owned.

Bonneville Cutthroat Trout

Sample sizes were small in the first years of sampling the Thomas Fork tributaries, with one sample taken in Giraffe Creek in 1979 and two samples each taken in Giraffe and Preuss creeks in 1981 (Table 4). Mean densities in the early years of sampling were relatively low, 4.4 and 6.7/100 m^2, in 1979 and 1981, respectively. Parr densities were much higher in 1985, 1986, and 1987 at 26, 18, and 18/100 m^2, respectively. These years followed abundant water years of 1982 through 1984, which could have improved trout survival. Trout density dropped sharply in 1990 and has continued to drop through 1993. Mean parr density in 1991 and 1993 were 2.3 and 1.8/100 m^2, respectively. Fishing was closed throughout the Thomas Fork drainage in both 1992 and 1993 to eliminate angler caused mortality on Bonneville cutthroat trout. Changes in livestock management are planned for 1994 to improve riparian and stream channel habitat.

Bonneville cutthroat trout densities in Stratum B of Preuss Creek remained low, averaging slightly less than in 1991 and were the lowest on record (Table 5) (Figure 4). Density of parr in 1993 was dependent on conditions during 1992 and earlier, which were years of severe drought and intense streambank grazing in the meadow reach. Densities were higher in the more confined and well vegetated Stratum C and D where the density in the four sections sampled averaged 5.8 parr/100 m^2 (Figure 4).

Table 3. Size and relative species composition of game fish from five sample reaches along the Bear River in Idaho. To make the data most comparable between reaches, only data from the first day's sample were used since there was no second-day sample for some reaches.

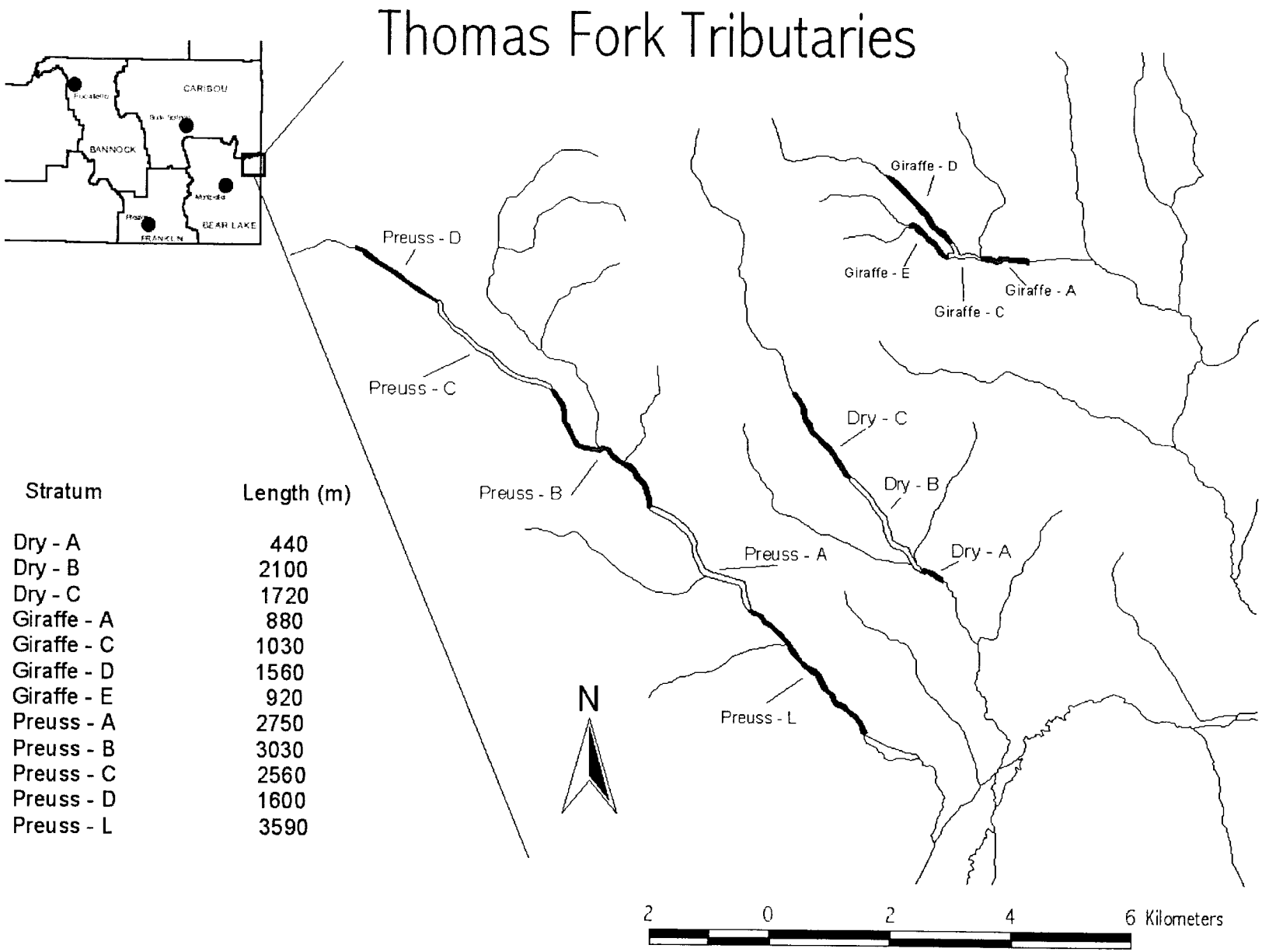
Reach	Species	Sample size and (%)	Mean length (mm)	Mean weight (g)	Length range (mm)
Pegram	Whitefish	19 (73%)	238	129	116 to 346
	Rainbow trout	4 (15%)	316	303	272 to 344
	Brown trout	1 (4%)	485	1,072	NA
	Cutthroat trout	2 (8%)	279	208	236 to 322
	Sub-total:	**26**			
Nounan	Whitefish	117 (73%)	294	345	146 to 440
	Rainbow trout	17 (11%)	286	266	240 to 360
	Brown trout	14 (9%)	264	192	196 to 344
	Cutthroat trout	13 (8%)	320	398	235 to 472
	Sub-total	**161**			
Soda Dam	Whitefish	28 (26%)	273	NA	155 to 405
	Rainbow trout	43 (41%)	349	NA	250 to 515
	Brown trout	35 (33%)	203	103	170 to 245
	Cutthroat trout	0			
	Sub-total	**106**			
Red Point	Whitefish	49 (55%)	326	422	148 to 455
	Rainbow trout	0			
	Brown trout	40 (45%)	309	369	210 to 527
	Cutthroat trout	0			
	Sub-total	**89**			
Station Cr.	Whitefish	28 (70%)	358	585	306 to 455
	Rainbow trout	1 (3%)	390	750	NA
	Brown trout	11 (27%)	245	191	204 to 413
	Cutthroat trout	0			
	Sub-total	**40**			
Riverdale	Whitefish	5 (36%)	366	584	336 to 455
	Rainbow trout	1 (7%)	391	790	NA
	Brown trout	8 (57%)	380	841	235 to 525
	Cutthroat trout	0			
	Sub-total	**14**			

