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DEPARTMENT OF FISH AND GAME

FEDERAL AID IN SPORT FISH RESTORATION
1999 Annual Performance Report
Program F-71-R-24

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS
UPPER SNAKE REGION (Subprojects I-G, II-G, III-G, IV-G)

PROJECT I.	**SURVEYS AND INVENTORIES**
Job a.	**Upper Snake Region Mountain Lakes Investigations**
Job b.	**Upper Snake Region Lowland Lakes Investigations – Island Park Reservoir, Henrys Lake**
Job c[1].	**Upper Snake Region Rivers and Streams Investigations- South Fork Snake River**
Job c[2].	**Upper Snake Region Rivers and Streams Investigations- Henrys Fork Snake River, Buffalo River, Willow Creek**
PROJECT II.	**TECHNICAL GUIDANCE**
PROJECT III.	**HABITAT MANAGEMENT**
PROJECT IV.	**POPULATION MANAGEMENT**

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SURVEYS AND INVENTORIES – Upper Snake Region – Habitat Management

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-24

Project I: Surveys and Inventories | Subproject I-G: Upper Snake Region

Job: a | Title: Mountain Lakes Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

No mountain lake investigations were conducted during 1999.

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1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-24

Project I: Surveys and Inventories | Subproject I-G: Upper Snake Region

Job: b - Island Park Reservoir, Henrys Lake | Title: Lowland Lakes Investigations

Contract Period: July 1 1999 to June 30 2000

ABSTRACT

Seven net-nights of gill net effort was used to assess species composition, relative abundance and size structure of the fishery in Island Park Reservoir. Catch composition was 62% nongame fish (Utah chub *Gila atraria*, Utah suckers *Catostomus ardens*, and redside shiner *Richardsonius balteatus*). Rainbow trout *Oncorhynchus mykiss* comprised 23% and splake (lake trout *Salvelinus namaycush* x brook trout *S. fontinalis*) 8% of the total catch. Kokanee salmon *O. nerka*, brook trout and mountain whitefish *Prosopium williamsoni* accounted for 7% of the catch.

The 1999 spawning operations at Henrys Lake produced 1,851,400 eyed Yellowstone cutthroat trout *O. clarki bouvieri* eggs and 265,700 eyed Yellowstone cutthroat-rainbow trout hybrid eggs. All hybrid eggs were heat-shocked to produce sterile triploids. Yellowstone cutthroat trout in the Hatchery Creek run averaged 435 mm and hybrid trout averaged 442 mm. No brook trout eggs were taken in 1999. Catch composition in six net-nights of gillnetting at Henrys Lake was 42% cutthroat trout, 29% hybrid trout, 21% brook trout, and 8% Utah chub.

Disease samples were collected from trout ascending the raceway at Hatchery Creek to test for the presence of whirling disease. Pathology tests detected *Myxobolus cerebralis* in 7 of 12 five-fish pools in Henrys Lake cutthroat trout in 1999.

Preliminary genetic analyses of phenotypically identified cutthroat trout sampled throughout the 1999 Henrys Lake hatchery run suggest these fish are not significantly introgressed with rainbow trout. Naturally produced juvenile cutthroat trout from five Henrys Lake tributaries show a range of introgression with rainbow trout. Additional genetic analyses are ongoing.

Estimated total angling effort on Henrys Lake was 228,000 hours in 1999. Total catch rate was 0.65 fish/h. Estimated harvest was 27,355 fish comprised of 22% cutthroat trout, 65% hybrid trout and 13% brook trout. The proportion of brook trout in the harvest was the highest since 1982.

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OBJECTIVE

To obtain current information for fishery management decisions on mountain lakes, including angler use and success, fish population characteristics, spawning potential, stocking success, limnology, morphology, and notes on other aquatic life and develop appropriate management recommendations.

METHODS

Island Park Reservoir

Lowland Lake Survey

Since the 1992 drawdown and renovation of Island Park Reservoir, annual standardized gillnetting has been used to monitor species composition, relative abundance, and size structure of the fishery. On May 21-22, 1999, four sinking and three floating experimental gill nets (seven net-nights) were fished at standardized locations. Set and pull times were recorded for each net, and all captured fish were identified, enumerated, and measured. Relative abundance data were compiled and compared to data from 1993-1998.

Henrys Lake

Spawning Operation

The Hatchery Creek fish ladder was opened on March 5 and remained in operation until May 10. Fish ascending the ladder were identified as cutthroat trout *Oncorhynchus clarki* or hybrid trout *O. mykiss* and enumerated. A sub-sample of approximately 10% of each group was measured (fork length). Hybrid trout were produced with cutthroat trout eggs and Kamloops rainbow trout sperm obtained from Hayspur Hatchery. Cutthroat trout males and females were spawned to produce cutthroat trout for supplemental stocking in Henrys Lake and other Idaho fisheries. No brook trout *Salvelinus fontinalis* eggs were taken from Henrys Lake during 1999.

All hybrid trout eggs produced in 1999 were subjected to heat-shock to induce triploidy. Cutthroat trout eggs (seven-female pools) were fertilized with Hayspur Kamloops sperm (five-male pools). Ten minutes after fertilization, eggs were poured into Heath trays and immersed in a 27°C circulating water bath for 20 minutes. Eye-up rates were monitored and compared to previous years hybrid eggs not subjected to heat shocks. Four lots of eyed hybrid eggs were shipped to Mackay Hatchery for hatch and rearing, where they were combined into three raceways. In August, research personnel took blood samples from 25 to 32 fish in each of the three rearing lots, and had the samples analyzed for ploidy level.

Disease samples were taken from the cutthroat trout spawning run. Ovarian fluids were collected from cutthroat trout (seven-fish pooled samples) during spawning at Henrys Lake Hatchery. Twelve five-fish pools were also sacrificed for whirling disease sampling. All samples were sent to the Eagle Laboratory for analysis.

Genetic Analysis

We continued a genetic inventory of the Henrys Lake cutthroat trout population. In 1999, a total of 60 phenotypic cutthroat trout were sampled at the hatchery ladder throughout the spawning run. Fin clips (for mitochondrial and nuclear DNA analysis) and tissue samples (for protein electrophoresis) were collected from each fish. In each of six tributaries (Howard, Targhee, Wild Rose, Timber, Duck, and Hope creeks) young of the year (YOY) and juvenile trout were collected randomly with a combination of fry traps, dip nets and backpack electrofishing gear. Fin clips or whole fry were taken and preserved in lysis buffer for DNA analyses. Sample preparation and analysis is being completed by staff at the University of Idaho Aquaculture Experiment Station (AES). At the time of this writing, the analyses are incomplete and we present only preliminary results below.

Gillnetting

As part of routine population monitoring on Henrys Lake, gill net samples were collected from six standardized locations (total six net-nights; May 24-25). Nets were set at dusk and retrieved the following morning. Set and pull times were recorded and captured fish were identified to species and measured (total length).

Creel Survey

Henrys Lake Hatchery personnel conducted a randomized structured creel survey throughout the fishing season (Labor day weekend through the end of October) to estimate angler use and harvest on the lake. Survey structure followed that of previous creel censuses on Henrys Lake, and consisted of seven strata (based on previous years effort), secondarily stratified into weekdays and weekends (60% of sampling effort occurring on weekdays, 40% weekends). Creel surveys began at randomly chosen start times and lasted six hours. Approximately 45 interviews were conducted during each survey period, and included anglers utilizing different methods (boat, bank, or float tube). Effort estimates were gathered from two instantaneous counts spaced six hours apart. Initial start times for these counts were randomly chosen, with the second count occurring six hours later. Counts were conducted with a spotting scope and a high vantage point in combination with a boat driven around the lake. During inclement weather, counts were conducted from a car driven around the lake. Along with gathering effort information, creel clerks conducted interviews and identified, measured and recorded fin clips on all fish observed in the creel. We entered and analyzed data using Idaho Department of Fish and Game (Department) creel census program (IDFG 1993).

RESULTS AND DISCUSSION

Island Park Reservoir

Lowland Lake Survey

A total of 863 fish were captured with a combined gillnetting effort of 130.25 hours (Table 1). Catch composition included nine species. Game fish (trout *Oncorhynchus spp*., char *Salvelinus spp*., mountain whitefish *Prosopium williamsoni*, and kokanee salmon *O. nerka*) comprised 38% of the total catch, compared to 20% in May 1998 samples. Utah chub *Gila atraria*, Utah sucker *Catostomus ardens*, and redside shiners *Richardsonius balteatus* comprised 62% of the catch, compared to 80% in 1998. Hatchery and wild rainbow trout *O. mykiss* comprised almost 23% of the catch compared to only 14% in 1998 samples. A total of 69 splake *Salvelinus fontinalis x S. namaycush* were sampled, 63 of which were from the previous week's stocking at McCrea's Bridge.

Henrys Lake

Spawning Operation

A total of 4,894 cutthroat trout ascended the spawning ladder between March 5 and May 10, with 2,749 males and 2,145 females. Hybrid trout totaled 1,734 fish, with 653 males and 1,081 females. Mean length for male and female cutthroat trout was 440 and 426 mm, respectively (Figure 1). Combined average cutthroat trout length was 435 mm. Hybrid trout males and females averaged 456 and 432 mm (Figure 2). Combined average hybrid trout length was 442 mm.

Cutthroat green eggs totaled 2,817,968 from 1,162 females for an average fecundity of 2,430 eggs per female. Eyed cutthroat eggs totaled 1,851,400 for an overall eye-up rate of 66%.

Hybrid trout green eggs (all heat-shocked) totaled 616,000 from 280 cutthroat trout females for an average fecundity of 2,526 eggs per female. Eyed hybrid trout eggs totaled 265,700 for an overall eye-up rate of 43%.

Cutthroat trout ovarian fluid disease samples showed no viral pathogens, and a low level of potential bacterial pathogens. Seven of 12 five-fish pools sampled from the ladder tested positive for *Myxobolus cerebralis*, the causative agent for whirling disease.

After several years of experimentation, 1999 was the first year fisheries staff attempted to induce triploidy in all Henrys Lake hybrid trout. Overall eye-up rate was poor (43%) and about 25% lower than typical for untreated hybrid trout eggs. Estimated overall triploidy induction rate was 74%.

Table 1. Gill net catch composition in Island Park Reservoir, Idaho, May 1999.

Location	Soak time (hrs)	Catch Composition								
		Utah chub	Rainbow trout	Brook trout	Kokanee salmon	Mountain whitefish	Utah sucker	Redside shiner	Splake	Total
Brush Pile	22.00	73	47	5	16	0	0	0	21	165
Bill's Island	20.75	97	43	1	23	0	15	4	12	195
Mill Creek	20.00	14	31	1	0	0	3	0	30	79
Trudes Bay	15.75	51	17	0	0	0	4	0	2	75
Goose Island	16.50	24	13	0	2	0	4	0	1	46
Goose Box #25	17.25	107	30	0	1	1	3	5	3	150
Goose Box #56	18.00	129	15	1	1	2	4	1	0	153
Total	130.25	495	196	8	43	3	33	10	69	863
%	-	57	23	1	5	1	4	1	8	-

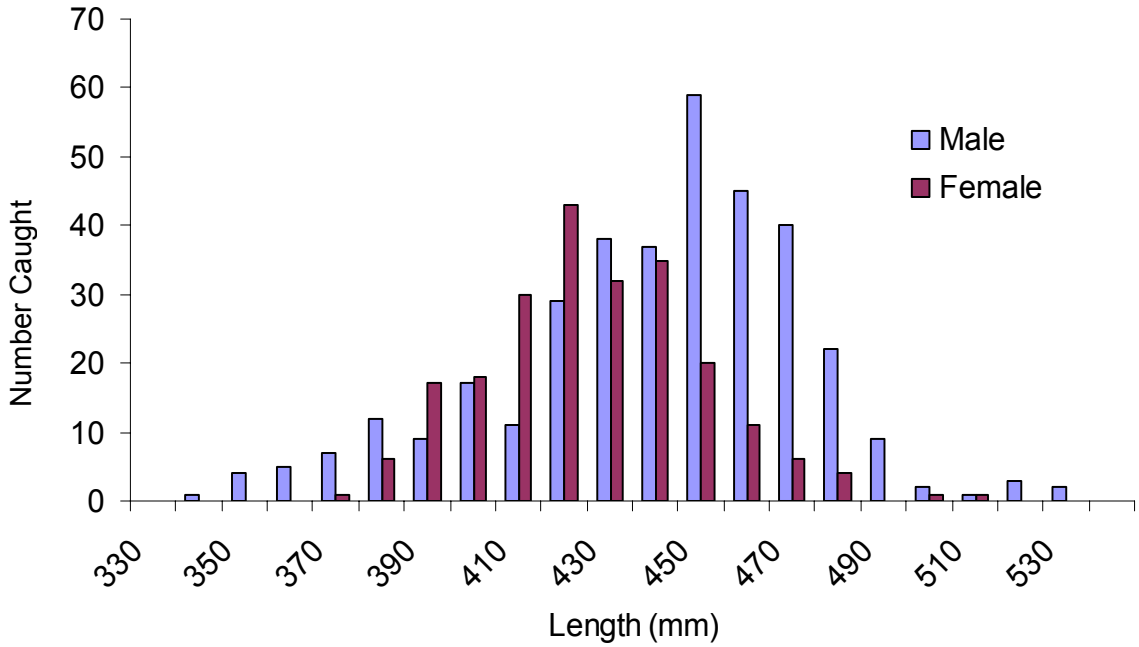

Figure 1. Length frequency of cutthroat trout (male and female, fork length) captured in the spring spawning run on Hatchery Creek, Henrys Lake, Idaho, 1999.

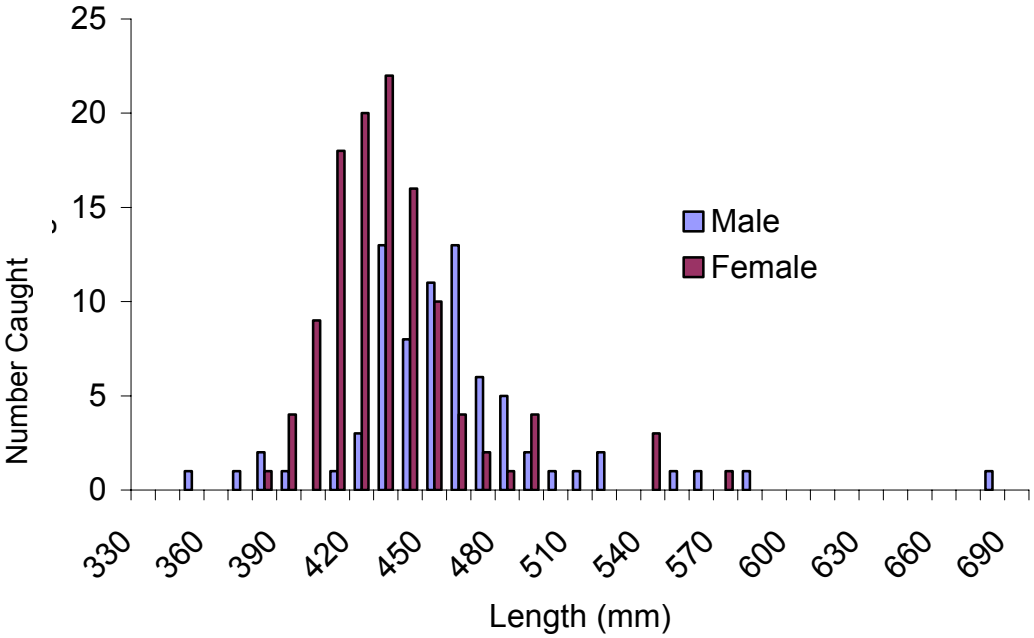

Figure 2. Length frequency of hybrid trout (male and female, fork length) captured in the spring spawning run on Hatchery Creek, Henrys Lake, Idaho, 1999

Poor eye-up and triploidy induction rates could be related to egg quality or the heat-shock protocol. Cutthroat trout eggs used for hybrid production are typically the first eggs taken at the hatchery ladder. It is likely that some of the cutthroat trout were not completely ripe when spawned. This same heat-shock procedure produced 97% triploidy in experimental lots. We suggest that in 2000, hybrid production should be moved back to the second or third week of the spawning operation to insure better egg quality. The same heat-shock treatment should be used as that done in 1999. If triploidy rates do not improve with adjustments in egg-take time, further experimentation with different heat shock treatments may be necessary.

Genetic Analysis

Preliminary results of 1998 genetic analyses suggested the phenotypic cutthroat trout in the hatchery run are in fact likely all introgressed at some level with rainbow trout. However, the 1998 samples were all taken on April 23, and were not representative of the cutthroat trout run as a whole. From March 23 to May 6 1999, a total of 60 phenotypic cutthroat trout were sampled at the hatchery ladder. To date, AES staff has analyzed two nuclear loci (Rag3' and Ikaros), one mitochondrial locus (ND2-Rsa-I), and one protein locus (malic enzyme) from these samples. No rainbow trout genes were detected in this sample. These results should be considered tentative, however. Previous work by AES staff showed considerable disagreement between protein and nuclear DNA results for the same fish. We intend to corroborate these results where possible, by re-analyzing these same fish samples at other reputable genetics laboratories.

In all six Henrys Lake tributaries, the nuclear and mitochondrial DNA techniques did detect varying levels of introgression (Table 2). Again, these data should be considered preliminary until more complete genetic analyses are obtained.

