FISHERY MANAGEMENT INVESTIGATIONS

FEDERAL AID IN FISH RESTORATIONS
1997 JOB PERFORMANCE REPORT
PROGRAM F-71-R-22

Steven M. Huffaker, Director

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, Ririe Reservoir, Henrys Lake**
Job c[1].	**Upper Snake Region Rivers and Streams Investigations-South Fork Snake River**
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PROJECT II.	**TECHNICAL GUIDANCE**
PROJECT III.	**HABITAT MANAGEMENT**
PROJECT IV.	**POPULATION MANAGEMENT**

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1997 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-22

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

Job: a | Title: Mountain Lakes Investigations

Contract Period: July 1, 1997 to June 30, 1998

ABSTRACT

Regional personnel used gillnetting and angling gear to sample fish in Bench, Betty, and Goat lakes in the Copper Basin. Hatchery cutthroat trout *Oncorhynchus clarki* were the only fish species collected. Only 3 fish were sampled in Bench Lake, ranging from 222 to 273 mm. In Betty Lake, 25 fish ranging from 190 to 352 mm were collected. In Goat Lake 8 fish ranging from 350 to 420 mm were sampled. Scales and otoliths were collected from each fish for age and growth analysis. No amphibians were observed.

This was the first year's effort at building a database on fish growth and size structure and amphibian presence/absence in Upper Snake Region mountain lakes. As the database develops we will use the information to modify stocking programs where appropriate.

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1997 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-22

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

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

Contract Period: July 1, 1997 to June 30, 1998

ABSTRACT

Gill net catch composition on Island Park Reservoir in May was 36% Utah chub *Gila atraria*, 31% hatchery rainbow trout *Oncorhynchus mykiss*, 10% wild rainbow trout, 7% splake *Salvelinus namaycush x S. fontinalis* and 5% Utah sucker *Catostomus ardens*, with the remaining catch comprised of brook trout *S. fontinalis*, cutthroat trout *O. clarki spp.,* kokanee salmon *O. nerka*, mountain whitefish *Prosopium williamsoni*, and redside shiner *Richardsonius balteatus*. Nongame fish were 46% of the total gill net catch compared to 83% in 1996. Catch data are not directly comparable to 1992-1996 data due to differences in sampling time.

A randomized creel survey was conducted on Ririe Reservoir from the May 24 opener through October 31. Objectives included evaluating relative return of differentially marked hatchery rainbow trout catchables planted from Nampa and Hagerman state fish hatcheries. Creel clerks contacted 412 anglers who fished a total of 1,069 hours, caught 883 fish of which 427 were harvested. Total catch rate was 0.83 fish/h and harvest rate was 0.40 fish/h. Harvest composition from the creel survey was 59% hatchery rainbow trout, 23% yellow perch *Perca flavescens*, 13% kokanee salmon, and 4% wild rainbow trout. Although stocked in equal proportions, Nampa Hatchery catchables returned to the creel at a significantly ($p<0.05$) higher rate than Hagerman Hatchery catchables.

On June 13, volunteers from the Eagle Rock Bass Masters collected 241 largemouth bass *Micropterus salmoides* from southwest Idaho and released them in Ririe Reservoir. The fish ranged in size from 160 mm to 400 mm, and averaged 285 mm. All were given a left pelvic fin clip prior to planting.

Catch data for four bass tournaments on Ririe Reservoir were summarized. Average tournament catch rate for legal smallmouth bass *M. dolomieui* and largemouth bass was 0.14 fish/h.

The 1997 spawning operations at Henrys Lake produced 1,651,182 eyed cutthroat trout eggs, 123,760 eyed rainbow trout x cutthroat trout (hybrid) trout eggs, and 485,913 eyed brook trout eggs. Cutthroat trout in the Hatchery Creek run averaged 441 mm, hybrid trout averaged 472 mm, and brook trout averaged 305 mm. Catch composition in six net nights of gillnetting at Henrys Lake was 42% cutthroat trout, 37% hybrid trout, 17% brook trout, and 4% Utah chub.

Pathology tests did not detect *Myxobolus cerebralis* in Henrys Lake cutthroat trout in 1997. *Myxobolus* spores were detected in one of 12 five-fish brook trout pools and confirmed as *M. cerebralis* by histology.

Angling effort on Henrys Lake in 1997 was estimated at 228,952 hours. Mean season catch rate was 0.54 fish/h, with an estimated total harvest of 32,415 fish. Catch composition was 51% cutthroat trout, 46% hybrid trout, and 3% brook trout. Mean size in the harvest was 427 mm, 434 mm, and 389 mm, respectively.

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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 fish community. On May 16-17, four sinking and three floating experimental gill nets were set at standardized locations. Set and pull times for each net were recorded, and all fish were identified, enumerated, and measured. Relative abundance data were compiled and compared to data from 1993-1996.

Limnology

On August 13 we measured water temperature and dissolved oxygen (DO) profiles at ten stations throughout Island Park Reservoir to describe availability of useable trout habitat during peak summer temperatures. Useable trout habitat was characterized as areas with water temperatures $\leq 18^{o}C$ and DO ≥ 5 ppm. We also sampled zooplankton with standard (140 mm) nets at three sites (off the dam, just west of Bill's Island, and south of Goose Island). Zooplankton samples were not analyzed in time for inclusion in this report.

Ririe Reservoir

Spot Creel Checks and Catchable Trout Evaluation

A randomized roving creel survey was conducted from May 24 through October 31. The primary objective of the survey was to describe relative return to creel of hatchery rainbow trout O*. mykiss* catchables from Hagerman and Nampa state fish hatcheries. Both hatcheries stocked approximately 4,000 fish monthly in May, June, and July at the Blacktail access (Table 1). All Nampa hatchery catchables were given a left pelvic fin clip and Hagerman hatchery fish were given an adipose clip. Creel clerks were instructed to record angler effort and catch, records species and total lengths for harvested fish, and to examine hatchery rainbow trout for fin clips. We did not include angler counts in the creel survey. Comparative performance of Hagerman and Nampa hatchery catchables was assessed based relative contribution to the fishery during the census period.

Table 1. Hatchery trout stocked in Ririe Reservoir in 1997 for evaluation of relative return to creel.

Hatchery	Date	Number stocked	Mean length (in)	Mark
Hagerman	5/05	4,200	8.8	Adipose clip
	6/10	4,100	9.5	Adipose clip
	7/10	4,107	10.2	Adipose clip
Nampa	5/08	4,050	9.7	Left pelvic clip
	6/09	4,040	10.4	Left pelvic clip
	7/07	4,180	11.0	Left pelvic clip

Largemouth Bass Stocking

The Upper Snake Region issued a permit for the Eagle Rock Bass Masters club to collect, transport, mark, and stock largemouth bass *Micropterus salmoides* in Ririe Reservoir. Club members found a source population in southwest Idaho and provided personnel to collect and transport fish on June 12-13. All fish were measured and fin-clipped (left pelvic fin) prior to stocking to assess survival and contribution to the fishery.

Bass Tournaments

Catch data from four bass tournaments were compiled from a combination of mail-in tournament report forms and Region 6 bass angler scorecards. Catch rates for legal (weighed-in) smallmouth bass *M. dolomieu* were summarized for each tournament. Most bass angler scorecard data did not differentiate between largemouth and smallmouth bass captured, so summaries include catch data for both species combined.

Henrys Lake

Spawning Operation

The Hatchery Creek fish ladder was opened on March 5 and remained in operation until April 25. Fish ascending the ladder were identified as cutthroat or hybrid trout and enumerated. A subsample of approximately 10% of each group was measured (fork length - mm). Hybrid trout were produced with cutthroat trout *O. clarki* 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.

On October 3, Ashton Hatchery personnel began a morpholine drip in the Henrys Lake Hatchery spawning facility. From October 10 through November 14 the fish ladder was opened

to collect spawning brook trout *S. fontinalis*. Fish entering the trap were sexed, enumerated, and measured. Spawning methods differed from previous years. Gametes were taken and pooled into groups of five at the spawn house. Oxygen was added to bags containing pooled sperm, and both egg and sperm bags were transported in coolers to Ashton Hatchery. At Ashton Hatchery, ovarian fluid samples were taken, the eggs fertilized, disinfected, enumerated, and placed into Heath stacks for incubation.

Disease samples were taken from both spawning runs. Ovarian fluids were collected from cutthroat trout during spawning at Henrys Lake Hatchery. A mixed-sex group of 60 adult cutthroat trout were also sacrificed for disease testing. All samples were sent to the Eagle Fish Health Laboratory. Brook trout ovarian fluid samples were obtained at Ashton Hatchery prior to egg fertilization, and 50 adult male brook trout were sacrificed from the spawning ladder.

Gillnetting

On May 21-22, gill net samples were collected from six standardized sampling locations (total six net nights). Nets were set at dusk and retrieved the following morning. Captured fish were identified to species, measured, and weighed.

Creel Census

Henrys Lake Hatchery personnel performed a randomized structured creel survey throughout the fishing season. Survey structure followed the protocol of previous creel censuses on Henrys Lake. Creel clerks conducted angler counts and interviews and identified, measured, and recorded clips on all fish observed in the creel. Data were entered and analyzed using the Idaho Department of Fish and Game (Department) creel census program.

Limnology

Late winter (January to March 1998) dissolved oxygen concentrations were assessed at established sampling sites throughout Henrys Lake. In addition, data from previous years were compared to 1998 data to describe trends in winter oxygen depletion at established sampling locations.

Sterile Hybrids

In March 1996, Department research personnel heat-shocked approximately 70,000 rainbow x cutthroat hybrid eggs to induce triploidy (Dillon and Alexander 1997). Another 30,000 hybrid eggs served as controls. All were reared at Ashton Hatchery. Blood work indicated 46% triploidy in treatment groups. Treatment and control fish were given left and right pelvic fin clips, respectively. Two thousand of each group were stocked into the East Harriman Pond in September 1996.

In March 1997, research personnel modified heat-shock treatments and again attempted to produce triploid hybrids. These fish were reared along with controls at Grace Hatchery. One treatment (27°C, 10 minutes after fertilization, 10 minute duration) provided a 70% triploidy rate. Treatment and control fish were given left and right pelvic clips and stocked (2,000 each) into the East Harriman Pond in September 1997.

During August 1997, East Harriman Pond was sampled to assess relative performance of sterile triploid and control diploid hybrids from brood year 1996. A combination of floating experimental gill nets and electrofishing was used to collect fish. Total length and clips of all hybrid trout encountered were recorded, and blood samples were taken to verify ploidy level. Blood samples were sent to Washington State University for analysis.

RESULTS AND DISCUSSION

Island Park Reservoir

Lowland Lake Survey

A total of 371 fish were captured with a combined gillnetting effort of 120 hours. Catch composition included nine species of which sport fish (trout, char, mountain whitefish *Prosopium williamsoni*, and kokanee *O. nerka kennerlyi*) comprised 54% of the total catch. Utah chub *Gila atraria*, Utah sucker *Catostomus ardens*, and redside shiner *Richardsonius balteatus* comprised 46% of the catch. Hatchery and wild rainbow trout comprised over 40% of the sport fish catch, and splake comprised 7% of the catch.

Proportions of nongame fish were considerably lower than those seen in 1996, but our gillnetting data may not be directly comparable between 1996 and 1997 due to temporal differences among sample years. Sampling in 1997 was conducted in May, whereas 1996 sampling occurred in July. Island Park Reservoir does not stratify. However, warmer July water temperatures in 1996 compared to May 1997 may have influenced the higher proportion of nongame to game fish observed in 1996. Stocking allocations in previous years do not appear to explain the changes in 1996 to 1997 gill net sampling data (Table 2).

The 26 splake sampled were from a single stocking of 42,000 fish in October 1995. Mean size at stocking was 178 mm. Size in gill net samples ranged from 240 to 465 mm and averaged 358 mm.

Table 2. Annual total stocking numbers for hatchery trout and kokanee salmon in Island Park Reservoir, 1992 to 1996.

Year	Trout fingerlings[a]	Trout catchables[b]	Kokanee fry
1992	988,972	95,666	142,142
1993	346,928	26,372	200,624
1994	1,275,063	161,841	596,250
1995	827,912	136,500	500,000
1996	1,075,977	55,910	5,000

[a] Includes rainbow, Lahontan cutthroat trout *O. clarki henshawi* and rainbow x cutthroat hybrids.
[b] Includes rainbow trout and splake.

Limnology

Representative temperature and oxygen profiles for August 13, 1997 are presented in Appendix A. The entire water column throughout the reservoir was considered useable trout habitat.

Ririe Reservoir

Spot Creel Checks and Catchable Evaluation

From May 24 through October 31, creel clerks contacted 412 individual anglers in 172 interviews. Anglers fished a total of 1,069 hours, caught 883 fish, of which 427 were harvested. Mean catch rate was 0.83 fish/h and harvest rate was 0.40 fish/h. Effort was comprised of 49% bait, 51% lure, and less than 1% fly-fishing. Harvest composition was 59% hatchery rainbow trout, 23% yellow perch *Perca flavescens*, 13% kokanee salmon and 4% wild rainbow trout. Other fish observed included smallmouth bass (n=6) and splake (n=1).

Of the 93 marked rainbow trout observed in the creel, 32 were from the Hagerman Hatchery and 61 were from the Nampa Hatchery. Nampa Hatchery fish returned to the creel at a significantly higher proportion (Chi-square; $p<0.05$) than the 50:50 stocking ratio, indicating better post-stocking survival in the reservoir or increased vulnerability to angling.

Largemouth Bass Stocking

The Eagle Rock Bass Masters club collected 241 largemouth bass and transported them to Ririe Reservoir. Fish ranged from 160 mm to 400 mm total length and averaged 285 mm. Because all were given left pelvic fin clips, largemouth bass sampled in Ririe in subsequent years should be inspected for clips.

Some eastern Idaho anglers have expressed interest in developing a largemouth bass fishery in the Upper Snake Region, despite the poor growth potential and irregular recruitment expected in our waters. Monitoring the population dynamics of this newly developing fishery will be necessary to adequately evaluate success of these fish in the reservoir, and to communicate results of any stockings to the public in general.

Bass Tournaments

Bass angler scorecards and tournament report forms were summarized for four tournaments from May 11 through September 28, 1997 (Table 3). Most anglers did not differentiate between largemouth and smallmouth bass on the bass angler scorecards, so summary data include both species. Average tournament catch rate for legal (weighed-in) fish ranged from 0.04 to 0.33 fish/h and averaged 0.14 fish/h. Total bass catch rates (including sub-legal fish) averaged 1.14 fish/h.

Table 3. Summary of 1997 bass tournament effort and catch for Ririe Reservoir.

Tournament dates	Number of Anglers	Total Hours Fished	Number of Sub-legal Fish caught	Number of Legal fish Weighed in	Catch rate For legal fish (f/h)
5/11	9	74	2	3	.04
6/29	38	604	511	71	.12
9/07	14	127	255	26	.20
9/28	7	61	110	20	.33
TOTALS	68	866	878	123	.14

Henrys Lake

Spawning Operation

A total of 5,844 cutthroat trout ascended the spawning ladder between March 5 and April 24 and were comprised of 52% males and 48% females. Hybrid trout totaled 2,380 fish, of which 27% were males and 73% were females. Mean length for male and female cutthroat was 443 mm and 439 mm, respectively, while overall mean length was 441 mm. Hybrid trout males and females averaged 480 mm and 468 mm, respectively, with a combined mean length of 472 mm.

