FISHERY MANAGEMENT INVESTIGATIONS

FEDERAL AID IN FISH RESTORATION

2003 ANNUAL PERFORMANCE REPORT

Cal Groen, Director

Program F-71-R-28

REGIONAL FISHERIES MANAGEMENT INVESTIGATIONS

PANHANDLE REGION (Subproject I-G, II-G, III-G)

PROJECT I.	SURVEYS AND INVENTORIES
Job a.	Panhandle Region Mountain Lakes Investigations
Job b[1].	Panhandle Region Lowland Lakes Investigations – Miscellaneous Waters
Job b[2].	Priest Lake Creel Survey
Job c.	Panhandle Region Rivers and Streams Investigations
Job c[1].	Bull Trout Redd Counts
Job c[2].	Cuthrout Trout Trend Assessment
Job c[3].	Middle Fork East River Bull Trout Assessment
PROJECT II.	TECHNICAL GUIDANCE
PROJECT III.	HABITAT MANAGEMENT

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2003 Panhandle Region Fisheries Management Report

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2003 PANHANDLE REGION FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	a	Title:	Mountain Lake Investigations

Contract Period: July 1, 2003 to June 30, 2004

ABSTRACT

There were no surveys done on mountain lakes in the Panhandle Reigon during the period July 1, 2003 to June 30, 2004,

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2003 PANHANDLE REGION ANNUAL FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	b[1]	Title:	Lowland Lakes Investigations – Miscellaneous Waters

Contract Period: July 1, 2003 to June 30, 2004

ABSTRACT

A midwater trawl was used to estimate the kokanee *Oncorhynchus nerka* population in Coeur d'Alene Lake in late July. Trawl results indicated a low number of adult kokanee, with the total population of age-3 fish estimated at 182,000 or 19 fish/ha. We estimated 970,000 age-1, 501,000 age-2 and 3.3 million age-0 kokanee for a total population estimate of 4.9 million fish in 2003. The standing stock of kokanee in Coeur d'Alene Lake was estimated at 27.66 kg/ha. This is a slight improvement over the 2002 estimate of 26.62/ha and a significant improvement over the 2000 and 2001 estimates of 3.86 and 5.80 kg/ha, respectively.

We counted 51 Chinook salmon *O. tshawytscha* redds in the Coeur d'Alene River drainage and 27 in the St. Joe River for a total of 78 redds. All redds were left undisturbed to provide natural production. We stocked 42,000 age-0 Chinook salmon at the Mineral Ridge boat ramp in Wolf Lodge Bay in June 2003. Chinook eggs were collected at Big Springs Hatchery, Oregon, hatched at Cabinet Gorge Hatchery and were reared in the Nampa Hatchery. Mean size was 160 mm, and all fish were marked with right ventral fin clip.

An additional 59 lake trout *Salvelinus namaycush* were tagged by the Priest Lake volunteer angler. Fish ranged from 330 to 520 mm (TL), with a mean size of 484 mm. All of these fish were tagged near Bartoo Island. A total of 34 tagged lake trout were recaptured by anglers in 2003. All had been tagged in Priest Lake between 1990 and 2003.

We used gillnets to capture and remove a total of 571 lake trout in two netting efforts from Upper Priest Lake in 2003. During our June effort, 267 lake trout were removed with an additional 304 lake trout captured and removed during August 2003. Standardized catch ranged from 0.92 to 1.04 fish/hr/100 m^2 of net in our June and August efforts, respectively. Size of lake trout ranged from 225 to 863 mm (TL), with a modal size of 515 mm. We incidentally netted 14 bull trout *S. confluentus* during the lake trout netting efforts and four bull trout mortalities were known to have occurred. The ratio of lake trout to bull trout was 41:1 compared to 93:1 in 2002.

We conducted kokanee spawner counts along the shoreline of Priest Lake in November. A total of 2,832 kokanee spawners were counted at five historic locations in Priest Lake. We were unable to survey Upper Priest Lake as low water levels prevented boat traffic from entering the Thorofare. The numbers of spawners observed at each of the five sites on Priest Lake were as follows: Copper Bay 1,237, Huckleberry Bay 38, Cavanaugh Bay 933, Hunt Creek beach 642, and Indian Creek beach 0. Female kokanee ranged from 370 to 410 mm with a mean length of 384 mm. Male kokanee ranged from 285-450 mm with a mean length of 398 mm.

We tagged 147 black crappie *Pomoxis nigromaculatus* in Hayden Lake in 2003 with reward tags to estimate annual crappie exploitation by anglers. A total of 36 of these tags were returned within one year of initial capture for an uncorrected annual exploitation rate of 22 percent. We assumed minimal tag loss and a non-reporting rate of 25%. Therefore, total exploitation was likely around 28% compared to 36% in 2002. We also implanted 41 $10 reward Floy tags in largemouth bass in Hayden Lake on April 29. A total of 17 tags were returned within one year of initial capture. Of these tagged bass four were harvested for an uncorrected annual exploitation rate of 10 percent. Corrected, total exploitation was estimated at around 12%.

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INTRODUCTION

This report documents efforts by Panhandle Region fisheries personnel to evaluate the status of lake fisheries and their response to changes in management, fishing pressure, habitat alteration, and climatic conditions. These findings are instrumental in ensuring proper actions will be taken to protect, preserve, perpetuate and manage the fishes of Idaho.

OBJECTIVES

1. Evaluate stock status of kokanee in Coeur d'Alene Lake.

2. Estimate production of wild Chinook salmon by counting Chinook salmon redds in the Coeur d'Alene and St. Joe Rivers.

3. Estimate angling effort and harvest of lake trout from Priest and Upper Priest Lakes.

4. Determine stock status of lake trout and bull trout in Upper Priest Lake.

5. Compare gill net catch rates of lake trout in 2003 with catch rates from previous years to provide additional information on the effectiveness of our lake trout suppression efforts.

6. Determine shoreline spawning areas used by kokanee and estimate the number of spawners in Priest and Upper Priest Lakes.

7. Estimate exploitation of crappie in Hayden Lake.

METHODS

Fish Population Characteristics

Coeur d'Alene Lake

Kokanee Population Estimate - We used a midwater trawl, as described by Bowler et al. (1979), Rieman and Meyers (1990), and Rieman (1992), to estimate the kokanee *Oncorhynchus nerka* population in Coeur d'Alene Lake. Twenty-two transects were trawled during the dark phase of the moon on July 28-29, 2003. Trawl transects were selected using a stratified random sample design and were in identical locations (as near as possible) to those used in previous years (Figure 1). Kokanee were measured and weighed, and scale and otoliths were collected from representative length groups for age analysis.

We used an experimental sinking gillnet to estimate mean length of male and female kokanee spawners. The net was set at depths of 3-5 m near Higgins Point for 40 minutes on December 2, 2003. Potential egg deposition (PED) was estimated as the number of female

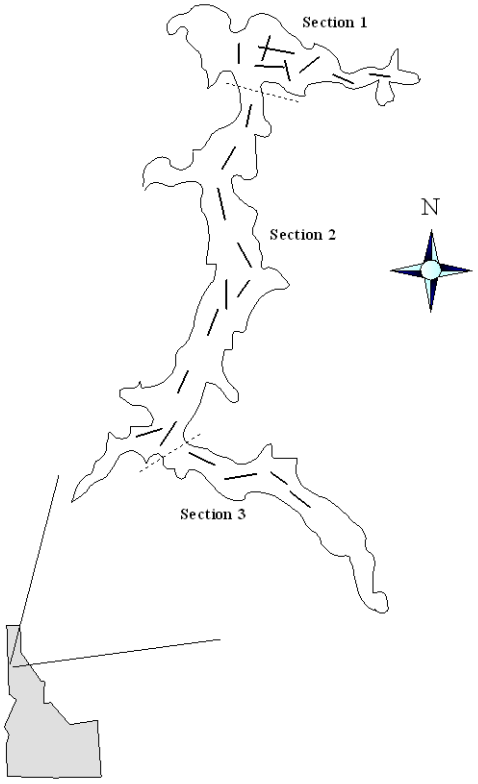


Figure 1. Location of the midwater trawling transects in three sections of Coeur d'Alene Lake, Idaho, used to estimate kokanee population abundance in 2003.

kokanee spawners (half the mature population based on midwater trawling) multiplied by the average number of eggs produced per female. The average number of eggs produced per female kokanee was calculated using the following length to fecundity regression (Rieman 1992):

$$Y = 3.98x - 544$$

Where: x =mean length of female kokanee spawners (mm)
Y =mean number of eggs per female

Chinook Salmon Abundance - Department personnel used a helicopter to conduct Chinook *O. tshawytscha* redd surveys in the Coeur d'Alene River, North Fork Coeur d'Alene River, South Fork Coeur d'Alene River, Little North Fork Coeur d'Alene River and St. Joe River on October 9, 2003. We estimated natural production using these redd counts, an estimate of 4,000 eggs per redd, and a mean egg-to-smolt survival of 10%.

Spirit Lake

Kokanee population and relative year-class abundance are typically evaluated each year. However, due to low lake levels in 2003 we were unable to launch our 9.12 m trawling boat at Spirit Lake and no estimate was made.

Priest Lake

2003 Tagging and Tag Returns. - Lake trout *Salvelinus namaycush* were tagged as part of an ongoing effort to quantify angler exploitation and help define the population dynamics of lake trout in Priest Lake. All fish were caught and tagged by Randy Phelps, a volunteer angler. Spaghetti tags were placed in the dorsal musculature beneath the dorsal fin. Catch location, date, fish length and weight, and any comments regarding the health or release of the fish were recorded at the time of tagging along with the tag number. Fish were released back to the same water from where they were captured. In addition, we continued to collect information from lake trout reported by anglers tagged in previous years. As in past years, we summarized total and annual growth and distance from original capture site.

Kokanee Spawner Counts. Lakeshore areas were surveyed to determine the location of kokanee spawning and to quantify the number of spawners. Kokanee spawner counts were conducted in five historic spawning areas on Priest Lake over a four- week period to confirm peak spawning time. Spawner counts were conducted October 21, 31, November 4, and 10, 2003. Surveys were conducted using a boat with two observers standing on the bow while a third person drove the boat contouring the shoreline at a depth of about 3 m. Each observer counted spawners and an average of the two counts was used as the estimate for each of the five sites. Our efforts were concentrated on the area between the Granite Creek delta and Copper Bay, Indian Creek campground and marina, Cavanaugh Bay Marina, Hunt Creek delta and Huckleberry Bay (Figure 2).

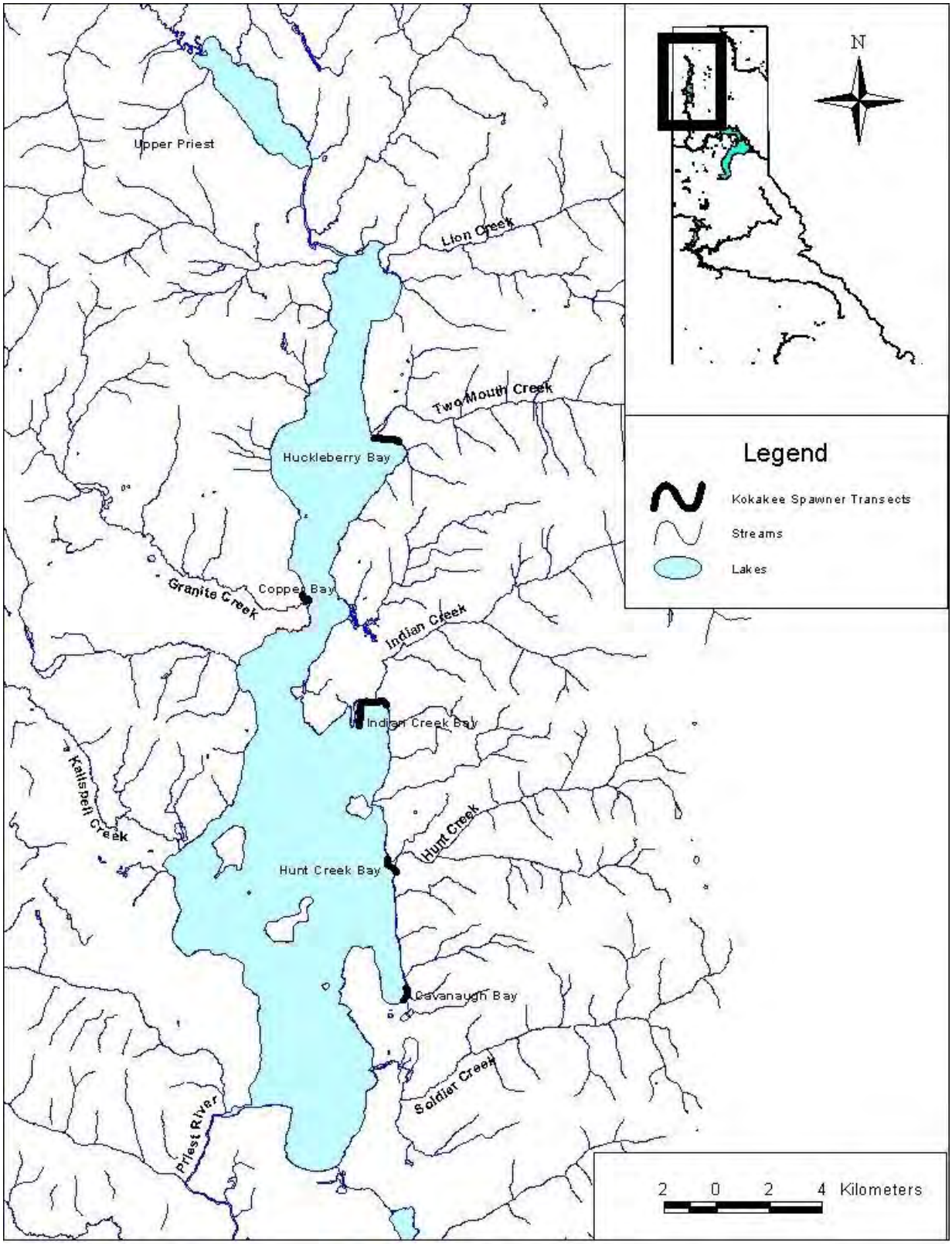


Figure 2. Locations of kokanee spawner counts on Priest Lake, Idaho, 2003.

Upper Priest Lake

Lake Trout Netting - Lake trout were removed from Upper Priest Lake using four 91.4 x 2.4 m experimental, monofilament, sinking gillnets with three panels of 2.5, 3.8, and 5.1 cm mesh.

Netting occurred on June 24-26 and August 19-21, 2003. Gillnets were set throughout the lake and were moved based on catch rates at a particular site and the discretion of the netting crew. A concerted effort was made to avoid incidental bull trout *S. confluentus* captures. Gillnets were set perpendicular to shore at depths ranging from 20 to 33 m. Nets were set during daylight hours only and were pulled every 45-60 minutes. We standardized catch to a unit of sampling effort (fish/hr/100 m^2 of gillnet) to allow comparison with previous netting efforts. Netted lake trout were measured, examined for tags and killed. All processed lake trout were filleted and given to various food banks throughout the Idaho panhandle.

Hayden Lake

Crappie and Largemouth Bass Exploitation – Black crappie *Pomoxis nigromaculatus* and largemouth bass *Micropterus salmoides* were collected by electrofishing and tagged with Floy T-bar anchor reward tags in 2003 to estimate annual angler exploitation. Tagging occurred on April 29, 2003.

RESULTS

Fish Population Characteristics

Coeur d'Alene Lake

Kokanee Abundance - Trawl results indicated a low number of adult kokanee, with the total population of age-3 fish estimated at 182,000 or 19 fish/ha, far below the 24 year mean of 782,000 age-3 kokanee, but a significant improvement over the 70,000 estimate in 2002 (Table 1). We estimated 970,000 age-1 kokanee, slightly higher than the 2002 estimate (Table 1), but well below the 1979-2002 mean of 1.5 million. Age-2 kokanee were estimated at 501,000. This is down from the 2002 estimate of 695,000, and far below the 24-year mean of 1.5 million. The estimated population of age-0 kokanee was 3.3 million, slightly lower than the 24-year mean of 3.4 million fish. The standing stock of kokanee in Coeur d'Alene Lake was estimated at 27.66 kg/ha. This is a slight improvement over the 2002 estimate of 26.62/ha and a significant improvement over the 2000 and 2001 estimates of 3.86 and 5.80 kg/ha, respectively. Consistent with previous years, the highest age-0 kokanee densities were in the northern section of the lake (Table 2). Based on the 2002 PED estimate and the 2003 age-0 estimate, egg to fry survival was 13%, which is near the mean for the past 10 years and well above the 24 year mean (Table 3).

Kokanee fry collected in the trawl ranged from 30 to 59 mm TL. Age-1 kokanee ranged from 90 to 150 mm, with a modal length of around 130 mm. Age-2 fish ranged from 170 to 250 mm, with a modal length of around 200 mm. Size of the age-3 kokanee at the time of trawling ranged from 250 to 289 mm, with a modal length of 255 mm (Figure 3). This is comparable to the modal length of age-3 fish in 2002 and 2001. Typical of kokanee in Coeur d'Alene Lake, maturity was primarily at age-3. Three of the 11 age-2 kokanee examined were mature, and all of the age-3 kokanee captured were mature.

Table 1. Estimated abundance of kokanee made by midwater trawl in Coeur d'Alene Lake, Idaho, from 1979-2003. To follow a particular year class of kokanee, read up one row and right one column.

Sampling Year	Age Class				Total	Age 3+/ha
	Age-0+	Age-1+	Age-2+	Age-3/4+		
2003	3,300,594	970,831	501,432	182,334	4,955,192	19
2002	3,507,000	934,000	695,200	70,800	5,207,000	7
2001	7,098,700	929,900	193,100	25,300	8,247,00	3
2000	4,184,800	783,700	168,700	75,300	5,212,600	8
1999	4,091,500	973,700	269,800	55,100	5,390,100	6
1998	3,625,000	355,000	87,000	78,000	4,145,000	8
1997	3,001,100	342,500	97,000	242,300	3,682,000	25
1996	4,019,600	30,300	342,400	1,414,100	5,806,400	147
1995	2,000,000	620,000	2,900,000	2,850,000	8,370,000	296
1994	5,950,000	5,400,000	4,900,000	500,000	12,600,000	52
1993	5,570,000	5,230,000	1,420,000	480,000	12,700,000	50
1992	3,020,000	810,000	510,000	980,000	5,320,000	102
1991	4,860,000	540,000	1,820,000	1,280,000	8,500,000	133
1990	3,000,000	590,000	2,480,000	1,320,000	7,390,000	137
1989	3,040,000	750,000	3,950,000	940,000	8,680,000	98
1988	3,420,000	3,060,000	2,810,000	610,000	10,900,000	63
1987	6,880,000	2,380,000	2,920,000	890,000	13,070,000	93
1986	2,170,000	2,590,000	1,830,000	720,000	7,310,000	75
1985	4,130,000	860,000	1,860,000	2,530,000	9,370,000	263
1984	700,000	1,170,000	1,890,000	800,000	4,560,000	83
1983	1,510,000	1,910,000	2,250,000	810,000	6,480,000	84
1982	4,530,000	2,360,000	1,380,000	930,000	9,200,000	97
1981	2,430,000	1,750,000	1,710,000	1,060,000	6,940,000	110
1980	1,860,000	1,680,000	1,950,000	1,060,000	6,500,000	110
1979	1,500,000	2,290,000	1,790,000	450,000	6,040,000	46
Previous $\ddot{x}$	**3,438,396**	**1,511,920**	**1,566,332**	**782,817**	**6,605,057**	**81**

Table 2. Kokanee population estimates and standing crop (kg/ha) in each section of Coeur d'Alene Lake, Idaho, July 28-29, 2003.

Section	Age-0	Age-1	Age-2	Age-3	Kg/ha
1	3,111,862	68,079	51,495	20,349	5.30
2	188,732	467,992	409,333	130,664	11.82
3	0	434,761	40,604	31,321	10.54
Whole lake	**3,300,594**	**970,831**	**501,432**	**182,334**	27.66
(90% CI)	1,929,655	779,723	269,812	88,573	

Table 3. Estimates of female kokanee spawning escapement, potential egg deposition, fall abundance of kokanee fry, and their subsequent survival rates in Coeur d'Alene Lake, Idaho, 1979-2003.

Year	Estimated female escapement	Estimated potential number of eggs ($x10^6$)	Fry estimate the following year ($x10^6$)	Percent egg to fry survival
2003	91,000	62		
2002	35,000	25	3.30	13.2
2001	12,650	10	3.50	34.0
2000	37,700	32	7.10	22.2
1999	28,000	19	4.18	22.6
1998	39,000	26	4.09	15.7
1997	90,900	54	3.60	6.67
1996	707,000	358	3.00	0.84
1995	1,425,000	446	4.02	0.90
1994	250,000	64	2.00	0.31
1993	240,000	92	5.95	6.46
1992	488,438	198	5.57	2.81
1991	631,500	167	3.03	1.81
1990	657,777	204	4.86	1.96
1989	516,845	155	3.00	1.94
1988	362,000	119	3.04	2.55
1987	377,746	126	3.42	2.71
1986	368,633	103	6.89	6.68
1985	530,631	167	2.17	1.29
1984	316,829	106	4.13	3.90
1983	441,376	99	0.70	0.71
1982	358,200	120	1.51	1.25
1981	550,000	184	4.54	2.46
1980	501,492	168	2.43	1.45
1979	256,716	86	1.86	2.20

In a 40 minute gillnet set near Higgins Point in Wolf Lodge Bay on December 2, 2003, we collected 60 kokanee spawners. As usual, males outnumbered females, with 30% of the sample being females. Female kokanee ranged from 295 to 342 mm with a mean length of 309 mm (TL), (n=30, SD=11.6). Male kokanee ranged form 305 to 390 mm with mean and modal lengths of 332 and 320 mm, respectively, (n= 59 SD=12.6). Mean length of spawners was comparable to 2001 and 2002. Spawner length during the past four years was the largest it has been since 1960 (Figure 4). Mean fecundity was estimated at 686 eggs per female based on a mean female spawner length of 309 mm, and potential egg deposition (PED) was approximately 62 million eggs (Table 3). This is much higher than the 2001 and 2002 PED estimates of 10 and 25 million eggs respectively, but is still well below the average for the past 24 years (127 million).

Chinook Salmon Abundance - We counted 51 Chinook salmon redds in the Coeur d'Alene River drainage and 27 in the St. Joe River for a total of 78 redds in 2003 (Table 4). All redds were left undisturbed to provide natural production. Conditions for counting were relatively favorable (clear skies and clear water), and we were able to see most redds easily. We estimated the natural production using these redd counts, an estimated 4,000 eggs per redd, and a mean egg-to-smolt survival of 10%. Based on these figures, we estimated smolt production for wild Chinook to be 31,200 fish in 2004.

In June 2003 we stocked 42,000 age-0 Chinook salmon at the Mineral Ridge boat ramp in Wolf Lodge Bay. Chinook eggs were collected at Big Springs Hatchery, Oregon, hatched at Cabinet Gorge Hatchery and reared at the Nampa Hatchery. Mean size was 160 mm, and all fish were marked with an adipose fin clip. We estimated that 2,000 age-0 Chinook died prior to stocking. Stress related to travel time and warm surface water temperatures were responsible for the loss. Over the past 22 years we have stocked an average of 30,000 age-0 Chinook salmon in Wolf Lodge Bay (Table 5). The total hatchery and wild Chinook salmon stocking in Coeur d'Alene Lake in 2003 was about 62,000 fish (Table 5).

Priest Lake

2003 Tagging and Tag Returns - An additional 59 lake trout were tagged by the Priest Lake volunteer angler, Mr. Randy Phelps. Fish ranged from 330 to 520 mm (TL), with a mean size of 484 mm. All of these fish were tagged near Bartoo Island.

A total of 34 tagged lake trout were recaptured in 2003. All had been tagged in Priest Lake between 1990 and 2003 (Table 6). Lake trout were caught from 0 to 8.9 km from their original capture site, with an average distance from original capture of approximately 3 km.

Annual growth, as reported from angler tag returns, ranged from 0 to 5.1 cm/year, with an average annual growth of 2.1 cm/year. This compares to a reported mean annual growth of 1.8 cm/year in 2002, 3.4 cm/yr in 2001, and 4 cm/yr in 2000.

Kokanee Spawner Counts - Kokanee spawner counts in Priest Lake increased each week surveyed. A total of 1,483 kokanee spawners were observed on October 21 with spawner counts increasing each week and peaking on November 10. A total of 2,832 kokanee spawners were counted at the five historic shoreline sites on November 10 (Table 7). Number of redds observed at each of the five sites on November 10 were as follows; Copper Bay 1,237, Huckleberry Bay 38, Cavanaugh Bay 933, Hunt Creek beach 624. No kokanee spawners were observed at Indian Creek beach since 2001 (Table 7).

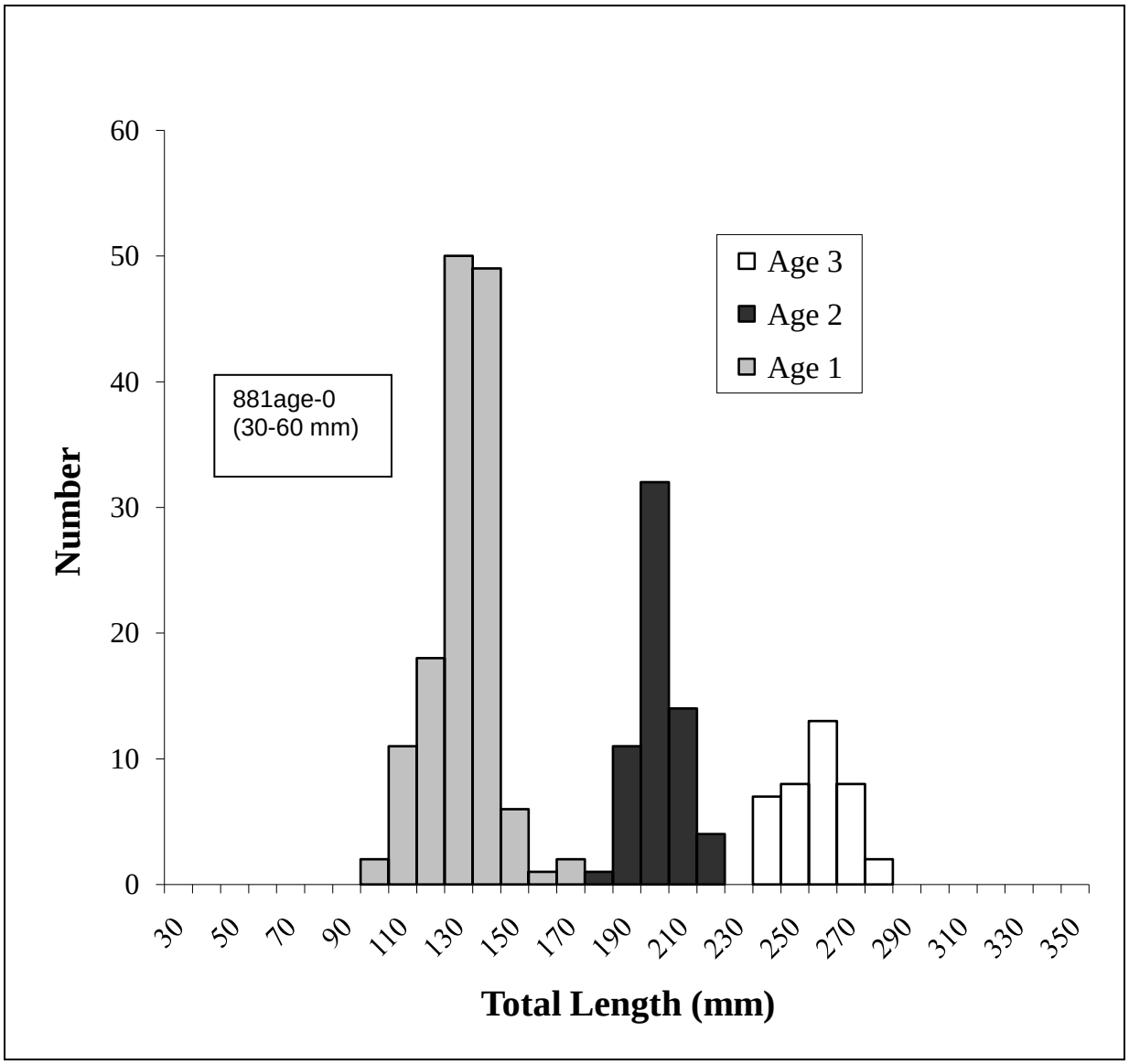


Figure 3. Length frequency and age of kokanee collected by midwater trawling in Coeur d' Alene Lake, Idaho, in 2003.

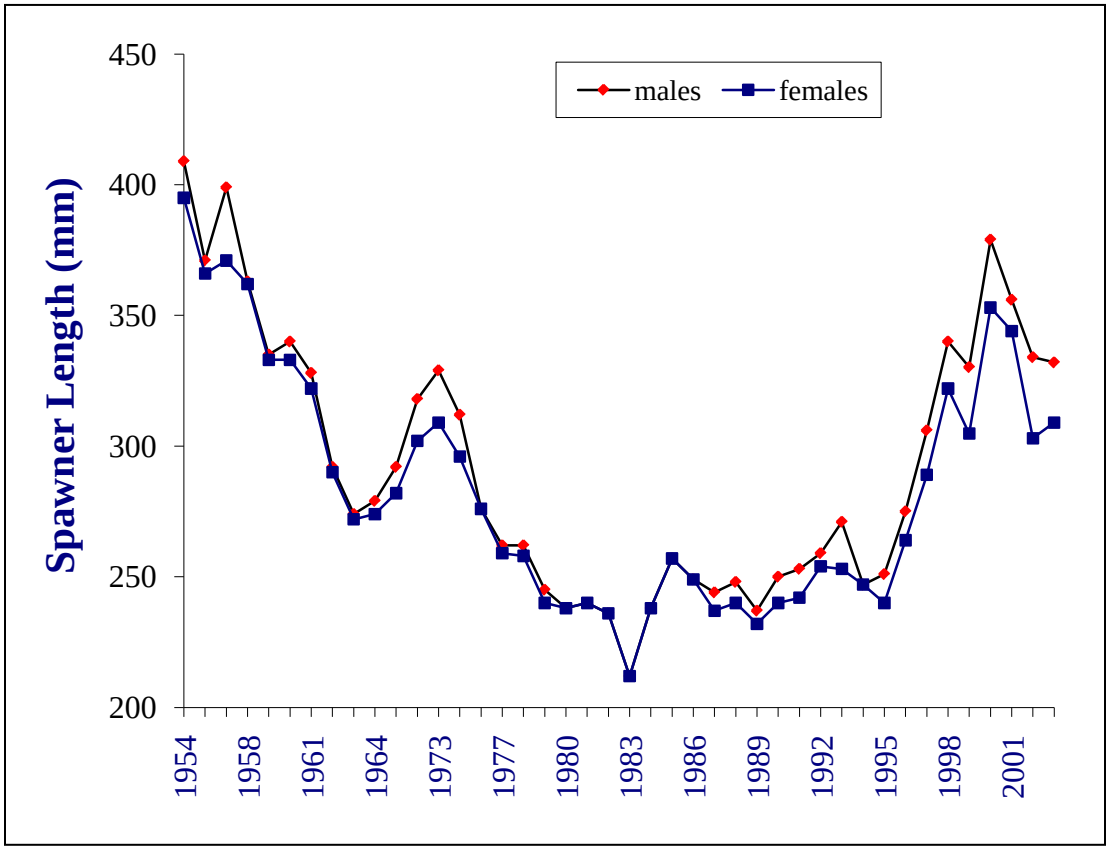


Figure 4. Mean total length of male and female kokanee spawners in Coeur d'Alene Lake, Idaho, from 1954 to 2003. Year where mean lengths were identical between sexes are a result of averaging male and female lengths.

Table 4. Chinook salmon redd counts in the Coeur d'Alene River drainage, St. Joe River, and Wolf Lodge Creek, Idaho, 1990-2003.

Location	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Coeur d'Alene River														
Cataldo Mission to S.F. Cd'A R	41	11	29	80	82	45	54	18	11	7	16	18	14	27
S.F. Cd'A River to L.N.F. Cd'A R	10	0	5	11	14	14	13	5	3	5	20	13	10	17
L.N.F. Cd'A River to Steamboat Creek	--	2	3	6	1	1	13	6	1	0	3	2	6	2
Steamboat Creek to steel bridge	--	--	1	0	0	2	0	3	0	0	0	1	0	0
Steel bridge to Beaver Creek	--	--	--	--	0	0	0	1	0	0	0	0	0	0
S. F. Cd'A River	--	--	--	--	13	--	4	0	0	0	5	4	3	5
L.N.F. Cd'A River	--	--	--	--	0	2	0	0	0	0	1	0	0	0
Coeur d'Alene River Subtotal	51	13	38	97	110	64	84	33	15	12	45	38	33	51
St. Joe River														
St. Joe City to Calder	4	0	18	20	6	1	59	20	3	0	5	21	14	15
Calder to Huckleberry C.G.	3	1	1	4	0	0	5	2	1	0	0	15	4	9
Huckleberry C.G. to Marble Crk	3	0	2	0	1	0	7	2	0	0	0	--	0	3
Marble Creek to Avery	0	0	0	0	1	0	0	0	2	0	0	--	0	0
St. Joe River Subtotal	10	1	21	24	8	1	71	24	6	0	5	36	18	27
Wolf Lodge Creek	--	--	--	--	--	--	--	--	4	5	3	4	0	0
TOTAL	**66**	**14**	**63**	**121**	**118**	**65**	**155**	**57**	**25**	**17**	**53**	**78**	**51**	**78**

Table 5. Number of chinook salmon stocked and estimated number of naturally produced Chinook salmon entering Coeur d'Alene Lake, Idaho, 1982-2003. The number of Chinook redds is the count from the previous fall.

	Hatchery Produced				Naturally Produced		
Year	Number	Stock	Rearing Hatchery	Fin Clip	Previous year redd counts	Estimated Smolts	Total
1982	34,4000	Bonneville	Hagerman	--	--	--	34,400
1983	60,100	Bonneville	Mackay	--	--	--	60,100
1984	10,500	L. Michigan	Mackay	--	--	--	10,500
1985	18,500	L. Michigan	Mackay	Left Ventral	--	--	18,500
1986	29,500	L. Michigan	Mackay	Right Ventral	--	--	29,500
1987	59,400	L. Michigan	Mackay	Adipose	--	--	59,400
1988	44,600	Coeur d’Alene	Mackay	Left Ventral	--	--	44,600
1989	35,400	Coeur d’Alene	Mackay	Right Ventral	--	--	35,400
1990	36,350	Coeur d’Alene	Mackay	Adipose	52	23,400	59,100
1991	42,650	Coeur d’Alene	Mackay	Left Ventral	70	31,500	73,100
1992	10,000	Coeur d’Alene	Mackay	Right Ventral	14	6,300	16,300
1993	0	--	--	--	63	28,350	28,350
1994	17,269	Coeur d’Alene	Nampa	Adipose	100	40,000	57,269
1995	30,200	Coeur d’Alene	Nampa	Left Ventral	100	40,000	70,200
1996	39,700	Coeur d’Alene	Nampa	Right Ventral	65	26,000	65,700
1997	12,100	Coeur d’Alene	Nampa	Adipose	84	33,600	45,700
1998	55,200	Priest Rapids	Cabinet G.	Left Ventral	37	14,800	70,000
1999	25,000	Big Springs	Cabinet G.	Right Ventral	25	10,000	35,000
2000	28,200	Big Springs	Nampa	Adipose	17	6,800	35,000
2001	0	--	--	--	53	21,200	21,200
2002	30,000	Big Springs	Nampa	Left Ventral	78	31,000	61,000
2003	42,000	Big Springs	Nampa	Right Ventral	51	20,400	62,400

Table 6. Size, growth, and locations of tagged lake trout reported caught by anglers from Priest Lake, Idaho, in 2003.

		Recapture				Mark			Growth (mm)		
Color	**Tag#**	**Date**	**Length (mm)**	**Weight**	**Location**	**Date**	**Length**	**Location**	**Total Growth**	**Annual Growth**	**Distance from original capture site (km)**
Blue	R1-00810	6/13/03	470		S. of Bartoo	6/16/01	465	NEB*	4.9	2.5	--
Blue	R1-120	7/15/03	0	2.5	E. Kalispell	10/1/95	483	NEB	--	--	--
Blue	R1-139		610	5	Kalispell	10/5/95	425	NEB	184.6	23.1	--
Blue	R1-336	6/26/03	356		Cav. Bay	6/24/02	350	NEB	5.6	6	--
Green	R1-00241	7/1/03	470		Cav. Bay	9/29/99	510	NEB	--	10	--
Green	R1-00273	5/12/03	0	3	Kalispell	6/2/00	480	NEB	--	--	--
Green	R1-00299	8/30/03	508	3.5	S. of Bartoo	9/19/00	429	SEB*	79	26.3	3.2
Green	R1-00322	5/17/03	457	3	Hills Resort	7/25/98	460	NEB	--	--	3.2
Green	R1-00354	1/1/03	495		S. of Bartoo	6/29/00	465	NEB	30.3	10	3.2
Green	R1-00445	8/30/03	610	5	Reeder Bay	7/13/00	455	NEB	154.6	51.5	4.8
Green	R1-00485	7/1/03	0	3.5	Bartoo	7/24/00	205	NEB	--	--	3.2
Green	R1-00715	6/28/03	406		8 Mile	9/5/00	440	NEB	--	--	0
Green	R1-00718	7/5/03	495		Bartoo	9/7/00	500	NEB	--	--	4.0
Green	R1-00725	8/31/03	508	2.25	Bartoo	9/12/00	371	SEB	137	45.7	0.8
Green	R1-00728	6/10/03	445		Kalispell	9/15/00	450	NEB	--	--	5.6
Green	R1-00735	7/20/03	407		8 Mile	9/15/00	370	NEB	36.4	12	0
Green	R1-00754	5/26/03	533		N. of Bartoo	9/25/00	450	NEB	83.4	28	3.2
Green	R1-00770	4/23/03	521		E. Bartoo	10/17/00	495	NEB	25.7	8.7	0
Green	R1-00772	7/15/03	560		Bartoo	10/17/00	550	NEB	10	3.3	0
Green	R1-00880	7/6/03	470		8 Mile	7/19/01	420	NEB	49.9	25	4.8
Green	R1-00910	1/19/03	457		Pinto Point	7/27/01	410	NEB	47.2	23.5	3.2
Green	R1-00959	6/13/03	508		Kalispell	9/14/01	415	NEB	93	46.5	0.8
Green	R1-00962	5/26/03	406		NEB	9/14/01	415	NEB	--	--	0
Green	R1-00998	6/1/03	406		NEB	6/21/02	420	NEB	--	--	0

Table 6. Continued.

		Recapture				Mark			Growth (mm)		
Color	**Tag#**	**Date**	**Length (mm)**	**Weight**	**Location**	**Date**	**Length**	**Location**	**Total Growth**	**Annual Growth**	**Distance**
Orange	02583	7/17/03	724	8	S. of Bartoo	11/6/00	642	Thorofare	81.9	27.3	4.8
Red	02883	8/9/03	0	2.25					--	--	--
White	A000317	5/16/03	661		Cape Horn	5/16/90	325	Pinto Point	335.4	26	3.2
Yellow	R1-00322	8/9/03	572	4	Bartoo				--	--	--
Yellow	R1-01314	6/28/03	0	4.2	E. Kalispell	6/12/96	400	NEB	--	--	--
Green	R1-00874	12/11/03			Kalispell	7/19/01	425	NEB	--	--	4.8
Red	02902	6/7/03	425		N. of Bartoo				--	--	--
Orange	02567	4/6/03	625		Kaniksu	10/23/00	524	Thorofare	101	40	14.5
Green	R1-01011	7/6/03			Reeder Bay	8/22/02	395	NEB	--	--	8.0
Blue	R1-135	8/7/03	546	3.5	Reeder Bay	10/5/95	200	NEB	346	43	8.9

*NEB – northeast side of Bartoo Island
*SEB – southeast side of Bartoo Island

Table 7. Counts of shoreline spawning kokanee salmon in Priest Lake and Upper Priest Lake, Idaho, 2001-2003.

Location	**2001**	**2002**	**2003**
Priest Lake			
Copper Bay	588	549	1237
Cavanaugh Bay	523	921	933
Huckleberry Bay	200	49	38
Indian Creek Bay	222	0	0
Hunt Creek Mouth	232	306	624
Upper Priest Lake			
West Shoreline	10	---[1]	---[1]
Total	**1775**	**1825**	**2832**

[1] Upper Priest Lake was not included in the spawner counts due to low water in the Thorofare and no access to Upper Priest Lake.

Annual growth, as reported from angler tag returns, ranged from 0 to 5.1 cm/year, with an average annual growth of 2.1 cm/year. This compares to a reported mean annual growth of 1.8 cm/year in 2002, 3.4 cm/yr in 2001, and 4 cm/yr in 2000.

Kokanee Spawner Counts - Kokanee spawner counts in Priest Lake increased each week surveyed. A total of 1,483 kokanee spawners were observed on October 21 with spawner counts increasing each week and peaking on November 10. A total of 2,832 kokanee spawners were counted at the five historic shoreline sites on November 10 (Table 7). Number of redds observed at each of the five sites on November 10 were as follows; Copper Bay 1,237, Huckleberry Bay 38, Cavanaugh Bay 933, Hunt Creek beach 624. No kokanee spawners were observed at Indian Creek beach since 2001 (Table 7).

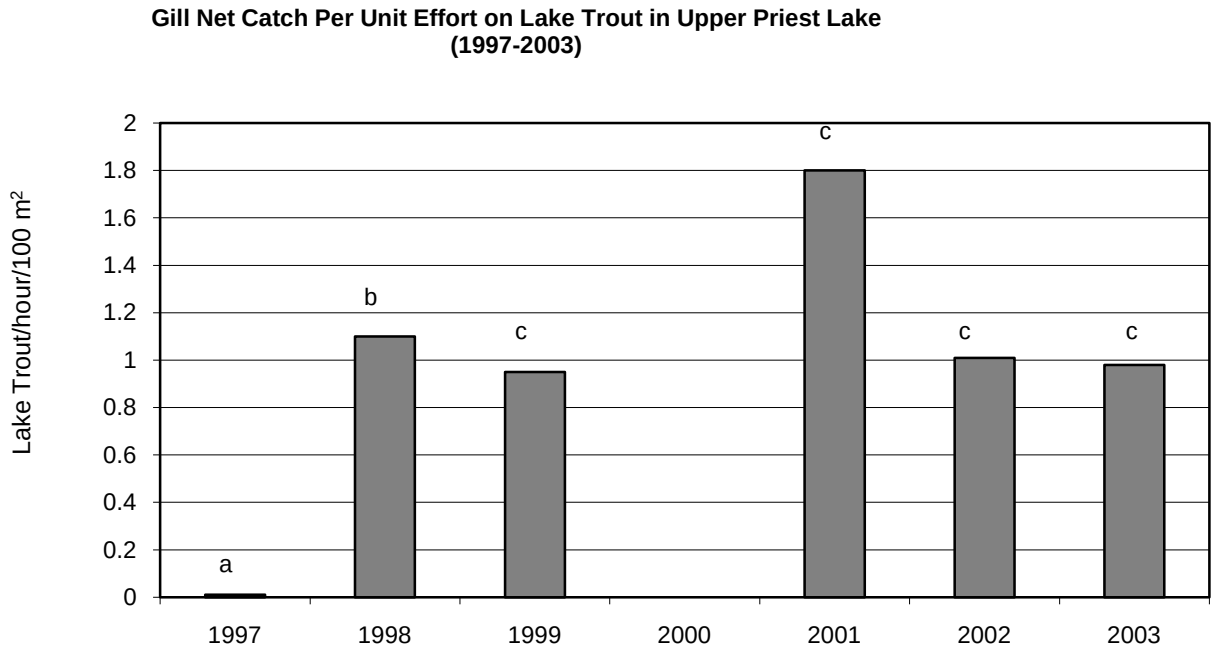
Female kokanee lengths (TL) ranged from 370-410 mm with a mean length of 384 mm. Male kokanee ranged from 285-450 mm with a mean length of 398 mm. No significant change in mean length has been observed in Priest Lake adult kokanee over the past three years.

Landowners have reported small concentrations of kokanee spawners at the mouth of Granite Creek, Steamboat Bay and in the Priest River between Outlet Bay and the outlet dam. We will investigate these reports the fall of 2004. The entire shoreline of Upper Priest Lake was surveyed on November 18 and no kokanee spawners were observed. Ten kokanee spawners were observed in Upper Priest Lake in 2001. In 2002 and 2003 we were unable to conduct spawner counts in the upper lake due to extremely low water levels preventing us from boating through the Thorofare.

Upper Priest Lake

Lake Trout Netting - We netted and removed a total of 571 lake trout in the four netting efforts in 2003. Catches ranged from 267 lake trout in our June 24-26 effort to 304 fish in our August 19-21 effort. Standardized catch ranged from 0.92 to 1.04 fish/hr/100 m^2. We saw little evidence that the lake trout population had been significantly impacted by the 2002 effort, when 836 lake trout were removed. Gillnet catch rates were comparable to catch rates the past few years. We saw little evidence of shifting size structure due to exploitation in 2002. Mean catch rate during 2003 was .98 fish/hr/100 m^2 of gillnet compared to the 2002 effort of 1.02 fish/hr/100 m^2 and 1.8 fish/hr/100 m^2 in 2001 (Figure 5). Size of lake trout ranged from 225 to 863 mm (TL), with a modal size of 515 mm (Figure 6).

We incidentally netted 14 bull trout during the lake trout netting efforts in 2003 and recorded four bull trout mortalities. Bull trout ranged in size from 385-730 mm (Figure 7).



[a]During 1997, 45.7 X 1.8 m gill nets were used and gill net placement occurred throughout the lake.

[b]During 1998, 45.7 X 1.8 m gill nets were used for approximately 25% of the effort and remaining effort used 90 X 2.4 m nets. Net placement occurred throughtout the lake.

[c]During 1999, 2001, 2002, and 2003, all gill nets were 90 x 2.4 m and gill net placement was standardized in areas where higher catch rates occurred.

Figure 5. Standardized catch rates (fish/hour/100m^2 of gill net) for lake trout from Upper Priest Lake, Idaho, 1997-2003.

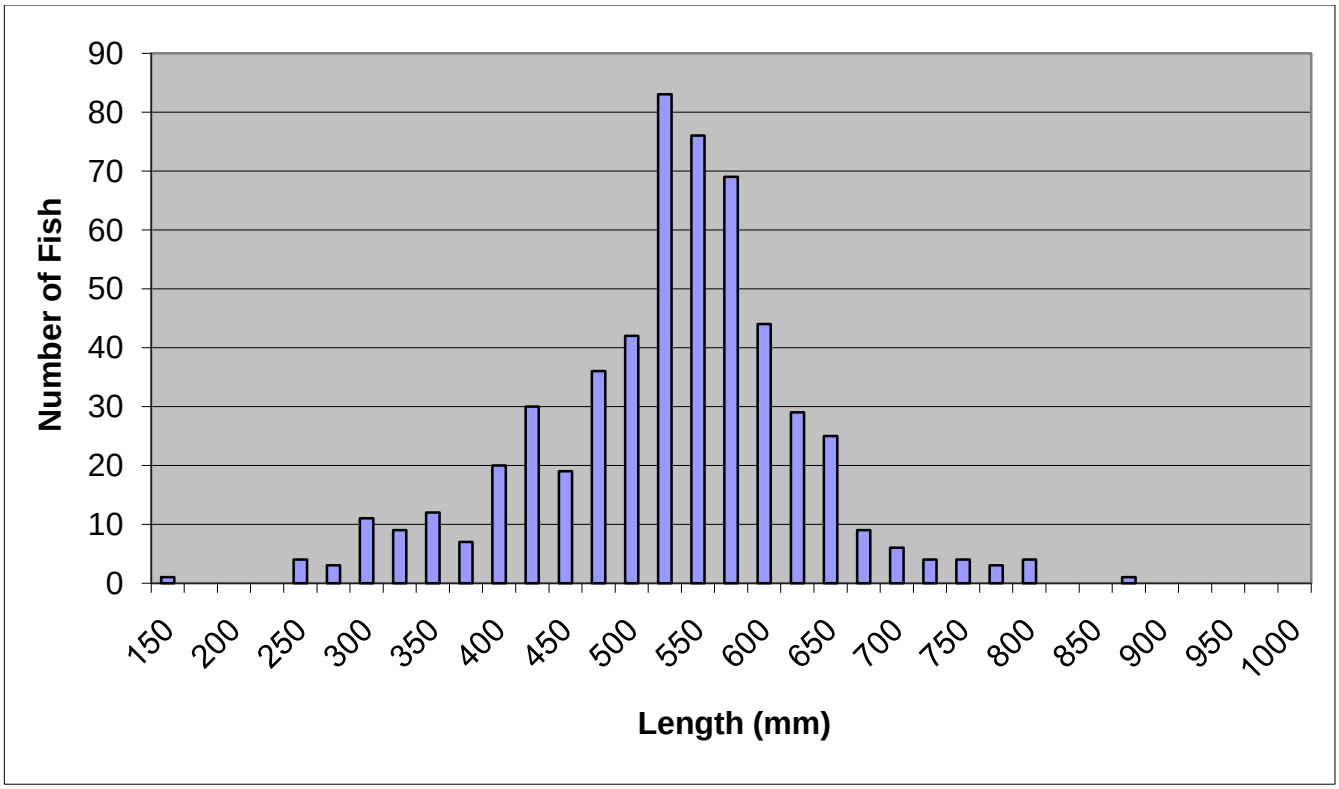


Figure 6. Length frequency of lake trout collected in gillnets from Upper Priest Lake, Idaho, 2003.

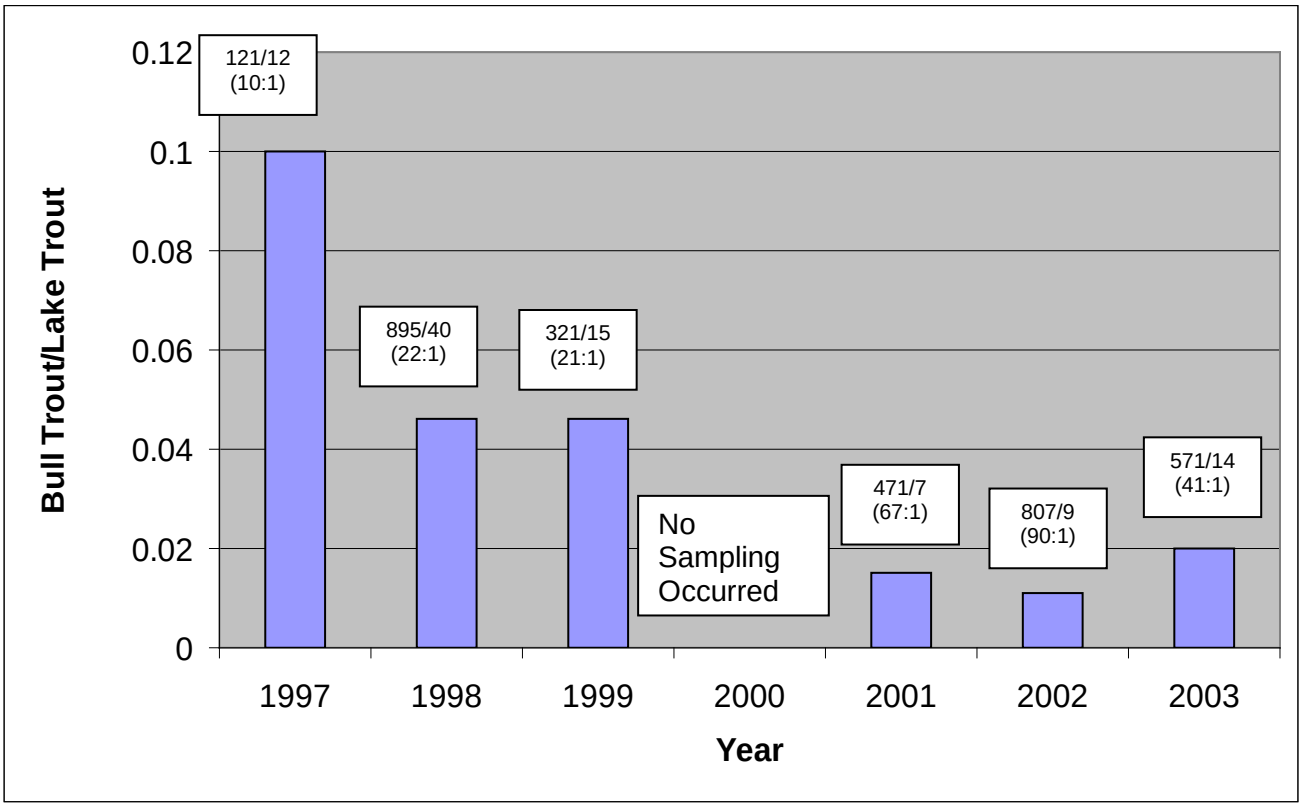


Figure 7. Bull trout to Lake trout ratio collected in gillnets from Upper Priest Lake, Idaho, 1997-2003.

Hayden Lake

Black Crappie Exploitation - We implanted 144 $10 reward Floy T-bar tags in black crappie in Hayden Lake on April 29 to estimate annual exploitation in 2003. A total of 36 tagged fish were caught with 32 being harvested within one year of initial capture for an uncorrected annual exploitation rate of 22 percent. We assumed minimal tag loss and a non-reporting rate of 25%. Therefore, total exploitation was likely around 28% compared to 36% in 2002 and 30% in 2001. Fifty-eight percent of the crappie were caught in May. Twenty-six anglers were responsible for the 36 crappie tag returns in 2003.

Largemouth bass Exploitation – We also implanted 41 $10 reward Floy tags in largemouth bass in Hayden Lake on April 29. A total of 17 tags were returned within one year of initial capture. Of these tagged bass, four were harvested for an uncorrected annual exploitation rate of 10 percent. Corrected, total exploitation was estimated at around 12%.

DISCUSSION AND RECOMMENDATIONS

Coeur d'Alene Lake Kokanee and Chinook

The kokanee population in Coeur d'Alene Lake is still well below the long-term average, but continues to improve. As in the previous five years, the low densities have resulted in much larger than average kokanee. Fish from the age-3 population appear to be similar in length to what they were in 2002, however, in terms of numbers; the population is higher than it has been since 1997. Age-3 kokanee are more than twice as numerous as 2002. The late summer fishery remains very popular due to the large size of mature fish.

Age-2 kokanee are still well below the 25 year average and slightly lower than 2002. However, other than in 2002, the age-2 kokanee population estimate is the highest it has been since 1995. Age-1 kokanee remained below the long-term average, but higher than the past 10 year average. Age-0 kokanee estimates were down slightly from 2002, and remain slightly below the 25-year average. Spawning escapement in 2002 was among the weakest since trawling began, but three times the 2001 estimate. Potential number of eggs deposited (PED) was around 25 million eggs. Because of the size of mature kokanee (250-330 mm) in recent trawl efforts, and the decreased capture efficiency with increasing size (Rieman 1992); we most likely underestimated the population of spawners. This suggests escapement of spawners the last four years was greater than trawl-based estimates indicate, and may partially account for the exceptionally high PED to fry survival rates in since 1999.

We stocked 42,000 hatchery juvenile Chinook in Coeur d'Alene Lake in June, 2003. These fish were hatched at Cabinet Gorge Hatchery and reared at the Nampa Hatchery. The warmer water temperatures of Nampa Hatchery allowed for accelerated growth resulting in an average size of 160 mm at time of release. The large size of the hatchery fish is expected to have a positive influence on their survival (Rick Alsager, IDFG Nampa Hatchery Manager, Personnel Communication). Elevated water temperatures in Coeur d'Alene Lake at the time of stocking resulted in an estimated loss of 2,000 juveniles. We counted 51 Chinook redds in 2003 in the Coeur d'Alene and St. Joe River drainages. We estimated natural production should yield 20,400 wild smolts to provide a total stocking of around 62,000 Chinook in 2003.

Angler reports indicate wild Chinook continue to make up the majority of Chinook caught in Coeur d'Alene Lake. During the Lake Coeur d'Alene Anglers Association sponsored Big One Derby, 90% of the fish caught were of wild origin. Since 1999 we have obtained Chinook eggs from Big Springs Hatchery, Oregon. Despite being reared to a mean size of 160 mm at our

Nampa Hatchery, this stock of fish continues to perform poorly relative to returning to the creel. An alternate source of Chinook eggs is being sought at this time.

Hayden Lake

Fishing regulations on Hayden Lake are difficult and confusing for anglers to understand and difficult for us to justify to the angling public. Hayden Lake has exceptions to the statewide fishing rules and limits for trout, bass, crappie, and northern pike in addition to fishing closures on all major tributaries entering the lake to maximize production of wild fish.

The number and strain of cutthroat trout and rainbow trout stocked in Hayden Lake has varied each year. From 1992 through 2002 we stocked an average of 126,400 cutthroat trout fingerlings and 358,000 fingerling domestic Kamloops rainbow trout in Hayden Lake. Despite these efforts anglers continue to complain about the declining trout fishery. A creel survey and a standard lake survey will be conducted in 2005 to gather biological and social data on the Hayden Lake fishery.

RECOMMENDATIONS

1. Stock 50,000 age-0 Chinook salmon in 2004 to supplement the estimated 31,000 naturally produced fish, for a combined total of 80,000 age-0 Chinook salmon smolts.

2. Continue to monitor the recovery of the kokanee population and adjust age-0 Chinook salmon supplementation accordingly.

3. Continue to encourage catch-and-keep Chinook salmon fishing.

4. Request Nampa Hatchery to transport Chinook salmon in late May to avoid mortalities due to elevated water temperatures.

5. Identify a new source of fall Chinook eggs with consideration given to spawn timing, disease, and availability.

6. Conduct a creel survey on Hayden Lake to collect biological and angler data to evaluate the need for differential smallmouth bass and largemouth bass regulations.

Upper Priest Lake

Lake Trout Netting – The 2003 gillnetting results once again confirmed the need for a lake trout migration barrier in the Thorofare if lake trout reduction efforts are to be effective. Gillnet catch rates were comparable to our previous three year efforts. In 2003, we saw little evidence that the lake trout population had been significantly impacted by our 2002 effort. Gillnet catch rates were comparable to catch rates in the past few years. We saw no evidence of shifting size structure due to exploitation the previous years, however, the lake trout:bull trout ratio improved in 2003 with 14 bull trout collected. The ratio of lake trout to bull trout in 2003 was 41:1 compared to 93:1 in 2002, and 67:1 in 2001 (Figure 7). Bull trout ranged in size from 385-730 mm. No juvenile bull trout were collected, and comparison with gillnet data from 1956 indicates juvenile bull trout are currently absent from the population (Figure 8).

Priest Lake and Upper Priest Lake Kokanee Spawner Counts

We counted 2,832 kokanee spawners at five historic sites on Priest Lake in 2003 compared to 1,825 in 2002 and 1,765 in 2001(Table 7). Kokanee spawning occurred between mid-October and early December with the peak around mid-November. Irizarry (1974) reported the timing of kokanee spawning Priest Lake to be between October 13 and December 15 peaking on November 13.

Unfortunately, it appears that a considerable number of beach spawned kokanee eggs are lost each year at Priest Lake because of winter drawdown of approximately one meter. Suitable shoreline spawning habitat for kokanee appears to be limited in Priest Lake. Spawning is concentrated in localized areas mainly on the west shoreline near Granite Creek and Copper Bay and the southern edge of Cavanaugh Bay. Seventy-seven percent of the kokanee spawners counted in 2003 spawned at these two locations compared to 81% in 2002 (Table 7). The bottom contour in these two major spawning areas is gently sloping, which results in exposure of spawning substrate or shallow water depths when the lake is drawn down.

The effect of fall drawdown on egg to fry survival in shoreline areas was first reported by Irizarry (1975). An evaluation drawdown and of loss of kokanee eggs commenced on Oct 18, 1974. Between Oct 18 and Dec 19, the lake lost 90% of its storage. During the bulk of the spawning season (Oct 24-Dec 1) the lake was lowered 0.5 meters accounting for an average shoreline horizontal distance loss of 4.9 m at west side spawning areas. At peak spawning (mid-November), many kokanee eggs were deposited in water depths averaging 25.4 cm or less. Irizarry (1975) estimated a loss of 1,245,805 kokanee eggs as a result of drawdown in west side shoreline spawning areas.

Idaho Department of Fish and Game believes the historical and present day data shows that late drawdown on Priest Lake seriously impacts kokanee spawning success. Major shoreline kokanee spawning areas are concentrated in areas of shallow sloping bottoms. Kokanee spawn from mid October through mid November, reaching a peak by early November. Stabilization of the winter pool level prior to the peak of kokanee spawning would enhance egg to fry survival. Even a small percentage of redds lost to dewatering may be significant when accompanied with high predation rates by lake trout.

With the recent addition of Indian Creek boat ramp at Indian Creek State Park, anglers now have a public year round, maintained, deep water boating access to Priest Lake. There are also other deep water marinas (Blue Diamond in Cavanaugh Bay) that offer moorage for those boaters who would like to extend their season. Discussions continue with various agencies and property owners relative to drawdown dates.

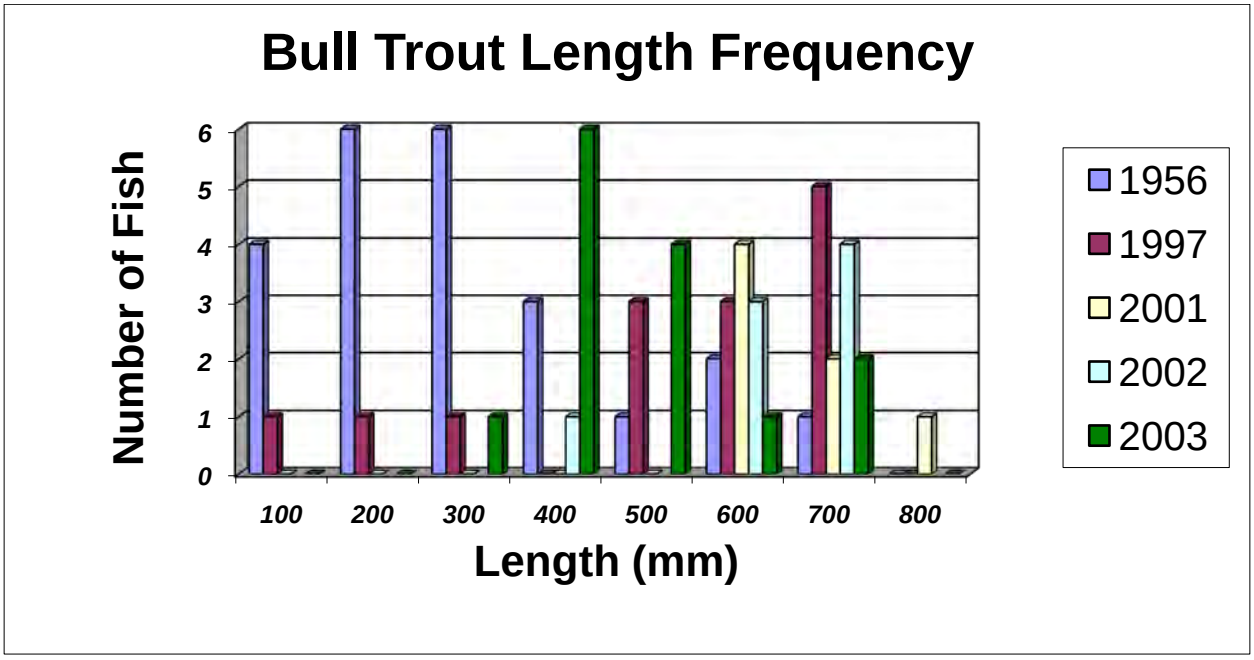


Figure 8. Length frequency of bull trout collected in gill nets from Upper Priest Lake, Idaho, 1956-2003.