Gillnetting

A total of 63 fish were collected in six net-nights. Catch composition was 41% cutthroat trout, 28% hybrid trout, 21% brook trout, and 8% Utah chub. Cutthroat trout ranged from 170 to 475 mm total length, hybrids 165 to 495 mm, and brook trout 170 to 440 mm. Brook trout contribution to gill net catches has increased from 3% in 1995, but was similar to 1998 sampling (20%).

Although the total gill net sample size was relatively small (n = 63), the 8% contribution of Utah chub is the highest recorded since they were first documented in Henrys Lake in 1993. Additional gillnetting effort in more locations will be required to effectively monitor Utah chub abundance.

Creel Survey

Anglers fished an estimated 228,293 hours on Henrys Lake in 1999 (Table 3). Mean season catch rate was 0.65 fish/h. An estimated 27,355 fish were harvested, with harvest

Table 2. Summary of preliminary genetic analyses of Henrys Lake fish sampled from the hatchery ladder and from tributaries of Henrys Lake, Idaho in 1999.

Location	Sample size	Fish size	Tissue sampled	Type of Analyses[a]	Percent of individuals identified as hybrids
Hatchery ladder	60	adult	fins, eye, liver, muscle, heart	nDNA mDNA	0%
Duck Creek	44	fry	whole fish	nDNA mDNA	4%
Howard Creek	42	fry	whole fish	nDNA mDNA	14%
Targhee Creek	48	fry	whole fish	nDNA mDNA	25%
Hope Creek	9	sub-adult	fins	nDNA mDNA	40%
Timber Creek	21	4 fry 17 sub-adult	whole fish fins	nDNA mDNA	fry 0% sub-adults 59%
Wild Rose Creek	32	8 fry 24 sub-adults	whole fish fins	nDNA mDNA	fry 12% sub-adults 100%

[a] completed in time for inclusion in this report; additional analyses ongoing

Table 3. Summary data for the 1999 creel census on Henrys Lake.

Total angling effort (hrs)	Effort and Catch			% Released
	Harvest	Harvest rate (fish/h)	Catch rate (fish/h)	
228,293	27,355	0.12	0.65	72%

	Cutthroat trout	Hybrid trout	Brook trout	Total
Harvest composition	22%	65%	13%	100%
Mean size (mm)	440	442	400	--
% > 500 mm (> 450 mm for BKT)	8	12	18	--
Total harvest	5,691	17,191	3,459	26,341

comprised of 22% cutthroat trout, 65% hybrid trout, and 13% brook trout. Mean size in the harvest was 439 mm, 442 mm, and 401 mm, respectively. Brook trout contribution to the harvest was the highest recorded since 1982.

Although the proportion of the harvest provided by cutthroat trout (22%) is the lowest ever recorded for Henrys Lake, this probably does not represent a shift in overall species composition in the lake population. Since initiation of genetics testing at the ladder and in tributaries, hatchery and management personnel have been made aware of introgression in otherwise phenotypic cutthroat trout. Consequently, staff were much more conservative in identifying cutthroat trout in both the spawning run and the creel survey in 1999 than in previous years. As a result, estimated contribution of cutthroat trout to both has declined markedly since 1997. We believe this reflects a change in identification criteria rather than a change in the lake population.

RECOMMENDATIONS

Island Park Reservoir

1. Continue spring gill net surveys to monitor changes in species composition.

2. Continue spot creel checks to monitor catch composition, size of catch and catch rates.

3. Assess zooplankton size structure as an index of forage availability for game fish.

Henrys Lake

1. Continue annual standard gill net surveys to describe population trends.

2. Continue to evaluate sterile hybrid production and stocking program; develop evaluation plans to assess triploid hybrid trout performance in Henrys Lake.

3. Continue genetic assessment of Yellowstone cutthroat trout in the hatchery run and in tributaries.

4. Continue assessments of natural recruitment from key tributaries; begin fry trapping by June 1.

LITERATURE CITED

Idaho Department of Fish and Game, 1993. Statewide angler opinion and harvest surveys. Creel Census System. Job completion report, Project F-73-R-15. Subproject I, Study I.

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-24

Project I: Surveys and Inventories

Subproject I-G: Upper Snake Region

Job: c^2 - Henrys Fork Snake River, Buffalo River, Willow Creek drainage

Title: Rivers and Streams Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

An electrofishing survey on the Box Canyon section of the Henrys Fork provided a population estimated of 4,807 wild rainbow trout *Oncorhynchus mykiss* over 150 mm in length. RSD-Q (406 mm) was 15%, slightly higher than estimates for 1997 and 1998.

Electrofishing samples in the Henrys Fork below St. Anthony were 8% wild rainbow trout, 6% brown trout *Salmo trutta*, and 58% mountain whitefish *Prosopium williamsoni*. Nongame fish comprised 30% of the total catch. Rainbow trout ranged in size from 160 to 530 mm, and brown trout from 180 to 470 mm.

Henrys Fork Foundation staff conducted a creel survey on the upper Henrys Fork. Anglers fished an estimated 17,575 hours from the confluence of Big Springs and Henrys Lake Outlet to Coffee Pot Rapids. They caught an estimated 23,770 fish and harvested 3,370. Release rates averaged 86%. Based on fish identified in the creel, the estimated harvest of hatchery catchable rainbow trout was 814, a 6% return to creel. Including fish caught and released, angler utilization of hatchery rainbow trout likely approached 40%. These estimates are likely biased by incorrect classification of hatchery and wild rainbow trout by creel clerks.

An estimated 56 rainbow trout including 27 adult spawners >406 mm ascended the Buffalo River fish ladder from February 1 to April 3. This compares to 252 total fish and 38 adult spawners >406 mm over the same time period in 1998. Attempts to estimate total emigration of juvenile rainbow trout into Box Canyon were unsuccessful.

Efforts to monitor Yellowstone cutthroat trout *O. clarki bouvieri* populations in the Willow Creek drainage continued in 1999. Three tributaries and one mainstem site were sampled, for a total of nine sites in the last two years. In eight of nine sites, Yellowstone cutthroat trout densities were substantially lower than in the early 1980s.

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OBJECTIVES

To obtain current information for fishery management decisions on rivers and streams, including angler use and success, harvest and opinions, fish population characteristics, spawning success, habitat characteristics, return-to-the-creel for hatchery trout, and to develop appropriate management recommendations.

1. Estimate abundance and size structure of wild rainbow trout *Oncorhynchus mykiss* >150 mm in the Box Canyon Reach of the Henrys Fork.

2. Monitor use of the Buffalo River fish ladder by spawning rainbow trout from Box Canyon.

3. Assess fish populations in the lower Henrys Fork below St. Anthony.

4. Monitor Yellowstone cutthroat trout *O. clarki bouvieri* populations in the Willow Creek drainage.

METHODS

Henrys Fork Snake River

Box Canyon Population Estimate

Fisheries personnel electrofished Box Canyon on May 19-20 (marking event) and May 27, 1999 (recapture event). Two drift boat electrofishers made a total of nine passes during the marking event. All captured fish were identified, measured and given a lower caudal fin punch. Four passes were made during the recapture event. Mark-recapture data were analyzed with MR5 software.

St. Anthony to Parker Bridge

The lower Henrys Fork has become an increasingly popular fishery in the last ten years. Since 1997, fish population data has been collected on river sections above and immediately below Ashton Reservoir, but no recent data are available for the section below St. Anthony. To describe species composition and size structure, fisheries personnel made one electrofishing pass from the railroad bridge below St. Anthony to the Parker Bridge on July 16, 1999. All fish sampled were identified as to species and measured (total length).

Upper Henrys Fork Creel Survey

From May 29 to September 29, 1999. Henrys Fork Foundation personnel conducted a structured randomized creel survey designed by Department personnel. The sample section stretched from the confluence of Big Springs and Henrys Lake outlet downstream to the lower

end of Coffee Pot Rapids. The reach was divided into two sections: above the Mack's Inn bridge (Section 1) and below this bridge (Section 2). Creel clerks did angler counts by floating through each section.

Counts at Coffee Pot Rapids were done from the bank. Angler interview data were collected during or after counts. Creel clerks were instructed to identify and measure all harvested fish. Angler count and interview data were analyzed by Department personnel using the Department's creel census program.

Buffalo River

Fish Ladder and Smolt Traps

Video monitoring of fish ascending the Buffalo River fish ladder followed the sampling protocol developed by Henrys Fork Foundation (HFF) staff. In 1999, the video monitor was in operation from February 1 to April 3, 1999. This timeframe was shorter than was used in 1998 (January 1 to April 23). Sizes of observed fish were recorded and estimates of abundance partitioned into total fish and fish $\geq$406 mm (adult spawners).

On May 14 a rotating screw trap (smolt trap) was installed to sample and enumerate rainbow trout produced in the Buffalo River that were migrating back to Box Canyon. The trap was located approximately 0.5 km above the dam and hydroelectric plant. To maximize trapping efficiency we positioned the trap in the thalweg and used a pulley system to adjust positioning. On June 21, HFF personnel installed an additional trap on the Buffalo River dam spillway. This trap was essentially a flume constructed with perforated sheet metal that captured approximately 20% of the spillway flow and shunted fish into a downstream trap box. Both the screw trap and spillway trap were operated through January 2000. Trapping and data collection were coordinated with HFF staff. Captured fish were processed 2-3 days per week. All fish were identified to species, checked for fin clips, enumerated and measured. Salmonid fry (<40 mm) were released below the traps. To calculate sampling efficiencies and estimate total outmigration, all salmonids >40 mm were adipose-clipped, transported upstream approximately 1.5 km to the Highway 20 bridge and released. Recaptured fish were counted on each day.

Data were summarized by time period (May 14 to June 20; June 21 to January 30) and trap type. Trapping efficiency was compared between trap types for the period when both were operating. To compare screw trap efficiency and outmigration estimates to previous years, screw trap data were summarized for the May 14 to October 30 period.

Willow Creek Drainage

Fish populations in the Willow Creek drainage have not been assessed on a broad scale since the early 1980s. Moore et al. (1983) and Corsi (1986) surveyed over 30 individual stream sections in 12 tributaries, the mainstem Willow Creek and the mainstem Grays Lake outlet. In 19 sites, they used multiple-pass depletion methods to estimate abundance and density of Yellowstone cutthroat trout, and also characterized species composition and habitat conditions at some sites.

In 1998, fisheries staff began re-surveying these established sample sites throughout the drainage, completing surveys on five tributary sites. Surveys continued in 1999 on three tributaries (Homer Creek, Sawmill Creek, and Grays Lake Outlet) and one mainstem Willow Creek site (below High Bridge). At each site backpack electrofishing gear was used to complete three-pass depletion estimates of fish abundance and species composition. Results were compared to previous estimates (Moore et al. 1983; Corsi 1986).

RESULTS AND DISCUSSION

Henrys Fork Snake River

Box Canyon Population Estimate

A total of 913 wild rainbow trout >152 mm were sampled in marking and recapture runs combined. Other fish sampled included brook trout *Salvelinus fontinalis* (n = 3), hatchery rainbow trout (n = 47), and rainbow x cutthroat trout hybrids *O. mykiss x O. clarki* (n = 6). Based on species, fin clips, and fin erosion patterns, less than 7% of the total catch were emigrants from Island Park Reservoir.

Wild rainbow trout sampled in this reach ranged in size from 80 to 573 mm (Figure 1). Estimated abundance of wild rainbow trout >152 mm was 4,807 fish using the modified Peterson method and 5,110 fish using the log-likelihood method (Table 1). These estimates are 27% and 40% lower, respectively, than 1998 estimates. Using the modified Peterson estimates this equates to about 2,003 fish per river mile. Quality stock density (RSD-Q; ≥ 406 mm TL) was 15%, a slight increase from 1998.

St. Anthony to Parker Bridge

The single electrofishing pass conducted on the St. Anthony reach resulted in the capture of 607 fish. Species composition included mountain whitefish *Prosopium williamsoni* (58%); Utah sucker *Catostomus ardens* (26%), wild rainbow trout (8%), and brown trout *Salmo trutta* (6%). Utah chub *Gila atraria*, redside shiner *Richardsonius balteatus*, and dace *Rhinichthys spp*. comprised 4% of the total catch. Rainbow trout (n=46) ranged in length from 160 to 530 mm, and brown trout (n=34) from 180 to 470 mm.

Upper Henrys Fork Creel Survey

Henrys Fork Foundation creel clerks interviewed a total of 258 anglers over the course of the survey; 142 above the Mack's Inn bridge and 116 below. Over 60% of the anglers interviewed were nonresidents (Table 2). Anglers fished an estimated 9,264 h in Section 1 and 8,311 h in Section 2. Catch rates and total harvest were similar between sections. Hatchery rainbow trout comprised 21-25% of the harvest. Wild rainbow trout comprised 50% of the harvest above the bridge and 15% below. Brook trout comprised 18% of the harvest above the

bridge and 49% below. An estimated total of 814 hatchery rainbow trout were harvested out of 13,280 stocked, or about a 6% return to creel. However, release rates in both sections were high (84 and 88%), suggesting that up to 4,600 additional hatchery trout were likely caught and released. This equates to 40% utilization of hatchery fish.

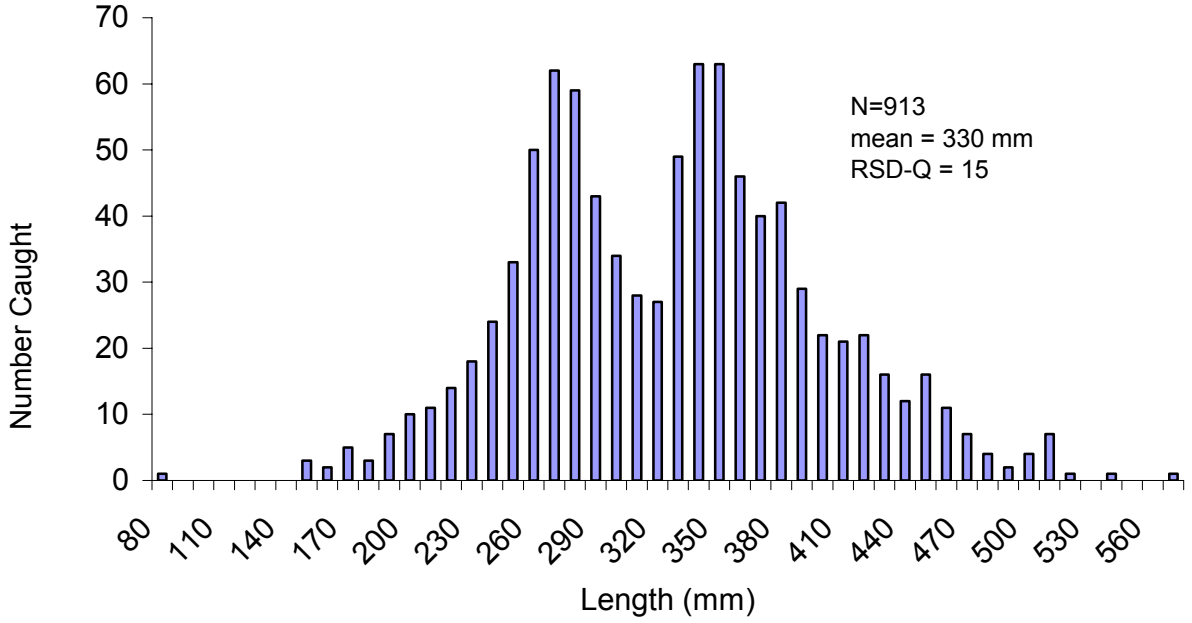

Figure 1. Length frequency distribution for rainbow trout collected electrofishing in Box Canyon, Henrys Fork of the Snake River, Idaho, 1999.

Table 1. Estimated abundance of wild rainbow trout (>150 mm) in the Box Canyon section, Henrys Fork Snake River, Idaho, 1993-1999.

Season/Year	Modified Peterson method (MPM)	Log-likelihood method (LLM)	# / River mile by MPM (LLM)	#/Reach MPM (LLM)	RSD-Q (406 mm)
Fall 1993	~10,000		~4,200	11,800	NA
Spring 1994	7,234	9,359	3,014 (3,900)	8,489 (10,920)	39
Spring 1995	6,080	5,904	2,533 (2,460)	7,092 (6,888)	28
Spring 1996	3,390	4,210	1,413 (1,754)	3,965 (4,911)	19
Spring 1997	5,302	5,278	2,209 (2,199)	6,185 (6,157)	13
Spring 1998	6,619	8,527	2,758 (3,553)	7,722 (9,948)	12
Spring 1999	4,807	5,110	2,003 (2,129)	5,608 (5,961)	15

Table 2. Summary of creel survey data on the Upper Henrys Fork, Idaho, May 29 to September 29, 1999. Section 1 is from the confluence of Big Springs and Henrys Lake outlet downstream to the Mack's Inn (Highway 20) bridge. Section 2 is from the Mack's Inn bridge downstream to the lower end of Coffee Pot Rapids.

	Total effort (h)	Total catch	Total harvest	Catch rate (fish/h)	Harvest composition[a]	Angler residency	Angler type	Gear type[b]
Section 1	9,264	12,970	2,075	1.4	WRB 50% HRB 25% BKT 18% YCT 7%	63% Nres 37% Res	46% boat 21% bank 33% wade	42% bait 11% lure 47% fly
Section 2	8,311	10,804	1,297	1.3	WRB 15% HRB 21% BKT 49% YCT 15%	65% Nres 35% Res	13% bank 87% wade	16% bait 11% lure 73% fly
Total / Overall	17,575	23,774	3,372	1.35	WRB 35% HRB 24% BKT 31% YCT 10%	63.6% Nres 36.4% Res	24% boat 18% bank 58% wade	28% bait 11% lure 61% fly

[a] WRB = wild rainbow trout; HRB = hatchery rainbow trout; BKT = brook trout; YCT = Yellowstone cutthroat or hybrid trout
[b] Estimated from interview data

It is suspected that these data do not accurately characterize the fishery, particularly the species composition in the harvest. In a 1995 Department creel survey on the same reach, hatchery rainbow trout comprised 79% of the harvest while wild rainbow trout were only 2% of the harvest (IDFG unpublished data). In the current survey, overall harvest was estimated to be 24% hatchery rainbow trout, 35% wild rainbow trout, and 31% brook trout. Creel clerks received minimal training in fish identification and only observed a total of 92 harvested fish throughout the survey. It is likely that hatchery return to creel and contribution to the harvest is higher than reported here.