Table 4. Densities (number/100 m^2) of cutthroat trout parr ($\geq$ 76 mm) from the Thomas Fork tributaries of Preuss, Dry and Giraffe creeks, Idaho, from 1979 to 1993.

Year	Mean Density	Individual Sample Densities
1979	4.4	4.4
1981	6.7	4.2, 0.2, 16.3, 6.2
1985	26.1	31.6, 20.5
1986	18.3	15.0, 17.5, 21.4, 19.1
1987	18.1	9.3, 15.7, 7.0, 10.1, 14.2, 32.7, 41.5, 14.4
1989	14.4	2.0, 2.7, 19.0, 33.9
1990	6.0	3.1, 3.5, 6.8, 14.1, 5.5, 4.4, 4.3
1991	2.3	0.6, 0.0, 2.0, 5.8, 0.7, 5.5, 1.7
1993	1.8	1.5, 0.5, 0.0, 9.6, 3.0, 9.5, 1.1, 0.5, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0

Table 5. Densities of Bonneville cutthroat trout parr inside and out of the Stratum B livestock exclosure on Preuss Creek, Idaho, from 1981 through 1993.

Year	Inside Exclosure	Outside Exclosure
1981	16.3	6.2
1985	31.6	20.5
1986	17.5	15.0
1987 [August]	15.7	9.3
1987 [October]	14.2	10.1
1989	2.6	2.0
1990	3.5	3.1
1991	2.0	0.3 (0.6 and 0.0)
1993	1.5	0.3 (0.5 and 0.0)



Stratum	Length (m)
Dry - A	440
Dry - B	2100
Dry - C	1720
Giraffe - A	880
Giraffe - C	1030
Giraffe - D	1560
Giraffe - E	920
Preuss - A	2750
Preuss - B	3030
Preuss - C	2560
Preuss - D	1600
Preuss - L	3590

Figure 4. Map indicating location and lengths of sampling strata within tributaries to the Thomas Fork of the Bear River, Idaho.