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RECOMMENDATIONS:

1. Continue to monitor kokanee spawner numbers on Priest and Upper Priest Lakes and expand surveys to include lower sections of historical spawning tributaries.

2. Pursue funding for permanent strobe light installation for the Priest Lake Thorofare. A possible site would be near the lower end of the Thorofare close to electrical power, but away from any homes or cabins.

3. Continue annual removal of lake trout from Upper Priest Lake.

4. Work with marina owners and permitting agencies to facilitate marina dredging so the impact of earlier drawdowns to benefit shoreline spawning kokanee can be mitigated.

5. Work with marina owners and agencies to complete lake drawdown by November 1.

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2003 PANHANDLE REGION ANNUAL FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	b-2	Title:	Lowland Lakes Investigations - Priest Lakes Creel Survey

Contract Period: July 1, 2003 to June 30, 2004

ABSTRACT

We conducted a 10-month creel survey on Priest and Upper Priest Lakes from March 1, 2003 through December 28, 2003. The intent was to compare the current lake trout fishery and recently liberalized regulations on lake trout to the 1994 creel survey results (Davis et al. 1995). Our boat count-interview census was composed of two parts: instantaneous boat counts to obtain an estimate of fishing pressure, and personal interviews with anglers to estimate catch rates and collect questionnaire data. The 10-month study period was divided into 22 two-week intervals. We interviewed 940 anglers in 450 boats on Priest Lake and Upper Priest Lake from March 1, 2003 through December 28, 2003. Anglers were interviewed both while they were fishing and at boat launches to obtain completed trip information. Anglers targeting lake trout (mackinaw) *Salvelinus namaycush* accounted for 99% of the total effort. We estimated 48,322 lake trout were caught; of these 29,727 were harvested and 18,581 lake trout were released during the 10-month survey. The overall catch rate for lake trout over the 10-month survey was .84 fish/hour with the highest catch rate during interval 19 (November 5-18) (1.7 fish/hour). Lake trout ranged from 190-910 mm in total length and averaged 555 mm. Mean weight of angler caught lake trout was 0.94 kg and individual fish ranged from 0.27- 6.8 kg. A comparison of lake trout catch rates during the 1994 and 1978 creel surveys suggests that catch rates for lake trout is better than ever recorded. A comparison of lake trout lengths and weights in the Priest Lakes in 1978, 1988 and today illustrates growth of lake trout has declined dramatically.

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INTRODUCTION

We conducted a 10-month creel survey on Priest and Upper Priest Lakes from March 1, 2003 through December 28, 2003. The intent was to compare the current lake trout fishery and recently liberalized regulations on lake trout to the 1994 creel survey results (Davis et al. 1995).

METHODS

Effort Estimates

Our boat count-interview census was composed of two parts: instantaneous boat counts to obtain an estimate of fishing pressure, and personal interviews with anglers to estimate catch rates and collect questionnaire data. The 10-month study period was divided into 22 two-week intervals. During each interval, effort estimates were conducted by boat. Three weekdays and two weekend days were randomly selected during each interval for counts. Counts were also conducted on seven holidays. Instantaneous boat counts were conducted twice on randomly selected count days, once at a randomly selected time in the morning, and again at a randomly selected time in the afternoon. Boat counts were restricted to the number of boats that were actively fishing at the time of the count.

To account for differences in fishing effort by area, Priest Lake was stratified into four sections, while Upper Priest Lake was considered a fifth section (Figure 9). All five sections were sampled each creel day; however, Upper Priest Lake (section 5) could only be sampled from March 22 through October 13, 2003 due to the lowering of water level and inaccessibility through the Thorofare.

Angler Interviews

Anglers were interviewed both while they were fishing and at boat launches to obtain completed trip information. Interviews consisted of asking anglers how many hours they had fished, how many anglers were fishing in each boat, how many rods were used, whether the trip was complete, whether the anglers were resident or non-resident and the number of each species caught, kept or released (Appendix A). Angler questionnaires regarding the present and future management of the fishery in Priest Lake's fishery were handed out during angler contacts. The questionnaires were pre-stamped and self-addressed for return to the Idaho Department of Fish and Game Panhandle Office (Appendix B).

Our 2003 creel census was helpful in quantifying exactly how much use occurs on Priest Lake after October 1. Past creel census have indicated that there is very little boating effort after the Labor Day holiday weekend and that most of that effort is by anglers. This had not changed in 2003. The 2003 creel census indicates that after October 7, 2003 little fishing occurs on the Priest Lakes. Of the 48,840 hours spent fishing during our 2003 creel survey, 2,700 hours, or six percent were spent after October 7 (Figure 9)

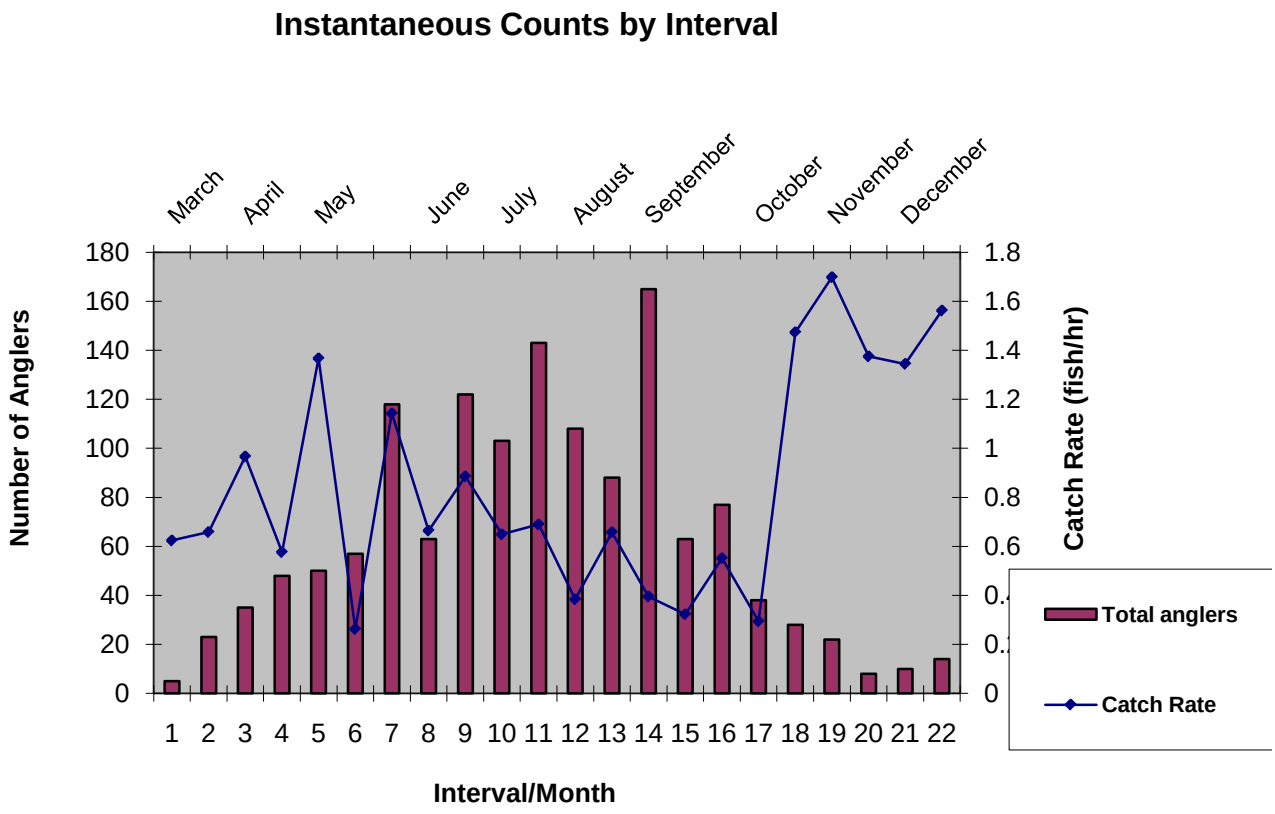

Figure 9. Number of anglers interviewed and catch rates (lake trout/hr) by interval and month on Priest Lake and Upper Priest Lakes, Idaho, 2003.

Data Summary

We used the Idaho Creel Census System software (CCS; McArthur et al. 1992) to outline survey periods as well as data analysis and summary. Total harvest for each interval was estimated as:

$$Y=P*CR$$

Where: Y = total catch of a species

P = Pressure (fishing pressure in rod hours per day)
CR = Mean Catch Rate (rod hours per species)

Fishing effort or P (Pressure) was estimated as:

$$P = C * H$$

Where: C = total number of rods (boat counts * the mean number of rods/boat)
H = total daylight hours in interval

More detailed methods of summary calculations, including variance estimates are included in the CCS manual (McArthur et al. 1992).

RESULTS

Effort

We interviewed 940 anglers in 450 boats on Priest Lake and Upper Priest Lake from March 1, 2003 through December 28, 2003. Completed trip information was obtained from 90 of these interviews. During the creel census period approximately 48,840 angler hours ($\pm$ 95%, α=0.05) or 97,680 rod hrs were spent fishing on Priest and Upper Priest Lakes (Table 8). We estimated a total of approximately 9.5 rod h/ha. During the survey period, the mean number of anglers per boat was 2.2 and the mean number of rods per boat was 2.004. Average trip length for the survey period was 2.5 hours per day.

Anglers targeting lake trout (mackinaw) *Salvelinus namaycush* accounted for 99% of the total effort. We estimated 48,322 lake trout were caught; of these 29,727 were harvested and 18,581 lake trout were released during the 10-month survey. The estimated catch of 29,727 lake trout represents a significant increase in harvest relative to any previous estimates (Table 9). Anglers seeking cutthroat trout comprised less than one percent of the total effort. We did not interview any anglers specifically targeting bull trout or kokanee, however, two anglers did report catching and releasing one kokanee each. No bull trout were reported caught in Priest Lake or Upper Priest Lake.

Boat anglers accounted for 99% of the effort. Trolling for lake trout was the most popular angling method accounting for 89% of the effort (Appendix C). Jigging, the second most popular method for lake trout anglers, accounted for 10% of the effort. Shoreline anglers comprised less than 1% of the effort. Due to a mild winter, no ice fishery occurred during the 2003 survey period.

The distribution of fishing pressure on the Priest Lakes appears to be fairly well spread out with nearly one third (30%) expended in section 2 relative to 21% in section 1, 28% in section 3, 15% in section 4 and 6% in section 5, (Upper Priest Lake) (Table 8). Weekends were by far the most popular fishing days. Approximately 52% of the total effort occurred on weekends and holidays.

Table 8. Estimated angler hours expended in each section of Priest Lake (sections 1-4) and Upper Priest Lake (section 5), Idaho, 2003.

Section	Total hours	% of total hours	95%CI	Hectares	Rod hr/ha
1	10,224	21	2,444	1,807	11.3
2	14,695	30	2,349	4,790	6.1
3	14,064	28	4,900	756	37.2
4	7,106	15	2,281	2,101	6.8
5	2,751	6	742	567	9.7
Total	**48,840**		**5,818**	**10,021**	**9.7**

Maximum estimated effort for a two-week interval was 3,792 hours in interval 14 (August 27-September 9) which included the Labor Day weekend while the lowest effort occurred during interval 1 (March 1-12) with 507 hours (Figure 10).

Catch Rates

Catch rates for lake trout in the Priest Lakes fluctuated throughout the 10-month census. The overall catch rate for lake trout over the 10-month survey was .84 fish/hour with the highest catch rate during interval 19 (November 5-18) (1.7 fish/hour). The lowest catch rate occurred during interval 6 (May 7-May-20) (.26 fish/hr), (Figure 10).

Thirty percent of the boats interviewed had more than three fish while 38% had no fish. Anglers interviewed during the census reported catching 1,055 lake trout and releasing 280 or 27%.

Length and Weight

We were able to get a good sample of lengths (181) and weights (100) from harvested lake trout during the 10-month census. Lake trout ranged from 190-910 mm in total length and averaged 555 mm. Mean weight of angler caught lake trout was 0.94 kg and individual fish ranged from 0.27- 6.8 kg.

Angler Questionnaire

A total of 76 angler questionnaires were returned. Fifty-one percent of the respondents said they caught between three and six lake trout per trip, while 42% of the respondents said they harvest three to five lake trout per trip. When asked if they support a shift in management direction from a lake trout fishery to a more traditional fishery for native cutthroat and bull trout and a harvest fishery for kokanee, 35% were in favor (Appendix B). Additional Priest Lake census and questionnaire data are summarized in Appendices B and C.

During the 2003 creel census, the majority of anglers sampled were non-residents (54%) (Appendix C). Most of the nonresidents appeared to be residents of Washington State. We did not a keep record of the actual state of residency, however, of the 76 pre-stamped and self-addressed angler questionnaires that were returned 57% were nonresidents and all were from Washington State.

Comparison with Previous Creel Survey Results

A comparison of estimated fishing effort in the past 45 years, (Table 9) suggests that total fishing effort during this creel census period was considerably less than in years past, however, in earlier years the effort was spread out over several species including cutthroat trout, bull trout, kokanee and lake trout. Today nearly all (99%) of the total effort is directed at lake trout. Rieman and Lukens 1979 reported effort for lake trout and bull trout at 9,000 hours in 1956, 10,500 hours in 1966 and 53,000 hours in 1978. Davis et al. 1995 reported fishing effort to be 62,602 hours in Priest Lake in 1994 with 85% of this effort targeted at lake trout. This translates to 53,000 hours of effort toward lake trout in 1994 compared to 48,800 hours in 2003.

A comparison of catch rates among past creel surveys is difficult as sample size, season length, and length of creel surveys vary. Additionally, prior to the late 70's anglers in the Priest Lakes commonly caught species other than what they were specifically seeking, therefore, we will only make comparisons among the 1978, 1994 and current creel surveys.

A comparison of lake trout catch rates during the 1994 and 1978 creel surveys suggests that catch rates for lake trout in 2003 were better than ever recorded. Rieman and Lukens (1979) reported a catch rate of 9.8 hrs/fish for anglers specifically seeking lake trout. Davis et al. 1995 reported average catch rate for lake trout anglers fishing Priest Lake in 1994 at 5 hrs/fish (0.22 fish/hr). Catch rates for lake trout anglers during this creel survey fluctuated throughout the season with the best catch rates occurring during interval 19 (November 5-18) (1.7 fish/hour) (Figure 9). The average for the 10 month census period was 0.84 fish/hr.

A comparison of lake trout lengths and weights in the Priest Lakes in 1978, 1988 and 2003 today illustrates growth size of lake trout has declined dramatically. Rieman and Lukens 1979 reported lake trout caught by anglers in Priest Lake ranged from 360-1,170 mm and averaged 690 mm. Weights of lake trout in Priest Lake in 1978 ranged from .9-19.9 kg and averaged 5.8 kg. Mauser et al. (1988) reported that mean length of lake trout in Priest Lake had decreased to 550 mm by 1983 and mean weight had decreased to 1.8 kg at that time. Mean length in 2003 was 555 mm with individual fish ranging from 190-910 mm. Mean weight of angler caught lake trout in 2003-04 was 0.94 kg and individual fish ranged from 0.27- 6.8 kg. Although the mean length of angler caught lake trout has not changed since 1983, the mean weight of lake trout harvested was only about 50% of fish harvested in 1983.

Table 9. Estimated effort and harvest by species in Priest and Upper Priest Lake, Idaho, 1956- 2003. Numbers in parentheses are the 2003 equivalents for survey period of previous year's creel.

Survey period	Year	Angler hours	Kokanee	Cutthroat	Bull trout	Lake trout	Total harvest	Overall success (fish/hr)
April 30-October 15	1956	96,630 (42,639)	102,360	3,580	1,590	270 (24,602)	107,800	1.12
April 30-November 30	1966	64,604 (43,568)	68,884	2,387	1,173	199 (26,059)	72,643	1.12
May 18-September 6	1968	48,286 (33,695)	32,314	1,611	1,096	0 (20,034)	35,021	0.73
June 2-September 6	1969	46,819 (29,756)	37,880	1,256	650	0 (18,164)	39,786	0.85
May 16-October 2	1970	82,063 (36,796)	79,840	2,776	1,526	138 (21,359)	84,280	1.03
April 15-December 15	1978	99,157 (45,685)	4,593	2,585	2,320	5,724 (27,614)	15,222	0.15
April 16-December 15	1983	47,039 (45,685)	66	105	92	4,620 (27,614)	4,883	0.10
April 12-November 7	1986	71,516 (44,780)	0	134	0	6,295 (27,181)	6,429	0.09
May 9-July 17	1987	27,903 (18,359)	0	11	0	2,969 (6,640)	2,980	0.11
January 23-March 1	1993	12,918 (0[1)]	0	0	0	2,605 (0[1)]	2,605	0.20
January 1-December 31	1994	62,602	0	0	0	13,987 (29,727)	13,987	0.22
March 1-December 28	2003	48,840 (48,840[2)]	0	0	0	29,727	29,831	0.72

[1]No sampling occurred during this period in 2003
[2]This number represents the season total. There was no sampling between January 1 and February 28

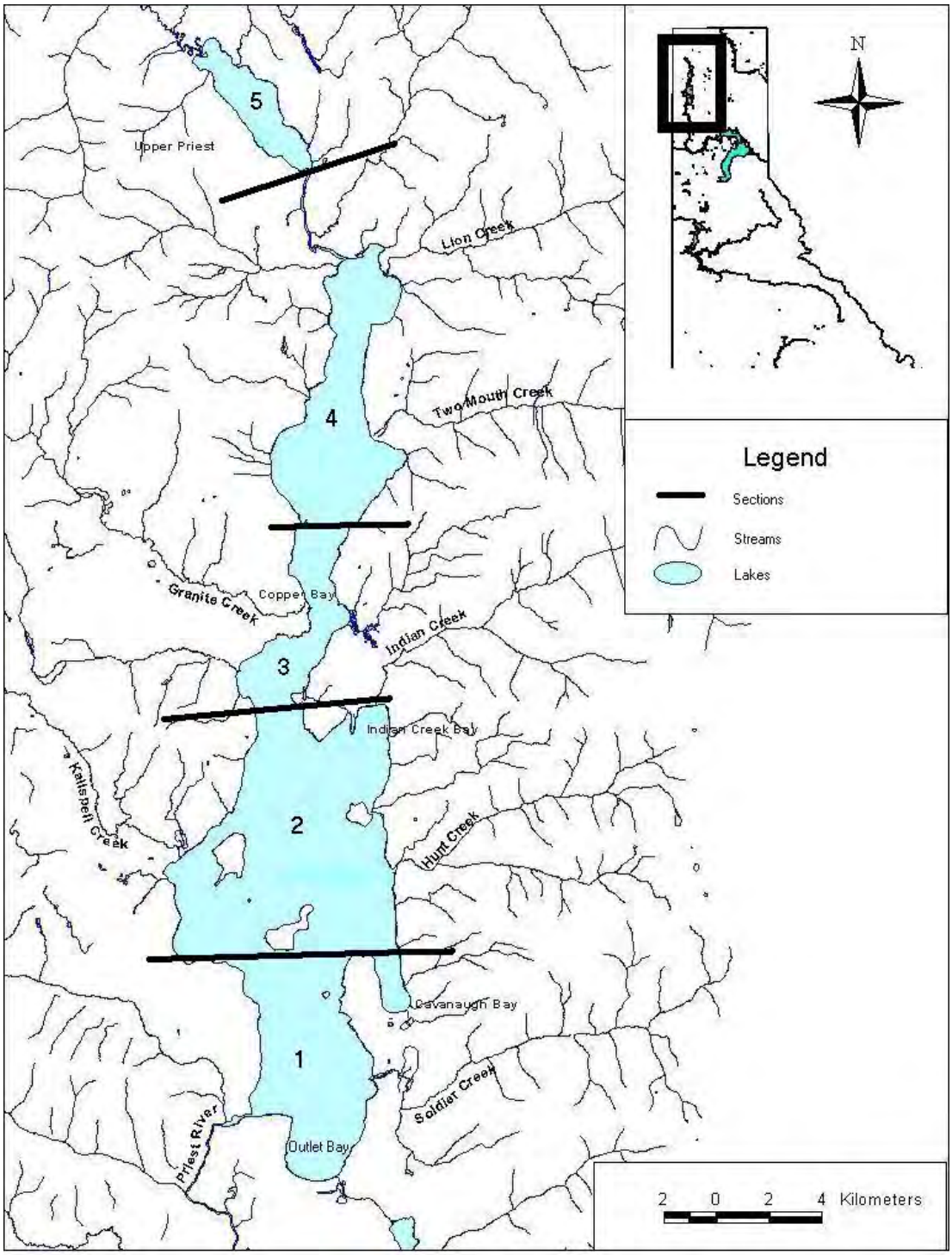

Figure 10. Map of Priest Lake and Upper Priest Lake, Idaho, with 2003 creel survey sections.

A visual comparison of angler caught lake trout from 1952 to present illustrates this reduction in mean length over time (Fig 11). During the 1994 creel survey, a slot limit was in place with no lake trout between 660-813 mm allowed; therefore no comparison with 1994 length of angler caught fish was possible. Increased survival of young lake trout due to the establishment of Mysis shrimp, and decreased survival of older lake trout from higher angler exploitation and loss of kokanee forage base has likely contributed to this shift in length frequency over time.

Boat anglers accounted for 99% of the effort in this creel survey compared to 98% in 1994. Nonresidents made up 54% of the anglers interviewed compared to 51% in 1994. During this creel survey and in 1994 anglers seeking cutthroat trout comprised less than one percent of the total effort. Trolling for lake trout was the most popular method accounting for 89% of the effort compared to 82% in 1994. Jigging, the second most popular method for lake trout anglers accounted for 10% of the effort compared to 15% in 1994. As in 1994, shoreline anglers comprised less than 1% of the effort and no ice fishery occurred.

Our survey results indicate fishing for kokanee and bull trout are nearly nonexistent. Some cutthroat trout fishing continues on Upper Priest Lake. Bull trout have been closed to harvest since 1984 and kokanee since 2000. Fourteen percent of the anglers returning the angler questionnaire said they fish for cutthroat trout when fishing Upper Priest Lake.

Largemouth bass *Micropterus salmoides* and yellow perch *Perca flavescens* have been fairly common in some of the weedy shoal areas of Priest Lake for many years. More recently, smallmouth bass *M. dolomieui* and northern pike *Esox lucius* have been reported in Priest Lake. At this time it appears little effort is expended to catch these species as no anglers interviewed reported fishing for or catching any of these species.

The response to question number 7 in the angler questionnaire regarding support for a shift in management direction away from lake trout and more towards the native cutthroat and bull trout with a harvest fishery for kokanee is difficult to interpret in light of the fact that currently lake trout support 99% of the fishing effort. Sixty-six percent of the anglers returning questionnaires said they support our current management emphasis for the existing lake trout fishery (Appendix B).

Since the 1994 creel survey (Davis et al 1994) there have been several changes in fishing regulations on Priest Lake. In 1994 lake trout anglers were limited to 3 lake trout with none between 26 and 32 inches and only one over 32 inches. From 1998-2001 anglers were further limited to 2 lake trout of any size. In 2000 we implemented the two-pole fishing permit. From 2002 to present the lake trout limit on Priest Lake has been liberalized to 6 fish of any size.

The intent of the more liberalized bag limit in 2002 was to provide additional angling opportunity and interest in lake trout fishing on Priest Lake. The objective of the 2003 creel survey was to compare the lake trout fishery today with the 1994 creel survey results and assess the potential of anglers to intentionally overexploit the lake trout population to benefit native cutthroat and bull trout.

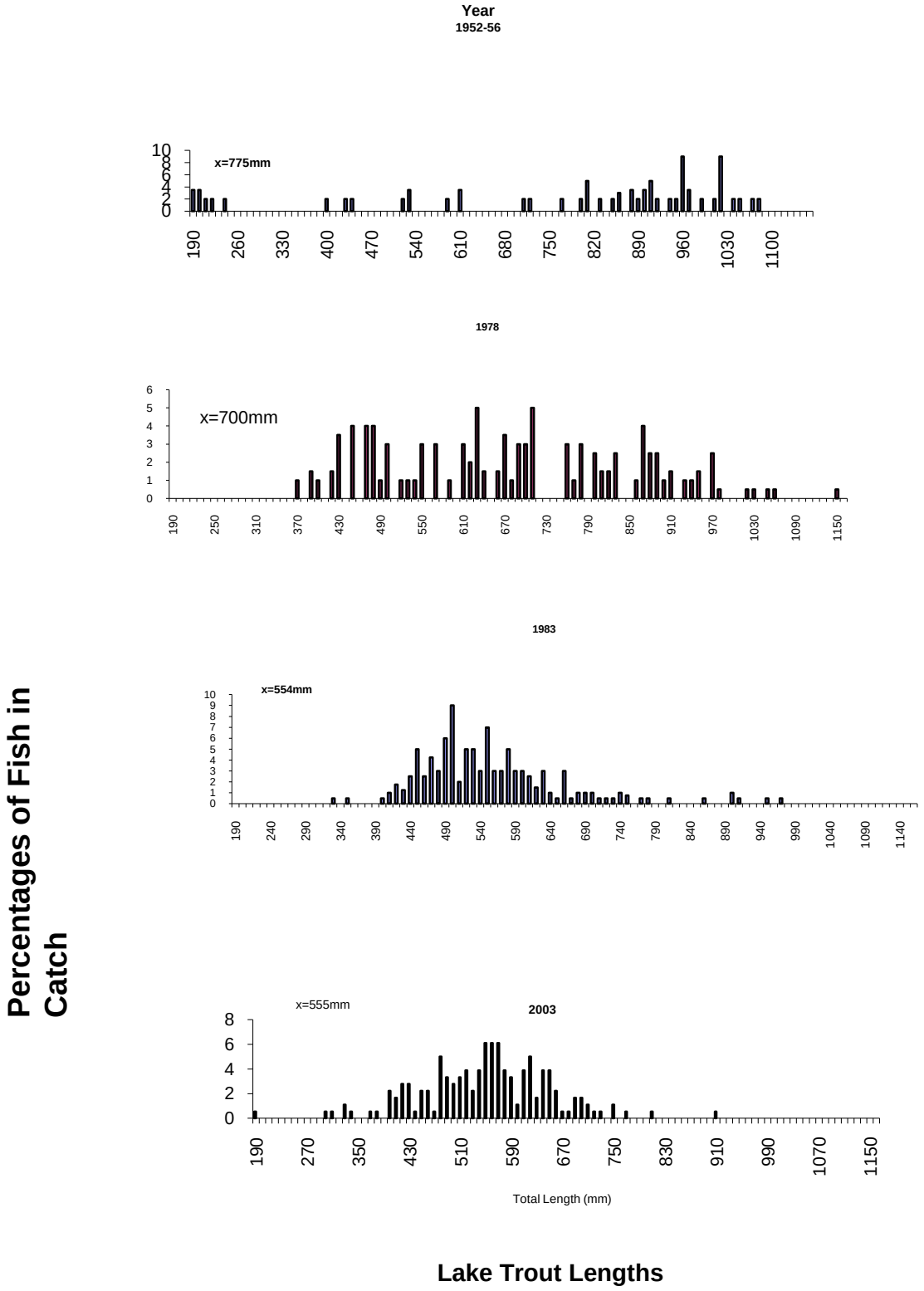

Figure 11. Length frequency comparison of angler caught lake trout from 1952-2003 in Priest Lake, Idaho.

It appears the more liberalized bag limit in 2002 did little to increase the interest in lake trout fishing and recruitment of anglers who may have been discouraged by restrictive regulations in the past. Effort directed toward lake trout on Priest Lake has not changed significantly since 1994. Angler effort in 1994 on Priest Lake was 62,602 hours with 85.6% (53,000 hrs) of the effort targeted at lake trout compared to 48,840 angler hours in 2003. The implementation of a two-pole fishing permit in 2000 has not resulted in additional rods used by trollers on Priest Lake. During the survey period, the mean number of anglers per boat was 2.2 and the mean number of rods per boat was 2.004.

Although effort changed little since 1994, harvest of lake trout has more than doubled. In 1994 Priest Lake anglers caught an estimated 20,000 lake trout and harvest 13,987 of these. During the ten-month creel survey in 2003 anglers caught 48,322 and harvested 29,727 lake trout. Lake trout catch rates have also improved dramatically since 1994. Anglers reported a catch rate of 0 .20 lake trout per hour in 1994 compared to .84 lake trout per hour in 2003.

We summarized lake trout tag returns by year from 2001-2003. We tabulated the number of lake trout tags returned annually from 2001-2003 (Table 10). These returned tags were then converted to percent return on an annual basis (Table 11). The return rate for tagged lake trout the first year at large from 2001-2003 ranged from 3.1 to 4.2 percent. Based on this tag return data and assuming 50% non-compliance, average exploitation is less than 8%. Fredericks et al. (2000) estimated exploitation to be around 7% between 1983 and 2000. Fredericks estimated an exploitation rate of 30-40% would be necessary to achieve a level unsustainability or over-harvest of lake trout in Priest Lake. It appears that although the recently liberalized bag limit has provided additional angling opportunity on Priest Lake it does not appear that anglers have the potential to overexploit the lake trout population.

The future of fisheries management in the Priest Lakes is at a crossroad. We need to further investigate and determine what anglers want: a fishery dominated by lake trout or one that provides more diversity with restoration of native cutthroat and bull trout and a kokanee fishery at the expense of lake trout. It is not feasible to expect both. Maintaining the current high-density lake trout population and rebuilding the kokanee population at the same time is probably not possible. If kokanee and cutthroat are considered to be a priority in the Priest Lakes then there appears to be no reason to be conservative with the management of lake trout. Based on data gathered in the 2003 creel survey and our general impressions after considerable time in the field, lake trout fishing is considered to be good despite the fact that the overall size of lake trout is not what it was in the 1970's.

If kokanee are to have a chance at recovering in the Priest Lakes changes in current level management practices are needed. It is our opinion that lake drawdown needs to be complete by November 1 to provide maximum spawning success for kokanee; therefore, we have requested lake drawdown reaching the minimum pool level by November 1. In most years this would require starting the drawdown on October 1. Some marina and resort owners at Priest Lake have requested a mid-October start to the water release resulting in the lake reaching winter pool level in mid November to reduce potential impacts on docks and ramps located in shallow water.

Idaho Code 70-507 requires the Idaho Department of Water Resources (IDWR) to maintain Priest Lake at an elevation of 3.0 feet "until the time after the main recreation season". Historically, this was through the Labor Day weekend, but more recently, marina operators around the lake have requested the lake be kept at summer pool level for as long as possible into October to extend boat use at their facilities. The Idaho Water Resources Board (IWRB)

and IDFG have proposed several amendments to the 1996 Priest River Basin Plan. A kokanee recovery plan suggesting the lake level be lowered starting October 15 in order to reach the 0.0 feet goal at the outlet gauge by early November was being recommended by the Board. Lower lake levels would ensure a higher success rate for kokanee redds because the water would be at its lowest level before kokanee initiate spawning. The biggest economic impact is the potential lost revenue associated with a reduced operating season for marinas around the lake i.e. resort and marina owners may incur losses as low levels may make their docks and existing boat ramps inaccessible to boaters. However, our creel survey results indicate that after October 1, little fishing occurs on the Priest Lakes. Of the 48,840 hours spent fishing during our 2003 creel survey 4,576 hours or nine percent were spent after October 1 (Figure 9).

Table 10. Lake trout reward tag returns (by number) from 2000 through 2003 in Priest Lake, Idaho.

		Return year			
Tag year	# tags out	2000	2001	2002	2003
2000	365	9	15	13	13
2001	195		4	6	6
2002	82			4	3
2003	59				0

Table 11. Lake trout reward tag returns (by percent) from 2000 through 2003 in Priest Lake, Idaho. Percentages were calculated by dividing tag return number minus number of tags previously reported.

		Return year			
Tag year	# tags out	2000	2001	2002	2003
2000	365	2.5	4.2	3.8	3.9
2001	195		2	3.1	3.2
2002	82			4.8	3.8
2003	59				0

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2003 PANHANDLE REGION FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	c	Title:	Rivers and Streams Investigations

Contract Period: January 1, 2003 to December 31, 2003

ABSTRACT

Bull trout *Salvelinus confluentus* trend monitoring continued for the third year in the in tributaries of Priest River, Pend Oreille Lake, Kootenai River, St. Joe River, and Little North Fork of the Clearwater River. Overall, the number of redds counted continues to trend upward when compared to year-one. Current population parameters used to measure recovery of bull trout under ESA guidelines have not been met.

We are attempting to conduct snorkel transects, compile historic data and provide locations of original transects in the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River so that we will produce consistent trend data that accurately portrays the status of the cutthroat trout fishery in these rivers. A total of 78 transects in the St. Joe and Coeur d'Alene Rivers were snorkeled to estimate trout and whitefish abundance and approximate size distribution. Both rivers show increasing trends in abundance of cutthroat trout and mountain whitefish following the declines observed after the 1996 and 1997 flood events.

The Middle Fork East River (MFER) is the only tributary of Priest River that is known to support a bull trout population. Radio transmitters were implanted into 20 adult bull trout to monitor migrational movements and habitat utilization periods. The drainage was also surveyed both man-made and natural barriers. Monitoring was also conducted to evaluate the impacts of brook trout *S. fontinalis* on this isolated population of bull trout.

2003 PANHANDLE REGION FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	c-[1]	Title:	Rivers and Streams Investigations Bull Trout Redd Counts

Contract Period: January 1, 2003 to December 31, 2003

ABSTRACT

We conducted bull trout *Salvelinus confluentus* redd counts in tributaries of Priest River, Pend Oreille Lake, Kootenai River, St. Joe River, and Little North Fork of the Clearwater River in September and October 2003 to add to the long-term trend data set. These counts were used to estimate spawning run size, help with management strategies, assess restorations activities and evaluate whether federal recovery goals were met in each of the core areas that occur in the Idaho Department of Fish and Game (IDFG) Panhandle Region.

We counted 41 redds in the Upper Priest Lake basin, 836 bull trout redds in the Pend Oreille Lake and Priest River drainage, 40 redds in the Kootenai River drainage, 46 redds in the St. Joe River drainage, and 48 redds in the Little North Fork of the Clearwater River drainage. Improving trends in bull trout redd abundance was apparent for the Pend Oreille Lake, and Little North Fork Clearwater River basins whereas a decline in redd numbers was apparent in the Priest River and St. Joe River basins. Redds have only been counted for three years in Idaho tributaries of the Kootenai River.

Five Federal Bull Trout Recovery core areas occur in the IDFG Panhandle. These are the Priest Lake, Pend Oreille Lake, Kootenai River, Coeur d'Alene Lake and North Fork Clearwater River core areas. Four recovery goals must be met in each of the core areas before bull trout can be considered as recovered. Currently, all four of the recovery goals are not being met in any of the bull trout core areas that occur in the IDFG Panhandle Region. If an increasing trend in bull trout abundance continues in the Pend Oreille Lake Core Area, it is believe it will meet all of its recovery goals by 2004. The Kootenai River Core Area may also reach all of its recovery goals once higher flows return to the basin. The Priest Lake and Coeur d'Alene Lake core areas meet one or none of their recovery goals respectively and considerable efforts must occur before these bull trout populations will ever approach the current recovery goals.

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INTRODUCTION

Bull trout *Salvelinus confluentus* within the Klamath and Columbia River basins were listed as threatened on June 10,1998 under the Endangered Species Act. As a result of this listing, recovery plans for bull trout in specific geographic areas (recovery units) were developed by experts in the field (USFWS 2002). Each recovery unit is separated into core areas (river or lake basins) and for each core area it describes conditions, defines recovery criteria, and identifies specific recovery actions for bull trout. The Panhandle Region of the Idaho Department of Fish and Game encompasses part or all of the following recovery units: Clark Fork River, Kootenai River, Coeur d'Alene Lake Basin, and Clearwater River. Core areas of these recovery units that occur in the Panhandle Region are Priest Lake, Pend Oreille Lake, Kootenai River, Coeur d'Alene Lake, and the North Fork Clearwater River (USFWS 2002).

The overall goal of the Bull Trout Draft Recovery Plan is to ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed throughout the species' native range so that the species can be delisted (USFWS 2002). To accomplish this goal, the following recovery criteria addressing distribution, abundance, habitat and connectivity were identified.

1. Maintain the current distribution of bull trout and restore their distribution in previously occupied areas.
2. Maintain stable or increasing trends in abundance of bull trout.
3. Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
4. Conserve genetic diversity and provide opportunity for genetic exchange.

For core areas that occur within or overlap into the IDFG (Idaho Department of Fish and Game) Panhandle Region, the distribution and abundance recovery criteria will be met when the total number of stable local populations and the total number of adult bull trout have reached the levels indicated in Table 1.

Trend recovery criteria will be met when the overall bull trout populations in specified core areas are accepted, under contemporary standards of the time, to be stable or increasing, based on at least 10 years of monitoring data.

Connectivity criteria will be met when migratory forms are present in all local populations and when intact migratory corridors among all local populations in the core area provide opportunity for genetic exchange and diversity.

Table 1. Abundance criteria required before bull trout can be considered as recovered in the following basins of Northern Idaho (USFWS 2002).

Core Area	Recovery Criteria		
	Minimum number local of populations that have more than 100 adults	Minimum number of adults in the entire core area.	Trend in abundance
Priest Lake basin	5	1,000	Stable or Increasing
Pend Oreille Lake basin	6	2,500	Stable or Increasing
Kootenai River basin[A]	5	1,000	Stable or Increasing
Coeur d'Alene Lake basin	NA	1,100[B]	Stable or Increasing
North Fork Clearwater River basin[C]	11 (> 100 adults not required)	5,000	Stable or Increasing

[A] This core area includes tributaries in Canada and Montana.

[B] This value is the desired annual spawning escapement - not the total number of adults in the core area. At least 800 must occur in the St. Joe River and 300 in the Coeur d'Alene River.

[C] Only the Little North Fork Clearwater River, a tributary of the North Fork Clearwater River basin, occurs in the Panhandle Region.

Bull trout have been found to have a strong fidelity to their natal streams (Spruell et al. 1999), their redds are relatively easy to count (Pratt 1984) and redds are only a measure of the reproductive adults. These attributes make redd counts an appropriate technique for evaluating trends in adult bull trout population strength. In addition, redd counts are relatively quick and inexpensive to conduct when compared to other techniques such as weiring, netting, or electroshocking. For these reasons the determination of the status of bull trout populations in each of the core areas will be evaluated through redd counts. Bull trout redds are being counted in each of the core areas in the Panhandle Region of the Idaho Department of Fish and Game. These counts will not only allow us to evaluate the status of bull trout in each of the core areas as it pertains to recovery, but it will also help guide future management decisions and assess the success of recovery actions.

STUDY SITES

Bull trout redds were counted in tributaries of the Priest, Pend Oreille, Kootenai, St. Joe, and Little North Fork of the Clearwater drainages where bull trout are believed to spawn (Figures 1-7). These watersheds make up all or part of five different core areas that occur in the IDFG Panhandle Region (USFWS 2002). These core areas are Priest Lake, Pend Oreille Lake, Kootenai River, Coeur d'Alene Lake and North Fork Clearwater River. The boundary of the Kootenai River and North Fork Clearwater River core areas span outside of the Panhandle Region. Actual streams surveyed were dependent on available time and findings from previous surveys. Streams where no redds had been found over several consecutive years were often not surveyed to save time and/or allow more time to investigate new streams.

OBJECTIVES

1. Quantify bull trout redds and spawning escapement in Priest Lake, Pend Oreille Lake, Kootenai River, Coeur d'Alene Lake and North Fork Clearwater River core areas.

2. Assess whether bull trout abundance in each of the core areas meets recovery criteria outlined in the federal Bull Trout Draft Recovery Plan.

3. Explore new streams to determine if bull trout spawning is occurring there.

METHODS

Bull Trout Spawning Surveys

Bull trout redds were counted in selected tributaries of the Priest Lake, Priest River, Pend Oreille Lake, Kootenai River, St. Joe River, and Little North Fork of the Clearwater River basins. Counts in each of these basins were summarized in the core area they occurred in. Counts occurred at similar times (September and October) as had occurred in the past (DuPont et al., In Press a). In addition, several stream reaches within the Little North Fork Clearwater River basin were surveyed for the first time to evaluate whether bull trout were spawning in previously unknown areas. Survey techniques and identification of bull trout redds followed the methodology described by Pratt (1984). Research has demonstrated the level of observer training and experience may influence the accuracy of redd counts (Bonneau and LaBar 1997; Dunham et al. 2001). To reduce observer variability in bull trout redd counts, attempts were made to use only those individuals who attended a bull trout redd count training exercise on September 22, 2003. To add to our knowledge on preferred bull trout spawning areas and to help evaluate recovery efforts, the location of redds were recorded on maps and/or GPS units during redd counts. Sections of the Kootenai River and North Fork Clearwater core areas occurred outside the Panhandle Region. Redds count data for these areas were collected from the personnel responsible for conducting these surveys.

To help assess potential limiting factors, any man-made fish passage barriers noticed during the redd counts were documented. We also attempted to ascertain who the responsible parties were for the documented barriers.

Data Analysis

To estimate the spawning escapement or population abundance (depending on recovery area) of bull trout in streams, we used Downs and Jakubowski (2003) findings where on average, 2.9 adult bull trout entered tributaries of Lake Pend Oreille for every redd that was counted during annual redd count surveys. We decided to use this adult to redd ratio because this estimation came from one of the core areas in the Panhandle Region and because it is near the mid-point of two commonly used adult to redd ratios used to evaluated bull trout spawning escapement (2.2 adults/redd - Bonar et al. 1997; 3.2 adults/redd - Fraley and Shepherd 1998). Baxter and Westover (1999) and Downs and Jakubowski (2003) found that repeat spawning is common for adfluvial bull trout where 90-100% of the surviving bull trout spawned in consecutive years. For this reason we decided to use the total spawning escapement calculated from redd counts from the Priest, Pend Oreille and Coeur d'Alene Lake core areas as an estimate for the total number of adults that occurred there. We recognize this will give us a conservative estimate, as bull trout in every tributary in the Panhandle do not spawn every year

(DuPont et al., In Press c). The one exception to this is for the Little North Fork Clearwater, where research by Schriever and Schiff (2002) found that anywhere from 50-75% of the adult bull trout return to spawning grounds in consecutive years. Consequently, for the Little North Fork Clearwater we multiplied the spawning escapement by 1.33 (75% repeat spawners) to estimate how many adults occurred in the core area. The total number of adult bull trout associated with each tributary and each core area was compared to the criteria specified in the Bull Trout Draft Recovery Plan to determine the status of the different bull trout populations.

To evaluate whether the numbers of adult bull trout in each core area were stable or increasing, we used a linear regression with sample year as the independent variable and the number of redds as the dependent variable. Other studies have used regressions to evaluate whether bull trout populations were stable or increasing; however in each of these cases they either used non-parametric techniques (Rieman and Myers 1997) or converted the redd counts using a $\log_e$ transformation (Maxell 1999). We decided not to convert the data or use non-parametric techniques because we believe it is easier for most individuals to visualize trends and understand how bull trout abundance is changing if the actual redd count data are used (no transformation or ranking of the data). Over time, if it seems other techniques are better suited to evaluate whether bull trout populations are stable or increasing, we are not opposed to changing our form of analysis.

For a simple linear regression, if the slope of the regression line is greater than or equal to zero and 10 or more years of redd count data exists, then a bull trout population can be considered as stable or increasing. A significant ($P < 0.05$) slope of the regression line is preferred before one determines that a particular population is stable or increasing; however, a statistically significant relationship is not necessary to come up with this conclusion. As the abundance of individuals in a population reaches its carrying capacity and/or stabilizes (slope of regression line near zero), it is impossible for a significant relationship to occur. When a statistically significant relationship ($P < 0.05$) does not occur, interpretation and professional judgment must be used to determine if the amount of variation seen around a regression line is too great for a particular population to be considered stable or increasing.

RESULTS

Priest Lake Core Area

A total of 41 bull trout redds were counted in the Upper Priest River basin from September 29 to October 1-7, 2003 (Figure 1 and Table 1). The majority of these redds were counted in Upper Priest River (37 out of 41). Brook trout and their redds were observed in Hughes Fork and Gold Creek. For this reason, any redds smaller than 350 mm in diameter were not included in the bull trout redd counts. No attempts were made to counts redds in tributaries of Priest Lake. The number of redds counted in 2003 is the highest we have counted since 1999 and is 1.7 times higher than what we saw during 2002. However, this count is still around four times lower than what was counted in 1985 (Figure 8 and Table 1). Expanding the number of redds observed by 2.9 fish/redd, the spawning escapement of bull trout for the Upper Priest Lake basin is estimated to be 119 fish. This is considerably lower than the recovery goal of 1,000 adults for the Priest Lake Basin (Table 1). A downward trend is evident in the abundance of bull trout in the Priest Lake Core Area, especially if one evaluates redds counted during 1985 and 1986 (Figure 8 and Table 2).

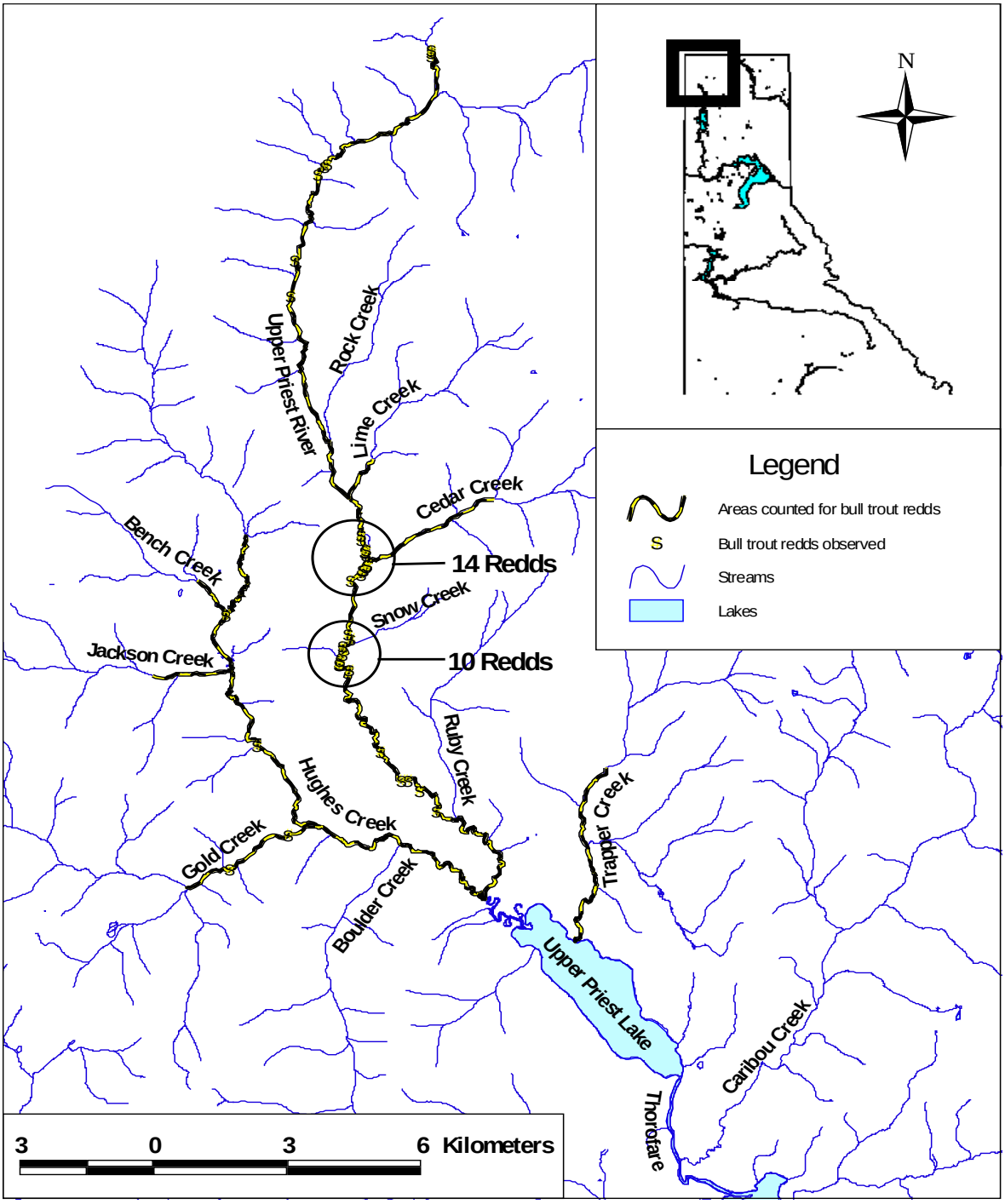

Figure 1. Stream reaches where bull trout redds were counted in the Upper Priest Lake basin, Idaho, during September 29 to October 3, 2003, and the locations of where redds were observed.

Table 2. Description of bull trout redd count transect locations, distance surveyed and number of redds counted in the Priest Lake basin, Idaho, from 1985 to 2003.

Stream	Transect Description	Length (km)	1985	1986	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Upper Priest River	Falls to Rock Cr.	12.5	--	--	--	--	--	--	15	4	15	33	7	7	17	8
	Rock Cr. to Lime Cr.	1.6	--	--	--	2	1	1	2	0	3	7	0	2	0	0
	Lime Cr. to Snow Cr.	4.2	12[a]	5[a]	--	3	4	2	8	1	10	9	9	5	1	16
	Snow Cr. to Hughes Cr.	11.0	--	--	--	0	0	--	0	3	7	4	2	8	3	13
	Hughes Cr. to Priest Lake	2.3	--	--	--	0	0	--	0	--	--	0	0	--	--	--
Rock Cr.	Mouth to F.S. trail 308	0.8	--	--	0	0	--	--	2	1	0	--	0	0	0	--
Lime Cr.	Mouth upstream 0.8 km	1.2	4[b]	1[b]	0	0	--	--	0	2	0	1	0	0	0	0
Cedar Cr.	Mouth upstream 1.6 km	3.4	--	--	--	0	2	1	0	1	0	0	0	0	0	0
Ruby Cr.	Mouth to waterfall	3.4	--	--	0	0	--	--	--	0	0	--	--	--	0	--
Hughes Cr.	Trail 312 to trail 311	2.5	1	17	7	3	2	0	1	4	0	1	0	0	0	1
	Trail 311 to F.S. road 622	4.0	35[c]	2[c]	2	0	7	1	2	0	0	0	0	0	0	1
	F.S. road 622 to mouth	7.1	4[d]	0[d]	--	1	--	--	2	3	1	0	2	6	1	0
Bench Cr.	Mouth upstream 0.8 km	1.1	1	2	0	2	2	0	1	0	0	0	0	0	0	0
Jackson Cr.	Mouth to F.S. trail 311	2.2	--	--	4	0	0	0	0	0	0	--	--	--	0	0
Gold Cr.	Mouth to culvert	3.7	24	23	5	2	6	5	3	0	1	1	9	5	2	2
Boulder Cr.	Mouth to waterfall	2.3	--	--	0	0	0	--	0	0	0	--	0	--	--	--
Trapper Cr.	Mouth upstream 5.0 km	5.0	--	--	--	4	4	2	5	3	8	2	0	1	0	0
Caribou Cr.	Mouth to old road crossing	2.6	--	--	--	1	0	0	0	0	0	--	--	--	--	--
All stream reaches combined		83.8	80[e]	48[e]	18	18	28	12[f]	41	22	45	58	29	34	24	41
Only those stream reaches evaluated during 1985-6		23.8[g]	80	48	14[h]	11	21[h]	8[f]	17	10	12	12	20	16	4	20

[a] Redds were counted from Lime Creek to Cedar Creek, which is about 1/2 the distance that is currently counted.
[b] Redds were counted from the mouth to FS road 1013, which is about 1/4 of the distance that is currently counted.
[c] About 2/3 of the distance was counted in 1985 and 1986 that is currently counted.
[d] Redds were counted from FS road 622 to the FS Road 1013, which is about 1/3 of the distance that is currently counted.
[e] Redds were counted in about 1/5 of the stream reaches where they are currently counted.
[f] Observation conditions impaired by high runoff.
[g] During 1985 and 1986 about 15 km of stream was counted.
[h] Two of the sites were not counted

Table 3. The status of bull trout populations during 2003 in each of the cores areas that occur in the Idaho Panhandle Region.

Core Area	2003 adult bull trout population estimate	Recovery goal	No. of local populations that have more than 100 adults	Recovery goal	Is this population stable or increasing?	Have 10 or more years of data been collected?	Are there streams that have known man-made barriers that block bull trout migrations?
Priest Lake	119	1000	1	5	no	yes	Yes - Gold Creek
Pend Oreille Lake	2424	2500	6	6	yes	yes	Yes - Uleda Creek
Kootenai River	481	1000	3	5	yes	yes	None in Idaho
Coeur d'Alene Lake	133	1100	1	NA	no	yes	Yes - Red Ives, Entente, Cascade and Bluebell
N.F. Clearwater River	587	5000	11[a]	11[a]	yes	no	None in L.N.F. Clearwater

[a] A total of 100 adults or more are not required.

Table 4. Statistics for the linear regression of bull trout redds counted in different watershed in bull trout recovery core areas included in the Idaho Panhandle Region during 2003.

Streams/Core Area	Years evaluated	No. of observations	R value	R square	P value	Slope (Redd Coefficient)	Redd Standard Error
Upper Priest - 1985 sites	1985-2003	11	-0.818	0.670	0.002	-3.014	0.705
Upper Priest - all streams	1996-2003	8	-0.127	0.016	0.765	-0.619	1.979
Pend Oreille - index streams	1983-2003	19	0.155	0.024	0.526	2.296	3.547
Pend Oreille - index streams	1992-2003	11	0.710	0.505	0.014	20.167	6.661
Pend Oreille - all streams	1983-2003	15	-0.087	0.008	0.757	-1.841	5.822
Pend Oreille - all streams	1992-2003	11	0.823	0.677	0.001	28.247	6.512
Lightning Creek - all tribs	1992-2003	11	0.610	0.372	0.046	4.941	2.141
Kootenai River - Idaho streams	2002-2003	2	NA	NA	NA	NA	NA
Kootenai River - all streams	1996-2003	8	0.098	0.010	0.818	2.048	8.524
Kootenai River - three streams	1990-2003	14	0.619	0.383	0.018	6.785	2.487
St Joe River - index streams	1992-2003	12	0.262	0.069	0.410	1.161	1.351
St Joe River - all streams	1992-2003	12	-0.192	0.037	0.551	-0.871	1.409
LNF Clearwater - four streams	1996-2003	7	0.896	0.803	0.003	3.060	0.620
LNF Clearwater - all streams	2001-2003	3	0.545	0.297	0.633	3.000	4.619
NF Clearwater - all streams	2001-2003	3	0.997	0.994	0.048	11.500	0.866

One man-made barrier was noted during our survey that we believe blocks upstream migration of bull trout. This barrier is a U.S. Forest Service culvert located where F.S. road 1013 crosses Gold Creek (T63N, R5W, Section 17).

Pend Oreille Lake Core Area

A total of 836 bull trout redds were counted in the Pend Oreille Lake Core Area during 2003, of which 591 (71%) were in the six index streams (Trestle, East Fork Lightning, Gold, North Gold, Johnson, and Grouse creeks) (Figure 2-3 and Table 4). Redd counts in the Middle Fork East River and Uleda Creek were added to the Pend Oreille Lake Core Area in 2003 when these bull trout were documented to spend their adult life in Pend Oreille Lake (DuPont and Horner, In Press c). All redds were counted between October 6 and October 15, 2003 except for the Middle Fork East River and Uleda Creek, which were counted on September 30. The 836 redds counted in the Pend Oreille Lake Core Area is down from what was counted during 2002 (891), although this is the third highest redd count since they began in 1983. Expanding the number of redds observed by 2.9 fish/redd, the spawning escapement of bull trout for Pend Oreille Lake Core Area is estimated to be 2,424 fish (this includes 35 fish passed upstream of Cabinet Gorge Dam). This is just below the recovery goal of 2,500 adults for the Pend Oreille Lake Core Area (Table 2 and 5). Six tributaries in the Pend Oreille Basin had an estimated spawning escapement of 100 adults or at least 35 redds were counted (Table 4 and 5). This equals the recovery goal, which states at least six populations with over 100 adults must occur in the Pend Oreille Lake Core Area (Table 2).

When the redd counts were evaluated from 1983 to 2003 (1986, 1988-91 and 1995 were not evaluated) the linear regression showed a slightly negative slope of -1.841 redds/year (Figure 9 and Table 3). However, if we only evaluate that data from 1992 to 2003 (1995 was not evaluated) a significant ($P = 0.001$) positive trend is seen (28.247 redds/year).

Besides the Dams located on the Pend Oreille River (Albeni Falls Dam) and Clark Fork River (Cabinet Gorge Dam, Noxon Rapids Dam and Thompson Falls Dam), several other man-made migration barriers to bull trout were know to occur in the Pend Oreille Lake Core Area. This includes the city water diversion on Strong Creek, the hatchery and city water diversion on Spring Creek and an old log crossing on Uleda Creek. Currently, only the barrier on Uleda Creek appears to be blocking migration of bull trout, as spawning and rearing bull trout populations are not known to occur in Strong Creek and Spring Creek. The barrier in Uleda Creek occurs on property managed by the Idaho Department of Lands about 0.5 km up from the mouth (T58N, R3W, Section 15).

In addition to these man-made barriers, excessive bedload movement has caused channel intermittency on lower Lightning Creek, Rattle Creek, Savage Creek, East Fork Lightning Creek and Granite Creek. We recognize bedload movement is a natural process; however, we believe poor past timber management and poor road construction and maintenance practices have contributed to an increase in the amount of bedload movement. This in turn is believed to increase the length and duration of the channel intermittency in these streams. Each of these streams support spawning and rearing bull trout populations and in the past over 100 adults historically ascended them.

Three different groupings of streams (all streams, index streams and Lightning Creek tributaries) were evaluated separately to help evaluate why we are seeing improvements in the abundance of bull trout between 1992 and 2003. All three groupings have a significant

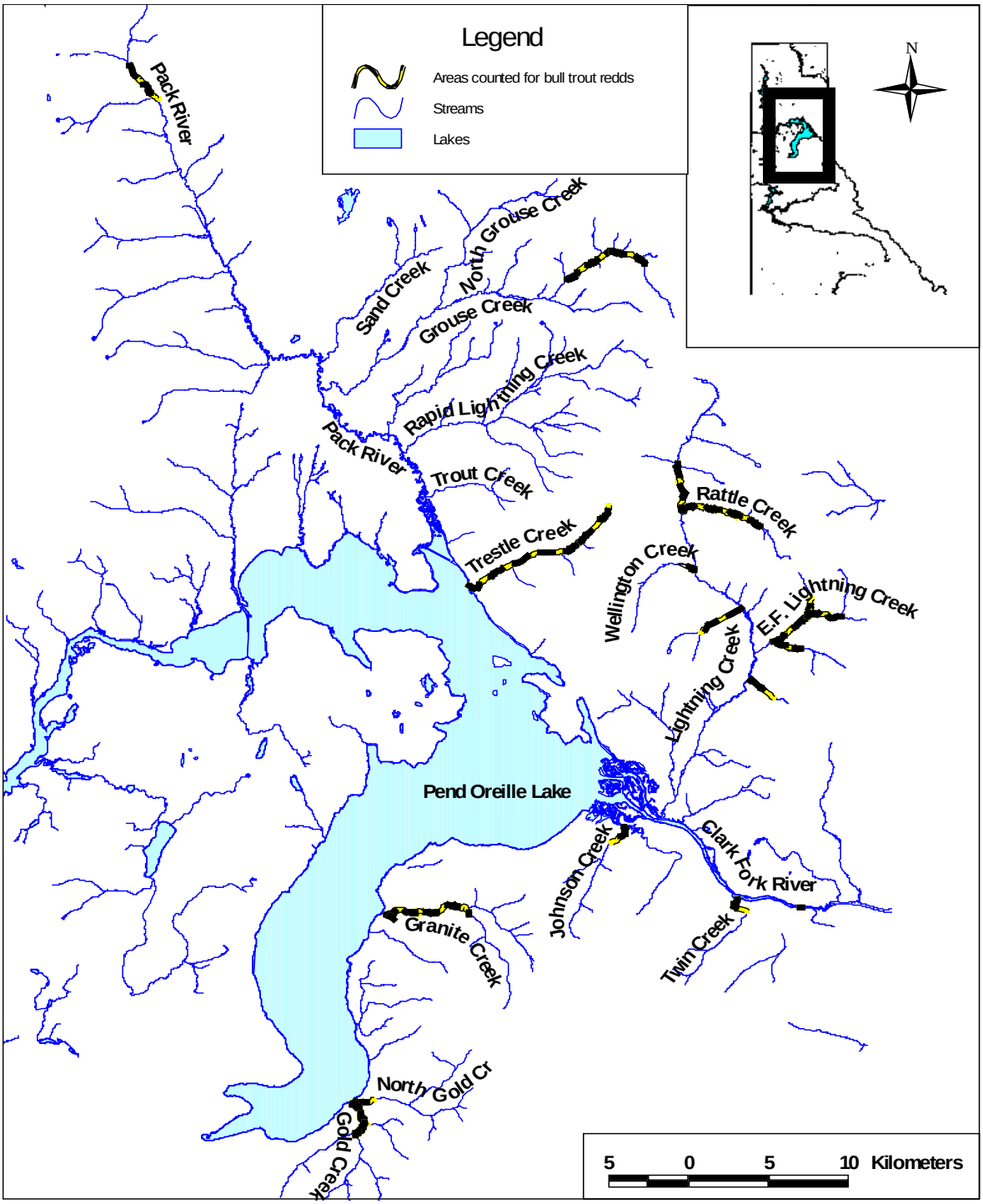

Figure 2. Stream reaches where bull trout redds were counted in Pend Oreille Lake basin, Idaho, on October 6-15, 2003.