Buffalo River

Fish Ladder and Smolt Traps

From February 1 to April 3, 1999, an estimated total of 56 wild rainbow trout ascended the Buffalo River fish ladder. Twenty-seven of these fish were >406 mm and assumed to be spawning adults. This compares to 252 fish, 38 of which were greater than 406 mm, ascending the ladder during the same time frame in 1998. The shorter period of video camera operation in 1999 makes year-to-year comparisons difficult. In 1998, the February 1 to April 3 period accounted for 43% of the total estimated run during the January 1 to April 23 camera operation.

From May 14 to June 20, 1999, the screw trap captured 208 juvenile rainbow trout, 176 of which were marked and released upstream. Of the total fish, 171 (82%) were 31 to 115 mm. Nine fish were recaptured, a 5% efficiency for this time period. Estimated total outmigration of rainbow trout was estimated at 3,442. Twelve brook trout were also captured, marked and released, but none were recaptured.

From June 21 1999 to January 31, 2000, both the screw trap and spillway trap were operated concurrently. The screw trap captured 115 rainbow trout. Ninety were marked and released; only one was recaptured. The spillway trap captured 45 rainbow trout. Twenty-six were marked and released, and four were recaptured. Brook trout catch in the screw trap was 92 fish, 89 of which were marked and one recaptured. In the spillway trap, 206 brook trout were captured, 156 marked, and one recaptured. Efficiency of the spillway trap for juvenile rainbow trout (15%) was higher than the screw trap (1%) over this time interval, but total catch rates were poor. Because sample sizes were relatively small, no estimates of outmigration were made for either trap for this time interval.

Willow Creek Drainage

Of the four 1999 sample sites, only one (Willow Creek below High Bridge) had sufficient catch rates of Yellowstone cutthroat trout to complete a depletion estimate of abundance (Table 3). Eight of nine stream sections sampled in 1998-1999 had fewer Yellowstone cutthroat trout than in the early 1980s. In six of the nine, too few Yellowstone cutthroat trout were captured to allow depletion estimates. The Cellars Creek site below the Long Valley road had the highest density of Yellowstone cutthroat trout (36 fish per 100 m^2) of the nine sites. With the exception of this site, fish communities were dominated by cyprinids and catostomids including redside shiners, dace, and Utah sucker. One ripe female hatchery rainbow trout (LV clip – stocked in Ririe Reservoir) was captured in Hell Creek. Splake were present in lower Cellars Creek (1998)

Table 3. Yellowstone cutthroat trout density estimates, species composition, and comparisons to previous data for five sites in four tributaries to Willow Creek, Idaho, August 1998.

Location	1998-99				1980s
	Transect length	Total YCT captured	YCT density (fish/100m^2)	Species composition (sample size)	YCT density (fish/100m^2)
Brockman Cr. below FS road 282	77 m	1 fry	NE[a]	redside shiner 54% dace 28% sculpin 18% (n=57)	3.6[b]
Lava Cr. above Brockman Rd	180 m	34	6.3	Yellowstone cutthroat 21% redside shiner 45% dace spp. 29% sucker spp. 5% (n=164)	17.1[b]
Cellars Cr. below Bone Rd	60 m	1	NE[a]	Yellowstone cutthroat 6% redside shiner 50% sucker spp. 37% sculpin 6% (n=16)	42-58[c]
Cellars Cr. below Long Valley Rd	141 m	132	35.9	Yellowstone cutthroat 56% dace spp. 24% sculpin 9% sucker spp. 8% redside shiner 2% brook, brown, splake 2% (n=237)	22-34[b]
Hell Cr. above Dan Cr. Rd	200 m	1	NE[a]	Yellowstone cutthroat 4% sucker spp. 75% dace spp. 18% hatchery rainbow 4% (n=28)	5.0[b] 13.0[c]
Lower Homer Cr.	400 m	3	NE[a]	Yellowstone cutthroat 25% brown trout 75% (n=12)	1.4[b]
Sawmill Cr.	~200 m	0	NE[a]	salmonids 0% dace, shiners, suckers present	38.4[b]
Willow Cr. below High Bridge	256 m	68	3.0	Yellowstone cutthroat 59% splake 26% brown trout 15% (n=115)	7.6[b]
Grays Lake Outlet above Dan Cr. Rd	~500 m	6	NE[a]	Yellowstone cutthroat 43% brown trout 50% brook trout 7% (n=14)	2.5[b]

[a] YCT capture rates insufficient to estimate density
[b] Corsi (1986)
[c] Moore et al. (1983)

and middle sections of Homer Creek (1999), and were abundant at the High Bridge site on Willow Creek (1999). The splake had been stocked in Ririe Reservoir and had traveled up to 40 km upstream.

RECOMMENDATIONS

1. Continue spring estimates of wild rainbow trout in the Box Canyon Reach of the Henrys Fork Snake River.

2. Continue to monitor the Buffalo River fish ladder and recruitment of juvenile rainbow trout to the Henrys Fork. Develop alternative methods to estimate outmigration, and characterize net effect of the fish ladder on the Henrys Fork trout population.

3. Continue Yellowstone cutthroat trout surveys in the Willow Creek drainage; include lower mainstem reaches in Willow Creek and Grays Lake Outlet.

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1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-24

Project I: Surveys and Inventories | Subproject I-G: Upper Snake Region

Job: c^2 - South Fork Snake River | Title: Rivers and Streams Investigations

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

In the South Fork Snake River, a total of 2,876 trout were captured during four days of electrofishing at the Conant section in October 1999. Trout species composition and relative abundance were cutthroat trout *Oncorhynchus clarki* (63%), rainbow trout *O. mykiss* and hybrid rainbow X cutthroat trout (19%), and brown trout *Salmo trutta* (18%). No lake trout *Salvelinus namaycush* or kokanee *O. nerka kennerlyi* were caught. Estimated densities were 1,847 fish/km for cutthroat trout, 654 fish/km for rainbow and hybrid trout, 512 fish/km for brown trout, and 2,831 fish/km for all species combined. Mean total length was 310 mm for cutthroat trout, 312 mm for rainbow and hybrid trout, 292 mm for brown trout *Salmo trutta*, and 307 mm for all species combined. Quality stock density (QSD) was 2.6% for cutthroat trout, 11.6% for rainbow and hybrid trout, 9.1% for brown trout, and 5.5% for all species combined.

A total of 1,431 trout were captured during four days of electrofishing at the Lorenzo section in September and October 1999. Trout species composition and relative abundance were cutthroat trout (23%), rainbow trout and hybrid trout (<1%), and brown trout (76%). No lake trout or kokanee were caught. Estimated densities were 321 fish/km for cutthroat trout, 1,170 fish/km for brown trout, and 1,485 fish/km for all species combined. Rainbow and hybrid trout density estimates were not possible due to the small sample size. Mean total length was 334 mm for cutthroat trout, 350 mm for rainbow and hybrid trout, 272 mm for brown trout, and 287 mm for all species combined. Quality stock density (QSD) was 8.0% for cutthroat trout, 0.0% for rainbow and hybrid trout, 7.8% for brown trout, and 7.8% for all species combined.

Rainbow and hybrid trout were removed during Conant and Lorenzo recapture runs and either transplanted into Gem Lake (109 fish), Rexburg Kid's Pond (133 fish), or sacrificed (4 fish).

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INTRODUCTION AND STUDY AREA

Trout populations in the South Fork Snake River have been monitored annually since 1986 using electrofishing. Four river sections have been electrofished (Figure 1): Palisades (5.0 km), Conant (4.9 km), Twin Bridges (2.9 km), and Lorenzo (4.8 km). However, only the Conant section has been sampled every year, a portion of which was sampled in 1982 as well (Moore and Schill 1984). The last creel census was conducted in 1996 (Schrader et al. 2003).

Special regulations restricting harvest of cutthroat trout *Oncorhynchus clarki* were enacted upstream of the Heise measuring cable to Irwin in 1984 and extended to Palisades Dam in 1988 (Appendix A). Based on this success, the restricted cutthroat trout harvest regulation was implemented throughout eastern Idaho in 1990 and included the lower South Fork (below Heise) and all South Fork tributaries. The two fish, none between 8-16 inches, regulation was extended to all trout species (including brown trout *Salmo trutta*) in the mainstem (but not tributaries) in 1992. Emergency changes in 1999 removed rainbow trout *O. mykiss* (and later hybrid cutthroat x rainbow trout from special regulations, returning them to the general six fish bag limit with no size restrictions. The lower river (below the Heise cable) is open year-round to fishing, whereas the upper river is closed December 1 to Memorial Day weekend.

OBJECTIVES

To obtain current information for fishery management decisions on rivers and streams, including angler use and success, harvest and opinions, fish population characteristics, spawning success, habitat characteristics, return-to-the-creel for hatchery trout, and to develop appropriate management recommendations. Specific objectives related to the South Fork of the Snake River were to:

1. Monitor South Fork Snake River trout populations by electrofishing.

2. Summarize trout species composition, relative abundance, size structure, average fish length, quality stock density (QSD), and density.

METHODS

During 1999, the Conant section was electrofished on October 13-14 and 20-21, and the Lorenzo section was electrofished on September 28-29 and October 6-7. The upper or lower half of a section was sampled each day. At Conant, flows varied from 101.1 to 118.1 m^3/s (3,570 to 4,170 ft^3/s) at the Irwin gage (USGS, unpublished data; Appendix B). At Lorenzo, flows varied from 49.6 to 86.7 m^3/s (1,750 to 3,060 ft^3/s) at the Lorenzo gage (USGS, unpublished data; Appendix G). A minimum of 70.8 m^3/s (2,500 ft^3/s) is needed at either section for safe boat operation and efficient sampling.

Fish were captured using direct-current (DC) electrofishing gear (Coffelt VVP-15 powered by a Honda 5000 W generator) mounted in an 18-foot Alumaweld sled with a 150 hp outboard jet. We used pulsed DC current through two boom-and-dangler anodes fixed to the bow while driving

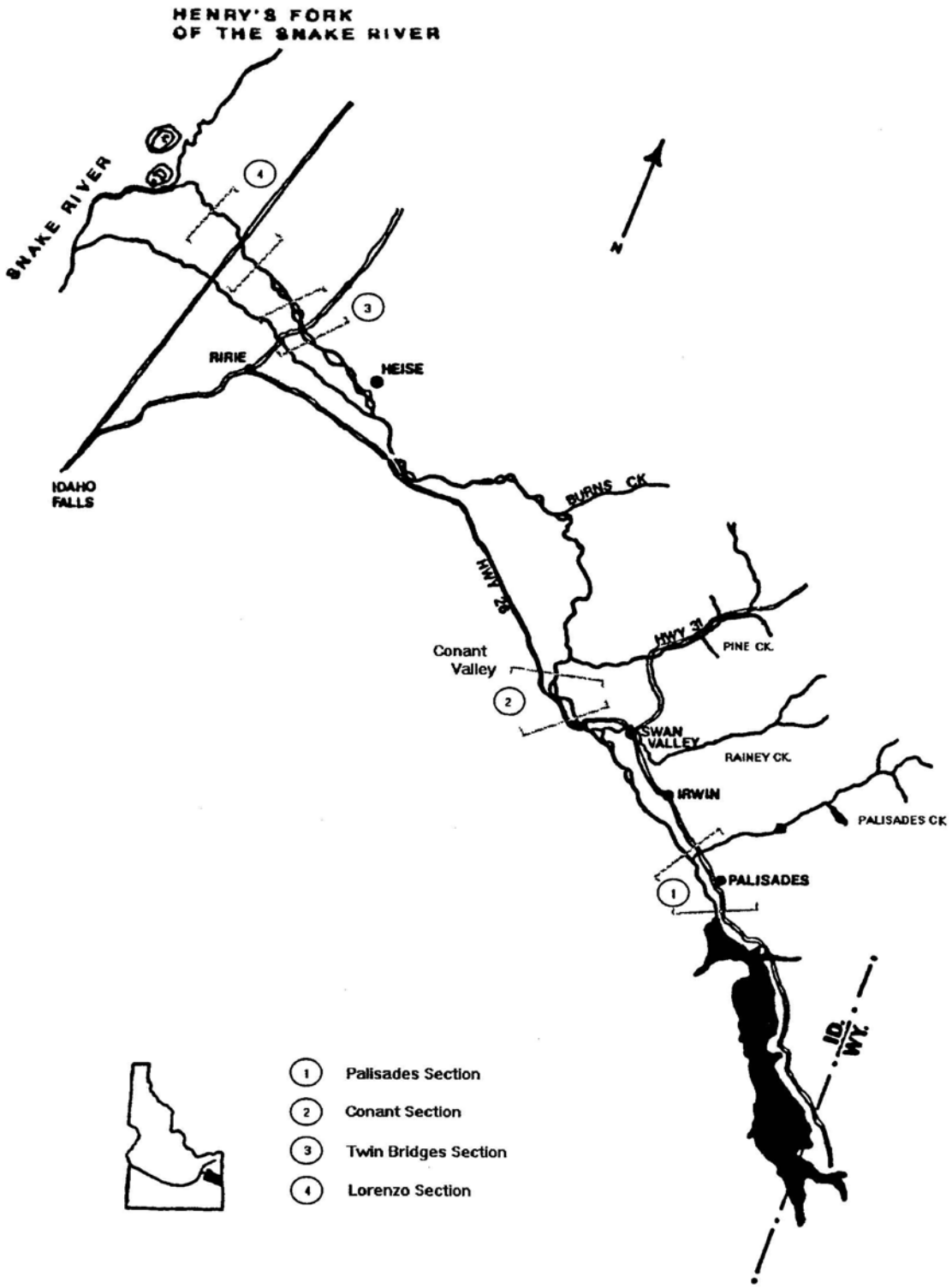

Figure 1. Map of South Fork Snake River showing electrofishing sections.

downstream. The boat hull was the cathode. Similar to previous years, the VVP settings were at 200-225 V, 5 A, 20% pulse width, and 90 Hz (pulses per second).

We attempted to capture all species and sizes of trout. Hereafter, "rainbow trout" will refer to rainbow and hybrid trout combined. Fish were anesthetized, identified, and measured to the nearest millimeter for total length (TL). Brown trout less than 150 mm and all other species less than 100 mm (approximately age-0) were not marked, as they are not effectively recruited to the gear. Age-1 and older fish were marked with a caudal fin punch and released. All rainbow trout caught during recapture runs were either transplanted to other waters or killed.

Electrofishing data were entered and analyzed using the computer program Mark Recapture 5.0 (Montana Department of Fish, Wildlife, and Parks 1994). Other data were entered and analyzed using Microsoft Excel. General statistical analysis was conducted according to Zar (1984).

We assumed capture probabilities did not vary with species, and relative abundance was estimated using proportions of all individual trout captured (excluding recaptures). Although capture probabilities vary with fish length (Schill 1992), population size structures (length-frequency distributions) and average fish lengths were estimated using all sizes of individual fish captured. Quality stock density was estimated using the number of individual fish captured $\geq$406 mm, divided by the number $\geq$203 mm, multiplied by 100. Density was estimated using two methods in the MR5 computer program. The log-likelihood method was preferred over the modified Peterson method if modeled efficiency curves were acceptable (termcode=1 and at least one of two chi-square p-values>0.05).

RESULTS

Conant Electrofishing

A total of 2,876 trout were captured during four days of electrofishing in October 1999. Trout species composition and relative abundance were cutthroat trout (63%), rainbow trout (19%), and brown trout (18%), Figure 2, Appendix C. No lake trout *Salvelinus namaycush* or kokanee salmon *Oncorhynchus nerka kennerlyi* were captured. Less than 1% of the cutthroat trout captured was of hatchery origin.

The cutthroat, rainbow, and brown trout length frequency distributions show strong groups of age-1 fish (about 100 to 250 mm for cutthroat trout, 150 to 300 mm for rainbow and brown trout) and age-2 and older fish (>250-300 mm; Figures 3-5). Ages were approximated from these frequency distributions and will be validated with otoliths in the future.

Mean total length (TL) was 310 mm for cutthroat trout, 312 mm for rainbow trout, 292 mm for brown trout, and 307 mm for all species combined (Appendix D). Quality stock density (QSD) was 2.6% for cutthroat trout, 11.6% for rainbow trout, 9.1% for brown trout, and 5.5% for all species combined. Sample sizes were similar to previous years.