Cutthroat trout green eggs totaled 2,218,680 from 1,047 females for an average fecundity of 2,119 eggs per female. Eyed cutthroat eggs totaled 1,651,182 for an overall eye-up rate of 74%.

Hybrid trout green eggs totaled 1,611,800 from 907 cutthroat trout females for an average fecundity of 1,777 eggs per female. Eyed hybrid trout eggs totaled 1,236,760 for an overall eye-up rate of 77%.

From October 10 through November 14, a total of 1,672 brook trout ascended the fish ladder, with a composition of 55% males and 45% females. Male and female brook trout length averaged 293 mm and 314 mm for a combined average of 305 mm.

Brook trout green eggs totaled 641,234 from 401 females for an average fecundity of 1,599 eggs per female. Eyed eggs totaled 485,913 for an overall eye-up rate of 76%.

Cutthroat trout ovarian fluid disease samples showed no viral pathogens and a low level of potential bacterial pathogens. In the 12 pooled samples of adult cutthroat trout, no *Myxobolus* spores were detected by the digestion method, although this population was confirmed positive for *M. cerebralis* in 1996.

No pathogens were detected from brook trout ovarian samples. In adult brook trout samples, *Myxobolus* spores were detected by the digestion method in one of 12 pooled samples. For the first time, histology was able to confirm the species as *M. cerebralis*.

Gillnetting

A total of 119 fish were collected in the six net nights (total soak time 112.5 hr). Catch composition was 42% cutthroat trout, 37% hybrid trout, and 17% brook trout, and 4% Utah chub. Cutthroat trout ranged from 220 mm to 510 mm total length, hybrids 100 mm to 510 mm, and brook trout 130 mm to 420 mm. Brook trout contribution to gill net catches increased from 3.4% in 1995 and 9.4% in 1996. Sample size for Utah chub was small (n=5) but appeared to contain two age classes, with two fish 150 to 160 mm and three fish 250 to 270 mm.

Creel Census

Anglers fished an estimated 228,952 hours on Henrys Lake in 1997. Mean season catch rate was 0.54 fish/h. An estimated 32,415 fish were harvested with harvest comprised of 51% cutthroat, 46% hybrids, and 3% brook trout. Mean size in the harvest was 427 mm, 434 mm, and 389 mm, respectively. Additional creel survey statistics are given in Table 4.

Table 4. Summary data for the 1997 creel census on Henrys Lake.

	Effort and catch			
Total angling effort (hrs)	Harvest	Harvest rate (fish/hr)	Catch rate (fish/hr)	% Released
228,952	32,415	0.25	0.54	74%

Harvest composition		
Cutthroat trout	Hybrid trout	Brook trout
51%	46%	3%

	Sizes observed in the creel			
	Mean size (in)	%>20 in	Number >20 in	Total harvest
Cutthroat	16.8	6.8	12	14,810
Hybrid	17.1	20.2	35	14,387
Brook	15.3	9.1>18 in	6 >18 in	1,263

Limnology

Dissolved oxygen data for January to March 1998 are presented in Appendix B. Oxygen levels were sufficient to provide adequate overwintering habitat in Henrys Lake. The aeration system was not used. Within the ranges observed, dissolved oxygen levels declined at a relatively constant rate throughout the January to March monitoring period. Winter oxygen levels also appear to be influenced by water levels going into the winter. In winters following drought years (e.g., 1992, 1993) January-March oxygen levels were consistently lower than in winters following wet years (1997, 1998). We may be able to predict likelihood of winter kill based on January oxygen levels, but further analyses are required to develop this predictor.

Sterile Hybrids

Twenty hybrid trout were sampled from the East Harriman Pond (Table 5). Of these, 12 were from the treatment group and seven were controls. Of the 12 treated fish, seven were confirmed triploid by blood analysis (Paul Wheeler, Washington State University, personal communication). Mean length of confirmed triploids was 277 mm, while mean length of diploids was 260 mm (Table 5).

Sterile triploid hybrids, if they perform as well as normal hybrids, represent a management tool to maintain the trophy component of the Henrys Lake fishery while protecting genetic integrity of the native Yellowstone cutthroat trout. Although the current data suggest no difference in growth, evaluations in the East Harriman Pond should continue through at least 1998. We will also continue to develop heat shock treatments to improve triploidy induction rates. If performance of sterile triploid hybrids is comparable to normal fertile hybrids, all of the hybrid production for Henrys Lake should eventually be heat shocked to produce sterile fish.

Table 5. Summary of sterile rainbow x cutthroat hybrid sampling data from the East Harriman Pond, August 1997.

Fish sample Number	Experimental Group	Confirmed Ploidy level	Total length (mm)
1	treatment	diploid	248
4	control	diploid	263
6	control	diploid	241
7	treatment	diploid	233
11	treatment	diploid	303
13	control	diploid	270
14	treatment	diploid	288
15	treatment	diploid	276
16	control	diploid	250
17	control	diploid	268
18	control	diploid	245
19	control	diploid	241
		mean length	260
2	treatment	triploid	297
3	treatment	triploid	300
5	treatment	triploid	266
8	treatment	triploid	291
9	treatment	triploid	231
10	treatment	triploid	278
12	treatment	triploid	273
		mean length	277

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. Continue monitoring seasonal DO and temperature gradients to describe useable trout habitat.

Ririe Reservoir

1. Continue evaluation of experimental splake stocking program.

Henrys Lake

1. Continue annual standard gill net surveys to describe population trends. Use additional gillnetting and/or trapnetting to monitor distribution and status of the Utah chub population.

2. Continue experimental sterile hybrid project. Evaluate performance in East Harriman Pond.

3. Use existing winter oxygen data to develop a predictor of winter kill risk based on January dissolved oxygen levels. Utilize winter aeration operations manual to provide guidelines for use of aeration system.

LITERATURE CITED

Dillon, J.C., and C.B. Alexander. 1997. Hatchery trout evaluations. Job Performance Report, Project F-73-R-19. Idaho Department of Fish and Game, Boise.

APPENDICES

Appendix A. Temperature (°C) and dissolved oxygen (DO; mg/l) profiles at four sites on Island Park Reservoir, August 13, 1997.

	Near dam		SE of Bill's Island		W of Bill's Island		S of Goose Island	
Depth (m)	Water temperature (°C)	Dissolved oxygen (mg/l)	Water temperature (°C)	Dissolved oxygen (mg/l)	Water temperature (°C)	Dissolved oxygen (mg/l)	Water temperature (°C)	Dissolved oxygen (mg/l)
Surface	19.0	7.1	18.9	8.3	19.0	8.2	18.8	7.5
1	18.9	6.9	18.9	8.0	18.9	8.1	18.8	7.4
2	18.5	7.1	18.6	7.8	18.6	8.1	18.7	7.5
3	18.4	7.1	18.5	7.8	18.4	7.6	18.6	7.3
4	18.3	7.1	18.4	7.8			18.2	7.1
5	18.2	6.8	18.4	7.8			18.1	4.5
6	18.1	6.4	18.4	7.6				
7	17.8	5.4	17.7	5.7				
8			17.6	5.4				

Appendix B. Winter 1998 dissolved oxygen concentrations at three standard sampling sites in Henrys Lake.

		Dissolved oxygen (mg/l)		
Location	**Depth (m)**	**January 7**	**January 30**	**March 16**
1 mile south of Pittsburgh Creek	ice bottom	9.3	9.2	7.7
	1	9.1	8.9	7.6
	2	7.5	7.9	5.3
	3	5.9	6.0	3.5
	4	4.0	5.2	1.7
	5	2.6	2.7	0.9
300 yards off county dock	ice bottom	9.4	8.2	5.2
	1	8.7	7.6	4.9
	2	7.4	4.8	4.0
	3	5.6	3.2	1.2
	4	3.2	1.1	0.6
	5	2.2	0.6	0.5
300 yards off Wild Rose	ice bottom	12.0	8.9	7.2
	1	12.0	8.5	7.1
	2	7.4	5.3	4.5
	3	6.5	3.6	2.5
	4	3.1	0.7	0.6
	5	2.4	0.5	0.4

1997 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-22

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ABSTRACT

In the South Fork Snake River, a total of 3,086 individual trout were captured during four days of electrofishing at the Conant section in October 1997. Trout species composition and relative abundance were wild and hatchery cutthroat trout *Oncorhynchus clarki* (54%), wild rainbow *O. mykiss* and hybrid rainbow x cutthroat trout *O. mykiss x O. clarki* (27%), wild brown trout *Salmo trutta* (18%), lake trout *Salvelinus namaycush* (<1%), and kokanee salmon *O. nerka kennerlyi* (<1%). A total of 2,710 individual trout were captured during four days of electrofishing at the Palisades section in September 1997. Trout species composition and relative abundance were wild and hatchery cutthroat trout (55%), wild rainbow and hybrid trout (12%), wild brown trout (33%), lake trout (<1%), and kokanee salmon (<1%).

Brown trout relative abundance at the Conant section has varied from 7% to 19% since 1982, the first year of electrofishing in the South Fork Snake River. Relative abundance at the Palisades section has varied from 4% to 33% since 1987. There is no apparent trend at either section. Cutthroat trout relative abundance at both the Conant and Palisades sections was at an all-time low in 1997. In contrast, rainbow and hybrid trout relative abundance was at an all-time high at Conant but not Palisades.

At Conant, average length was 292 mm for wild and hatchery cutthroat trout, 262 mm for rainbow and hybrid trout, 274 mm for brown trout, and 279 mm for all species combined. Quality stock density (QSD) was 5% for wild and hatchery cutthroat trout, 4% for rainbow and hybrid trout, 13% for brown trout, and 6% for all species combined. At Palisades, average length was 254 mm for wild and hatchery cutthroat trout, 231 mm for rainbow and hybrid trout, 244 mm for brown trout, and 249 mm for all species combined. For wild and hatchery cutthroat trout QSD was 6%, 11% for rainbow and hybrid trout, 5% for brown trout, and 6% for all species combined.

At Conant, estimated density of age 1 and older fish was 160 fish/ha for wild and hatchery cutthroat trout, 87 fish/ha for rainbow and hybrid trout, 52 fish/ha for brown trout, and 276 fish/ha for all species combined. At Palisades, estimated density of age 1 and older fish was 99 fish/ha for wild and hatchery cutthroat trout, 37 fish/ha for rainbow and hybrid trout, 62 fish/ha for brown trout, and 189 fish/ha for all species combined.

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INTRODUCTION AND STUDY AREA

Wild trout populations in the mainstem South Fork Snake River are monitored annually using electrofishing. Four river sections have been electrofished in various years since 1986 (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 this section was sampled in 1982 as well (Moore and Schill 1984). The last major creel census was conducted in 1996 (Schrader et al., in press).

In the mainstem, special regulations restricting harvest of cutthroat trout *Oncorhynchus clarki* were enacted in the reach stretching from the Heise measuring cable to Irwin in 1984 and extended to Palisades Dam in 1988 (Table 1). Based on this success, the Upper Snake restricted cutthroat 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 in the mainstem (but not tributaries) in 1992. The river below the Heise cable is open year-round to fishing, whereas the upper river is closed from December 1 to Memorial Day weekend (Figure 1).

OBJECTIVES

1. Monitor South Fork Snake River wild trout populations in the mainstem by electrofishing. Enter electrofishing data into MR4 computer program for standardized database and analysis. Summarize trout species composition, relative abundance, size structure, average fish length, quality stock density, and density for selected electrofishing sections.

METHODS

Main Stem Electrofishing

During 1997, we electrofished at Conant on October 16, 17, 23 and 27 and at Palisades on September 24-25 and October 1-2 (Figure 1). Two marking run days, one day each at the upper and lower section, were followed by two recapture run days about a week later. As in 1995, the Palisades section was shortened to 5.0 km to avoid running a rapid just below Palisades Creek.

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 150-hp outboard jet. We used pulsed DC current through two boom-and-dangler anodes fixed to the bow while driving downstream. The boat hull was the cathode. The VVP settings were at 200-300 V, 5-7 A, 20% pulse width, and 60 Hz (pulses per second). Measured water temperatures varied from 10^{o}C to 14^{o}C. Flows varied from 2,460 to 7,560 cfs (at Irwin gage; USGS, provisional data).

Table 1. Main stem South Fork Snake River fishing regulations, 1970-1997.

Year	Season	Trout bag & size limit	Special
1970	May 30 - Nov 30	7 lb. + 1 fish, not to exceed 15 fish	Whitefish *Prosopium williamsoni* 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 23/24-Nov 30	Same	Same
1988-1989	May 27/28-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

Table 1. Continued.

Year	Season	Trout bag & size limit	Special
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

Though sections were not blocked at each end, we assumed fish would not move beyond natural habitat boundaries between marking and recapture runs.

We attempted to capture all species and sizes of trout; mountain whitefish and nongame fish were ignored. Fish were anesthetized with MS-222 (tricaine methane-sulfonate), identified, and measured to the nearest millimeter (TL). Incidental fish mortalities were dissected for otoliths using Schneidervin and Hubert's (1986) technique. Brown trout less than 150 mm and all other species less than 100 mm (approximately age 0) were not marked; age 1 and older fish were marked with a caudal fin punch and then released.

Electrofishing data for 1998 were entered and analyzed using the computer program MARKRECAPTURE 4.0 (MR4; MDFWP 1994). General statistical analysis was conducted according to Zar (1984).

We assumed capture probabilities did not vary with species, and we estimated relative abundance using proportions of all individual trout captured. 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 densities (QSD) were estimated using the number of individual fish captured >16 inches divided by the number >8 inches multiplied by 100. Densities were estimated using two methods in the MR4 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).