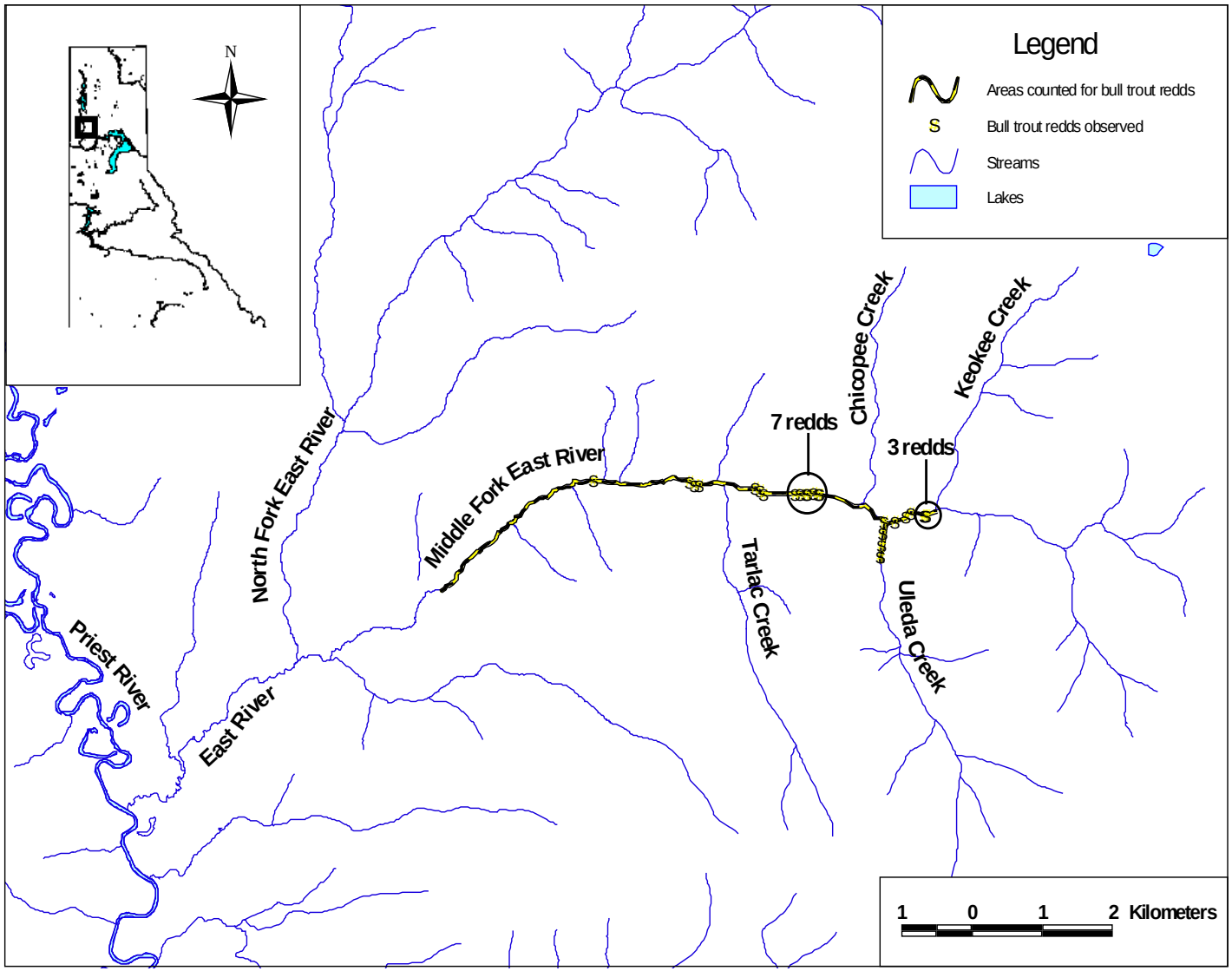

Figure 3. Stream reaches where bull trout redds were counted in the East River, Priest River drainage, Idaho, on September 30, 2003, and the locations of where redds were observed.

Table 5. Number of bull trout redds counted per stream in the Pend Oreille Lake, Idaho, Core Area, from 1983 to 2003.

Stream	1983[a]	1984	1985	1986[b]	1987	1988	1989	1990	1991[c]	1992	1993	1994	1995[d]	1996	1997	1998	1999	2000	2001	2002	2003
CLARK FORK R.	--	--	--	--	--	--	--	--	--	2	8	17	18	3	7	8	5	5	6	7	8
Lightning Cr.	28	9	46	14	4	--	--	--	--	11	2	5	0	6	0	3	16	4	7	8	8
East Fork	110	24	132	8	59	79	100	29	--	32	27	28	3	49	22	64	44	54	36	58	38
Savage Cr.	36	12	29	--	0	--	--	--	--	1	6	6	0	0	0	0	4	2	4	15	7
Char Cr.	18	9	11	0	2	--	--	--	--	9	37	13	2	14	1	16	17	11	2	8	7
Porcupine Cr.	37	52	32	1	9	--	--	--	--	4	6	1	2	0	0	0	4	4	0	0	5
Wellington Cr.	21	18	15	7	2	--	--	--	--	9	4	9	1	5	2	1	22	8	7	7	8
Rattle Cr.	51	32	21	10	35	--	--	--	--	10	8	0	1	10	2	15	13	12	67	33	37
Johnson Cr.	13	33	23	36	10	4	17	33	25	16	23	3	4	5	27	17	31	4	34	31	0
Twin Cr.	7	25	5	28	0	--	--	--	--	3	4	0	5	16	6	10	19	10	1	8	3
Morris Cr.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	0	7	1
Strong Creek	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	--
NORTH SHORE																					
Trestle Cr.	298	272	298	147	230	236	217	274	220	134	304	276	140	243	221	330	253	301	335	333	361
Pack River	34	37	49	25	14	--	--	--	--	65	21	22	0	6	4	17	0	8	28	22	24
Grouse Cr.	2	108	55	13	56	24	50	48	33	17	23	18	0	50	8	44	50	77	18	42	45
EAST SHORE																					
Granite Cr.	3	81	37	37	30	--	--	--	--	0	7	11	9	47	90	49	41	25	7	57	101
Sullivan Springs	9	8	14	--	6	--	--	--	--	0	24	31	9	15	42	10	22	19	8	15	12
North Gold Cr.	16	37	52	8	36	24	37	35	41	41	32	27	31	39	19	22	16	19	16	24	21
Gold Cr.	131	124	111	78	62	111	122	84	104	93	120	164	95	100	76	120	147	168	127	203	126
PRIEST RIVER																					
Middle Fork East River	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4	8	21
Uleda Creek	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	4	3
Total 6 index streams[e]	570	598	671	290	453	478	543	503	423	333	529	516	273	486	373	597	541	623	566	691	591
Total of all streams	814	881	930	412	555	478	543	503	423	447	656	631	320	608	527	726	705	732	710	890	836

[a] A significant portion of Grouse Creek was not counted.
[b] A significant portion of Rattle Creek and East Fork Lightning Creek were not counted.
[c] Represents partial counts due to early snow fall.
[d] Observation conditions impaired by high runoff.
[e] Index streams include Trestle, East Fork Lightning, Gold, North Gold, Johnson, and Grouse creeks.

Table 6. The estimated number of adult bull trout associated with each tributary where redds were counted in the Pend Oreille Lake, Idaho, Core Area from 1983 to 2003. Stream counts shaded in gray indicate when over 100 adults were associated with it. Total counts shaded in gray indicate when the entire population exceeded 2,500 fish.

Stream	1983[a]	1984	1985	1986[b]	1987	1988	1989	1990	1991[c]	1992	1993	1994	1995[d]	1996	1997	1998	1999	2000	2001	2002	2003
CLARK FORK R.	--	--	--	--	--	--	--	--	--	6	23	49	52	9	20	23	15	15	17	20	23
Lightning Cr.	81	26	133	41	12	--	--	--	--	32	6	15	0	17	0	9	46	12	20	23	23
East Fork	319	70	383	23	171	229	290	84	--	93	78	81	9	142	64	186	128	157	104	168	110
Savage Cr.	104	35	84	--	0	--	--	--	--	3	17	17	0	0	0	0	12	6	12	44	20
Char Cr.	52	26	32	0	6	--	--	--	--	26	107	38	6	41	3	46	49	32	6	23	20
Porcupine Cr.	107	151	93	3	26	--	--	--	--	12	17	3	6	0	0	0	12	12	0	0	15
Wellington Cr.	61	52	44	20	6	--	--	--	--	26	12	26	3	15	6	3	64	23	20	20	23
Rattle Cr.	148	93	61	29	102	--	--	--	--	29	23	0	3	29	6	44	38	35	194	96	107
Johnson Cr.	38	96	67	104	29	12	49	96	73	46	67	9	12	15	78	49	90	12	99	90	0
Twin Cr.	20	73	15	81	0	--	--	--	--	9	12	0	15	46	17	29	55	29	3	23	9
Morris Cr.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	3	0	20	3
Strong Creek	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	--
NORTH SHORE																					
Trestle Cr.	864	789	864	426	667	684	629	795	638	389	882	800	406	705	641	957	734	873	972	966	1047
Pack River	99	107	142	73	41	--	--	--	--	189	61	64	0	17	12	49	0	23	81	64	70
Grouse Cr.	6	313	160	38	162	70	145	139	96	49	67	52	0	145	23	128	145	223	52	122	131
EAST SHORE																					
Granite Cr.	9	235	107	107	87	--	--	--	--	0	20	32	26	136	261	142	119	73	20	165	293
Sullivan Springs	26	23	41	--	17	--	--	--	--	0	70	90	26	44	122	29	64	55	23	44	35
North Gold Cr.	46	107	151	23	104	70	107	102	119	119	93	78	90	113	55	64	46	55	46	70	61
Gold Cr.	380	360	322	226	180	322	354	244	302	270	348	476	276	290	220	348	426	487	368	589	365
PRIEST RIVER																					
Middle Fork East River	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	12	23	61
Uleda Creek	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9	12	9
Trap and Transport	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35	35	35
Total 6 index streams[e]	1653	1734	1946	841	1314	1386	1575	1459	1227	966	1534	1496	792	1409	1082	1731	1569	1807	1641	2004	1714
Total for all streams	2361	2555	2697	1195	1610	1386	1575	1459	1227	1296	1902	1830	928	1763	1528	2105	2045	2123	2059	2581	2424

[a] A significant portion of Grouse Creek was not counted.
[b] A significant portion of Rattle Creek and East Fork Lightning Creek were not counted.
[c] Represents partial counts due to early snow fall.
[d] Observation conditions impaired by high runoff.
[e] Index streams include Trestle, East Fork Lightning, Gold, North Gold, Johnson, and Grouse creeks.

(P < 0.05) increasing trend, although the slope for all three is quite different (Table 3). When evaluating all streams combined (21 streams) there has been on average an increase of about 28 redds/year (slope). This averages out to about an increase of 1.3 redds/stream every year. The slope for the six index streams was about 20 redds/year, which averages to about an increase of 3.4 redds/stream each year. When evaluating only the Lightning Creek tributaries (7 streams) there has been on average an increase of about 5 redds/year. This averages out to about an increase of 0.7 redds/stream every year.

Kootenai River Core Area

Three tributaries (North Callahan, South Callahan and Boulder creeks) were surveyed for bull trout redds in the Idaho portion of the Kootenai River Core Area and a total of 40 redds were counted (Figure 4 and Table 6). No redds were counted in Boulder Creek. These streams were surveyed several times between September 24 and October 9, 2003 to get a more complete and accurate count of the number of bull trout redds that were constructed in these tributaries. This was only the second or third year redds were counted in tributaries of the Idaho portion of the Kootenai River Core Area. The 40 redds counted during 2003 was more than double what was counted in previous years. Expanding the number of redds observed by 2.9 fish/redd, the spawning escapement of bull trout for the Idaho portion of the Kootenai River Core Area is estimated to be 116 fish.

In the Montana portion of the Kootenai River Core Area, 126 redds were counted during 2003 (Table 7). This converts (2.9 fish/redd) to an estimated spawning escapement of 365 fish. When combined with the Idaho spawning escapement (116 fish), the total spawning escapement for the Kootenai River Core Area comes out to 481 fish. No corrections were made for fish that do not spawn every year to come up with the total number of adult fish that occur in the Core Area. As a result, a conservative estimate for the number of adult bull trout that occur in the entire Kootenai River Core Area is 481 fish. The recovery goal is 1,000 fish. During 1999, an estimated 664 bull trout occurred in this Montana section of the Core Area. No streams were surveyed in Idaho during this year, but based on what was observed in 2003 (40 redds), the total number of adult bull trout that occurred in the entire Kootenai River Core Area likely exceeded 800 fish.

Three local populations (spawning tributaries) were believed to have over 100 adults associated with them in the Kootenai River Core Area during 2003. These tributaries include Quartz Creek (143 adults), O'Brien Creek (131 adults) and Callahan Creek (116 adults). To reach the recovery goal there must be five populations with over 100 adults associated with it (Table 2). During 1999, five local populations were believed to have at least 100 adults associated with them, assuming Callahan Creek had similar numbers as observed during 2003.

Trend analysis (linear regression) of bull trout redds in Montana tributaries that have been counted consistently since 1990 indicate this population is significantly (P = 0.018) increasing (Table 3 and Figure 10). However, during the last two years (2002-2003) a noticeable drop in the number of redds has occurred in these streams. Starting in 1996 bull trout redd counts in all tributaries in Montana have been fairly consistent. Analysis of this data suggests that since 1996 the bull trout population has increased slightly, even though a decline has occurred during the last two years (Table 3 and Figure 10). Despite the drop in redd counts over the last two years, the numbers appeared to be higher than what was observed during the mid to early 1990's and a significantly increasing trend was observed (1990-2003), which brings

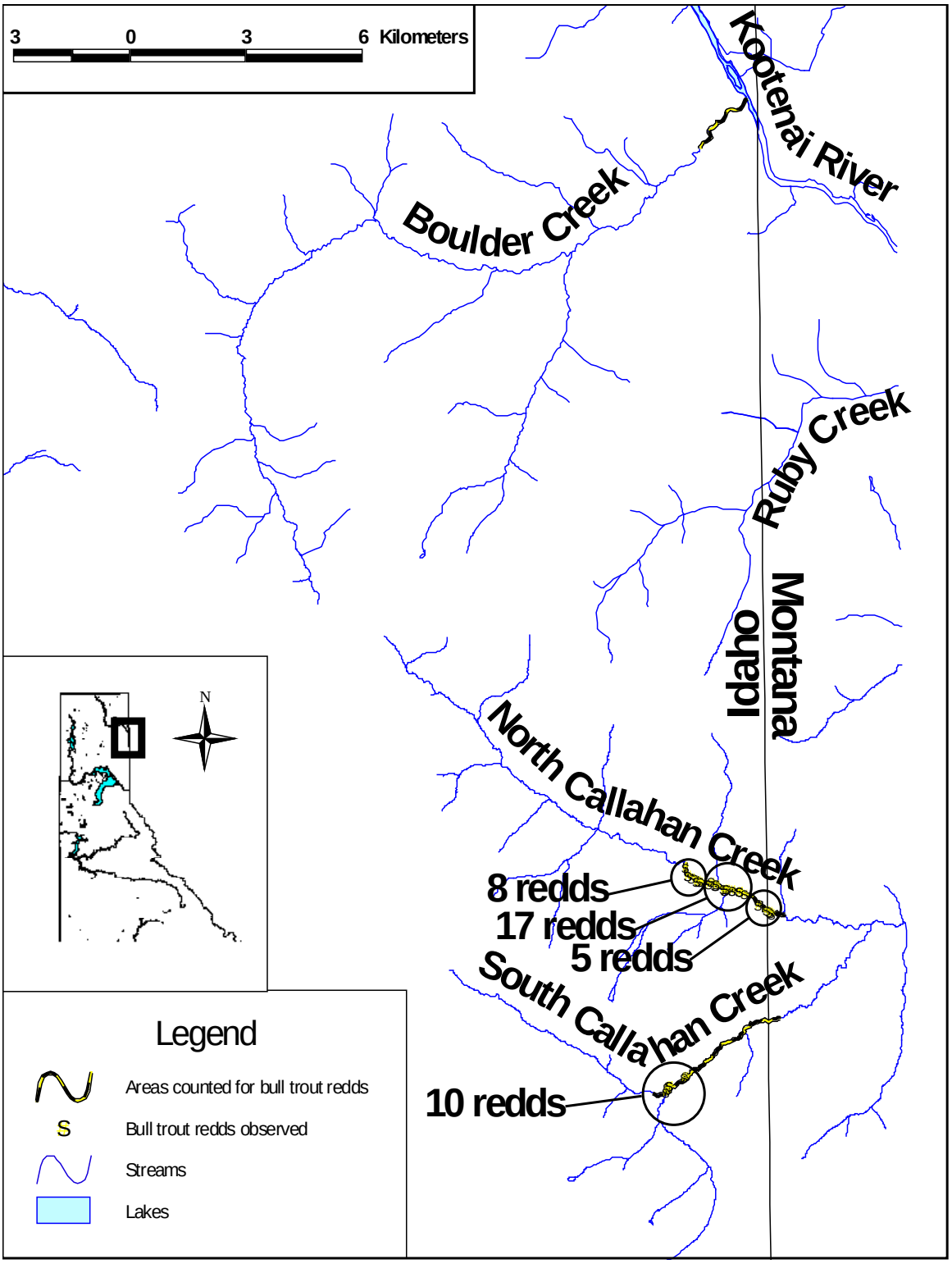

Figure 4. Stream reaches where bull trout redds were counted in tributaries of Kootenai River, Idaho, from September 24 to October 9, 2003, and the locations where redds were observed.

Table 7. The number of bull trout redds counted per stream in the Idaho section of the Kootenai River Core Area, from 2001 to 2003.

Stream	Transect Description	Length (km)	2001	2002	2003
North Callahan Creek	to falls/barrier	3.3	--	13	30
South Callahan Creek	Idaho border bridge to	4.3	--	4	10
Boulder Creek	Mouth to Falls/Barrier	1.8	2	2	0
All Streams		9.4	2	19	40

Table 8. The number of bull trout redds counted per stream in the Montana section of the Kootenai River Core Area from 1990 to 2003.

Stream	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Quartz	76	77	17	89	64	67	47	69	105	102	91	154	62[d]	55
O'Brien	--	25	24	6	7	22	12	36	47	37	34	47	45	46
Pipe	6	5	11	6	7	5	17	26	34	36[b]	30	6[a]	11	10
Bear	--	--	--	--	--	6	10	13	22	36	23	4[c]	17	14
West Fisher	--	--	--	2	0	3	4	0	8	18	23	1	1	1
Quartz/O'Brien/Pipe	82	107	52	101	78	94	76	131	186	175	155	207	118	111
All Streams	82	107	52	103	78	103	90	144	216	229	201	212	136	126

[a] A human built dam (stacked up cobble) was constructed downstream of the traditional spawning area.
[b] This count includes redds constructed by resident and migratory fish.
[c] Libby Creek was dewatered at the Highway 2 bridge, downstream of Bear Creek spawning sites, during the bull trout spawning run.
[d] A log jam may have been a partial barrier.

us to conclusion that the bull trout population in the Kootenai River Core Area is stable or increasing.

Coeur d'Alene Lake Core Area

We counted 46 redds in the St. Joe River drainage on September 23, 2003 (Figure 5 and Table 8). Every one of these redds came from the three index streams (Medicine Creek, Wisdom Creek, and upper St. Joe River) surveyed by IDFG. In the past five years (1999-2003) no more than two redds have been observed during any one year outside the three index streams. The 28 redds counted in Medicine Creek represents 61% of all the redds counted in the entire Coeur d'Alene Lake Core Area during 2003. No attempts were made to search for bull trout redds in the Coeur d'Alene River basin. Expanding the number of redds observed by 2.9 fish/redd, the spawning escapement of bull trout for the Coeur d'Alene Lake Core Area is estimated to be 133 fish, which is considerably lower than the recovery goal of 1,100 adults (Table 2).

A downward trend (non-significant P = 0.551) is evident in the spawning escapement of bull trout in the Coeur d'Alene Lake Core Area if one evaluates all the streams surveyed (Figure 11 and Table 3). However, many of these streams have not been surveyed consistently and some of the stream reaches were surveyed by individuals inexperienced in counting redds. If we evaluate only those streams that have been consistently surveyed by experienced counters (the three index streams), an upward trend is evident (Figure 11 and Table 3). This trend is not

significant (P = 0.410) as the standard error about the trend line is larger than the actual slope of the line (Table 3). Due to the large variation in annual redd counts and the downward trend that is portrayed when we evaluate all the streams, we can not conclude that this population is stable or increasing.

Several complete and/or partial barriers occur in streams where we believe bull trout spawning and rearing is occurring. Red Ives Creek has a diversion dam on it within 2 km of the mouth that is a migration barrier to at least some fish. We have had reports of a few spawning bull trout upstream of the dam, but for the most part we believe it is a barrier to bull trout migration. Entente Creek has a culvert barrier just upstream from where a bull trout redd was reported and there appears to be suitable habitat upstream of the culvert. There are culverts that appear to be barriers on Cascade and Bluebells Creeks, although juvenile bull trout have been found upstream of them. Other barriers may occur in streams that we believe have the potential to support spawning and rearing bull trout populations.

North Fork Clearwater River Core Area

Bull trout redd surveys were conducted on September 20-25, 2003 in the upper Little North Fork Clearwater River drainage. During this survey, 48 redds were counted, which is the highest we have ever seen (Figures 6-7 and Table 9). Five of these redds were believed to have been constructed by resident fish. Explorations to find new bull trout spawning areas occurred in Buck Creek, Canyon Creek and Rutledge Creek (Figures 6-7). Surveys of these stream reaches found five redds to occur in Buck Creek and one in Rutledge Creek, which represent 13% (6 out of 48) of all the redds that were counted. Since 2001 we have started exploring new streams to better assess where bull trout are spawning in the Little North Fork Clearwater River. What we are seeing is that bull trout spawn in many different streams, but not necessarily on a consistent basis (Table 9).

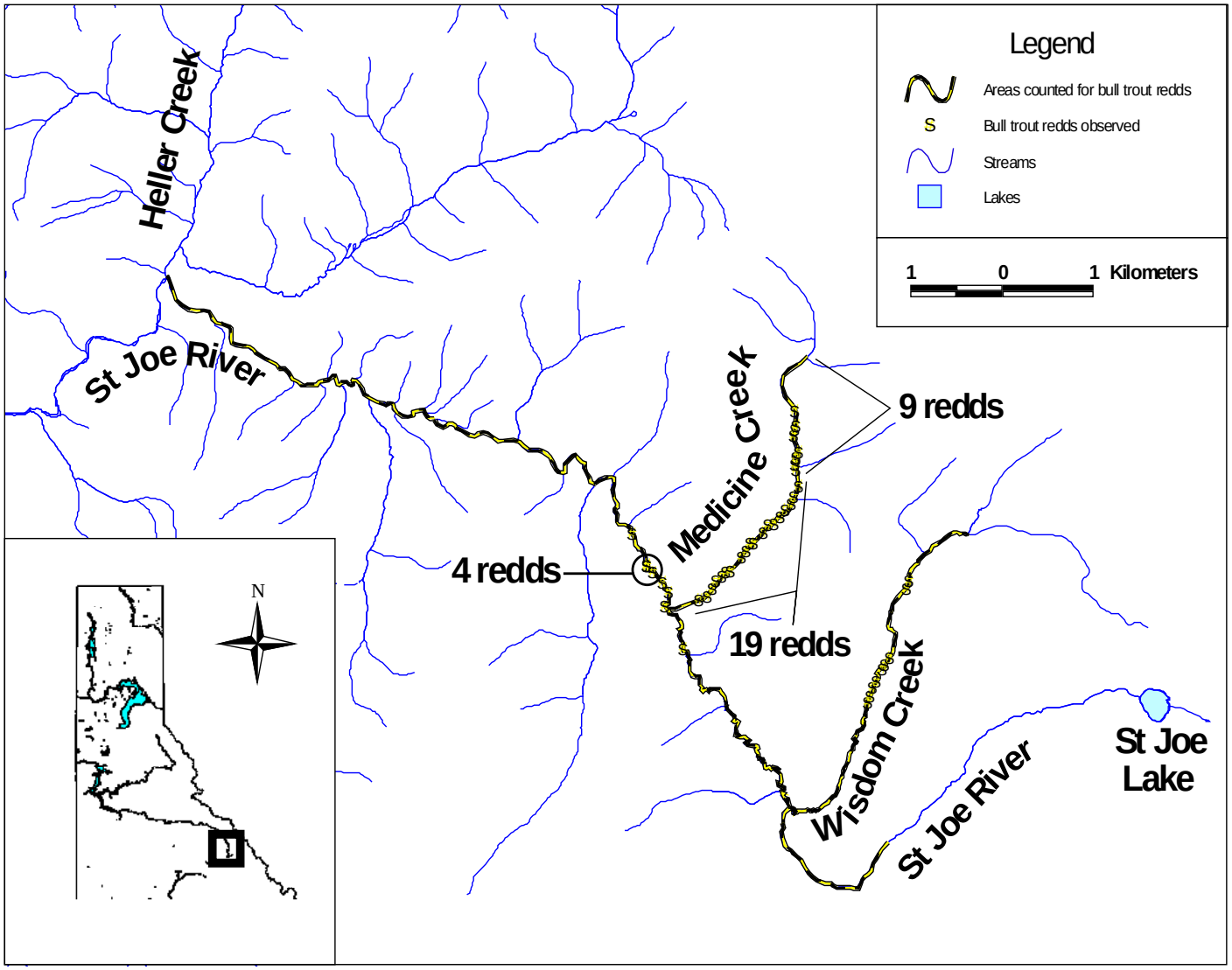

Figure 5. Stream reaches where bull trout redds were counted in the St. Joe River, Idaho, on September 23, 2003, and the locations where redds were observed.

Table 9. The number of bull trout redds counted by stream in the St. Joe River basin, Idaho, from 1992 to 2003. Counts shaded in gray are index streams that have been surveyed by the Idaho Department of Fish and Game since 1995. All other stream reaches are counted by the U.S. Forest Service and/or volunteers.

Stream Name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Aspen Cr.	--	--	--	--	--	--	--	--	--	--	0	--
Bacon Cr.	0	--	--	--	--	--	--	--	--	--	--	--
Bad Bear Cr.	--	0	0	--	--	--	--	--	--	--	--	0
Bean Cr.	14	--	--	0	--	--	--	--	--	--	--	--
Beaver Cr.	2	2	0	0	0	0	1	0	--	0	0	0
Bluff Cr.- East Fork	0	--	--	--	--	--	--	--	--	--	--	--
California Cr.	2	4	0	2	3	0	--	--	0	0	0	0
Copper Cr.	--	--	0	--	0	--	--	--	--	--	0	0
Entente Cr.	--	--	--	--	--	--	--	0	--	--	1	0
Fly Cr.	1	--	--	0	0	0	2	0	--	--	1	0
Gold Cr. Lower mile	--	0	--	--	--	0	--	0	--	--	--	0
Gold Cr. Midde	--	--	--	0	--	--	--	0	--	--	--	--
Gold Cr. Upper	--	2	--	--	1	1	0	--	--	--	--	--
Gold Cr. All	--	--	--	--	--	--	--	--	--	1	0	--
Heller Cr.	0	0	0	0	--	1	0	0	0	--	0	0
Indian Cr.	0	0	--	--	--	--	--	--	--	--	--	--
Medicine Cr	11	33	48	17 [a]	23 [a]	13 [a]	11 [a]	48 [a]	43	16	42	28
Mosquito Cr.	0	--	0	0	4	0	2	--	--	--	--	--
Quartz Cr.	--	--	--	--	--	--	--	--	--	--	0	--
Red Ives Cr.	--	0	1	1	0	1	0	0	0	0	0	0
Ruby Cr.	0	1	--	8	--	--	--	--	--	--	--	--
Sherlock Cr.	0	3	0	2	1	1	0	1	0	--	--	0
Simmons Cr. - Lower	--	0	0	0	--	--	--	--	--	0	--	--
Simmons Cr. - NF to Three Lakes	--	5	0	--	--	--	--	--	--	--	--	--
Simmons Cr. - Three Lakes to Rd 1278	--	3	5	5	0	0	0	0	--	--	--	--
Simmons Cr. - Rd 1278 to Washout	--	0	0	0	1	0	1	0	--	--	--	--
Simmons Cr. - Upstream of Washout	--	0	--	--	--	0	--	--	--	--	--	--
Simmons Cr. - East Fork	--	--	0	--	--	--	--	--	--	--	--	--
St. Joe River - below Tento Creek	--	--	--	--	0	--	--	--	--	--	--	--
St. Joe River - Spruce Tree to St. Joe Ldg.	--	--	--	0	--	--	--	--	--	--	--	--
St. Joe River - St. Joe Ldg to Broken Leg	--	--	--	4	--	--	--	--	--	--	--	--
St. Joe River - Broken Leg Cr upstream	--	--	--	0	--	--	--	--	--	--	--	--
St. Joe River - Bean to Heller Cr.	0	0	--	--	--	--	--	--	--	--	--	--
St. Joe River - Heller to St. Joe Lake	10 [b]	14 [b]	3 [b]	20	14	6	0	10	2	11	3	9
Three Lakes Creek	--	--	--	--	0	--	--	--	--	--	--	--
Timber Cr.	--	0	1	0	--	--	--	--	--	--	--	--
Wampus cr	--	0	0	--	--	--	--	--	--	--	--	--
Washout cr.	--	3	0	0	0	0	--	--	--	--	--	--
Wisdom Cr	1	1	4	5	1 [a]	0	4	11	3	13	9	9
Yankee Bar	1	0	--	--	--	0	--	--	1	0	0	0
Total - Index Streams	22	48	55	42	38	19	15	69	48	40	54	46
Total - All Streams	42	71	62	64	48	23	21	70	49	41	56	46
Number of streams reaches surveyed	16	23	19	21	16	17	12	13	8	9	14	14

[a] These counts differed from what the U.S. Forest Service counted.

[b] These counts did not include from California Creek to Medicine Creek, a reach where bull trout spawning typically occurs.

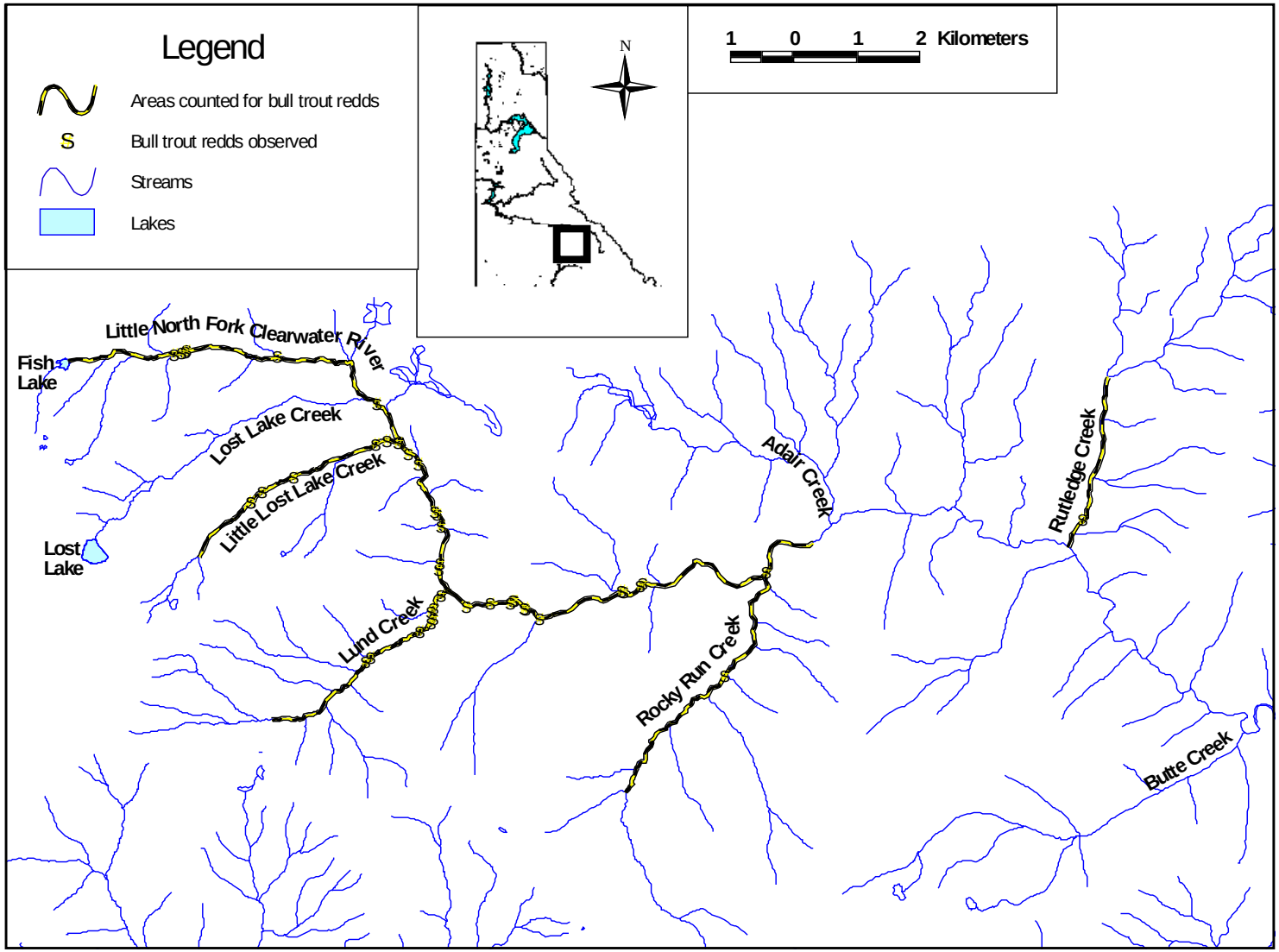

Figure 6. Stream reaches where bull trout redds were counted in the Little North Fork Clearwater River, Idaho, on September 20-24, 2003, and the locations where redds were observed.

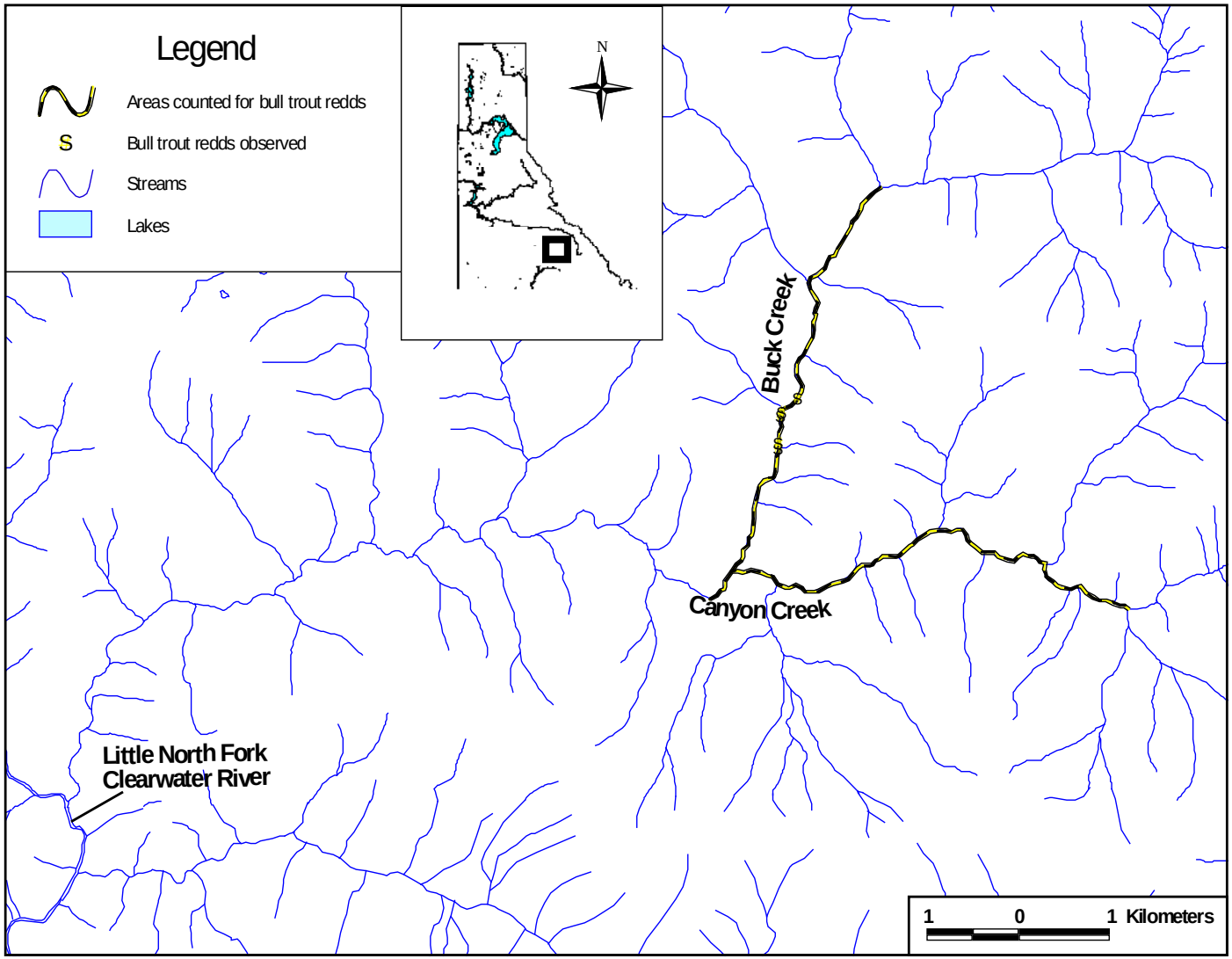

Figure 7. Stream reaches where bull trout redds were counted in Canyon Creek and Buck Creek, Idaho, on September 25, 2003, and the locations where redds were observed.

Table 10. Number of bull trout redds counted per stream in the Little North Fork Clearwater River basin, Idaho, from 1994 to 2003. Numbers in parentheses are redds smaller than 300 mm in diameter.

Stream	Length (km)	1994[a]	1996	1997	1998	1999	2000	2001	2001[b]	2002	2003
Buck Creek	4.8	--	--	--	--	--	--	--	--	--	5
Canyon Creek	5.5	--	--	--	--	--	--	--	--	--	0
Butte Creek	1.2	--	--	--	--	--	--	--	5	0	--
Rutledge Creek	2.9	--	--	--	--	--	--	--	--	--	1
Rocky Run Creek	4.7	--	--	--	--	--	--	--	--	5	1
Lund Creek	3.9	0	7	2	2	1	1	13	5	7	7 (1)
Little Lost Lake Creek	3.9	0	1	1	1	7	3	1	--	2 (4)	4 (3)
Lost Lake Creek	3.0	0	0	0	0	--	1	--	--	0	--
Little North Fork Clearwater River											
1268 Bridge to Lund Cr.	7.0	--	--	--	--	--	--	--	17	6	13
Lund Cr. to Lost Lake Cr.	3.8	--	--	3	1	9	8	3	12	5 (2)	7
Lost Lake Cr. to headwaters	5.4	0	2	0	0	--	5	1	--	5	5 (1)
All reaches surveyed in 2003	41.9	0	10	6	4	17	18	18	39	30 (6)	43 (5)

[a] Streams were surveyed between 9/16/1994 and 9/19/1994 - one week earlier than surveys in following years.
[b] These redds were counted by personnel from the Clearwater Region.

Expanding the number of redds observed (48) by 2.9 fish/redd, the spawning escapement of bull trout for the upper Little North Fork Clearwater River is estimated to be 139 fish. Another 235 adults bull trout (81 redds) were estimated to spawn in the Breakfast Creek and North Fork Clearwater River drainages within the Clearwater Region (Table 10). When combined with the upper Little North Fork Clearwater, this give us a total spawning escapement of 374 bull trout for the North Fork Clearwater River Core Area. Not all streams are surveyed in the North Fork Clearwater River Core Area every year due to their remote locations. Based on previous redd counts (Tables 9 and 10), it is believe that during 2003 about 15% of the redds were not counted due to unsurveyed streams. By adding another 15% (multiply by 1.18) to this number, the estimated bull trout spawning escapement for the entire North Fork Clearwater Core Area is 441 fish. We multiplied the spawning escapement by 1.33 (at least 25% are not repeat spawners), which give us a total of 587 adult bull trout that occurred in the North Fork Clearwater Core Area during 2003. This is considerably lower than the recovery goal of 5,000 adult bull trout (Table 2).

It is difficult to evaluate the trend in the number of redds counted in the North Fork Clearwater Core Area. This difficulty stems from the irregularity in counting the same stream reaches throughout the years, adding new reaches, and inconsistency in counting redds that were created by resident fish. If we only look at those stream reaches that we have counted consistently in the upper Little North Fork Clearwater (Lund Creek, Little Lost Lake Creek and the Little North Fork Clearwater from Lund Creek to Lost Lake Creek and Lost Lake Creek to headwaters) a significant ($P = 0.003$) increasing trend is evident (Figure 12 and Table 3). From 2001-2003, redd counts in the upper Little North Fork Clearwater River and North Fork Clearwater River have been fairly consistent. If we evaluate only this data an increasing trend is also evident in both systems (Figure 12 and Tables 3 and 10), although these trends are based on only three years of data. Record high numbers of redds in both the Little North Fork and North Fork Clearwater Rivers during 2002 and 2003 also suggest this population is increasing (Table 10). As bull trout redd counts continue in a more consistent manner in the Little North Fork Clearwater River and North Fork Clearwater River basins, we will gain a clearer picture of what the trend in bull trout abundance is in this Core Area.

DISCUSSION

Priest Lake Core Area

Bull trout redd counts from 1985 to 2003 indicate the bull trout population in the Upper Priest Lake basin is declining at a significant rate. The number of bull trout spawning in these tributaries appears to be a fraction of what it was historically. Some of the smaller tributaries (Trapper Creek, Lime Creek, Rock Creek, Cedar Creek, Bench Creek and Jackson Creek) have not had any redds counted in them for at least two years, where only 10 years ago counts of one to four redds were common. Even in some of the larger tributaries (Gold Creek and Hughes Fork) where 20 or more redds were counted on an annual basis during the 1980's, fewer than three redds were counted in 2002 and 2003. Only Upper Priest River has had redd counts of any appreciable number (> 20). This information supports work conducted on Upper Priest Lake where bull trout numbers appear to be declining significantly and only larger bull trout remain (DuPont et al., In Press b). It seems evident that the expanding population of lake trout in Upper Priest Lake poses an increasing threat to the adfluvial bull trout population (Fredericks et al. 2002; Donald and Alger 1993). If this is true, we may continue to see even further declines in the bull trout population from Upper Priest Lake. Bull trout redd counts by Mauser (1986) document this very thing on tributaries of Priest Lake where the number of redds observed in tributaries declined from double digits to zero from 1983 to 1985. This decline in

Table 11. Number of bull trout redds counted per stream in the North Fork Clearwater River and Breakfast Creek basins, Idaho, from 1994 to 2003. These streams all occur in the Clearwater Region and were counted by personnel from the Clearwater Region or U.S. Forest Service.

Stream Surveyed	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
North Fork Clearwater River										
Black Canyon	--	--	--	--	--	--	--	--	1	--
Bostonia Creek	0	0	0	0	0	4	1	1	1	18
Boundary Creek	--	--	--	--	--	--	--	--	--	2
Collins Creek	--	--	--	--	--	--	--	0	--	--
Goose Creek	--	--	--	--	--	--	--	1	0	2
Hidden Creek	--	--	--	--	--	--	--	--	1	0
Isabella Creek	--	--	--	--	--	--	--	--	1	1
Kelley Creek - North Fork	--	--	--	--	--	--	--	14	--	--
Lake Creek	--	--	--	--	--	--	19	7	20	14
Little Moose Creek	--	--	--	--	--	--	--	0	--	--
Long Creek	--	--	--	--	--	--	--	--	5	0
Moose Creek	--	--	--	--	--	--	0	0	0	0
Niagra Gulch	--	--	--	--	--	--	2	5	6	10
Osier Creek	--	--	--	--	--	--	3	0	2	0
Placer Creek	3	1	2	2	2	7	4	2	4	6
Pollock Creek	--	--	--	--	--	--	--	--	--	1
Quartz Creek	--	--	--	--	--	--	--	4	0	0
Ruby Creek	--	--	--	--	--	0	0	--	--	--
Skull Creek	--	--	--	--	--	--	--	--	0	6
Swamp Creek	--	--	--	--	--	--	2	0	1	0
Upper NF	--	--	--	--	--	--	--	--	--	7
Vanderbilt Gulch	--	--	--	--	--	--	--	24	18	13
Weitas Creek	--	--	--	--	--	--	1	--	--	--
Windy Creek	--	--	--	--	--	2	--	--	--	--
Breakfast Creek										
Floodwood Creek	--	--	--	--	--	--	--	--	4	0
Gover Creek	--	--	--	--	--	--	--	--	--	1
Stony Creek	--	--	--	--	--	--	--	--	4	0
Total for all streams	3	1	2	2	2	13	32	58	68	81

redds occurred several years after a crash in the bull trout population was noticed in Priest Lake. These findings add to the urgency for correcting the lake trout problem in Upper Priest Lake. Delays in correcting this problem could result in significant losses to or the extirpation of this bull trout population.

One promising note is after three consecutive years of declines in bull trout redd counts, an increase was observed in 2003. This increase may be in response to the intensive gill netting that occurred during in 1998 when 912 lake trout were removed from the lake reducing the population by about 75% (Fredericks et al. 2002). The lower number of lake trout likely resulted in increased survival of juvenile bull trout the following year or two. Bull trout in Pend Oreille Lake rear three or more years before they return to spawn for the first time (Downs and Jakubowski 2003). If the reduction in lake trout did result in increased survival of juvenile bull trout, you would expect to see an increase in the number of redds 3 or more years later (2002+). The higher number of redds we saw in 2003 suggests that lake trout removal in Upper Priest Lake did result in increases in the bull trout population. During lake trout removal efforts in Upper Priest Lake during 2003, we saw an increase in the number of bull trout between 300 and 500 mm in length (DuPont et al., In Press d), also an indication that juvenile bull trout survival increased as a result of gill netting efforts during 1998. Continued lake trout removal is necessary in Upper Priest Lake in order for this bull trout population to persist.

The total adult bull trout abundance for the Priest Lake Core Area was estimated at 119 fish. This is considerably lower than the current recovery goal of 1,000 adult fish with at least five local populations having over 100 adults. None of the tributaries of Priest Lake have been surveyed for redds since 1986 when Mauser (1986) documented the collapse of this population. Bull trout are known to still occur in some of the tributaries of Priest Lake (DuPont et al., In Press a), but all totaled, probably contribute fewer than 50 adult fish to the entire core area.

The recovery goal of 1,000 adult fish appears to be reasonable for the Priest Lake Core Area, especially since in the early 1970^{s}, annual harvests of over 1,000 bull trout were common with a peak harvest in 1978 of about 2,300 fish (Mauser et al. 1988). However, increases in bull trout numbers in Priest Lake tributaries are unlikely with the thriving lake trout population that occurs in the lake. The best opportunity for restoring a healthy bull trout population is in the Upper Priest Lake basin, where it may be possible to control the lake trout population. Redd counts in 1985 only surveyed about 21% of what we believe is the high quality spawning habitat in the Upper Priest Lake basin. In this survey, 80 redds were counted. If all the high quality habitat were surveyed, about 380 redds would have been counted, assuming they were distributed similarly in the un-surveyed areas. The 380 redds when multiplied by 2.9 (adults/redd) gives us a rough estimate of 1,102 adult fish occurred in the Upper Priest Lake basin in 1985. To get back to these types of bull trout numbers, the lake trout population must be significantly reduced. Any hope of accomplishing this relies on controlling the immigration of lake trout from Priest Lake (Fredericks et al. 2002). We are unsure of what influence the expanding brook trout population in tributaries will have on restoring bull trout in the Upper Priest Lake basin.

One man-made barrier was noted during our survey that we believe blocks upstream migration of bull trout. This barrier is a U.S. Forest Service culvert located where F.S. road 1013 crosses Gold Creek (T63N, R5W, Section 17). Currently, bull trout habitat below this culvert is not fully utilized, but spawning and rearing habitat should not be artificially limited for this depressed population.

Pend Oreille Lake Basin

edd counts in the Pend Oreille Lake basin indicated this system has the most abundant and stable bull trout population in northern Idaho and possibly the state. Evaluation of the six index streams since 1983 showed the trend in bull trout redds counted is fairly stable, although, if we evaluated only those redd counts since 1992, a significant increasing trend was evident. The 836 redds counted in 2003 was the third highest ever recorded and exceeds redd counts anywhere else in the state. Redd counts in Trestle Creek and Gold Creek consistently produced the highest counts and have remained relatively stable or have increased over time. Redd counts in other streams such as Rattle Creek, Grouse Creek, Johnson Creek and the Pack River have fluctuated widely over the years. Those streams having high variability in their redd counts typically have unstable and/or degraded habitat conditions (Rieman and Myers 1997). However, periodic increases in the number of redds counted from these streams indicate they have the potential to support strong bull trout populations once improvements occur. Those streams where consistently low redd counts have occurred since 1986 (Lightning Creek, Savage Creek, Morris Creek and Porcupine Creek) may require considerable time and money to recover the population and/or they may have little potential to support high numbers of bull trout.

Redd counts in the Middle Fork East River and Uleda Creek were added to the Pend Oreille Lake Core Area in 2003 when these bull trout were documented to spend their adult life in Pend Oreille Lake (DuPont and Horner, In Press c). Redd counts first occurred in the Middle Fork East River basin in 2001; however, only a portion of the area bull trout are known to spawn in were counted. In 2002, the redd counts covered the entire stream reach where bull trout are believed to spawn; however, the counts occurred in mid October after brook trout had began spawning, and it was difficult to determine where the bull trout redds were. The first year we believe accurate redd counts were collected was 2003 when all know spawning areas were assessed and counts occurred on September 30 after the bull trout were finished spawning and before brook trout had begun. Future redd counts in the Middle Fork East River drainage should occur near the end of September, two weeks before redd counts occur in the rest of the Pend Oreille Lake Core Area.

The significantly increasing trend in the number of redds counted since 1992 (all streams combined) is believed to be largely a response to changes in fishing regulations in Pend Oreille Lake that occurred in 1994 (harvest changed from 2 to 1 fish) and 1996 (changed to catch-and-release). In the Lightning Creek tributaries, the number of bull trout redds have been increasing at a much slower rate than other tributaries of Pend Oreille Lake.

Habitat in the Lightning Creek tributaries is believed to be degraded and of lower quality than the other bull trout tributaries in Pend Oreille Lake (PBTTAT 1998), suggesting that the abundance of bull trout in Lightning Creek was and continue to be suppressed more by the quality of the habitat than past fishing pressure. Significant efforts to protect and restore habitat in tributaries of Lake Pend Oreille have been occurring and likely have contributed to the increase in bull trout numbers we have seen since 1992 (Downs and Jakubowski 2003). These types of efforts are necessary to ensure bull trout populations will continue to increase in the Pend Oreille Lake Core Area.

Efforts are also occurring to increase the distribution and/or population strength of bull trout in the Pend Oreille Lake Core Area by addressing man-made barriers. All of the barriers that we believe are suppressing bull tout abundance are being evaluated and/or efforts are being taken to correct the problem. For example, a historic stream crossing occurs about 0.6

km upstream from the mouth of Uleda Creek, a tributary of the Middle Fork East River, that is currently a complete barrier to bull trout migrations. Removing this barrier will increase the amount of available high quality habitat for bull trout by at least 4 km. Uleda Creek is probably the most important stream reach in the Middle Fork East River basin to this bull trout population as the highest densities of bull trout and no brook trout were found to occur there as recently as 2003. Removal of this barrier could lead to significant increases in this bull trout population. The U.S. Fish and Wildlife Service has provided funds to the Idaho Department of Lands to remove this barrier, which they plan to do in June or July 2004. Work is also going on to evaluate entrainment and possibilities of creating upstream fish passage for Albeni Falls Dam (Geist et al. 2004) and Cabinet Gorge Dam (Lockard et al. 2003). Improvements in fish passage at these dams could result in significant increases in the bull trout population in the Pend Oreille Lake Core Area.

Funding has been secured (through AVISTA Corp.) and plans are in progress to correct an intermittent stream reach on Granite Creek (Chris Downs, IDFG, personal communication). This intermittent stretch of stream occurs about 1 km upstream from the mouth and has blocked bull trout migration to one of the top bull trout streams in the core area. In past years, bull trout were trapped and hauled to get them by this barrier. The current plans are to reconstruct this section of stream so that intermittency is no longer a problem.

Intermittent stream reaches are also a problem for bull trout migration on lower Lightning Creek, Rattle Creek, Savage Creek and East Fork Lightning Creek. The U.S. Forest Service halted new road construction and timber harvest in the Lightning Creek watershed in 1984 in an effort to help reverse this problem (Chad Baconrind, US Forest Service, personal communication). A watershed assessment of this watershed is planned and funded (AVISTA Corp.) to evaluate what can be done to reduce or eliminate these problems (Chris Downs, IDFG, personal communication).

The biggest threat to the entire bull trout population in the Pend Oreille Lake Core Area is believed to be from lake trout that occur in the lake (LPOBTWAG 1999). Findings from Donald and Alger (1993) suggests that over the long run bull trout will not persist in the presence of lake trout. Priest Lake and Flathead Lake, Montana have experience dramatic declines in bull trout numbers as lake trout numbers increased (Mauser 1986; Deleray et al. 1999). Currently efforts are being made to evaluate the status (growth, age, mortality, immigration etc.) of the lake trout population in Pend Oreille Lake. Findings from this study should help answers questions about the threat lake trout pose to bull trout and techniques that may be available to prevent lake trout from increasing to where they could impact the bull trout population.

The Pend Oreille Lake basin is the only core area in the Panhandle Region that is currently near its federal recovery goals. Currently four of the five recovery goals are being met - the overall population is increasing, six local populations have over 100 adults in them and efforts are being made to correct all known man-caused barriers. The only recovery goal that is not being met is having an overall population size of 2,500 adults. Currently, the population estimate for adult bull trout is 2,424, only 76 fish short of the recovery goal. This estimate is conservative as it assumes all bull trout in Pend Oreille Lake spawn every year. During 2002, the adult population was estimated to be 2,584 fish, which exceeded the recovery goal. If the bull trout population continues to increase at the rate it has over the past 11 years, all recovery goals in the Pend Oreille Lake Core Area will be met in the near future.

The State of Idaho developed a recovery plan for bull trout in the Lake Pend Oreille Core Area (LPOBTWAG 1999). The recovery goals (restoration targets) of this plan are that six tributaries must support healthy spawning populations. A healthy spawning population is defined as one that shows a stable or increasing trend and has a 95% probably of persistence over the next 100 years (LPOBTWAG 1999). There is no minimum number of adults that must be associated with each of these tributaries or a total number of adults that must be associated with the entire core area in the state recovery plan. Analysis of redd counts in the Pend Oreille Lake basin by Downs and Jakubowski, (In Press) found that five bull trout spawning populations (Trestle, Sullivan Springs, Granite, Gold and Clark Fork River) appear to be stable or increasing. However based on the BAVAM model (Lee and Rieman 1994), none of them had over a 95% probability of persistence for the next 100 years. These findings suggest that recovery of bull trout (according to the state criteria) in the Pend Oreille Lake Core Area may be quite a ways off. Downs and Jakubowski (In Press) argue that the techniques used to calculate probably of persistence are being refined and current models may not be appropriate for this analysis. They recommend that probability of persistence modeling not be used to evaluate recovery, and instead they suggest that recovery in the Pend Oreille Basin be evaluated through a combination of goals recommended in both the State and Federal plans. The recovery goals they suggest for the Pend Oreille Lake Core Area are, a minimum of 2,500 adults must occur in the core area, there must be at least six local populations with over 100 adults, and these six local populations must have a stable or increasing trend in their abundance of adults. The only difference between this suggestion and the federal recovery goals is, instead of requiring a stable or increasing trend for the entire bull trout population, a stable or increasing trend must occur for six different spawning tributaries. All six spawning tributaries that had a spawning escapement of over 100 adults during 2003 showed increasing trends in abundance since1992. Only two of these trends were significant at the $P < 0.05$ level although none of the trends had a p-value that exceeded 0.17. Regardless of which recovery goals we use, it appears that if increases in redd counts continue to occur, bull trout numbers should reach both recommended recovery goals in the near future.

Unfortunately, the differences between the Federal and State Bull Trout Recovery Plans add confusion to what it actually takes to recovery bull trout in the Pend Oreille Lake Core Area. To reduce this confusion, we recommend these plans be changed so they have the same recovery goals. This should not be difficult, as many of the same people developed both plans. Until these changes are made, we will continue to follow the Federal Recovery Plan, as the US Fish and Wildlife are responsible for determining when recovery and delisting occurs under the Endangered Species Act.

Once recovery goals are met in the Pend Oreille Lake Core Area, we believe the Idaho Fish and Game and U.S. Fish and Wildlife Service should investigate allowing limited harvest of bull trout on Pend Oreille Lake. We believe that allowing limited harvest of bull trout will keep fishermen interested and concerned about the species, which inevitably will lead to more support for continued efforts to improve this fishery. Any harvest allowed on this fishery should not exploit weak local populations or result in not meeting any of the stated recovery goals.

Kootenai River Core Area

North and South Callahan creeks are the only two streams that appear to be important for spawning bull trout in the Idaho portion of the Kootenai River Core Area. Forty redds were counted in both of theses tributaries, which suggests this population supports 116 adults. This population estimate is probably high as redd surveys occurred several times throughout the spawning season to get a more complete count. The bull trout to redd ratio we used (2.9

fish/redd) was based on one redd count survey per stream. Many other streams have also been surveyed in Idaho, but bull trout redds were not found in any of them except for a few in Boulder Creek (Jody Walters, IDFG, personal communication). The majority of the bull trout population in the Kootenai River Core Area occurs in Montana. During 2003, 76% of the redds were counted in Montana, and in 2002, 88% of the redds were found to occur there.

The total estimate of adult bull trout that occurred in the entire Kootenai River Core Area was 481 fish during 2003. This estimate is believed to be very conservative, as during 2003, it was believed that low flows may have blocked or prevented bull trout from entering many of the spawning streams (Mike Hensler, MFWP, personal communication). In fact the drop in bull trout numbers that were observed during 2002 and 2003 in the Kootenai River watershed may be in response to the drought that occurred over this period (Mike Hensler, MFWP, personal communication).

Entrainment of bull trout from Lake Koocanusa through Libby Dam may be helping to bolster the population of bull trout in the Kootenai River Core Area. Redd counts downstream of Libby Dam more than doubled after the 1996 flood. Lake Koocanusa has a thriving bull trout population, and entrainment of these fish through Libby Dam could be high on flood years. To test whether bull trout being entrained over Libby Dam were contributing to the spawning escapement in Montana Tributaries, Montana Fish, Wildlife and Parks put radio transmitters in many of the bull trout located just downstream of Libby Dam. During this study, none of the radio tagged bull trout made migrations into known spawning tributaries in Montana (Mike Hensler, MFWP, personal communication). Most of these fish remained near the Dam, although some made migrations downstream into Idaho. It's still not clear what role entrainment plays in the population status of bull trout in the Kootenai River Core Area.

Based on our results, it appears that two of the four recovery goals are currently being met in the Kootenai River Core Area (Table 2). Despite this report, we think we are close to meeting all the bull trout recovery goals for this core area. During 1999, we believe five bull trout populations had a spawning escapement over 100 adults, which meets the recovery goal, and the spawning escapement for the entire core area was probably over 800 fish (the goal is 1000 adults). Based on radio telemetry studies, many bull trout located downstream of Libby Dam do not spawn every year, and consequently, many more adults were in the core area than redd counts indicate. Possibly over 1000 adult bull trout occurred in the core area during this year and as the drought cycle ends, it is very likely we will see bull trout numbers bounce back to what we saw in 1999.

Coeur d'Alene Lake Core Area

Redd counts in the Coeur d'Alene Lake Core Area indicate that only the three index streams (Medicine Creek, Wisdom Creek and the upper St. Joe River) located in the upper St. Joe River watershed are responsible for producing all or the vast majority of the bull trout in the entire core area. In the past five years, no more than two redds have been counted during any one year in streams other than the three index sites, and a downward trend in redd counts was calculated. In the 1930's, most of the major tributaries in the St. Joe River and some in the St. Maries Rivers were documented to have bull trout in them (IDFG 1933). This apparent loss of bull trout populations in so many tributaries makes it critical that we learn more about what the major sources of mortality are and what may be limiting their numbers. Answers to these types of questions may be necessary before proper actions can be taken to restore this bull trout population.

All bull trout redds counted in the three index streams during 2003 were within 4 km of each other. This puts the entire bull trout population in the Coeur d'Alene Lake Core Area at risk from one catastrophic event. Currently, a dense stand of lodge pole pine and large amounts of dead and dying trees occur in this area, which makes susceptible for an intense fire. Despite these alarming facts, when we evaluated the trend in abundance of redds in the three index streams they appear to be increasing. This trend was not significant, but it still gives us some confidence that the bull trout populations in the index streams are not in jeopardy of collapsing in the near future.

Redd surveys in Medicine Creek have consistently produced the highest counts in the Coeur d'Alene Lake Core Area, and the 28 redds counted in 2003 represented about 61% (28 out of 46) of all the redds counted. It is believed that Medicine Creek is critical to the persistence of bull trout in the Spokane River drainage. Ironically, the habitat in Medicine Creek is not unaltered. Several stream segments still remain channelized from mining activities that occurred in the early 1900s. These channelized stream reaches provide poor spawning and rearing habitat. The US Forest Service should investigate the potential for habitat restoration in Medicine Creek.

Currently, none of the bull trout recovery goals are being met in the Coeur d'Alene Lake Core Area. The adult bull trout population appears to be declining, man-made barriers still exist that block bull trout migrations and the adult population size is estimated to be 133 fish. The current recovery plan asks for a stable or increasing population, with full access to potential spawning streams, and at least 1,100 adult spawners, 300 of which must occur in the Coeur d'Alene River watershed. Obviously, considerable efforts must occur before this bull trout population will ever approach the current recovery goal. As efforts to improve this bull trout population occur, the recovery goals should be re-evaluated to determine how realistic they are.