Electrofishing sampling efficiencies (R/C) were also similar to previous years and ranged from 12% for rainbow trout to 13% for cutthroat and brown trout (Appendix E). Estimated densities of age-1 and older fish were 1,847 fish/km for cutthroat trout, 654 fish/km for rainbow

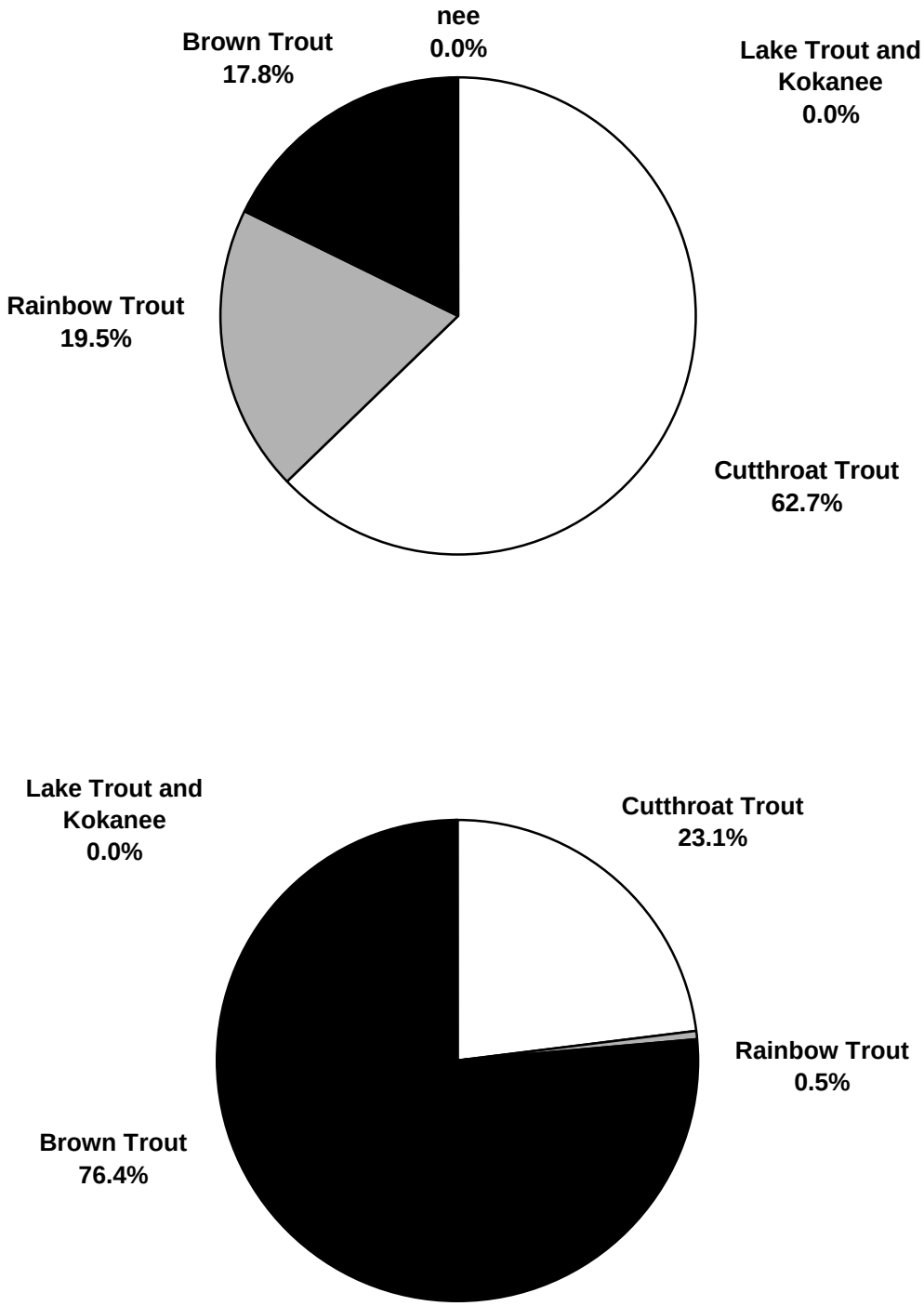

Figure 2. Trout species composition and relative abundance at the Conant (top, n=2,876) and Lorenzo (bottom, n=1,431) electrofishing sections, South Fork Snake River, 1999. Results are from the MR5 database for all sizes of fish.

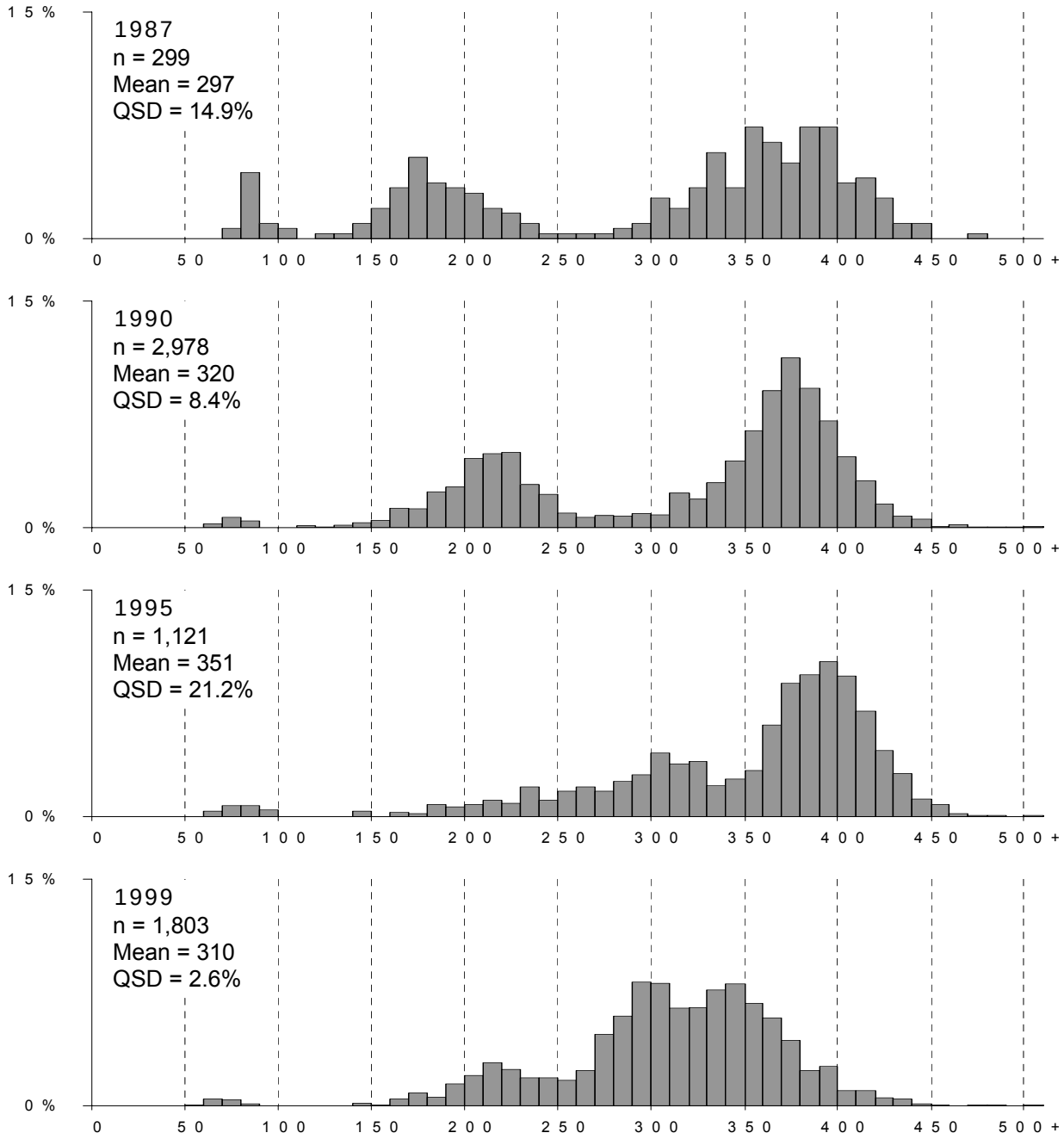

Figure 3. Length frequency distributions of cutthroat trout captured in the fall at the Conant electrofishing section, South Fork Snake River. Note strong age-1 groups (about 100 to 250 mm) in 1987, 1990, and 1999, but a weak group in 1995. Total individual fish captured during mark and recapture runs = n. Results are from MR5 database for all sizes of fish.

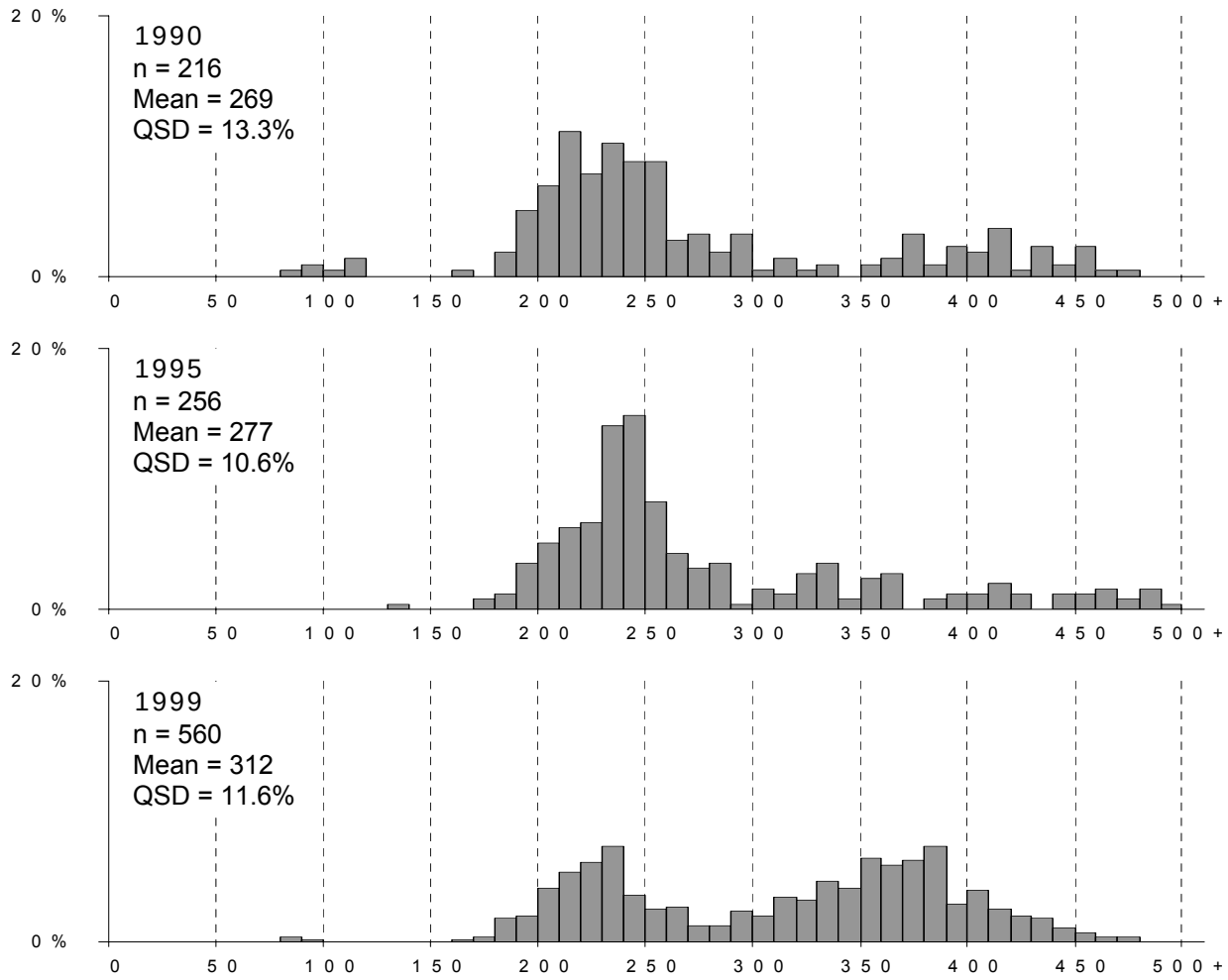

Figure 4. Length frequency distributions of rainbow trout captured in the fall at the Conant electrofishing section, South Fork Snake River. Note strong age-1 groups (about 150 to 300 mm) in 1990 and 1995, but less so in 1999. Not shown is 1987 when only six fish were captured. Total individual fish captured during mark and recapture runs = n. Results are from MR5 database for all sizes of fish.

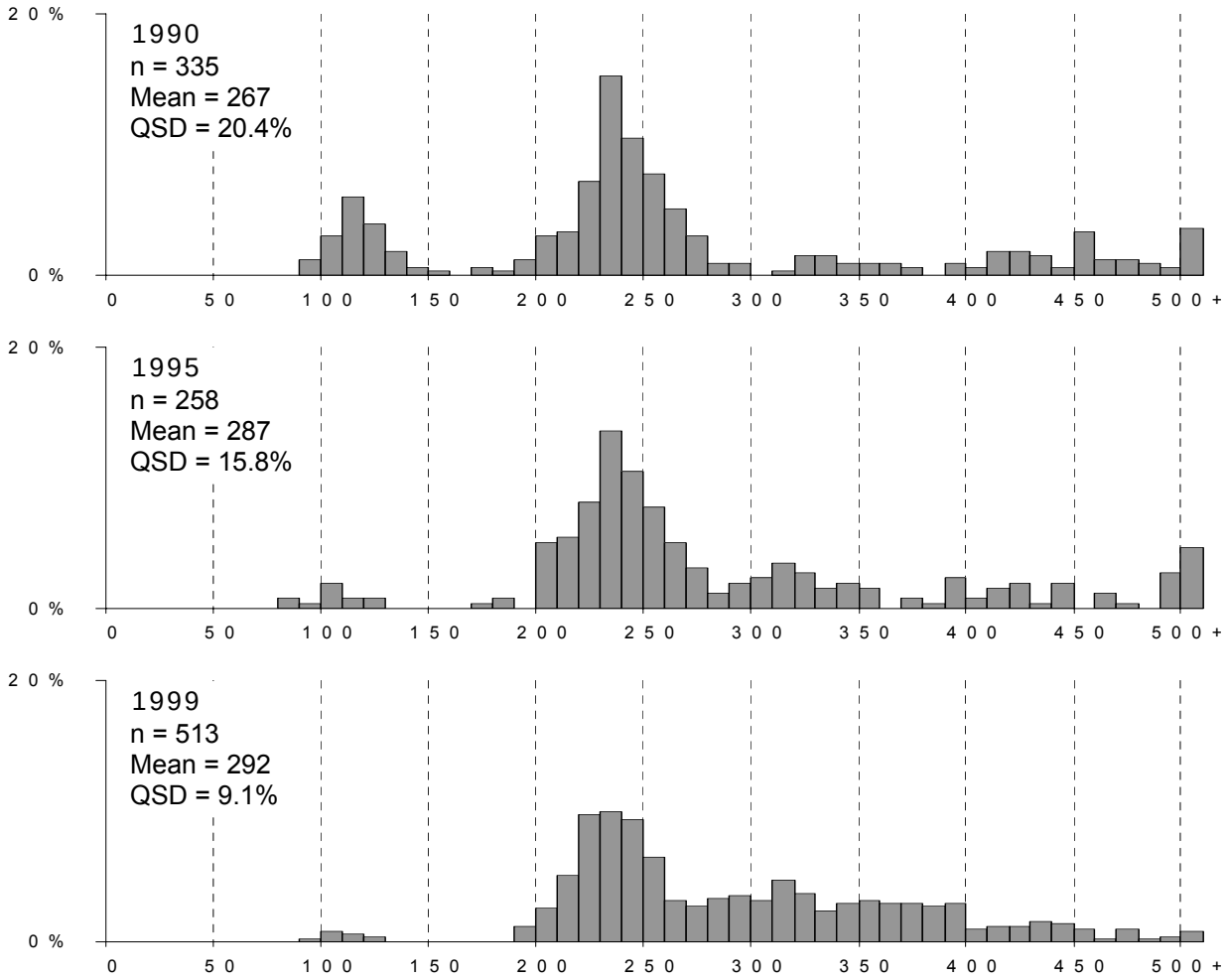

Figure 5. Length frequency distributions of brown trout captured in the fall at the Conant electrofishing section, South Fork Snake River. Note strong age-1 groups (about 150 to 300 mm) in 1990 and 1995, but less so in 1999. Not shown is 1987 when only 43 fish were captured. Total individual fish captured during mark and recapture runs = n. Results are from MR5 database for all sizes of fish.

trout, 512 fish/km for brown trout, and 2,831 fish/km for all species combined (Figure 6, Appendix F). We removed all rainbow trout caught during recapture runs (242 fish). Local Trout Unlimited and Upper Snake River Fly Fishers volunteers helped transplant these fish into Gem Lake (109 fish) and Rexburg Kid's Pond (133 fish).

Lorenzo Electrofishing

A total of 1,431 trout were captured during four days of electrofishing in September and October 1999. Trout species composition and relative abundance were cutthroat trout (23%), rainbow trout (<1%), and brown trout (76%); Figure 2, Appendix H. No lake trout or kokanee were captured. None of the cutthroat trout captured was of hatchery origin.

The cutthroat trout length frequency distribution shows a weak group of age-1 fish (about 100 to 250 mm), although age-2 and older fish (>250 mm) are well represented (Figure 7). In contrast, a strong group of age-1 brown trout (about 150 to 300 mm) was observed (Figure 8). Ages were approximated from these frequency distributions and will be validated with otoliths in the future.

Mean total length (TL) was 334 mm for cutthroat trout, 350 mm for rainbow trout, 272 mm for brown trout, and 287 mm for all species combined (Appendix I). Quality stock density (QSD) was 8.0% for cutthroat trout, 0.0% for rainbow trout, 7.8% for brown trout, and 7.8% for all species combined. Sample sizes were similar to previous years.