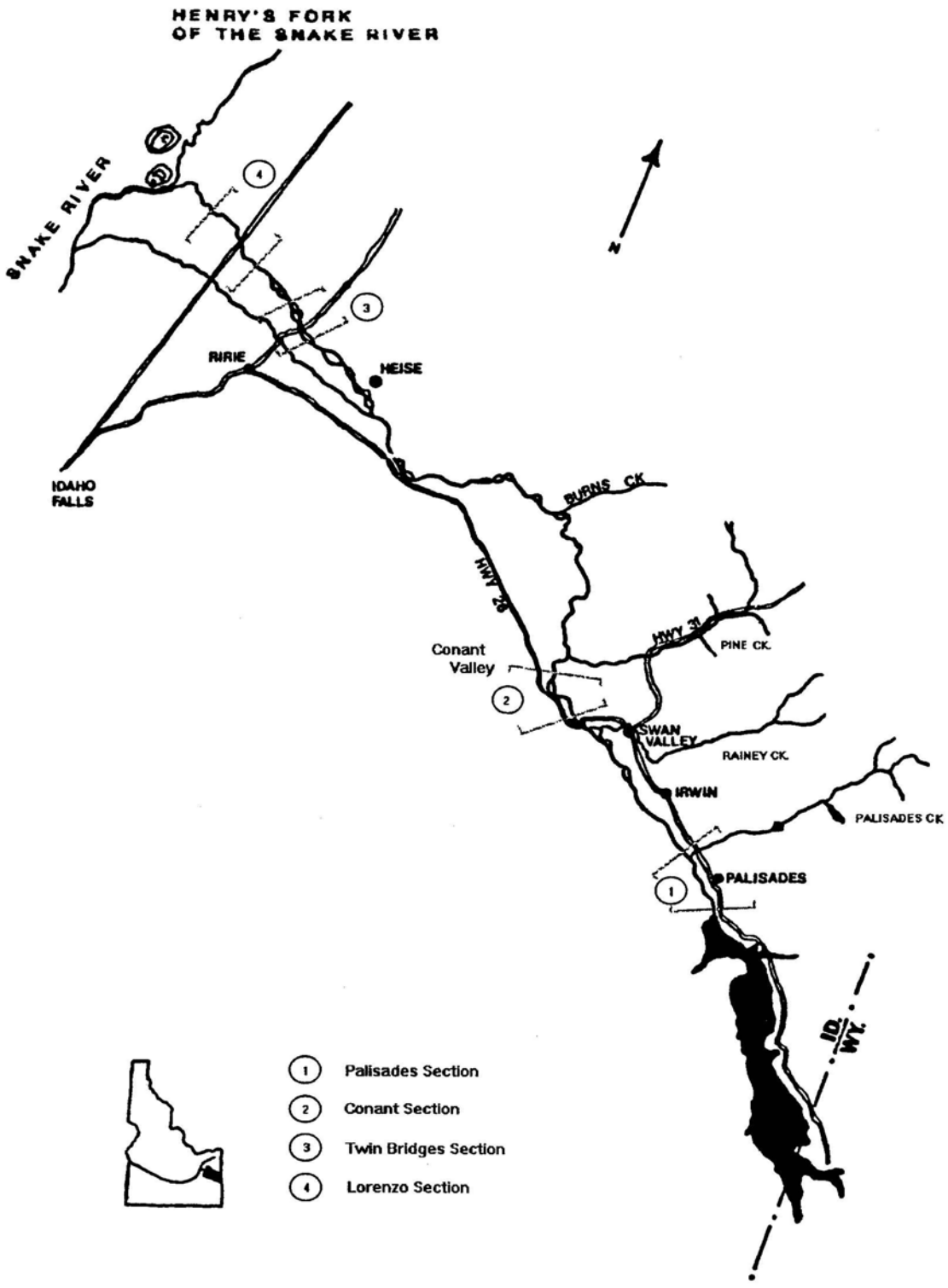

Figure 1. Map of South Fork Snake River showing electrofishing sections.

RESULTS AND DISCUSSION

Main Stem Electrofishing

Conant Section

Trout Species Composition and Relative Abundance-A total of 3,086 individual trout were captured during four days of electrofishing in October 1997. Trout species composition and relative abundance (Figure 2; Appendix A) were wild and hatchery cutthroat trout (55%), wild rainbow and hybrid trout *O. mykiss x O. clarki* (27%), wild brown trout *Salmo trutta* (18%), lake trout *Salvelinus namaycush* (<1%), and kokanee salmon *O. nerka kennerlyi* (<1%). Hatchery cutthroat trout (finespotted), lake trout, and kokanee salmon are flushed from Palisades Reservoir; their numbers may be directly related to the extent of reservoir drawdown (Gamblin et al. 1993). About 1% of the cutthroat trout captured were of hatchery origin.

The proportion of brown trout captured by electrofishing has varied from 7% to 19% since 1982 (Appendix A). There is no apparent trend. The proportion of wild and hatchery cutthroat trout captured by electrofishing is at an all-time low (55%) since electrofishing began in 1982. The proportion of rainbow and hybrid trout is at an all-time high (27%). We view the 1982, 1986, and 1987 data with caution as sampling was conducted in November rather than in October. Further, the section was shortened in 1982 and 1987, and sample sizes were small (n=229 and n=348, respectively).

Size Structure, Average Length, and QSD-Wild and hatchery cutthroat trout length frequency distribution for 1997 shows good representation of what we believe are age 1 fish (152 mm to 254 mm or 6 in to 10 in) and age 2 and older fish (>254 mm or >10 in; Figure 3). Likewise, strong groups of similar-sized age 1 rainbow and hybrid trout (Figure 4) and brown trout (Figure 5) are apparent. However, rainbow and hybrid trout and brown trout length frequency distributions show relatively few age 2 and older fish.

For 1997, average fish length was 292 mm (11.5 in) for wild and hatchery cutthroat trout (n=1,676), 262 mm (10.3 in) for rainbow and hybrid trout (n=840), 274 mm (10.8 in) for brown trout (n=567), and 279 mm (11.0 in) for all species combined (n=3,086; Appendix B). QSD was 4.5% for wild and hatchery cutthroat trout, 4.3% for rainbow and hybrid trout, 12.5% for brown trout, and 6.0% for all species combined. Overall sampling efficiencies in 1997 were comparable to those of past years (Appendix C).

Density-For 1997, using the log-likelihood method, estimated density of age 1 and older fish was 160 fish/ha for wild and hatchery cutthroat trout (Appendix D); 87 fish/ha for rainbow and hybrid trout (Appendix E); 52 fish/ha for brown trout (Appendix F); and 276 fish/ha for all species combined (Appendix G). Age 1 and older fish were considered $\geq$102 mm (4 in) for cutthroat, rainbow, and hybrid trout, and $\geq$152 mm (6 in) for brown trout.

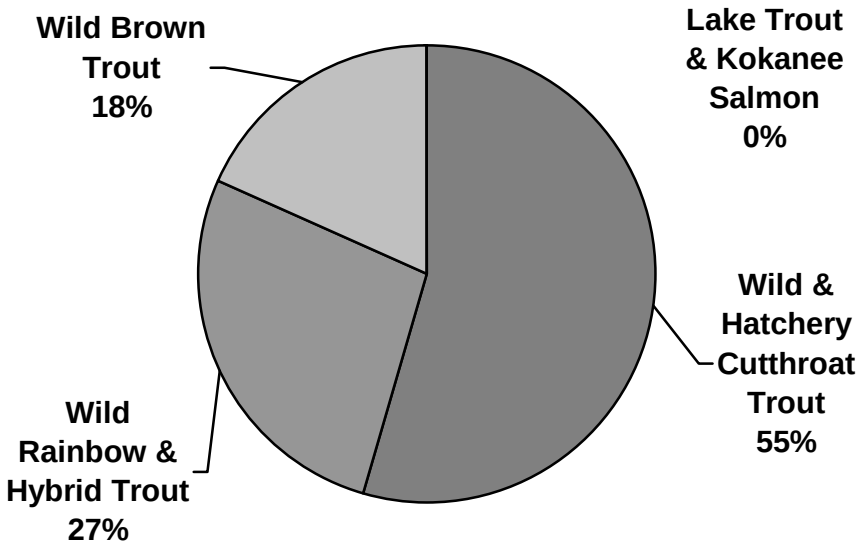

Figure 2. Trout species composition and relative abundance (%) at the Conant electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = 3,086. Results are from MR4 database for all sizes of fish.

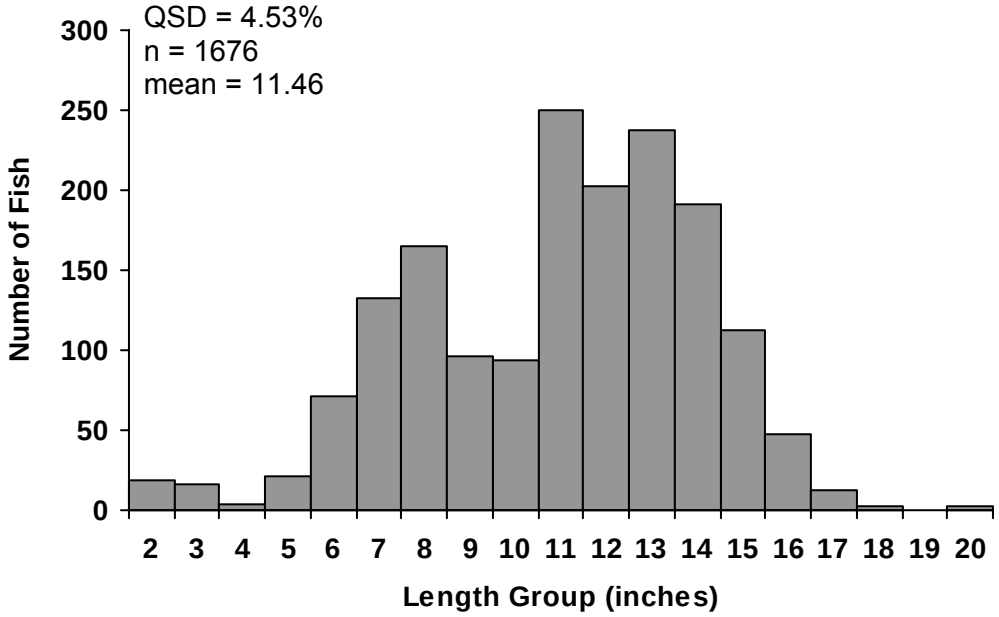

Figure 3. Length frequency distribution of wild and hatchery cutthroat trout captured at the Conant electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

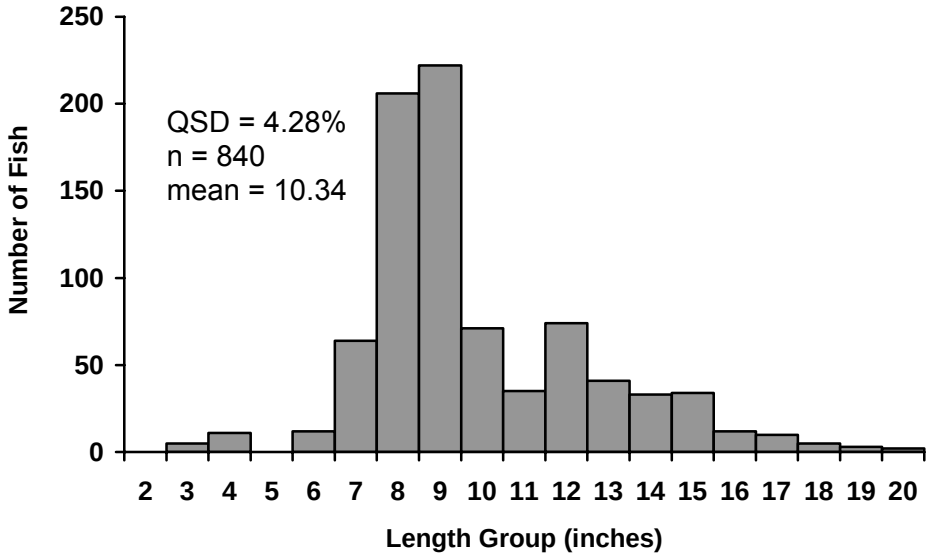

Figure 4. Length frequency distribution of wild rainbow and hybrid trout captured at the Conant electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

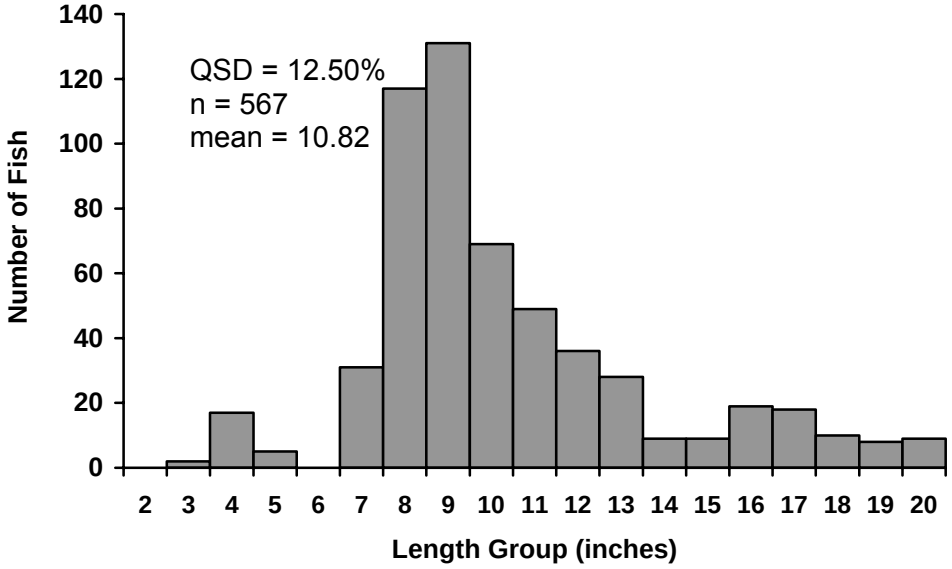

Figure 5. Length frequency distribution of wild brown trout captured at the Conant electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

Palisades Section

Trout Species Composition and Relative Abundance-A total of 2,710 individual trout were captured during four days of electrofishing in September 1997. Trout species composition and relative abundance (Figure 6; Appendix H) were wild and hatchery cutthroat trout (55%), wild rainbow and hybrid trout (12%), wild brown trout (33%), lake trout (<1%), and kokanee salmon (<1%). Hatchery cutthroat trout (finespotted), lake trout, and kokanee salmon are flushed from Palisades Reservoir; their numbers may be directly related to the extent of reservoir drawdown (Gamblin et al. 1993). About half (53%) of the cutthroat trout captured were of hatchery origin.

The proportion of brown trout captured by electrofishing has varied from 4% to 33% since 1987 (Appendix H). Like Conant, there is no apparent trend. The large proportion captured in spring 1987 and fall 1997 may reflect holdover from spawning.

Like Conant, the proportion of wild and hatchery cutthroat trout captured by electrofishing is at an all-time low (55%) since electrofishing began in 1987 (Appendix H). The proportion of rainbow and hybrid trout (12%) fell 21 points from the all-time high (33%) in 1995. We view the 1987 data with caution as sampling was conducted in March rather than September and the sample size was small (n=301).

Size Structure, Average Length, and QSD-Like Conant, wild and hatchery cutthroat trout length frequency distribution for 1997 shows good representation of what we believe are age 1 fish (152 mm to 254 mm or 6 in to 10 in) and age 2 and older fish (>254 mm or >10 in; Figure 7). Likewise, strong groups of similar-sized age 1 rainbow and hybrid trout (Figure 8) and brown trout (Figure 9) are apparent. However, rainbow and hybrid trout and brown trout length frequency distributions show relatively few age 2 and older fish.

For 1997, average fish length was 254 mm (10.0 in) for wild and hatchery cutthroat trout (n=1480), 231 mm (9.1 in) for rainbow and hybrid trout (n=329), 244 mm (9.6 in) for brown trout (n=898), and 249 mm (9.8 in) for all species combined (n=2,710; Appendix I). Overall sampling efficiency in the Palisades reach was 21% (Appendix J). The QSD was 6.3% for wild and hatchery cutthroat trout, 11.0% for rainbow and hybrid trout, 4.9% for brown trout, and 6.2% for all species combined.

Density-For 1997, using the log-likelihood method, estimated density of age 1 and older fish was 99 fish/ha for wild and hatchery cutthroat trout (Appendix K); 37 fish/ha for rainbow and hybrid trout (Appendix L); 62 fish/ha for brown trout (Appendix M); and 189 fish/ha for all species combined (Appendix N). As at Conant, age 1 and older fish were considered $\geq$102 mm (4 in) for cutthroat, rainbow, and hybrid trout, and $\geq$152 mm (6 in) for brown trout.