No attempts were made to survey tributaries of the Coeur d'Alene River for bull trout redds as we are not aware of any data that suggests spawning and rearing populations occur there. Anglers have reported catching bull trout in recent years from the Coeur d'Alene River, although biologists have verified none. Two different anglers indicated they caught bull trout from the South Fork Coeur d'Alene River at the mouth of Bear Creek. Bear Creek is known to have a strong brook trout population and brook trout are often misidentified as bull trout even by experienced individuals. Fish surveys (electrofishing or snorkeling) should occur in areas where bull trout reports commonly occur to help substantiate their validity.

North Fork Clearwater River Core Area

The 48 bull trout redds counted in the Little North Fork Clearwater drainage during 2003 was the highest count we have recorded by 12 redds. Nine additional km of stream were surveyed in 2003; however, these only accounted for six additional redds. Redd counts in the North Fork Clearwater River and Breakfast Creek (81) also were the highest ever recorded. Redd counts have been conducted in a fairly consistent manner in four Little North Fork Clearwater River streams over the last eight years (1996-2003). A linear regression of redd counts in these four streams shows a significantly increasing trend. This increasing trend, coupled with the record high counts, give strong reason to believe that the bull trout population in the entire core area is increasing in abundance.

Increasing numbers of redds in tributaries of the Little North Fork Clearwater River do not appear to be related to improving habitat conditions, as most of these stream are fairly remote and little human activity occurs in them. The improvements in bull trout numbers may

be attributed to when fishing regulations changed in 1994 from an allowable 2 fish harvest to no harvest on bull trout.

Currently, three of the four recovery goals appear to be met in the North Fork River Core Area (Table 2). The population appears to be stable or increasing, there are at least 11 local populations, and no man-made barriers were observed during redd counts in the Little North Fork Clearwater River. We did not do any redd surveys in the North Fork Clearwater watershed, and consequently, we are unsure whether any barriers exist in this area. The only goal not being met is that at least 5,000 adults must occur in the entire core area. The adult population estimate during 2003 was 587 fish. We recognize that the remote nature of this core area makes it difficult to survey many of the streams; however, we believe we are now counting most of the important spawning streams in the core area.

The recovery goal for the entire North Fork Clearwater Core Area (5,000 adults) is twice that of the Pend Oreille Lake Core Area (2,500 adults). The Pend Oreille Lake Core area is believed to support the strongest bull trout population in Idaho. The sterile nature of the streams in the North Fork Clearwater Core Area is believed to limit primary production and in turn fish biomass in many of these tributaries. As a result, we should not expect to see the same number of bull trout as occurs in the Pend Oreille Lake Core Area where many of the spawning tributaries are low elevation spring fed streams, and a large stable lake provides high survival for maturing juveniles and over-wintering adults. We do not believe the recovery goal of 5,000 adults in the North Fork Clearwater River Core Area is realistic. We suggest that this portion of the recovery plan be re-evaluated and a more realistic goal be developed.

RECOMMENDATIONS

1. Continue to monitor bull trout spawning escapement through redd counts in the Priest Lake Pend Oreille Lake, Kootenai River, St. Joe River and Little North Fork Clearwater River watersheds.

2. Using redd counts, continue to evaluate that status of bull trout in each of the core areas that occur in the Idaho Panhandle Region.

3. Investigate new streams/stream reaches where bull trout spawning may be occurring.

4. Continue to provide annual training to all people who will be conducting redd counts in the Panhandle Region.

5. Re-work the recovery goals for the State and Federal Recovery Plans for the Pend Oreille Lake Core Area so that they are the same.

6. Discuss with the U.S. Forest Service the feasibility of habitat restoration in Medicine Creek and/or Wisdom Creek.

7. Conduct a survival study on bull trout in the St. Joe River basin to better evaluate what the major limiting factors are.

8. Re-evaluate the recovery goals for the North Fork Clearwater River Core Area

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2003 PANHANDLE REGION FISHERIES MANAGEMENT REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	c-2	Title:	Rivers and Streams Investigations Cutthroat Trout Trend Assessment

Contract Period: January 1, 2003 to December 31, 2003

ABSTRACT

Extensive efforts were made in this report to describe methods used to conduct snorkel transects, compile historic data and provide locations of original transects in the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River so that we will produce consistent trend data that accurately portrays the status of the cutthroat trout fishery in these rivers. The historic data in the St. Joe River and Coeur d'Alene River was also re-evaluated to help us better understand how changes in fishing regulations can influence densities of desired fish species.

In July 2003, a total of 78 transects in the St. Joe and Coeur d'Alene Rivers were snorkeled to estimate trout and whitefish abundance and approximate size distribution. All transects were evaluated to ensure they were at the same locations as when they were originally set up. Transects that had been deleted or their locations changed were either added to the list of transects to snorkel or moved back to their original location. Due to channel shifting and pool filling a few of the original transect locations were moved to areas with similar habitat conditions.

Mean densities of age-1 and older cutthroat trout *Oncorhynchus clarkii* and mountain whitefish *Prosopium williamsoni* in the St. Joe River transects were 0.90 and 01.47 fish/100 m^2, respectively. Mean densities in the Coeur d'Alene River transects were 0.45 fish/100 m^2 for cutthroat and 3.13 fish/100 m^2 for mountain whitefish. Both rivers show increasing trends in abundance of cutthroat trout and mountain whitefish following the declines observed after the 1996 and 1997 flood events.

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INTRODUCTION

Westslope cutthroat trout *Oncorhynchus clarkii lewisi* are a highly sought after game fish native to northern Idaho attracting anglers from around the United States. The popularity of cutthroat trout stems from their eagerness to take a dry fly, their beautiful appearance and the pristine environment they inhabit. In northern Idaho, the major cutthroat trout fisheries occur in many of the larger rivers and streams that drain the rugged landscape. During 1996, over 60,000 hours of fishing effort was estimated to have occurred on the St. Joe and Coeur d'Alene rivers, two of the more popular rivers for cutthroat trout fishing in the Panhandle Region (Davis et al. 1997). Evidence suggests fishing pressure for cutthroat trout has continued to increase in the Panhandle Region (Davis et al. 1997).

In the early 1900's, many considered the streams and rivers in northern Idaho to be some of the finest trout streams in America. The local newspaper of St. Maries, Idaho frequently reported catches of seven to nine-pound trout, and trips where anglers caught 50-100 cutthroat trout averaging three to five pounds in a few hours (Rankel 1971). By the 1960's, cutthroat trout abundance had declined in many rivers in the Panhandle and studies were initiated to determine why these declines had occurred and what could be done to restore the fishery (Mallet 1967; Dunn 1968; Rankel 1971; Bowler 1974; Lewynsky 1986). This research found that declines in the fishery were largely a response to over harvest in the St. Joe River and a combination of over harvest, habitat degradation and toxic mine wastes in the Coeur d'Alene River (Rankel 1971; Bowler 1974; Lewynsky 1986; Rabe and Sappington 1970; Mink et al. 1971). As efforts were made to correct the causes of the decline in the fishery, it was necessary to monitor trends in fish numbers to evaluate how successful recovery efforts were. Transects were set up in the St. Joe and Coeur d'Alene rivers that have been snorkeled on a regular basis (Rankel 1971; Bowler 1974). Fish counts in these trend transects were successful in documenting how changes in fishing regulations and/or habitat have influenced cutthroat trout densities.

Snorkel transects are now set up in the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River to assess their fisheries. Transects in the St. Joe River were established in 1969, the Coeur d'Alene River in 1973 and the Little North Fork Clearwater River in 1997. Over time some of the transects were dropped or changed while others were added. Also, the names of the transects changed and the time when they snorkeled varied between years. These types of changes or variations make comparisons of fish densities between years less meaningful and more difficult to explain. The long term trend data sets collected from these snorkel transects are very important in documenting how changes in fishing regulations, habitat and weather patterns influence trends in fish populations. To ensure this data is collected in a consistent manner in the future and to increase the ease of locating the snorkel sites, this report has set out to clearly describe techniques one should used to collect the data, the time when snorkeling should occur and the locations of the transects. Extensive efforts have been made to collect and compile the existing historic data in this report so that in the future one does not have to sort through the raw data. The goal of this report is to help ensure that in the future, data collected from snorkeling the St. Joe River, Coeur d'Alene River, Little North Fork Clearwater River and any other rivers that may be assessed in the future is collected in a manner that will allow us to effectively evaluate the status of the fishery and assess how changes in fishing regulations, habitat and weather patters have influenced the fishery.

OBJECTIVES

1. Describe the methods one should follow when conducting snorkel surveys at established trend sites.

2. Compile existing historic data from past snorkel surveys conducted on the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River.

3. Clearly describe where the snorkel transects are located.

4. Estimate salmonid density and trends in abundance in snorkeling transects in the St. Joe and Coeur d'Alene rivers.

STUDY SITES

St. Joe River

Twenty-eight snorkel transect (SJ01-SJ28) were established in the St. Joe River during 1969 by selecting sites that were considered good cutthroat trout habitat (Rankel 1971). These transects spanned from Avery upstream to Ruby Creek, a distance of about 76 river km. Due to channel shifting and changes in stream habitat, two of the original transects (SJ24 and SJ25) were moved about 50-100 m downstream to reaches that had similar characteristics to what historically occurred upstream. Six additional transects (SJ29-SJ35) were added between Avery and Calder (39 km of river) during 1993 (Davis et al. 1996). These transects were selected based on fish holding capabilities, access, and permanence for future study. All combined, a total of 35 snorkel transects occur in the St. Joe River spanning a total of 115 km of river (Figure 8). Coordinates for the location of each of these transects are displayed in Appendix E and photographs (taken in 2002 or 2003) of each of the samples locations are displayed in our previous years report. These photos not only show a picture of the transects, but also depict where snorkeling should stop and end and the approximate length of stream that should be snorkeled.

Coeur d'Alene River

Thirty-eight snorkel transects in the Coeur d'Alene River system were initially established in 1973 by selecting sites that were considered good cutthroat trout habitat (Bowler 1974). Twenty-three of these transects were in the North Fork Coeur d'Alene River (85 river km), 10 were in the Little North Fork Coeur d'Alene River (36 river km) and five were in Tepee Creek (8 river km). Some of the transect locations have been changed over the years as the river has shifted positions and pools have filled in. Modified transect boundaries were selected based on closeness and similarity to original site, access, and permanence for future study. Transects that have changed locations from their original location in the Coeur d'Alene River basin include TP01, NF17, NF20 and NF23, LNF02, LNF04. During 2002, three additional transects (LNF10, LNF12 and LNF 13) were added into the Little North Fork Coeur d'Alene River in the catch-and-release area bringing the number of transects in this area to five. This was accomplished to better evaluate whether differences in fish densities occurred between the catch-and-release and harvest areas of the Little North Fork Coeur d'Alene River. Two temporary snorkel transects (REHAB1 & REHAB2) were established during 2002 in the

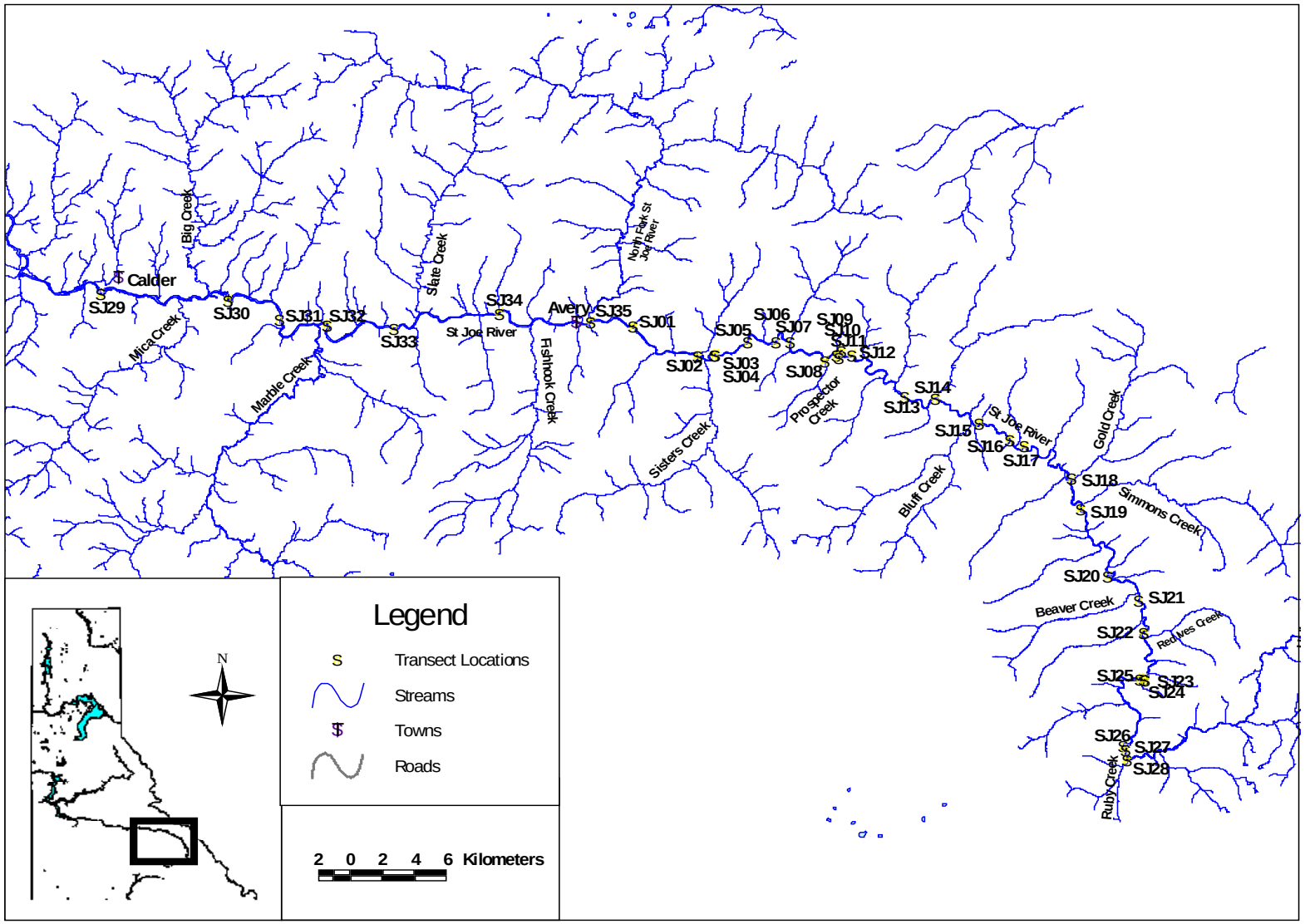


Figure 8. Location of transects snorkeled on the St. Joe River, Idaho, during August 12-14, 2003.

upstream portion of Tepee Creek where the US Forest Service had completed some extensive stream restoration in 2001. These sites were added to evaluate how fish densities respond to this restoration over time. This brings the total number of transects that snorkeled in the Coeur d'Alene basin during 2003 to 45 which spans about 138 km of river (Figure 9). Thirteen sites were on the Little North Fork Coeur d'Alene River; seven were on Tepee Creek and 23 on the North Fork Coeur d'Alene River. Coordinates for the location of each of these transects are displayed in Appendix I and photographs (taken in 2002 or 2003) of each of the samples locations are displayed in our previous year's report. These photos not only show a picture of the transects, but also depict where snorkeling should starft and end and the approximate length of stream that should be snorkeled. Photos of the original transects taken in 1973 can be viewed in previous year's reports, and provide a good comparison of if and how the sites have changed over the years.

The actual names of the Coeur d'Alene River transects have changed many times since 1973. By 2002, some river reaches had transect numbers that increased as you moved upstream whereas in other reaches the numbers increased as you moved downstream. Because of this confusion, the transect numbers were changed in 2003 so that they all increased from the mouth upstream. This is the same system transects are numbered in the St. Joe River and Little North Fork Clearwater River. Hopefully, this will eliminate confusion and prevent any changes in the numbering scheme in the future.

Little North Fork Clearwater River

The Little North Fork Clearwater River was not snorkeled in 2003; however, we have included documentation of where the snorkel transects occurred so that the site descriptions of all the snorkel transects in the Panhandle Region are included in one document. Thirty-five snorkel transects were initially established in the Little North Fork Clearwater River in 1997 by systematically selecting reaches at approximately 800 m intervals (Davis et al. 2000). During 2002, an additional 13 transects were added to better evaluate the bull trout population and the fishery in the more roaded section of the Little North Fork Clearwater River (upstream of Adair Creek). These 13 sites were selected based on what was considered good habitat for bull trout and cutthroat trout. The total number of transects that were snorkeled during 2002 was 48 and covered 36 km of river (Figure 10). The actual transect numbers were changed in 2002 so that a similar numbering scheme (increase as you move upstream) was used as occurs in the St. Joe River and Coeur d'Alene River. Coordinates for the location of each of these transects are displayed in Appendix I.

METHODS

Field Work

The methods described below were used during 2003 to evaluate trends in fish abundance in the St. Joe River and Coeur d'Alene River. We suggest these techniques be followed when conducting snorkel surveys on any river or large stream in the Panhandle Region to ensure data is collected in a consistent comparable manner. This consistency is important if we wish to effectively evaluate the status of the fishery and how changes in fishing regulations, habitat and weather patterns have influenced it.

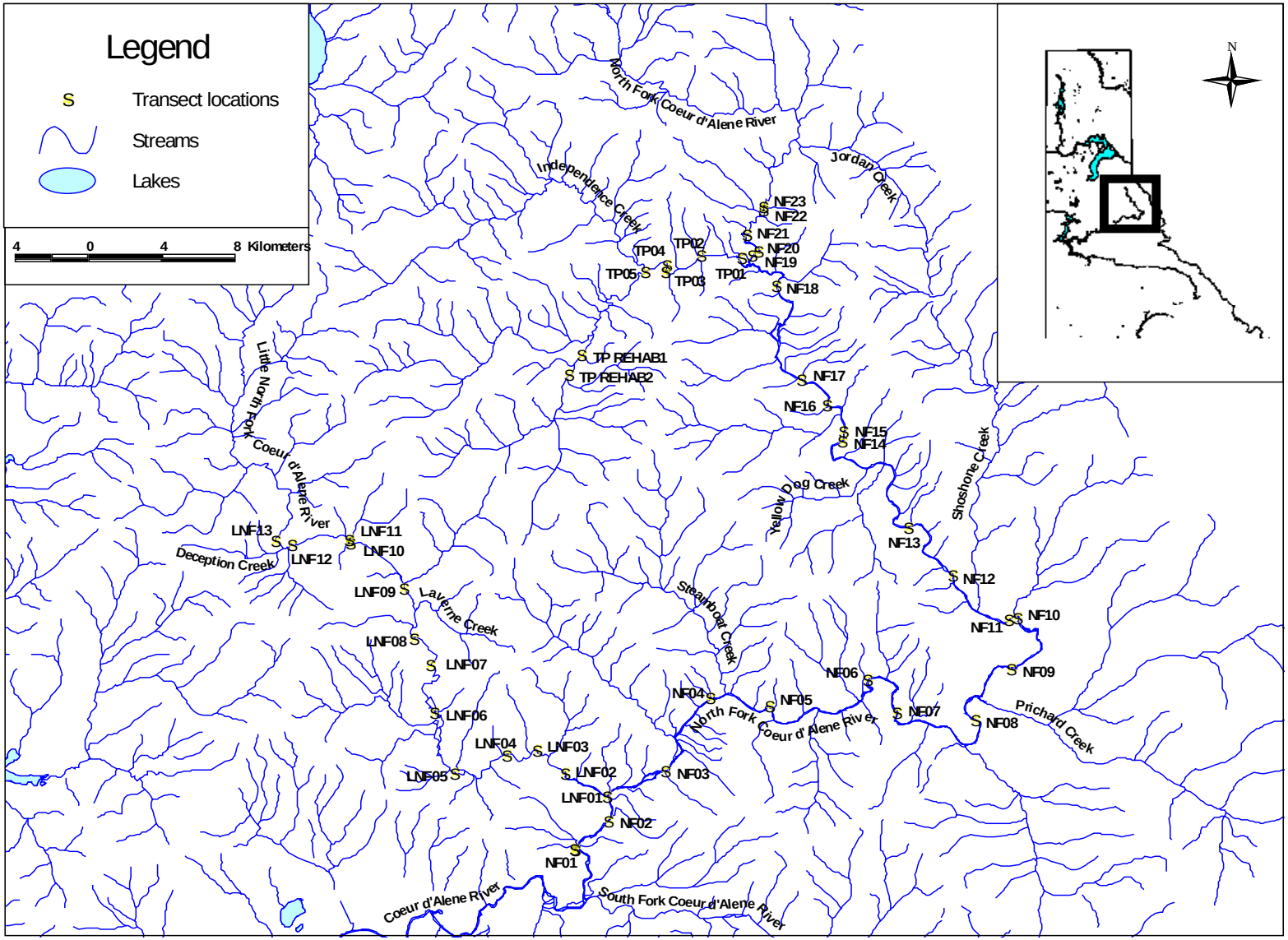


Figure 9. Location of transects snorkeled on the Coeur d'Alene River, Idaho, during August 5-7, 2003.

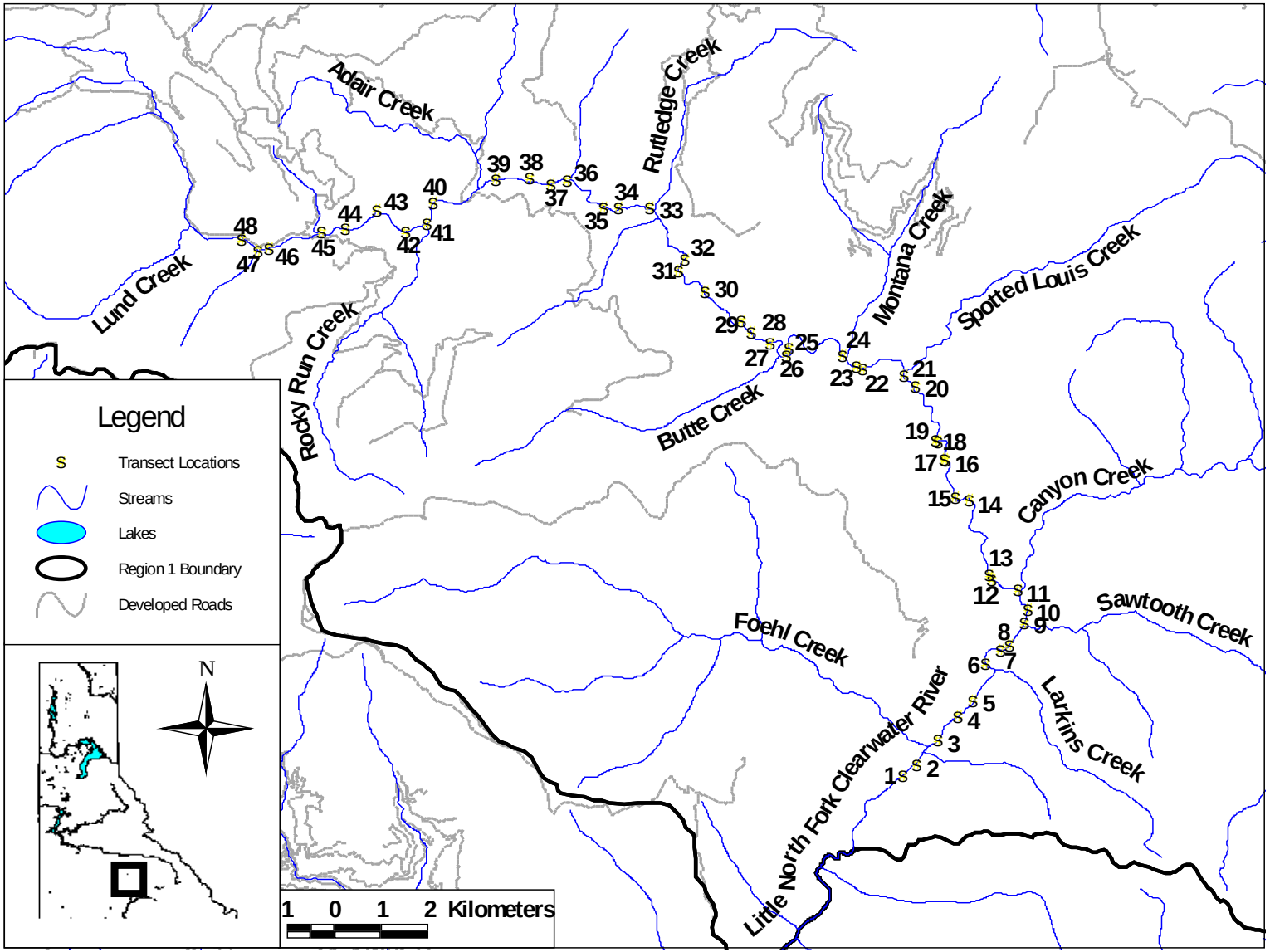


Figure 10. Location of transects snorkeled in the Little North Fork Clearwater River, Idaho, on August 19-22, 2002.

The snorkel technique used at each transect was based on sightability and transect width. Our intent was to be reasonably certain that all fish in the transect were visible to the divers and few or no fish were overlooked. In the wider transects or in more turbid water, where one diver could not easily see fish across the river, two divers were used, one on each side of the river. Divers began at the upstream end of the transect and snorkeled downstream, as the size of the rivers generally precluded upstream counts. When snorkeling in pairs we tried to remain even with each other and the snorkeler counted only those fish that passed. This prevent double counting of fish that often spook out in front of one snorkeler and then swim past the other. In areas where pocket water was the dominant habitat or shallow turbulent water limited visibility, transects were snorkeled upstream. In these habitats, the snorkeler often moves too fast through the reach to make accurate counts. In addition, when the stream channel was < 10 m in width, the transect was snorkeled upstream. Often when snorkeling narrow channels fish will spook downstream leading to low counts. Where woody debris or boulders were common, the snorkeler would often have to swim around them to ensure all fish were counted. We periodically duplicated counts using different divers to check for accuracy. If noticeable differences occurred in fish counts or length estimates between snorkelers, discussions as to why this happened were made and then the transect was re-snorkeled.

When snorkeling in fairly calm water, we have found that it is best to remain fairly motionless and near the surface. Too much motion can spook fish downstream, even out of the survey area. Snorkeling near the stream edge or away from where most of the fish are holding can also significantly reduce spooking fish downstream. It's also important to snorkel to the very end of the transect, which typically should be the tail-out of a pool, glide or run. We have often observed large numbers of fish moving downstream in-front of snorkelers until they reach the end of the transect (tail-out). At this point, fish will often swim back upstream past the snorkelers to access deeper water. If the snorkeler did not swim to the end of the reach, these fish would remain at the end of the transect and go uncounted. For this reason, no transect should end in the middle of a pool, run or glide.

Estimates of fish abundance were limited to age 1+ fish (>75 mm), as summer counts for young of the year fishes are typically unreliable. Most YOY cutthroat trout will be smaller than 80 mm during surveys in July and occupy the shallow stream margins where snorkeling is less effective (Thurow 1994). All observed fish were recorded for each transect by species in 75 mm length groups. Prior to snorkeling each observer practiced guessing the lengths of objects (pipes, imitation fish, rocks etc.) to ensure accurate estimates of fishes' lengths were made. Throughout the snorkel surveys we periodically held these practice sessions to maintain our accuracy.

After completing fish counts, we measured the length and width of each transect with a rangefinder to determine the surface area (m^2) surveyed. At least four width measurements should be taken to get an average stream width of the transect surveyed. Do not rely on lengths and widths collected from previous surveys as stream channels and flow will change from year to year and we do not always snorkel the exact same reach. Characteristics of the transects were also recorded at each site. This type of information could help explain why changes in counts occur over time. Transect characteristics collected included: habitat type, maximum depth, amount and type of available cover and water temperature (see appendix F for data sheets we used).

In an effort to accurately locate and duplicate snorkel surveys in the future, transect locations were recorded as waypoints using a Global Positioning System (Garmin GPSmap76S). In addition, photographs of each site were taken with permanent landmarks in

the photo including starting and ending points of each transect. Prior to conducting the snorkel surveys, the most up-to-date coordinates should be downloaded into a GPS unit and used to navigate to the site. Once near the transect, the most recent photos should be used to locate the exact starting and stopping points to snorkel.

Periodically, channel shifting, bedload movement, and/or blow outs will alter a site so that it does not represent the original transect (changed from a pool to a riffle) or it does not occur anymore (dry channel). Many of the transects were originally selected because they represented good habitat for particular fish species (cutthroat trout and/or bull trout). When a transect changes drastically from what it once was, continuing to conduct counts at this site may lead to low density estimates, which could lead to false assumptions about the fishery. Consequently, when a transect changes substantially so that it does not represent its original characteristics, a new transect should be selected. Old photographs and habitat descriptions should be evaluated before a decision to move the transect is made. New transects should be selected based on the following conditions, which are listed in their order of importance: 1) closeness to original transect, 2) similarity to original site, 3) access (avoid posted private property), and 4) permanence for future study (avoid areas where the channel appears to be shifting constantly).

The St. Joe River and Coeur d'Alene River should be evaluated almost every year because of their popularity to fishermen, and intense land management activities in the watersheds. The Little North Fork Clearwater River should be surveyed every 3-5 years. The combination of its remote location, low fishing pressure and moderate amount of land management makes it less critical to monitor the Little North Fork Clearwater River on an annual basis. In the future, we may want to add new rivers to this list (e.g. Moyie River) so that we can assess the status of the fishery on a regular basis and increase our understanding of how changes in fishing regulations, habitat and weather patterns have influenced it. If snorkel trend sites are added to a new river, similar protocols should be followed as listed above.

The Coeur d'Alene River should be snorkeled about the first week in August, the St. Joe River the second week in August and the Little North Fork Clearwater River the third week in August. These are the same dates these sites were originally surveyed, and completing these surveys on or near the same dates will help ensure the data is more comparable between the years.

Data Analysis

Fish counts for each transect were converted to density (fish/100 m^2) to standardize the data and make it possible to compare counts within the watershed as well as to other watersheds. Average densities of each salmonid species (all sizes) and for cutthroat trout ≥ 300 mm were calculated for the entire St. Joe River and Coeur d'Alene River as well as for different stream reaches within each watershed (roadless vs. roaded, catch-and-release vs. limited harvest, upstream vs. downstream etc). These averages were calculated by summing the total number of fish counted in a particular reach or stream and dividing it by the total area snorkeled. It is important to note that this is not the same as calculating an average from the density recorded at each snorkel transect within a particular reach or stream. The densities of these fishes were added to the long-term data set to evaluate their trends in abundance (see Appendices H and I for historic data). This was accomplished by graphing the average fish density over time. Attempts were made to assess why trends were occurring by evaluating when changes in fishing regulations, known climatic events (floods, droughts etc), habitat improvement projects and factors causing habitat degradation occurred.

From 1970 to 1990 the average stream width and length of each transect snorkeled in the St. Joe River was not recorded. During these years, attempts were made to snorkel the exact same reaches as were set up in 1969. For this reason, the same area that was snorkeled in 1969 was also used for calculating fish densities from 1970 to 1990.

To evaluate whether densities of cutthroat trout differed between the different stream reaches in the St. Joe River and Coeur d'Alene River we conducted an analysis of variance (ANOVA) on the density of fish in each of the transect sites. We used a p-value ≤ 0.10 to denote when a significant difference in density occurred between stream reaches. This value is often used to show significance when evaluating fish and wildlife populations for management purposes (Peterman 1990; Johnson 1999; Anderson et al. 2000). When an ANOVA showed that a significant difference ($p \leq 0.10$) in cutthroat trout density occurred between the stream reaches we used Fisher's Least-Significance-Difference Test to evaluate which stream reaches differed significantly. Fisher's Least-Significance-Difference Test was chosen for this analysis as this test tends to maximize the power, which increases that ability to show statistically significant differences with low sample sizes (Milliken and Johnson 1992).

RESULTS

St. Joe River

Thirty-five transects were snorkeled in the St. Joe River from August 12-14, 2003. A total of 831 cutthroat trout, 13 rainbow trout *Oncorhynchus mykiss*, zero bull trout *Salvelinus confluentus* and 1,352 mountain whitefish *Prosopium williamsoni* were counted (Table 1). Cutthroat trout were observed in all but two of the 35 St. Joe River snorkel sites. Densities of cutthroat trout (all size classes) at these transects ranged from 0.00 to 6.39 fish/100 m^2 with an overall average of 0.90 fish/100 m^2 (Table 1 and Table 2). About 15 percent of the cutthroat trout observed were estimated to be ≥ 300 mm in length and their overall density was calculated to be 0.13 fish/100 m^2 (Table 1 and Table 3).

Analysis of variance (ANOVA) testing indicated that the density of cutthroat trout is not uniform throughout the St. Joe River (p value = 0.003). The highest average density of cutthroat trout (all sizes) was observed in the reach between Prospector Creek and Red Ives Creek (Table 2 and Figure 11). Fisher's LSD test (Table 4) showed that there were significantly higher densities of cutthroat trout between Prospector Creek and Red Ives Creek than any of the downstream reaches (Calder to N.F. St. Joe and N.F. St. Joe to Prospector Creek). The stream reach between Calder and the N.F. St. Joe had the lowest mean density of cutthroat trout. This stream reach has the warmest water temperature and is the only stream reach were harvest of cutthroat trout is allowed. When we only evaluated cutthroat trout ≥ 300 mm, ANOVA testing indicated their densities do not significantly differ (p value = 0.450) between the four reaches surveyed. Despite this analysis, average densities of cutthroat trout ≥ 300 mm appeared to increase as we moved upstream (Figure 11). Wide confidence intervals prevented us from showing any significant difference occurred between the reaches (Figure 11).

Since 1969, transects in the St. Joe River have been snorkeled from the N.F. St. Joe River to Ruby Creek. Plotting the average density of cutthroat trout in this reach of river shows how cutthroat trout abundance has changed over the years in response to changes in fishing regulations, extreme climatic events and fish stocking. The first year these transects were snorkeled in 1969 was when the lowest density of cutthroat trout (all sizes) was observed (0.27 fish/100 m^2). In 1971, the observed density of cutthroat trout (all sizes) increased to 0.52 fish/100 m^2 (Figure 12). This increase coincides with a change in fishing regulations from a 15

Table 1. Number and density (fish/100 m^2) of fish observed while snorkeling transects in the St. Joe River, Idaho, during August 12-14, 2003. Calder to North Fork St. Joe River is the only area outside of the catch-and-release regulation zone as of 2000.

Reach	Transect Number	Habitat Type	Length (m)	Average Width (m)	Area (m2)	Cutthroat trout Numbers Counted <300mm	Cutthroat trout Numbers Counted ≥300mm	Cutthroat trout Numbers Counted All sizes	Cutthroat trout Density (No./100 m^2)	Rainbow Trout Counted	Bull Trout Counted	Whitefish Counted	Whitefish Density (No./100 m^2)
Calder to North. Fork St. Joe River	SJ29	Run	220	31.80	6,996	2	0	2	0.03	2	0	25	0.36
	SJ30	Pool	270	38.80	10,476	0	0	0	0.00	0	0	10	0.10
	SJ31	Pool	210	33.00	6,930	5	0	5	0.07	0	0	38	0.55
	SJ32	Run	180	31.50	5,670	3	0	3	0.05	2	0	65	1.15
	SJ33	Run	118	45.40	5,357	0	0	0	0.00	0	0	3	0.06
	SJ34	Run	90	22.83	2,055	3	2	5	0.24	0	0	84	4.09
	SJ35	Run	80	33.17	2,653	20	8	28	1.06	9	0	96	3.62
N.F. St. Joe River to Prospector Creek.	SJ01	Run	110	41.00	4,510	13	5	18	0.40	0	0	8	0.18
	SJ02	Pool	95	21.60	2,052	27	4	31	1.51	0	0	350	17.06
	SJ03	Pool	80	13.50	1,080	20	3	23	2.13	0	0	19	1.76
	SJ04	Pool	75	13.60	1,020	13	0	13	1.27	0	0	15	1.47
	SJ05	Run	155	26.17	4,056	22	8	30	0.74	0	0	18	0.44
	SJ06	Pool	148	30.20	4,470	20	6	26	0.58	0	0	32	0.72
	SJ07	Pool	110	26.40	2,904	11	9	20	0.69	0	0	36	1.24
Prospector Creek. To Red Ives Creek	SJ08	Pool	180	18.60	3,348	27	9	36	1.08	0	0	102	3.05
	SJ09	Pool	80	23.40	1,872	18	0	18	0.96	0	0	2	0.11
	SJ10	Pool	160	23.43	3,749	45	3	48	1.28	0	0	12	0.32
	SJ11	Pool	55	23.20	1,276	17	3	20	1.57	0	0	14	1.10
	SJ12	Pool	100	17.20	1,720	42	4	46	2.67	0	0	39	2.27
	SJ13	Run	110	24.00	2,640	38	1	39	1.48	0	0	37	1.40
	SJ14	Pool	95	19.60	1,862	52	4	56	3.01	0	0	101	5.42
	SJ15	Run	102	14.20	1,448	29	1	30	2.07	0	0	3	0.21
	SJ16	Pool	90	11.50	1,035	38	0	38	3.67	0	0	7	0.68
	SJ17	Pool	146	16.17	2,360	55	1	56	2.37	0	0	15	0.64
	SJ18	Pool	50	16.60	830	42	3	45	5.42	0	0	50	6.02
	SJ19	Run	40	16.80	672	9	0	9	1.34	0	0	0	0.00
	SJ20	Pool	60	17.00	1,020	14	4	18	1.76	0	0	3	0.29
	SJ21	Pool	36	17.40	626	26	14	40	6.39	0	0	60	9.58
	SJ22	Pool	57	25.20	1,436	17	4	21	1.46	0	0	40	2.78
Red Ives Creek to Ruby Creek	SJ23	Run	40	13.80	552	18	1	19	3.44	0	0	0	0.00
	SJ24	Run	70	18.33	1,283	16	7	23	1.79	0	0	10	0.78
	SJ25	Run	60	17.6	1,056	26	11	37	3.50	0	0	8	0.76
	SJ26	Run	80	20.00	1,600	6	3	9	0.56	0	0	0	0.00
	SJ27	Pool	54	18.50	999	13	2	15	1.50	0	0	50	5.01
	SJ28	Run	50	12.00	600	3	1	4	0.67	0	0	0	0.00
Total	35 Sites	--	3,656	--	92,214	710	121	831	0.90	13	0	1,352	1.47

Table 2. Average density (fish/100 m^2) of all sizes of cutthroat trout counted by reach during snorkel evaluations from 1969 to 2003 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
Calder to North Fork St. Joe	--	--	--	--	--	--	--	--	--	--	--	--
N.F. St. Joe to Prospector Cr.	0.01	0.00	0.07	0.04	0.01	0.11	0.08	--	0.04[b]	0.08	0.12	0.03
Prospector Cr. to Red Ives Cr.	0.25	0.31	0.58	0.59	0.76	1.40	1.53	3.59[a]	1.72	1.63	1.50	2.93
Red Ives Cr. to Ruby Cr.	1.38	1.39	2.07	2.63	2.55	5.01	6.12	1.89	4.62	3.14	1.46	3.31
All transects - entire river	--	--	--	--	--	--	--	--	--	--	--	--
Avery to Ruby Creek	0.27	0.29	0.52	0.58	0.63	1.23	1.40	3.10[a]	1.60[b]	1.11	0.88	1.68

Reach	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
Calder to North Fork St. Joe			0.07	0.23	0.16	0.14	0.15	0.09	--	0.22[c]	0.11	0.11
N.F. St. Joe to Prospector Cr.	0.18	0.22	0.47	0.33	0.79	0.33	0.18	0.12	0.46	0.52	0.52	0.80
Prospector Cr. to Red Ives Cr.	2.44	2.79	2.13	1.66	2.56	2.42	2.79	1.05	1.11	1.38	1.46	2.01
Red Ives Cr. to Ruby Cr.	2.41	4.05	1.17	1.39	2.58	2.57	1.13	1.44	1.06	1.19	0.93	1.76
All transects - entire river	--	--	0.79	0.76	1.19	1.06	1.09	0.50	--	0.80[c]	0.64	0.90
Avery to Ruby Creek	1.43	1.82	1.30	1.18	1.99	1.77	1.74	0.79	0.88	1.02	1.00	1.51

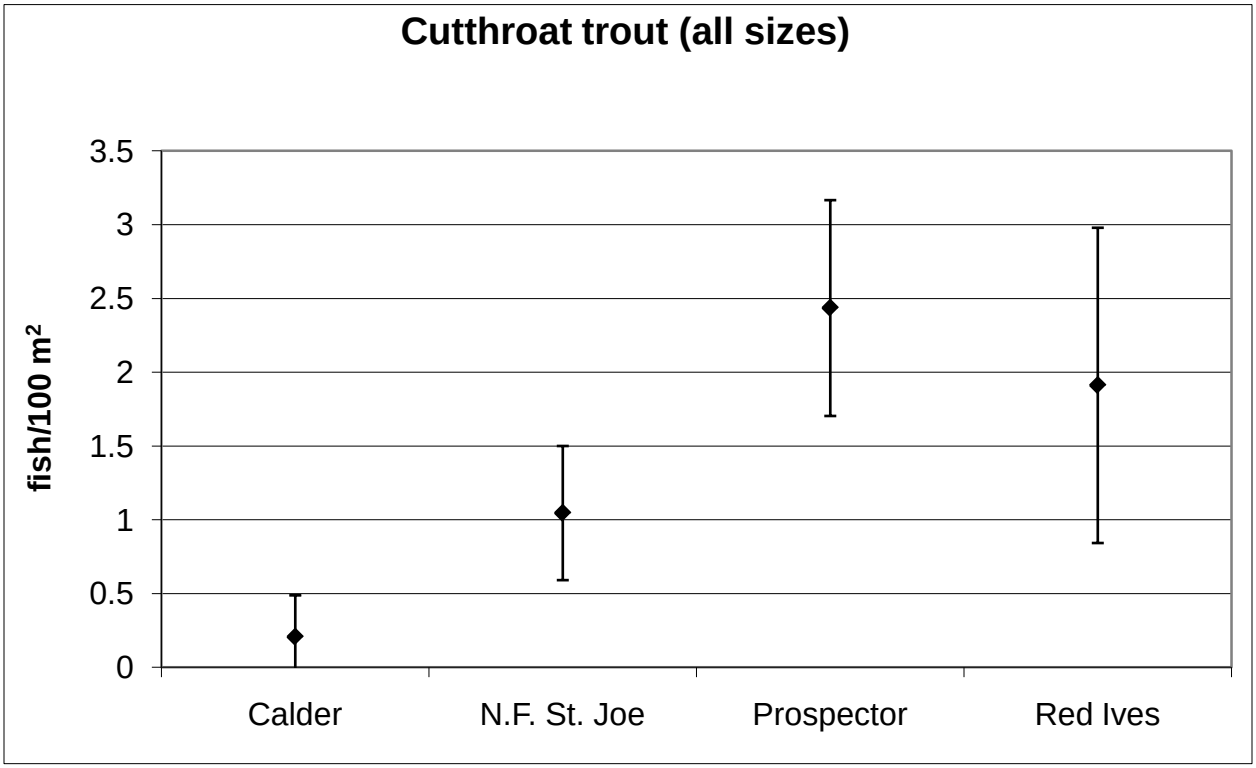
[a] Transects SJ01-SJ12 were not snorkeled.
[b] Transects SJ01-SJ04 were not snorkeled.
[c] Transect locations differed this year from other years.

Table 3. Average density (fish/100 m^2) of cutthroat trout ≥ 300 mm counted by reach during snorkel evaluations from 1969 to 2003 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
Calder to North Fork St. Joe	--	--	--	--	--	--	--	--	--	--	--	--
N.F. St. Joe to Prospector Cr.	0.01	0.00	0.00	0.00	0.00	0.00	0.00	--	0.00[b]	0.00	0.01	0.00
Prospector Cr. to Red Ives Cr.	0.02	0.02	0.02	0.00	0.10	0.00	0.00	0.00[a]	0.00	0.07	0.12	0.23
Red Ives Cr. to Ruby Cr.	0.12	0.11	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.17	0.47	0.40
All transects - entire river	--	--	--	--	--	--	--	--	--	--	--	--
Avery to Ruby Creek	0.03	0.02	0.01	0.00	0.06	0.00	0.00	0.00[a]	0.00[b]	0.05	0.11	0.15

Reach	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
Calder to North Fork St. Joe	--	--	0.02	0.05	0.02	0.03	0.00	0.01	--	0.02[c]	0.00	0.02
N.F. St. Joe to Prospector Cr.	0.02	0.09	0.08	0.02	0.05	0.07	0.01	0.01	0.12	0.04	0.07	0.17
Prospector Cr. to Red Ives Cr.	0.44	0.95	0.69	0.46	0.40	0.56	0.16	0.08	0.24	0.20	0.30	0.20
Red Ives Cr. to Ruby Cr.	0.81	0.88	0.72	0.47	0.70	0.76	0.13	0.26	0.18	0.11	0.24	0.41
All transects - entire river	--	--	0.26	0.20	0.19	0.25	0.06	0.05	--	0.10[c]	0.12	0.13
Avery to Ruby Creek	0.30	0.57	0.43	0.31	0.33	0.43	0.11	0.08	0.19	0.13	0.19	0.21

[a] Transects SJ01-SJ12 were not snorkeled.
[b] Transects SJ01-SJ04 were not snorkeled.
[c] Transect locations differed this year from other years.



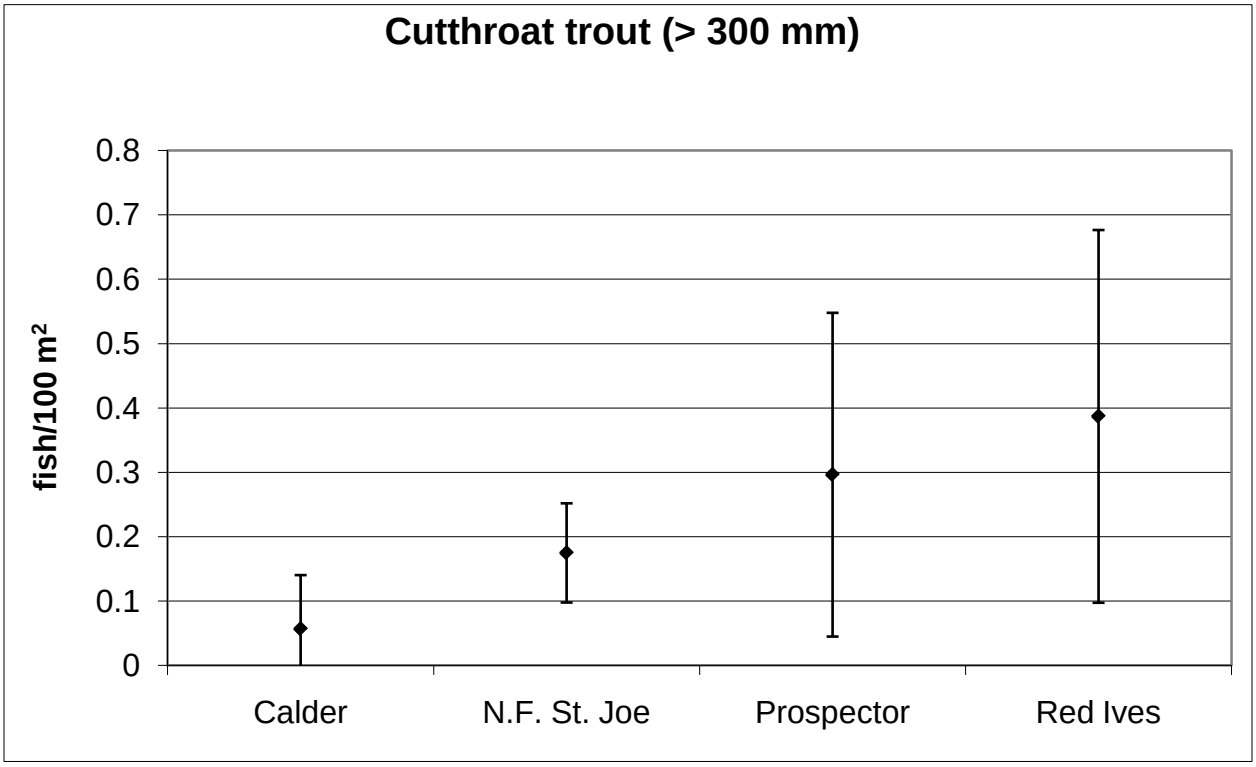


Figure 11. The average cutthroat trout density and 90% confidence intervals (all sizes and only those ≥ 300 mm) determined from snorkeling four different reaches in the St. Joe River, Idaho, during 2003.

Table 4. Fishers Least-Significance-Difference Test matrix of pairwise comparison probabilities of cutthroat trout densities between four stream reaches in the St. Joe River, Idaho during 2003. Shaded cells indicate which stream reaches had significantly different ($p \leq 0.10$) cutthroat trout densities.

	Calder.	N.F. St. Joe	Prospector	Red Ives
Calder	1.000			
N.F. St. Joe	0.216	1.000		
Prospector	0.000	0.020	1.000	
Red Ives	0.019	0.220	0.388	1.000

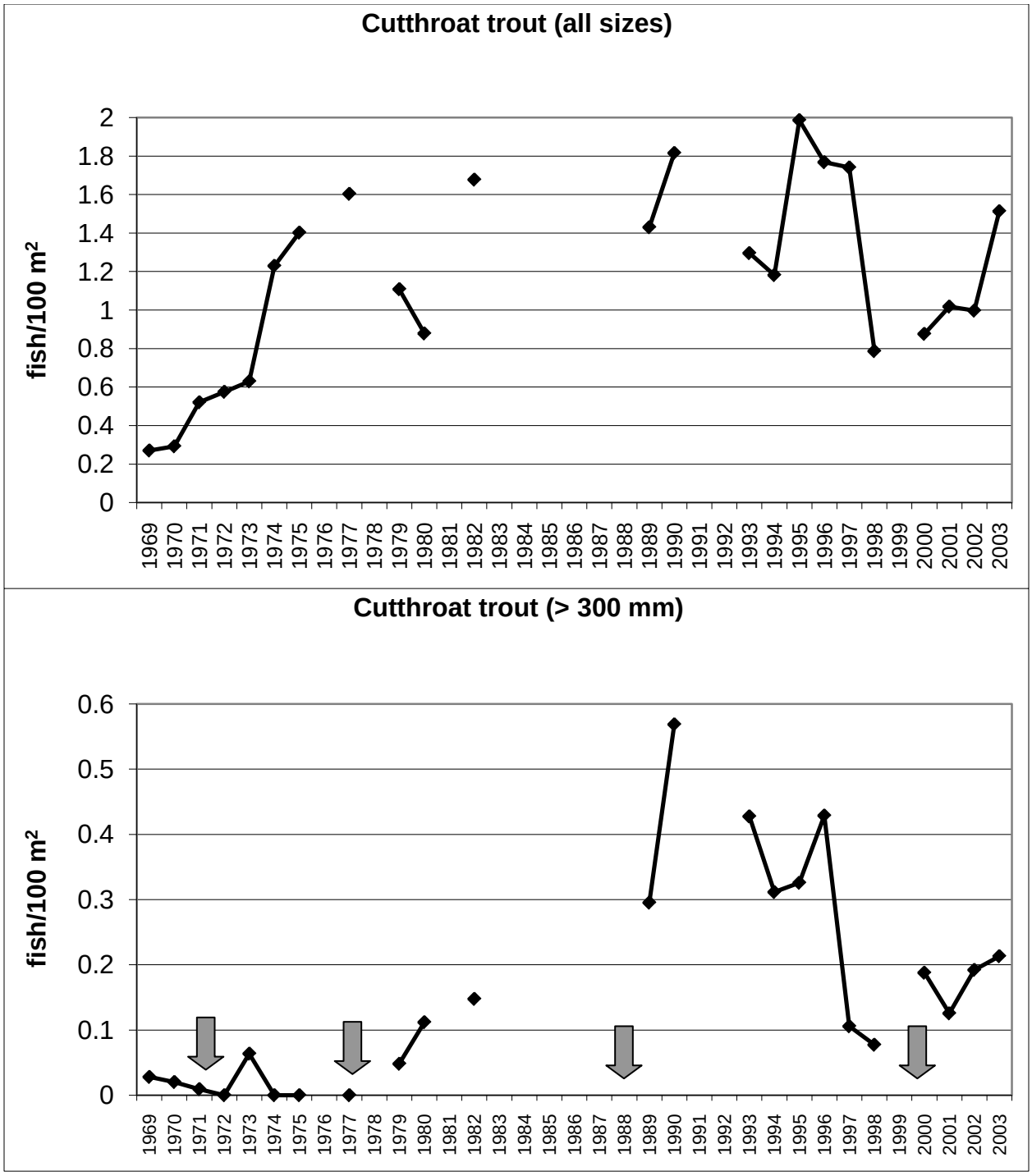


Figure 12. The average density (fish/100 m^2) of all size classes of cutthroat trout and cutthroat trout ≥ 300 mm observed while snorkeling the St. Joe River, Idaho, between the North Fork St. Joe River and Ruby Creek from 1969 to 2003. Arrows signify when significant changes occurred in the cutthroat trout fishing regulations. Refer to Table 5 to see how the regulations changed on these particular dates.

Table 5. History of fishing regulations for cutthroat trout in the St. Joe River and Coeur d'Alene River, Idaho.

St. Joe River			
Year	CdA Lake to N.F. St Joe	N.F. St. Joe to Prospector Cr.	Prospector Cr. to headwaters
1941-1945	15 lbs plus 1 fish - not to exceed 25 fish		
1946-1950	10 lbs plus 1 fish - not to exceed 20 fish		
1951-1954	7 lbs plus 1 fish - not to exceed 20 fish		
1955-1970	7 lbs plus 1 fish - not to exceed 15 fish		
1971	7 lbs plus 1 fish - not to exceed 15 fish		3 fish, none < 13 inches
1972-1975	7 lbs plus 1 fish - not to exceed 10 fish		3 fish, none < 13 inches
1976	10 fish, only 5 > 12 inches and 2 > 18 inches		3 fish, none < 13 inches
1977-1987	6 fish, only 2 > 16 inches		3 fish, none < 13 inches
1988-1999	1 fish, none < 14 inches		Catch-and-release
2000-2004	2 fish, none between 8"-16"	Catch-and-release	

Coeur d'Alene River			
Year	CdA Lake to Yellow Dog Creek	Yellow Dog Creek to headwaters	Laverne Creek to headwaters (LNFCdA)
1941-1945	15 lbs plus 1 fish - not to exceed 25 fish		
1946-1950	10 lbs plus 1 fish - not to exceed 20 fish		
1951-1954	7 lbs plus 1 fish - not to exceed 20 fish		
1955-1971	7 lbs plus 1 fish - not to exceed 15 fish		
1972-1974	7 lbs plus 1 fish - not to exceed 10 fish		
1975	7 lbs plus 1 fish - not to exceed 10 fish	3 fish, none < 13 inches	
1976	10 fish, only 5 > 12 inches & 2 > 18 inches	3 fish, none < 13 inches	
1977-1985	6 fish, only 2 > 16 inches	3 fish, none < 13 inches	
1986-1987	6 fish, only 2 > 16 inches	Catch-and-release	3 fish, none < 13 inches
1988-1999	1 fish, none < 14 inches	Catch-and-release	
2000-2004	2 fish, none between 8"-16"	Catch-and-release	

fish limit for the entire river to where only 3 fish ≥ 13 inches could be kept each day upstream of Prospector Creek (Table 5). From 1971 to 1977 the density of cutthroat trout (all sizes) continued to increase to the point where densities in 1977 (1.60 fish/100 m^2) were about six times higher that what was observed in 1969 (Table 2 and Figure 5). Snorkel surveys from 1979 to 1997 showed that cutthroat trout densities (all sizes) remained near these densities until 1997. This same trend was not observed when we evaluated only those cutthroat trout ≥ 300 mm in length. From 1969 to 1977 the density of cutthroat trout ≥ 300 mm declined to the point that none were counted between 1974 and 1977 (Table 3 and Figure 5). Increases in the densities of cutthroat trout ≥ 300 mm in length were first observed in 1979. This increase in density occurred two years after a significant change in fishing regulations in 1977 (changed from 10 fish to six fish harvest downstream of Prospector Creek). By 1982, the density of cutthroat trout ≥ 300 mm had increased to 0.15 fish/100 m^2 and they represented about 9% of all cutthroat trout (Table 5 and Figure 5). A noticeable increase in densities of cutthroat trout ≥ 300 mm were observed again after 1988 when fishing regulations changed so that upstream of Prospector Creek all cutthroat trout had to be released and downstream of Prospector Creek only 1 fish over 14 inches could be harvested each day (Table 5 and Figure 5). By 1990 about 31% of the cutthroat trout were ≥ 300 mm. Densities of cutthroat trout ≥ 300 mm remained near this level until 1997.

A sharp decline in cutthroat trout density (all sizes and ≥ 300 mm) was observed in 1997 and in 1998 (Figure 5). No changes in fishing regulations occurred around this time. However, during February 1996 the second highest peak flow event since 1950 occurred and was followed in 1997 by the second highest mean annual flow year since 1950 (Figure 6). Following this decline, cutthroat trout densities have increased steadily. The 2003 cutthroat trout density (all sizes) now is approaching some of the higher densities ever observed on the St. Joe River (Table 2 and Figure 5). Cutthroat trout ≥ 300 mm have not seen this dramatic of an increase, but their densities have steadily increased (Table 3 and Figure 5).

Mountain whitefish were counted in 31 of the 35 transects snorkeled during 2003 and were the most numerous fish observed (Table 1). The overall mean density of mountain whitefish we observed (1.47 fish/100 m^2) was the second highest recorded since 1969 (Table 6 and Figure 6). The highest density of mountain whitefish (2.39 fish/100 m^2) was observed in the reach between the North Fork St. Joe River and Prospector Creek (Table 4). This is the third year in a row mountain whitefish densities have increased since the large decline that occurred after 1996 (Table 6 and Figure 7).

All 13 rainbow trout counted during 2003, were observed downstream of the North Fork St. Joe River where this species had been stocked in the past (Table 1). Rainbow trout densities have steadily declined since 1969 (Table 7 and Figure 7) and correlate closely to the number of fish stocked on an annual basis (Figure 8).

The year 2003 was the first year no bull trout were counted in snorkel transects since 1989. The numbers of bull trout counted have shown a declining trend since 1973 although none were observed in 1969 and 1970 (Figure 9).

Table 6. Average density (fish/100 m^2) of mountain whitefish counted by reach during snorkel surveys from 1969 to 2003 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
Calder to N.F. St Joe River	--	--	--	--	--	--	--	--	--	--	--	--
NF St Joe to Prospector Cr.	0.86	0.90	0.98	0.24	1.09	0.95	1.08	--[a]	--[b]	1.09	0.77	--[d]
Prospector Cr. to Red Ives Cr.	1.24	1.16	1.12	0.82	3.72	1.33	0.97	0.71[a]	0.23[c]	1.69	1.20	--[d]
Red Ives Cr. to Ruby Cr.	1.83	1.32	1.89	2.26	1.39	2.28	2.45	1.14	1.56	2.79	1.27	0.94[d]
Average for all sites	--	--	--	--	--	--	--	--	--	--	--	--
NF St Joe to Ruby Creek	1.14	1.06	1.14	0.73	2.29	1.27	1.19	0.84[a]	0.34[b,c]	1.54	1.01	0.11[d]

Reach	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
Calder to N.F. St Joe River	--	--	0.60	0.18	0.34	0.88	0.44	0.10	--	1.25[e]	0.33	0.80
NF St Joe to Prospector Cr.	0.70	1.13	0.40	2.12	1.29	1.03	0.27	1.39	0.51	0.33	0.75	2.38
Prospector Cr. to Red Ives Cr.	2.17	2.01	2.11	0.65	1.67	1.02	0.47	0.80	0.55	1.22	1.22	1.87
Red Ives Cr. to Ruby Cr.	1.32	2.22	0.66	1.03	1.73	1.60	0.35	0.38	0.47	0.56	0.37	1.12
Average for all sites	--	--	0.95	0.75	1.03	1.01	0.41	0.60	--	0.92[e]	0.68	1.47
NF St Joe to Ruby Creek	1.42	1.65	1.20	1.19	1.56	1.11	0.39	0.94	0.53	0.79	0.92	1.98

[a] Transects SJ01-SJ12 were not snorkeled.
[b] Transects SJ01-SJ04 were not snorkeled.
[c] Transects SJ05-SJ16 were only evaluated for presence/absence.
[d] Transects SJ01-SJ25 were only evaluated for presence/absence.
[e] Transect locations differed this year from other years.

Table 7. Average density (fish/100 m^2) of rainbow trout counted by reach during snorkel evaluations from 1969 to 2003 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
Calder to N.F. St Joe River	--	--	--	--	--	--	--	--	--	--	--	--
NF St Joe to Prospector Cr.	0.07	0.13	0.25	0.25	0.16	0.44	0.86	--[a]	0.01[b]	0.14	0.10	0.18
Prospector Cr. to Red Ives Cr.	0.25	0.94	0.82	0.05	0.09	0.18	0.47	0.00[a]	0.04	0.04	0.27	0.01
Red Ives Cr. to Ruby Cr.	0.11	0.41	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average for all sites	--	--	--	--	--	--	--	--	--	--	--	--
NF St Joe to Ruby Creek	0.16	0.52	0.48	0.14	0.11	0.27	0.59	0.00[a]	0.02[b]	0.08	0.16	0.09

Reach	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
Calder to N.F. St Joe River	--	--	0.14	0.10	0.21	0.20	0.03	0.15	--	0.23[c]	0.04	0.03
NF St Joe to Prospector Cr.	0.28	0.43	0.15	0.10	0.07	0.37	0.06	0.46	0.00	0.00	0.01	0.00
Prospector Cr. to Red Ives Cr.	0.00	0.10	0.01	0.05	0.01	0.03	0.00	0.05	0.00	0.00	0.00	0.00
Red Ives Cr. to Ruby Cr.	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average for all sites	--	--	0.10	0.08	0.11	0.17	0.02	0.16	0.00	0.06[c]	0.02	0.01
NF St Joe to Ruby Creek	0.12	0.23	0.07	0.06	0.03	0.14	0.02	0.17	0.00	0.00	0.00	0.00

[a] Transects SJ01-SJ12 were not snorkeled.
[b] Transects SJ01-SJ04 were not snorkeled.
[c] Transect locations differed this year from other years.