Electrofishing sampling efficiencies (R/C) were also similar to previous years and ranged from 0% for rainbow trout to 16% for cutthroat trout (Appendix J). Estimated densities of age-1 and older fish were 321 fish/km for cutthroat trout, 1,170 fish/km for brown trout, and 1,485 fish/km for all species combined (Figure 9; Appendix K). Similar to previous years, only seven rainbow trout were captured and a density estimate was not possible. We killed all rainbow trout caught during recapture runs (4 fish).

DISCUSSION

At both sections in 1999, cutthroat trout density is similar to previous years (Figures 6 and 9), although their relative abundance at Conant has been declining with increasing rainbow trout (Figure 10). Rainbow trout at Conant (but not Lorenzo) have increased an order of magnitude since 1989 – the first year an estimate was possible. We conclude that this growing rainbow trout population in the upper river is the major threat to the genetic integrity and long-term viability of cutthroat trout in the South Fork. Hopefully, liberalized rainbow trout harvest regulations implemented in 1999 will reverse these trends.

Cutthroat trout are much less abundant in the lower South Fork (at Lorenzo) compared to the upper river (at Conant). This difference is probably due to recruitment limitations or irrigation diversion entrainment in the lower river. In contrast, brown trout are most abundant in the lower river and appear to be increasing. Brown trout density estimates at Lorenzo (but not

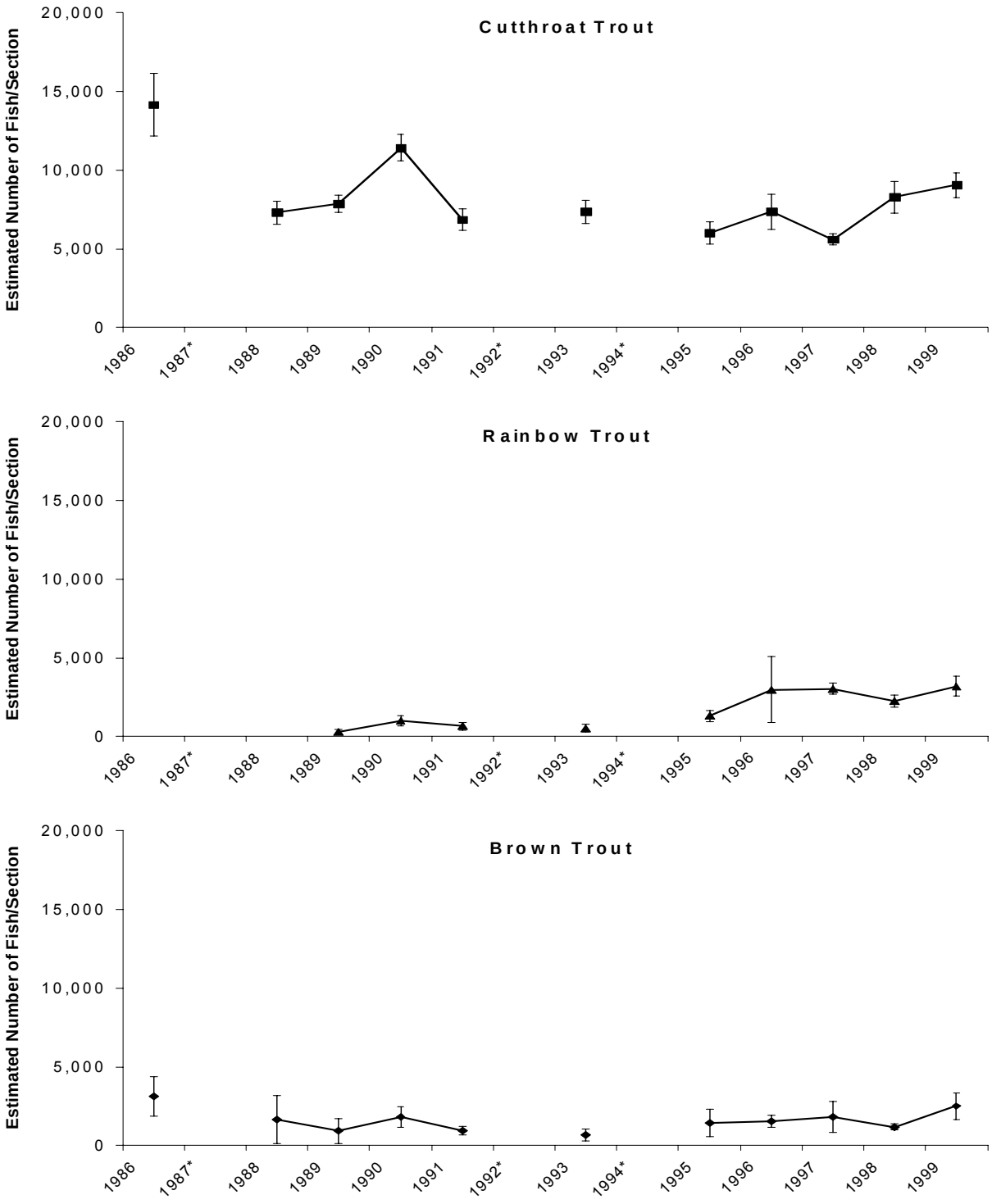

Figure 6. Abundance trends for age-1 and older cutthroat (top, ≥102 mm), rainbow (middle, ≥102 mm), and brown trout (bottom, ≥152 mm) at the Conant electrofishing section, South Fork Snake River, October and November 1986-1999. Confidence intervals are at 95%. Asterisks indicate years when no estimate was possible.

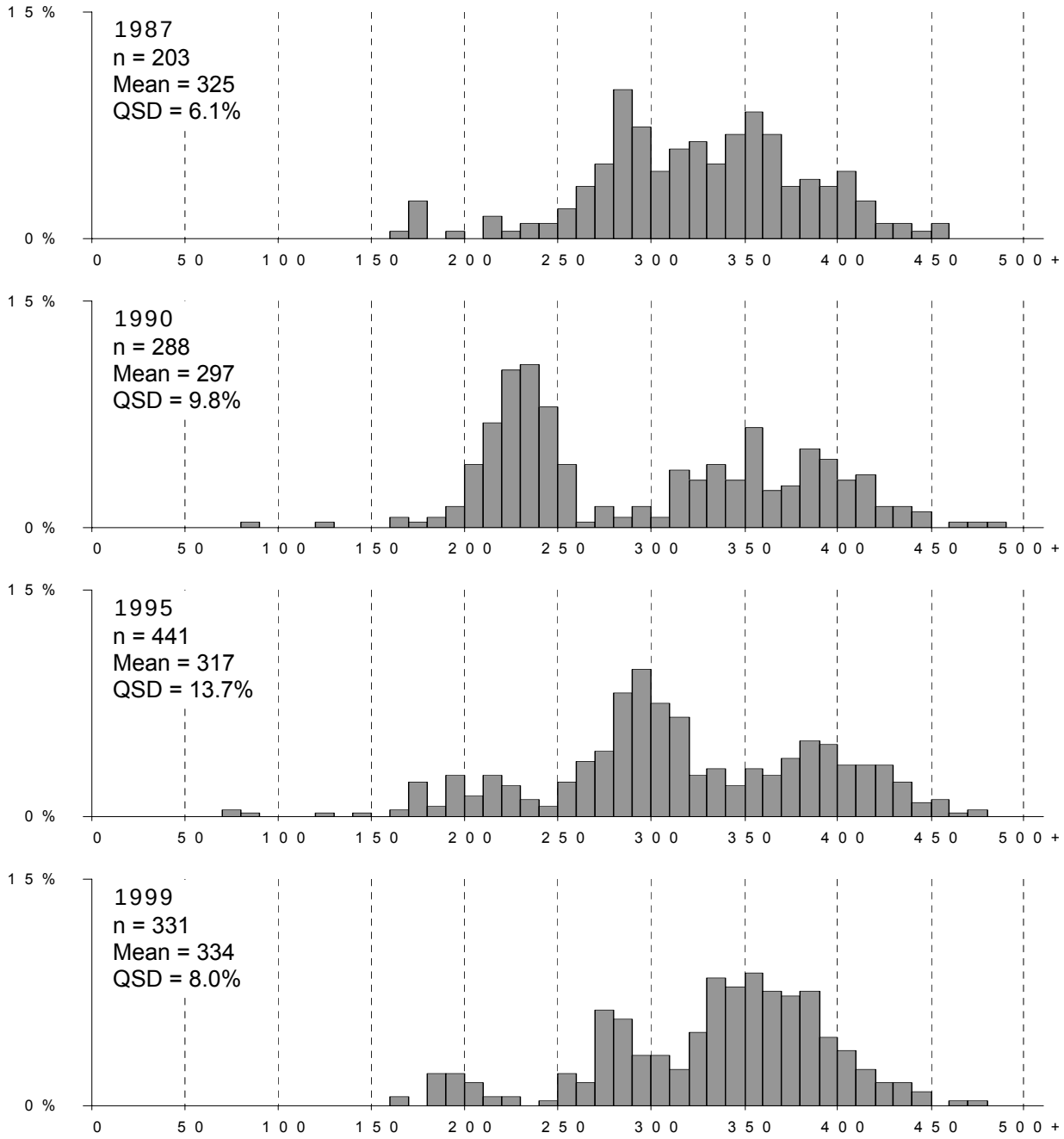

Figure 7. Length frequency distributions of cutthroat trout captured in the fall at the Lorenzo electrofishing section, South Fork Snake River. Note a strong age-1 group (about 100 to 250 mm) in 1990, but weak groups in 1987, 1995, and 1999. Total individual fish captured during mark and recapture runs = n. Results are from MR5 database for all sizes of fish.

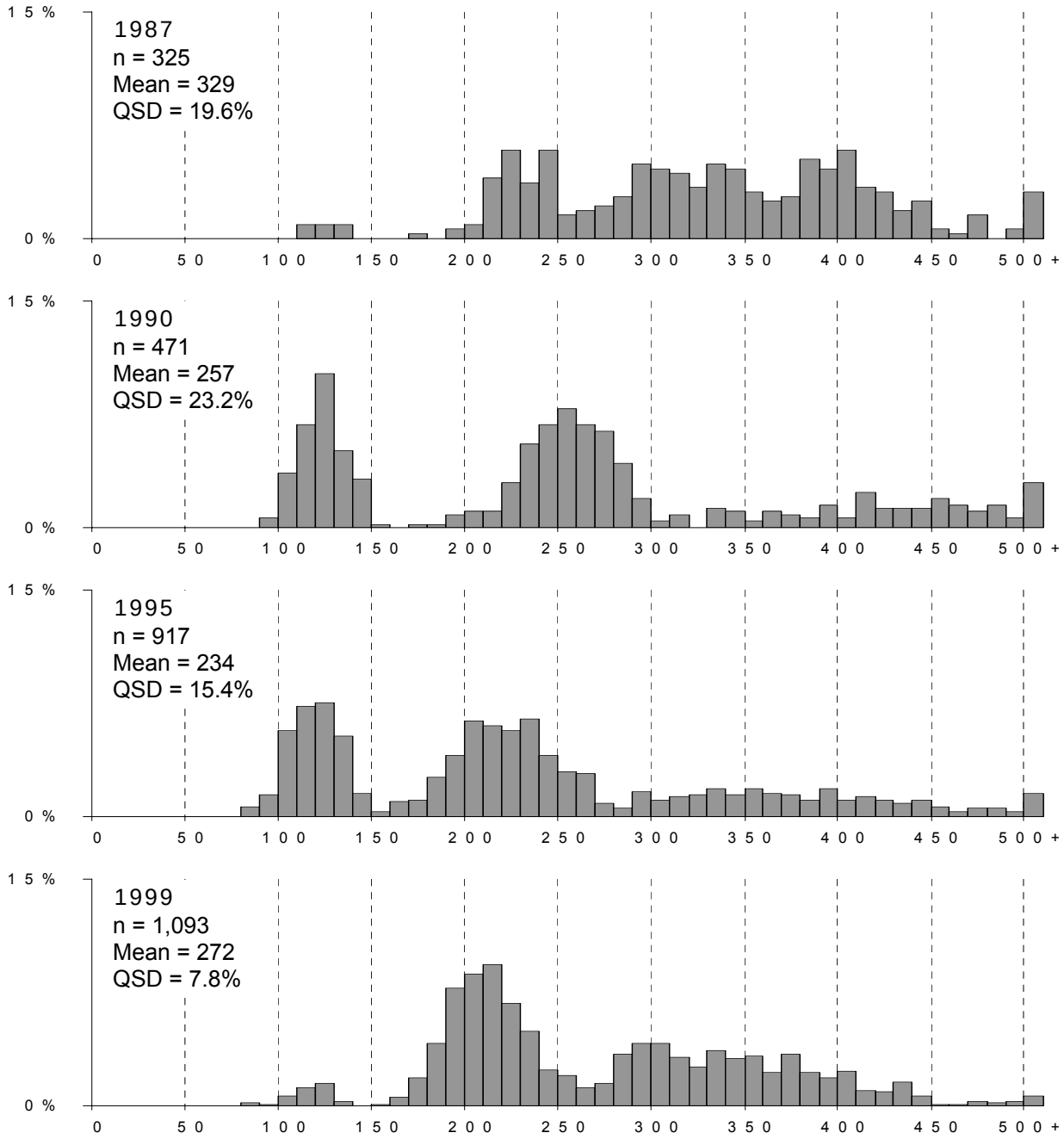

Figure 8. Length frequency distributions of brown trout captured in the fall at the Lorenzo electrofishing section, South Fork Snake River. Note strong age-1 groups (about 150 to 300 mm) in 1990, 1995, and 1999, but less so in 1987. Total individual fish captured during mark and recapture runs = n. Results are from MR5 database for all sizes of fish.

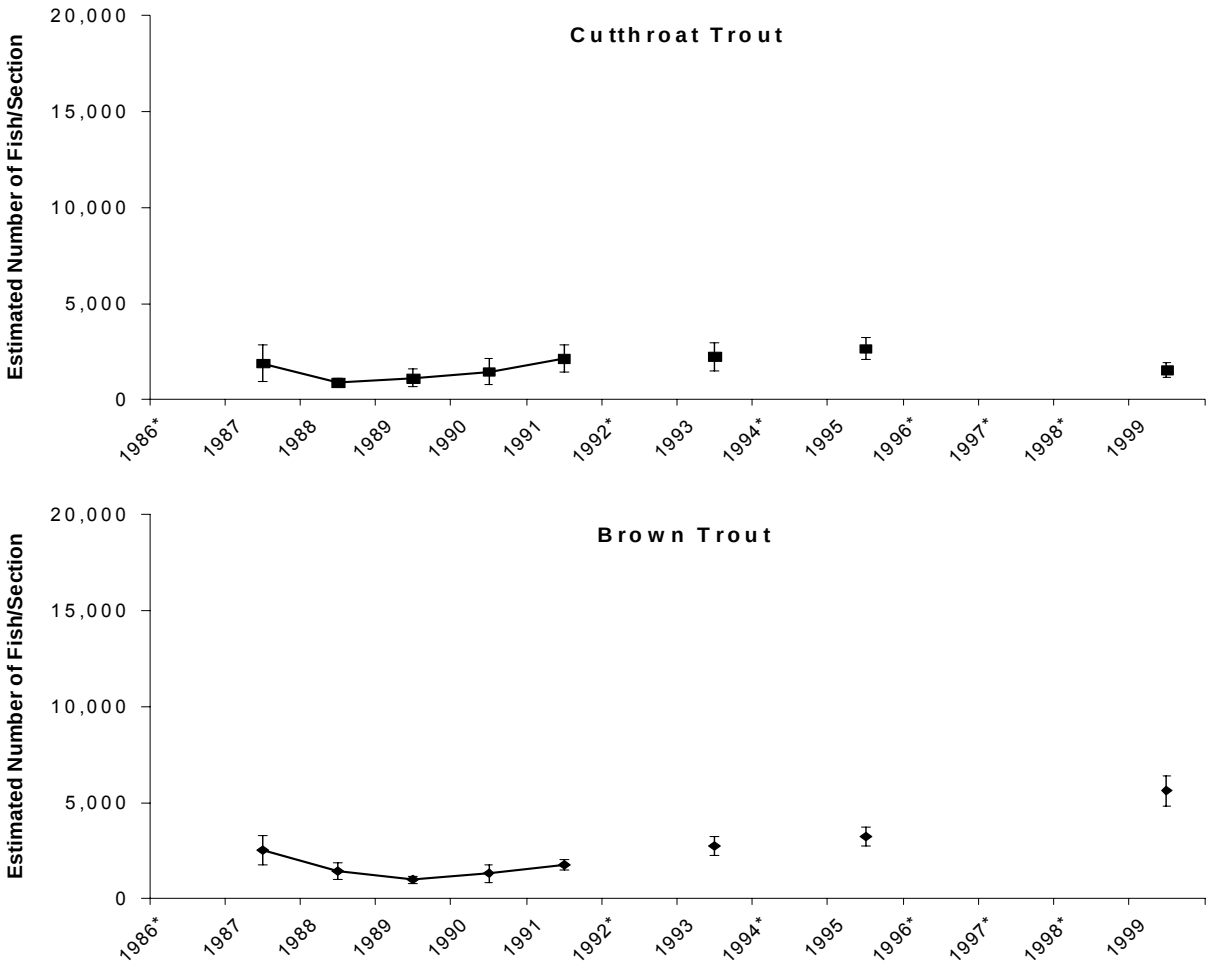

Figure 9. Abundance trends for age-1 and older cutthroat (top, ≥102 mm) and brown trout (bottom, ≥152 mm) at the Lorenzo electrofishing section, South Fork Snake River, September and October 1987-1999. Confidence intervals are at 95%. Asterisks indicate years when no estimate was made.