RECOMMENDATIONS

1. Continue monitoring South Fork Snake River wild trout populations in the mainstem by electrofishing. Analyze Lorenzo data 1987-95.

2. Develop length-weight regressions for each wild trout species using electrofishing data collected in 1994 and 1995. Test for significant spatial (between sections) and temporal (between years) differences. Predict fish weights from measured lengths and estimate biomass and standing crops for all sections and years. Analyze for significant trends.

3. Coordinate with in-house Yellowstone Cutthroat Trout Management Team on management and research guidelines.

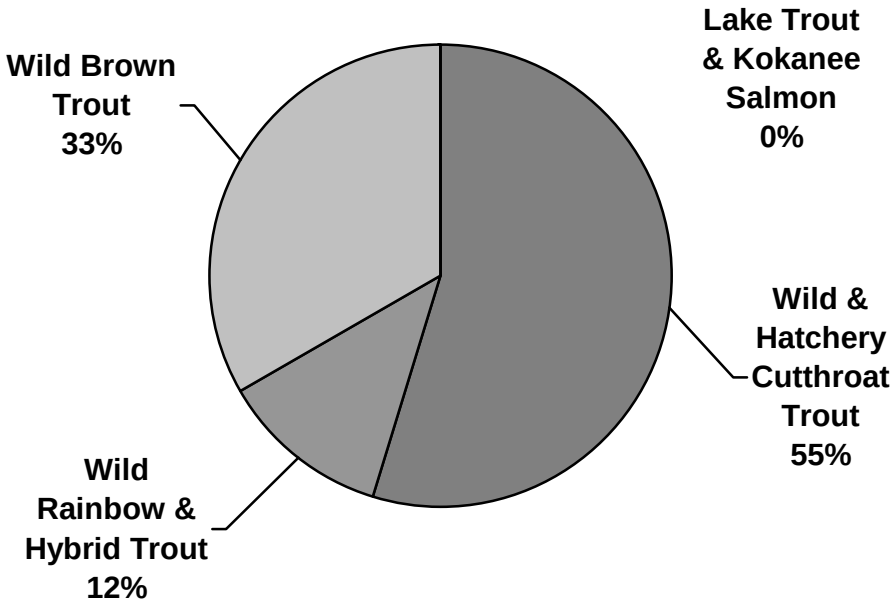

Figure 6. Trout species composition and relative abundance (%) at the Palisades electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = 2,710. Results are from MR4 database for all sizes of fish.

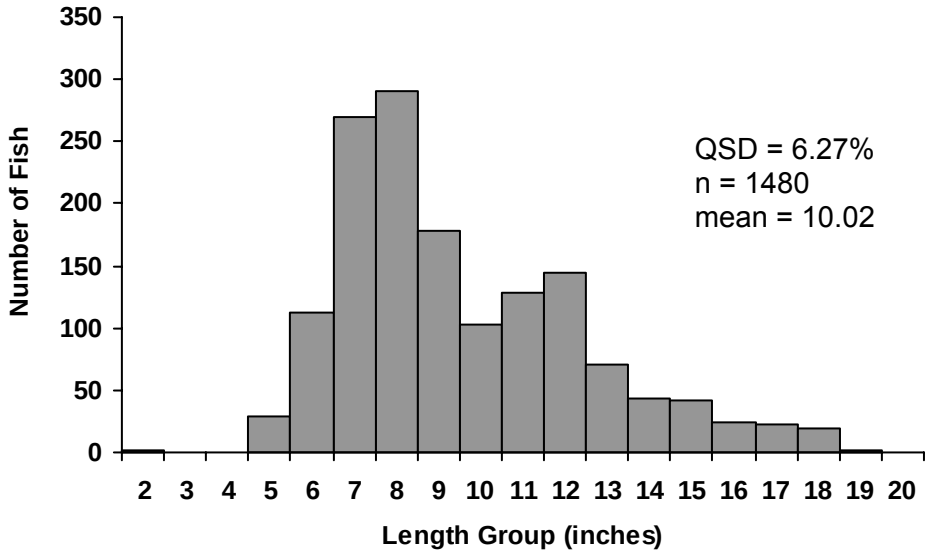

Figure 7. Length frequency distribution of wild and hatchery cutthroat trout captured at the Palisades electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

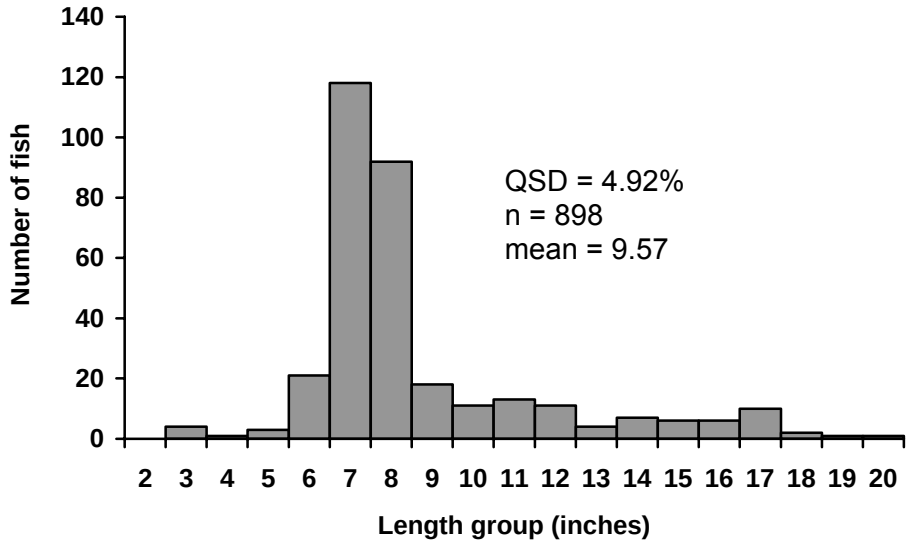

Figure 8. Length frequency distribution of wild rainbow and hybrid trout captured at the Palisades electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

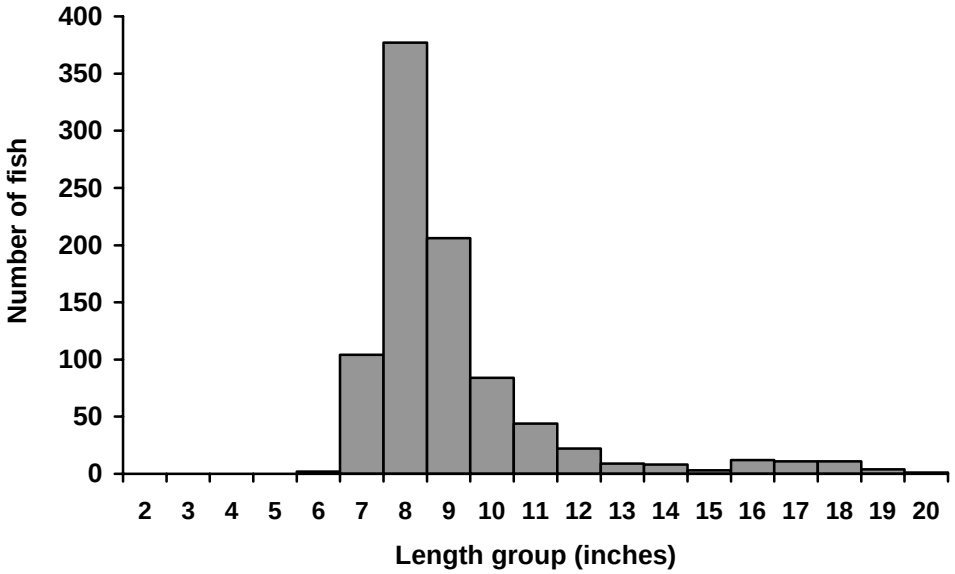

Figure 9. Length frequency distribution of wild brown trout captured at the Palisades electrofishing section, South Fork Snake River, 1997. Total individual fish captured during mark and recapture runs = n. Results are from MR4 database for all sizes of fish.

ACKNOWLEDGEMENTS

Fishery technician Doug Megargle (Department), bio-aide John Anderson (Department), and volunteers Ted Chu (Department), Dick Bauman (BOR), Rick Henderson (USU), and Jeff Copeland (Department) helped with electrofishing. Doug Megargle (Department) entered the data.

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APPENDICES

Appendix A. Trout species composition and relative abundance (%) at the Conant electrofishing section, South Fork Snake River, October 1982-1997. Total individual fish captured during mark and recapture runs is in parentheses. Results are from MR4 database for all sizes of fish.

Year	WCT & HCT[a,b]	WRB & HYB[a]	BRN[a]	LKT[a,b]	KOK[a,b]	Total
1982[c,d,e]	79 (181)	1 (2)	19 (44)	1 (2)	0 (0)	100 (229)
1986[d]	83 (1,647)	2 (47)	14 (285)	<1 (4)	0 (0)	99 (1,983)
1987[d,f,g]	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[f]	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[f]	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[h]	54 (1,676)	27 (840)	18 (567)	<1 (1)	<1 (2)	99 (3,086)

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout; LKT = lake trout; KOK = kokanee salmon.
[b] HCT, LKT, and KOK are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.
[c] Only 1.9 km of larger 4.9 km section was electrofished.
[d] Electrofishing conducted in early November.
[e] From Moore and Schill (1984), not MR4 database.
[f] No recapture runs due to low flows.
[g] Only 3.2 km of larger 4.9 km section was electrofished with drift boat.
[h] Major habitat changes with spring runoff.

Appendix B. Mean total length and quality stock density (QSD, %) of wild trout captured at the Conant electrofishing section, South Fork Snake River, October 1986-1997. Total individual fish captured during mark and recapture runs = n. QSD = (number ≥16 in/number ≥8 in) x 100. Results are from MR4 database for all sizes of fish.

	WCT/HCT[a,b]			WRB/HYB[a]			BRN[a]			All[b,c]		
Year	n	Mean (in)	QSD	n	Mean (in)	QSD	n	Mean (in)	QSD	n	Mean (in)	QSD
1986[d]	1,647	13.0	8.5	47	12.1	11.4	285	13.3	29.0	1,983	13.0	11.5
1987[d,e,f]	299	11.7	14.9	6	10.3	0.0	43	9.8	11.5	348	11.5	14.3
1988	1,570	13.3	5.6	58	12.9	12.3	159	12.2	22.8	1,788	13.2	7.3
1989	2,291	13.9	8.8	103	12.7	19.6	175	13.5	38.5	2,569	13.8	11.2
1990	2,978	12.6	8.4	216	10.6	13.3	335	10.5	20.4	3,533	12.2	9.7
1991	1,646	13.1	11.2	150	9.9	6.6	259	10.8	14.1	2,055	12.6	11.3
1992[e]	598	13.1	9.0	34	11.1	2.9	87	10.4	6.6	719	12.7	8.4
1993	1,528	13.8	15.3	113	13.4	18.2	166	13.0	34.2	1,807	13.7	17.2
1994[e]	867	11.7	11.2	100	9.9	13.4	136	9.3	7.4	1,104	11.3	10.9
1995	1,121	13.8	21.2	256	10.9	10.6	258	11.3	15.8	1,635	12.9	18.7
1996	1,190	12.2	8.7	274	10.3	6.6	325	11.2	12.7	1,791	11.7	9.2
1997[g]	1,676	11.5	4.5	840	10.3	4.3	567	10.8	12.5	3,086	11.0	6.0

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout.
[b] HCT, LKT, and KOK are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.
[c] Includes lake trout (LKT) and kokanee salmon (KOK).
[d] Electrofishing conducted in early November.
[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 C. Range of flows, mean flow, and electrofishing sampling efficiencies (R/C) at the Conant section, South Fork Snake River, 1986-1997. Flows were recorded at the USGS Irwin gage. Electrofishing results are from MR4 database for all sizes of fish.

Sampling dates	Range of flows (cfs)	Mean flow (cfs)	WCT & HCT[a,b]				WRB & HYB[a]				BRN[a]				All[b,c]				Catch rate (fish/ day)[d]
			M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	
11/4,5, 6, 7,20 1986	3540-3780	3590	1,171	546	70	13	32	17	2	12	186	107	8	7	1393	670	80	12	413
11/5,6 1987[e,f]	869-941	905	299	--	--	--	6	--	--	--	43	--	--	--	348	--	--	--	174
10/3,4,11 1988	3600-3710	3650	1,101	567	98	17	41	18	1	6	115	48	4	8	1,257	634	103	16	630
10/18,19,27 1989	2990-3060	3040	1,424	1,067	200	19	58	55	10	18	107	79	11	14	1,589	1,201	221	18	930
10/11,12,18 1990	3490-3690	3560	1,768	1,527	317	21	118	112	14	12	213	134	12	9	2,102	1,774	343	19	1,292
10/7,8,15 1991	4490-4790	4650	1,159	627	140	22	105	54	9	17	158	120	19	16	1,422	801	168	21	741
10/14 1992[e]	--	2130	598	--	--	--	34	--	--	--	87	--	--	--	719	--	--	--	719
10/13,14,21,22 1993	2620-3820	3210	998	630	100	16	78	41	6	15	110	66	10	15	1,186	737	116	16	481
10/7,11,14 1994[e]	1220-2440	1850	867	--	--	--	100	--	--	--	136	--	--	--	1,104	--	--	--	368
10/5,6,12,13 1995	2570-4090	3290	633	565	77	14	130	143	17	12	154	117	13	11	917	825	107	13	436
10/3,4,10,11 1996	3760-3790	3775	714	548	72	13	165	114	5	4	216	127	18	18	1,097	789	95	12	472
10/16,17,23,27 1997[g]	2460-3500	2980	914	926	164	18	436	476	72	15	352	298	83	28	1,703	1,702	319	19	851

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout; 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.

[b] Hatchery cutthroat trout (HCT), lake trout (LKT), and kokanee salmon (KOK) are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.

[c] Includes lake trout (LKT) and kokanee salmon (KOK).

[d] Includes recaptured fish; catch rate = (M+C)/number days sampled.

[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.

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Appendix D. Estimated abundance (N) of age 1 and older (≥4 in) wild and hatchery cutthroat trout at the Conant electrofishing section, South Fork Snake River, 1986-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/Section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
11/4/86	3.04	4.9	35.0	9,021 (961)	14,161 (1005)	2,967	4,658	1,841	2,890	258	405	2.58	4.05
11/5/87	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/3/88	3.04	4.9	35.0	6,249 (541)	7,306 (370)	2,056	2,403	1,275	1,491	179	209	1.79	2.09
10/18/89	3.04	4.9	35.0	7,403 (434)	7,860 (269)	2,435	2,586	1,511	1,604	212	225	2.12	2.25
10/11/90	3.04	4.9	35.0	8,304 (374)	11,416 (432)	2,732	3,755	1,695	2,330	237	326	2.37	3.26
10/7/91	3.04	4.9	35.0	5,087 (352)	6,854 (340)	1,673	2,255	1,038	1,399	145	196	1.45	1.96
10/14/92	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/13/93	3.04	4.9	35.0	6,004 (515)	7,364 (374)	1,975	2,422	1,225	1,503	172	210	1.72	2.10
10/7/94	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/5/95	3.04	4.9	35.0	4,399 (429)	6,029 (367)	1,447	1,983	898	1,230	126	172	1.26	1.72
10/3/96	3.04	4.9	35.0	5,324 (546)	7,361 (562)	1,751	2,421	1,087	1,502	152	210	1.52	2.10
10/16/97[b]	3.04	4.9	35.0	4,946 (314)	5,609 (190)	1,627	1,845	1,009	1,145	141	160	1.41	1.60

[a] No estimate; recapture runs not made.
[b] Major habitat changes with spring runoff.