Young-of-the-Year (Fry) Trout

We caught no trout fry in any of the Preuss Creek samples, including Stratum D that had produced fry in recent years. We captured one fry (43 mm) in stratum C-section 2 on Dry Creek and six fry in stratum C-section 1 on Giraffe Creek, which averaged 45 mm and ranged from 43-49 mm. It is possible that the August 10-13, 1993 samples were taken before most fry had emerged from their intergravel spawning beds. Snowpack was large during the 1992-93 winter, so spawning may have been late. Also, a prolonged spring snowmelt and increased groundwater flow would have lengthened the egg and alevin incubation periods. Some of our sampling in earlier years was done in September; most if not all fry would have emerged and been available for sampling. The worst case scenario would be that five consecutive years of drought from 1987 through 1992 and the associated increased dependence of riparian areas for livestock grazing had reduced the population of cutthroat trout spawners to critically low levels by the spring of 1993.

Bonneville Cutthroat Trout Outside the Thomas Fork Drainage

Behnke and Proebstal (unpublished report submitted to the Idaho Department of Fish and Game) reported their findings of Bonneville cutthroat trout stock purity from 11 of Idaho's Bear River tributaries, outside the Thomas Fork drainage (Table 6). The authors stated "all the samples were predominated by a phenotype that exemplifies the native cutthroat." They found that North Canyon Creek contained pure or essentially pure native cutthroat trout. Additionally, they stated that Pearl Creek trout might also represent pure native populations. While the remainder of the populations showed slight signs of past influence with non-native trout (either rainbow or Yellowstone cutthroat trout, and possibly Lahontan cutthroat trout in Dairy Creek), they were predominately native cutthroat trout. Population density and habitat status of the newly identified populations are unknown. In 1994, Cache National Forest biologists will collect trout for stock purity analysis in most Bear River tributaries where past analyses have not been done.

Behnke and Proebstal considered the North Canyon, Pearl, and Maple creek samples to be pure or close to pure native cutthroat trout. They stated that the remainder of the populations showed slight signs of past influence with non-native trout, but that they were predominately native cutthroat trout. The authors recommended that efforts be taken to prevent any future introgression with non-native taxa, especially in North Canyon and Pearl creeks.

Finespot Cutthroat Trout

Cutthroat trout were collected in four of the six sections on Crow Creek. Brown trout were captured in the two lowest sections. Of the 713 fish captured in the five sections, 6.7% were cutthroat trout, 3.4% were brown trout, and 89.9% were sculpins *Cottus sp.* Most of the fish were measured both for length and weight. The data, stored in the Southeast Region office, could be used to calculate standing crop. Trout densities in the six sections are displayed in Table 7.

Table 6. Meristic analyses of cutthroat trout from 11 streams in the Bear River basin of Idaho excluding the Thomas Fork.

Creek Name Sample Size	Gill rakers	Lateral line scales	Scales above lateral line	Pyloric caeca	Basi-branchial teeth	Spots on head	Possible hybridization with
North Canyon sample #1, n=10	18-21	165-186	41-42	39-55	0-15 (1 without)	none	none
North Canyon sample #2 n=8	17-21	177-184	42-46	35-50	2-12	none	none
Pearl n=8	18-20	161-183	34-39	41-52	1-15	none	none
Co-op n=5	18-19	165-195	42-44	33-41	6-19	none	greenback cutthroat (very large spots)
Stauffer n=5	17-20	168-195	38-44	N.A.	2-9	a few on 50% of samples	greenback cutthroat (very large spots) rainbow trout (spots on head)
Cottonwood (upper) n=6	18-20	156-184	37-43	34-58	1 of 6 specimens without BB teeth mean=5.0	most with spots on head	rainbow trout (spots on head, wide range of caeca, some without BB teeth) Yellowstone cutthroat (well developed gill rakers)
Cottonwood (lower) n=12	15-19	168-181	38-43	34-66	present on all, mean=3.2	most with spots on head	rainbow trout (spots on head, wide range of caeca, some without BB teeth) Yellowstone cutthroat (well developed gill rakers)
Mink n=2	18-20	159-180	34-41	31-45	0-4 (3 without)	none	Yellowstone cutthroat (larger and more concentrated spots toward the tail, large number of BB teeth)
Cub River n=10	17-20	164-201	37-49	38-53	0-48 (mean-13.3)	40% had some	Yellowstone cutthroat (large number of BB teeth) rainbow trout (spots on head)
Maple n=21	16-21	146-184	30-43	37-55	0-15 (1 without)	1 (of 21) with	none
Dairy n=15	19-22	162-182	36-47	35-51	0-37	some	Yellowstone (all meristics more similar to Yellowstone than Bonneville)
Second n=15	18-20	159-180	34-41	31-45	0-4 (3 without)	half with head spots	rainbow trout (20% w/o BB teeth, half with spots on head)
Logan River n=14	18-20	166-182	37-43	39-58	0-15	none	rainbow trout (large number of caeca, some w/o BB teeth)