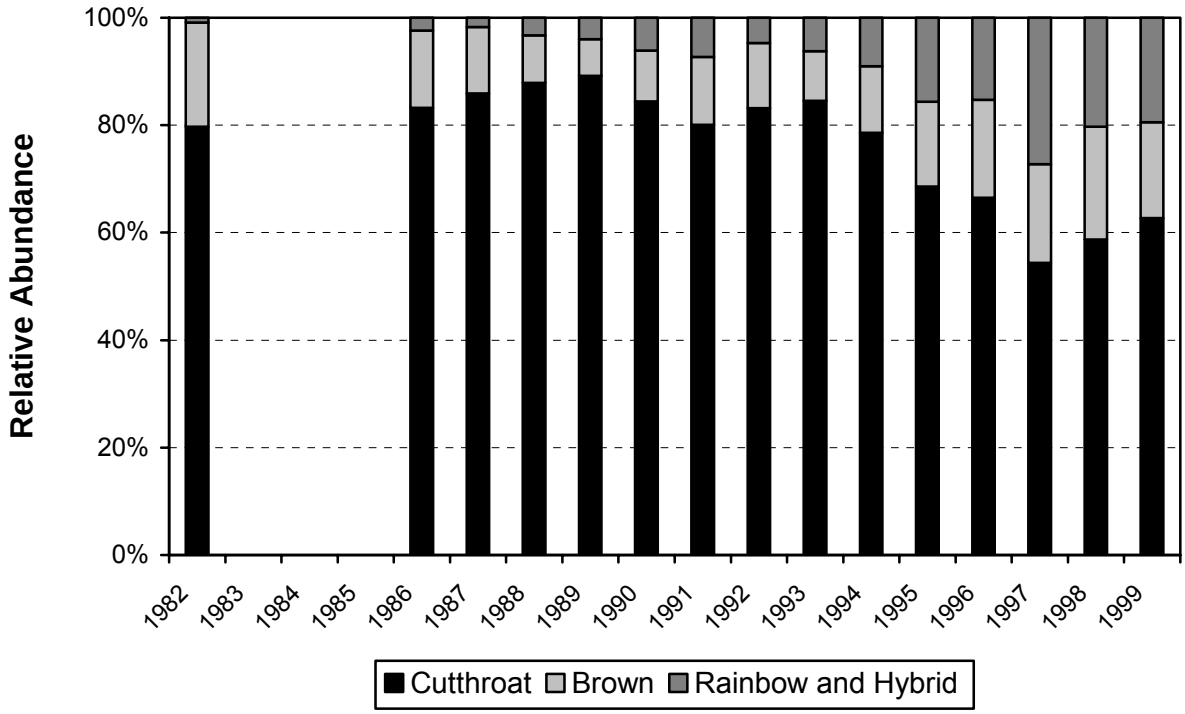

Figure 10. Trout relative abundance trends at the Conant electrofishing section, South Fork Snake River, 1982 to 1999. Results are from MR5 database for all sizes of fish (Appendix C) except for 1982, which is from Moore and Schill (1984).

Conant) are highest on record - showing an upward trend similar to rainbow trout at Conant (Figures 6 and 9). It is likely that factors affecting cutthroat trout in South Fork have not had the same effect on rainbow and brown trout.

Cutthroat trout quality stock density (QSD) at Conant (2.6%) is the lowest on record (Figure 11). The decline is due to few large (>400 mm) fish rather than more small fish. Cutthroat trout QSD has declined at Lorenzo since 1995 as well. In contrast, rainbow and brown trout QSDs have held steady at both sections. It is likely that harvest, rather than recruitment limitations, explains the difference.

Because the 1982, 1986 and 1987 electrofishing efforts were conducted in November rather than in October, and the section was shortened in 1982 and 1987 resulting in smaller sample sizes, comparability of data from these years is somewhat limited. Similarly, the 1997 data may be confounded by significant habitat changes that occurred with near-record runoff of 1,275 m^3/s (45,000 ft^3/s).

RECOMMENDATIONS

1. Continue monitoring South Fork Snake River trout populations by electrofishing.

2. Develop length-weight regressions for each trout species. Predict fish weights from measured lengths and estimate biomass and standing crops for all sections and years. Compare relative weights.

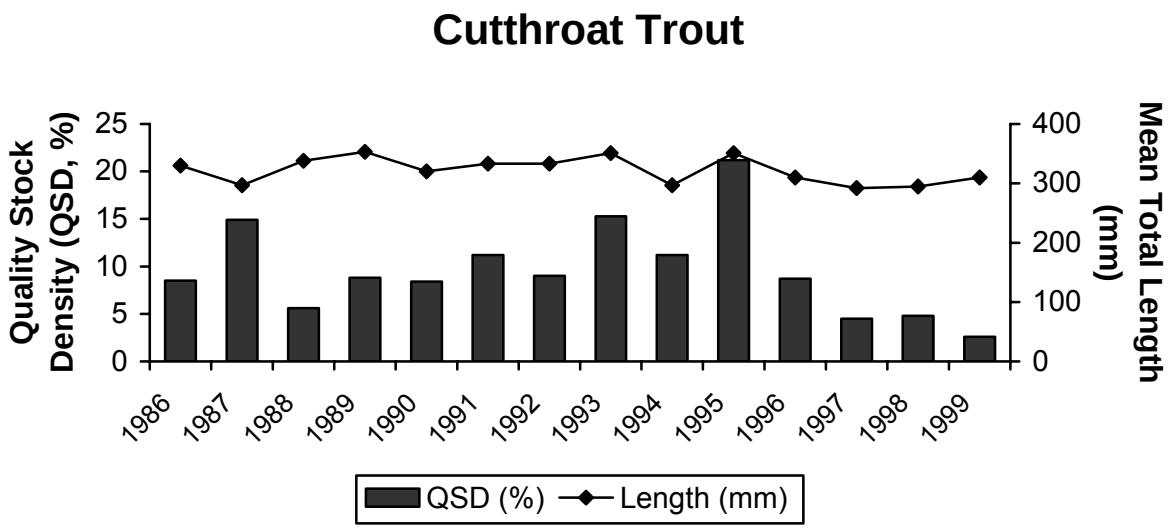

Figure 11. Cutthroat trout quality stock density (QSD) and mean total length trends at the Conant electrofishing section, South Fork Snake River, 1986 to 1999. Results are from MR5 database for all sizes of fish (Appendix D).

ACKNOWLEDGMENTS

Department fishery technician Kevin Brenden, Department volunteers Dan Duggan, Gregg Losinski, Jeb Blakely, Don Kemner, Dale Allen, Dave Koehler, Barry Clayden, Steve Schmidt, Clint Rasmussen, Ted Chu; Pat Clancey (MDFWP), Kent England, and Dick Bauman (BOR) helped with electrofishing. Trout Unlimited volunteers John Patten, Jerry Bullock, and Ken McAntosh helped remove rainbow trout and stock them into Gem Lake. Upper Snake River Fly Fishers volunteers Doug Munns, Harry Sutherland, Phil Murdock, and numerous Rick's College students helped remove rainbow trout and stock them into Rexburg Kid's Pond. Department fishery technician Scott Host entered the data.

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APPENDICES

Appendix A. Idaho fishing regulations for the South Fork Snake River 1970-1999.

Year	Season	Trout bag & size limit	Special
1970	May 30 - Nov 30	7 lb. + 1 fish, not to exceed 15 fish	Whitefish open 3/1 to 4/30 Irwin to Dam; Mouth to Heise cable open all year
1971	May 29 - Nov 30	Same	Same
1972	May 27 - Nov 30	7 lb. + 1 fish, not to exceed 10 fish	Same
1973	May 26 - Nov 30	Same	All species open 3/1 to 9/30 Irwin to Dam; Mouth to Heise cable open all year
1974	May 25 - Nov 30	10 fish, not more than 2 exceeding 14”	Same
1975	May 24 - Nov 30	Same	Same
1976	May 29 - Nov 30	10 fish, not more than 5 exceeding 12”, and not more than 2 exceeding 18”	Same
1977	May 28 - Nov 30	6 fish, only 2 over 16”	Same, except dam tailrace closed
1978	May 27 - Nov 30	Same	Dam tailrace closed; all species open 5/27 to 9/30 Irwin to Dam; Mouth to Heise cable open 5/27 to 12/31
1979	May 26 - Nov 30	Same	Dam tailrace closed; all species open 4/1 to 9/30 Irwin to Dam; Mouth to Heise cable open all year
1980	May 24 - Nov 30	Same	Same
1981	May 23 - Nov 30	Same	Same
1982	May 29 - Nov 30	Same	Same, except open 9/1 to 11/30 within 100 yards of Burns Creek
1983	May 28 - Nov 30	Same	Same
1984	May 26 - Nov 30	Same, except Heise cable to Irwin only 2 CT, none between 10-16”, barbless hooks	Same
1985	May 25 - Nov 30	Same, except added hybrids	Same
1986-1987	May 24/23-Nov 30	Same	Same
1988-1989	May 28/27-Nov 30	6 fish, only 2 over 16”; except Heise cable to Dam only 2 CT or HYB, none between 10-16”	Mouth to Heise cable open all year; open 9/1 - 11/30 within 100 yards of Burns Creek
1990-1991	May 26/25-Nov 30	6 fish (except only 2 CT or HYB, none between 8-16”, on all rivers and streams)	Mouth to Heise cable open all year
1992-1993	May 23/29-Nov 30	2 fish, none between 8-16”	Same
1994-1995	May 28/27-Nov 30	Same	Same
1996-1997	May 25/24-Nov 30	Same	Same
1998	May 23 - Nov 30	Same	Same
1999	May 29 - Nov 30	6 fish (except only 2 CT, HYB, or BRN, none between 8-16”)	Same

Appendix B. Sampling dates, flows, and catch rates at the Conant electrofishing section, South Fork Snake River, 1986-1999. Flows were recorded at the USGS Irwin gage. Catch rate results are from the MR5 database for all sizes of fish.

Sampling dates	Range of flows (m^3/s)	Range of flows (ft^3/s)	Mean flow (m^3/s)	Catch rate (fish/day)[a]
11/4,5, 6, 7, 20 1986	100.2-107.0	3,540-3,780	101.7	413
11/5, 6 1987[b,c]	24.6-26.6	869-941	25.6	174
10/3, 4, 11 1988	102.0-105.0	3,600-3,710	103.4	630
10/18, 19, 27 1989	84.7-86.7	2,990-3,060	86.1	930
10/11, 12, 18 1990	98.8-104.5	3,490-3,690	100.8	1,292
10/7, 8, 15 1991	127.2-135.7	4,490-4,790	131.7	741
10/14 1992[b]	60.3	2,130	60.3	719
10/13, 14, 21, 22 1993	74.2-108.2	2,620-3,820	90.9	481
10/7, 11, 14 1994[b]	34.5-69.1	1,220-2,440	52.4	368
10/5, 6, 12, 13 1995	72.8-115.8	2,570-4,090	93.2	436
10/3, 4, 10, 11 1996	106.5-107.3	3,760-3,790	106.9	472
10/16, 17, 23, 27 1997[d]	69.7-99.1	2,460-3,500	84.4	851
10/7,8, 14, 15 1998	91.5-126.6	3,230-4,470	109.6	593
10/13, 14, 20, 21 1999	101.1-118.1	3,570-4,170	109.6	763

[a] Includes recaptured fish; catch rate = (M+C)/number days sampled.
[b] No recapture runs due to low flows.
[c] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[d] Major habitat changes with spring runoff.

Appendix C. Trout species composition and relative abundance (%) at the Conant electrofishing section, South Fork Snake River, 1982-1999. Total individual fish captured during mark and recapture runs are in parentheses. Results are from MR5 database for all sizes of fish.

Year	Cutthroat trout[a]	Rainbow trout	Brown trout	Lake trout	Kokanee	Total
1982[b,c,d]	79 (181)	1 (2)	19 (44)	1 (2)	0 (0)	100 (229)
1986[c]	83 (1,647)	2 (47)	14 (285)	<1 (4)	0 (0)	99 (1,983)
1987[c,e,f]	86 (299)	2 (6)	12 (43)	0 (0)	0 (0)	100 (348)
1988	88 (1,570)	3 (58)	9 (159)	<1 (1)	0 (0)	100 (1,788)
1989	89 (2,291)	4 (103)	7 (175)	0 (0)	0 (0)	100 (2,569)
1990	84 (2,978)	6 (216)	9 (335)	<1 (4)	0 (0)	99 (3,533)
1991	80 (1,646)	7 (150)	13 (259)	0 (0)	0 (0)	100 (2,055)
1992[e]	83 (598)	5 (34)	12 (87)	0 (0)	0 (0)	100 (719)
1993	85 (1,528)	6 (113)	9 (166)	0 (0)	0 (0)	100 (1,807)
1994[e]	79 (867)	9 (100)	12 (136)	0 (0)	<1 (1)	100 (1,104)
1995	69 (1,121)	16 (256)	16 (258)	0 (0)	0 (0)	101 (1,635)
1996	66 (1,190)	15 (274)	18 (325)	<1 (1)	<1 (1)	99 (1,791)
1997[g]	54 (1,676)	27 (840)	18 (567)	<1 (1)	<1 (2)	99 (3,086)
1998	59 (1,312)	20 (454)	21 (469)	<1 (1)	0 (0)	100 (2,236)
1999	63 (1,803)	19 (560)	18 (513)	0 (0)	0 (0)	100 (2,876)

[a] Includes hatchery cutthroat trout.
[b] Only 1.9 km of larger 4.9 km section was electrofished.
[c] Electrofishing conducted in early November rather than October.
[d] From Moore and Schill (1984), not MR5 database.
[e] No recapture runs due to low flows.
[f] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[g] Major habitat changes with spring runoff.

Appendix D. Mean total length and quality stock density (QSD) of trout captured at the Conant electrofishing section, South Fork Snake River, 1986-1999. Total individual fish captured during mark and recapture runs equals n. QSD=(number ≥406 mm/number ≥203 mm) x 100. Results are from MR5 database for all sizes of fish.

Year	Cutthroat trout[a]			Rainbow trout			Brown trout			All trout[b]		
	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)
1986[c]	1,647	330	8.5	47	307	11.4	285	338	29.0	1,983	330	11.5
1987[c,d,e]	299	297	14.9	6	262	0.0	43	249	11.5	348	292	14.3
1988	1,570	338	5.6	58	328	12.3	159	310	22.8	1,788	335	7.3
1989	2,291	353	8.8	103	323	19.6	175	343	38.5	2,569	351	11.2
1990	2,978	320	8.4	216	269	13.3	335	267	20.4	3,533	310	9.7
1991	1,646	333	11.2	150	251	6.6	259	274	14.1	2,055	320	11.3
1992[d]	598	333	9.0	34	282	2.9	87	264	6.6	719	323	8.4
1993	1,528	351	15.3	113	340	18.2	166	330	34.2	1,807	348	17.2
1994[d]	867	297	11.2	100	251	13.4	136	236	7.4	1,104	287	10.9
1995	1,121	351	21.2	256	277	10.6	258	287	15.8	1,635	328	18.7
1996	1,190	310	8.7	274	262	6.6	325	284	12.7	1,791	297	9.2
1997[f]	1,676	292	4.5	840	262	4.3	567	274	12.5	3,086	279	6.0
1998	1,312	295	4.8	454	318	13.3	469	279	8.4	2,236	297	7.4
1999	1,803	310	2.6	560	312	11.6	513	292	9.1	2,876	307	5.5

[a] Includes hatchery cutthroat trout.
[b] Includes lake trout and kokanee.
[c] Electrofishing conducted in early November rather than October.
[d] No recapture runs due to low flows.
[e] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[f] Major habitat changes with spring runoff.

Appendix E. Electrofishing statistics for the Conant section, South Fork Snake River, 1986-1999. Results are from MR5 database for all sizes of fish.

Year	Cutthroat trout[a]				Rainbow trout				Brown trout				All trout[b]			
	M[c]	C[c]	R[c]	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)
1986[d]	1,171	546	70	13	32	17	2	12	186	107	8	7	1,393	670	80	12
1987[d,e,f]	299	ND[g]	ND	ND	6	ND	ND	ND	43	ND	ND	ND	348	ND	ND	ND
1988	1,101	567	98	17	41	18	1	6	115	48	4	8	1,257	634	103	16
1989	1,424	1,067	200	19	58	55	10	18	107	79	11	14	1,589	1,201	221	18
1990	1,768	1,527	317	21	118	112	14	12	213	134	12	9	2,102	1,774	343	19
1991	1,159	627	140	22	105	54	9	17	158	120	19	16	1,422	801	168	21
1992[e]	598	ND	ND	ND	34	ND	ND	ND	87	ND	ND	ND	719	ND	ND	ND
1993	998	630	100	16	78	41	6	15	110	66	10	15	1,186	737	116	16
1994[e]	867	ND	ND	ND	100	ND	ND	ND	136	ND	ND	ND	1,104	ND	ND	ND
1995	633	565	77	14	130	143	17	12	154	117	13	11	917	825	107	13
1996	714	548	72	13	165	114	5	4	216	127	18	18	1,097	789	95	12
1997[h]	914	926	164	18	436	476	72	15	352	298	83	28	1,703	1,702	319	19
1998	679	694	61	9	221	259	26	10	276	242	49	20	1,176	1,196	136	11
1999	1,021	899	117	13	347	242	29	12	297	247	31	13	1,665	1,388	177	13

[a] Includes hatchery cutthroat trout.
[b] Includes lake trout and kokanee.
[c] M=number of fish marked on marking run; C=total number of fish captured on recapture run; R=number of recaptured fish on recapture run.
[d] Electrofishing conducted in early November rather than October.
[e] No recapture runs due to low flows.
[f] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[g] ND = no data; no recapture runs.
[h] Major habitat changes with spring runoff.