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Appendix E. Estimated abundance (N) of age 1 and older (≥4 in) wild rainbow and hybrid trout at the Conant electrofishing section, South Fork Snake River, 1986-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/Section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
11/4/86	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
11/5/87	3.04	4.9	35.0	--[b]	--	--	--	--	--	--	--	--	--
10/3/88	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/18/89	3.04	4.9	35.0	294	310 (65)	97	102	60	63	8	9	0.08	0.09
10/11/90	3.04	4.9	35.0	835	1004 (161)	275	330	170	205	24	29	0.24	0.29
10/7/91	3.04	4.9	35.0	544	657 (135)	179	216	111	134	16	19	0.16	0.19
10/14/92	3.04	4.9	35.0	--[b]	--	--	--	--	--	--	--	--	--
10/13/93	3.04	4.9	35.0	449	538 (127)	148	177	92	110	13	15	0.13	0.15
10/7/94	3.04	4.9	35.0	--[b]	--	--	--	--	--	--	--	--	--
10/5/95	3.04	4.9	35.0	1025	1326 (181)	337	436	209	271	29	38	0.29	0.38
10/3/96	3.04	4.9	35.0	2956	4942 (1845)	972	1626	603	1009	84	141	0.84	1.41
10/16/97[c]	3.04	4.9	35.0	2823	3037 (183)	929	999	576	620	81	87	0.81	0.87

[a] Unbiased estimate not possible as R < 3 (Ricker 1975).
[b] No estimate; recapture runs not made.
[c] Major habitat changes with spring runoff.

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Appendix F. Estimated abundance (N) of age 1 and older (≥6 in) wild brown trout at the Conant electrofishing section, South Fork Snake River, 1986-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/Section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
11/4/86	3.04	4.9	35.0	2,166	3,142 (632)	713	1,034	442	641	62	90	0.62	0.90
11/5/87	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/3/88	3.04	4.9	35.0	1,061	1,652 (776)	349	543	217	337	30	47	0.30	0.47
10/18/89	3.04	4.9	35.0	596	936 (405)	196	308	122	191	17	27	0.17	0.27
10/11/90	3.04	4.9	35.0	1,578	1,806 (331)	519	594	322	369	45	52	0.45	0.52
10/7/91	3.04	4.9	35.0	905	954 (129)	298	314	185	195	26	27	0.26	0.27
10/14/92	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/13/93	3.04	4.9	35.0	602	663 (194)	198	218	123	135	17	19	0.17	0.19
10/7/94	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/5/95	3.04	4.9	35.0	1,175	1,442 (440)	387	474	240	294	34	41	0.34	0.41
10/3/96	3.04	4.9	35.0	1,400	1,538 (196)	461	506	286	314	40	44	0.40	0.44
10/16/97[b]	3.04	4.9	35.0	1,171	1,809 (507)	385	595	239	369	33	52	0.33	0.52

[a] No estimate; recapture runs not made.
[b] Major habitat changes with spring runoff.

Appendix G. Estimated abundance (N) of all trout (≥4 in, including lake trout and kokanee salmon) at the Conant electrofishing section, South Fork Snake River, 1986-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
11/4/86	3.04	4.9	35.0	11,521	13,935 (608)	3,790	4,584	2,351	2,844	329	398	3.29	3.98
11/5/87	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/3/88	3.04	4.9	35.0	7,601	9,005 (434)	2,500	2,962	1,551	1,838	217	257	2.17	2.57
10/18/89	3.04	4.9	35.0	8,427	8,788 (262)	2,772	2,891	1,720	1,793	241	251	2.41	2.51
10/11/90	3.04	4.9	35.0	10,596	14,633 (435)	3,486	4,813	2,162	2,986	303	418	3.03	4.18
10/7/91	3.04	4.9	35.0	6,640	7,920 (287)	2,184	2,605	1,355	1,616	190	226	1.90	2.26
10/14/92	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/13/93	3.04	4.9	35.0	7,215	8,058 (324)	2,373	2,651	1,472	1,644	206	230	2.06	2.30
10/7/94	3.04	4.9	35.0	--[a]	--	--	--	--	--	--	--	--	--
10/5/95	3.04	4.9	35.0	6,785	8,349 (391)	2,232	2,746	1,385	1,704	194	239	1.94	2.39
10/3/96	3.04	4.9	35.0	8,900	11,233 (640)	2,928	3,695	1,816	2,292	254	321	2.54	3.21
10/16/97[b]	3.04	4.9	35.0	8,845	9,659 (234)	2,910	3,177	1,805	1,971	253	276	2.53	2.76

[a] No estimate; recapture runs not made.
[b] Major habitat changes with spring runoff.

Appendix H. Trout species composition and relative abundance (%) at the Palisades electrofishing section, South Fork Snake River, September 1987-1997. Total individual fish captured during mark and recapture runs is in parentheses. Results are from MR4 database for all sizes of fish.

Year	WCT & HCT[a,b]	WRB & HYB[a]	BRN[a]	LKT[a,b]	KOK[a,b]	Total
1987[c]	62 (188)	6 (19)	31 (94)	0 (0)	0 (0)	99 (301)
1989	82 (824)	10 (97)	8 (84)	<1 (1)	0 (0)	100 (1,006)
1991	71 (681)	22 (213)	6 (60)	<1 (1)	0 (0)	99 (955)
1994[d,e]	62 (572)	33 (307)	4 (38)	<1 (1)	0 (0)	99 (918)
1995[d]	60 (785)	33 (426)	7 (88)	<1 (1)	<1 (3)	100 (1,303)
1997[d,f]	55 (1,480)	12 (329)	33 (898)	<1 (2)	<1 (1)	100 (2,710)

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout; LKT = lake trout; KOK = kokanee salmon.

[b] HCT, LKT, and KOK are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.

[c] Electrofishing conducted during March.

[d] Electrofishing conducted from Sheep Creek to Palisades Creek; section length reduced from 5.1 km to 5.0 km.

[e] Only two marking and no recapture runs done due to high flows.

[f] Major habitat changes with spring runoff.

Appendix I. Mean total length and quality stock density (QSD, %) of wild trout captured at the Palisades electrofishing section, South Fork Snake River, September 1987-1997. Total individual fish captured during mark and recapture runs = n. QSD = (number ≥16 in/number ≥8 in) x 100. Results are from MR4 database for all sizes of fish.

	WCT/HCT[a,b]			WRB/HYB[a]			BRN[a]			All[b,c]		
Year	n	Mean (in)	QSD	n	Mean (in)	QSD	n	Mean (in)	QSD	n	Mean (in)	QSD
1987[d]	188	12.8	9.2	19	10.4	21.4	94	16.1	44.7	301	13.7	21.2
1989	824	13.8	22.2	97	12.4	31.3	84	11.6	18.0	1006	13.4	22.7
1991	681	13.5	30.7	213	10.0	11.8	60	10.4	12.0	955	12.5	26.7
1994[e,f]	572	11.9	34.7	307	9.7	13.6	38	10.3	5.3	918	11.1	26.0
1995[e]	785	12.4	30.7	426	10.3	14.0	88	11.0	4.6	1303	11.6	23.6
1997[e,g]	1480	10.0	6.3	329	9.1	11.0	898	9.6	4.9	2710	9.8	6.2

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout.
[b] Hatchery cutthroat trout (HCT), lake trout, and kokanee salmon are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.
[c] Includes lake trout and kokanee salmon.
[d] Electrofishing conducted during March.
[e] Electrofishing conducted from Sheep Creek to Palisades Creek; section length reduced from 5.1 km to 5.0 km.
[f] Only two marking and no recapture runs done due to high flows.
[g] Major habitat changes with spring runoff.

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Appendix J. Range of flows, mean flow, and electrofishing sampling efficiencies (R/C) at the Palisades section, South Fork Snake River, 1987-1997. Flows were recorded at the USGS Irwin gage. Electrofishing results are from MR4 database for all sizes of fish.

Sampling dates	Range of flows (cfs)	Mean flow (cfs)	WCT & HCT[a,b]				WRB & HYB[a]				BRN[a]				All[b,c]				Catch rate (fish/ day)[d]
			M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	M	C	R	R/C (%)	
3/17,18,23 1987	1030-1070	1050	115	81	8	10	7	13	1	8	68	28	2	7	190	122	11	9	104
9/20,21,28 1989	5170-7000	6290	600	289	65	22	64	41	8	20	61	33	10	30	725	364	83	23	363
9/4,5,11 1991	8130-8600	8440	504	235	58	25	150	67	4	6	52	14	6	43	706	317	68	21	341
9/19,20 1994[e,f]	6400-6420	6410	572	--	--	--	307	--	--	--	38	--	--	--	918	--	--	--	459
9/19,20,28,29 1995[e]	5570-7300	6500	498	346	59	17	253	191	18	9	53	42	7	17	807	580	84	14	347
9/24,25;10/1,2 1997[e,g]	7470-7510	7480	805	870	195	22	167	185	23	12	487	525	114	22	1461	1581	332	21	760

[a] WCT = wild cutthroat trout; HCT = hatchery cutthroat trout; WRB = wild rainbow trout; HYB = wild rainbow x cutthroat hybrid; BRN = wild brown trout; 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.

[b] Hatchery cutthroat trout (HCT), lake trout, and kokanee salmon are believed to emigrate from Palisades Reservoir and numbers are directly related to extent of drawdown.

[c] Includes lake trout and kokanee salmon.

[d] Includes recaptured fish; catch rate = (M+C)/number days sampled.

[e] Electrofishing conducted from Sheep Creek to Palisades Creek; section length reduced from 5.1 km to 5.0 km.

[f] No recapture runs due to high flows.

[g] Major habitat changes with spring runoff.

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Appendix K. Estimated abundance (N) of age 1 and older (≥4 in) wild and hatchery cutthroat trout at the Palisades electrofishing section, South Fork Snake River, 1987-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
3/17/87	3.17	5.1	40.4	1,025 (294)	1,287 (302)	323	406	201	252	25	32	0.25	0.32
9/20/89	3.17	5.1	40.4	2,622 (266)	3,640 (257)	827	1,148	514	714	65	90	0.65	0.90
9/4/91	3.17	5.1	40.4	2,015 (212)	2,588 (168)	636	816	395	507	50	64	0.50	0.64
9/19/94	3.11	5.0	39.6	---[a]	---	---	---	---	---	---	---	---	---
9/19/95	3.11	5.0	39.6	2,829 (308)	3,558 (252)	910	1,144	566	712	71	90	0.71	0.90
9/24/97[b]	3.11	5.0	39.6	3,576 (195)	3,938 (122)	1,150	1,266	715	788	90	99	0.90	0.99

[a] No estimate; recapture runs not made.
[b] Major habitat changes with spring runoff.

Appendix L. Estimated abundance (N) of age 1 and older (≥4 in) wild rainbow and hybrid trout at the Palisades electrofishing section, South Fork Snake River, 1987-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
3/17/87	3.17	5.1	40.4	---[a]	---	---	---	---	---	---	---	---	---
9/20/89	3.17	5.1	40.4	263	361 (87)	83	114	52	71	7	9	0.07	0.09
9/4/91	3.17	5.1	40.4	2,039	2,653 (1,252)	643	837	400	520	50	66	0.50	0.66
9/19/94	3.11	5.0	39.6	---[b]	---	---	---	---	---	---	---	---	---
9/19/95	3.11	5.0	39.6	2,466	3,379 (515)	793	1,086	493	676	62	85	0.62	0.85
9/24/97[c]	3.11	5.0	39.6	1,264	1,458 (177)	406	469	253	292	32	37	0.32	0.37

[a] Unbiased estimate not possible as R < 3 (Ricker 1975).
[b] No estimate; recapture runs not made.
[c] Major habitat changes with spring runoff.

Appendix M. Estimated abundance (N) of age 1 and older (≥6 in) wild brown trout at the Palisades electrofishing section, South Fork Snake River, 1987-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/section		N/mi		N/km		N/ha		N/100m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
3/17/87	3.17	5.1	40.4	---[a]	---	---	---	---	---	---	---	---	---
9/20/89	3.17	5.1	40.4	191	---[b]	60	---	37	---	5	---	0.05	---
9/4/91	3.17	5.1	40.4	113	---[b]	36	---	22	---	3	---	0.03	---
9/19/94	3.11	5.0	39.6	---[c]	---	---	---	---	---	---	---	---	---
9/19/95	3.11	5.0	39.6	289	---[b]	93	---	58	---	7	---	0.07	---
9/24/97[d]	3.11	5.0	39.6	2,231	2,475 (268)	717	796	446	495	56	62	0.56	0.62

[a] Unbiased estimate not possible as R <3 (Ricker 1975).
[b] No estimate; log-likelihood model not suitable.
[c] No estimate; recapture runs not made.
[d] Major habitat changes with spring runoff.

Appendix N. Estimated abundance (N) of all trout (≥4 in, including lake trout and kokanee salmon) at the Palisades electrofishing section, South Fork Snake River, 1987-1997. Results are from MR4 database and analysis using modified Peterson (P) and log-likelihood (L) estimators. Standard deviations are in parentheses.

First marking date	Section length			N/section		N/mi		N/km		N/ha		N/100 m^2	
	(mi)	(km)	(ha)	P	L	P	L	P	L	P	L	P	L
3/17/87	3.17	5.1	40.4	1957	1966 (372)	617	620	384	385	48	49	0.48	0.49
9/20/89	3.17	5.1	40.4	3102	3585 (167)	979	1131	608	703	77	89	0.77	0.89
9/4/91	3.17	5.1	40.4	3248	4273 (274)	1025	1348	637	838	80	106	0.80	1.06
9/19/94	3.11	5.0	39.6	---[a]	---	---	---	---	---	---	---	---	---
9/19/95	3.11	5.0	39.6	5389	6701 (394)	1733	2155	1078	1340	136	169	1.36	1.69
9/24/97[b]	3.11	5.0	39.6	6917	7501 (197)	2224	2412	1383	1500	175	189	1.75	1.89

[a] No estimate; recapture runs not made.
[b] Major habitat changes with spring runoff.

1997 ANNUAL PERFORMANCE REPORT

State of: Idaho

Program: Fisheries Management F-71-R-22

Project I: Surveys and Inventories

Subproject I-G: Upper Snake Region

Job: c^2

Title: Rivers and Streams Investigations-Henrys Fork Snake River, Buffalo River

Contract Period: July 1, 1997 to June 30, 1998

ABSTRACT

An electrofishing survey on the Box Canyon Reach of the Henrys Fork Snake River provided a population estimate of 5,278 wild rainbow trout *Oncorhynchus mykiss* over 6 inches (150 mm) in length. This is a 25% increase from 1996 and reverses the downward trend observed from 1993 to 1996.