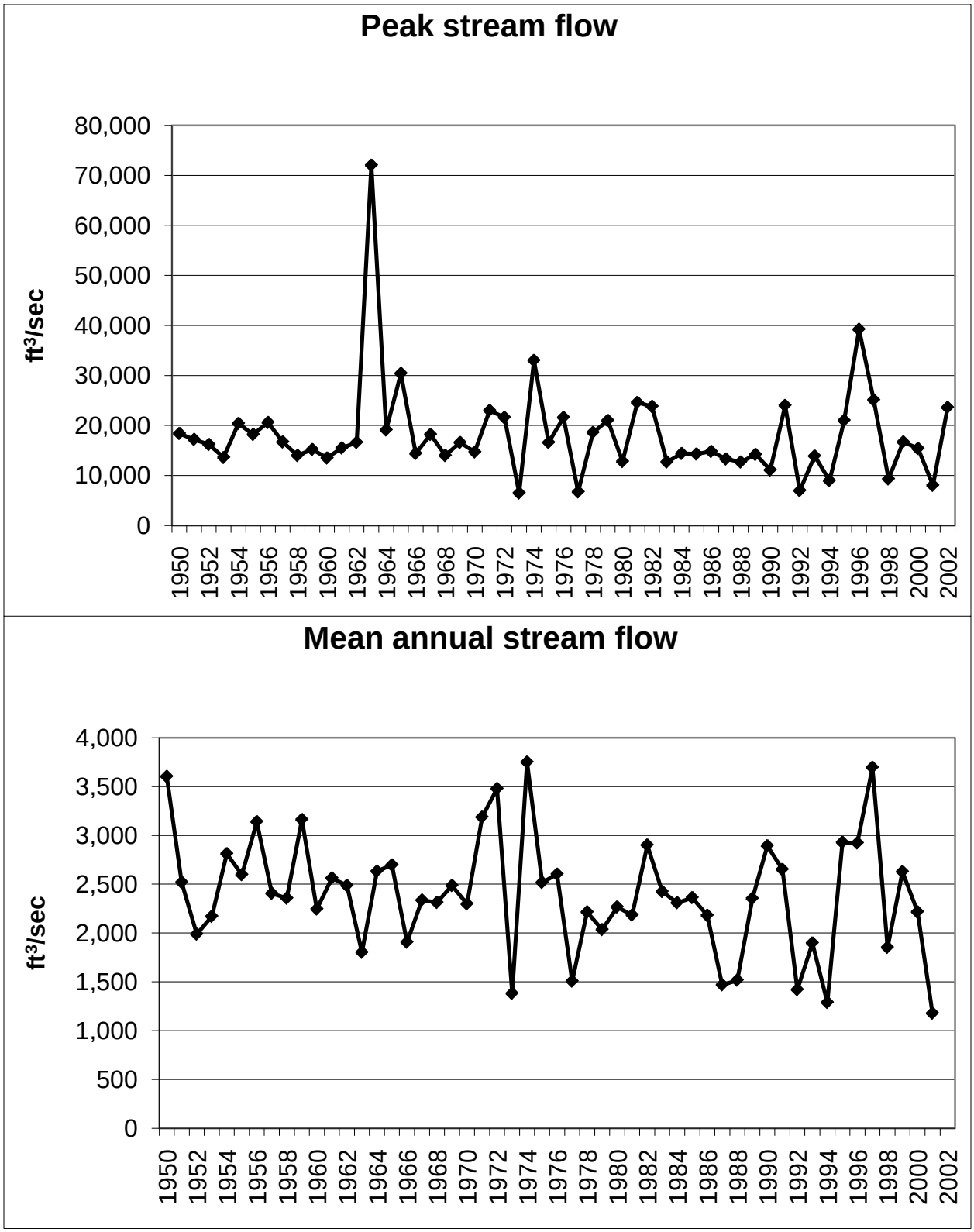


Figure 13. The peak stream flow and mean annual stream flow documented by USGS for the St. Joe River, Idaho, at Calder from 1950 to 2002.

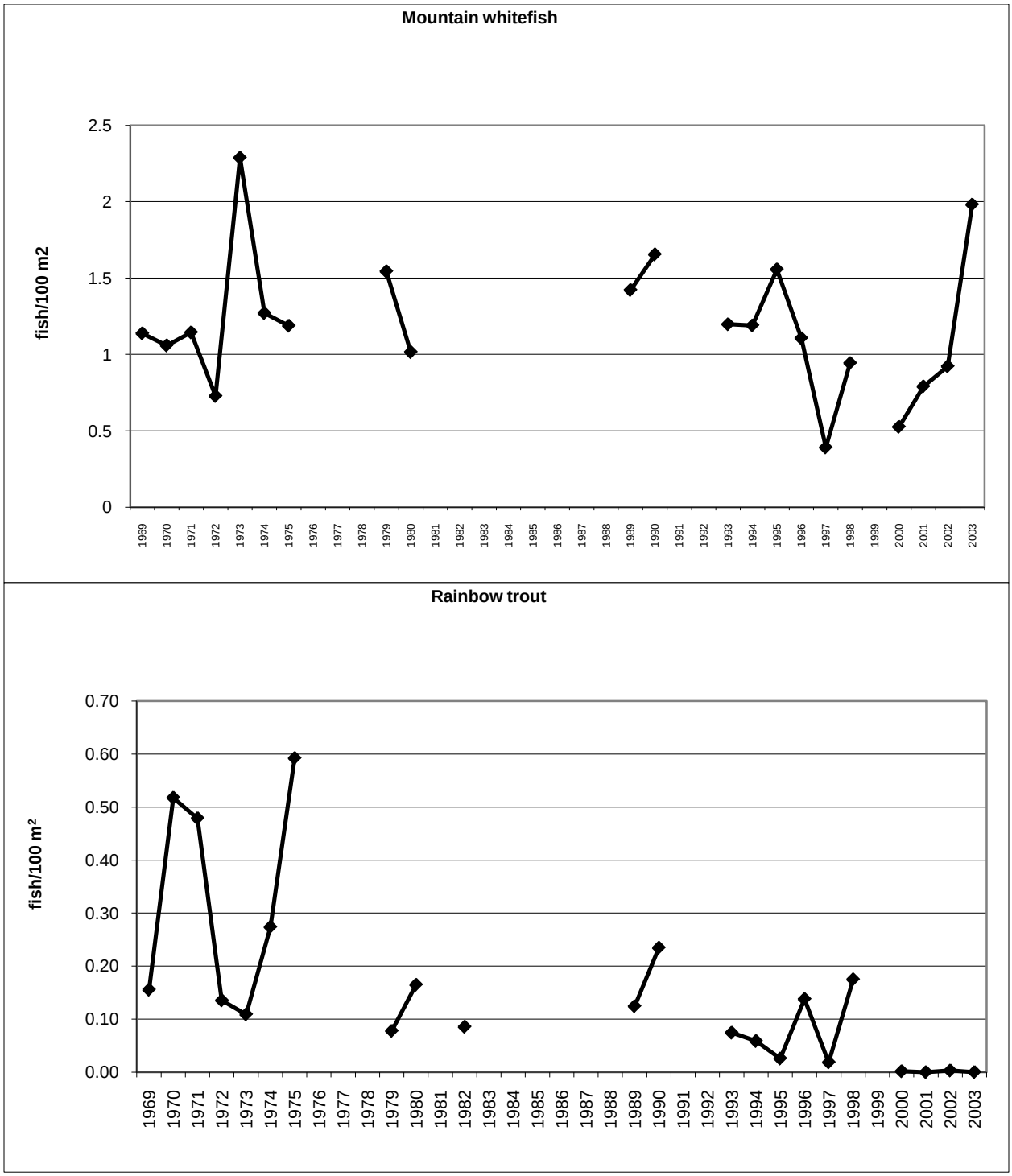


Figure 14. The average density of mountain whitefish and rainbow trout (fish/100 m^2) observed while snorkeling the St. Joe River, Idaho, between the North Fork St. Joe River and Ruby Creek from 1969 to 2003.

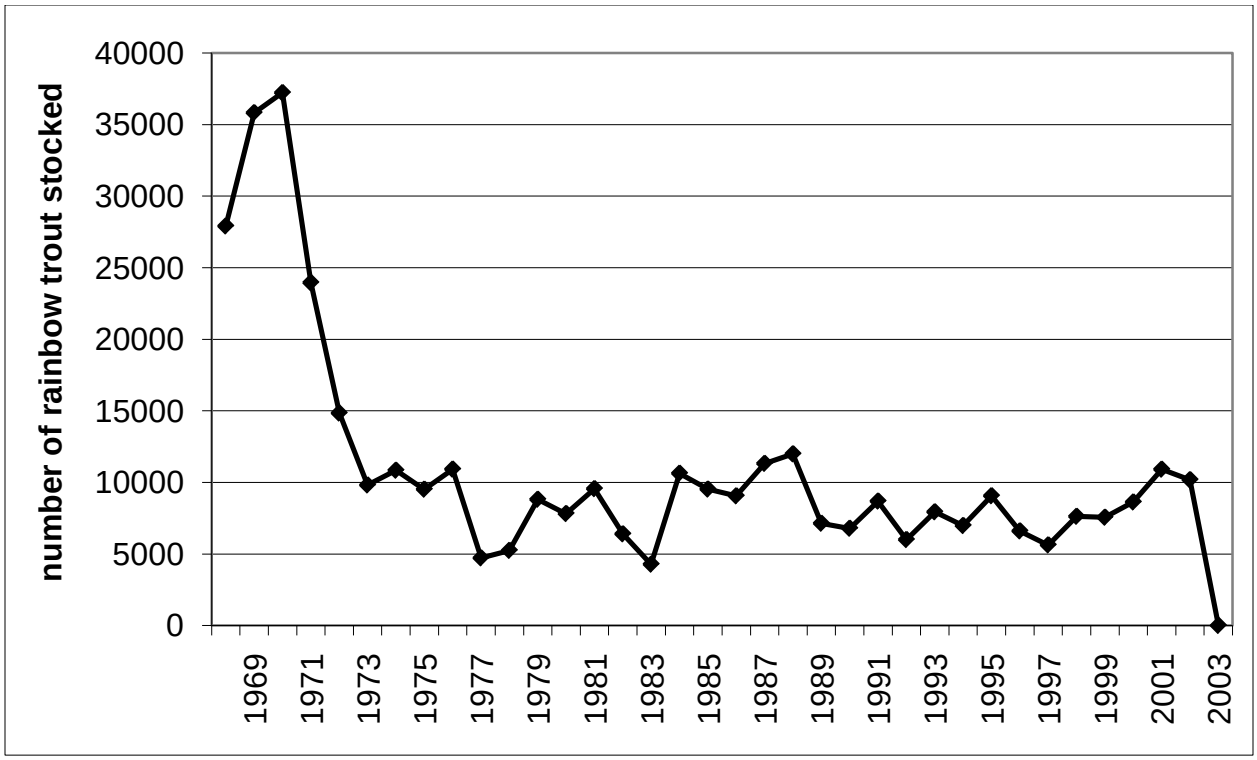


Figure 15. The number of rainbow trout > 6 inches in length stocked in the St. Joe River, Idaho, between 1968 and 2003.

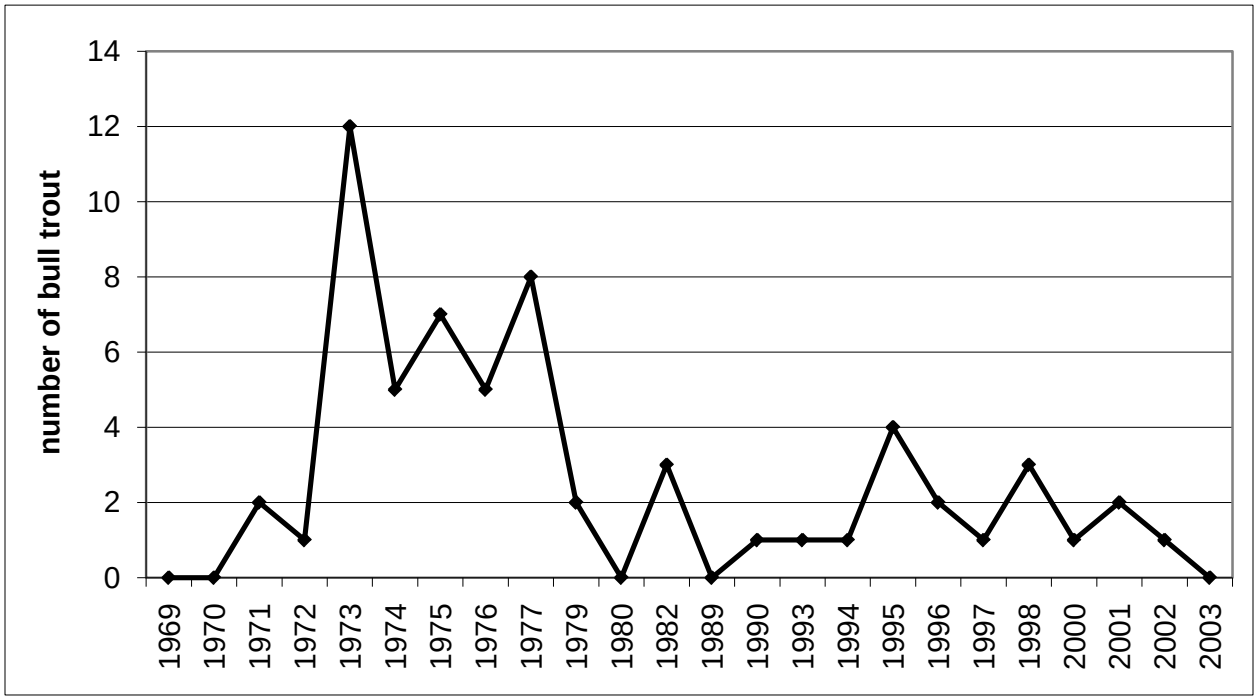


Figure 16. The number of bull trout counted while snorkeling transects in the St. Joe River, Idaho, from 1969 to 2003.

Coeur d'Alene River

Forty-three transects were snorkeled in the Coeur d'Alene River from August 5 - 7, 2003. A total of 622 cutthroat trout, 289 rainbow trout, one brook trout *Salvelinus fontinals* and 4,335 mountain whitefish were counted (Table 8). Cutthroat trout were observed in 34 of the 43 transects snorkeled. Densities of cutthroat trout (all size classes) in these transects ranged from 0.00 to 2.13 fish/100 m^2 with an overall average of 0.45 fish/100 m^2 (Tables 8 and 9). About 25 percent of the cutthroat trout observed were estimated to be ≥ 300 mm in length and their overall density was calculated to be 0.12 fish/100 m^2 (Tables 8 and 10).

Analysis of variance testing indicated cutthroat trout densities (all size and fish ≥ 300 mm) did not significantly differ (p value > 0.100) between the seven different stream reaches we surveyed in the North Fork Coeur d'Alene River watershed. Wide confidence intervals prevented us from showing any significant difference occurred between the reaches snorkeled (Figure 10). However, the highest average densities occurred in the upstream reaches where cooler water temperatures occurred and catch-and-release fishing was required for cutthroat (Figure 10 and Tables 9-10). The transect (NF01–slough) with the highest density of cutthroat trout was located in the most downstream transect in the lower North Fork Coeur d'Alene River. Transect NF01-slough is actually an 80 m long slough that joins into transect NF01. Historically the slough had been included with transect NF01 during snorkel counts. However, because the fish density is this slough were so much higher than the rest of the transect we decided to keep the fish counts separate for informational purposes. The water temperatures in the slough (NF01-slough) was 2°C cooler than the main river (NF01) at 10:00 AM.

Transects in the North Fork Coeur d'Alene River watershed have been snorkeled since 1973. Plotting the average density of cutthroat trout in various reaches of this river over time shows how cutthroat trout abundance has changed in response to changes in fishing regulations, extreme climatic events and fish stocking. The lowest densities of cutthroat trout (all sizes) in the North Fork Coeur d'Alene River were observed between 1973 and 1981. During this period, significant changes in fishing regulations occurred (1975 – 1977) in which the entire Coeur d'Alene River basin changed from essentially a 15 fish limit for cutthroat trout to a 6 fish limit in the lower half of the basin and a 3 fish limit (none < 13 inches) upstream of the Yellow Dog Creek in the North Fork and upstream of Laverne Creek in the Little North Fork (Table 5). Starting in 1988, cutthroat trout densities (all sizes) steadily increase until 1997 to the point where densities were about double what was observed between 1972 and 1981 (Figure 11 and Table 9). This initial increase in cutthroat trout density coincided with significant changes in the fishing regulation in 1986 and 1988 where upstream of Yellow Dog Creek and Laverne Creek it was catch-and-release for cutthroat trout and downstream of these streams only one fish (none < 14 inches) could be harvested. This same trend was not observed when we evaluated only those cutthroat trout ≥ 300 mm in length (Figure 11 and Table 10). From 1973 to 1981, the observed density of cutthroat trout ≥ 300 mm in length increased from 0.01 fish/100m^2 to 0.05 fish/100m^2. However, from 1981 to 1996 the observed density of cutthroat trout ≥ 300 mm fluctuated some but never increased above 0.08 fish/100 m^2 despite the significant changes in fishing regulations that occurred during this time. In 1996, about 11% of the cutthroat trout observed were ≥ 300 mm in length.

A noticeable decline in cutthroat trout densities (all sizes and ≥ 300 mm) were observed in 1997 and in 1998 (Figure 11 and Tables 9-10). No changes in fishing regulations occurred around this time. However, during February 1996 the second highest peak flow event since 1950 occurred and was followed in 1997 by the third highest mean annual flow year since 1950 (Figure 12). Following this decline, densities of cutthroat trout ≥ 300 mm in length have

Table 8. Number and density (fish/100 m^2) of fish observed while snorkeling transects in the North Fork Coeur d'Alene River, Idaho, during August 5-7, 2003.

Reach	Transect # 2002	Transect # 2003	Habitat Type	Length (m)	Average Width (m)	Area (m^2)	Cutthroat trout Number counted <300mm	Cutthroat trout Number counted >300mm	Cutthroat trout Density (No./100 m^2)	Rainbow Trout Counted	Brook Trout Counted	Whitefish Number Counted	Whitefish Density (No./100 m^2)
Lower North Fork Coeur d'Alene (Limited Harvest Allowed)	NF-20	NF-01[1]	pool	150	28.3	4,250	5	2	0.16	13	0	160	3.76
	--	NF-01 (slough)	slough	80	16.0	1,280	14	16	2.34	2	0	400	31.25
	NF-19	NF-02	pool	191	36.3	6,940	6	0	0.09	12	0	170	2.45
	NF-18	NF-03	pool	230	34.6	7,951	17	3	0.25	52	0	187	2.35
	NF-17	NF-04	pool	205	37.2	7,619	9	0	0.12	18	0	570	7.48
	NF-16	NF-05	pool	230	25.1	5,783	20	3	0.40	15	0	94	1.63
	NF-15	NF-06	run	215	30.8	6,622	37	9	0.69	77	0	265	4.00
	NF-14	NF-07	pool	180	33.0	5,940	16	10	0.44	34	0	1500	25.25
	NF-13	NF-08	pool	188	36.4	6,843	42	9	0.75	21	0	94	1.37
	NF-12	NF-09	pool	270	37.0	9,990	26	4	0.30	4	0	87	0.87
	--	NF-10[2]	run/pool	273	30.7	8,372	41	23	0.76	0	0	180	2.15
	NF-11	NF-11[1]	run	230	29.7	6,823	0	0	0.00	0	0	0	0.00
	--	NF-12[2]	run	202	22.5	4,545	2	1	0.07	0	0	0	0.00
	NF-10	NF-13	run	89	29.4	2,617	0	0	0.00	0	0	0	0.00
N. F. Cd'A (Catch-and-Release)	NF-9	NF-14	pool	134	23.3	3,127	15	5	0.64	0	0	73	2.33
	NF-8	NF-15	pool	73	26.5	1,935	22	8	1.55	0	0	232	11.99
	NF-7	NF-16	run	175	23.5	4,113	2	1	0.07	0	0	0	0.00
	NF-6	NF-17	run	291	28.2	8,197	63	23	1.05	0	0	185	2.26
	NF-5	NF-18	pool	82	18.0	1,476	5	3	0.54	0	0	72	4.88
	NF-24	NF-19	run	27	14.8	398	0	0	0.00	0	0	0	0.00
	NF-25	NF-20	pool	70	11.6	812	12	2	1.72	0	0	0	0.00
	NF-26	NF-21	pool	55	17.3	953	18	4	2.31	0	0	5	0.52
	NF-27	NF-22	pool	55	19.0	1,045	5	3	0.77	0	0	0	0.00
	NF-28	NF-23	pool	38	12.6	479	1	0	0.21	0	0	0	0.00
Tepee Creek (Catch-and-Release)	TP-5(NF-5)	TP-01	pool	99	16.2	1,604	16	8	1.50	0	0	10	0.62
	TP-4(NF-4)	TP-02	run	225	16.0	3,600	1	2	0.08	0	0	0	0.00
	TP-3(NF-3)	TP-03	pool	90	12.0	1,080	0	0	0.00	0	0	0	0.00
	TP-2(NF-2)	TP-04	run	113	9.7	1,092	0	1	0.09	0	0	0	0.00
	TP-1 (NF-1)	TP-05	pool	71	20.0	1,420	8	3	0.77	0	0	45	3.17
	TP REHAB-1	TP REHAB-1	run/riffle	159	5.1	818	0	0	0.00	0	0	0	0.00
	TP REHAB-2	TP REHAB-2	run/riffle	184	6.5	1,196	0	0	0.00	0	0	0	0.00

Table 8. Continued.

Reach	Transect # 2002	Transect # 2003	Habitat Type	Length (m)	Average Width (m)	Area (m^2)	Cutthroat trout Number counted <300mm	Cutthroat trout Number counted >300mm	Cutthroat trout Density (No./100 m^2)	Rainbow Trout Counted	Brook Trout Counted	Whitefish Number Counted	Whitefish Density (No./100 m^2)
L.N.F. Cd'A (Limited Harvest Allowed)	LNF-10	LNF-01	pool	72	15.6	1,123	14	0	1.25	13	0	0	0.00
	LNF-9	LNF-02	run	199	19.4	3,861	6	7	0.34	11	1	0	0.00
	LNF-8	LNF-03	pool	90	24.3	2,183	2	0	0.09	0	0	2	0.09
	LNF-7	LNF-04[1]	Run/Pool	75	12.4	930	5	0	0.54	14	0	0	0.00
	LNF-6	LNF-05[1]	pool	130	21.3	2,763	2	0	0.07	1	0	4	0.14
	--	LNF-06[2]	pool	71	23.5	1,669	7	0	0.42	0	0	0	0.00
	LNF-4	LNF-07[1]	pool	91	12.0	1,092	1	0	0.09	0	0	0	0.00
	LNF-3	LNF-08	pool	60	18.4	1,104	0	0	0.00	1	0	0	0.00
L.N.F. Cd'A (Catch-and-Release)	LNF-2	LNF-09	run	45	16.0	720	0	0	0.00	0	0	0	0.00
	LNFB	LNF-10	pool	110	12.8	1,408	0	0	0.00	0	0	0	0.00
	LNF-1	LNF-11	pool	80	14.0	1,120	9	1	0.89	0	0	0	0.00
	--	LNF-12[3]	run/pool	66	12.5	825	8	6	1.70	0	0	0	0.00
	LNFA	LNF-13	run	50	11.6	580	8	0	1.38	1	0	0	0.00
Total	38 sites	43 sites	--	5,813	--	138,295	465	157	0.45	289	1	4,335	3.13

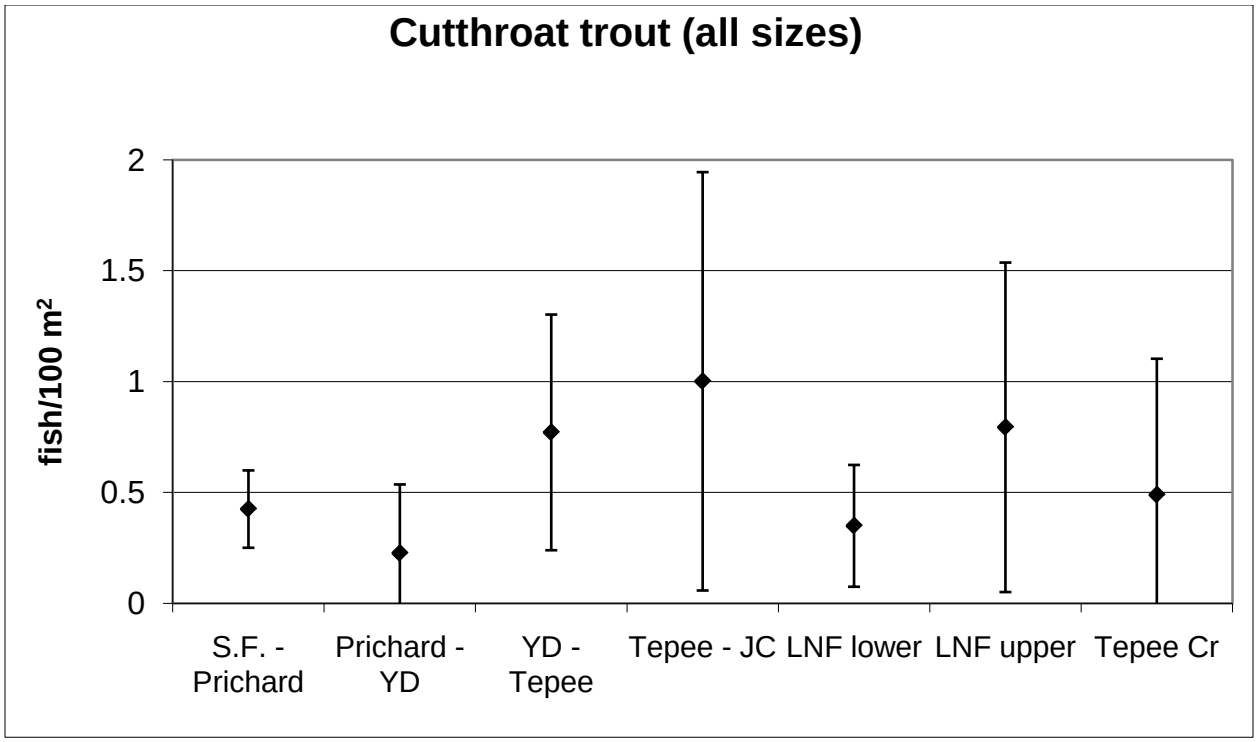
[1] This site was moved back to its original location that was established in 1973
[2] This site was a historic site that was skipped in the past and has now be re-added to the transects we snorkel.
[3] This site was added to increase the number of transects in the catch and release area of the Little North Fork Coeur d'Alene River (LNF Cd'A).

Table 9. Average density (fish/100 m^2) of all size classes of cutthroat trout counted in reaches of the North Fork Coeur d'Alene River (N.F. Cd'A), Little North Fork Coeur d'Alene River (L.N.F. Cd'A), and Tepee Creek, Idaho, during snorkel evaluations from 1973 to 2003.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Cd'A - S. F. Cd'A to Prichard Cr.	0.06	0.02	0.02	--	0.05	0.18	0.56	0.31	0.47	0.51	0.35	0.32	0.41	0.53	0.28	0.41
N.F. Cd'A - Prichard Cr to Yellowdog Cr.	0.05	0.00	0.02	--	0.02	0.14	0.08	0.28	0.19	0.06	0.44	0.41	0.13	0.51	0.49	0.30
N.F. Cd'A - Yellowdog Cr to Tepee Cr.	0.24	0.31	0.28	1.05	1.10	1.18	0.35	1.70	1.57	1.71	1.70	0.63	0.63	1.74	0.54	0.78
N.F. Cd'A - Tepee Cr. to Jordan Cr.	1.48	0.68	0.74	2.34	0.46	0.11	0.27	1.31	0.46	1.17	1.87	1.18	1.49	1.02	2.40	1.22
L.N.F. Cda - Mouth to Laverne Cr.	0.33	0.04	0.02	--	0.10	0.09	0.18	0.03	0.04	0.12	0.22	0.39	0.36	0.28	0.13	0.30
L.N.F. Cda - Laverne Cr. to Deception Cr.	0.79	1.03	1.95	--	0.90	0.66	0.03	0.47	0.22	0.90	0.00	0.65	0.79	0.12	0.98	0.69
Tepee Creek	0.00	0.14	0.43	0.24	0.12	0.24	0.19	0.12	0.13	0.02	0.45	1.24	0.25	0.24	0.84	0.44
Entire N.F. Cd'A River	0.13	0.10	0.11	--	0.33	0.32	0.35	0.54	0.53	0.63	0.69	0.44	0.38	0.76	0.43	0.47
Entire L.N.F. Cd'A River	0.38	0.15	0.24	--	0.27	0.20	0.15	0.13	0.09	0.35	0.17	0.45	0.45	0.25	0.31	0.39
All Transects	0.20	0.11	0.14	--	0.31	0.30	0.31	0.43	0.42	0.50	0.57	0.49	0.38	0.61	0.44	0.46
Tepee Creek Rehab Area	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.87	0.00

Table 10. Average density (fish/100 m^2) of cutthroat trout ≥ 300 mm in length counted in reaches of the North Fork Coeur d'Alene River (N.F. Cd'A) Little North Fork Coeur d'Alene River (L.N.F. Cd'A), and Tepee Creek Idaho, during snorkel evaluations from 1973 to 2003.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Cd'A - S. F. Cd'A to Prichard Cr.	0.00	0.02	0.01	--	0.01	0.01	0.08	0.01	0.01	0.04	0.00	0.00	0.01	0.03	0.01	0.10
N.F. Cd'A - Prichard Cr to Yellowdog Cr.	0.00	0.00	0.00	--	0.01	0.03	0.02	0.04	0.01	0.01	0.01	0.03	0.01	0.06	0.04	0.09
N.F. Cd'A - Yellowdog Cr to Tepee Cr.	0.02	0.12	0.04	0.12	0.08	0.13	0.04	0.31	0.07	0.14	0.11	0.02	0.07	0.07	0.12	0.21
N.F. Cd'A - Tepee Cr. to Jordan Cr.	0.07	0.35	0.20	1.25	0.23	0.06	0.23	0.37	0.29	0.30	0.21	0.18	0.38	0.09	0.44	0.24
L.N.F. Cda - Mouth to Laverne Cr.	0.02	0.02	0.00	--	0.05	0.05	0.06	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00	0.05
L.N.F. Cda - Laverne Cr. to Deception Cr.	0.18	0.37	0.18	--	0.09	0.00	0.03	0.00	0.00	0.05	0.00	0.00	0.06	0.00	0.11	0.15
Tepee Creek	0.00	0.03	0.43	0.20	0.06	0.18	0.08	0.09	0.09	0.00	0.08	0.08	0.05	0.04	0.22	0.16
Entire N.F. Cd'A River	0.01	0.05	0.02	--	0.04	0.04	0.06	0.08	0.03	0.07	0.03	0.02	0.04	0.05	0.05	0.12
Entire L.N.F. Cd'A River	0.03	0.05	0.02	--	0.06	0.04	0.06	0.00	0.00	0.02	0.00	0.00	0.04	0.00	0.02	0.07
All Transects	0.01	0.05	0.04	--	0.05	0.04	0.06	0.06	0.03	0.06	0.03	0.02	0.04	0.03	0.06	0.12
Tepee Creek Rehab Area	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05	0.00



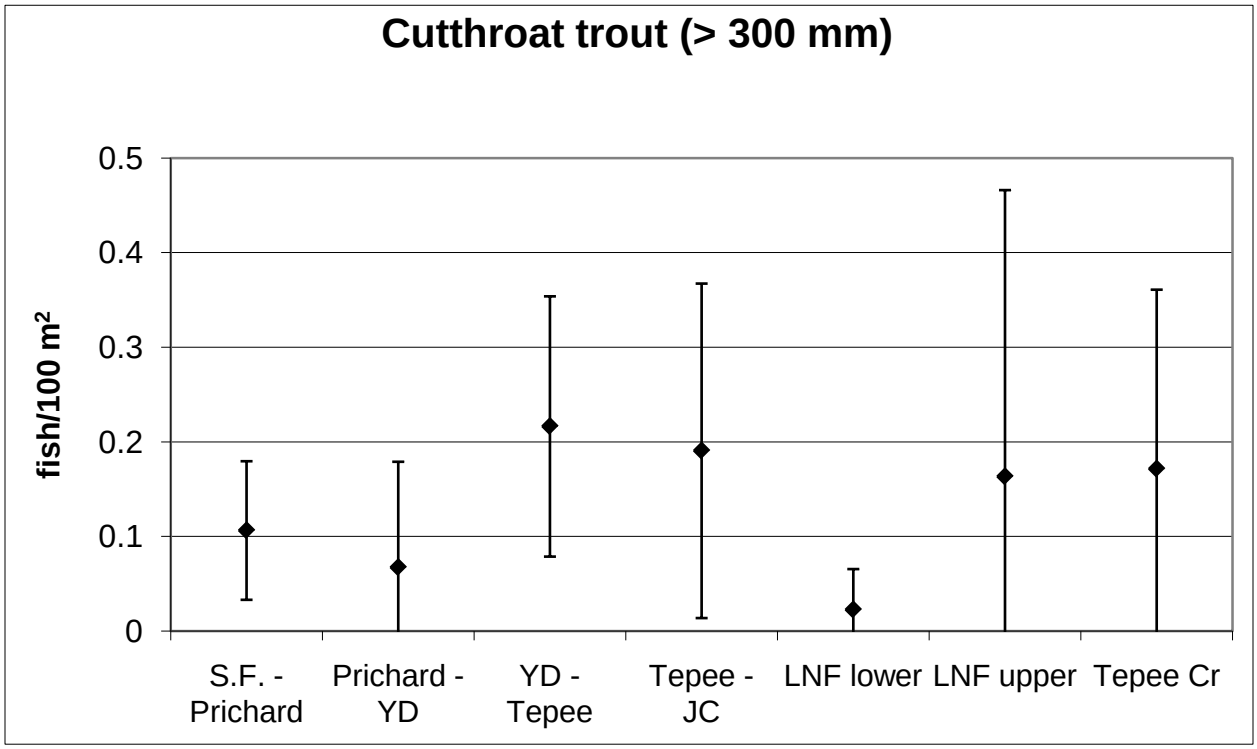


Figure 17. The average cutthroat trout density and 90% confidence intervals (all sizes and only fish ≥ 300 mm) determined from snorkeling seven different reaches in the North Fork Coeur d'Alene River, Idaho, during 2003.

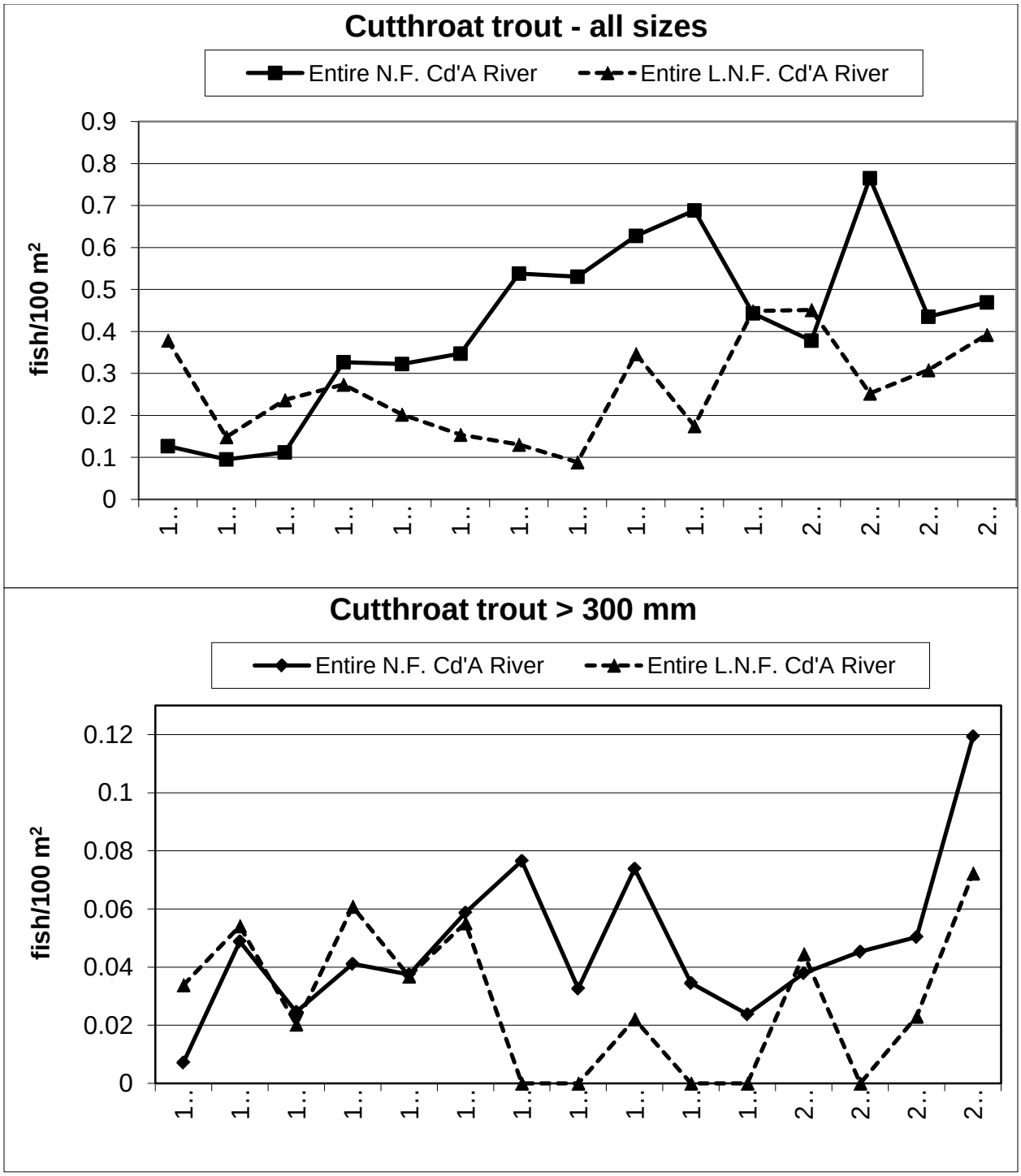


Figure 18. The average density (fish/100 m^2) of all size classes of cutthroat trout and cutthroat trout ≥ 300 mm observed while snorkeling the North Fork Coeur d'Alene River (N.F. Cd'A) and Little North Fork Coeur d'Alene River (L.N.F. Cd'A), Idaho, from 1973 to 2003.

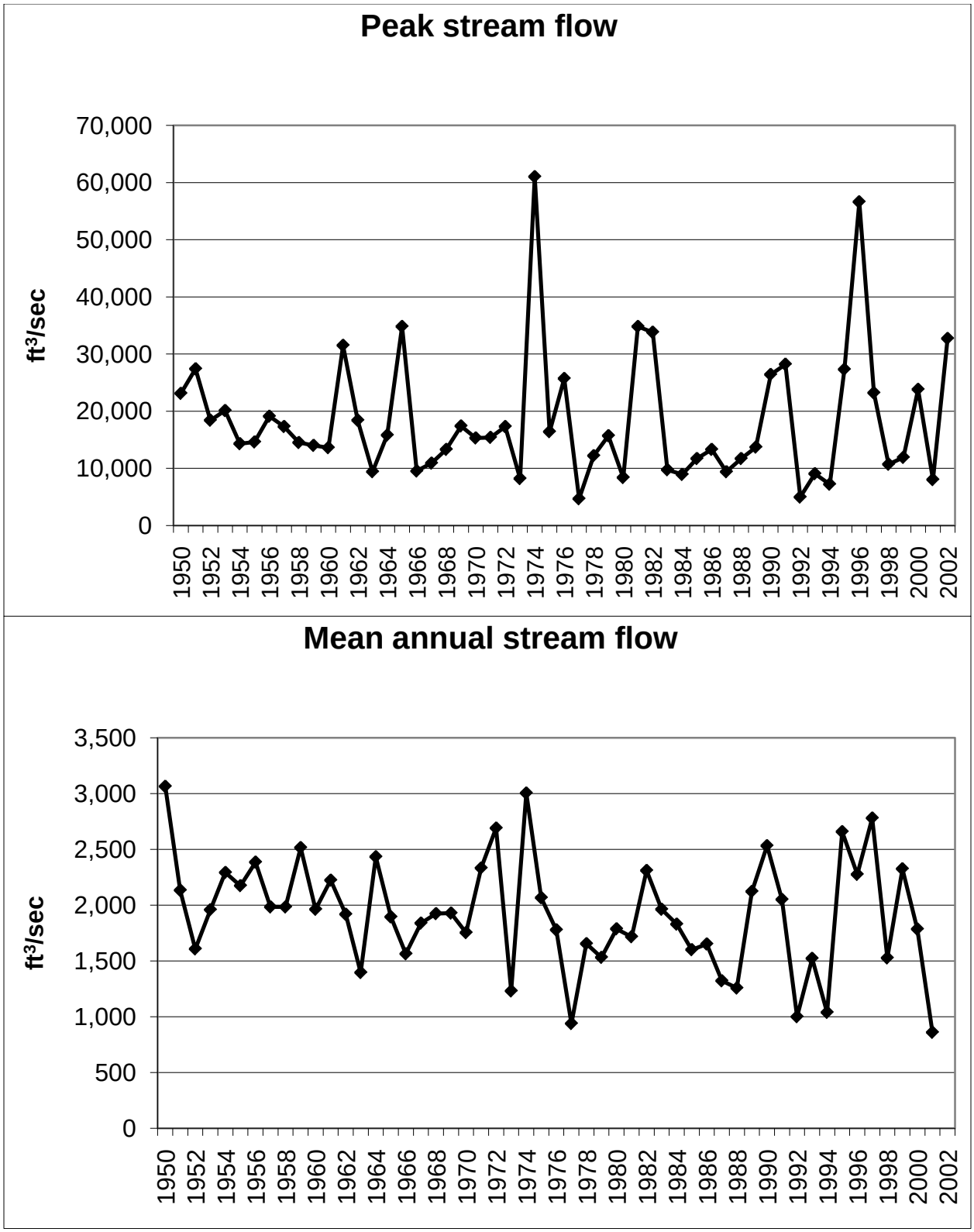


Figure 19. The peak stream flow and mean annual stream flow documented by USGS for the North Fork Coeur d'Alene River, Idaho, at Enaville from 1950 to 2002.

increased steadily. In fact, the density of cutthroat trout ≥ 300 mm in length in 2003 was the highest ever recorded and represented about 26% of the cutthroat trout observed (Figure 11 and Tables 9-10). Cutthroat trout < 300 mm have not seen this dramatic of an increase since their decline in 1998, but their densities appear to be increasing (Figure 11).

Little North Fork Clearwater River

Trends in cutthroat trout densities have been quite different for the Little North Fork Coeur d'Alene River. For the most part, densities of cutthroat trout (all sizes and ≥ 300 mm) declined from 1973 to 1995 (Figure 11 and Table 9 and 10). Then, from 1996 to 2003 densities (all size classes) increased steadily, although they were about the same in 2003 as was observed in 1973 (0.4 fish/100 m^2). Densities of cutthroat trout ≥ 300 mm fluctuated near zero until 2002, and in 2003 the highest densities (0.07 fish 100/m^2) were recorded for this size of fish (Figure 11 and Table 10).

No cutthroat trout were observed in the two transects we snorkeled in the rehabilitation area of Tepee Creek during 2003. During 2002, an average density of 0.87 cutthroat trout/100 m^2 (all size classes combined) and 0.15 cutthroat trout/100 m^2 for fish ≥ 300 mm was observed at these sites.

Mountain whitefish were observed in 20 snorkel transects in the Coeur d'Alene River basin and densities ranged from 0.00 to 31.25 fish/100 m^2 with a mean density of 3.1 fish/100 m^2. The highest densities of mountain whitefish were in the lower North Fork Coeur d'Alene River, with few mountain whitefish observed upstream of Tepee Creek or in the Little North Fork Coeur d'Alene River (Tables 8 and 11). The average density of mountain whitefish observed in Coeur d'Alene River (all transects combined) tied the highest ever recorded in during our snorkeling efforts (Table 11). The average mountain whitefish density observed in the North Fork Coeur d'Alene River has fluctuated greatly since 1973 and a trend over time is not evident (Table 11 and Figure 13).

Rainbow trout were observed in 16 snorkel transects during 2003. Over 99% of the rainbow trout were observed in the most downstream reaches where harvest is allowed (Tables 8 and 12). These are the same stream reaches where rainbow trout were stocked in the past. Densities of rainbow trout observed at each transect ranged from 0.00 to 1.51 fish/100 m^2, with an overall average density of 0.21 fish/100 m^2. Of the 289 rainbow trout observed, 49 (17%) were estimated to be ≥ 300 mm in length. Between 1991, and 2003 the average density of rainbow trout has remained relatively constant in the Coeur d'Alene River (Table 12 and Figure 13), despite decreased stocking within the basin (Figure 14). The year 2003 was the first year no rainbow trout were stocked into any flowing waters in the Panhandle Region.

DISCUSSION

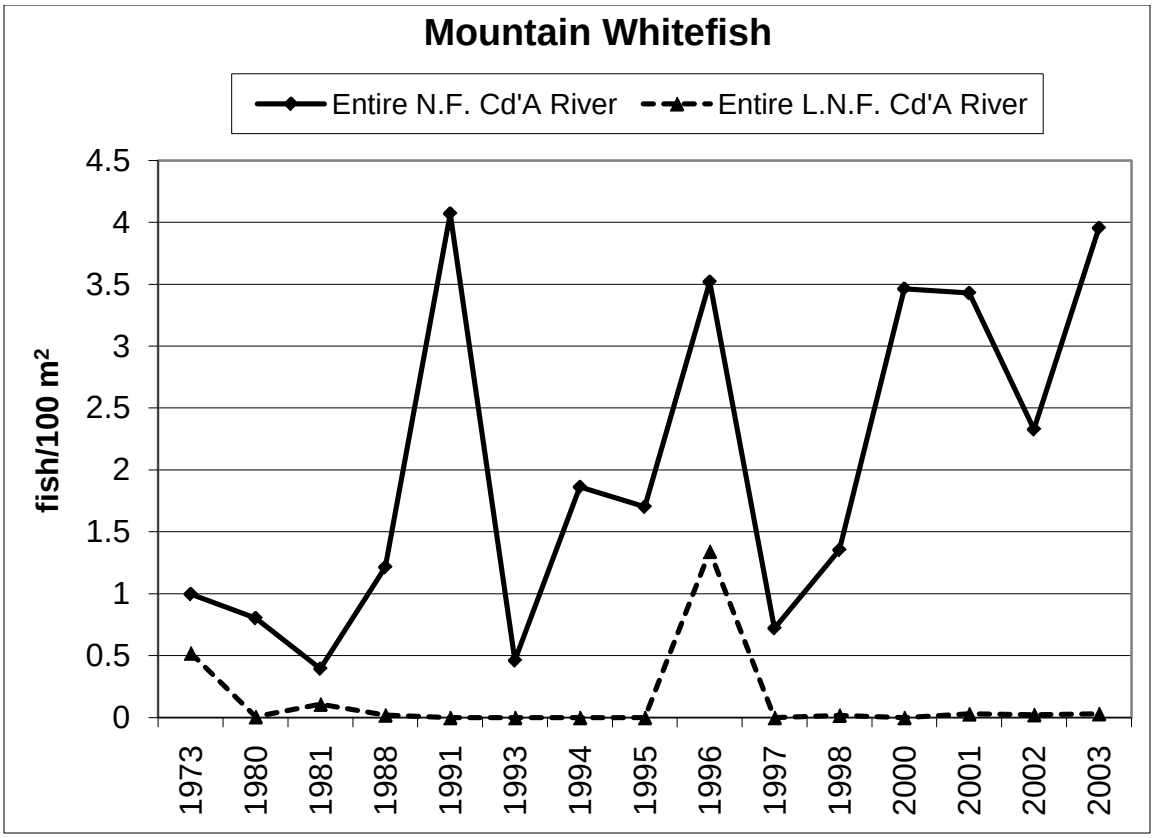
St. Joe River versus the Coeur d'Alene River

Similar lengths of stream have been snorkeled in the St. Joe River and Coeur d'Alene River since 1993. Comparisons of the average density of cutthroat trout (all sizes) observed in all of the snorkel transects in each of the rivers showed that from 1993 to 1997 cutthroat trout densities were about two to three times higher in the St. Joe River than the Coeur d'Alene River (Figure 15). After 1997, declines in cutthroat trout densities were observed in both rivers although declines were greatest in the St. Joe River. In 1998, the overall density of cutthroat

trout observed in the snorkel transects in the St. Joe River and Coeur d'Alene River was very similar (0.50 versus 0.49 fish/100 m^2 respectively). Every year since 1998, cutthroat trout densities in the St. Joe River have improved faster than the Coeur d'Alene River and are beginning to approach densities observed before the flood when densities were two to three times higher in the St. Joe River (Figure 15).

Table 11. Average density (fish/100 m^2) of all size classes of mountain whitefish counted in reaches of the North Fork Coeur d'Alene River (N.F. Cd'A), Little North Fork Coeur d'Alene River (L.N.F. Cd'A), and Tepee Creek, Idaho, during snorkel evaluations from 1973 to 2003.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Cd'A - S. F. Cd'A to Prichard Cr.	0.75	1.47	0.18	--	3.09	6.59	0.45	2.42	2.53	5.54	0.69	1.05	7.38	4.36	2.91	6.46
N.F. Cd'A - Prichard Cr to Yellowdog Cr.	0.46	0.02	0.12	--	0.03	1.25	0.29	0.65	0.11	1.13	0.56	0.58	0.23	0.20	0.32	0.83
N.F. Cd'A - Yellowdog Cr to Tepee Cr.	3.19	1.18	1.71	1.34	1.09	5.52	1.07	2.60	1.65	5.05	1.45	3.57	2.90	4.00	2.13	2.98
N.F. Cd'A - Tepee Cr. to Jordan Cr.	0.00	0.00	0.00	0.00	0.11	0.00	0.00	1.33	2.41	1.12	0.00	2.80	0.13	0.97	0.65	0.14
L.N.F. Cda - Mouth to Laverne Cr.	0.59	0.01	0.12	--	0.03	0	0	0	0	1.88	0	0.02	0	0.04	0.03	0.04
L.N.F. Cda - Laverne Cr. to Deception Cr.	0.00	0.00	0.00	--	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tepee Creek	0.00	0.35	0.00	0.00	0.00	0.00	0.06	0.00	0.00	2.68	0.00	0.20	0.36	1.09	0.91	0.63
Entire N.F. Cd'A River	1.00	0.80	0.39	--	1.21	4.07	0.46	1.86	1.70	3.52	0.72	1.35	3.46	3.43	2.33	3.95
Entire L.N.F. Cd'A River	0.52	0.01	0.11	--	0.02	0.00	0.00	0.00	0.00	1.34	0.00	0.02	0.00	0.03	0.02	0.03
All Transects	0.87	0.65	0.33	--	0.96	3.18	0.37	1.35	1.26	3.03	0.52	1.00	2.78	2.49	1.85	3.18
Tepee Creek Rehab	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00



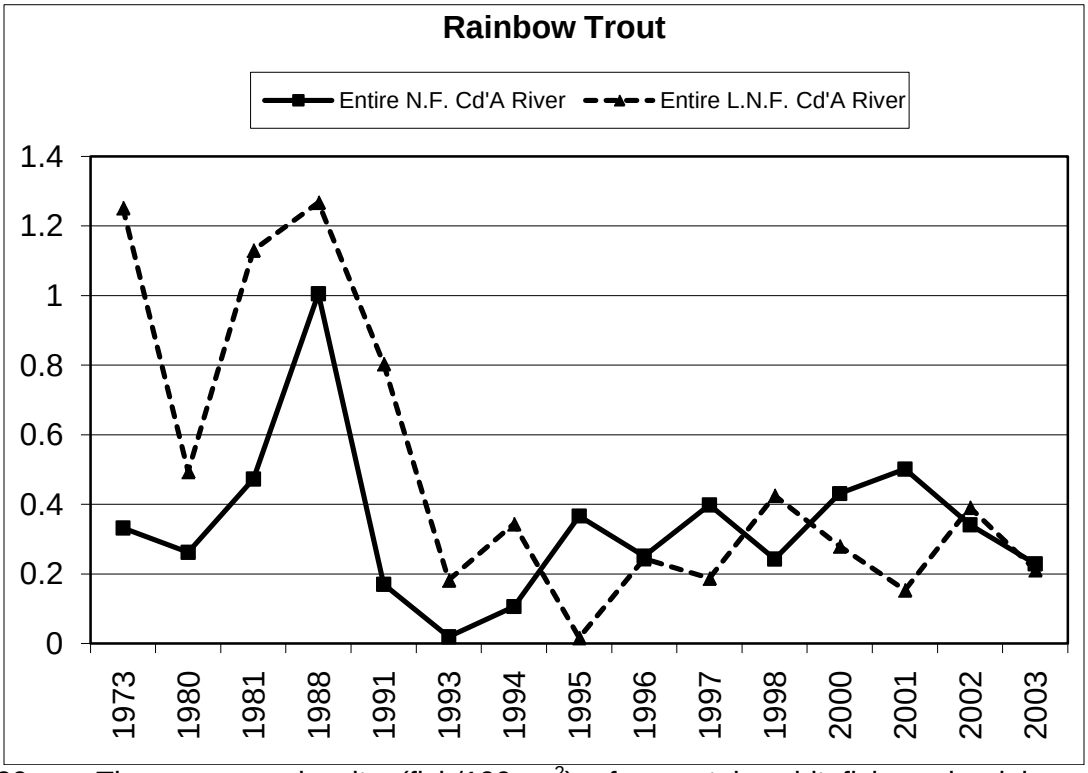


Figure 20. The average density (fish/100 m^2) of mountain whitefish and rainbow trout observed while snorkeling the North Fork Coeur d'Alene River (N.F. Cd'A) and Little North Fork Coeur d'Alene River (L.N.F. Cd'A), Idaho, from 1973 to 2003.

Table 12. Average density (fish/100 m^2) of all size classes of rainbow trout counted in reaches of the North Fork Coeur d'Alene River (N.F. Cd'A), Little North Fork Coeur d'Alene River (L.N.F. Cd'A), and Tepee Creek, Idaho, during snorkel evaluations from 1973 to 2003.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Cd'A - S. F. Cd'A to Prichard Cr.	0.35	0.45	0.59	--	3.15	0.22	0.04	0.16	0.61	0.50	0.75	0.42	1.06	0.76	0.52	0.46
N.F. Cd'A - Prichard Cr to Yellowdog Cr.	0.48	0.12	0.46	--	0.14	0.20	0.01	0.08	0.14	0.02	0.12	0.06	0.03	0.11	0.00	0.01
N.F. Cd'A - Yellowdog Cr to Tepee Cr.	0.03	0.21	0.34	0.11	0.03	0.04	0.00	0.00	0.02	0.25	0.01	0.01	0.01	0.14	0.00	0.00
N.F. Cd'A - Tepee Cr. to Jordan Cr.	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
L.N.F. Cda - Mouth to Laverne Cr.	1.39	0.55	1.25	--	1.6	0.99	0.22	0.45	0.02	0.09	0.24	0.54	0.35	0.18	0.46	0.27
L.N.F. Cda - Laverne Cr. to Burnt Cabin Cr.	0.12	0.06	0.18	--	0.05	0.03	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.13	0.02
Tepee Creek	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Entire N.F. Cd'A River	0.33	0.26	0.47	--	1.00	0.17	0.02	0.11	0.37	0.25	0.40	0.24	0.43	0.50	0.34	0.23
Entire L.N.F. Cd'A River	1.25	0.49	1.13	--	1.27	0.80	0.18	0.34	0.02	0.24	0.19	0.43	0.28	0.15	0.39	0.21
All Transects	0.46	0.29	0.56	--	0.99	0.27	0.04	0.14	0.28	0.22	0.32	0.27	0.38	0.39	0.33	0.21
Tepee Creek Rehab	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.00	0.00

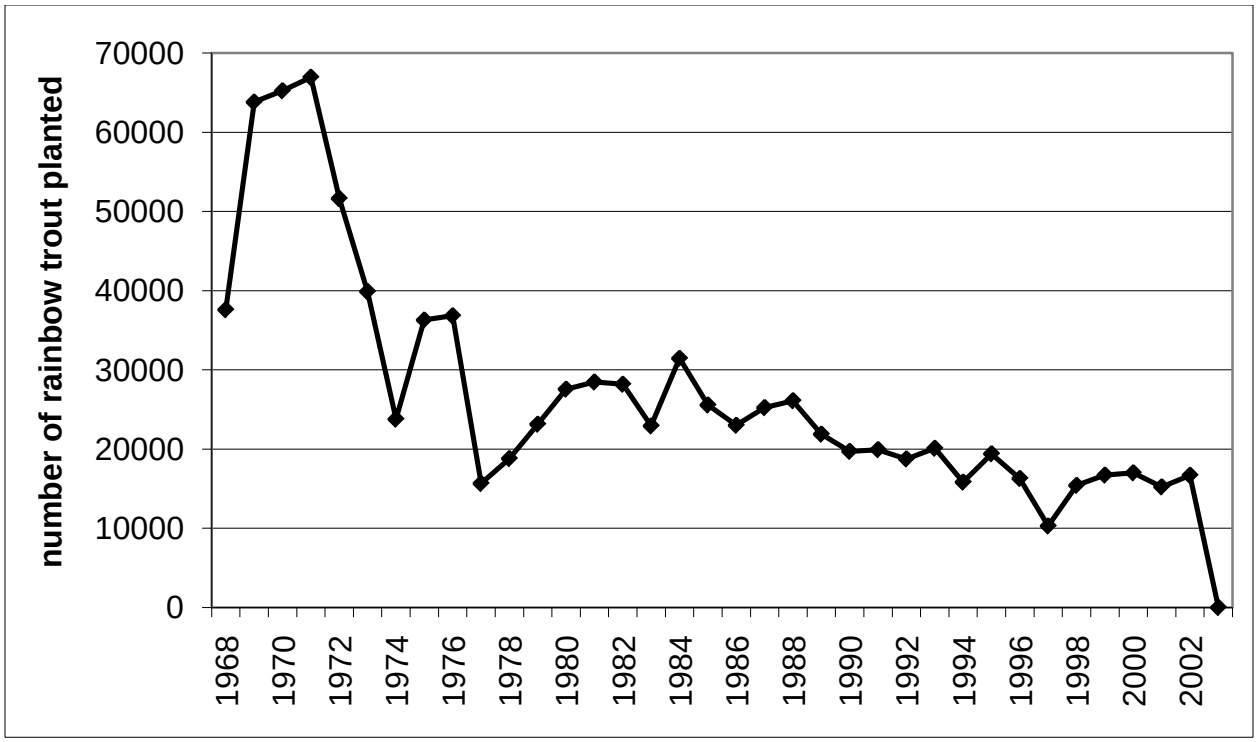


Figure 21. The number of rainbow trout > 6 inches in length stocked in the Coeur d'Alene River basin between 1968 and 2003.

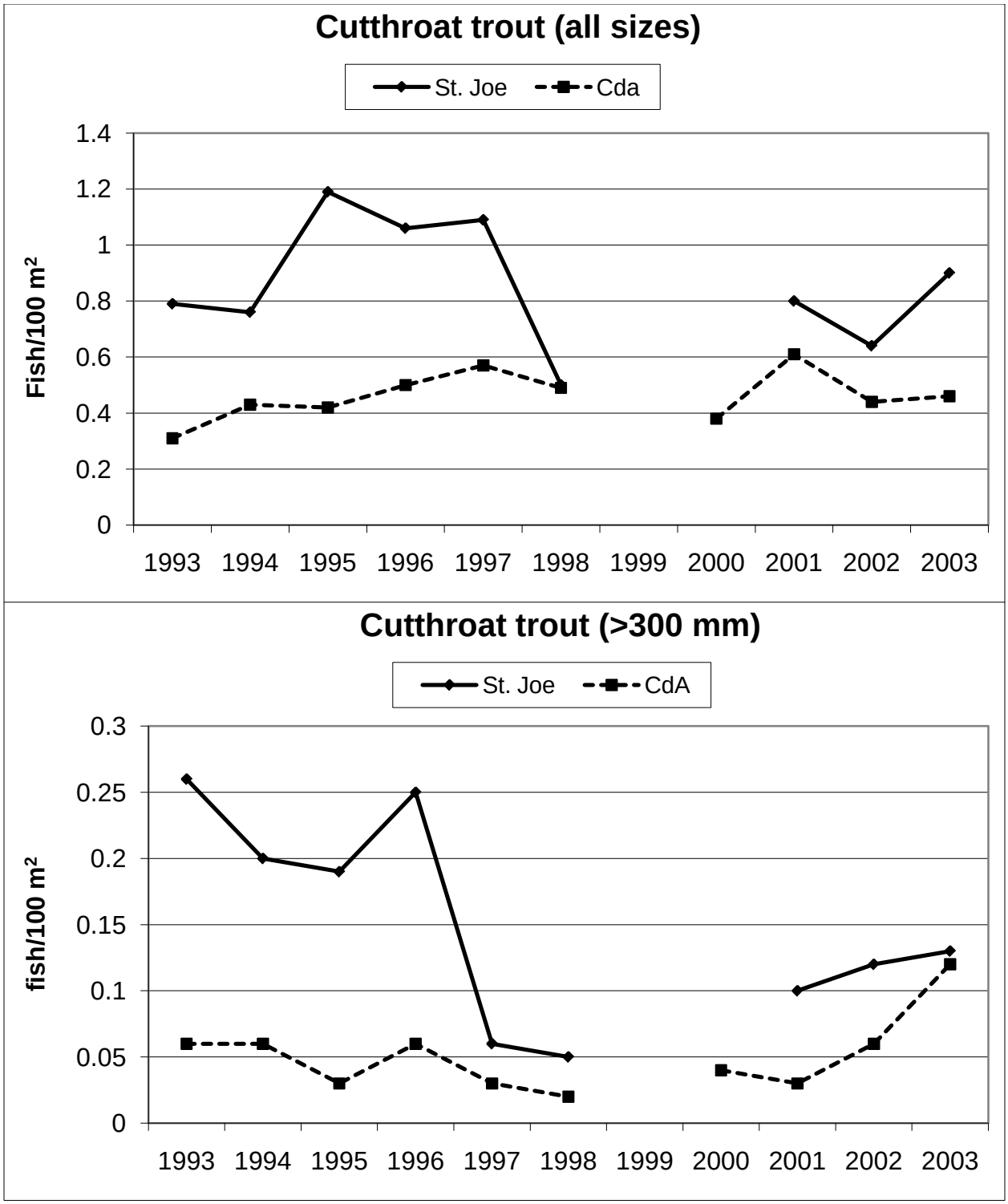


Figure 22. The average density of cutthroat trout (all sizes and only fish ≥ 300 mm) observed when snorkeling all the transects in the St. Joe River (Calder to Ruby Creek) and Coeur d'Alene River (South Fork to headwaters), Idaho from 1993 to 2003.