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Table 7. Estimated number of trout and densities in five sections of upper Crow Creek and in one section of Deer Creek, tributary to upper Crow Creek, Idaho in 1993.

Section	Mean width (m)	Length (m)	Area (m^2)	Cutthroat Num. Estimate 95% C.I.'s	Brown Num. Estimate 95% C.I.'s	Cutthroat density #/100 m^2	Brown density #/100 m^2
Crow-1	1.54	100.5	154.77	2 [2.0-6.9]	0	1.29	0
Crow-2	2.62	100.3	262.78	0		0	0
Crow-3	3.3	95.7	315.81	15 [14-19.8]	0	4.75	0
Crow-4	3.53	100.7	375.59	0	10 [8.0-20.7]	0	2.66
Crow-5	3.33	112.5	374.71	3 [3.0-8.5]	14 [14.0-16.2]	0.8	3.74
Deer	2.93	113.2	331.68	28 [33.5-26.0]	0	8.4	0

Opening Weekend Check Station at the Interstate 15 Port of Entry

Of the 1,164 anglers surveyed, 269 fished rivers or streams and accounted for 20% of total fishing effort. River and stream anglers had fished 1,119 hours and caught 479 fish for a mean catch rate of 0.43 fish/h. Mean catch rate was slightly less than that of 1992 (0.53 fish/h) and the number of anglers interviewed decreased by 16%. River and stream anglers fished an average of 4.2 h/trip. The total number of different rivers and streams fished by interviewees decreased slightly from 19 to 18.

Trout were the only game fish reported from rivers and streams. The most popular fisheries were Pebble Creek, upper Portneuf River, and Toponce Creek, where 16%, 13%, and 13% of fishing effort occurred. Pebble and Toponce creeks are tributaries of the upper Portneuf River and are located in the Bannock/Caribou County boundary area. The highest trout catch rates were from the upper Portneuf River and Soda Creek at 0.9 and 0.8 fish/h, respectively. Poorest catch rates were from Toponce and Eight-mile creeks at < 0.1 fish/h.

Mean rainbow trout lengths for each water body did not vary widely, ranging from 172 mm at Garden Creek to 297 mm in the upper Portneuf River. Mean trout length was generally between 250 and 300 mm with some carryover trout in the 350-400 mm size range. Most trout observed at the check station were hatchery rainbow trout. Anglers did harvest brown trout from the lower Portneuf and Bear rivers as well as Montpelier Creek. Brook trout were harvested from Eight-mile, Twentyfour Mile, and Garden creeks.

Upper Portneuf River – Sediment Status

Sample collection sites from upriver to downstream are: Utah Bridge (at Croney Road), Slaughterhouse, and Anderson Bridge areas. Three samples were taken at each location. The cores were wet-sieved and the percent weight of fines, ≥6.3 mm diameter, was averaged for the three samples. Little, if any change had occurred between 1987 and 1993 at the Slaughterhouse and Anderson Bridge locations (Table 8). At Utah Bridge, where percent fines were highest in 1987, there appeared to be a decrease in sediment. However, the decrease was only to 44% sediment, which would still be rated as poor for salmonid spawning (Chapman and McLeod 1987).

Table 8. Average percent fine sediment less than 6.3 mm in diameter in McNeil core samples from the upper Portneuf River, Idaho in 1987 and 1993.

Sites	Year	Avg. % fines <6.3 mm
Utah Bridge	1987	57.5%
	1993	43.6%
Slaughterhouse	1987	40.6%
	1993	41.0%
Anderson Bridge	1987	37.2%
	1993	36.9%

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APPENDICES

Appendix A. Bonneville cutthroat trout parr (≥76 mm) statistics from Preuss Creek, Idaho August 10, 1993.