The rainbow trout population in the Stone Bridge reach of the Henrys Fork Snake River was estimated to be 14,975 to 17,827 fish >102 mm. Overall abundance was similar to 1988 estimates, but proportionately fewer rainbow trout <125 mm were observed. Proportions of brown trout *Salmo trutta* increased from 12% in 1988 to 28% in 1997. We observed 23 rainbow trout with clinical signs of whirling disease, and pathological examinations confirmed the presence of *Myxobolus cerebralis* in a sub-sample of these fish.

Species composition in the Ora Bridge to Seeley's section of the Henrys Fork Snake River was similar to 1988 estimates. Over 98% of the trout population is comprised of rainbow trout. Size structure suggests strong rainbow trout recruitment. We noted only two fish with clinical signs of whirling disease, and pathological examinations confirmed presence of *M. cerebralis*.

Angler effort on the Buffalo River was estimated at 6,180 hours, with an average catch rate of 1.5 fish/hour. The release rate was 75%. Estimated return to creel (harvest) of hatchery rainbow trout was 28%, but the estimated total catch, including catch and release, approaches 100% of numbers stocked. An estimated 210 wild adult rainbow trout from Box Canyon were harvested in the Buffalo River.

From February 1 to May 13 a total of 742 rainbow trout were observed ascending the Buffalo River fish ladder from Box Canyon. Of these, 224 were adult spawners. Additional fish likely gained access to the Buffalo River before and after the monitoring period.

From May through September an estimated 24,600 juvenile rainbow trout, 9,600 rainbow trout fry, and 2,850 brook trout *Salvelinus fontinalis* emigrated from the Buffalo River to Box Canyon.

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OBJECTIVES

1. Estimate abundance and size structure of wild rainbow trout *Oncorhynchus mykiss* (>6") in the Box Canyon reach of the Henrys Fork Snake River.

2. Assess angler effort, catch, and harvest in the Buffalo River.

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

4. Estimate outmigration of juvenile rainbow trout in the Buffalo River.

5. Estimate abundance and size structure of trout populations in the Henrys Fork Snake River from Stone Bridge to the Highway 20 Bridge.

6. Estimate abundance and size structure of trout populations in the Henrys Fork Snake River from Ora Bridge to Seeley's access.

METHODS

Henrys Fork Snake River

Box Canyon Population Estimate

Electrofishing surveys were conducted in Box Canyon on May 8-9 (marking event) and May 15 (recapture event). Two drift boat electrofishers made a total of 8 passes during the marking event. All captured fish were identified, measured and given an upper caudal fin punch. Six passes were made during the recapture event. To avoid duplicate counting, fish captured during each recapture pass were given a lower caudal fin punch. Mark-recapture data were analyzed with MR4 software.

Stone Bridge Section Population Estimate

Electrofishing surveys on the Henrys Fork Snake River from Stone Bridge to the Highway 20 Bridge were conducted on September 8-9 (marking event) and September 16 (recapture event). Two drift boat electrofishers made a total of four passes during the marking event and two passes during the recapture period. Captured fish were identified, measured, and marked with an upper caudal fin punch. We also examined fish for clinical signs of whirling disease *Myxobolus cerebralis* (sloped heads, black tails). A sub-sample of fish exhibiting clinical signs were sacrificed and preserved on ice for pathological examination.

Ora Bridge Section

Electrofishing was conducted from Ora Bridge to Seeley's access on September 10 (two drift boat electrofishers, one pass). Captured fish were identified, measured and marked with an upper caudal fin punch. Fish were also examined for clinical signs of whirling disease. Flows were abnormally high and capture efficiency too low to permit a mark-recapture population estimate. However, species composition and size structure information were obtained.

Buffalo River

Creel Survey

Regional fisheries personnel worked with the Henrys Fork Foundation (HFF) to design and implement a structured roving creel census on the Buffalo River similar to the 1996 survey (Van Kirk et al. 1997). The primary objectives were to describe angler effort and catch and to monitor harvest of adult rainbow trout spawners from Box Canyon. The 1997 survey ran from the May 24 opener to September 1, during which time HFF interns did counts and interviews, and HFF research personnel analyzed the data.

Fish Ladder and Smolt Trap

The Buffalo River fish ladder was opened to fish migration on December 1, 1996. From February 1 to May 13, HFF personnel used a video camera monitoring system to quantify rainbow trout spawning escapement from Box Canyon through the fish ladder and into the Buffalo River. The video camera recorded all fish ascending the ladder during daylight hours, and HFF personnel reviewed the videotape to enumerate and estimate size of fish. Data were summarized as total fish and number of fish >406 mm (adult spawners) using the fish ladder.

On May 1, a rotating screw trap (smolt trap) was installed to sample and enumerate rainbow trout production in the Buffalo River and migration back to Box Canyon. The trap was assembled just below the Highway 20 Bridge, floated downstream, and installed approximately 0.5 km above the dam and hydroelectric plant. To maximize trapping efficiency the trap was positioned in the thalweg and a pulley system was utilized to fine-tune positioning. Trapping was coordinated with HFF interns who were trained on trapping protocol. From May 2 to October 9, captured fish were processed 2-3 days per week. All fish were identified to species, checked for fin clips, enumerated and measured. Salmonid fry (fish <40 mm) were released below the trap. All salmonids >40 mm were adipose-clipped, transported upstream approximately 1.5 km to the Highway 20 bridge, and released. Recaptured fish were so noted on each day.

We used proportions of marked fish recaptured at the screw trap to estimate trapping efficiency. Low recapture rates precluded us from stratifying efficiency estimates over time. Total outmigration for rainbow and brook trout *Salvelinus fontinalis* was estimated by dividing the total number captured by the overall trapping efficiency. Although we did not mark salmonid

fry <40 mm, we assumed a similar efficiency when estimating fry outmigration. All salmonid fry observed during the sample period were assumed to be rainbow trout.

Monthly capture data (May through September) were analyzed to assess seasonal trends in outmigration and species composition.

RESULTS AND DISCUSSION

Henrys Fork Snake River

Box Canyon Population Estimate

A total of 1,284 wild rainbow trout >6 inches (152 mm) were sampled in marking and recapture runs combined. Other fish sampled included brook trout (n=2), rainbow x cutthroat hybrids *O. mykiss x O. clarki* (n=4), kokanee salmon *O. nerka kennerlyi* (n=2) and hatchery rainbow trout (n=6).

Wild rainbow trout sampled in this reach ranged in size from 2 inches to 24 inches (50 mm to 610 mm; Figure 1). Sampling efficiency increased slightly with fish size. Estimated abundance of wild rainbow trout (6 inches or 152 mm) was 5,302 fish using the modified Peterson method and 5,278 fish using the log-likelihood method (Table 1). These estimates are 57% and 25% higher, respectively, than 1996 estimates. Abundance estimates equate to about 2,200 fish per river mile. The increase in Box Canyon population estimates reverses the downward trend observed since fall of 1993.

Stone Bridge Section Population Estimate

A total of 1,483 (69%) rainbow trout and 659 (31%) brown trout *Salmo trutta* >4 inches (102 mm) were sampled in marking and recapture events combined. For fish >150 mm, brown trout increased from 12% of the population in 1988 (Elle and Corsi 1994) to 28% in 1997. Estimated abundance of wild rainbow trout >102 mm was 14,975 using the modified Peterson method and 17,827 using the log-likelihood method. Estimated abundance of wild rainbow trout >152 mm (6 inches) was 12,083, almost identical to the 1988 estimate of 11,967 (Elle and Corsi 1994). Rainbow trout length frequencies were skewed towards intermediate sizes, with relatively few fish <125 mm observed (Figure 2). About 10% exceeded 305 mm and <2% exceeded 406 mm. Estimated abundance of brown trout was 9,874 using the log-likelihood method and 7,090 using the modified Peterson method. The brown trout population is supplemented by or possibly dependent on annual fingerling stocking. No fish <100 mm were observed, but length frequencies for fish 100 mm and larger show a more typical size-abundance pattern (Figure 3). About 6.5% exceeded 305 mm and 3% exceeded 406 mm.

During the mark and recaptured events, 23 wild rainbow trout with possible clinical signs of whirling disease were observed. Six fish with severe cranial deformities were sacrificed and sent to Eagle Fish Health Lab for pathological examination. All six were presumptive positive

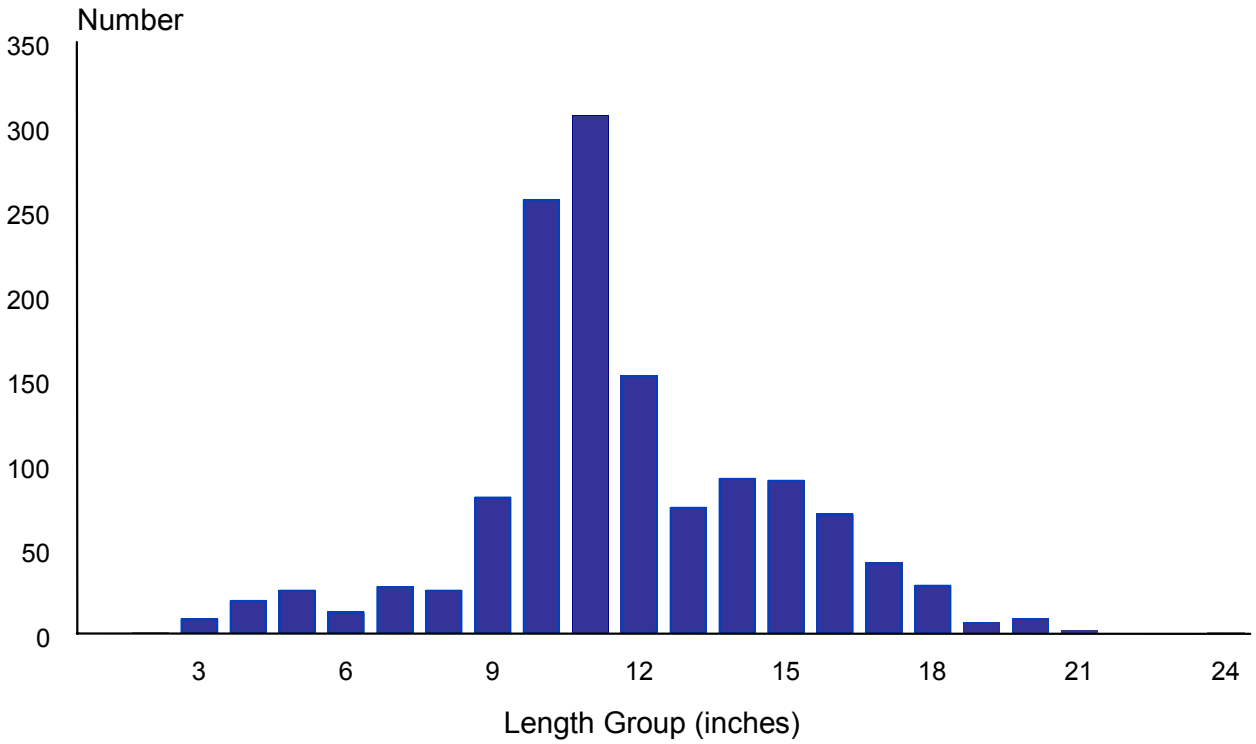

Figure 1. Length frequency distribution of wild rainbow trout captured electrofishing in the Box Canyon section of the Henrys Fork Snake River, May 1997.

Table 1. Estimated abundance of wild rainbow trout (~6 in or 152 mm) in the Box Canyon section, Henrys Fork Snake River, 1993-1997.

Season/year	Modified Peterson method (MPM)	Log-likelihood method (LLM)	Sample section length (mi)	Entire reach length (mi)	# / river mile by MPM (LLM)	# / reach
Fall 1993	~10,000		2.4	2.8	~4,200	11,800
Spring 1994	7,234	9,359	2.4	2.8	3,014 (3,900)	8,439 (10,920)
Spring 1995	6,080	5,904	2.4	2.8	2,533 (2,460)	7,092 (6,888)
Spring 1996	3,390	4,210	2.4	2.8	1,413 (1,754)	3,965 (4,911)
Spring 1997	5,302	5,278	2.4	2.8	2,209 (2,199)	6,185 (6,157)

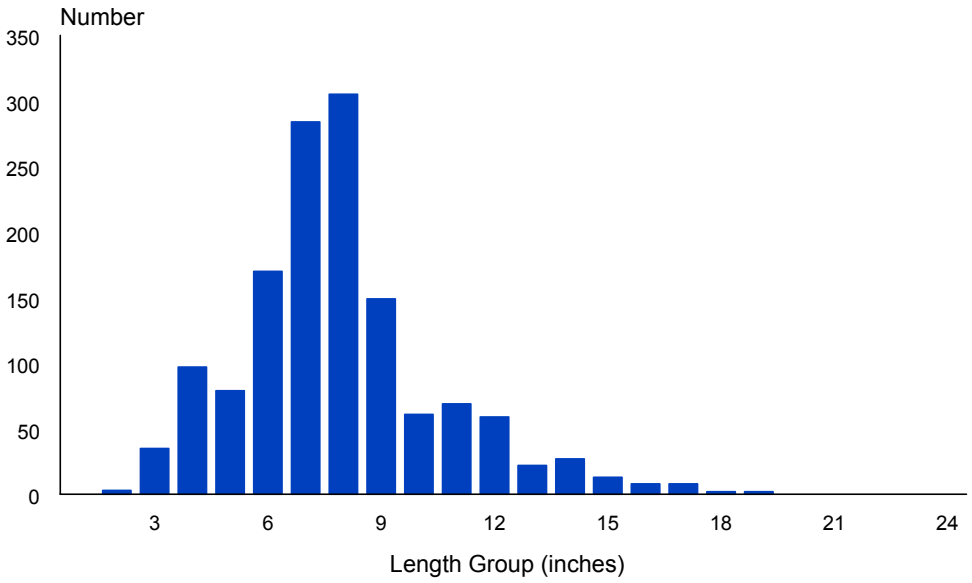

Figure 2. Length frequency distribution for wild rainbow trout captured electrofishing in the Stone Bridge reach of the Henrys Fork, May 1997.