The average densities of cutthroat trout (all size classes) in the St. Joe River (0.90 fish/100 m^2) were about two times higher than what was observed in the North Fork Coeur d'Alene River (0.46 fish/100 m^2) during 2003. These densities were significantly different based on a T-test evaluation (p value < 0.001). Analysis of variance (ANOVA) testing indicated that the density of cutthroat trout is not uniform throughout the St. Joe and North Fork Coeur d'Alene rivers (p value < 0.001) when we compared average densities of cutthroat trout between four stream reaches in the St. Joe River and seven in the North Fork Coeur d'Alene River. The highest average density of cutthroat trout (all size classes) was observed in the three upstream reaches on the St. Joe River (Figure 16). Fisher's LSD testing (Table 13) showed that there were significantly higher densities of cutthroat trout (all size classes) in the two upstream reaches of the St. Joe River than any of the stream reaches in the North Fork Coeur d'Alene basin except between Tepee Creek and Jordan Creek (Table 13).

The density of cutthroat trout ≥ 300 mm observed in the St. Joe River (0.13 fish/100 m^2) transects was about the same as that observed in the Coeur d'Alene River (0.12 fish/ 100 m^2) during 2003. This is the first time densities of cutthroat trout ≥ 300 mm in the St. Joe River and Coeur d'Alene River has been so similar (Figure 15). Despite these similarities in densities, T-test evaluations indicate that the average transect density of cutthroat trout ≥ 300 mm in the St. Joe River was significantly higher (P = 0.048) that what was observed in the Coeur d'Alene River during 2003. When we evaluate cutthroat trout densities ≥ 300 mm on a reach by reach basis between the St. Joe River and North Fork Coeur d'Alene River, no significant differences were detected using ANOVA testing (P = 0.491). Wide confidence intervals prevented us from showing any significant difference occurred between the reaches snorkeled, although, the highest average densities of cutthroat trout ≥ 300 mm occurred in the reaches of the St. Joe River upstream of Prospector Creek (Figure 16).

DISCUSSION

St. Joe River

Cutthroat trout densities have increased markedly in the St. Joe River since snorkel counts were first initiated in 1969. Early research indicated the depressed cutthroat trout fishery was a result of over-fishing (Mallet 1967; Dunn 1968; Rankel 1971). As a result, fishing regulations were changed in 1971 from a 15 fish limit for the entire river to where only 3 fish ≥ 330 mm could be kept each day upstream of Prospector Creek. From 1971 to 1977 the density of cutthroat trout (all size classes) counted at the snorkel transects more than tripled and was attributed to changes in the fishing regulations (Johnson and Bjornn 1975). Claims were made that more restrictive regulations had improved the fishing (Johnson and Bjornn 1978). However, when we evaluated this snorkel data, we also looked at how the density of cutthroat trout ≥ 300 mm changed. What we found is that for the most part, the density of cutthroat trout ≥ 300 mm declined after the regulations were changed. In fact, between 1974 and 1977 not one cutthroat trout ≥ 300 mm was observed during the snorkel surveys.

With anglers being allowed to keep cutthroat trout ≥ 330 mm, their survival of larger fish did not increase. In fact, survival of cutthroat trout ≥ 330 mm may have decreased because harvest was focused on a limited number of large fish. Prior to the 13 inch minimum size limit, the same fisherman may have kept smaller fish to eat. It appeared that fishing pressure was high enough that once cutthroat trout reached the legal size (330 mm) they were cropped off.

Table 13. Fishers Least-Significance-Difference Test matrix of pairwise comparison probabilities of cutthroat trout densities between seven stream reaches in the North Fork Coeur d'Alene River basin and four from the St. Joe River basin, Idaho, during 2003. Shaded cells indicate which stream reaches had significantly different ($p \leq 0.10$) cutthroat trout densities.

	North Fork Coeur d'Alene River Reaches							St. Joe River Reaches			
	SF-Prich	Prich-YD	YD-Tepee	Tepee-JC	LNF lower	LNF upper	Tepee	Calder	NF St. Joe	Prospector	Red Ives
SF-Prich	1.000										
Prichard-YD	0.715	1.000									
YD-Tepee	0.673	0.472	1.000								
Tepee-JC	0.291	0.202	0.535	1.000							
LNF lower	0.874	0.821	0.570	0.233	1.000						
LNF upper	0.499	0.348	0.793	0.731	0.415	1.000					
Tepee	0.906	0.663	0.791	0.397	0.797	0.614	1.000				
Calder	0.659	0.973	0.413	0.158	0.773	0.296	0.614	1.000			
NF St. Joe	0.211	0.146	0.448	0.937	0.162	0.652	0.321	0.104	1.000		
Prospector	0.000	0.000	0.000	0.005	0.000	0.001	0.000	0.000	0.002	1.000	
Red Ives	0.005	0.005	0.024	0.119	0.003	0.057	0.016	0.002	0.107	0.257	1.000

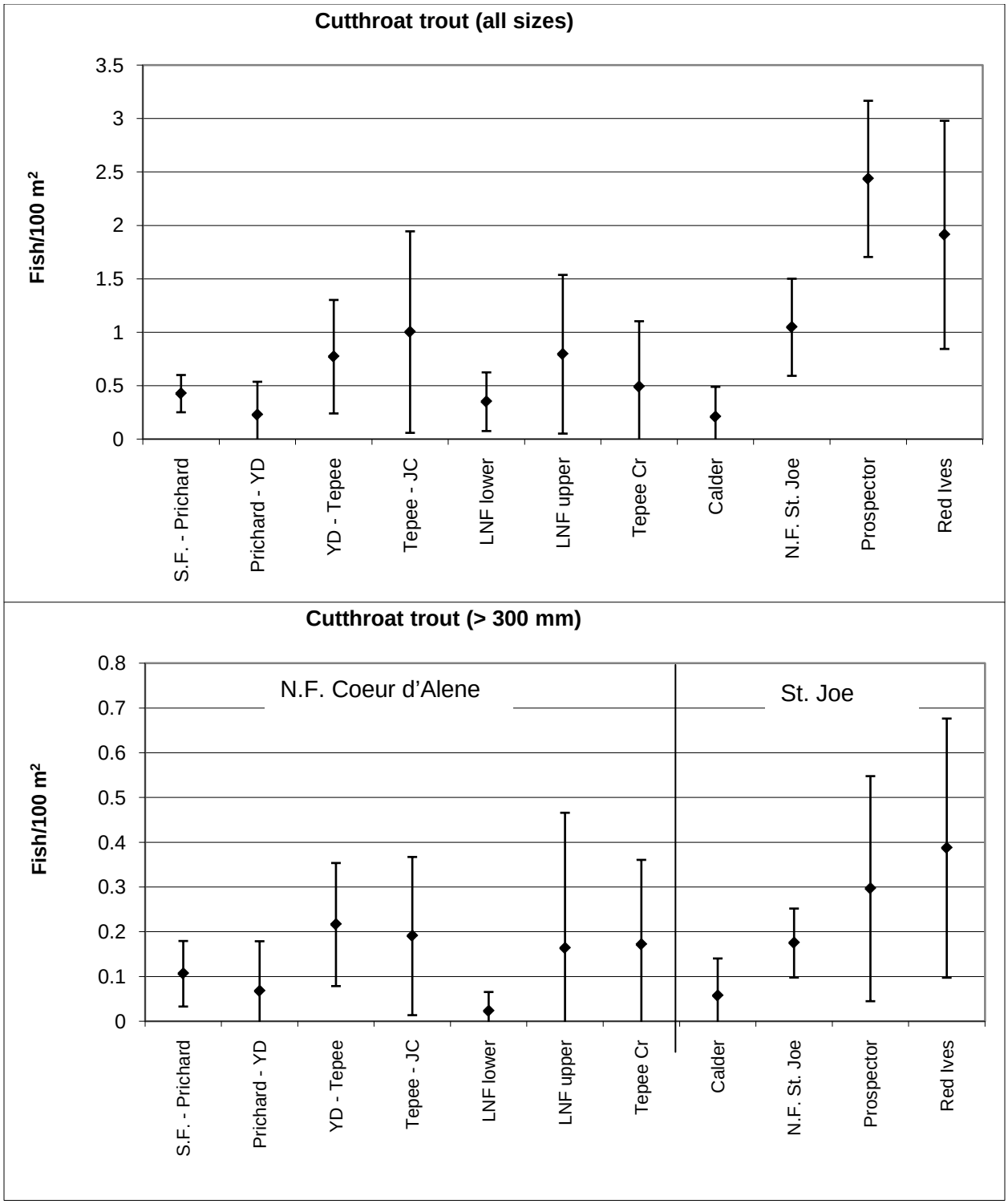


Figure 23. The average cutthroat trout density and 90% confidence intervals (all sizes and only fish ≥ 300 mm) determined from snorkeling seven different reaches in the North Fork Coeur d'Alene River and four different stream reaches in the St. Joe River, Idaho.

Talking to fisherman who fished during this period, it was uncommon to catch a legal sized fish (≥ 330 mm) although you would catch numerous small fish throughout the day (Joe DuPont, IDFG, Personal Communication). So, although the overall catch rate for cutthroat trout increased, it appears the catch rate for fish ≥ 330 mm probably decreased up until 1977.

This analysis shows the importance of being thorough when evaluating trend data. A closer look at this trend data actually portrayed a different picture than was originally claimed to have occurred. Originally, we claimed that the changes in fishing regulations in 1971 improved the cutthroat trout fishery in the St. Joe River. Changes in the fishing regulations were effective in rebuilding and maintaining a wild cutthroat trout population, but it didn't appear to lead to an increase in the abundance of legal sized fish (≥ 330 mm) for the first six years.

It wasn't until after 1977 when we actually started seeing an increase in the density of legal size fish (≥ 330 mm) in the St. Joe River. After 1977, it appeared that densities of smaller (< 300 mm) cutthroat trout had increased to the point that fishermen were not able to crop off all the fish recruiting to a legal size (≥ 330 mm). From 1977 to 1982 densities of cutthroat trout ≥ 300 mm increased steadily from 0.0 to 0.15 fish/100 m^2 and represented 9% of all the cutthroat trout observed during snorkel surveys.

In 1988 major changes occurred to the fishing regulations for the St. Joe River. Upstream of Prospector Creek all cutthroat trout had to be released and downstream of Prospector Creek only 1 fish over 14 inches could be harvested each day. These changes in the fishing regulations didn't lead to increases in the overall density of cutthroat trout in the St. Joe River; however, they did appear to result in significant increases in the density of cutthroat trout ≥ 300 mm. In 1990 the density of cutthroat trout ≥ 300 mm peaked out at 0.57 fish/100 m^2, over a five fold increase from what was observed ten years earlier in 1980. In 1990, 31% of all the fish observed were over 300 mm in length. Densities of cutthroat trout remained near this level until 1997. It appeared that the cutthroat trout population had already reached its carrying capacity and the regulation changes resulted in a more desirable fishery for larger fish, but not increased numbers of fish.

In 1997 and 1998, a dramatic decline in cutthroat trout densities was observed in the St. Joe River. In all likelihood, the decrease in cutthroat trout density in 1998 was a delayed response to the large flood events that occurred during the winter of 1996 and spring of 1997 and not a factor of changes in fishing pressure or a change in fishing regulations. Floods have been found to impact fish populations through increases in bedload movement, changes in channel morphology, silting of spawning gravel and scouring or filling of pools and riffles (Swanston 1991; Pearson et al. 1992; Abbott 2000; DeVries 2000). Large swings in cutthroat trout densities are not uncommon in Idaho rivers and have even been documented in wilderness rivers (Selway & Middle Fork Salmon) where fishing pressure and habitat degradation are usually not issues (Dan Schill, IDFG, Personal Communication). The decline in cutthroat trout abundance following the flood was just as pronounced for cutthroat trout ≥ 300 mm as densities were about four times as high prior to the flood as they were following the flood in 1997.

Densities of cutthroat trout in the St. Joe River have been increasing since the decline that was observed in 1998. In fact, the average density of cutthroat trout (all sizes combined) that were observed in 2003 in the St. Joe River was near what was observed before the floods (1.5 fish/100 m^2). Densities of cutthroat trout ≥ 300 mm increased for the third straight year but were still significantly lower than what was observed before the floods (t-test, $P < 0.05$). Many of the cutthroat trout observed during 2003 were between 250 and 300 mm in length. If survival

of these fish is high through the winter, it should translate into a large increase in the density of cutthroat trout ≥ 300 mm in 2004.

Changes in the fishing regulations for the St. Joe River in 2000 increased the catch-and-release zone by about 20 km so that it extends from the confluence of the North Fork St. Joe River to the headwaters. The remainder of the river was managed with a slot limit where all cutthroat trout between 203 and 406 mm (8 and 16 in) had to be released. Previously fish over 356 mm (14 in) could be harvested. These more restrictive regulations should ensure the recovery of the cutthroat trout population will continue.

The highest densities of cutthroat trout (all size classes and fish ≥ 300 mm) in 2003 were observed upstream of Prospector Creek. This section of river has been catch-and-release since 1988, whereas the section of river between the North Fork and Prospector Creek has been catch-and-release for cutthroat trout since 2000. Differences in fishing regulations may explain some of the reason why differences in densities occur between sections of river. However, more than likely, the reason we see higher densities of cutthroat trout upstream of Prospector Creek is that the upper reaches of the St. Joe River maintain water temperatures throughout the summer that are more suitable to cutthroat trout than occurs downstream of Prospector Creek. Cutthroat trout in the St. Joe River have been documented to move from downstream of the North Fork St. Joe River to upstream of Prospector Creek during the summer primarily in response to temperature increases (Hunt and Bjornn 1992; Fredericks et al. 2002a; Eric Johnson, Parametrics, Personal Communication).

During snorkel surveys, it appeared that more large cutthroat trout were seen where access to the river was difficult. These were areas that involved considerable hiking or climbing down steep rocky slopes to get to the river from the road. The habitat did not appear to differ greatly in stream reaches that had easy access versus difficult access. Probably the greatest difference between these reaches is that sites with easy road access received more fishing pressure. Assuming this is true, these findings suggest that hooking mortality, illegal harvest or a combination of the two are having an impact on the number of larger fish in the St. Joe River in areas with easy road access. Research on the Coeur d'Alene River suggests that areas with easy road access suffer higher levels of illegal fish harvest (DuPont et al. In Prep.).

Coeur d'Alene River

Snorkel surveys in the Coeur d'Alene River basin first occurred in 1973. From 1973 to 1997 an increasing trend in cutthroat trout density (all sizes combined) was apparent in the in Coeur d'Alene River basin. Increases in cutthroat trout densities were believed to occur from a combination of more restrictive fishing regulations, improvements in tributary habitat and reductions in heavy metal mining wastes (DuPont et al. In Press). In 1998, a decline in cutthroat trout densities was observed and by 2000 the density dropped to 33% lower than was observed in 1997. In all likelihood, the decrease in cutthroat trout density in 1998 was a delayed response to the large flood events that occurred during the winter of 1996 and spring of 1997 and not a factor of changes in fishing pressure or a change in fishing regulations. As mentioned before, floods have been found to impact fish populations through increases in bedload movement, changes in channel morphology, silting of spawning gravel and scouring or filling of pools and riffles (Swanston 1991; Pearson et al. 1992; Abbott 2000; DeVries 2000). As of 2003, densities of cutthroat trout had still not rebounded to pre-flood levels. We did record a big spike in cutthroat trout density in 2001 that we can't explain. Unusual spikes or dips in fish densities such as this may be explained by observer error. New or untrained observers can often lead to misleading results, although we are not sure if this was the case.

The post flood decline in cutthroat trout density was not observed in Tepee Creek or the Little North Fork Coeur d'Alene River. It's unclear why we did not see declines in these streams following the flood. One possibility is that floods have the ability to change habitat in a positive way for fish through introductions of large woody debris and creation or deepening of pools through scour action (Andersen and Faler 1998, Nakamura and Swanson 2003). Another possibility is survival of cutthroat trout was not significantly effected by the winter flood in Tepee Creek or the Little North Fork Coeur d'Alene River. Both Tepee Creek and the Little North Fork Coeur d'Alene River have areas where wide floodplains are present. Recent telemetry work on cutthroat trout in Tepee Creek and the Little North Fork Coeur d'Alene River showed that during winter, the fish moved to stream reaches where these floodplains occurred (DuPont et al. In Prep). These wide floodplains provide cutthroat trout areas of refugia during severe winter flood events when cutthroat trout are believed to be most vulnerable to extreme flow conditions (Jakober 1995; Giberson and Caissie 1998). We are unsure at this time whether Tepee Creek and the Little North Fork Coeur d'Alene River have more floodplain habitat than other areas of the Coeur d'Alene River where noticeable declines in cutthroat trout density occurred.

Snorkel surveys in the Coeur d'Alene River showed quite a different pattern if we only evaluate cutthroat trout ≥ 300 mm in length. Densities increased from 1973 to 1980, but from 1980 to 2002 no apparent increase or decrease in density was observed. Several theories may explain why densities of cutthroat trout ≥ 300 mm were not increasing in the Coeur d'Alene River whereas juvenile fish densities were: 1) Habitat for juvenile trout (tributary habitat) was improving whereas habitat important for larger cutthroat trout (deep, slow velocity pools) was not; 2) High incidental mortality and/or poaching is cropping off the larger fish; 3) As cutthroat trout in the Coeur d'Alene River increase in size, they move downstream or upstream to areas where snorkel transects are not located; 4) A large proportion of this cutthroat trout population is made up of adfluvial fish – the larger fish would therefore have migrated down to the lake by the time the snorkeling was conducted; and 5) Some combination of the above. A telemetry study on cutthroat trout in the Coeur d'Alene River Basin was completed in 2004 to help answer these questions (DuPont et al., In Prep.). Preliminary finding from this study suggest that high fishing mortality (legal and illegal), grouping of fish in areas with cold water refugia and habitat availability may all help explain why increases in the density of cutthroat trout ≥ 300 mm were not observed during snorkel surveys while juvenile fish densities were.

Little North Fork Clearwater River

During 2003 we observed the highest density of cutthroat trout ≥ 300 mm in both the North Fork Coeur d'Alene and Little North Fork Coeur d'Alene rivers since these transects were first snorkeled in 1973. These findings are very promising and may suggest that survival of larger cutthroat trout is improving. A series of mild winters (2000-2003) and a lack of winter rain-on-snow events may have increased survival of these larger adult fish. Future surveys will indicate whether this increase in the number of large cutthroat trout is a temporary or long-term trend.

The highest densities of cutthroat trout in the Coeur d'Alene River were observed in the catch-and-release areas upstream of Yellow Dog Creek and in the Little North Fork Coeur d'Alene River upstream of Laverne Creek. It was unclear whether these higher densities were primarily a result of lower fishing mortality or differences in habitat condition. Habitat work in the Coeur d'Alene River by Hunt and Bjornn (1995) found a greater percentage of pool and run habitat occurred upstream of Yellow Dog Creek than downstream of it. Studies in the St. Joe River (Hunt and Bjornn 1992; Fredericks et al. 2002a) found that cutthroat trout tend to move

upstream during summer, likely in search of cooler water temperatures. However, an ongoing telemetry study in the Coeur d'Alene River basin found that many cutthroat migrated downstream of catch-and-release areas after spawning and did not migrate upstream during warm summer months (DuPont et al., In Prep.). In addition, Fredericks et al. (2002b) and Fredericks et al. (2003) estimated the number of cutthroat trout > 100 mm downstream of the South Fork Coeur d'Alene River to range between 521 and 444 fish/km. About half of these fish were over 250 mm. Although these studies were conducted in late May to early June, recaptured fish from this study and results from the telemetry study (DuPont et al., In Prep.) indicate they remain in the lower river throughout the summer. These findings indicated that high numbers of cutthroat trout utilized the lower reaches of the Coeur d'Alene River throughout the summer unlike what occurs in the St. Joe River.

It is believed that angling pressure has increased on the Coeur d'Alene River, and it is likely that fishing mortality on cutthroat trout is having an impact on areas where limited harvest is allowed (downstream of Yellow Dog Creek and Laverne Creek). New fishing regulations implemented in 2000 (release all cutthroat trout between 8 and 16 inches where previously fish over 14 inches could be harvested) should limit the impacts that fishing would have on this fishery. Our snorkeling surveys showed that 7.0% of the fish in the catch-and-release area are > 381 mm (15 in) whereas 5% of the fish in the limited harvest areas were > 381 mm. This difference in abundance is small suggesting that these larger fish were not being cropped off in the limited harvest areas. On the flip side, findings from a telemetry study conducted in 2003-2004 on cutthroat trout ≥ 300 mm) in the Coeur d'Alene River suggests that fishing mortality (both legal and illegal) may be suppressing cutthroat trout abundance downstream of Prichard Creek where access is high (paved road on both sides of the river) and a harvest fishery was traditionally provided by stocking rainbow trout.

Increases in fishing pressure could result in increased compliance with fishing regulations through self-policing. Lewynsky (1986) believed non-compliance helped explain why cutthroat trout densities did not increase in the Coeur d'Alene River after more restrictive fishing regulations were applied in 1975.

The telemetry study completed on cutthroat trout ≥ 300 mm in 2004 in the Coeur d'Alene River suggests that larger cutthroat trout are grouping in areas where colder water occurs (DuPont et al. In Prep.). One of these areas where fish concentrated during the heat of the summer was located at snorkel transect NF01-slough. The highest density of cutthroat trout in all the transects snorkeled in the entire Coeur d'Alene River basin was observed at this particular site (2.34 fish/100 m^2). The summer of 2003 was unusually hot, which may have caused more fish to seek out these cold water refugia and helps explain why such a high variance in fish density was observed in the lower North Fork Coeur d'Alene River.

St. Joe River versus the Coeur d'Alene River

From 1993 to 1997 cutthroat trout densities were two to three times higher in the St. Joe River than what was observed in the Coeur d'Alene River. However, after the flood and higher water events in 1996 and 1997, dramatic drops in cutthroat trout densities were observed. Declines in density were much greater in the St. Joe River than in the Coeur d'Alene River. We believe the reason the decline was greater in the St. Joe River has to do with the difference in geomorphology. The St. Joe River has a steeper gradient and the river is more confined between the side walls with little to no floodplain. During flood events on the St. Joe River, there are few areas for the river to spread out and, and consequently, the water picks up speed and energy. If a flood event occurs during the winter when cutthroat trout are struggling to

conserve their energy and there are few areas to get away from these high flows, the mortality of these fish can be quite significant. The flood in 1996 did occur during the winter. The Coeur d'Alene River has many areas with wide floodplains where flood water can spread out, reducing it's energy. These floodplains provide refugia where fish can avoid fast, turbulent water that will quickly rob them of their winter energy reserves.

In 1998, the overall densities of cutthroat trout observed in the snorkel transects in the St. Joe River and Coeur d'Alene River were very similar (0.50 vs. 0.49 fish/100 m2). Every year since then the density of cutthroat trout in the St. Joe River has improved faster than the Coeur d'Alene River and is beginning to approach what we observed before the floods when densities were typically two to three times higher in the St. Joe River. The faster recovery of cutthroat trout in the St. Joe River indicates that factors such as reduced habitat quality and fishing mortality are suppressing the cutthroat trout numbers in the Coeur d'Alene River.

When we evaluated the overall density of cutthroat trout ≥ 300 mm observed the St. Joe River (0.13 fish/100 m^2) it was about the same as we observed in the Coeur d'Alene River (0.12 fish/ 100 m^2). This information is somewhat surprising as many have claimed that the fishing is much better in the St. Joe River than the Coeur d'Alene River. Probably the reason for these comments is the cutthroat trout in the St. Joe River are congregated upstream of Prospector Creek where most people fish, whereas the cutthroat trout in the Coeur d'Alene River are more uniformly distributed throughout the basin. It would probably be more appropriate to state that there are areas in the St. Joe River where the fishing is much better than in the Coeur d'Alene River. Based on our snorkel surveys, fishing for cutthroat trout in the St. Joe River downstream of Avery would be worse than most locations in the Coeur d'Alene River basin. In 2003 many of the cutthroat trout we observed in the St. Joe River were between 250 and 300 mm in length. If survival of these fish is high the density of larger fish (≥ 300 mm) should increase significantly in 2004.

Mountain Whitefish

Our snorkel surveys showed that mountain whitefish densities had remained fairly steady in the St. Joe River from 1969 until 1997 when a fairly significant decline was documented. In all likelihood, the decrease in mountain whitefish densities in 1997 was a response to the large flood events that occurred during 1996 and 1997. Since these flood events, mountain whitefish densities have rebounded and are now above what we observed pre-flood. The series of mild winters from 1998 to 2003 likely played a large role in this rapid recovery. In addition, bag limits for mountain whitefish were reduced from 50 fish to 25 fish in 2000, which may also have helped speed up the recovery of this fishery.

Based on our snorkel surveys, the density of mountain whitefish in the Coeur d'Alene River had gone through a series of ups and downs since 1973. Unstable habitat coupled with large amounts of bedload movement may have played a role in these cycles. A significant decline in mountain whitefish density in the Coeur d'Alene River was also observed following the 1996 flood, although densities rebounded within a couple years. The average whitefish density for the Coeur d'Alene River in 2003 was near a record high.

Snorkel observations indicated that mountain whitefish were about twice as abundant in the Coeur d'Alene River as occurs in the St. Joe River during 2003. Most mountain whitefish in the North Fork of the Coeur d'Alene River were observed in the large, deep pools and runs in the lower section of river. Interestingly, the lowest densities of mountain whitefish in the St. Joe

River were observed in the lower St. Joe River (downstream of the North Fork) where the deepest slowest pools occurred. We are unsure of why these differences occurred.

Rainbow Trout

Rainbow trout were observed in the most downstream reaches of the St. Joe River (Transects 29-35) and North Fork Coeur d'Alene River (Transects NF1-9) and throughout the entire Little North Fork Coeur d'Alene River. Rainbow trout were not stocked into any rivers or streams in the Panhandle Region during 2003. Consequently, these fish were either holdovers from earlier stockings or are offspring from natural reproduction.

In the St. Joe River, only 13 rainbow trout were observed and indicate very little natural reproduction and overwinter survival is occurring. In the Coeur d'Alene River rainbow trout densities are about the same as cutthroat trout densities in first nine transects (most downstream) of the North Fork Coeur d'Alene River and first 10 transects of the Little North Fork Coeur d'Alene River. Based on past snorkel surveys and other work conducted in the Coeur d'Alene River it appears that a natural reproducing rainbow trout population exists in the North Fork Coeur d'Alene downstream of Shoshone Creek and downstream of Laverne Creek in the Little North Fork Coeur d'Alene River. The apparent difference in survival of rainbow trout in the St. Joe River versus the Coeur d'Alene River probably has to do with the difference in the two river's geomorphology. As mentioned earlier, the St. Joe River is more canyon-like, has a steeper grade and fewer floodplain areas than occurs in the Coeur d'Alene River. Consequently, for rainbow trout to survive throughout a year in the St. Joe River they would have to go through a more complex migration than they would in the Coeur d'Alene. Many cutthroat trout that spend the summer upstream of Avery in the St. Joe River migrate over 30 km downstream to overwinter near Calder where the river is slower, deeper and has a wider floodplain (Hunt and Bjornn 1992; Fredericks et al. 2002). Cutthroat trout evolved over thousands of year to adapt to this type of migration in the St. Joe River to maximize their survival. Introduced rainbow trout in the St. Joe River don't have this adaptation and this helps explain why they are not found upstream of Avery.

Based on a recent telemetry study (DuPont et al. In Prep.), overwinter habitat is much more abundant in the Coeur d'Alene River basin than the St. Joe River. Consequently, trout do not have to make large migrations in the Coeur d'Alene River to access quality spawning, summer and winter habitat. This would make it much easier for introduced rainbow trout to survive throughout a year and helps explain why they are more abundant in the Coeur d'Alene River than the St. Joe River.

The stream reaches in the Coeur d'Alene River with the lowest cutthroat trout densities (lower North Fork and lower Little North Fork) had the highest densities of rainbow trout. If we combine the densities of these two species, the average trout density in the limited harvest reaches is not far below what we see in the catch-and-release areas (0.66 fish/100m^2 vs. 0.78 fish/100 m^2 in the North Fork and 0.57 fish/100m^2 vs. 0.69 fish/100m^2 in the Little North Fork). We are unsure if rainbow trout are limiting cutthroat trout numbers in the lower river reaches. Rainbow trout have been known to outcompete and hybridize with cutthroat trout in many rivers (Behnke 1992). Past snorkel surveys indicate that rainbow trout numbers are not increasing in the Coeur d'Alene River whereas cutthroat trout numbers are. Continual monitoring of this fishery should reveal population trends in rainbow trout and their potential impact on cutthroat trout in the lower North Fork and Little North Fork Coeur d'Alene rivers.

RECOMMENDATIONS

1. Continue to monitor cutthroat trout abundance in the St. Joe and Coeur d'Alene Rivers through snorkel surveys.

2. Evaluate fishing mortality of cutthroat trout in the North Fork Coeur d'Alene River using reward tags.

3. Assess whether rainbow trout are having an impact on cutthroat trout in the Coeur d'Alene River.

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2003 ANNUAL PERFORMANCE REPORT

State of:	Idaho	Program:	Fisheries Management F-71-R-28
Project:	I-Surveys and Inventories	Subproject:	I-A Panhandle Region
Job No.:	c-3	Title:	Rivers and Streams Investigations Middle Fork East River Bull Trout Assessment

Contract Period: January 1, 2002 to December 31, 2003

ABSTRACT

Based on our electrofishing efforts in the Middle Fork East River basin during 2002, 2001 and 1986, it appears that juvenile bull trout *Salvelinus confluentus* rear in about 8 km of stream, with the majority of use occurring in about 3 km of stream. Brook trout *S. fontinalis* are in sympatry with bull trout in all these stream reaches except for Uleda Creek (0.6 km reach) where the highest bull trout densities were found. The highest brook trout densities tend to occur in the lower reaches of the Middle Fork East River and in the smaller tributaries – areas where few or no bull trout occur. The presence of brook trout in this system is a concern as brook trout have been found to displace bull trout through hybridization and competition.

Stream temperature may play a role in the distribution of bull trout and brook trout in the Middle Fork East River. Uleda Creek, which supports the highest density of bull trout and does not support brook trout, was the only stream reach we evaluated where the daily average temperature did not exceed 10°C. Many of the surrounding streams had daily average water temperatures only 1°C warmer than Uleda Creek, and brook trout were present. Tarlac Creek, which is about 1°C warmer than Uleda Creek, was dominated by bull trout in 1986 and now has only brook trout.

During our electrofishing survey we identified a man made barrier in Uleda Creek about 0.6 km upstream from its mouth. Uleda Creek appears to be the most important stream in the Middle Fork East River to rearing bull trout. Removing this barrier would increase the amount of habitat available to bull trout by at about 4 km. Based on these findings, the Idaho Department of Lands removed this barrier in August 2004.

Twenty radio transmitters were surgically inserted in bull trout (400-752 mm in length) located in Middle Fork East River and attempts were made to to evaluate their movement and habitat use on a weekly basis. Based on our tracking results, bull trout from the Middle Fork East River have an adfluvial life cycle where the adults migrate to either Pend Oreille Lake or Pend Oreille River. Movement patterns in the Middle Fork East River basin can be characterized by little movement the month prior to spawning (no fish moved more than 1 km), followed by increased movement during the spawning period (several fish moved over 6 km). Following spawning, a gradual downstream movement was documented with most fish congregating in beaver ponds. Only three bull trout were found to migrate out of East River prior to November, which may be due to the absence of fall rains. Within the Middle Fork East River, the radio tagged bull trout were found associated with various forms of cover including large organic debris, boulder, undercut stream banks, overhead cover and pools. One ½ km

section of stream that appears to be avoided by the radio tagged bull trout was absent of large woody debris.

In an effort to save the radio tagged bull trout in the East River the four remaining fish were trapped and transported downstream to Priest River on December 9th, 2003. Once in the Priest River, all four fish moved rapidly to the Pend Oreille River making a 17 km migration in 12-24 hours. Two of the fish continued on to Pend Oreille Lake migrating 26 km upstream in one to two days. During late May, two of the fish from Pend Oreille Lake migrated back to Priest River migrating 26 km downstream in 15 to 40 hrs. These two fish and one other fish that over-wintered in the Pend Oreille River returned to the Middle Fork East River in 2003. Two other fish were believed to stay in Pend Oreille Lake throughout the summer.

Between October 3 and November 13, 2002 we documented 11 different dead bull trout in the Middle Fork East River. One to three other bull trout died in the Priest River bringing the post-spawn mortality to 60-70%. This mortality rate is not unusual for post-spawn bull trout, especially for the low water conditions these fish encountered during the fall of 2002. The death of these bull trout is believed to be from natural causes (post-spawn stress, lack of feed and predation), although we can not rule out poaching. Throughout the one year period of this study 13 to 15 of the bull trout that were radio tagged died, bringing their annual morality rate to 65-75%.

Bull trout were observed spawning in the Middle Fork East River and Uleda Creek from late August to Mid September during 2002. Through redd surveys, we identified 12 bull trout redds, with most being located in Uleda Creek and the Middle Fork East River between Uleda Creek and Tarlac Creek. Based the number of redds observed, electrofishing results and observations made during radio tracking, it appears that the bull trout spawning escapement for the Middle Fork East River was between 30 and 40 fish during 2002.

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INTRODUCTION

The Middle Fork East River (MFER) is the only tributary of Priest River that is known to support a bull trout *Salvelinus confluentus* population. Robertson and Horner (1987) first reported this bull trout population in 1986 and found them to occur throughout much of the MFER. Adults up to 541 mm were sampled during this survey, indicating that at least some this population had an adfluvial or fluvial life cycle. The MFER was electrofished in 2000 (Idaho Department of Lands 2000a) and 2001 (DuPont and Horner, In Press a; Rothrock 2003) to evaluate the status of the fishery. Based on these findings, the bull trout population still existed, although its distribution appeared to have diminished. One tributary was found to still support high densities of bull trout (> 10/100 m^2), with adults ranging up to 700 mm in length.

The bull trout that utilize MFER have a couple attributes that make them unique from other populations in the Idaho Panhandle. First, this population is relatively isolated. This population appears to use about 10 km of the MFER for spawning and rearing and no other bull trout population is know to occur within 50 stream km of this population. Second, it is believed their life history includes a fluvial life cycle or an adfluvial life cycle where the fish must swim downstream from a lake (either Pend Oreille Lake or Priest Lake) before they turn upstream into the East River to spawn (Figure 24). No other bull trout population in the Pend Oreille River basin of Idaho is known to have either of these life cycles.

The MFER watershed has been managed intensively for timber for nearly a century. Road densities exceed 5 miles/$mile^2$ within the watershed; the main haul road parallels the MFER; and several historic clearcuts encompassed sections of the river as well as some of the major tributaries (Panhandle Bull Trout Technical Advisory Team 1998). Intensive timber management will continue in the watershed, although efforts are being made to close roads. The impact timber management has had on this bull trout population is unknown.

The invasion or introduction of exotic fish into the MFER may also have impacted this bull trout population. The MFER supports what appears to be a thriving brook trout *Salvelinus fontinalis* population. Based on electrofishing findings during 2001, brook trout appear to be increasing in numbers and expanding their range and may have displaced bull trout (out competed and/or hybridized with) from some of the tributaries (DuPont and Horner, In Press a). The Idaho Department of Fish and Game introduced brown trout *Salmo trutta* into this system in 1976 and 1978 and they currently utilize the lower reaches of the MFER. The impact brown trout have on this bull trout population is unknown, although introductions of brown trout have been associated with the decline of bull trout populations (Mullan et al. 1992; Rieman and McIntyre 1993).

Despite invasions by brook trout, introductions of brown trout, and intensive timber management within this watershed, bull trout have managed to persist in the MFER. These risks, coupled with the uniqueness of this population and the small area they occupy puts this population at risk of extinction. A radio-telemetry study would help us to better understand the movement patterns and habitat use of this bull trout population to help ensure that proper actions are taken in the future to protect and restore it.

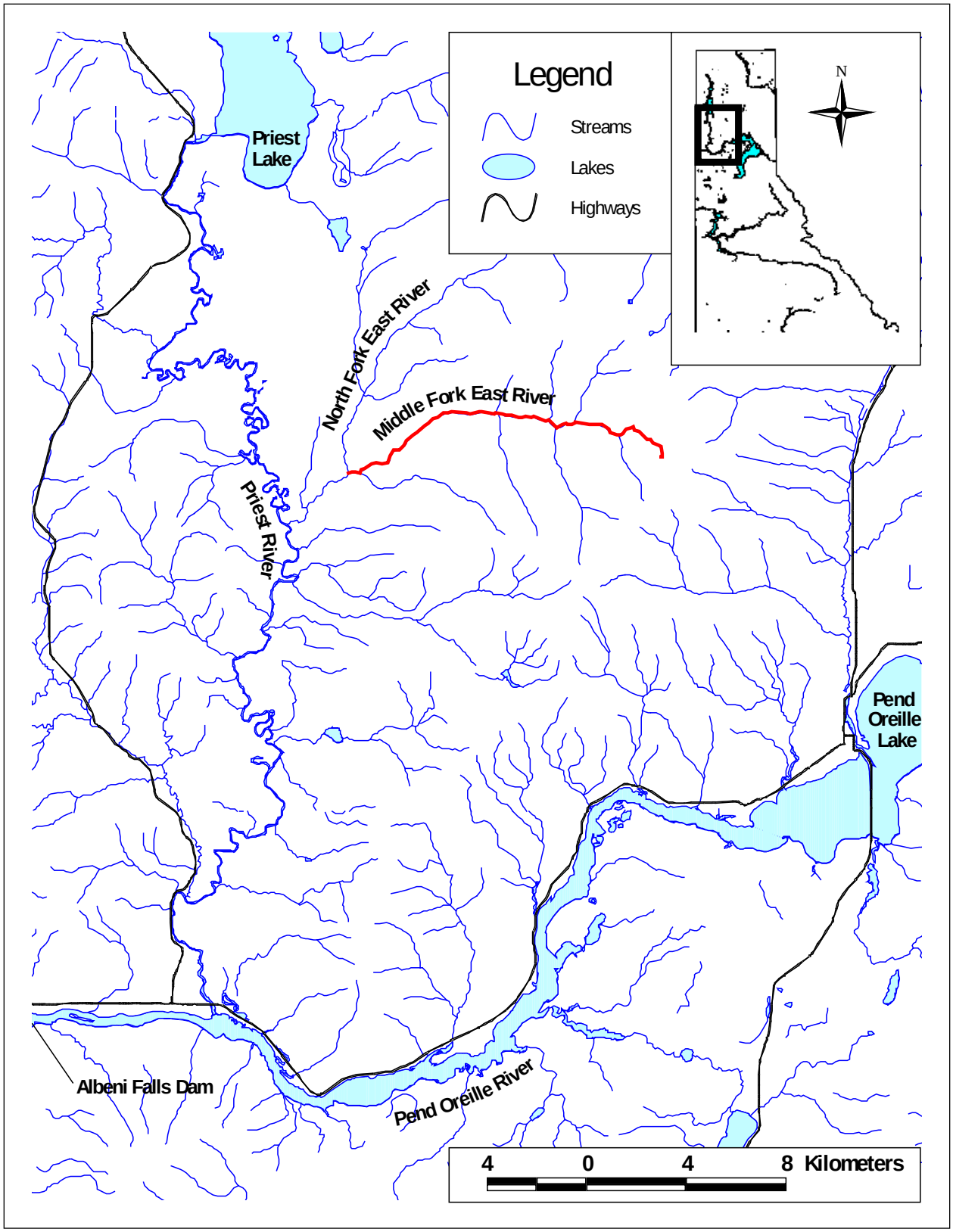


Figure 24. Location of the Middle Fork East River, Idaho.

STUDY SITES

The Middle Fork East River is located in the Panhandle of Idaho (Figure 1). This small river occurs in a watershed about 8,750 ha in size and flows about 15 km from the headwaters to where it joins the North Fork East River to form the East River. The East River flows about 4 km to where it enters the Priest River. Priest Lake is located about 37 river km upstream from this confluence and the Pend Oreille River is located about 34 river km downstream. A dam (operated by AVISTA Corp.) is located at the outlet of Priest Lake and is believed to be a barrier to fish passage the majority of the time. Albeni Falls Dam (operated by the Corps of Engineers) is located about 7 river km downstream of the confluence of the Pend Oreille River and Priest River and is a permanent barrier to fish passage. Pend Oreille Lake is located about 37 river km upstream of the confluence of the Pend Oreille River and Priest River and no barriers to fish migration exists between these points.

The MFER is about 6-8 m wide near the mouth and about 3 m wide near the upstream limits of where bull trout have been identified. The stream grade near the mouth of the MFER is about 2-4%, hardwoods dominated the riparian vegetation, and beaver ponds are common. As you move upstream, especially in the areas where bull trout are located, the gradient increases (> 4%), the riparian area becomes dominated by conifers and beaver activity is uncommon. Major tributaries of the MFER include, Tarlac Creek, Chicopee Creek, Uleda Creek and Keokee Creek. The gradient in these streams is typically > 6% and conifers dominate the riparian area.

About 90% of the MFER watershed occurs on land managed by Idaho Department of Lands. The remaining 10% is private and U.S. Forest Service. The majority of this watershed is timbered and only small clearings occur because of fires, logging and rock outcrops. The land surrounding the East River is mostly private. Logging, grazing and clearing for development has impacted this area. The East River is currently considered a water quality limited stream and is on the States 303(d) list.

OBJECTIVES

1. Assess the distribution of bull trout and brook trout in the Middle Fork East River.

2. Determine movement and habitat use of adult bull trout captured from Middle Fork East River.

3. Evaluate what influence stream temperature has on bull trout distribution and movement.

4. Conduct bull trout redd counts and estimate the spawning escapement on the Middle Fork East River.

METHODS

Bull Trout and Brook Trout Distribution

To collect bull trout for our radio telemetry study we electrofished those areas where past surveys indicated the highest densities of bull trout would occur (Tarlac Creek to Uleda Creek). We also electrofished upstream and downstream of this area to better evaluate the distribution of juvenile bull trout and brook trout. Electrofishing was conducted using a Smith-

Root SR 15 backpack electrofisher and a three-person crew. While electrofishing, we periodically collected and measured all fish we captured over a known stream length to help evaluate fish densities and the size distribution of fish.

Our fish distribution data was combined with past studies (Robertson and Horner 1987; DuPont and Horner, In Press a) to help determine where the primary bull trout rearing areas were as well as maximum upstream and downstream use areas of bull trout and brook trout. While electrofishing we also recorded where potential barriers to fish migration occurred and documented whether bull trout or brook trout were located above these places.

Movement and Mortality

To determine movement of bull trout we placed radio transmitters inside all adult bull trout captured through our electrofishing efforts. Captured adult bull trout were placed in a "V" shaped cradle constructed out of a rubberized wire mesh and a wood frame. The cradle was designed so that when it was placed in a tub filled with water, the fish's gills would be submerged, and its abdomen would be out of water. This would allow the fish to breath while we inserted the radio transmitter through a 20-30 mm incision placed in its abdomen. The radio transmitter was inserted in the fish using a modification of the shielded needle technique (Ross and Kleiner 1982; Rich 1992). Three to four interrupted stitches using a ½ curved needle and 2-0 chromic gut suture were used to close the incision. Betadyne was rubbed over the incision area and at the antenna exit site both before and after the surgery. During surgery, we used sterile rubber gloves, or our hands were rubbed down with betadyne.

No anesthetic was used during the surgery, as once upside down, the fish would remain stationary through the entire process. The key to using this strategy is ensuring the gills are submerged in water. Because no anesthetic was used, the bull trout were released back to the same place they were captured immediately after surgery.

The transmitters placed into the bull trout were pulsed radio transmitters (Lotek model MBFT-5, 8.9 g air, 4.3 g water, 25.8 bpm) that had a life expectancy 294 days. The weight of the transmitter did not exceed 2% of the body weight of the bull trout based on recommendations from Winter (1983). Using the 2% rule we could put transmitters in bull trout down to 445 g in weight and this rule was not violated.

After the bull trout were released back to the stream, attempts were made to track each fish once a week. Fish were tracked on ground (car, foot and raft) using an SRX-400 Lotek receiver with an "H" antennae. With a little practice we were able to track fish to their exact location. Often, the fish we were tracking were visually identified. The coordinates of where each of the bull trout were located were recorded with a Global Positioning Unit (Garmin Map76S). The Global Positioning Units also recorded the elevation and time. When the Global Positioning Units could not communicate with a sufficient number of satellites to record a fish's location, we marked the location down on a U.S.G.S. topographic map.

We set up a fixed receiving station just upstream from the mouth of Priest River. This fixed station would tell us if and when bull migrated to the Pend Oreille River. Battelle, a consulting firm that is evaluating entrainment of bull trout over Albeni Falls Dam, also set up fixed stations at Albeni Falls Dam and Dover (7 km downstream of Pend Oreille Lake). The combination of these fixed sites enabled us to determine whether fish that enter the Pend Oreille River go downstream over the dam, upstream to the lake or stay in the river. Each station consisted of an SRX-400 radio receiver connected to aerial Yagi antennas. The

receivers were supplied with either AC or DC power, and solar panels were used to recharge the DC power systems. To aide the ground radio tracking and recordings at the fixed stations, Battelle conducted occasional aerial surveys for fish that entered Priest River or Pend Oreille River.

Habitat Use

Habitat characteristics were recorded each time a radio tagged bull trout was accurately located in the MFER. Our ability to track these fish to their exact location allowed us to accurately describe the depth, temperature, type of cover, and habitat type (pool, riffle, run) they occurred in. We originally planned to collect velocity measurements, but many of the bull trout were located in log jams and under boulders making this measurement impossible to take. Habitat use was summarized temporally (pre-spawn, spawn, post spawn and overwinter) to evaluate whether certain attributes were selected during different periods of these fish's lives. Once these fish left the East River we did not collect detailed habitat characteristics because of our inability to identify their exact location.

Temperature Effects

We collected hourly temperatures at five locations on the MFER (Figure 25) to help determine if water temperature played a role in fish distribution or movement. Stream temperatures were collected with Onset Tidbit Temperature Loggers. These temperature loggers were placed on the stream bottom, in shaded areas, where we believed the stream would flow year round. Temperature loggers were housed in 50 mm sections of 32 mm (1 ¼ in) copper pipe to protect them from debris and moving substrate.

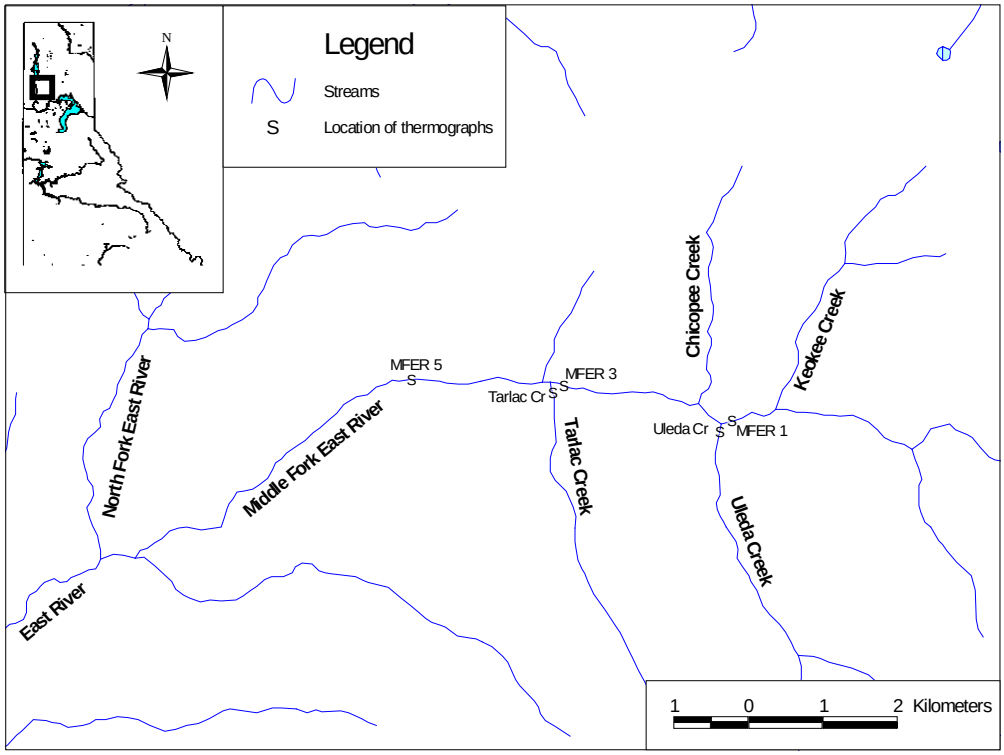


Figure 25. Locations where thermographs were placed in the Middle Fork East River basin during 2002.

Bull Trout Spawning Surveys

All areas of the East River drainage where we believed bull trout may spawn were walked in mid October to evaluate if any spawning activity had occurred (presence of redds). Survey techniques and identification of bull trout redds followed the methodology described by Pratt (1984). Research has demonstrated the level of observer training and experience may influence the accuracy of redd counts (Bonneau and LaBar 1997; Dunham et al. 2001). To reduce observer variability in bull trout redd counts, only individuals who attended a bull trout redd count training exercise on September 23, 2002 were used to count redds in the MFER. The location of redds were recorded on maps and/or GPS units during redd counts. Any redds smaller than 500 mm in diameter were considered to be constructed by brook trout or small brown trout. To verify if redds were made by bull trout or large brown trout, we overlayed the location of where the radio tagged bull trout were during the spawning season with redd locations. Redds that occurred outside known bull trout locations were considered to be made by brown trout. We estimated the abundance of adult bull trout spawners entering each drainage by applying a low estimate of 2.2 fish/redd (Bonar et al. 1997) and an upper estimate of 3.2 fish/redd (Fraley and Shepherd 1998) to the total number of redds observed.

Genetics

To evaluate whether MFER bull trout were hybridizing with brook trout and to help determine their similarity with fish from Pend Oreille Lake and Priest Lake, we took tissue samples from fish we collected for genetic analysis. A small section of fin (the size of an eraser head) was collected from 50 bull trout located throughout all surveyed transects. Fin clips were placed in vials with a 95% ethanol preservative. All fin clips were labeled with the suspected species they came from, the date they were sampled, the length of the fish and where they were sampled. These samples were stored until genetic analysis could occur.

RESULTS

Bull Trout and Brook Trout Distribution

We electrofished the Middle Fork East River during August 14-16, 2002 to capture adult bull trout to surgically insert radio transmitters in. During this survey we periodically collected and measured all fish we electrofished. Through this periodic sampling, we captured 24 bull trout, 13 brook trout, nine cutthroat trout *Oncorhynchus clarkii*, one brown trout and 18 slimy sculpin *Cottus cognatus*. We also sampled what appeared to be two bull trout/brook trout hybrids. Most of these fish ranged between 40 and 270 mm, although three adult bull trout were captured that were over 540 mm in length (Figure 26). The sizes of bull trout we captured indicate there are four age classes of juvenile fish and at least three age classes of adult fish.

Based on our electrofishing efforts during 2002, 2001 and 1986, it appeared that juvenile bull trout reared in about 8 km of stream in the MFER basin, with the majority of use occurring in about 3 km of stream (Figure 27). Brook trout were in sympatry with bull trout in all these stream reaches except for Uleda Creek (0.6 km reach) where the highest bull trout densities were found. The highest brook trout densities tended to occur in the lower reaches of the MFER and in the smaller tributaries – areas where few or no bull trout occurred.

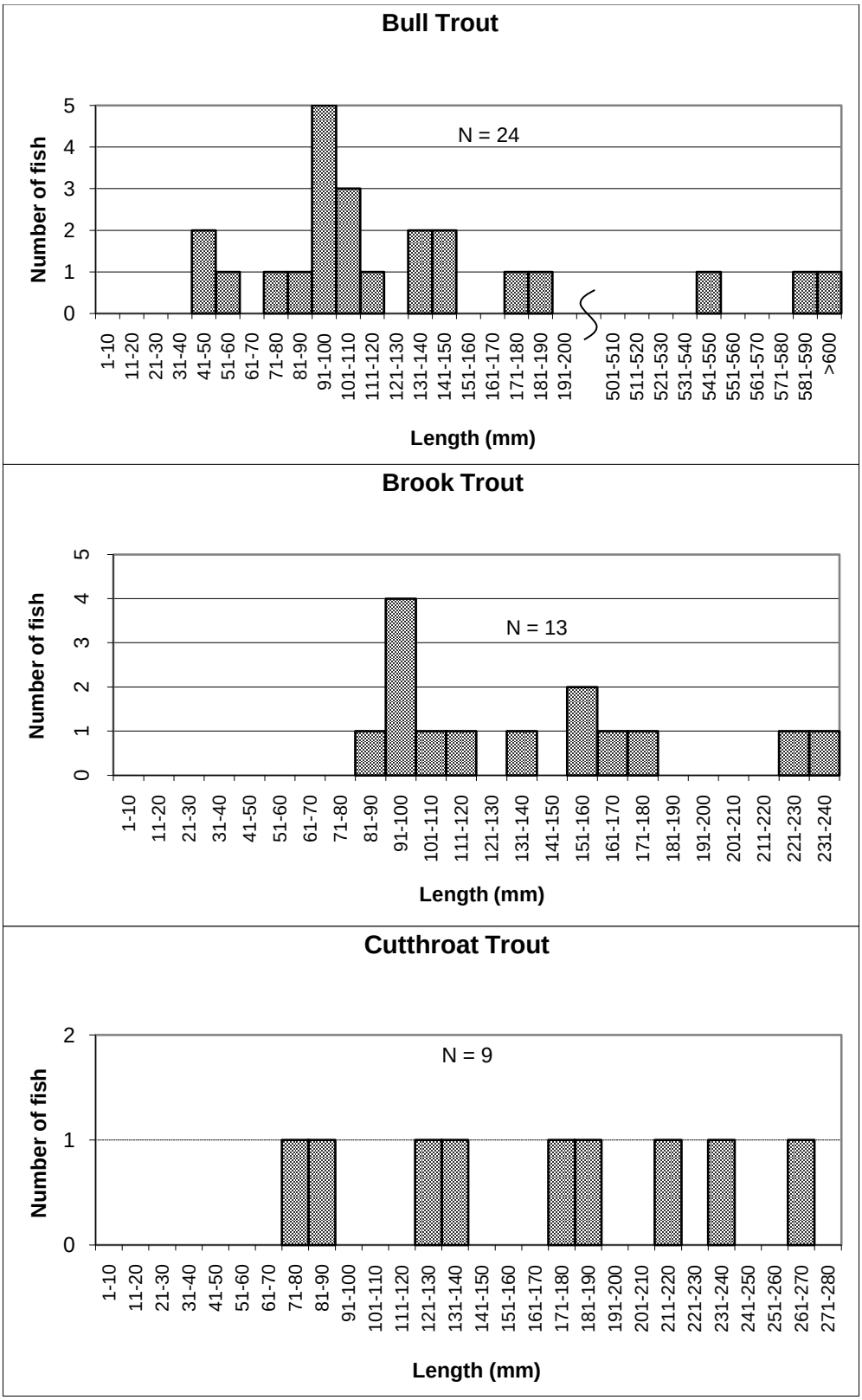
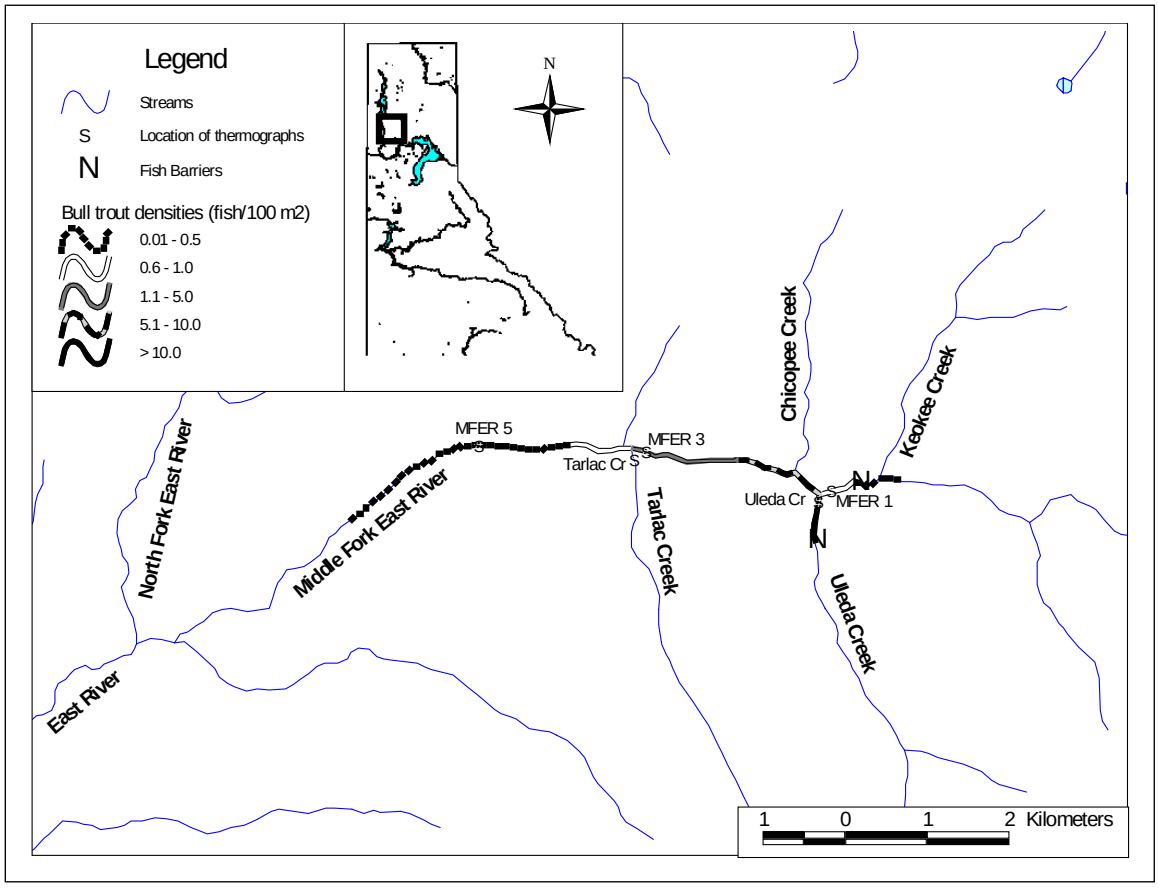


Figure 26. Length frequency histogram of bull trout, brook trout and cutthroat trout collected by electrofishing the Middle Fork East River, Idaho, during August 14-16, 2002.



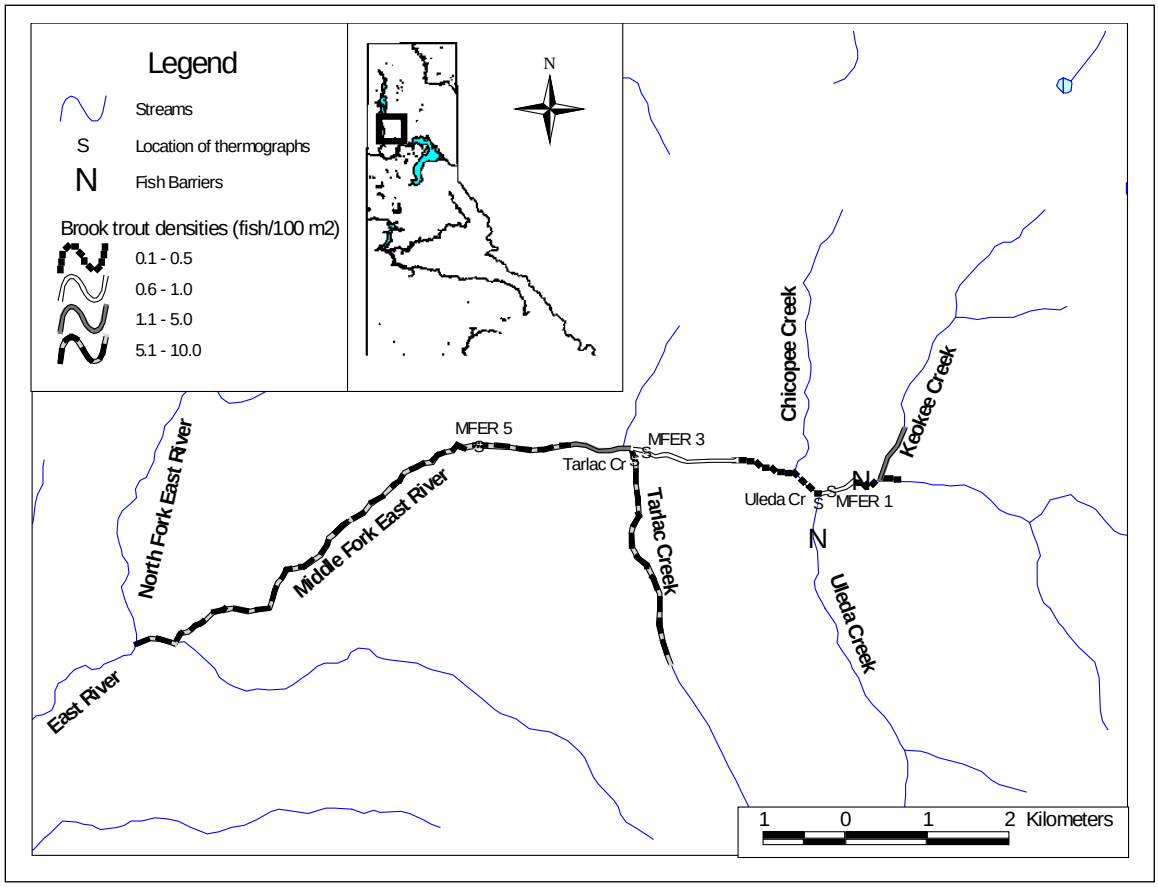


Figure 27. Estimated distribution and density of bull trout and brook trout in the Middle Fork East River, Idaho, based on sampling during 1986, 2001 and 2002.

Table 1. Water temperature collected from various sites in the Middle Fork East River, Idaho from August 16, 2002 to November 18, 2002.