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Appendix F. Estimated abundance (N) of age-1 and older cutthroat trout (≥102 mm), rainbow trout (≥102 mm), brown trout (≥152 mm), and all trout (≥102 mm) at the Conant electrofishing section, South Fork Snake River, 1986-1999. Results are from MR5 database and analysis using the log-likelihood estimator. Standard deviations are in parentheses.

First marking date	Cutthroat trout[a]		Rainbow trout		Brown trout		All trout[b]	
	N/section	N/km	N/section	N/km	N/section	N/km	N/section	N/km
11/4/86	14,161 (1,005)	2,890	NUE[c]	NUE	3,142 (632)	641	13,935 (608)	2,844
11/5/87	NE[d]	NE	NE	NE	NE	NE	NE	NE
10/3/88	7,306 (370)	1,491	NUE	NUE	1,652 (776)	337	9,005 (434)	1,838
10/18/89	7,860 (269)	1,604	310 (65)	63	936 (405)	191	8,788 (262)	1,793
10/11/90	11,416 (432)	2,330	1,004 (161)	205	1,806 (331)	369	14,633 (435)	2,986
10/7/91	6,854 (340)	1,399	657 (135)	134	954 (129)	195	7,920 (287)	1,616
10/14/92	NE	NE	NE	NE	NE	NE	NE	NE
10/13/93	7,364 (374)	1,503	538 (127)	110	663 (194)	135	8,058 (324)	1,644
10/7/94	NE	NE	NE	NE	NE	NE	NE	NE
10/5/95	6,029 (367)	1,230	1,326 (181)	271	1,442 (440)	294	8,349 (391)	1,704
10/3/96	7,361 (562)	1,502	2,982[e] (1,076)	609[e]	1,538 (196)	314	11,233 (640)	2,292
10/16/97[f]	5,609 (190)	1,145	3,037 (183)	620	1,809 (507)	369	9,659 (234)	1,971
10/7/98	8,286 (510)	1,691	2,257 (196)	461	1,189 (90)	243	10,770 (389)	2,198
10/13/99	9,051 (407)	1,847	3,207 (317)	654	2,508 (423)	512	13,873 (443)	2,831

[a] Includes hatchery cutthroat trout.
[b] Includes lake trout and kokanee.
[c] NUE = no unbiased estimate possible as R ≤ 3 (Ricker 1975).
[d] NE = no estimate; recapture runs not made.
[e] Modified Peterson rather than log-likelihood estimate.
[f] Major habitat changes with spring runoff.

Appendix G. Sampling dates, flows, and catch rates at the Lorenzo electrofishing section, South Fork Snake River, 1987-1999. Flows were recorded at the USGS Lorenzo gage. Catch rate results are from the MR5 database for all sizes of fish.

Sampling dates	Range of flows (m^3/s)	Range of flows (ft^3/s)	Mean flow (m^3/s)	Catch rate (fish/day)[a]
9/29,30; 10/7 1987	58.6-69.7	2,070-2,460	64.5	183
10/4,6,11 1988	30.9-34.3	1,090-1,210	33.1	205
10/13,16,23 1989	24.7-25.5	871-899	25.1	197
10/3,4,10 1990	49.9-79.0	1,760-2,790	67.7	265
9/18,19,30 1991	60.3-77.3	2,130-2,730	71.5	346
9/23,27; 10/4,7 1993	46.2-72.0	1,630-2,540	56.6	244
10/2,4,10,11 1995	27.4-45.0	967-1,590	36.1	358
9/28,29; 10/6,7 1999[b]	49.6-86.7	1,750-3,060	67.0	378

[a] Includes recaptured fish; catch rate = (M+C)/number days sampled.
[b] Major habitat changes with spring, 1997, runoff.

Appendix H. Trout species composition and relative abundance (%) at the Lorenzo electrofishing section, South Fork Snake River, 1987-1999. Total individual fish captured during mark and recapture runs are in parentheses. Results are from MR5 database for all sizes of fish.

Year	Cutthroat trout	Rainbow trout	Brown trout	Lake trout	Kokanee	Total
1987	38 (203)	<1 (2)	61 (325)	0 (0)	0 (0)	99 (530)
1988	36 (210)	1 (6)	63 (363)	0 (0)	0 (0)	100 (579)
1989	34 (191)	1 (3)	65 (362)	0 (0)	0 (0)	100 (556)
1990	38 (288)	<1 (2)	62 (471)	0 (0)	0 (0)	100 (761)
1991	37 (359)	1 (6)	63 (610)	0 (0)	0 (0)	101 (975)
1993	37 (342)	2 (15)	62 (572)	0 (0)	0 (0)	101 (929)
1995	32 (441)	1 (9)	67 (917)	0 (0)	0 (0)	100 (1,367)
1999[a]	23 (331)	<1 (7)	76 (1,093)	0 (0)	0 (0)	99 (1,431)

[a] Major habitat changes with spring, 1997, runoff.

Appendix I. Mean total length and quality stock density (QSD) of trout captured at the Lorenzo electrofishing section, South Fork Snake River, 1987-1999. Total individual fish captured during mark and recapture runs equals n. QSD=(number ≥406 mm/number ≥203 mm) x 100. Results are from MR5 database for all sizes of fish.

	Cutthroat trout			Rainbow trout			Brown trout			All trout[a]		
Year	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)	n	Mean (mm)	QSD (%)
1987	203	325	6.1	2	290	0.0	325	329	19.6	530	327	14.3
1988	210	332	9.8	6	311	0.0	363	309	22.0	579	317	17.2
1989	191	331	19.2	3	341	0.0	362	301	35.2	556	311	28.7
1990	288	297	9.8	2	512	100.0	471	257	23.2	761	273	17.4
1991	359	301	12.9	6	303	0.0	610	232	10.1	975	258	11.2
1993	342	325	5.3	15	294	15.4	572	261	13.1	929	285	9.9
1995	441	317	13.7	9	325	11.1	917	234	15.4	1,367	261	14.6
1999[b]	331	334	8.0	7	350	0.0	1,093	272	7.8	1,431	287	7.8

[a] Includes lake trout and kokanee.
[b] Major habitat changes with spring, 1997, runoff.

Appendix J. Electrofishing statistics for the Lorenzo section, South Fork Snake River, 1987-1999. Results are from MR5 database for all sizes of fish.

	Cutthroat trout				Rainbow trout				Brown trout				All trout[a]			
Year	M[b]	C[b]	R[b]	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)
1987	146	63	6	10	2	0	0	0	232	105	12	11	380	168	18	11
1988	133	90	13	14	4	2	0	0	250	136	23	17	387	228	36	16
1989	127	77	13	17	1	2	0	0	257	127	22	17	385	206	35	17
1990	208	92	12	13	2	0	0	0	342	152	23	15	552	244	35	14
1991	199	177	17	10	0	6	0	0	363	294	47	16	562	477	64	13
1993	144	216	18	8	7	8	0	0	277	322	27	8	428	546	45	8
1995	265	198	22	11	4	5	0	0	420	541	44	8	689	744	66	9
1999[c]	194	163	26	16	3	4	0	0	515	634	56	9	712	801	82	10

[a] Includes lake trout and kokanee.
[b] M=number of fish marked on marking run; C=total number of fish captured on recapture run; R=number of recaptured fish on recapture run.
[c] Major habitat changes with spring, 1997, runoff.

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Appendix K. Estimated abundance (N) of age-1 and older cutthroat trout (≥102 mm), rainbow trout (≥102 mm), brown trout (≥152 mm), and all trout (≥102 mm) at the Lorenzo electrofishing section, South Fork Snake River, 1987-1999. Results are from MR5 database and analysis using the log-likelihood estimator. Standard deviations are in parentheses.

First marking date	Cutthroat trout		Rainbow trout		Brown trout		All trout[a]	
	N/section	N/km	N/section	N/km	N/section	N/km	N/section	N/km
9/29/87	1,897 (490)	395	NUE[b]	NUE	2,548 (392)	531	4,657 (476)	970
10/4/88	896 (116)	187	NUE	NUE	1,441 (215)	300	2,539 (239)	529
10/13/89	1,125 (236)	234	NUE	NUE	992 (98)	207	3,250 (288)	677
10/3/90	1,462[c] (351)	305[c]	NUE	NUE	1,309 (241)	273	4,554 (360)	949
9/18/91	2,136 (356)	445	NUE	NUE	1,752 (138)	365	4,575 (319)	953
9/23/93	2,254 (376)	470	NUE	NUE	2,740 (259)	571	5,822 (357)	1,213
10/2/95	2,657 (282)	554	NUE	NUE	3,254 (250)	678	7,617 (350)	1,587
9/28/99[d]	1,539 (195)	321	NUE	NUE	5,618 (396)	1,170	7,130 (357)	1,485

[a] Includes lake trout and kokanee.
[b] NUE = no unbiased estimate possible as R ≤ 3 (Ricker 1975).
[c] Modified Peterson rather than log-likelihood estimate.
[d] Major habitat changes with spring, 1997, runoff.

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-24

Project II: Technical Guidance | Subproject II-G: Upper Snake Region

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

Technical guidance was provided to federal, state, county, municipal, and private agencies and entities upon request. Technical guidance was also provided to organized sportsmen's groups, conservation organizations and private citizens in the form of fish pond development, stocking and management advice, funding requests and project feasibility opinions, and various conservation and educational programs.

Upper Snake Region fisheries management staff provided technical assistance and guidance to the following government agencies and private groups:

Bingham County
Henrys Fork Foundation
Island Park Sportsmen Association
Sheridan Creek Restoration Committee
Henrys Fork Watershed Council
Henrys Fork Foundation
Upper Snake River Fly Fishers
Snake River Cutthroats (TU chapter)
U.S. Fish and Wildlife Service
Jackson National Fish Hatchery
U.S. Forest Service
U.S. Bureau of Land Management
City of Rexburg
North Fork Reservoir Company
Palisades Creek Canal Company
South Fork WAG
Fall River Rural Electric Cooperative
The Nature Conservancy
HFWC Water Quality SubCommittee
Region 6 Wildlife Council
Idaho Department of Parks and Recreation
Idaho Department of Water Resources
Idaho Department of Lands
U.S. Bureau of Reclamation
Idaho Water Resource Board
City of Idaho Falls
Teton Regional Land Trust
Wyoming Game and Fish Department
INEEL
Bonneville County
Fremont County
Henrys Lake Foundation
Idaho Division of Environmental Quality
U.S. Natural Resources Conservation Service
One Fly Committee
PacifiCorp
Idaho Fish and Wildlife Foundation
HFWC Cutthroat Trout SubCommittee

Fisheries staff responded to numerous requests for technical assistance and permit processing by private pond owners. Particular attention was given to private pond permit applications in the South Fork Snake River, Willow Creek, Teton River and Henrys Lake watersheds, where native Yellowstone cutthroat trout *Oncorhynchus clarki* management goals might conflict with private requests to stock rainbow trout *O mykiss* in those watersheds. The regulation of fish stockings in private ponds is a growing issue requiring an increasing amount of staff attention.

We gave numerous informational presentations to sporting groups and responded to public concerns and questions about cutthroat trout conservation measures implemented in the region.

Regional fishery management personnel contributed over 100 man-days to technical guidance requests in 1999.

Author:

Mark Gamblin
Regional Fisheries Manager

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-24

Project IV: Population Management Subproject IV-G: Upper Snake Region

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

In October 1999, approximately 270 sport fish including 17 cutthroat trout *Oncorhynchus clarki*, one rainbow trout *O. mykiss* - cutthroat trout hybrid, 153 brown trout *Salmo trutta*, 153 lake trout *Salvelinus namaycush*, and less than 100 mountain whitefish *Prosopium williamsoni* were salvaged from the Palisades Dam stilling basin and released to the South Fork Snake River immediately below the stilling basin. The number and size distribution of lake trout sampled again confirm this species is reproducing naturally in Palisades Reservoir. Personnel from the US Bureau of Reclamation (BOR) assumed responsibility for the salvage effort under the direction of Idaho Department of Fish and Game (Department) regional fisheries management personnel.

Golden Lake and the remainder of the Thurmon Creek drainage upstream were treated with Fintrol (Antimycin A) to eradicate populations of rainbow trout and brook trout *S. fontinalis*, preparatory to restocking those waters with Yellowstone cutthroat trout *O. clarki bouvieri*.

Authors:

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Regional Fisheries Manager

INTRODUCTION

In addition to routine hatchery fish stocking activities, a variety of fish population management situations require regional attention by fisheries management personnel. Annual maintenance of the Palisades Dam spill gates requires the stilling basin to be drained, stranding hundreds of fish. The Idaho Department of Fish and Game (Department), US Bureau of Reclamation (BOR), and volunteers routinely salvage and move stranded game fish to the main river channel.

Golden Lake / Thurmon Creek Renovation

Background

In 1997, the Native Trout Subcommittee of the Henrys Fork Watershed Council began work to identify and prioritize waters in the upper Snake River where Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* populations could be enhanced or reintroduced. The committee identified Thurmon Creek and Golden Lake, within the Harriman State Park and wildlife sanctuary, as a possible site for reintroduction. Nonnative rainbow trout *O. mykiss* and brook trout *Salvelinus fontinalis* were the only trout species present in the drainage at that time, and no angling is permitted in the drainage. Because in most cases Yellowstone cutthroat trout do not persist over time with rainbow and brook trout populations, near-complete eradication of the existing fish community was considered necessary prior to reintroducing cutthroat trout.

Treatment Area

The headwaters of Thurmon Creek originate at the base of Thurmon Ridge north and west of Harriman State Park (Figure 1). Three separate spring complexes give rise to West, Middle, and East Thurmon creeks. West and Middle Thurmon creeks flow directly into Golden Lake. A small, unnamed spring complex to the southwest also flows directly into the lake. An irrigation diversion just above the mouth of Middle Thurmon Creek is currently inoperable. East Thurmon Creek is completely diverted into an irrigation canal near the lake. The canal follows the east shore of the lake, and is connected to the lake only by a culvert near the dam. When Golden Lake is full, virtually all of the East Thurmon Creek flow remains in the canal and is used for pasture irrigation and stock watering on Harriman State Park. During spring runoff, water in the canal can reach and flow into the Henrys Fork.

Golden Lake covers approximately 22 ha at full pool, with a maximum depth of less than 3 m. Volume at full pool is about 221,940 m^3. Dense aquatic vegetation is present throughout the lake. Below Golden Lake, Thurmon Creek flows into Silver Lake, which drains into the Henrys Fork. The entire Golden Lake / Thurmon Creek drainage lies within the Harriman Wildlife Sanctuary; as a result, no angling is permitted.

Although Yellowstone cutthroat trout were the only trout native to the drainage, they have likely been absent for at least 50 years. The fish community prior to treatment was comprised of native redside shiner *Richardsonius balteatus*, long-nosed dace *Rhinichthys*

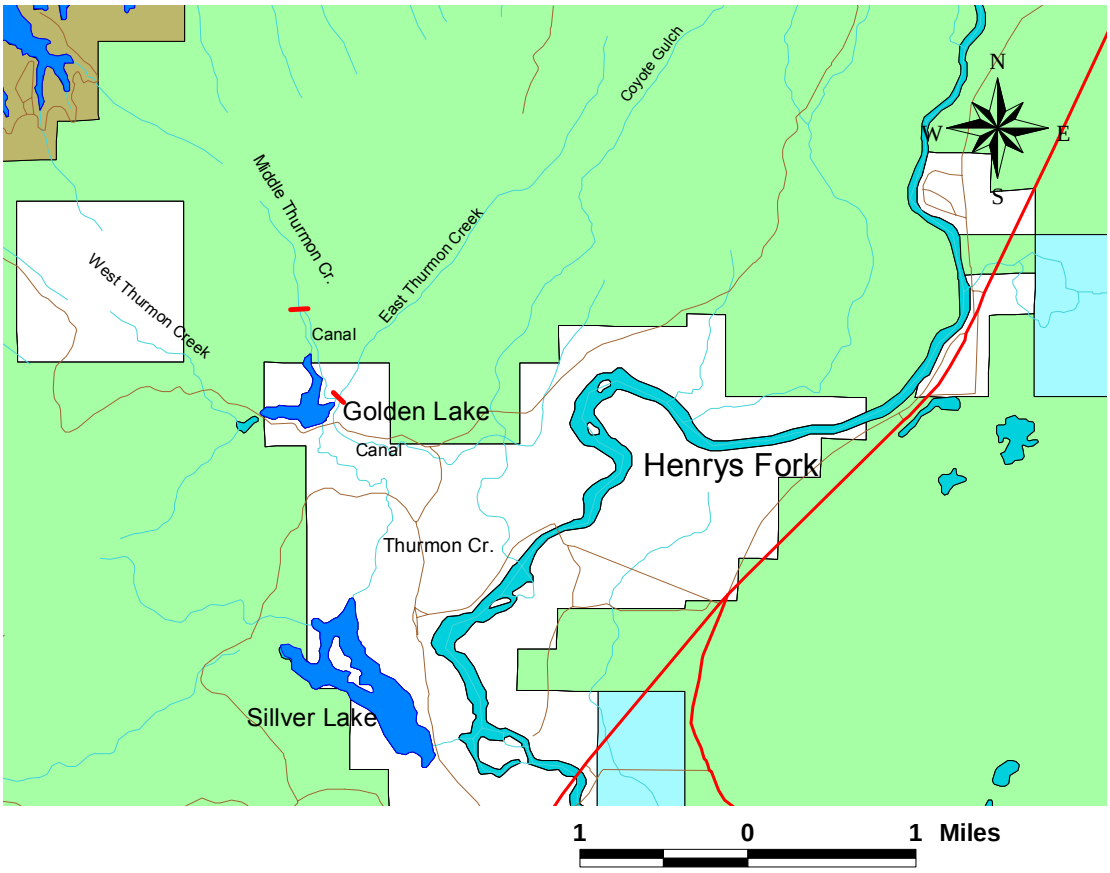

Figure 1. Map of the Thurmon Creek drainage, Idaho, including Golden and Silver lakes.

cataractae, and sculpin *Cottus spp.,* plus introduced naturalized populations of rainbow and brook trout. In late summer and early fall, brook trout and sculpin were the predominant species in tributaries, while all species were present in the lake.