Strata-Section	Mean Width (m)	Mean Length (m)	Surface Area (m^2)	Cutthroat Pop. Est.	95% Conf. Limits	Trout/ 100 m^2
B-Exclos			270.0	4	4.0- 5.6	1.48
B-1	1.97	98.8	194.6	1[a]	NA.	0.52[a]
B-2	2.60	100.2	260.5	0	NA	0.0
C-1	1.38	113.1	156.1	15	15.0-16.25	9.61
C-2	2.51	105.5	264.8	8	8.0-8.0	3.03
D-1	2.33	113.7	264.9	3[a]	NA	1.13[a]
D-2	1.23	94.0	115.6	11	11.0-12.57	9.51

[a]Unable to calculate population estimate. Actual number of fish caught.

Appendix B. Bonneville cutthroat trout parr (≥76 mm) statistics from Giraffe Creek, Idaho August 13, 1993.

Strata-Section	Mean Width (m)	Mean Length (m)	Surface Area (m^2)	Cutthroat Pop. Est.	95% Conf. Limits	Trout/ 100 m^2
C-1	1.73	115.8	200.33	1[a]	NA	0.5
C-2	1.84	100.8	185.47	0	NA	0.0
D-1	1.00	113.1	113.10	0	NA	0.0

[a]Unable to calculate population estimate. Actual number of fish caught

Appendix C. Bonneville cutthroat trout parr (≥76 mm) statistics from Dry Creek, Idaho August 12, 1993.

Strata-Section	Mean Width (m)	Mean Length (m)	Surface Area (m^2)	Cutthroat Pop. Est.	95% Conf. Limits	Trout/ 100 m^2
B-1	3.05	86.0	253.15	0	NA	0
B-2	2.76	94.4	260.54	0	NA	0
C-1	3.46	90.0	311.48	0	NA	0
C-2	2.45	96.4	236.18	0[a]	NA	

[a]One young-of-the-year trout was captured in section C-2.

JOB PERFORMANCE REPORT

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

Project II: Technical Guidance Subproject II-F: Southeast Region

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

ABSTRACT

The Southeast Region received an environmental staff biologist in October 1993. Prior to that time, fishery management personnel processed all fisheries-related, technical issues. We reviewed proposals and provided written and verbal comments on activities affecting fish and anglers. We coordinated with personnel of various agencies on hydropower, mining, road construction, stream alteration, grazing allotments, National Pollution Discharge and Elimination Systems (NPDES) permits, fill/excavation, and other projects. Southeast Region fisheries personnel worked with anglers in the region to improve rapport and open more channels of communication with agencies and the public. These technical assistance activities occupied approximately 25 days of regional fishery personnel time.

We met with the Marsh Center Irrigation Company to discuss the feasibility of increasing the height of the dam at Hawkins Reservoir to increase storage and obtain a minimum conservation pool for fish. We communicated with the Idaho Department of Water Resources, Soil Conservation Service, and U.S. Bureau of Reclamation on this project as well as with the Engineering Bureau of our Department. The Fisheries Chief, Regional Supervisor, and officials of the other agencies met with the irrigation company. Negotiations for this project continued into 1994.

Authors:

Richard J. Scully
Regional Fishery Manager

James Mende
Regional Fishery Biologist

JOB PERFORMANCE REPORT

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

Project III: Habitat Management Subproject III-F: Southeast Region

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

ABSTRACT

In 1994 we signed a contract with landowner Glen Transtrum to fence a reach of St. Charles Creek to prevent impacts to stream and riparian habitat from livestock. Mr. Transtrum initiated fence construction in the fall of 1993. We also met with the Fish Haven Creek irrigators to see if they would help maintain flows in Fish Haven Creek to improve Bear Lake cutthroat trout *Oncorhynchus clarki ssp.* migration, spawning, and rearing. If such assurance could be provided, state and federal agencies would restore lower Fish Haven Creek to eliminate a man-made migration barrier. Additionally, we investigated, with the assistance of a private engineering company, the feasibility of pumping water (rather than diverting) from St. Charles Creek for irrigation as a means to eliminate loss of juvenile cutthroat trout into an irrigation ditch. Additionally, the plan would eliminate the temporary migration barrier formed when St. Charles Creek is dammed for irrigation.

Authors:

Richard Scully
Regional Fisheries Manager

James Mende
Regional Fisheries Biologist

Submitted by:

Richard J. Scully
Regional Fishery Manager

James Mende
Regional Fishery Biologist

Approved by:

Dexter Pitman
Regional Supervisor