Temperature variable	MFER 1	Uleda Cr	MFER 3	Tarlac Cr	MFER 5
Maximum instantaneous	11.2	10.6	11.3	11.4	12.5
7-day maximum instantaneous	11.1	10.3	11.2	11.1	12.2
Maximum daily average	10.6	9.8	10.9	10.8	11.4
7-day maximum daily average	10.3	9.5	10.6	10.6	11.2

Uleda Creek, the only stream reach where bull trout and no brook trout were found to occur, had the coldest water temperature of the different sites we monitored (Table 1 and Figure 28). Bull trout and brook trout densities were similar at the MFER 3 site where the maximum water temperature was about 1°C warmer than what occurred in Uleda Creek. The maximum temperature of the most downstream reach we monitored (MFER 5) was about 2°C warmer than what occurred in Uleda Creek. High densities of brook trout and only occasional bull trout occurred downstream of MFER 5.

A complete man-made barrier (old stream crossing) was identified in Uleda Creek about 0.6 km upstream from the mouth. No bull trout were electrofished or observed upstream of this point (Figure 28). Habitat appears good upstream of this blockage, and no other barriers were identified in the 1 km we surveyed upstream of this point. A partial and temporary natural barrier (log jam – series of 3 ft drops) was also identified in the MFER about 0.6 km upstream of Uleda Creek. No juvenile bull trout were electrofished or observed upstream of this barrier, although we did electrofish and radio tag one adult bull trout (400 mm) above this point.

Movement and Mortality

We surgically inserted transmitters in 20 bull trout we captured in the MFER between Tarlac Creek and Keokee Creek during August (Appendix A – August 15, 2002). These bull trout ranged in size from 400 mm to 752 mm (Figure 29). In our attempts to capture adult bull trout we probably saw another 12 to14 fish we were not able to capture. We were able to relocate the majority of radio tagged bull trout every week through radio tracking until December 2002. After December we monitored these fish less frequently. The locations of where these fish were tracked to are displayed in Appendix. A.

Very little bull trout movement occurred during the first month of the radio telemetry study (August 15 to September 11, 2002). Only one bull trout moved more than 1 km and many of the fish were tracked to the exact same location throughout this period. The first spawning activity (digging a redd) was observed on September 5, 2002 and between September 11 and September 19 many of the fish made movements > 1 km and spawning behavior (grouping up and redd construction) was commonly observed. Spawning activity seemed to begin when maximum water temperatures dropped below 10°C. By October 3, 2002 spawning appeared over and most fish had moved downstream of the spawning areas, including three fish that we suspected had entered the Priest River. These three fish made downstream migrations of 7-11 km during a week's period. We floated the Priest River on October 10, 2002 from about 5 km upstream of its confluence with the East River to its mouth and did not find any of these three fish. Unfortunately, the fixed receiver was not set up properly and we were not able to determine if these fish made it to the Pend Oreille River. Further searches for these fish found that two of them migrated to Pend Oreille Lake and the transmitter of one was found on the bank near the mouth of Priest River.

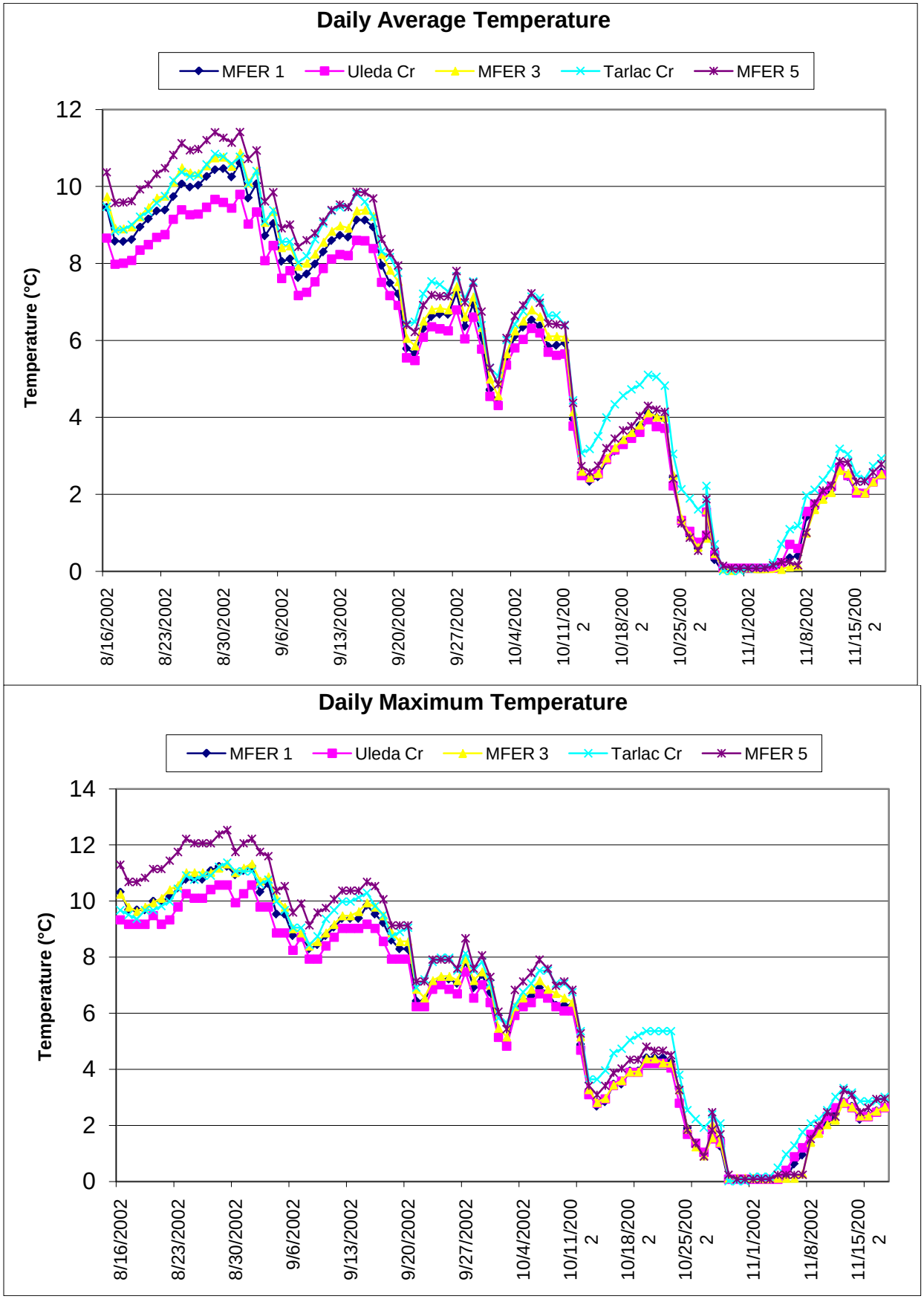


Figure 28. Daily maximum and daily average temperatures collected at various sites in the Middle Fork East River, Idaho, during 2002.

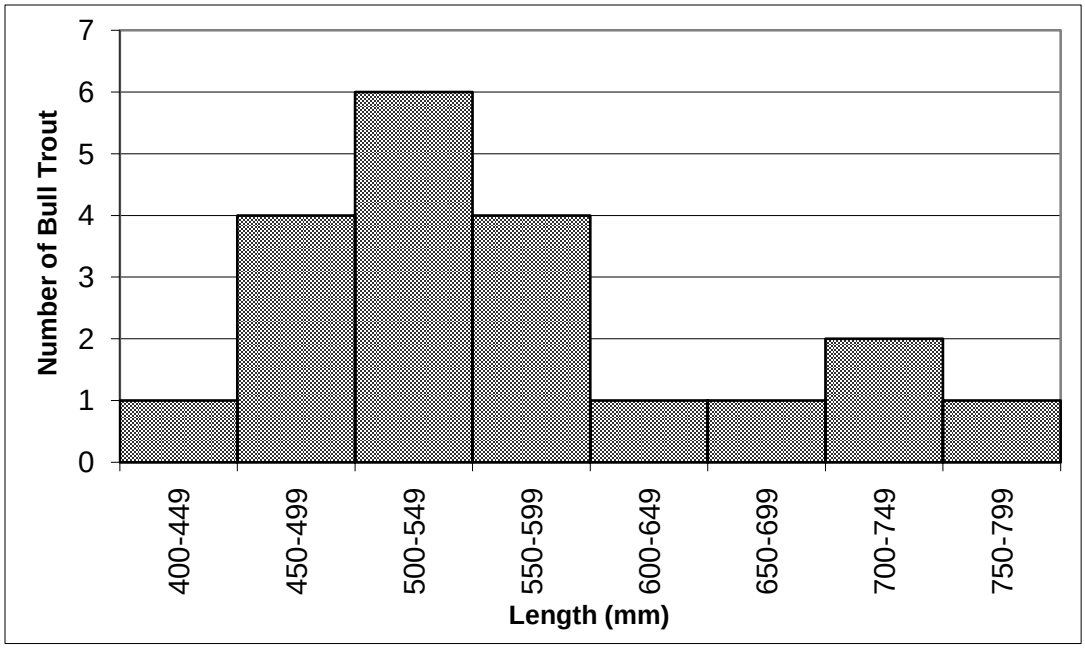


Figure 29. The lengths of bull trout that we inserted radio transmitters in on the Middle Fork East River, Idaho, during August 14-16, 2002.

Between October 3 and November 13, a gradual downstream movement of bull trout was noted in MFER, although no fish made it to Priest River and only one fish moved downstream of a beaver dam complex located about 1 km upstream of North Fork East River. During this period, bull trout began congregating in two different beaver ponds, and at one time, at least 10 bull trout (some without transmitters) were seen swimming together.

After October 3, we began seeing significant numbers of what we assumed to be post-spawn mortality of bull trout. Between October 3 and November 13 we documented 11 different dead bull trout. We didn't find the actual fish in many circumstances, just a radio transmitter located up on the bank or a signal that stopped moving. On October 13 we documented three dead bull trout. This was a time when flows increased (rains) following a period when intense cold caused the river to freeze completely over. It is believed these fish became stranded on the ice when attempting to migrate downstream with increasing flows. It is unclear why the radio tagged bull trout did not try to migrate downstream of these beaver ponds, as obvious flow did occur over the dams in places. We believe that every fish that did try to migrate downstream of the beaver ponds after September died before ever reaching Pend Oreille River. It should be noted that during this study this region was experiencing a drought and the tributaries were extremely low. Rains that typically come in October and November were lacking during 2002.

By December, we were concerned that the remaining four bull trout in MFER would die before making it out of the beaver ponds. On December 9, 2002 we captured all four tagged fish and two other adult bull trout without radio tags through electrofishing and moved them to the Priest River (Appendix A – December 9, 2002). Once moved to the Priest River, it took less than 12 hours before the first fish passed the fixed station at the mouth of Priest River (17 km migration). Within 40 hours all four fish had passed this fixed site. On December 11, one of

these fish had passed the fixed site at Dover (26 km upstream from Priest River) and another passed it on December 13. These two fish were not located again during the winter and presumably entered Pend Oreille Lake. The other two fish that made it to Pend Oreille Lake most likely migrated at a similar speed, as they entered Priest River in late-September and made in to Pend Oreille Lake before the Dover fixed receiving station was set up in mid-October.

All nine bull trout that made it to Priest River migrated downstream towards Pend Oreille River. No attempts to migrate upstream towards Priest Lake were documented. By mid-December we believe that six of these nine bull trout survived to make it to their over-wintering grounds. Between mid-December and the End of April, the fish we were able to track moved relatively little. Two fish over-wintred in the Pend Oreille River and we believe four over-wintered in Pend Oreille Lake (Table 2). Two of the fish that entered the Lake were regularly tracked at the Lakes outlet near the Long Bridge. None of the fish were ever tracked downstream from the mouth of the Priest River.

On May 24 and 25, 2003 two of the bull trout that had over-wintered in Pend Oreille Lake migrated downstream to the mouth of Priest River. One of these fish traveled 26 km from the fixed site at Dover to the fixed site at the mouth of Priest River in 15 hrs. Both of these fish were relocated on June 17 in the East River or MFER and both migrated steadily upstream to known bull trout spawning areas in the MFER. After July these fish moved very little. The location these fish were tracked to throughout August were 1.3 and 3.5 km from where they occurred during August 2002.

On July 1, 2003, the bull trout that had over-wintered near the mouth of Priest River was relocated in the East River. We are not sure how long this fish was in Priest River, as the fixed site at the mouth of Priest River did not document its reentry. The location of this fish was unknown from May 25 to July 1, 2003. After July 7 this fish was not relocated again and presumably the battery in its transmitter had died.

Table 2. Suspected overwintering locations of the six known surviving radio tagged bull trout in the Middle Fork East River, Idaho (August 14-16, 2002) from December 2002 to April 2003.

Frequency	Over-winter location
149.020	Pend Oreille Lake
149.629	Pend Oreille River - just upstream from mouth of Priest River
149.690	Pend Oreille Lake
150.179	Pend Oreille Lake/Pend Oreille River - just upstream from the Long Bridge to 2 km downstream
150.860	Pend Oreille Lake – Near railroad bridge upstream of the Long Bridge
151.000	Pend Oreille River – about 5 km upstream from the mouth of Priest River

One of the bull trout that over-wintered in Pend Oreille Lake was located in the Pend Oreille River (7.5 km downstream from the Long Bridge) in June and remained there until July 7, 2003. This fish was never located after this date. The behavior of this fish was quite different than others that made rapid downstream movements. Because the transmitter may have

expired shortly after July 7, it is difficult to say for certain what this fish did after this date. Water temperatures in the Pend Oreille River exceeded 20°C by mid-July.

Throughout the duration of this study (August 2002 to September 2003) we believe that 13 of the 20 bull trout that we tagged died, five survived and the fate of two are unknown (Table 3). This makes the one year survival rate for the bull trout we radio tagged to be between 25 and 35%. Of the five bull trout that we know survived, three returned to spawn the following year.

Table 3. The status of bull trout, as of September 2, 2003 (last tracking date), that were radio tagged on Middle Fork East River, Idaho, during August 14-16, 2002.

Frequency	Length (mm)	Status	Date of death	Date Last Located
148280	521	Dead – tag found on bank	11/13/2002	11/13/2002
148299	584	Dead – tag found on bank	9/19/2002	9/19/2002
148730	752	Dead – tag found on bank	10/3/2002	10/3/2002
148750	400	Dead – fish stopped moving	11/6/2002	11/6/2002
148770	530	Dead – tag found on bank	10/25/2002	10/25/2002
148960	590	Dead – tag found on bank	10/8/2002	10/8/2002
148979	650	Dead – dead fish found	10/8/2002	10/8/2002
149020	497	Alive – in Pend Oreille Lake	--	12/14/2002
149100	545	Dead – fish stopped moving	10/8/2002	10/8/2002
149297	480	Dead – tag found on bank	11/13/2002	11/13/2002
149430	615	Dead – tag found on bank	10/15/2002	10/15/2002
149629	732	Alive – in East River	--	9/2/2003
149658	485	Dead – tag fond on bank	10/23/2002	10/23/2002
149690	722	Alive – in Middle Fork East River	--	9/2/2003
150179	590	Alive – in Middle Fork East River	--	7/7/2003
150210	515	Dead – dead fish found	11/13/2002	11/13/2002
150442	545	Unknown – lost in Priest River	--	11/19/2002
150860	550	Alive – in Pend Oreille River	--	7/7/2003
151000	450	Unknown – little movement in Pend Oreille River	--	7/7/2003
151889	540	Dead – no movement in Priest River	12/5/2003	7/7/2003

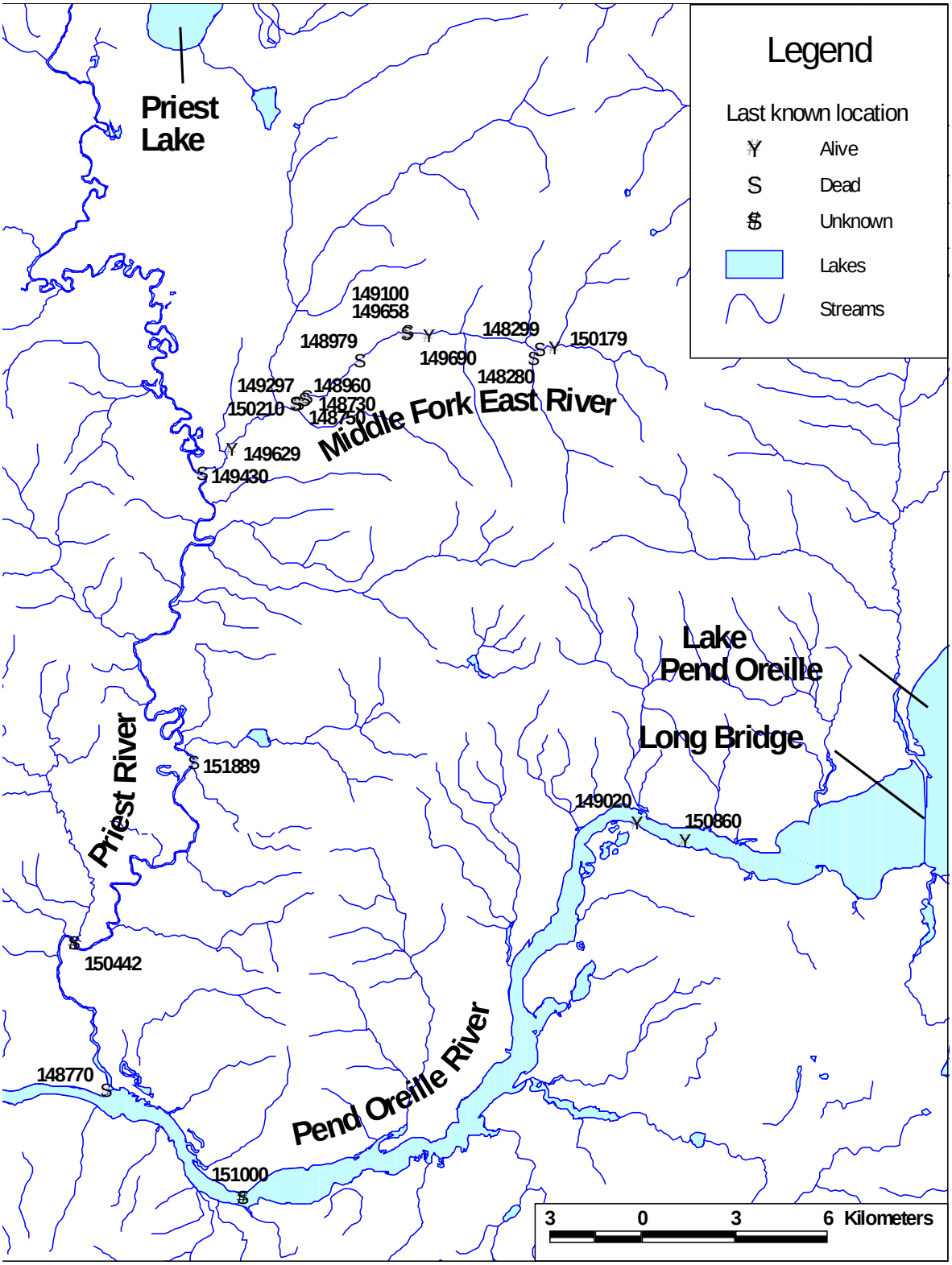


Figure 30. The last known location and likely fate of bull trout as of September 2, 2003 that were radio tagged in the Middle Fork East River, Idaho, during August 14-16, 2002.

Habitat Use

Habitat use of radio tagged bull trout in MFER was evaluated in four different periods – pre-spawn (August 15, 2002 to September 05, 2002), spawn (September 11, 2002 to September 24, 2002), post spawn (October 3, 2002 to December 09, 2002) and overwinter (December 13, 2002 to April 30, 2003). All the radio tagged bull trout had died or entered the Priest River, Pend Oreille River or Pend Oreille Lake by December 9, and detailed habitat measurements were not taken after this point.

During the pre-spawn period, the radio tagged bull trout were identified most commonly in pool habitat types where boulders and/or large organic debris (LOD) were available as cover and in water < 0.6 m deep (Figure 31). Although most of the pools the bull trout were located in had depths > 0.6 m, the bull trout were typically located along the pool margins where cover was available and slower water velocities occurred. A 0.5 km stream segment of the MFER (downstream of Chicopee Creek) had a noticeable absence of LOD. Not once during the pre-spawn period did we locate a bull trout in this reach. In fact, during the entire study, only once was a bull trout tracked to this reach of stream.

The pre-spawn period occurs during the warmest time of the year when water temperature may have an influence on bull trout distribution. Based on our thermograph data (Figure 28), none of the radio tagged bull trout were located in areas where the daily average temperature exceeded 11°C.

During the spawning season, bull trout were found mostly in pool and run habitat types (Figure 8). These are the same habitat types where we saw most of the spawning activity (pool tail outs and margins along runs). Bull trout were found to use overhead cover, boulders and LOD as cover. The increase in use of overhead cover was probably because some of the spawning bull trout were located along the stream margins where overhanging vegetation was common. Over 70% of the time we located bull trout they were in water depths < 0.6 m, similar to what we saw during the pre-spawn period.

During the post-spawn period, habitat use of radio tagged bull trout changed considerably. The use of beaver ponds changed from the least common habitat type used, to the most common habitat type used. Over 71% of the time we located a fish in a beaver pond during the post-spawn period (Figure 31). The type of cover used and the water depths these fish were located in are a reflection of what occurs in these ponds. During the post-spawn period, 95% of the time the radio tagged bull trout were found using LOD, overhanging vegetation and undercut banks for cover and were found 77% of the time in water depths between 0.3 and 0.9 m.

During the overwinter period all the radio tagged bull trout had died or moved (voluntarily or relocated) out of the East River basin. Throughout the winter the remaining living fish occurred either in Pend Oreille Lake or in Pend Oreille River (Table 2). Water depths often exceeded 15 m in the areas these fish occurred. However, we were able to pick up a strong signal on four of these fish, during many of the winter flights, which indicates they were in water < 7 m deep. We were not able to locate two of the fish that entered Pend Oreille Lake, which indicates they were probably in water deeper than 15 m. Two of the fish near the outlet of Pend Oreille Lake were often located under either a railroad bridge or the highway bridge (Long Bridge).

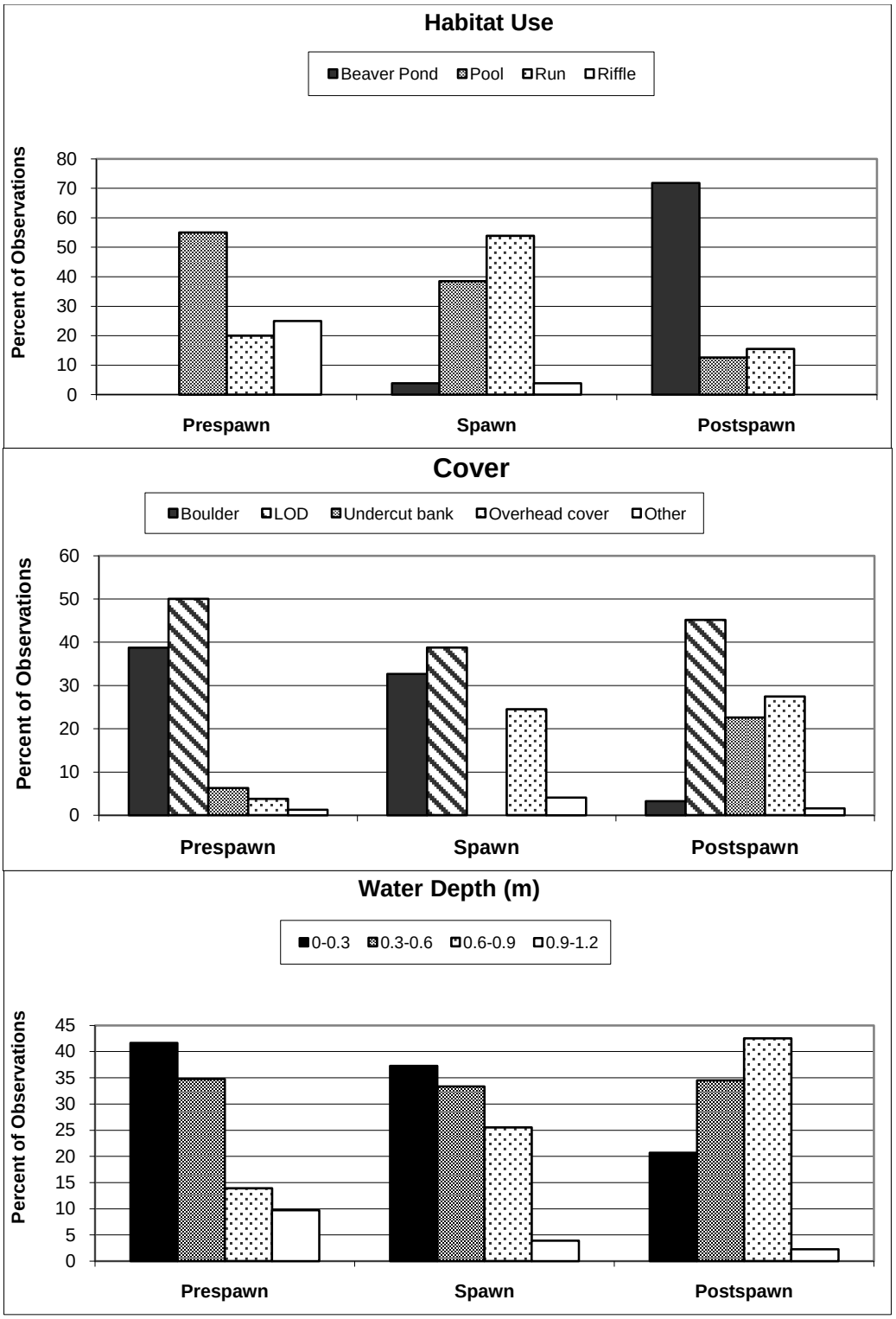


Figure 31. Use of habitat, cover and water depth by radio tagged bull trout in the East River basin, Idaho, during 2002.

Bull Trout Spawning Surveys

We walked sections of the East River, MFER and Uleda Creek to determine where bull trout were spawning in this basin (Figure 31). We conducted this redd survey on October 22 and 23, 2002. During this survey, we counted 16 redds > 500 mm in diameter (Figure 32). Numerous redds smaller than this were observed, which we considered to be constructed by brook trout, especially since brook trout were observed on many of them. When we overlaid the location of the radio tagged bull trout during the spawning season with the location of the redds we observed, the three most downstream redds did not appear to be constructed by bull trout. No bull trout were located in this area during the spawning period; consequently, it is believed these redds were constructed by large brown trout. The fourth redd up from the downstream point was located near where one radio tagged bull trout was located. However, we believe this bull trout was migrating from the system and this redd was smaller than the bull trout redds we observed. Based on this information we determined this was probably a brown trout redd. If you subtract these four redds from the total, we counted 12 bull trout redds.

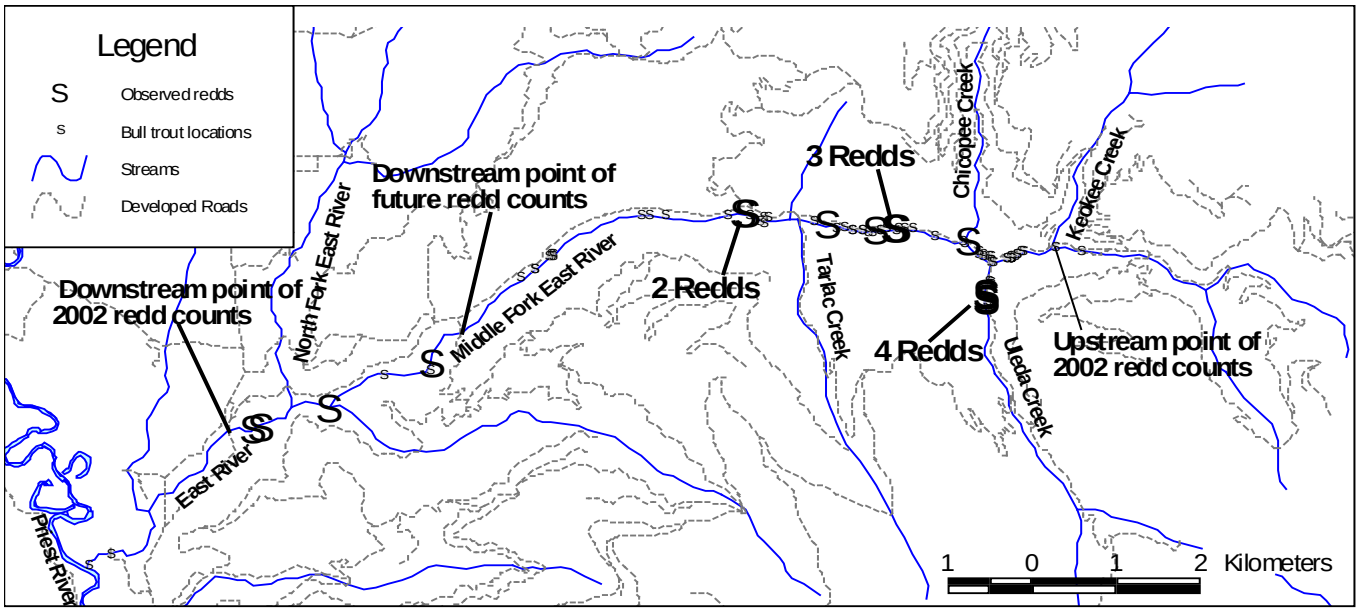


Figure 32. The location of redds > 500 mm in diameter and radio tagged bull trout during the spawning season in the East River basin, Idaho, during October 22-23, 2002.

This redd survey occurred at least one month after bull trout had finished spawning. Conducting counts this late in the season created several problems in identifying bull trout redds. First, algae was beginning to grow over redds and may have led to missed observations. Second, brook trout and brown trout began spawning in October, which adds to the difficulty in determining which redds were created by bull trout. Finally, brook and brown trout may have spawned over the top of bull trout redds making them impossible to identify.

The late date we conducted our spawning surveys gives us a conservative bull trout redd count estimate. Expanding the number of redds observed (12) by 2.2 and 3.2 fish/redd, the spawning escapement of adult bull trout in the East River ranged between 26-38 fish.

Genetics

We collected tissue samples from 50 bull trout and/or bull trout/brook trout hybrids from MFER and Uleda Creek. Due to time limitations in the lab, our tissue samples were not genetically evaluated to determine whether introgression with brook trout had occurred and the genetic similarity that occurs between these bull trout and fish from Pend Oreille Lake and Priest Lake. Our tissue samples are scheduled for analysis later this year. Findings will be reported in next year's annual report.

DISCUSSION

Bull Trout and Brook Trout Distribution

Based on our electrofishing efforts during 2000-2003 it appeared the majority of juvenile bull trout in the MFER rear in 3 km of stream. Juvenile bull trout did occur in another 5 km of stream, but densities were low (< 1 fish/ 100 m^2). The small area this bull trout population used for juvenile rearing is troubling. Typically, bull trout populations with a high probability of persistence have over 100 spawning adults (Rieman and Allendorf 2001; USFWS 2002), are spread over a wide area (USFWS 2002) and have other populations in close proximity where straying can bolster a declining population and increase genetic vigor (Spruell et al. 1999). This bull trout population did not have any of these characteristics, which put it in a high risk category for extinction.

Brook trout occurred in all the same stream reaches bull trout occurred in except for Uleda Creek (0.6 km reach), where the highest bull trout densities were found. The presence of brook trout in the East River basin also increased the probability of extinction for this bull trout population. Brook trout have been found to displace bull trout from watersheds through hybridization and competition (Dambacher et al. 1992; Mullan et al. 1992; Leary et al. 1993). It is believed that the competitive advantage that brook trout have over bull trout increases as habitat becomes degraded or stream temperature is elevated (Dambacher et al. 1992; Leary et al. 1993; McMahon et al. 1999; Gammett 2002). For these reasons it is important to maintain high quality habitat in the MFER basin. Increases in sediment delivery and/or losses of stream shading could increase the spread and density of brook trout in the basin.

Based on general observations, habitat conditions did not appear to be degraded (more fine sediment or less in-stream cover) where low bull trout densities and high brook trout densities occurred. Our stream temperature data suggested that throughout the summer months water temperatures in all areas we evaluated remained within or below the bull trout's thermal optimum (12 -16°C) as determined by McMahon et al. (1999). However, those stream reaches that had the highest densities of brook trout had the warmest water temperatures. Research and surveys suggest that where stream temperatures exceed 10-12°C brook trout have a competitive advantage over bull trout (Dambacher et al. 1992; Riehle 1993; McMahon et al. 1999). Uleda Creek, which does not support brook trout, was the only stream reach we evaluated where the daily average temperature did not exceed 10°C. Many of the surrounding streams had daily average water temperatures only 1°C warmer than Uleda Creek, and brook trout were present. Tarlac Creek, which is about 1°C warmer than Uleda Creek, was dominated by bull trout in 1986 and now has only brook trout. It's difficult to say for sure that these small differences in stream temperature play such a large role in fish distribution. Other factors such as stream grade, size and habitat condition may have an influence. More in depth evaluations of the stream habitat is required before we can say for certain that stream temperature is the major controller in bull trout and brook trout distribution in the MFER basin. We did not place

thermographs in the MFER until August 16,2002. Based on temperature data collected from other streams in the Panhandle Region, the warmest stream temperatures occurred around mid-July. Consequently, water temperatures in the MFER during 2002 probably exceeded what we found, and the difference in temperature between streams was also probably greater than what we reported.

Opportunities exist to increase the distribution and/or population strength of bull trout in the MFER basin. A man-made barrier (historic stream crossing) occurs about 0.6 km upstream from the mouth of Uleda Creek. Removing this barrier would increase the amount of high quality habitat by at least 1 km. Additional surveys in 2003 by the Idaho Department of Lands found no other barriers and good habitat occurred at least 4 km upstream of this barrier. While electrofishing and conducting redd counts on Uleda Creek several adult bull trout and four redds were found congregated just below this barrier, and no bull trout occurred upstream of it. Uleda Creek is probably the most important stream reach in the basin to this bull trout population as the highest densities of bull trout and no brook trout were found to occur there. During August 2004, the Idaho Department of Lands removed this barrier. Future redd counts will help determine if bull trout distribution will expand upstream of this barrier.

We may be able to increase the distribution and/or population strength of bull trout in the MFER basin by encouraging cooler stream temperatures. The Idaho Department of Lands has developed a correlation matrix that can be used to help evaluate stream temperature based on canopy cover (stream shading) and elevation (Idaho Department of Lands 2000b). This correlation matrix indicates that by increasing canopy closure over streams by 10% an approximate 1°C decline in stream temperature would occur. Increases in canopy cover over the MFER may not have this much effect on water temperature, as our data suggests that ground water has a large influence on stream temperature. However, managing riparian vegetation to encourage dense canopy cover with few breaks will help buffer the stream from solar radiation, hot air temperatures, and other factors that have a tendency to increase downstream temperatures. Historic clearcuts encompassed sections of the MFER and some of its major tributaries. As these cuts continue to grow and increase canopy cover over the stream, water temperatures could decline. Every effort should be made to increase canopy cover over the river and major tributaries, as it appears that small changes in water temperature may play a large role in bull trout and brook trout distribution.

Brook trout suppression activities may also benefit the East River bull trout population. Brook trout removal efforts in streams have proven effective in increasing bull trout populations where simple stream habitat occurs (Buktenica 2000). However, complete removal of brook trout in streams is almost impossible without use of poisons and extensive long-term electrofishing removal efforts (Buktenica 2000). Tarlac Creek may be a stream site where brook trout removal efforts may prove beneficial in helping restore bull trout. The small size of this stream with relatively few side tributaries suggests brook trout numbers could be significantly reduced through electrofishing. Continual efforts would be required to ensure brook trout numbers remain suppressed. Because bull trout were believed to be absent from Tarlac Creek, brook trout eradication may be possible through use of fish toxins (rotenone or Antimycin). Any attempts to eradicate brook trout from Tarlac Creek should require the construction of a barrier near the mouth that will allow upstream passage of adult bull trout but not brook trout.

The close proximity of the main haul road to the MFER causes a permanent loss in stream shading and makes it impossible to prevent sediment delivery to the river in places. Improvements in this road system could alleviate these problems.

Movement and Mortality

Our radio telemetry findings combined with our length frequency data shows that bull trout from the MFER have an adfluvial life cycle. All six known surviving bull trout either migrated to Pend Oreille Lake (four fish) or Pend Oreille River (two fish), which is more like a reservoir than a river. In addition, all the bull trout we sampled from the MFER were either < 200 mm or > 400 mm. If this were a fluvial or resident population, you would expect to see bull trout between 200 and 400 mm (Schill et al. 1994; Adams and Bjornn 1997; Schiff and Schriever In Press). The size structure of this bull trout population is very similar to the adfluvial population in Trestle Creek of Pend Oreille Lake (Downs and Jakubowski, 2003).

Juvenile bull trout from the MFER must make an unusual migration to reach Pend Oreille Lake. After juvenile bull trout outmigrate from East River, they must swim 34 river km down Priest River to where it joins Pend Oreille River. From the Pend Oreille River they must turn upstream and migrate 37 km to Pend Oreille Lake. If any juvenile bull trout swim downstream when they enter Pend Oreille River, they have 7 km before they will pass over Albeni Falls Dam. Because this will be the first time these juvenile bull trout make this migration, there may be some wandering before they determine that they must swim up the Pend Oreille River to reach Pend Oreille Lake. Based on this concept, entrainment may be an issue for juvenile bull trout, especially in years when flows are high in Pend Oreille River. Additional studies may be necessary to determine how juvenile bull trout make this migration and whether entrainment over Albeni Falls Dam is a problem. We are not sure how juvenile bull trout know to turn upstream at the Pend Oreille River to make it to Pend Oreille Lake. Work by Teeter (1980) found that sea lamprey *Petromyzon marinus* have the ability to detect chemical signals, originating from populations of sea lamprey larvae in a river, which may aid migrating adults in selecting a suitable spawning stream. Based on these findings, juvenile bull trout may detect chemicals given off from other bull trout in Pend Oreille Lake and assist in their upstream migration to the lake. If chemical signals given off from bull trout in Pend Oreille Lake cue juvenile bull trout on how to make their migration, we are not sure how chemical signals from bull trout from Priest Lake would influence this migration.

None of the radio tagged adult bull trout we had radio transmitters in were ever tracked downstream of Priest River, which would indicate that entrainment is not a significant source of mortality for the adult fish. However, Batelle captured 10 adult bull trout downstream of Albeni Falls Dam that they believed originated upstream of the dam (Geist et al. 2004).

Other bull trout populations are known to have an outlet spawning lifecycle similar to the MFER fish (Thomas 1992; Herman 1997; Ringel and DeLaVergne 2000; USFWS 2002; Scott Deeds, USFWS, personal communication, Tom Curet, IDFG, personal communication; Clark Watry, U of I, personal communication). However, only two of these populations are believed to migrate more than 10 km downstream from the lake's outlet and all but two spawn directly in the outlet stream or a short distance up a side tributary. The unique migratory behavior the MFER bull trout display may make it difficult to find fish from another system that could be successfully introduced to this system if the MFER population were ever to go extinct. Based on ethnographic reports, bull trout populations with a similar outlet spawning life cycle may have existed in tributaries downstream of Albeni Falls before its construction (Smith 1936). The MFER bull trout population may be the best hope of reestablishing runs downstream of the Albeni Falls Dam if upstream fish passage can be provided.

Studies of bull trout in southern Idaho found that populations composed of adfluvial fish had a much higher probability of persistence than resident populations (Dave Burns, USFS,

Personal Communication). The thought is that not all adfluvial fish are in tributaries at once making them less susceptible to extinction from catastrophic events. For example, streams reaches where bull trout were eradicated by intense fires in the Boise River basin were found to be repopulated several years later (Burton 2000). Large bull trout were observed in these streams following the fires suggesting that re-population was facilitated by migratory fish.

One of the adult bull trout captured while sampling the MFER had a missing adipose fin. Research conducted in 1998 (Dunham et al. 2001) and 2002 (Downs et al. 2003) clipped the adipose fins of 779 bull trout in tributaries of Pend Oreille Lake to conduct population estimates. We are unaware of how often bull trout lose adipose fins naturally; however, all fisheries biologists we have talked to believe it is a rare occurrence. Straying of bull trout from Pend Oreille Lake may play an important role in maintaining the bull trout population in the MFER, despite its relatively isolated nature.

During our study, none of the radio tagged bull trout attempted to migrate upstream from East River towards Priest Lake. It is possible that historically bull trout from both Priest and Pend Oreille lakes utilized the East River for spawning. Hopefully, future genetic analysis will shed some light on this issue. Locals have commented (Frank Waterman, Local, Personal Communication) on how they used to catch numerous bull trout at the outlet of Priest Lake. Since the construction of a dam at the outlet of Priest Lake in 1948, any outlet spawning populations that may have been present were eliminated.

The movement patterns our radio transmittered fish displayed during August and early September were similar to what has been seen in other studies (Fraley and Shepard 1989; Schiff and Schriever, In Press). Prior to spawning there is little movement and once spawning begins movement picks up. However, after the spawning period the movement patterns of our fish versus other studies differed. Other studies show that shortly after spawning bull trout quickly return to where they overwinter (Schill et al. 1994; Elle et al. 1994; Jakober 1995) – Pend Oreille Lake or Pend Oreille River in our case. Only three of our fish displayed this pattern (two of these fish migrated to Pend Oreille Lake). The remaining fish moved most of the way down the MFER until they encountered one of two beaver dam complexes, and once there, they tended to stay. By mid-November most of the fish that remained in the MFER had died (11 out of 20 fish). Similar behaviors have been seen in other systems. For example, over 20 bull trout were seen congregating upstream of a beaver dam in upper St. Joe River during the last week of September (Ned Horner, IDFG, Personal Communication). Elle (1995) reported that over 50 bull trout migrating out of Rapid River began congregating upstream of the weir where they trapped fish even though their was a path to get past it. Others have also reported this behavior with bull trout around weirs (Ratliff et al. 1994; Stelfox 1995). When high flows jeopardized the weir at Rapid River and eight pickets were pulled to increase flow, most of the bull trout moved past the weir (Elle 1995).

Based on this information, it is possible that bull trout were holding in the beaver ponds, waiting for higher flows to assist in their downstream migration. The fall of 2002 was very dry, and significant fall rains did not come until mid December, after we caught and moved the remaining four fish. The most downstream beaver pond complex where most of the bull trout were congregated had direct flow that passed over or around these ponds, and the bull trout still did not migrate reported similar post spawn mortalities especially during drought years. Schill et al. (1994) reported 67% post-spawn mortality for bull trout in Rapid River during 1992, a drought year. The following year the post-spawn mortality for bull trout was 47% (Elle et al. 1994). Schriever and Schiff (2002) reported a 60% mortality or tag loss on bull trout in North Fork Clearwater. In Trestle Creek, where bull trout migrate < 10 km upstream from Pend Oreille

Lake to spawning areas, the annual mortality was estimated at 40% (Downs and Jakubowski, 2003). We believe an additional two to four fish died during the winter bringing the annual mortality to for the bull trout we radio tagged to 65-75%.

The reason these fish died is not entirely clear. All the radio tags were recovered downstream of the spawning areas or were found up on the bank indicating they were not expelled during spawning as Schriever and Schiff (2002) believed occurred with some of their bull trout. We were able to find three radio tagged bull trout that had died and the incisions had healed well, and there did not appear to be any serious infections. The four bull trout we recapture and moved all were very thin and had loose skin suggesting that serious weight loss had occurred since they had entered MFER. It is likely these fish entered MFER in June and had little opportunity to feed since then. This lack of feeding coupled with the stress of spawning may be the reason for the high post-spawn mortality.

For eight of the bull trout that we assumed had died, the radio transmitters were found 3 m to 60 m from the water. We were able to recover six of these tags and only one of them had indications that an animal had eaten the fish (chew marks on antenna). The remaining five recovered transmitters did not have chew marks on them and no fish parts or animal scat was located nearby. Based on these observations we questioned whether these fish were killed from poaching, with the radio transmitters thrown up on the bank. After discussing this with others, it appears this phenomenon was observed in other studies (Schill et al. 1994, Elle et al 1994; Elle 1995; Schriever and Schiff 2002). Elle (1995) reported losing 22 bull trout from their weir trap on Rapid River over a week period. After removing two mink these mortalities stopped. It is possible that the large bull trout in the MFER were vulnerable to predators such as mink or otters. These fish may have died from natural causes and washed up on the stream bank where animals dragged them inland to feed upon them.

If fish are dying from poaching, changes in the fishing regulations may help reduce this source of mortality. Closing the East River to fishing while bull trout are in the river would reduce human contact with bull trout and make it easier to patrol which could prevent some bull trout poaching. However, we have no proof that fishermen killed any of the radio tagged fish. If fishermen were killing these fish, you would expect some of these transmitters to disappear. We can account for every radio tag but one, and this transmitter was last heard in the Priest River. Fishing pressure does appear to be heavy on the MFER at times. Trails are worn down between the road and many of the deeper pools, and fishing supplies including bait containers were commonly found at these sites. Many of the radio tagged bull trout were located in these pools, yet none of our fish were found dead or disappeared from these popular fishing sites. Two of the adult fish we captured had hook scars, although it is possible these fish were caught and released from Pend Oreille Lake before they entered the MFER. Because we are not aware of any bull trout that were killed by fisherman, it is difficult to warrant a change in the fishing regulations. A concern anytime you close down an entire fishery in a particular river or lake is that people will lose their interest in that area. We want to ensure that people continue to have strong interest in the MFER. If people enjoy there fishing experience in the MFER, they will more likely become proponents to any efforts that can improve the fishery. We believe that closing down an entire river or lake to fishing should only be utilized when it is absolutely necessary to save the fishery. However, this is a unique bull trout population that needs to be protected. Increases in mortality may cause undue harm to this population. Now that the Idaho Department of Fish and Game is aware of this bull trout population and its uniqueness, increased patrols by conservation officers should occur to keep poaching to a minimum.

Habitat Use

The habitat selected by radio tagged bull trout during the pre-spawn and spawning period agrees with other research, which states that all bull trout life stages are associated with various forms of cover including LOD, boulder, undercut stream banks, overhead cover and pools (Fraley and Shepard 1989; Hoelscher and Bjornn 1989; Pratt 1984, 1992; Thomas 1992). Large woody debris was the dominant cover type utilized by radio tagged bull trout during this study. A 0.5 km reach of stream located just downstream of Chicopee Creek appeared to be avoided by the bull trout we radio tagged. Upon closer inspection of this area, it appeared to have low quantities of LOD and may explain the apparent avoidance of this area. Additions of LOD to this area could improve bull trout habitat and increase the carrying capacity of the river.

During post-spawn, bull trout were located in beaver ponds over 71% of the time. We believed these bull trout congregated in these ponds waiting for higher flows to assist in their downstream migration. It's difficult to say for certain if beaver dams were a benefit or detriment to adult bull trout as every bull trout that remained behind the beaver dam died, unless we moved it. On the other hand every bull trout that did migrate past the beaver ponds after September did not make it to Pend Oreille River. During normal precipitation, rain showers and higher stream flows typically occur in October/November. If this type of precipitation had occurred during 2002, it is likely the bull trout would have migrated downstream and mortality would have been much lower.

Jakober (1995) found that juvenile and resident bull trout seek out beaver ponds for over-wintering. The slow water velocities, deeper depths and large amount of structure in these ponds make them ideal for over-wintering. Numerous cutthroat trout and brook trout (some may have been juvenile bull trout) were seen in these ponds during November and December. The importance of these ponds to over-wintering fish should preclude anyone from destroying them.

Priest River does not appear to provide over-winter habitat for bull trout. All bull trout appeared to move quickly through this habitat (or died trying) on their way to the Pend Oreille River or Pend Oreille Lake. Questions have been asked how increased flows in the Priest River during the fall would effect bull trout survival. Based on our information, increased flows should speed up the downstream migration of bull trout and possibly improve survival.

During the winter, two of the bull trout located near the outlet of Pend Oreille Lake were often found under either the railroad bridge or the highway bridge (Long Bridge). Both of these bridges have noticeable current passing under them and the abutments under them provide breaks from the current. Bull trout may be selecting these areas because the abutments provide breaks from the current and a place to ambush prey from.

Bull Trout Spawning Surveys

We counted 12 bull trout redds on MFER and Uleda Creek on October 22-23, 2002. Using these redd counts, the spawning escapement for the MFER was estimated between 26-38 fish. This estimate is conservative as we probably did not count some of the redds. By the time we conducted our redd survey most of the spawning had finished five weeks earlier. As a result, algae had begun growing back over the redds making them difficult to see. Three of the redds we witnessed being constructed during the spawning season were missed the first time we conducted the counts (October 22). A follow up survey was conducted on October 23, 2002, which located two additional redds. The late survey date also occurred after brook trout and brown trout began spawning. In areas, brook trout redds covered large areas of the shoreline

making it difficult to tell if bull trout had previously spawned there. No brook trout or brown trout were seen spawning while we witnessed the bull trout spawning. To improve the accuracy in the bull trout redd counts of the MFER, they should be conducted during the last week of September or first week of October when tributaries of Upper Priest Lake are being counted. This will help prevent problems with algae growth and brook trout and brown trout spawning. During 2003, we conducted redd counts on the MFER on September 30 and counted 24 redds and only a few brook trout were seen spawning.

Redd counts conducted in 2002 included areas where we believe large brown trout were spawning. To avoid this confusion, future redd counts should begin where a bridge crosses the MFER about 2.5 km upstream of North Fork East River and extend up to Keokee Creek (Figure 8). These points are easy to find, will avoid those areas where large brown trout are believed to spawn, and will include the area where we believe bull trout are spawning.

Despite what we believed to be a conservative estimate on the spawning escapement (26-38 fish) in MFER, we believe this estimate is fairly accurate. During our electrofishing effort to collect bull trout to put radio transmitters in, we captured 20 fish and saw another 12-14 we did not capture. Add to that another four to eight fish that we may not have seen and we come up with a total of 36-42 adult sized fish. In addition, when the radio tagged bull trout were tracked to areas where they congregated, such as the beaver ponds, about one third of the fish we visually observed did not have radio tags. This suggests that there were around 30 adult bull trout in the MFER. Although these techniques are all rough estimates of the bull trout spawning escapement in MFER, they all suggest that between 30 and 40 adult bull trout entered MFER during 2002.

No bull trout redds were identified in the MFER upstream of Uleda Creek, although seven adult bull trout were located in this area from August to early September. It's unclear why spawning did not occur in this section of stream. Water temperatures were 1°C warmer than what occurred in Uleda Creek, although spawning was document farther downstream where water temperatures were similar. Differences in ground water or habitat variables such as fine sediment may explain why spawning didn't occur in this area. During 2003, we counted six redds in this same section of stream where we counted none in 2002. The late date we conducted our counts in 2002 may have made it difficult to see these redds.

RECOMMENDATIONS

1. Partner with the Idaho Department of Lands and the United States Fish and Wildlife Service to secure funds in an effort to remove the existing barriers to migration within the Middle Fork East River basin especially Uleda Creek. (Note: This work is already in process and two barriers in Uleda Creek were removed in 2004).

2. Discuss with the Idaho Department of Lands the apparent importance that subtle changes in stream temperature have on bull trout and brook trout densities and distribution in the Middle Fork East River, and help develop a management strategy designed to encourage cooler downstream temperatures.

3. Discuss the importance of large woody debris to bull trout in the Middle Fork East River and help develop a management strategy that will allow for ample long-term recruitment to the stream.

4. Efforts should be made to reduce impacts to bull trout habitat occurring on private property in the most downstream reach of the Middle Fork East River and the East River.

5. Report findings of genetic evaluation on bull trout in next year's annual report, including similarities to bull trout from Pend Oreille Lake and Priest Lake.

6. Maintain current fishing regulations on Middle Fork East River.

7. Increase patrols by conservation officers to evaluate and reduce potential poaching activity.

8. Explore whether brook trout removal in the Middle Fork East River or some of its tributaries can help improve and/or expand the bull trout population in this system.

9. Additional studies are recommended to evaluate how juvenile bull trout make their migration from the East River to Pend Oreille Lake and whether entrainment over Albeni Falls Dam is a problem.

10. Conduct redd counts during the last week of September or first week of October to enumerate the spawning run of bull trout in the Middle Fork East River. These redd counts should occur from Keokee Creek downstream to the bridge that crosses Middle Fork East River about 2.5 km upstream of North Fork East River (see Figure 8 for details).

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2003 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-28

Project: II - Technical Guidance Subproject: I-A Panhandle Region

Contract Period: July 1, 2003 to June 30, 2004

ABSTRACT

Panhandle Region fisheries management personnel provided private individuals, organizations, public schools, and state and federal agencies with technical review and advice on various projects and activities that affect the fishery resources in northern Idaho. Technical guidance also included numerous angler informational meetings, presentations, and letters, continuation of the Panhandle Region portion of the Idaho Fish and Game 1-800-ASKFISH and website fishing report program.

Author:

Ned Horner
Regional Fishery Manager

OBJECTIVES

1. To furnish technical assistance, advice and comments to other agencies, organizations, or individuals regarding projects that affect fishery resources in northern Idaho.

2. To promote the understanding of fish biology and fish habitat needs and the ethical use of the fishery resource through individual contact, public school curriculum, club meetings, public presentations, informational brochures and fishing clinics.

METHODS

Regional fisheries management personnel provided both written and oral technical guidance.

RESULTS AND DISCUSSION

The technical guidance provided by Panhandle Region fish management personnel focused on activities that directly affected fishery resources or resource users in north Idaho. Numerous presentations and programs were made to civic and sportsmen's groups throughout the year. Letters were sent to numerous individuals and organizations in response to specific questions about the fisheries in northern Idaho.

Fishing Reports

Regional fishery management personnel provided information on Panhandle Region fishing opportunities for the 1-800-ASK-FISH and Idaho Fish and Game Internet Web Page angler information program. Knowledge of regional fisheries programs combined with input from tackle shops, local fishing experts and conservation officers were used to provide information on fishing opportunities.

Endangered Fish Species Issues

The Regional Fishery Manager provided information on the abundance and status of bull trout and westslope cutthroat trout populations in Panhandle Region waters to numerous individuals, organizations and personnel from state and federal agencies working on issues related to bull trout listing and the petition to list westslope cutthroat trout. The Regional Fisheries Manager coordinated with the Kootenai River sturgeon/burbot/trout research team, Kootenai Tribe, US Fish and Wildlife Service, British Columbia Ministry on Environment and the Fisheries Bureau to review and comment on issues related to white sturgeon *Acipenser transmontanus* flow requests, conservation culture, ecosystem (nutrient) issues, and transboundary management programs. Additional discussions were held with the research staff, State of Idaho Office of Species Conservation, U.S. Army Corps of Engineers, Bonneville Power Administration, U.S. Fish and Wildlife Service, Kootenai Tribe of Idaho and British Columbia Ministry of Environment on the depressed status of Kootenai River burbot *Lota lota* and possible changes in water management in the Kootenai River system to hopefully avoid another ESA listing.

Pend Oreille Lake Water Management

Fishery research personnel were responsible for completing all field activities, while the Fisheries Manager kept the public informed and involved in efforts to change lake level management on Lake Pend Oreille. Several sportsmen meetings were attended, articles were written and interviews were given to newspapers and the radio.

Fall population estimates for kokanee in 2003 showed improvement in the overall population, but record low adult escapement will likely result in poor fry recruitment in 2004. Winter pool levels were held at 2051 (low pool) during the 2003-2004 winter due to enough spawning gravel being available to accommodate the very limited number of spawners. Poor wild kokanee recruitment may be partially offset by a hatchery release of just over 13 million fry in 2004.

Deep Water Trap Net Evaluation – Lake Pend Oreille

The deep water trap net evaluation commenced in October 2003 and continued through March of 2004. A population estimate of 6,376 lake trout *Salvelinus namaycush* ≥ 52 cm was made with a 95% confidence interval of –18% (5,247 lake trout) to +27% (8,124 lake trout). This estimate was less than what was anticipated based on previous population and harvest estimates. Trap nets were selective for the benthic species they were designed for and mortality of non-target species was very low (Table 1). The trap nets were only used for research evaluation purposes and lake trout were not removed from the population. In 2003-2004, the trap nets caught about 16% of the estimated population of lake trout over 52 cm.

Table 1. Total catch and mortality rates of fish species caught in nine trap nets during the six-month study.

Species	Total Caught	Number of Mortalities	Mortality Rate
Lake Trout	1,100	11	1.0%
Lake Whitefish	41,204	3,049	7.4%
Bull Trout	136	7	5.1%
Rainbow Trout	4	4	100.0%
Brown Trout	1	0	0.0%
Pikeminnow	107	1	0.9%
Suckers	93	0	0.0%
Peamouth	11	3	27.3%
Kokanee	1	0	0.0%
Total	42,657	3,075	7.2%

The commercial rod-and-reel lake trout fishery was implemented in March 2003, with 10 licensed anglers as requested by the Lake Pend Oreille Citizens' Advisory Committee. The commercial license year runs from July 1 to June 30, and by June 30, 2003, only seven anglers renewed their licenses. Commercial license holders are also allowed to purchase up to $500 of lake trout from individual anglers on an annual basis. The total number of lake trout harvested by commercial rod-and-reel anglers and purchased from sport anglers from March 2003 through June 30, 2004 was 522 and 126, respectively.

Post Falls Dam Relicensing

The Regional Fishery Manager was an active participant in reviewing, commenting and shaping fisheries and water quality related issues and protection, mitigation and enhancement measures associated with the relicensing of the Post Falls Dam and three other Spokane River projects operated by the Avista Corporation, Spokane, Washington. Post Falls Dam impounds 7 feet of water in Coeur d'Alene Lake and greatly influences upstream riverine habitat in the Coeur d'Alene and St. Joe rivers, downstream riverine habitat in the Spokane River below Post Falls Dam and habitat in Coeur d'Alene Lake. Major areas of emphasis are better instream flows for the Spokane River to enhance the wild rainbow trout fishery and enhancement of the westslope cutthroat trout and bull trout fishery in Coeur d'Alene Lake.

Miscellaneous

Coordination meetings were held with hatchery, research, enforcement and Fisheries Bureau personnel to insure management goals were achieved. Requests for commercial guiding activities were reviewed and commented on. Anglers were kept informed of regional fishing opportunities and management programs at club meetings, monthly Sportsmen Breakfasts, through informational articles written for Panhandle Region newspapers, and numerous interviews with television, newspaper and radio reporters. The Regional Fisheries Management staff presented several programs to Panhandle Region schools on cutthroat trout and participated in other Water Awareness Week activities.

2003 ANNUAL PERFORMANCE REPORT

State of: Idaho Program: Fisheries Management F-71-R-28

Project: III - Habitat Management Subproject: I-A - Panhandle Region

Job No.: a Title: Marble Creek Splash Dam Assessment

Contract Period: July 1, 2003 to June 30, 2004

ABSTRACT

Upstream fish passage past a splash dam on Marble Creek, a tributary of St. Joe River, Idaho was evaluated by Joe DuPont (IDFG), Lisa Hawdon (USFS) and Ken Gebhardt (USFS) on November 10, 2003. Based on this evaluation it was concluded that this splash dam is most likely not a barrier to adult adfluvial bull trout and no other modifications should be made to improve fish passage. The condition of this splash dam has changed significantly since 1988 when much of the water went subsurface through debris stored in front of the dam. It is believed that the 1996 flood event washed away portions of the splash dam to the point where surface flow now occurs over the dam and no drops greater than 1.2 m occur.

Authors:

Joe DuPont
Regional Fisheries Biologist

Ned Horner
Regional Fisheries Manager

INTRODUCTION

The Federal Draft Bull Trout Recovery Plan states that before bull trout recovery can be considered in the Coeur d'Alene Lake basin, the number and distribution of spawning bull trout populations must expand (USFWS 2002). The Draft Bull Trout Recovery Plan lists streams where it is believed that bull trout can re-colonize once current threats are removed. Marble Creek is one of the streams believed to have a high potential for bull trout recovery if fish passage can be provided past a historic splash dam (Figure 1). This dam was constructed with a series of other dams around 1915 to deliver logs from the Marble Creek watershed downstream to the St. Joe River (Lisa Hawdon, USFS, Personal Communication). These dams were used to back up water so they would float a raft of logs. Water behind a dam would be released all at once so that the ensuing flush of water would transport the logs down to the next splash dam downstream. This procession would continue downstream until the logs would reach the St. Joe River. These dams remained in operation until 1931. Since then many of them were destroyed or have fallen apart; however, the one dam in question continued to persist. Several fisheries biologists visited this splash dam in 1988 and they concluded it was a barrier to upstream fish passage (Ned Horner, IDFG, Personal Communication). Large volumes of sediment were stored upstream of the dam making it undesirable to remove in fear of the effects that could occur downstream.

Upstream of this splash dam there are over 160 km of streams, some of which reach what appears to be high quality bull trout habitat at elevations over 1219 m (4000 ft). These streams provide habitat conditions similar to what we see in other areas where thriving bull trout population occur such as in the upper St. Joe River or the Little North Fork Clearwater River. The bull trout recovery team believed it was important to revisit this splash dam to investigate alternatives to providing passage around this structure if it was believed to still be a barrier. Allowing bull trout to pass upstream of this dam would greatly expand the range of bull trout in the St. Joe River basin and assist in the recovery of the species.

STUDY SITE

Marble Creek flows into the St Joe River about 94 km upstream from its mouth. Many splash dams occurred in the Marble Creek watershed, but one in particular was believed to be a barrier to fish passage. The remnants of this splash dam are located about 18 km upstream from mouth of Marble Creek (Figure 1). Over 160 km of 2nd order or larger streams exist above this splash dam. Many tributaries are believed to have habitat conditions that will support bull trout spawning and rearing, especially those streams that occur at elevations over 1219 m (Figure 2).