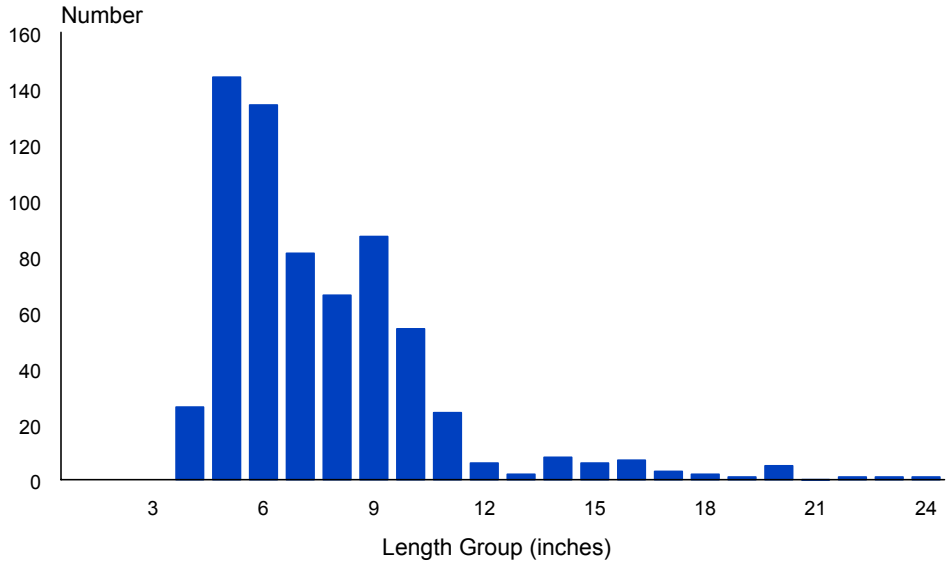

Figure 3. Length frequency distribution for brown trout captured electrofishing in the Stone Bridge reach of the Henrys Fork Snake River, May 1997.

for *M. cerebralis* by the digest method, and three of the six were confirmed positive histologically.

The presence of *M. cerebralis* and clinical signs in a small proportion of the rainbow trout suggests this population should be monitored closely. The lower relative abundance of fish <125 mm could reflect recruitment impacts by whirling disease. Alternatively, this reach of the Henrys Fork Snake River may simply have inadequate rearing habitat for juvenile rainbow trout. To address this, the population size structure should be assessed again in 1998 to determine if a consistent reduction in recruitment is evident.

Ora Bridge Section

A total of 636 wild rainbow trout, 79 mountain whitefish, and 19 brown trout were collected in the Ora Bridge area of the Henrys Fork Snake River during 1997. Species composition and size structure was similar to 1988 estimates (Elle and Corsi 1994). Wild rainbow trout ranged in size from 60 mm to 520 mm (Figure 4); PSD was 33 and QSD was 16. Brown trout ranged in size from 110 mm to 480 mm; PSD was 56 and QSD was 19. Mountain whitefish ranged in size from 100 mm to 460 mm.

Size structure of wild rainbow trout suggests strong natural recruitment below Ashton Reservoir. We noted only two wild rainbow trout in the section exhibiting clinical signs of whirling disease. These fish were sacrificed for pathological tests. Both were presumptive positive for *M. cerebralis* in the digest method, and one was confirmed histologically.

Buffalo River

Creel Survey

Anglers fished an estimated total of 6,180 hours from May 24 to September 1, and caught 9,120 fish for an overall catch rate of 1.5 fish/h (Van Kirk et al. 1997). Estimated harvest totaled 2,313 fish and was comprised of 42% brook trout and 38% hatchery rainbow trout. Wild rainbow trout (n=488) comprised 19% of the harvest, a negligible increase compared to 1996. Overall release rate by anglers (all species) was 75%. Although estimated harvest of hatchery rainbow trout was only 889 of the 3,226 stocked fish (28% return to creel), an additional 2,332 hatchery fish were caught and released. This suggests very high utilization of the hatchery fish despite low harvest rates.

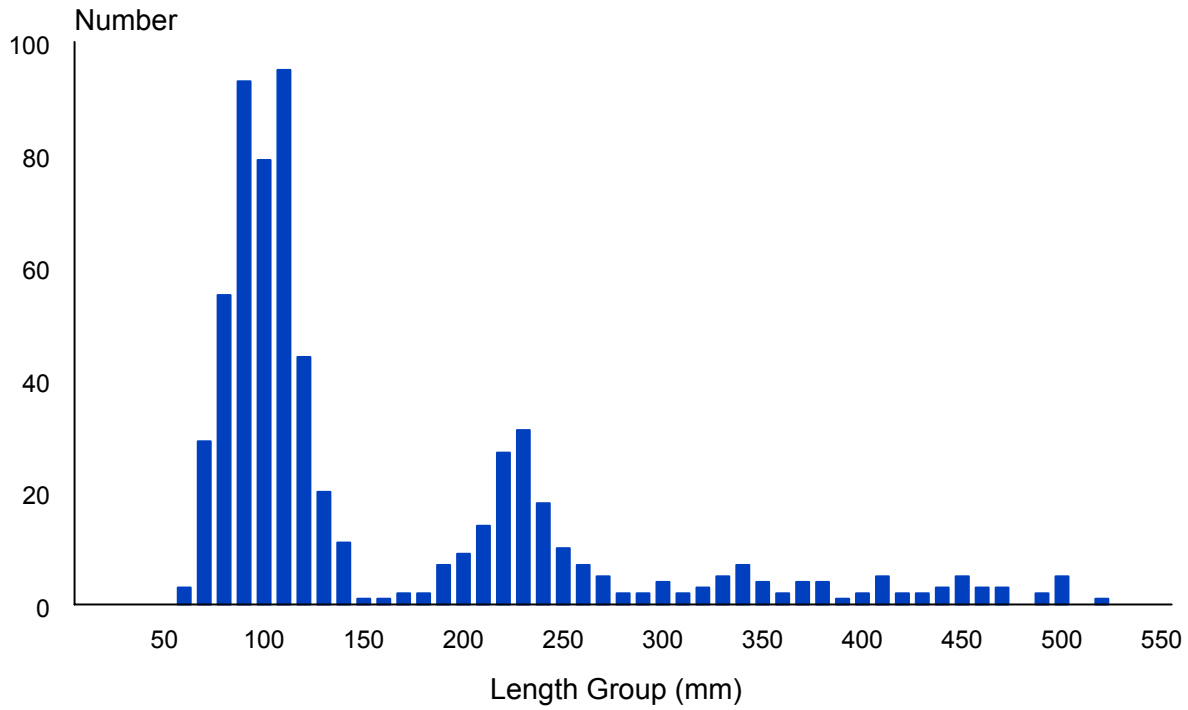

Figure 4. Length frequency distribution for rainbow trout captured electrofishing in the Ora Bridge reach of the Henrys Fork Snake River, May 1997.

An estimated 43% of the wild rainbow trout harvest were fish >16 inches (406 mm), suggesting they were adult spawners from Box Canyon. This equates to 210 fish, or nearly all of the 224 adults counted ascending the ladder. However, these proportions were based on only seven wild rainbow trout observed in the creel throughout the creel census period, with the harvest estimates derived through extrapolations of interview and count data. Although error bounds are not presented by Van Kirk et al. (1997), we have low confidence that the estimates are accurate. Also, the fish ladder was in operation for two months (December 1 to January 31) prior to installation of the video monitoring system. It is unknown how many additional adults ascended the ladder during this interval. Because ladder counts dropped during high water when the dam boards were removed, it is suspected that spawning adults could gain access to the Buffalo River without using the fish ladder. Thus the spawner escapement count derived from the video monitoring system should be considered a minimum estimate, and exploitation of adult spawners in the Buffalo is likely overestimated.

Fish Ladder and Smolt Trap

From December 1, 1996 to January 31, 1997, the fish ladder was in operation but not monitored. A total of 742 rainbow trout were observed ascending the Buffalo River fish ladder from February 1 to May 13. Of these, 224 were >16 inches (406 mm) and assumed to be spawning adults. Spawning migration peaked in March (Figure 5). During peak spring flows when boards were removed from the Buffalo Dam spillway, use of the ladder by spawning fish declined dramatically. This indicates fish could gain access to the Buffalo River without using the fish ladder.

Fish emigration rates from the Buffalo River to Box Canyon showed a bi-modal peak within our sampling period (May 2 to October 9). Rainbow trout fry (<40 mm) were captured in May, peaked in June, and were virtually absent July to October 9. Larger rainbow trout outmigrants (40 mm to 130 mm) peaked in abundance in September. Mean size of the larger rainbow trout outmigrants (>40 mm) was relatively constant (68 mm to 89 mm) throughout the trapping period. This suggests an extended spawning period in the Buffalo River, and also that outmigration of juvenile rainbow trout is likely size-dependent rather than seasonal.

A total of 492 rainbow trout >40 mm were captured, adipose clipped, and released at the Highway 20 Bridge. Through the season, 10 were recaptured at the smolt trap, for an estimated overall trapping efficiency of 2%. Based on this efficiency, total outmigration of rainbow trout >40 mm was estimated at 24,600 fish. If similar efficiencies exist for migrating rainbow trout fry (190 captured) and brook trout (57 captured), an estimated 9,600 rainbow trout fry and 2,850 brook trout also emigrated from the Buffalo River.

Estimates of total outmigration (37,050) should be interpreted with caution. Recapture rates were extremely low, and estimates could be positively biased by handling mortality of marked fish. Alternatively, although cross sectional area of the Buffalo River at our trap site was not measured, the trap clearly sampled only a fraction of the total stream flow. Low trapping efficiency would be expected under these conditions. Future operation of the smolt trap should incorporate wings or other devices to direct stream flow and improve efficiency.

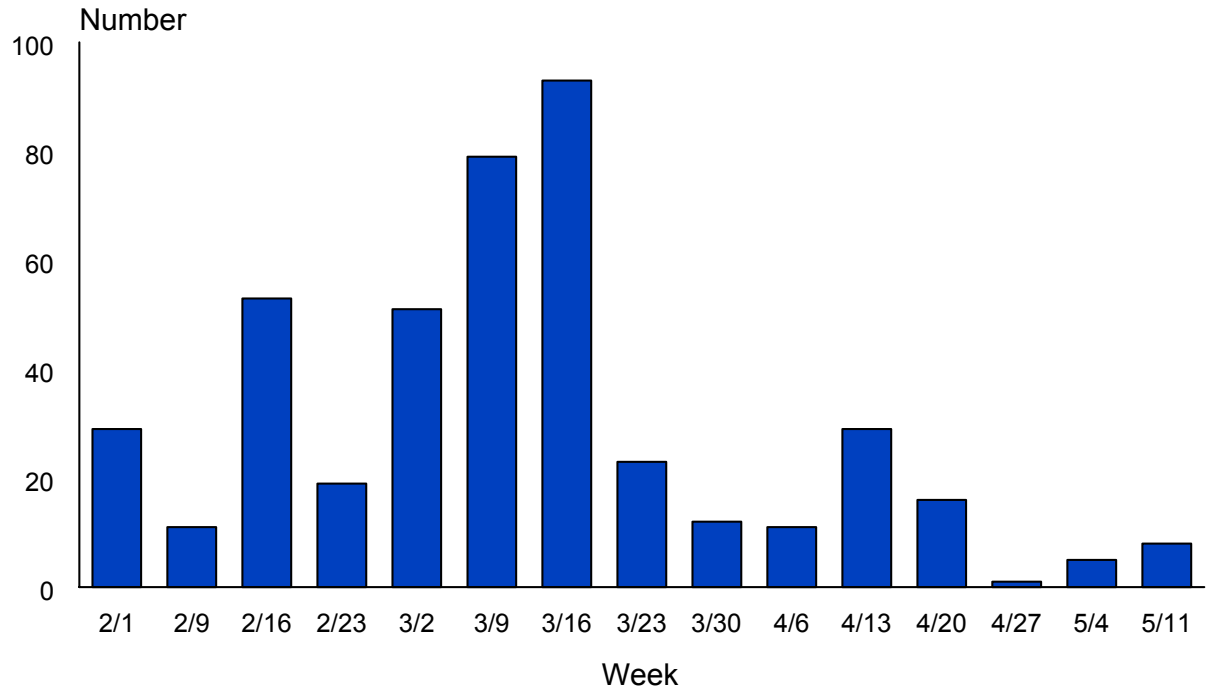

Figure 5. Run timing for Rainbow trout observed entering the Buffalo River from Box Canyon of the Henrys Fork Snake River, February to May 1997.

RECOMMENDATIONS

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

2. Continue monitoring angler effort and catch in Box Canyon and the Buffalo River to evaluate effects of the Buffalo River fish ladder.

3. Monitor the Stone Bridge section of the Henrys Fork Snake River for incidence of *M. cerebralis* infection. Evaluate potential trout population impacts from whirling disease.

4. Modify operation of the Buffalo River smolt trap to include wings or other devices to improve trapping efficiency.

5. Conduct population estimates for the lower Henrys Fork Snake River below St. Anthony (Warm Slough access area).

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Elle, S., and C. Corsi. 1994. Regional fisheries management investigations. Idaho Department of Fish and Game, 1988 Job Performance Report, Project F-71-R-13, Boise.

1997 ANNUAL PERFORMANCE REPORT

State of: Idaho | Program: Fisheries Management F-71-R-22

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

Contract Period: July 1, 1997 to June 30, 1998

ABSTRACT

Technical guidance was provided to federal, state, county, municipal, and private agencies/entities upon request. Organized sportsmen's groups, conservation organizations, and private citizens received technical guidance 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 agency and private groups:

Buffalo Hydro.	Idaho Department of Parks and Recreation
Henrys Fork Foundation	Idaho Department of Water Resources
Island Park Sportsmen Association	Idaho Department of Lands
Sheridan Creek Restoration Committee	US Bureau of Reclamation
Henrys Fork Watershed Council	Idaho Water Resource Board
Henrys Fork Foundation	Eagle Rock Bass Masters
Upper Snake River Fly Fishers	City of Idaho Falls
Trout Unlimited	Teton Valley Land Trust
US Fish and Wildlife Service	Wyoming Game and Fish Department
Jackson National Fish Hatchery	Idaho National Environmental Engineering Laboratory
US Forest Service	Bonneville County
Bureau of Land Management	Fremont County
City of Rexburg	Henrys Lake Foundation
North Fork Reservoir Company	Federal Emergency Management Agency
Palisades Creek Canal Company	Palisades Creek Property Owners

Over 15 man-days were devoted to flood response activities necessitated by the 1997 spring flood. Emergency property protection, property damage assessment and flood clean-up activities required technical assistance and comment.

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 bouvieri* management goals might conflict with private requests to stock rainbow trout *O. mykiss* in those watersheds.

The Department staff conducted a Trout Management Workshop addressing fish management issues for the South Fork Snake River fishery. Approximately 20 local anglers attended the workshop.

Regional fisheries management personnel contributed over 100 man-days to technical guidance requests in 1997.

Author:

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1997 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-22

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

Contract Period: July 1, 1997 to June 30, 1998

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. The 1997 flood flows on Palisades Creek resulted in erosion damage to the canal diversion, fish screen by-pass pipe facility and sedimentation problems in the fish screen containment basin. Upper Snake Region fish management and habitat management personnel and Engineering Bureau personnel worked with Federal Emergency Management Agency (FEMA), state and local agencies to coordinate flood damage repair efforts to the Palisades fish screen facility and private property.

Idaho Department of Fish and Game (Department) Engineering Bureau work crews constructed a new irrigation diversion and fish ladder facility on Rainey Creek, tributary to the South Fork Snake River, in a cooperative project with Targhee National Forest, Bureau of Land Management, Bureau of Reclamation and Trout Unlimited.

Regional fish management personnel, volunteers and students from Shelley High School rehabilitated the Sellars Creek riparian fence and began preparations to replace the Sellars Creek culvert fish ladder.

A cost-share agreement between the Department and a landowner on Mill Creek, tributary to Willow Creek, funded construction of over 2 miles of riparian fence to protect trout spawning and rearing habitat.

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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 fence to control livestock damage, reestablishment 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. In 1997, only maintenance and operations programs were conducted. No new riparian fence, fish screens or riparian habitat projects were implemented at Henrys Lake.