OBJECTIVES

1. Prevent wasteful loss of public game fish resources, where cost-effective and practical.

2. Continue to provide specialty fish angling opportunities where feasible and appropriate.

3. Restore Yellowstone cutthroat trout to the Thurmon Creek drainage.

METHODS

Palisades Reservoir Stilling Basin Salvage

Annual fall maintenance and repair of the Palisades Dam stilling basin by BOR personnel was coordinated with fish salvage efforts as in previous years. The maintenance and repair work requires shutting the spill gates and draining the stilling basin immediately below the gates, stranding fish in the drained stilling basin. Fish salvage operations were conducted on October 13, 1999, with the assistance of BOR personnel, and Department reservists and volunteers.

Stranded fish were crowded with a 50 m beach seine and captured with backpack electrofishing equipment. Gamefish and nongame fish were immediately sorted and trout and mountain whitefish *Prosopium williamsoni* were carried to the river in buckets and released. Yellowstone cutthroat trout were examined for fin clips, denoting hatchery catchables stocked in Palisades Reservoir.

Golden Lake / Thurmon Creek Renovation

Treatment Preparations

Prior to the antimycin treatment, flows were measured in each spring source and in the mainstem of each tributary. Travel time for water from each spring source to reach the lake was measured by adding fluoroscene dye and following its progression downstream. Fisheries staff used a digital meter to measure pH in the mainstem of each tributary, and measured temperatures at the spring source for each.

To assure an accurate estimate of the elevation-volume relationship for Golden Lake, calculations were contracted out to the engineering firm that had constructed a morphometric map for the lake in 1992. Estimates of volume at one foot intervals in elevation were provided.

To prevent nonnative fish from recolonizing the drainage after the treatment, permanent fish barriers were installed on the three outlets of Golden Lake Dam, and also in the east Thurmon Creek canal approximately 400m downstream from the dam. All barriers were self-cleaning grates constructed with 18 mm steel pipe with 12 to 25 mm gaps between pipes.

Three weeks prior to the treatment, Golden Lake was drawn down approximately three feet to kill aquatic vegetation around the periphery. The lake was then filled and allowed to spill over the spillway for several days to flush vegetation. Immediately prior to the treatment, the lake was again drawn down to approximately 12 to 14 ha surface area and 92,000 m^3. This level is below normal spillway height and the only discharge from the dam was through a gated culvert approximately 15 m east of the spillway.

To minimize risks to non-target fish outside the treatment area, a temporary picket weir was installed approximately two km below Golden Lake dam. Fish were salvaged in Thurmon Creek between the dam and the weir using two backpack shockers and a crew of 12-15 volunteers. A total of 40-50 adult rainbow and brook trout and over 1,000 juvenile trout were hauled to the Henrys Fork and released. Immediately prior to the treatment, Department and volunteer crews used a drift boat electrofisher in Golden Lake to salvage approximately 170 adult rainbow and brook trout and relocate them to the Henrys Fork.

A detoxification station was constructed below the Golden Lake Dam spillway to neutralize any antimycin that flowed out of the lake. Potassium permanganate ($KmnO_4$) was put into solution with water and pumped into a perforated pipe suspended above the stream, and metered into the outlet with an electric hopper. Target application rate was 2 mg/l, which equated to 122 g/min of $KmnO_4$ per m^3 of stream flow. Two backup detoxification stations (100 l drums filled with concentrated $KmnO_4$ solution) were prepared, one just downstream from the hopper and one at the picket weir site.

Antimycin Treatment and Detoxification

Tributary and lake treatments took place on October 5, with a crew of 22 assisting. All personnel were assigned a specific task for the treatment. Personal safety equipment (chemical gloves, goggles, respirators, Tyvek suits) was provided for any crewmember applying or in the vicinity of antimycin.

To monitor effectiveness of the treatment, small live cages containing 3-5 hatchery rainbow trout were placed at the lower end of each tributary, at two sites in the lake, and in the spillway above the detoxification station. Live cages were retrieved 4-6 hours after the treatment started. Another live cage was placed downstream at the picket weir. These fish were inspected periodically throughout the duration of the treatment.

Before treatments began, the gated culvert on the dam was closed allowing <1m^3 of flow past the dam. Tributary treatments began at 0900 hrs. Target application rate and duration for antimycin in tributaries was 15 μg/l for 3-4 hrs. Constant-rate drip stations were built using standard plastic oil pans and plastic 5-gal buckets. Each bucket was notched with a 25 mm hole in the top lip, and three 12 mm diameter holes drilled one inch below the notch. One 3 mm hole was drilled in the bottom edge of the oil pan. The bucket was then filled with 4 gallons of water and the prescribed amount of antimycin solution. The oil pan was placed on top of the bucket, and the whole apparatus inverted and placed on a platform above the stream. This

provided a relatively constant flow through the 3 mm hole, which lasted approximately 3.0-3.5 h. Antimycin concentration was adjusted for each tributary site based on stream flow at that site. We used a simple formula to calculate volume of stock antimycin solution (10% concentration) to add to each bucket at each site to achieve a constant 15 μg/l application.

Volume antimycin (ml) = 15.1 x flow (cfs) x time (h)

Preliminary treatment tests on East Thurmon Creek indicated that duration of toxicity in the tributaries was approximately 2.5 h. Drip stations were spaced along each tributary so that water travel time between stations did not exceed 1.5 h. Start time of each drip station was staggered so that the antimycin–treated water from each tributary entered the lake at approximately the same time. Total antimycin application for each tributary is provided in Table 1.

Table 1. Characteristics of Golden Lake tributaries, and antimycin treatment protocols for each.

Tributary	Number of primary springs	Total flow (cfs)	pH in mainstem	Number of antimycin drip stations	Total volume (pints) of antimycin used
West Thurmon	5	13.5	8.4	7	3.2
Middle Thurmon	3	8.0	8.0	5	2.0
East Thurmon	2	5.0	8.2	6	3.1

In all visible seeps, springs, and backwaters not treatable with drip stations, antimycin was applied using backpack pesticide sprayers filled with concentrated solution (10 mg/l). Personnel were instructed to spray each seep or spring three times over a period of three hours.

Lake application began at 1200 h, the time at which treated tributary water first reached the lake. The target application rate in Golden Lake was 10 μg/l antimycin. Because the lake was shallow after the drawdown, conventional boat operation was impossible. Therefore, an airboat operator was contracted to treat the lake with an airboat rigged with boom sprayers. Ten liters of 10% stock solution were diluted with water and applied to the lake surface.

Detoxification operations were started at the same time antimycin applications began. We estimated outflow to be <1 m^3/s, and calibrated the $KmnO_4$ hopper accordingly. Discharge from the dam remained at 0.5 m^3/s for over 12 h, at which time water levels reached the spillway and flow below the dam gradually increased. We continued to monitor flows and adjust $KmnO_4$ application for 48 h post-treatment.

Post-treatment Sampling

On October 14, two experimental mesh gill nets were set in Golden Lake. Nets were each fished four hours. On November 17-19, Henrys Fork Foundation (HFF) crews made four

overnight net sets. On November 30, HFF crews used backpack electrofishing gear to sample approximately 4 stream km in West, Middle, and East Thurmon creeks.

RESULTS AND DISCUSSION

Palisades Reservoir Stilling Basin Salvage

A total of 270 trout and less than 100 mountain whitefish were collected from the stilling basin below Palisades Reservoir. Seventeen cutthroat trout, one rainbow-cutthroat trout hybrid, 153 brown trout, 153 lake trout *Salvelinus namaycush* and all mountain whitefish were released into the Snake River below the stilling basin. None of the salvaged cutthroat trout were fin-clipped.

Lake trout in the salvage sample are again evidence that this species is self-sustaining in Palisades Reservoir. Kokanee have not been stocked in the reservoir or the South Fork Snake River drainage above the reservoir since the early 1960s. Lake trout were stocked in Palisades Reservoir until 1991. Most of the salvaged lake trout were too young to be hold-over hatchery fish from previous stockings.

Golden Lake / Thurmon Creek Renovation

Antimycin Treatment and Detoxification

Tributary and lake applications proceeded as planned, with few complications. Use of the airboat in the lake resulted in high turbidity, particularly in the very shallow west end of the lake. Caps on some of the backpack sprayers leaked and had to be repaired. Consequently some small seeps and springs did not receive the complete treatment protocol during the prescribed time frame. Most were sprayed at least twice, however.

Dead and dying fish were observed in the tributaries shortly after treatments began. All live cage fish near the mouths of tributaries were dead when live cages were recovered at approximately 1800 h. Live cage fish in the lake were also dead. Live fish were observed in the lake up to 48 h after the treatment, but all appeared to be suffering ill effects from antimycin exposure. Live cage fish below the dam were also ill but alive up to 48 h post-treatment.

The detoxification station below the spillway was in operation for 48 h. Prior to the lake refilling and spilling, no dead or dying fish were observed in the stream below the dam. The live cage fish at the weir were dewatered when the dam discharge was stopped during the lake treatment. These fish died, but there were no other dead or dying fish in the vicinity.

Post-Treatment Sampling

Gillnetting effort in Golden Lake totaled over 78 net-hours with six sets. No fish were captured. Tributary electrofishing yielded no fish in West or East Thurmon creeks. One brook trout (160 mm) was captured and removed from middle Thurmon Creek just above the diversion.

Although it appears the renovation was largely successful, additional sampling in Golden Lake and Thurmon Creek in 2000 is warranted prior to proceeding with Yellowstone cutthroat trout introductions.

RECOMMENDATIONS

1. Continue monitoring efforts for fin-clipped trout from Palisades Reservoir in Palisades Dam stilling basin.

2. Complete additional sampling in Golden Lake and Upper Thurmon Creek to evaluate success of renovation. Re-stock with genetically pure Yellowstone cutthroat trout from Henrys Lake and Tygee Creek.

1999 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-24

Project III: Habitat Management Subproject III-G: Upper Snake Region

Contract Period: July 1, 1999 to June 30, 2000

ABSTRACT

Regional personnel conducted routine maintenance and repair operations on Henrys Lake riparian fence and irrigation diversion fish screens and Palisades Creek and Burns Creek irrigation diversion fish screens.

Idaho Department of Fish and Game Engineering Bureau work crews completed construction of a new irrigation diversion structure and fish ladder on Palisades Creek. This structure will be used to manage escapement of spawning trout from the South Fork Snake River into Palisades Creek to conserve Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* genetic integrity in the South Fork Snake River.

The Department Engineering Bureau work crews completed a stream channel stabilization project on Sellars Creek. The Sellars Creek project restores passage for spawning Yellowstone cutthroat trout from Willow Creek to upper Sellars Creek.

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INTRODUCTION

Since the early 1980s, the Upper Snake Region fisheries management program has worked with local ranchers and Henrys Lake Foundation to improve Henrys Lake tributary spawning and rearing habitat; provide fish passage around in-stream barriers; and reduce cutthroat trout *Oncorhynchus clarki* fry losses to irrigation diversions. These projects include riparian fences to control livestock damage, re-establishment of riparian vegetation communities, and irrigation diversion fish screens. Each project is designed to maintain or increase the significant gains that have been achieved in the last 16 years towards restoring and enhancing cutthroat trout spawning and recruit production for the Henrys Lake fishery.

The Department, in cooperation with local landowners and the Bureau of Reclamation (BOR) has also installed, operated, and maintained two irrigation diversion screens on Burns Creek and Palisades Creek, two important South Fork Snake River cutthroat trout spawning tributaries. Under the terms of an agreement between the Department, BOR, and the Palisades Canal Company, the Department is responsible for the replacement of the original Palisades Canal water control structures. This cooperative agreement facilitated construction of the fish screen on the Palisades Canal. The Burns Creek fish screen was installed in 1981 under a cooperative agreement between the Department, Targhee National Forest and the Fullmer family, holders of the Burns Creek Canal water rights. Under this agreement, the Department is responsible for insuring that a reliable supply of irrigation water is provided beyond the point of the fish screen. Any and all maintenance and repair to the canal necessary to meet that obligation is the sole responsibility of the Department so long as the fish screen remains in operation. Construction of a permanent water diversion structure with a buried delivery pipe to the fish screen was identified as a permanent, low maintenance solution to this responsibility.

In 1988, Regional fisheries management personnel constructed approach pools and installed angle iron fish ladders in culverts crossing Sellars Creek and Mill Creek, tributaries to Willow Creek. These projects were designed to facilitate cutthroat trout spawning migrations from Willow Creek to spawning and rearing habitat in upper Sellars and Mill creeks. These endeavors were accomplished as cooperative projects with volunteer assistance from local anglers and a Boy Scout Troop. The Sellars Creek culvert fish ladder, in the Wolverine Road crossing culvert and at the upper end of the riparian fence exclosure, was severely damaged by flood flows in 1996 and completely blown out during flood flows in 1997. Re-construction of the Sellars Creek channel below the Wolverine Road crossing was necessary to permanently restore fish passage beyond that point.

In 1990, Department personnel constructed two riparian exclusion fences on Sellars Creek to rehabilitate and protect riparian habitat from uncontrolled cattle grazing. Grazing is permitted only in the fall on this section of the LDS Church-owned ranch property. Approximately 1.6 km of fence on both sides of Sellars Creek was constructed on the LDS Stake Farm between the Blackfoot Reservoir Road and the Wolverine Road. The second fence was constructed on privately owned property approximately 1.6 km above the Stake farm fence. The property owner maintains the fence on private property. Maintenance of the Stake farm fence is the responsibility of Upper Snake Region personnel.

OBJECTIVES

To obtain current information for fishery management decisions on rivers and streams, including angler use and success, harvest and opinions, fish population characteristics, spawning success, habitat characteristics, return-to-the-creel for hatchery trout, and to develop appropriate management recommendations.

1. Maintain existing riparian fence and irrigation diversion fish screen facilities on Henrys Lake and South Fork Snake River tributaries.

2. Complete construction of the Palisades Creek irrigation diversion structure.

3. Develop remedial measures for non-functional culvert fish ladders on Sellars Creek and Mill Creek.

1999 ACTIVITIES

Henrys Lake

The Henrys Lake tributary riparian fence and fish screen project operated without significant problems in 1999. Several fish screens have been scheduled for maintenance or repair over the next several years. Additionally, the Duck Creek middle fence will require reconstruction in the near future.

South Fork Snake River Tributaries

Palisades Creek

A cost-share agreement was developed between the BOR, Trout Unlimited and the Palisades Creek Canal Company to replace the Palisades Creek canal diversion with a permanent diversion and fish ladder structure. The Department Engineering Bureau work crews completed one-half of the new irrigation diversion structure construction and accomplished all of the erosion damage repair work to the fish screen foundation in 1998. The remainder of the irrigation diversion structure construction was completed in November 1999.

Rainey Creek

Construction of the canal diversion and fish ladder on Rainey Creek was completed in October 1997. The facility has been in operation for the South Fork Snake River spring spawning run since the 1998 irrigation season. Regional fisheries management personnel will continue collecting data on rainbow *Oncorhynchus mykiss* and cutthroat trout spawning escapement at the fish ladder. This data will help develop a conservation management strategy

for South Fork Snake River Yellowstone cutthroat trout. The Rainey Creek drainage will be managed solely for Yellowstone cutthroat trout production. To achieve this, some modification of the diversion structure will be necessary to ensure that fish passage can be completely blocked or selectively controlled at the diversion structure. Fisheries staff will continue to work with the Department's Engineering Bureau to make the necessary adaptations to the diversion and fish ladder structure by the spring of 2001.

Burns Creek

The Engineering Bureau and Regional fisheries management staff began design and planning for construction of a permanent water diversion structure and buried delivery pipe that will ensure irrigation water delivery and provide for fish passage and fish trapping capability at this site on Burns Creek.

Willow Creek Tributaries

Sellars Creek

Engineering Bureau personnel accomplished the initial survey and design work for re-construction of a permanent approach pool to the culvert fish ladder on Sellars Creek in 1997. Materials were procured and the project completed by the Engineering Bureau in November 1999. Spawning cutthroat trout escaping from Willow Creek now have permanent access to over 20 miles of spawning and production habitat in Sellars Creek above the Wolverine Creek road crossing.

RECOMMENDATIONS

1. Continue Sellars Creek fish habitat maintenance program with Shelley High School.

2. Modify the Palisades Creek canal diversion/fish ladder to provide for fish trapping capability and control of upstream fish movement.

3. Modify the Rainey Creek irrigation diversion structure to provide for fish trapping capability and control of upstream fish movement.

4. Continue to maintain the Burns Creek Canal in 2000 and complete construction of a new diversion structure and pipeline to insure a reliable and constant water supply to the point of the fish screen. Incorporate fish passage and fish trapping features to allow control of upstream fish movement.

5. Replace the Sellars Creek – Wolverine Road crossing culvert (corrugated metal pipe) with a pre-cast concrete box culvert.

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