The Idaho Department of Fish and Game (Department) has also cooperatively installed, operated, and maintained two irrigation diversion screens on important South Fork Snake River cutthroat trout spawning tributaries. Working with local landowners and the Bureau of Reclamation, these diversions were installed on Burns Creek and Palisades Creek. The Burns Creek screen has run continuously for over 20 years, and the Palisades Creek canal screen has been in operation since 1993. Spring flood flows in 1997 caused erosion damage and sedimentation problems at the Palisades Creek canal fish screen, requiring extra repair and maintenance work. This structure replaces a long-term diversion that relied on native streambed materials, corrugated tin and other relatively temporary construction materials. The original diversion required annual maintenance and reconstruction that necessitated in-channel work with heavy equipment. Consequently, stream channel instability, excessive sedimentation downstream of the diversion and blockage of upstream fish passage during important trout migration periods were annual problems.

In 1988, regional fisheries management personnel constructed approach pools and installed angle iron fish ladders in culverts crossing Sellars and Mill creeks, tributaries to Willow Creek. These projects were designed to facilitate cutthroat spawning migration from Willow Creek to spawning and rearing habitat in upper Sellars and Mill creeks and were accomplished as cooperative projects with volunteer assistance from local anglers and a Boy Scout Troop. The Sellars Creek culvert fish ladder was severely damaged by flood flows in 1996 and completely blown out during 1997 flood flows.

In 1990 two riparian exclusion fences on Sellars Creek were constructed to rehabilitate and protect riparian habitat from uncontrolled cattle grazing. Cattle grazing on this section of the LDS Church-owned ranch property is managed for fall grazing only. Approximately one mile 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 one mile above the Stake farm fence. The fence on private property is maintained by the property owner. Maintenance of the Stake farm fence is the responsibility of Upper Snake Region personnel and had lapsed since 1992 due to budget and personnel constraints. This fence was refurbished and put back in operation in September 1997 before cattle were turned onto the pasture for grazing.

OBJECTIVES

1. Maintain existing riparian fence and irrigation diversion fish screen facilities.

2. Replace existing Rainey Creek canal diversion with permanent diversion and fish ladder to prevent chronic stream channel disturbance and erosion and to provide permanent fish passage.

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

4. Rebuild the Sellars Creek riparian fence.

5. Develop a riparian conservation project on Mill Creek to enhance cutthroat trout spawning and rearing habitat.

METHODS

Henrys Lake

Riparian fence and fish screens on the Henrys Lake project were managed under standard maintenance schedules by temporary personnel at the Henrys Lake hatchery. Two fish screens from Howard Creek were pulled and transported to the Salmon Region fish screen shop for refurbishment at the end of the 1997 irrigation season.

South Fork Snake River Tributaries

Burns Creek

The Burns Creek screen received normal service and required no additional maintenance or repair in 1997.

Palisades Creek

The Palisades Creek fish screens were maintained by regional fish management temporary personnel. The 1997 flood caused erosion damage for the Palisades Canal diversion and the fish screen bypass pipe and caused the fish screen containment basin to fill almost completely with sediment. Regional fisheries management personnel worked with Regional habitat management personnel, Department Engineering Bureau personnel, Federal Emergency Management Agency (FEMA), Natural Resource Conservation Service (NRCS), and Bonneville County to assess damage to the fish screening facilities and adjacent private property. Damage claims were processed through FEMA for federal compensation for flood

damage to the fish screen facility. Regional fisheries management personnel also spent several days flushing sediment from the fish screen containment basin before the fish screens could be put into operation for the 1997 irrigation season.

Rainey Creek

The Department Engineering Bureau completed construction of a permanent irrigation canal diversion and fish ladder on Rainey Creek in the Targhee National Forest in October 1997. This project was funded cooperatively by the U.S. Bureau of Reclamation, Targhee National Forest, Bureau of Land Management, Trout Unlimited and the Department. The project was facilitated by a cooperative agreement with Dr. Edwin Biddulf, owner of the property and water rights served by the canal diversion and irrigation canal attached to this diversion.

Willow Creek Tributaries

Sellars Creek

The Sellars Creek riparian fence, constructed in 1990 but idle since 1992, was repaired and put up in September before cattle were moved onto the range for fall grazing. Regional fisheries management personnel were assisted by Shelley High School students through the Idaho National Environmental Engineering Laboratory (INEEL) Science Solutions program.

Regional fisheries management personnel retrieved the angle iron ladder from the culvert plunge pool. We also worked with Department Engineering Bureau personnel to design stream channel stabilization structures below the culvert that will raise the stream level to allow migratory Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri* to access the culvert and new fish ladder once repair work is complete. Materials were acquired and work scheduled with the Department Engineering Bureau to accomplish this fish passage restoration project in 1998.

Mill Creek

The Upper Snake Region habitat management program and fisheries management program entered into a cost-share agreement with NRCS and a Mill Creek property owner to jointly fund construction of over two miles of riparian fence above the Blackfoot Reservoir road, adjacent to state lands. This fence will protect Mill Creek from excessive cattle grazing for the benefit of cutthroat trout spawning and rearing habitat, wildlife habitat and water quality.

Fisheries staff also surveyed a fish passage barrier at the Blackfoot Reservoir road culvert and tentatively scheduled construction work to repair a fish ladder and approach pool structure (installed in 1988) that has become non-functional.

RESULTS AND DISCUSSION

Henrys Lake

The Henrys Lake tributary riparian fence and fish screen project operated without significant problems in 1997. The Howard Creek fish screens were installed and will be in operation for the beginning of the 1998 irrigation season.

South Fork Snake River Tributaries

Palisades Creek

New methods for flushing sediment out of the screen basin were developed in 1997 to make maintenance of this facility more efficient in the future. We were able to effectively remove very large accumulations of deposited silt by simply manipulating water flow through the screen basin with water control gates in the basin. This method will save a significant amount of time as well as personnel and equipment costs that would be required to mechanically remove sediment accumulations before making the screens operational at the beginning of the irrigation season. The 1997 flood flow in Rainey Creek caused the erosional loss of over 30 yards of stream bank immediately adjacent to the screen facility. This shortened the distance of the bypass pipe which returns fish to the creek by at least 30 yards and the bypass pipe was sheared off at the closest joint to the new stream bank. In the fall of 1997, NRCS facilitated stream channel stabilization work, which included that portion of the Rainey Creek channel that receives return water, and saved fish from the fish screen facility. The streambank and the fish screen bypass pipe was stabilized with rip-rap. Additional work will be necessary to cap the bypass pipe in concrete and perhaps lay additional rip-rap material to secure the bypass pipe from future stream bank erosion.

A cost-share agreement has also been developed between the US Bureau of Reclamation, Trout Unlimited and the Palisades Creek Canal Company to replace the Palisades Creek canal diversion with a permanent diversion and fish ladder structure similar to the Rainey Creek diversion structure described above.

Rainey Creek

Construction of the canal diversion and fish ladder was completed in October 1997. The facility will be in operation for the South Fork Snake River spring spawning run and the 1998 irrigation season. Regional fisheries management personnel will begin collecting data on rainbow *O. mykiss* and cutthroat trout *O. clarki* spawning escapement at the fish ladder. These observations will help us develop a conservation management strategy for South Fork Snake River Yellowstone cutthroat trout by managing the Rainey Creek drainage solely for Yellowstone cutthroat production. To achieve this, some modification of the diversion structure may be necessary to ensure that we can block or selectively allow fish passage at the diversion

structure. Work will continue with Department Engineering Bureau personnel to make the necessary adaptations to the diversion and fish ladder structure.

Willow Creek Tributaries

Sellars Creek

The initial survey and design work for reconstruction of a permanent approach pool to the culvert fish ladder was accomplished by Department Engineering Bureau personnel in 1997. Materials were procured and this project was scheduled by the Engineering Bureau for the fall of 1998. If completed on schedule, spawning cutthroat trout escaping from Willow Creek will again have access to the Sellars Creek drainage above the Wolverine Road crossing.

The Stake Farm riparian fence (New Zealand Electric Fence) was repaired, erected and energized before the fall 1997 grazing season. The fence operated successfully as designed, and will become a joint project for the Department, the Shelley High School Science Solutions class and the LDS Stake Farm. Monitoring of riparian habitat recovery and response to habitat improvement by the Yellowstone cutthroat population will be incorporated into the long term objectives for this joint project.

Mill Creek

Approximately two miles of riparian exclosure fence was constructed on Mill Creek, above the Blackfoot Reservoir Road during the summer of 1997. Baseline fish population sampling by regional fisheries management personnel using backpack electrofishing equipment found no trout in August 1997. It is likely that poor habitat and a complete migration barrier at the Blackfoot Reservoir Road culvert explains the absence of trout in the fence section of Mill Creek.

RECOMMENDATIONS

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

2. Complete Palisades Creek canal diversion/fish ladder, Sellars Creek fish passage and Mill Creek fish passage projects in 1998.

1997 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-22

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

Contract Period: July 1, 1997 to June 30, 1998

ABSTRACT

Approximately 701 game fish, including 120 cutthroat trout *Oncorhynchus clarki*, two rainbow trout *O. mykiss*, 175 brown trout *Salmo trutta* and 256 lake trout *Salvelinus namaycush*, 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.

Mud Lake was stocked with 50,000 Lahontan cutthroat trout *O. clarki henshawi* in October and with a total of 46,000 tiger muskies *Esox lucius* x *Esox masquinongy* in two stockings during August and September.

Sixteen mountain lakes were stocked with a total of 14,000 cutthroat trout, 2,000 rainbow trout and 4,000 Arctic grayling *Thymallus arcticus* in September 1997. All fish were reared at Mackay and Ashton hatcheries and were stocked by Idaho Department of Fish and Game (Department) personnel and volunteers via foot, motorcycle and horseback.

Catchable rainbow trout were provided to two private pond owners at their request for the purpose of supporting public youth and providing fishing opportunities for the developmentally challenged.

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Jeff Dillon
Regional Fishery Biologist

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 and volunteers routinely salvage and move stranded game fish to the main river channel.

Specialty fish stocking and mountain lake stocking projects require organized efforts by regional, reservist and volunteer personnel. In 1997, Mud Lake and 16 mountain lakes received hatchery fish supplementation to support public sport fishing opportunity. We also provided hatchery catchable rainbow trout *Oncorhynchus mykiss* to two private pond owners who granted public access to local youth and educational groups for angling outings.

OBJECTIVES

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

2. Capitalize on opportunities to enhance existing angling opportunities and where possible, develop new opportunities for the angling public.

METHODS

Palisades Reservoir Stilling Basin Salvage

Annual fall maintenance and repair of the Palisades Dam stilling basin by US Bureau of Reclamation 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 20 with the assistance of Bureau of Reclamation personnel, and Department reservists and volunteers.

Stranded fish were crowded with a 150-foot beach seine and captured with backpack electrofishing equipment. Gamefish and nongame fish were immediately sorted and trout and whitefish *Prosopium williamsoni* were carried to the river in buckets and released. Cutthroat trout *O. clarki* were examined for fin clips, denoting hatchery catchables stocked in Palisades Reservoir.

Mud Lake Stocking

Approximately 27,000 tiger muskies *Esox luscius* x *Esox masquinongy* averaging 89 mm in length were acquired as excess fish from the state of Colorado and released in Mud Lake on

August 7. On September 29, an additional 19,000 fry averaging 160 mm in length were acquired as excess fish from the state of Pennsylvania and released in Mud Lake. Both groups of tiger muskies (Colorado and Pennsylvania) were acquired for only the cost of transportation to Idaho.

Mountain Lake Stocking

To reduce costs, and because past experience has shown Forest Service fire helicopters to be unreliable for high altitude fish stocking exercises, we did not use aircraft to stock mountain lakes in 1997. We used volunteers, Department reservists, Upper Snake Region conservation officers, and fish management and hatchery personnel to stock all mountain lakes in early September. Stocking was accomplished by horseback or motorcycle where possible. In some cases, by necessity or preference, fish were transported to lakes by personnel hiking in on foot.

Private Pond Stocking

Two private ponds were stocked with hatchery catchable rainbow trout for public use by youth or organized fishing outings for developmentally challenged individuals. Both ponds were voluntarily made available to these public groups by the individual owners.

RESULTS AND DISCUSSION

Palisades Reservoir Stilling Basin Salvage

Salvage efforts on Palisades Reservoir resulted in the collection of 1,051 fish, of which 66% were trout, mountain whitefish or kokanee salmon *Oncorhynchus nerka kennerlyi*. Forty-eight wild cutthroat trout, 72 hatchery cutthroat trout, two rainbow trout, 175 brown trout *Salmo trutta*, 256 lake trout *Salvelinus namaycush* and 91 mountain whitefish were released back to the river.

Lake trout and kokanee salmon, both abundant in salvage samples, are again evidence that those species are self-sustaining in Palisades Reservoir. Kokanee salmon have not been stocked in Palisades Reservoir or the South Fork Snake River drainage above the reservoir since the early 1960s. Lake trout were stocked in Palisades Reservoir until 1991; however most of the salvaged lake trout were too young to be holdover hatchery fish from previous stockings.

Mud Lake Stocking

The 1997 supplemental stocking of tiger muskies was the first since a 1993 release of 1,500 tiger muskies following the 1992-1993 winterkill of Mud Lake. Because of the high cost to purchase tiger muskies, continued supplementation will rely on the availability of excess fish in

other state programs. Based on observations of growth following earlier (1988, 1989) tiger muskie stockings, those released in 1993 should be above the minimum length limit (30 inches), and those released in 1997 should reach legal size by the year 2000.

Mountain Lake Stocking

Sixteen of 19 lakes scheduled for stocking in 1997 were successfully stocked with trout and Arctic grayling *Thymallus arcticus* fry (Table 1). Three lakes scheduled for stocking did not receive fish due to unavailability of golden trout *Oncorhynchus aguabonita* (Fall Creek #1, Wildhorse #8) and logistical problems (Angel Lake). All lakes but one were located in the Pioneer Mountain range. Big Fall Creek Lake is in the Boulder Mountains.

RECOMMENDATIONS

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

2. Evaluate tiger muskie survival and recruitment in Mud Lake.

3. Continue mountain lake surveys to evaluate success of stocking program.

Table 1. Upper Snake Region high mountain lakes stocked with trout fry, 1997.

Lake Name	IDFG Catalog #	# Stocked	Species[a]
Boulder Mt. Range			
Big Fall Creek	15-0209	1,500	CT
Pioneer Mt. Range			
Ramey	15-0210	500	CT
Bellas #1	15-0715	1,500	CT
NF Bellas	15-0716	500	GR
Bench	15-0196	500	RB
Clear	15-0194	500	CT
Betty	15-0198	2,500	CT
Betty #2	- - -	500	RB
Goat	15-0202	2,000	CT
Kane Canyon	15-0208	1,000	CT
Boulder	15-0156	1,500	CT
Boulder #2	- - -	500	CT
Washington	15-0158	500	RB
Arrowhead	15-0160	2,000	CT
Airplane	15-0162	1,500	RB
Baptie	15-0200	1,500	GR

[a] CT = cutthroat trout; RB = rainbow trout; GR = arctic grayling

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