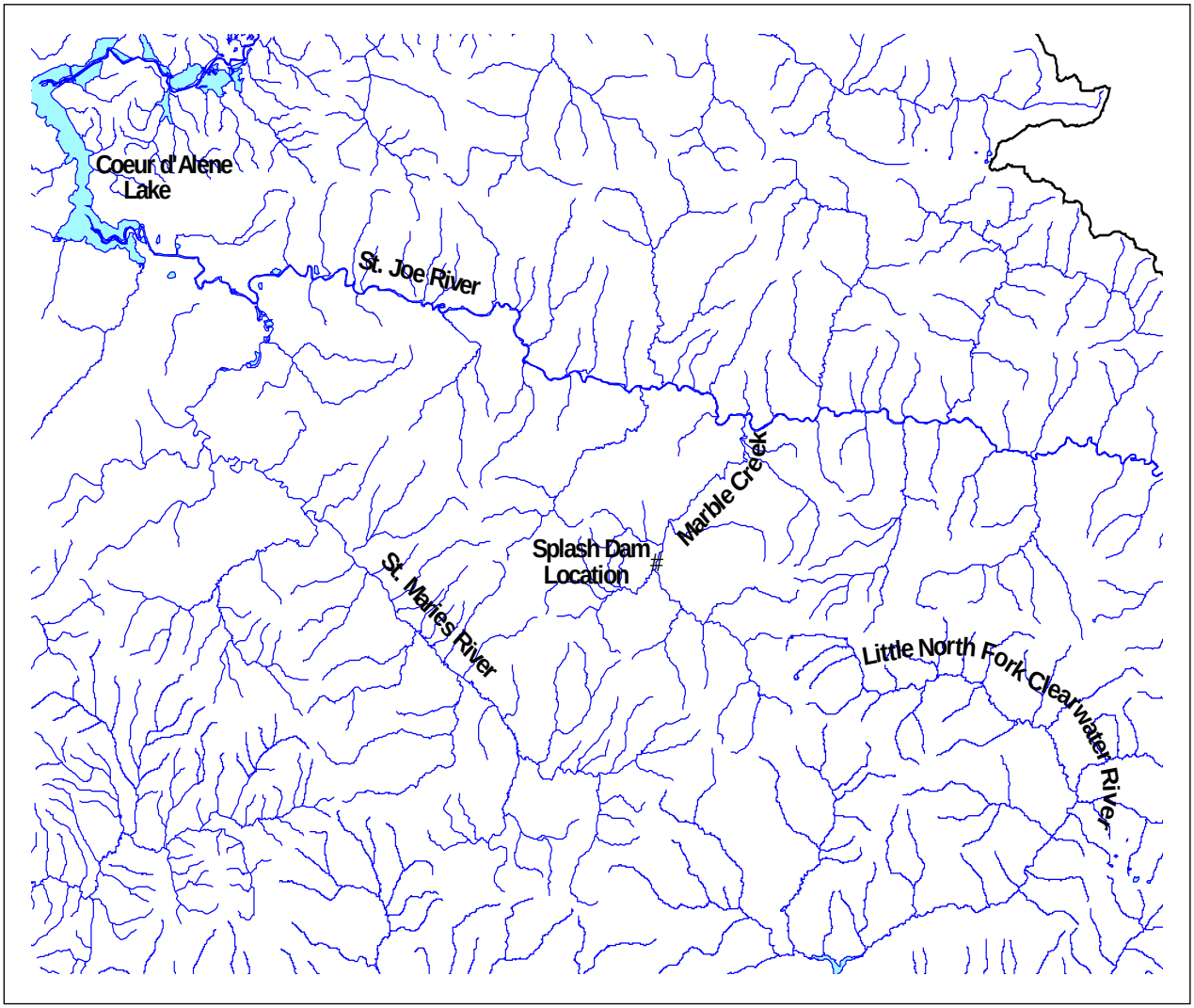

Figure 1. The location of the Marble Creek Splash Dam in the St Joe River Basin, Idaho.

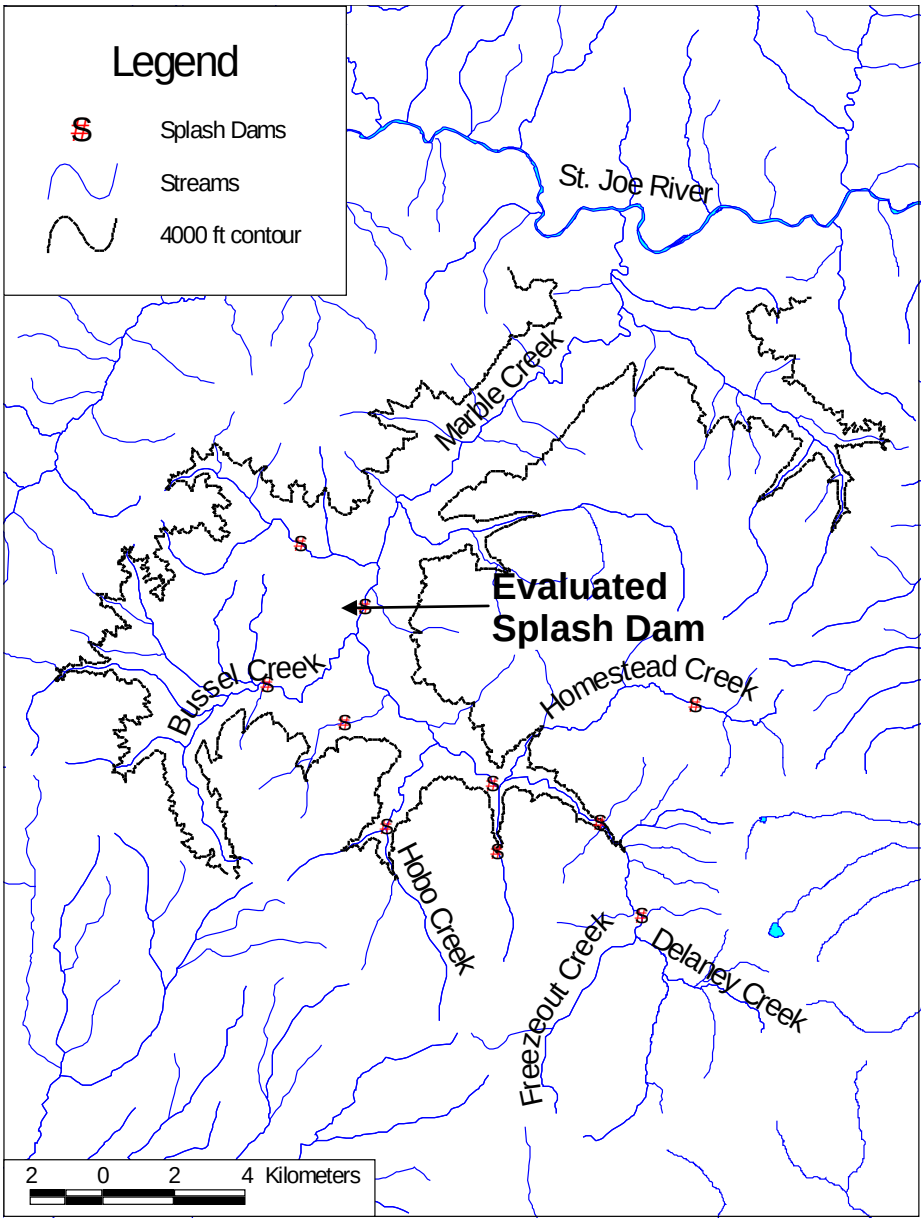

Figure 2. The location of the splash dam site evaluated on November 19, 2003 on Marble Creek, Idaho as well as the location of other splash dams that could block bull trout migrations to stream reaches that occur in elevations over 1219 m or 4000 ft (USFS 2003).

OBJECTIVES

1. Evaluate whether the splash dam on Marble Creek is a barrier to upstream fish passage.

2. Discuss alternatives to providing fish passage past the splash dam if it is a barrier.

FINDINGS

Joe DuPont (IDFG), Lisa Hawdon (USFS) and Ken Gebhardt (USFS) visited the Marble Creek splash dam site on November 10, 2003. This splash dam was constructed around a rock structure (possibly an old island) with logs 0.3-1.0 m in diameter (Figure 3). Rock was used in some of the foundation and walls for added support. The dam was about 40 m in width, 15 m deep and up to 10 m tall. The height of the dam in this location was about 3.5 m. Many of the logs on the west side (right side looking upstream) of the structure had either washed away or were beginning to break apart.

Figure 3. Looking upstream towards the base of the splash dam on Marble Creek, Idaho, on November 10, 2003.

The flow over/through the splash dam was divided into two main paths – one on the right side of the rock structure and one on the left side. The flow on the right side occurred through the area where many of the logs had washed away or were beginning to break apart. In this area the stream flow dropped about 3 m from the top of the dam to the bottom. This flow cascaded over three drops 1-1.2 m in height. Ice made it difficult to determine whether the water below these cascades were suitable for fish to hold in while attempting to negotiate this path. Rock and wood occurred throughout these cascades and the depth of water was over 30 cm in most places. The flow on the left side of the rock structure occurred below the logs on top of the splash dam. The water depth again appeared to be over 30 cm. The surface logs made it difficult to view the flow in places and we were not able to view where the flow made large drops. Again logs were located throughout the area of flow.

Based on this evaluation it is believed that adfluvial bull trout (> 400 mm) can migrate upstream past this splash dam. Since this splash dam was evaluated in 1988, much of the dam on the right side has washed away reducing the drop significantly (Figure 4). The water level between the top and bottom of this structure was about 3.3 m. In addition much of the large woody debris and sediment that had stacked up in front of the splash dam had washed away (Figures 4 and 5). In 1988 it was reported that most of the water flowed subsurface through the dam and backed up debris. In 2003, most of the water flowed on the surface and none of the drops exceeded what adult adfluvial bull trout can jump. The presence of logs and rocks in the cascades should improve the ability of bull to negotiate this splash dam. Bull trout have the ability to use structure (woody debris and rocks) to help them work their way over obstacles (Elle 1995; DuPont et al. In Press). Bull trout have been personally observed spawning upstream of debris jams that appeared more challenging than this splash dam. This splash dam may still be a barrier to smaller fish or cutthroat trout during their spawning migration when flows are higher. Further investigations of this splash dam during the spring runoff and during the summer would improve our evaluation of fish passage past this site.

It is suspected that many of the changes to the splash dam occurred during the winter of 1996 where 50 to 100 year flow events were reported to occur in many rivers and streams in Northern Idaho. High cut banks indicate that large quantities of substrate stored upstream of the splash probably washed out during this flood event. It is believed that in the next 10-20 years more of the splash dam will break apart making upstream fish passage even easier.

During the summer of 2003, an experienced fisherman reported catching a juvenile bull trout (~250 mm) just upstream of this splash dam (Ken Gebhardt, USFS, Personal Communication). If this is true, bull trout may already be in the process of re-colonizing lost habitat.

Other splash dams exist in the Marble Creek watershed (Figure 2), and many have not been recently evaluated to determine if they are fish barriers. These dams should be evaluated to ensure they don't block bull trout migrations to areas we believe could provide quality spawning and rearing habitat.

Figure 4. Comparative views between 1988 and 2003 looking downstream at the splash dam site on Marble Creek, Idaho.

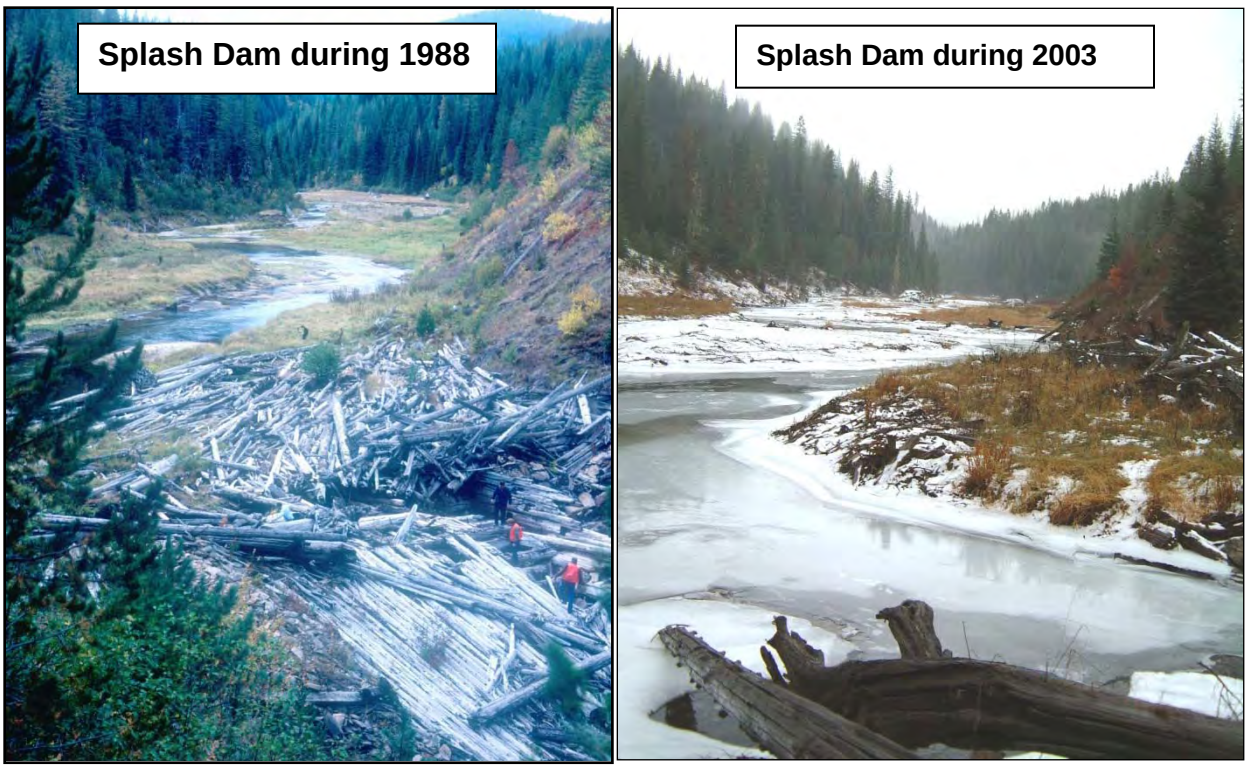

Figure 5. Comparative views between 1988 and 2003 looking upstream of the splash dam site on Marble Creek, Idaho.

RECOMMENDATIONS

1. It is believed the Marble Creek splash dam does not block upstream passage of adult adfluvial bull trout. As a result, we do not recommend making any changes to this structure to improve passage.

2. Revisit the splash dam site during spring runoff and summer to assess fish passage during higher flows and when ice cover will not obstruct the view of flow occurring over/through the dam.

3. Assess whether other barriers (splash dams, culverts or other) occur upstream of the evaluated splash dam that would prevent bull trout from reaching those streams that are believed to provide quality spawning and rearing habitat.

4. Periodically assess the condition of the splash dam to ensure changing conditions do not cause fish passage to change.

5. Periodically assess the fishery in those tributaries of Marble Creek where we believe bull trout can successfully re-colonize. If these areas are not re-colonized by bull trout in 5-10 years, it may be wise to discuss possibility of re-introducing bull trout into streams where we believe high quality habitat occurs.

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USFWS (U.S. Fish and Wildlife Service). 2002. Bull trout (*Salvelinus confluentus*) draft recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon.

APPENDIX

Appendix A. Angler Survey Form used during Priest Lake, Idaho creel survey, 2003

CLERK: **INTERVAL:** **DATE:**

SEC	DAY TYPE	TIME	# RODS	# RES	# NONRES	ANGLER TYPE	TRIP COMPLETE?	TROLL HOURS	JIG HOURS	SHORE HOURS	LAKE TROUT		OTHER		COMMENTS
											KEPT	RELEASED	KEPT	RELEASED	

Day Type 1=weekday
2=weekend Angler Type
BOAT SHORE

Appendix B. Summary of angler opinion survey for Priest Lakes, Idaho, creel survey 2003.

Fishing License # _____

IDAHO DEPARTMENT OF FISH AND GAME
PRIEST LAKE ANGLER QUESTIONAIRE

Lake trout (mackinaw) are now the most abundant game fish species in the Priest Lake system. Lake trout pose a serious risk to bull trout, cutthroat trout and kokanee in the Priest Lake system through competition and predation. Native species are a priority and we are placing more emphasis on native fish protection. Upper Priest Lake is currently being managed as the last stronghold for native fish in the Priest Lake system, but lake trout are increasing in abundance. A decision was made in 2002 to reduce lake trout numbers. Liberalized fishing regulations now allow anglers to harvest 6 lake trout per day in both Priest and Upper Priest Lakes with no size restriction. Lake trout reduction efforts will be evaluated during this regulation period. The current regulation was intended to do two things:

1) Allow liberal harvest of lake trout.
2) Reduce predation and competition by lake trout on bull trout and cutthroat trout and kokanee.

During 2003, an intensive yearlong angler creel survey will be completed to assess the lake trout fishery in the Priest Lake system. This questionnaire is part of that survey. Your answers to the following questions will help us develop future management direction for the Priest Lake system to provide the type of fishery you want.

Mark Your Answer

1. How many days per year do you fish **Priest Lake?**
   23% a. 0-5
   24% b. 6-10
   15% c. 11-15
   7% d. 16-20
   31% e. more than 20

2. What do you fish for in **Priest Lake**?
   88% a. lake trout
   6% b. cutthroat trout (catch and release)
   5% c. kokanee (catch and release)
   1% d. other (_____)

3. How many days per year do you fish **Upper Priest Lake**?
   95% a. 0-5
   3% b. 6-10
   1% c. 11-15
   0% d. 16-20
   1% e. more than 20

5. How many lake trout do you typically catch each trip?
   29% a. 0-2
   26% b. 3-4
   25% c. 5-6
   9% d. 7-8
   11% e. more than 8

6. How many lake trout do you typically harvest each trip?
   6% a. 0
   40% b. 1-2
   42% c. 3-5
   12% d. 6 (daily limit)

7. Would you support a shift in management emphasis in Priest Lake from lake trout (mackinaw), to a more traditional fishery for native cutthroat and bull trout and a harvest fishery for kokanee?
   34% a. I support a management shift towards a native fish and kokanee fishery.
   66% b. I support management emphasis for the existing lake trout fishery.

4. What do you fish for in **Upper Priest Lake**?

64% a. lake trout
14% b. cutthroat trout
7% c. kokanee (catch and release)
15% d. other (__________________)

Please include any additional comments below:

____

____

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NAME ____

ADDRESS ____

CITY, STATE, ZIP ____________________________________

IDAHO DEPARTMENT OF FISH AND GAME
2750 KATHLEEN AVENUE
COEUR d'ALENE ID 83815

- -

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Staple or Tape Here

APPENDIX C. Angler creel census data from Priest Lake, Idaho, 2003, showing survey parameters, instantaneous count data, angler interview summary, and effort, catch rate, and harvest estimates for each section by interval and day type. Dates appear as 1986 in count data as 1986 and 2003 dates/days aligned in creel program.

Angler Summary Report
Idaho Department of Fish and Game

01/12/04

Body of Water: PRIEST LAKE EPA Number: 0

Angler Composition

Total Number of Anglers:	959
Percent of resident:	46.40%
Percent of non-resident:	53.39%

Total Number of Interviews:	444
Ave Number Anglers/Interview:	2.16

Percentage of Interviews with --

1 angler :	19.82%
2 anglers:	54.73%
3 anglers:	17.79%
4 anglers:	4.50%
5 anglers:	1.35%
>5 anglers:	1.35%

Percentage of Anglers:

Catching:		Releasing:		Harvesting:	
0:	37.75%	0:	78.21%	0:	43.27%
1:	18.56%	1:	7.92%	1:	18.56%
2:	7.61%	2:	5.11%	2:	7.30%
3:	6.47%	3:	1.67%	3:	7.92%
4:	7.51%	4:	0.10%	4:	7.30%
5:	3.02%	5:	1.46%	5:	3.44%
more than 6:	19.08%	more than 6:	5.53%	6:	12.20%

Type of Fishing (from Instantaneous Counts)

Boat:	99.42%
Bank:	0.58%
Tube:	0.00%
Ice:	0.00%

Method of Fishing

Bait:	88.48%
Lure:	10.63%
Fly:	0.88%

Catch Composition

LKT:	99.87%	CT:	0.00%
KOK:	0.00%	BT:	0.00%
OTHER:	0.13%		

Number of Completed trips :	90
Average Time Spent Fishing:	1.47

Appendix D. Estimated effort and harvest by species, Priest Lakes, Idaho, 1956-2004. Numbers in parentheses are the 2003-2004 equivalents for survey period of previous years creel censuses.

Census period	Year	Angler hours	Kokanee	Cutthroat	Bull trout	Lake trout	Total harvest	Overall success (fish/hr)
April 30-October 15	1956	96,630	102,360	3,580	1,590	270	107,800	1.12
April 30-November 30	1966	64,604	68,884	2,387	1,173	199	72,643	1.12
May 18-September 6	1968	48,286	32,314	1,611	1,096	0	35,021	0.73
June 2-September 6	1969	46,819	37,880	1,256	650	0	39,786	0.85
May 16-October 2	1970	82,063	79,840	2,776	1,526	138	84,280	1.03
April 15-December 15	1978	99,157	4,593	2,585	2,320	5,724	15,222	0.15
April 16-December 15	1983	47,039	66	105	92	4,620	4,883	0.10
April 12-November 7	1986	71,516	0	134	0	6,295	6,429	0.09
May 9-July 17	1987	27,903	0	11	0	2,969	2,980	0.11
January 23-March 1	1993	12,918	0	0	0	2,605	2,605	0.20
January 1-December 31	1994	62,602	0	0	0	13,987	13,987	0.22
March 1-Februrary 27	2003-04	47,874	0	0	0	29,075	29,179	0.61

Appendix E. Global Position System coordinates for snorkel sites in the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River, Idaho. Coordinates were collected in UTM zone 11 format and the map datum was set at NAD27 CONUS.

St Joe River

Transect	Easting	Northing	Elevation
SJ01	593640	5233167	2537 ft
SJ02	597654	5231156	2613 ft
SJ03	598667	5231307	2677 ft
SJ04	598754	5231287	2680 ft
SJ05	600706	5232126	2665 ft
SJ06	602449	5232176	2698 ft
SJ07	603341	5232178	2717 ft
SJ08	605527	5230873	2797 ft
SJ09	606547	5231533	2825 ft
SJ10	606244	5231279	2830 ft
SJ11	606405	5231139	2835 ft
SJ12	607181	5231246	2845 ft
SJ13	610394	5228526	2948 ft
SJ14	612324	5228426	3027 ft
SJ15	615062	5226714	3101 ft
SJ16	616902	5225646	3157 ft
SJ17	617807	5225211	3220 ft
SJ18	620731	5223048	3375 ft
SJ19	621318	5220981	3408 ft
SJ20	622945	5216593	3697 ft
SJ21	624887	5214977	3725 ft
SJ22	625161	5212869	3755 ft
SJ23	625310	5209677	3819 ft
SJ24	625195	5209730	3822 ft
SJ25	624990	5209758	3829 ft
SJ26	623940	5205252	3918 ft
SJ27	624125	5205022	3925 ft
SJ28	624201	5204344	3940 ft
SJ29	560751	5235297	2125 ft
SJ30	568595	5234964	2254 ft
SJ31	571823	5233630	2274 ft
SJ32	574772	5233247	2175 ft
SJ33	578901	5233016	2248 ft
SJ34	585397	5234051	2363 ft
SJ35	591008	5233502	2499 ft

Appendix E. Continued.

Coeur d'Alene River

Transect	Easting	Northing	Elevation (ft)
NF01	555457	5270056	2160
NF01(slough)	555417	5270108	2160
NF02	557272	5271703	2175
NF03	560383	5274513	2198
NF04	562779	5278672	2230
NF05	565969	5278176	2250
NF06	571294	5279668	2290
NF07	572903	5277841	2322
NF08	577131	5277444	2375
NF09	579100	5280301	2415
NF10	579457	5283229	2455
NF11	578945	5283082	2462
NF12	575900	5285585	2495
NF13	573482	5288331	2540
NF14	569924	5293197	2638
NF15	569991	5293731	2644
NF16	569114	5295235	2665
NF17	567689	5296719	2688
NF18	566330	5302002	2765
NF19	565065	5303695	2803
NF20	565415	5303956	2818
NF21	564786	5304894	2845
NF22	565683	5306287	2893
NF23	565636	5306508	2900
LNF01	557178	5273053	2175
LNF02	554924	5274377	2202
LNF03	553380	5275727	2222
LNF04	551753	5275453	2243
LNF05	548928	5274398	2283
LNF06	547814	5277858	2352
LNF07	547607	5280546	2420
LNF08	546749	5282037	2470
LNF09	546160	5284827	2520
LNF10	543261	5287400	2622
LNF11	543207	5287617	2628
LNF12	540088	5287366	2717
LNF13	539236	5287576	2748
TP01	564519	5303607	2805
TP02	562306	5303758	2836
TP03	560331	5302731	2869
TP04	560439	5303183	2872
TP05	559224	5302784	2885
TP REHAB1	555828	5298099	3010
TP REHAB2	555090	5296965	3037

Appendix E. Continued.

Little North Fork Clearwater River

Transect	Easting	Northing	Elevation
1	600292	5201855	2414 ft
2	600584	5202093	2445 ft
3	601022	5202637	2251 ft
4	601431	5203158	2489 ft
5	601733	5203535	2490 ft
6	601947	5204330	2497 ft
7	602270	5204636	2510 ft
8	602438	5204741	2654 ft
9	602758	5205236	2661 ft
10	602806	5205519	2665 ft
11	602579	5205936	2673 ft
12	602020	5206137	2464 ft
13	601969	5206229	2384 ft
14	601480	5207825	2769 ft
15	601179	5207865	2773 ft
16	600945	5208650	2833 ft
17	600929	5208693	2839 ft
18	600769	5209065	2820 ft
19	600715	5209089	2822 ft
20	600254	5210236	2934 ft
21	599991	5210461	2947 ft
22	599124	5210544	3027 ft
23	598982	5210590	3034 ft
24	598678	5210840	3065 ft
25	597544	5210930	3180 ft
26	597489	5210791	3190 ft
27	597146	5211042	3200 ft
28	596736	5211244	3260 ft
29	596514	5211479	3275 ft
30	595721	5212079	3325 ft
31	595149	5212518	3345 ft
32	595274	5212760	3355 ft
33	594495	5213847	3448 ft
34	593840	5213827	3480 ft
35	593505	5213821	3507 ft
36	592723	5214352	3580 ft
37	592382	5214266	3611 ft
38	591919	5214375	3630 ft
39	591214	5214329	3680 ft
40	589904	5213787	3785 ft
41	589781	5213330	3835 ft
42	589355	5213119	3872 ft
43	588725	5213560	3905 ft
44	588077	5213153	3976 ft
45	587572	5213059	4025 ft
46	586479	5212661	4125 ft
47	586237	5212597	4136 ft
48	585887	5212831	4181 ft

Appendix F. Snorkel Data Form used to collect field data in the Panhandle Region.

IDFG Snorkel Data

Stream: _____ **Transect Name/Number:** _____

Date:_____ Time:_____ Temperature: _____ Visibility:_____ GPS Datum: _____

Observers:_____ No. of Snorkelers:_____ GPS Coord: (Easting) _____

(Northing) _____

Habitat Type: Pool, Riffle, Run, Glide, Pocket Water Max Depth (m): _____ Dominant Cover / % surface area: _____

Stream Length (m): _____ Stream Width (m): _____

Comments: _____

Length	WCT		RBT		BLT		BRK		MWF		LSS		NPM		Other
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	
<3"															
3"-6"															
6"-9"															
9"-12"															
12"-15"															
15"-18"															
18"-21"															
>21"															
Total															

Abbreviations: **WCT** = Westslope Cutthroat Trout; **RBT** = Rainbow Trout; **BLT** = Bull Trout; **BRK** = Brook Trout; **MWF** = Mountain Whitefish
MWF = Mountain Whitefish; **LSS** = Large Scale Sucker; **NPM** = Northern Pike Minnow; **RSS** = Redside Shiner; **LND** = Long Nose Dace.

Cover Types: **LWD** (large woody debris > 4"), **SWD** (small woody debris < 4")' **LS** (large substrate), **UB** (undercut banks), **OC** (ovehead cover)

Appendix G. Snorkel data collected from the St. Joe River, Idaho 2003.

Surface area of stream snorkeled during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Area snorkeled (m^2)											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	5,565	5,565	5,565	5,565	5,565	5,565	5,565	--	--	5,565	5,565	5,565
	S-2	5,794	5,794	5,794	5,794	5,794	5,794	5,794	--	--	5,794	5,794	5,794
	S-3	743	743	743	743	743	743	743	--	--	743	743	743
	S-4	468	468	468	468	468	468	468	--	--	468	468	468
	S-5	3,389	3,389	3,389	3,389	3,389	3,389	3,389	--	3,389	3,389	3,389	3,389
	S-6	8,432	8,432	8,432	8,432	8,432	8,432	8,432	--	8,432	8,432	8,432	8,432
	S-7	4,301	4,301	4,301	4,301	4,301	4,301	4,301	--	4,301	4,301	4,301	4,301
Prospector Creek to Red Ives Creek	S-8	2,337	2,337	2,337	2,337	2,337	2,337	2,337	--	2,337	2,337	2,337	2,337
	S-9	2,556	2,556	2,556	2,556	2,556	2,556	2,556	--	2,556	2,556	2,556	2,556
	S-10	3,613	3,613	3,613	3,613	3,613	3,613	3,613	--	3,613	3,613	3,613	3,613
	S-11	1,911	1,911	1,911	1,911	1,911	1,911	1,911	--	1,911	1,911	1,911	1,911
	S-12	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653	1,653
	S-13	1,706	1,706	1,706	1,706	1,706	1,706	1,706	1,706	1,706	1,706	1,706	1,706
	S-14	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383	2,383
	S-15	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720	2,720
	S-16	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875	1,875
	S-17	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920	1,920
	S-18	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280	1,280
	S-19	837	837	837	837	837	837	837	837	837	837	837	837
	S-20	1,488	1,488	1,488	1,488	1,488	1,488	1,488	1,488	1,488	1,488	1,488	1,488
	S-21	423	423	423	423	423	423	423	423	423	423	423	423
	S-22	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692	1,692
Red Ives Creek to Ruby Creek	S-23	881	881	881	881	881	881	881	881	881	881	881	881
	S-24	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155	1,155
	S-25	842	842	842	842	842	842	842	842	842	842	842	842
	S-26	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961
	S-27	820	820	820	820	820	820	820	820	820	820	820	820
	S-28	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593	1,593
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	64,336	64,336	64,336	64,336	64,336	64,336	64,336	25,228	51,767	64,336	64,336	64,336
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

		Area snorkeled (m^2)											
Reach	Transects	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	5,565	5,565	3,760	2,907	2,907	2,907	4,335	4,335	2,771	2,560	4,410	4,510
	S-2	5,794	5,794	5,798	1,949	2,688	2,688	2,937	2,937	2,827	2,576	3,815	2,052
	S-3	743	--	838	1,003	1,003	1,003	1,190	1,190	842	825	1,920	1,080
	S-4	468	--	975	898	898	898	1,088	1,088	--	--	--	1,020
	S-5	3,389	3,389	3,389	1,926	1,980	1,980	2,340	2,340	2,850	6,000	7,605	4,056
	S-6	8,432	8,432	8,432	5,224	4,542	4,542	4,960	4,960	6,343	7,590	6,800	4,470
	S-7	4,301	4,301	4,301	2,520	2,520	2,520	2,790	2,700	5,080	4,276	4,144	2,904
Prospector Creek to Red Ives Creek	S-8	2,337	2,337	2,337	3,032	3,032	3,032	3,718	3,718	2,379	2,124	2,756	3,348
	S-9	2,556	2,556	2,556	2,475	2,475	2,475	3,113	3,113	--	--	--	1,872
	S-10	3,613	3,613	3,613	3,416	3,416	3,416	4,381	4,381	5,500	5,500	5,500	3,749
	S-11	1,911	1,911	1,911	1,542	1,542	1,542	2,181	2,181	--	--	--	1,276
	S-12	1,653	1,653	1,653	1,227	1,370	1,370	1,645	1,645	3,465	3,528	3,041	1,720
	S-13	1,706	1,706	1,706	2,185	2,803	2,803	3,278	3,278	4,286	3,763	3,479	2,640
	S-14	2,383	2,383	2,383	1,629	1,629	1,629	1,897	1,897	2,735	2,240	2,662	1,862
	S-15	2,720	2,720	2,720	1,107	1,107	1,107	1,342	1,342	1,805	1,520	1,378	1,448
	S-16	1,875	1,875	1,875	1,330	1,330	1,330	1,511	1,511	3,127	2,323	3,410	1,035
	S-17	1,920	1,920	1,920	1,830	1,830	1,830	1,830	1,830	2,417	2,765	2,423	2,360
	S-18	1,280	1,280	1,280	1,315	1,315	1,315	1,507	1,507	858	900	515	830
	S-19	837	837	837	2,396	1,779	2,081	2,880	2,880	860	751	944	672
	S-20	1,488	1,488	1,488	1,148	1,554	1,334	1,638	1,638	1,705	1,656	1,104	1,020
	S-21	423	423	423	765	912	912	1,062	1,062	549	770	990	626
	S-22	1,692	1,692	1,692	1,195	1,305	1,305	1,061	1,061	1,575	1,609	2,219	1,436
Red Ives Creek to Ruby Creek.	S-23	881	881	881	690	1,000	1,000	825	825	--	--	--	552
	S-24	1,155	1,155	1,155	1,487	1,672	1,672	1,672	1,672	1,577	1,121	1,349	1,283
	S-25	842	842	842	865	850	1,770	1,239	1,239	1,613	1,444	1,224	1,056
	S-26	1,961	1,961	1,961	1,544	1,648	1,648	1,680	1,680	1,197	1,340	2,080	1,600
	S-27	820	820	820	925	925	925	805	805	1,340	1,777	2,120	999
	S-28	1,593	1,593	1,593	901	616	498	680	672	858	782	729	600
Calder to North Fork St Joe River	S-29	--	--	7,600	6,840	6,840	6,840	6,840	6,840	--	3,147	7,280	6,996
	S-30	--	--	8,550	9,200	9,200	9,200	10,350	10,350	--	4,860	7,467	10,476
	S-31	--	--	7,066	8,000	8,000	8,000	8,000	8,000	--	3,437	8,640	6,930
	S-32	--	--	5,205	3,077	2,917	3,121	3,440	3,440	--	4,470	6,160	5,670
	S-33	--	--	9,643	7,125	7,125	7,125	7,125	7,125	--	2,678	6,160	5,357
	S-34	--	--	2,545	1,883	2,580	2,580	2,580	2,580	--	3,872	3,952	2,055
	S-35	--	--	3,310	2,498	2,730	2,730	3,000	3,000			5,044	2,653
	Total 1-28	64,336	63,125	63,139	49,431	50,648	51,532	59,585	59,487	58,558	59,738	66,616	52,077
	Total 29-35	--	--	43,919	38,623	39,392	39,596	41,335	41,335	--	22,463	44,703	40,138

Grey shading shows transects that were snorkeled at different locations than other years.

Length of stream snorkeled during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Stream length (m) snorkeled											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	148	148	148	148	148	148	148	148	148	148	148	148
	S-2	204	204	204	204	204	204	204	204	204	204	204	204
	S-3	59	59	59	59	59	59	59	59	59	59	59	59
	S-4	40	40	40	40	40	40	40	40	40	40	40	40
	S-5	135	135	135	135	135	135	135	135	135	135	135	135
	S-6	243	243	243	243	243	243	243	243	243	243	243	243
	S-7	134	134	134	134	134	134	134	134	134	134	134	134
Prospector Creek to Red Ives Creek	S-8	114	114	114	114	114	114	114	114	114	114	114	114
	S-9	95	95	95	95	95	95	95	95	95	95	95	95
	S-10	178	178	178	178	178	178	178	178	178	178	178	178
	S-11	73	73	73	73	73	73	73	73	73	73	73	73
	S-12	68	68	68	68	68	68	68	68	68	68	68	68
	S-13	79	79	79	79	79	79	79	79	79	79	79	79
	S-14	114	114	114	114	114	114	114	114	114	114	114	114
	S-15	170	170	170	170	170	170	170	170	170	170	170	170
	S-16	125	125	125	125	125	125	125	125	125	125	125	125
	S-17	128	128	128	128	128	128	128	128	128	128	128	128
	S-18	80	80	80	80	80	80	80	80	80	80	80	80
	S-19	53	53	53	53	53	53	53	53	53	53	53	53
	S-20	86	86	86	86	86	86	86	86	86	86	86	86
	S-21	30	30	30	30	30	30	30	30	30	30	30	30
	S-22	72	72	72	72	72	72	72	72	72	72	72	72
Red Ives Creek to Ruby Creek.	S-23	74	74	74	74	74	74	74	74	74	74	74	74
	S-24	66	66	66	66	66	66	66	66	66	66	66	66
	S-25	55	55	55	55	55	55	55	55	55	55	55	55
	S-26	86	86	86	86	86	86	86	86	86	86	86	86
	S-27	40	40	40	40	40	40	40	40	40	40	40	40
	S-28	118	118	118	118	118	118	118	118	118	118	118	118
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	2868	2868	2868	2868	2868	2868	2868	2868	2868	2868	2868	2868
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

Reach	Transects	Stream length (m) snorkeled											
		1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	148	148	100	85	85	85	85	85	64	64	90	110
	S-2	204	204	204	89	89	89	89	89	110	112	140	95
	S-3	59	59	67	85	85	85	85	85	55	55	100	80
	S-4	40	37	76	68	68	68	68	68	--	--	--	75
	S-5	135	135	135	90	90	90	90	90	100	200	225	155
	S-6	243	243	243	155	155	155	155	155	215	220	200	148
	S-7	134	134	134	90	90	90	90	90	127	127	140	110
Prospector Creek to Red Ives Creek	S-8	114	114	114	143	143	143	143	143	122	118	130	180
	S-9	95	95	95	125	125	125	125	125	--	--	--	80
	S-10	178	178	178	193	193	193	193	193	250	250	250	160
	S-11	73	73	73	82	82	82	82	82	--	--	--	55
	S-12	68	68	68	55	55	55	55	55	126	126	111	100
	S-13	79	79	79	95	95	95	95	95	152	136	115	110
	S-14	114	114	115	90	90	90	90	90	113	112	104	95
	S-15	170	170	170	79	79	79	79	79	102	95	106	102
	S-16	125	125	125	91	91	91	91	91	162	163	174	90
	S-17	128	128	128	122	122	122	122	122	158	158	158	146
	S-18	80	80	50	96	96	96	96	96	55	59	49	50
	S-19	53	53	53	121	121	121	121	121	46	46	51	40
	S-20	86	86	86	70	70	70	70	70	87	86	64	60
	S-21	30	30	30	43	43	43	43	43	30	39	45	36
	S-22	72	72	72	58	58	58	58	58	63	65	81	57
	S-23	74	74	74	50	50	50	50	50	--	--	--	40
Red Ives Creek to Ruby Creek.	S-24	66	66	66	88	88	88	88	88	73	65	62	70
	S-25	55	55	55	50	50	71	71	71	75	75	60	60
	S-26	86	86	86	80	80	80	80	80	57	57	80	80
	S-27	40	40	40	46	46	46	46	46	67	69	80	54
	S-28	118	118	118	40	40	40	40	40	60	59	53	50
Calder to North Fork St Joe River	S-29	--	--	200	180	180	180	180	180	--	80	200	220
	S-30	--	--	150	230	230	230	230	230	--	120	200	270
	S-31	--	--	150	200	200	200	200	200	--	87	225	210
	S-32	--	--	100	64	64	64	64	64	--	120	250	180
	S-33	--	--	175	150	150	150	150	150	--	104	140	118
	S-34	--	--	100	86	86	86	86	86	--	89	130	90
	S-35	--	--	100	75	75	75	75	75	--	--	130	80
	Total 1-28	2868	2864	2834	2479	2479	2500	2500	2498	2469	2556	2668	2488
	Total 29-35	--	--	975	985	985	985	985	985	--	600	1275	1168

Grey shading shows transects that were snorkeled at different locations than other years.

Number of cutthroat trout counted (all size classes) during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Number of cutthroat trout counted (all size classes)											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	0	0	0	0	1	0	0	--	--	0	8	0
	S-2	0	0	0	1	1	9	5	--	--	3	0	1
	S-3	4	0	1	1	1	5	4	--	--	2	7	0
	S-4	0	0	3	2	0	2	0	--	--	1	4	0
	S-5	0	0	1	3	0	3	3	--	2	2	4	1
	S-6	0	0	7	3	1	3	6	--	0	5	7	1
	S-7	0	0	7	1	0	9	6	--	4	10	4	5
Prospector Creek to Red Ives Creek	S-8	1	4	4	7	4	6	8	--	7	25	9	21
	S-9	2	5	6	3	8	9	10	--	33	14	6	23
	S-10	1	8	8	2	18	22	15	--	11	6	5	37
	S-11	0	6	3	1	6	4	3	--	12	8	16	24
	S-12	5	11	12	5	11	24	15	--	17	36	24	18
	S-13	2	0	6	12	8	18	32	34	24	29	40	73
	S-14	7	1	6	7	5	22	24	24	35	36	38	36
	S-15	6	0	13	3	12	14	4	17	51	43	25	15
	S-16	7	9	9	7	7	14	26	24	26	18	13	36
	S-17	11	10	7	6	16	24	39	84	17	63	39	66
	S-18	4	8	16	11	18	43	35	71	52	67	69	104
	S-19	5	0	7	14	28	25	28	51	76	19	23	75
	S-20	15	10	28	23	36	48	91	115	20	30	25	136
	S-21	1	9	14	21	18	63	42	59	26	17	42	73
	S-22	3	6	27	46	21	61	62	167	82	51	51	94
Red Ives Creek to Ruby Creek.	S-23	4	4	27	21	21	30	36	6	36	51	10	56
	S-24	5	8	29	43	29	47	73	81	93	23	35	53
	S-25	16	3	20	30	28	31	42	31	33	49	19	71
	S-26	14	12	18	28	26	61	66	1	22	41	3	18
	S-27	25	34	25	21	28	83	73	6	37	25	21	20
	S-28	36	40	31	48	53	111	154	12	114	39	18	22
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	174	188	335	370	405	791	902	783	830	713	565	1,079
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

Reach	Transects	Number of cutthroat trout counted (all size classes)											
		1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	1	7	0	0	2	0	0	0	2	7	4	18
	S-2	4	13	14	13	56	14	13	2	11	17	31	31
	S-3	10	--	35	7	15	16	3	6	19	21	12	23
	S-4	8	--	33	13	24	7	3	3	--	--	--	13
	S-5	7	15	4	8	25	6	11	7	24	49	21	30
	S-6	2	5	30	7	9	7	2	2	31	18	44	26
	S-7	19	20	12	6	0	4	4	3	8	13	37	20
Prospector Creek to Red Ives Creek	S-8	28	44	70	23	43	35	16	1	18	22	17	36
	S-9	48	55	80	31	55	14	39	34	--	--	--	18
	S-10	25	44	65	49	44	44	39	50	23	26	31	48
	S-11	29	36	42	13	15	3	9	9	--	--	--	20
	S-12	37	29	37	13	80	32	37	24	13	33	41	46
	S-13	67	91	39	27	82	65	24	15	33	50	53	39
	S-14	29	31	22	18	60	125	16	32	25	28	37	56
	S-15	42	55	18	40	40	53	49	35	15	20	43	30
	S-16	39	21	28	23	8	24	49	20	57	18	47	38
	S-17	103	111	33	17	18	45	125	17	44	52	51	56
	S-18	48	58	72	88	51	32	47	33	37	31	39	45
	S-19	49	40	25	34	29	1	344	5	12	20	21	9
	S-20	46	50	37	11	63	36	19	21	19	20	18	18
	S-21	44	64	13	27	44	65	55	28	26	43	18	40
	S-22	60	63	24	27	70	90	55	22	26	43	29	21
Red Ives Creek to Ruby Creek.	S-23	8	7	3	4	22	16	15	11	--	--	--	19
	S-24	67	67	25	25	29	26	6	29	13	20	19	23
	S-25	52	39	3	10	27	65	19	4	25	22	22	37
	S-26	5	69	24	20	32	9	13	3	7	2	9	9
	S-27	31	42	12	30	57	70	12	26	13	19	10	15
	S-28	12	70	18	0	6	7	13	26	12	14	10	4
Calder to North Fork St Joe River	S-29	--	--	4	8	0	0	1	4	--	1	7	2
	S-30	--	--	0	4	0	0	6	0	--	35	4	0
	S-31	--	--	19	5	17	6	2	15	--	3	6	5
	S-32	--	--	3	9	13	13	0	2	--	7	7	3
	S-33	--	--	0	0	0	0	0	0	--	2	3	0
	S-34	--	--	3	28	33	21	6	5	--	2	7	5
	S-35	--	--	2	33	0	14	45	11	--	--	15	28
	Total 1-28	920	1,146	818	584	1,006	911	1,037	468	513	608	664	788
	Total 29-35	--	--	31	87	63	54	60	37	--	50	49	43

Grey shading shows transects that were snorkeled at different locations than other years.

Number of cutthroat trout counted (≥ 300 mm) during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Number of cutthroat trout counted (≥ 300 mm)											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	0	0	0	0	0	0	0	--	--	0	2	0
	S-2	0	0	0	--	0	0	0	--	--	0	0	0
	S-3	2	0	0	--	0	0	0	--	--	0	0	0
	S-4	0	0	0	--	0	0	0	--	--	0	0	0
	S-5	0	0	0	--	0	0	0	--	--	0	1	0
	S-6	0	0	0	--	1	0	0	--	--	0	1	0
	S-7	0	0	0	--	0	0	0	--	--	0	0	0
Prospector Creek to Red Ives Creek	S-8	0	0	0	--	0	0	0	--	--	1	1	2
	S-9	1	1	0	--	0	0	0	--	--	1	1	3
	S-10	1	1	1	--	0	0	0	--	--	0	0	3
	S-11	0	1	0	--	0	0	0	--	--	2	4	1
	S-12	0	0	2	--	0	0	0	--	--	3	1	2
	S-13	0	0	0	--	0	0	0	--	--	1	3	8
	S-14	1	0	1	--	2	0	0	--	--	0	2	2
	S-15	1	0	1	--	0	0	0	--	--	0	1	1
	S-16	0	1	0	--	2	0	0	--	--	1	1	2
	S-17	2	0	0	--	6	0	0	--	--	0	0	2
	S-18	0	0	1	--	2	0	0	--	--	0	4	6
	S-19	0	0	0	--	4	0	0	--	--	1	0	4
	S-20	1	1	0	--	6	0	0	--	--	1	6	16
	S-21	0	0	0	--	3	0	0	--	--	0	0	4
	S-22	0	0	0	--	3	0	0	--	--	8	10	10
Red Ives Creek to Ruby Creek.	S-23	0	0	0	--	3	0	0	--	--	0	2	2
	S-24	0	0	0	--	6	0	0	--	--	1	3	5
	S-25	0	0	0	--	0	0	0	--	--	0	1	5
	S-26	1	1	0	--	0	0	0	--	--	2	2	9
	S-27	2	3	0	--	--	--	--	--	--	3	14	4
	S-28	6	4	0	--	3	0	--	--	--	6	12	4
Calder to North Fork St Joe River	S-29												
	S-30												
	S-31												
	S-32												
	S-33												
	S-34												
	S-35												
	Total 1-28	18	13	6	0	41	0	0	0	0	31	72	95
	Total 29-35												

Cont.

Reach	Transects	Number of cutthroat trout counted (≥ 300 mm)											
		1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	1	5	0	0	0	0	0	0	1	0	0	5
	S-2	1	6	4	1	4	4	2	1	2	1	1	4
	S-3	2	--	2	1	2	3	0	0	9	0	0	3
	S-4	0	--	1	1	1	2	0	0	--	--	--	0
	S-5	2	5	2	0	0	2	0	1	6	5	2	8
	S-6	0	3	10	0	2	0	0	0	5	2	15	6
	S-7	1	5	2	0	0	0	0	0	1	2	2	9
Prospector Creek to Red Ives Creek	S-8	4	12	20	8	8	2	2	0	4	7	2	9
	S-9	18	25	30	10	6	4	2	1	--	--	--	0
	S-10	0	18	25	38	6	11	2	10	7	6	11	3
	S-11	1	25	10	12	0	0	0	0	--	--	--	3
	S-12	8	9	14	3	11	7	4	2	3	3	8	4
	S-13	21	42	12	3	18	45	0	0	11	10	15	1
	S-14	4	11	3	3	13	25	0	0	7	2	7	4
	S-15	1	10	6	8	8	10	0	0	0	3	7	1
	S-16	1	3	10	3	0	4	0	0	5	0	11	0
	S-17	24	22	11	5	0	8	7	0	4	0	3	1
	S-18	4	7	25	6	5	10	3	0	3	2	4	3
	S-19	8	16	8	3	5	0	3	0	1	2	4	0
	S-20	15	19	12	0	7	2	4	3	10	4	7	4
	S-21	2	20	0	2	7	10	13	8	8	8	5	14
	S-22	13	32	11	17	15	15	12	2	11	11	6	4
Red Ives Creek to Ruby Creek.	S-23	0	2	0	2	5	6	1	0	--	--	--	1
	S-24	12	16	10	5	6	6	0	1	2	2	5	7
	S-25	11	4	0	2	5	15	0	0	2	1	2	11
	S-26	3	8	22	15	15	4	2	1	1	1	3	3
	S-27	25	22	12	6	14	25	5	11	4	3	6	2
	S-28	8	12	8	0	2	1	1	5	3	0	2	1
Calder to North Fork St Joe River	S-29			0	1	0	0	1	1	--	1	0	0
	S-30			0	0	0	0	0	0	--	0	0	0
	S-31			2	0	0	0	0	2	--	0	0	0
	S-32			1	2	1	1	0	0	--	1	0	0
	S-33			0	0	0	0	0	0	--	0	0	0
	S-34			2	12	6	6	0	0	--	2	0	2
	S-35			2	3	0	4	0	0	--		2	8
	Total 1-28			277	172	172	232	64	49	110	79	130	121
	Total 29-35	190	359	270	154	165	221	63	46	110	75	128	111

Grey shading shows transects that were snorkeled at different locations than other years.

Number of mountain whitefish counted during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Number of mountain whitefish counted											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	18	62	57	4	79	72	30	--	--	9	32	yes
	S-2	88	100	81	11	200	100	122	--	--	170	38	yes
	S-3	20	22	4	4	4	8	15	--	--	31	27	yes
	S-4	5	19	1	2	1	6	10	--	--	14	23	yes
	S-5	12	9	13	14	0	12	37	--	yes	11	21	yes
	S-6	69	35	98	28	30	50	72	--	yes	45	46	yes
	S-7	35	10	27	7	0	25	24	--	yes	32	33	yes
Prospector Creek to Red Ives Creek	S-8	54	18	26	16	200	29	50	--	yes	71	46	yes
	S-9	47	52	15	10	yes	15	3	--	yes	9	16	yes
	S-10	48	50	30	22	200	77	32	--	yes	30	46	yes
	S-11	5	10	12	7	15	8	14	--	yes	21	11	yes
	S-12	34	32	70	23	300	48	30	--	yes	75	41	yes
	S-13	9	19	30	29	72	16	54	20	yes	45	45	yes
	S-14	24	45	39	19	87	32	28	24	yes	66	37	yes
	S-15	9	30	21	15	3	22	5	4	yes	10	4	yes
	S-16	5	6	1	5	3	1	2	0	yes	4	0	yes
	S-17	19	9	10	5	12	18	8	10	12	59	40	yes
	S-18	15	12	26	10	8	12	6	10	0	7	1	yes
	S-19	20	8	11	16	26	18	8	20	8	17	24	yes
	S-20	17	15	6	8	12	12	8	6	0	11	2	yes
	S-21	13	10	5	12	6	12	11	10	4	7	8	yes
	S-22	33	12	16	37	112	59	17	24	40	47	20	yes
Red Ives Creek to Ruby Creek.	S-23	8	13	24	40	12	41	12	1	6	22	13	yes
	S-24	11	8	5	19	6	13	42	50	20	11	38	yes
	S-25	20	6	13	18	14	8	30	30	12	8	10	yes
	S-26	24	22	26	15	14	23	18	0	0	36	5	12
	S-27	33	22	34	32	23	54	44	0	45	36	10	25
	S-28	37	25	35	40	32	26	32	2	30	89	16	31
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	732	681	736	468	1471	817	764	211	NA	993	653	NA
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

Reach	Transects	Number of mountain whitefish counted											
		1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	0	17	0	0	12	0	3	47	9	0	1	8
	S-2	129	217	30	300	150	90	20	101	52	22	87	350
	S-3	14	--	0	8	8	30	7	40	4	13	41	19
	S-4	9	--	25	11	10	3	2	25	--	--		15
	S-5	10	8	10	11	15	30	10	0	16	22	18	18
	S-6	27	57	30	12	17	15	10	33	18	17	26	32
	S-7	13	12	14	6	2	2	2	26	6	4	41	36
Prospector Creek to Red Ives Creek	S-8	111	74	100	25	43	30	9	0	31	38	43	102
	S-9	23	31	75	15	25	15	8	77	--	--		2
	S-10	29	65	65	0	50	16	10	8	20	46	49	12
	S-11	17	31	10	0	0	0	2	6	--	--		14
	S-12	129	29	30	8	30	15	40	2	9	41	50	39
	S-13	24	27	32	8	55	55	10	5	27	40	45	37
	S-14	53	90	75	15	12	30	15	30	30	80	60	101
	S-15	4	8	13	15	25	4	3	63	6	20	6	3
	S-16	0	1	25	15	0	3	5	13	12	3	22	7
	S-17	19	18	35	6	12	15	13	17	0	4	17	15
	S-18	13	6	60	12	30	0	5	2	4	24	24	50
	S-19	8	10	3	0	0	0	0	12	3	0	1	0
	S-20	6	11	30	0	60	22	3	16	0	4	9	3
	S-21	40	26	16	15	36	75	15	7	0	19	13	60
	S-22	140	145	30	40	80	0	17	5	30	39	33	40
Red Ives Creek to Ruby Creek.	S-23	0	0	2	0	0	0	3	0	--	--	--	0
	S-24	33	49	15	8	30	0	0	1	0	4	11	10
	S-25	34	27	11	0	12	50	2	0	0	10	8	8
	S-26	0	14	5	0	12	0	8	0	8	4	0	0
	S-27	25	46	0	50	60	70	5	10	13	11	2	50
	S-28	4	25	15	8	2	0	6	15	10	7	7	0
Calder to North Fork St Joe River	S-29	--	--	30	0	0	10	25	15	--	50	25	25
	S-30	--	--	25	0	0	75	75	0	--	4	5	10
	S-31	--	--	18	10	20	30	35	0	--	84	10	38
	S-32	--	--	20	0	0	40	32	0	--	78	17	65
	S-33	--	--	6	0	0	0	0	0	--	65	5	3
	S-34	--	--	150	30	100	115	15	15	--	0	25	84
	S-35	--	--	15	30	15	80	0	12	--	--	60	96
	Total 1-28	914	1044	756	588	788	570	233	561	308	472	614	1031
	Total 29-35	--	--	264	70	135	350	182	42	--	281	147	321

Number of rainbow trout counted during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Number of rainbow trout counted											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	0	2	3	0	8	1	2	--	--	3	7	--
	S-2	2	7	3	1	13	1	41	--	--	5	4	1
	S-3	3	12	3	0	3	0	2	--	--	2	2	--
	S-4	3	8	2	0	2	2	1	--	--	2	3	1
	S-5	4	3	6	2	8	4	16	--	1	4	2	4
	S-6	5	2	33	3	10	88	118	--	yes	21	9	20
	S-7	3	3	21	65	1	30	68	--	0	2	1	25
Prospector Creek to Red Ives Creek	S-8	8	7	141	5	9	26	100	--	7	0	62	4
	S-9	5	3	18	1	0	1	6	--	1	3	6	0
	S-10	8	4	28	4	1	16	13	--	0	2	6	0
	S-11	1	2	15	1	2	4	3	--	0	2	0	0
	S-12	1	14	15	1	7	2	11	--	2	2	4	0
	S-13	1	2	5	1	3	0	0	0	0	0	0	0
	S-14	4	80	4	0	0	0	0	0	0	1	0	0
	S-15	11	35	2	1	1	0	0	0	0	0	0	0
	S-16	0	3	0	0	0	0	0	0	0	1	0	0
	S-17	2	35	0	0	2	0	0	0	0	0	0	0
	S-18	5	12	3	0	0	1	0	0	0	0	0	0
	S-19	5	1	0	0	0	0	0	0	0	0	0	0
	S-20	3	6	0	1	0	0	0	0	0	0	0	0
	S-21	11	26	2	0	0	0	0	0	0	0	0	0
	S-22	7	36	1	0	0	0	0	0	0	0	0	0
Red Ives Creek to Ruby Creek.	S-23	0	2	2	0	0	0	0	0	0	0	0	0
	S-24	6	18	1	1	0	0	0	0	0	0	0	0
	S-25	2	9	0	0	0	0	0	0	0	0	0	0
	S-26	0	1	0	0	0	0	0	0	0	0	0	0
	S-27	0	0	0	0	0	0	0	0	0	0	0	0
	S-28	0	0	0	0	0	0	0	0	0	0	0	0
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	100	333	308	87	70	176	381	0	11	50	106	55
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

		Number of rainbow trout counted											
Reach	Transects	1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	1	7	0	0	0	0	0	0	1	0	0	0
	S-2	2	17	3	0	0	31	6	27	0	0	2	0
	S-3	0	--	2	0	1	2	0	4	0	0	0	0
	S-4	0	--	0	0	1	1	0	0	--	--	--	0
	S-5	0	2	0	0	1	1	0	2	0	0	0	0
	S-6	12	91	25	4	7	16	4	3	0	0	0	0
	S-7	64	2	12	12	1	11	1	53	0	0	0	0
Prospector Creek to Red Ives Creek	S-8	0	18	0	7	0	2	0	10	0	0	0	0
	S-9	0	0	4	0	0	4	0	2	--	--	--	0
	S-10	1	5	0	0	1	0	0	2	0	0	0	0
	S-11	0	5	0	0	0	0	0	0	--	--	--	0
	S-12	0	1	0	0	1	3	0	0	0	0	0	0
	S-13	0	0	0	0	0	0	0	1	0	0	0	0
	S-14	0	0	0	0	0	0	0	0	0	0	0	0
	S-15	0	0	0	6	0	0	0	0	0	0	0	0
	S-16	0	0	0	0	0	0	0	0	0	0	0	0
	S-17	0	0	0	0	0	0	0	0	0	0	0	0
	S-18	0	0	0	0	0	0	0	0	0	0	0	0
	S-19	0	0	0	0	0	0	0	0	0	0	0	0
	S-20	0	0	0	0	0	0	0	0	0	0	0	0
	S-21	0	0	0	0	0	0	0	0	0	0	0	0
	S-22	0	0	0	0	0	0	0	0	0	0	0	0
Red Ives Creek to Ruby Creek.	S-23	0	0	0	0	0	0	0	0	--	--	--	0
	S-24	0	0	1	0	0	0	0	0	0	0	0	0
	S-25	0	0	0	0	0	0	0	0	0	0	0	0
	S-26	0	0	0	0	0	0	0	0	0	0	0	0
	S-27	0	0	0	0	0	0	0	0	0	0	0	0
	S-28	0	0	0	0	0	0	0	0	0	0	0	0
Calder to North Fork St Joe River	S-29	--	--	10	0	7	0	0	0	--	0	0	2
	S-30	--	--	13	18	36	7	0	0	--	0	0	0
	S-31	--	--	2	7	15	3	6	0	--	0	1	0
	S-32	--	--	30	10	4	51	0	9	--	37	11	2
	S-33	--	--	0	0	0	0	1	0	--	14	1	0
	S-34	--	--	0	0	0	8	0	6	--	1	3	0
	S-35	--	--	7	3	20	11	6	47	--	--	1	9
	Total 1-28	80	148	47	29	13	71	11	104	1	0	2	0
	Total 29-35	0	0	62	38	82	80	13	62	0	52	17	13

Grey shading shows transects that were snorkeled at different locations than other years.

Number of bull trout counted during trend surveys to evaluate the fishery in the St. Joe River, Idaho, from 1969 to 2003.

		Number of bull trout counted											
Reach	Transects	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982
North Fork St Joe River to Prospector Creek	S-1	0	0	0	0	0	0	0	--	--	0	0	0
	S-2	0	0	0	0	0	0	0	--	--	0	0	0
	S-3	0	0	0	0	0	0	0	--	--	0	0	0
	S-4	0	0	0	0	0	0	0	--	--	0	0	0
	S-5	0	0	0	0	0	0	0	--	0	0	0	0
	S-6	0	0	0	0	0	0	0	--	0	0	0	0
	S-7	0	0	0	0	0	0	0	--	0	0	0	0
Prospector Creek to Red Ives Creek	S-8	0	0	0	0	0	0	0	--	0	0	0	0
	S-9	0	0	0	0	0	1	0	--	0	0	0	0
	S-10	0	0	0	0	0	0	0	--	0	0	0	0
	S-11	0	0	0	0	1	0	0	--	0	0	0	0
	S-12	0	0	0	0	0	0	0	0	0	1	0	0
	S-13	0	0	0	0	0	0	0	0	0	0	0	1
	S-14	0	0	0	0	0	1	0	0	0	0	0	0
	S-15	0	0	0	0	1	0	0	1	0	0	0	0
	S-16	0	0	1	0	0	0	0	0	0	0	0	0
	S-17	0	0	0	0	0	0	0	0	0	0	0	0
	S-18	0	0	0	0	1	0	0	0	0	0	0	0
	S-19	0	0	0	0	1	0	0	0	0	0	0	1
	S-20	0	0	0	0	0	0	0	1	0	1	0	0
	S-21	0	0	0	0	0	0	0	0	1	0	0	0
	S-22	0	0	0	0	0	0	0	3	0	0	0	0
Red Ives Creek to Ruby Creek.	S-23	0	0	0	0	1	0	1	0	0	0	0	0
	S-24	0	0	1	1	1	0	3	0	1	0	0	1
	S-25	0	0	0	0	1	1	3	0	1	0	0	0
	S-26	0	0	0	0	0	1	0	0	0	0	0	0
	S-27	0	0	0	0	3	1	0	0	4	0	0	0
	S-28	0	0	0	0	2	0	0	0	1	0	0	0
Calder to North Fork St Joe River	S-29	--	--	--	--	--	--	--	--	--	--	--	--
	S-30	--	--	--	--	--	--	--	--	--	--	--	--
	S-31	--	--	--	--	--	--	--	--	--	--	--	--
	S-32	--	--	--	--	--	--	--	--	--	--	--	--
	S-33	--	--	--	--	--	--	--	--	--	--	--	--
	S-34	--	--	--	--	--	--	--	--	--	--	--	--
	S-35	--	--	--	--	--	--	--	--	--	--	--	--
	Total 1-28	0	0	2	1	12	5	7	5	8	2	0	3
	Total 29-35	--	--	--	--	--	--	--	--	--	--	--	--

Cont.

Reach	Transects	Number of bull trout counted											
		1989	1990	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
North Fork St Joe River to Prospector Creek	S-1	0	0	0	0	0	0	0	0	0	0	0	0
	S-2	0	0	0	0	2	0	0	0	0	0	0	0
	S-3	0	0	0	0	1	0	0	0	0	0	0	0
	S-4	0	0	0	0	0	0	0	0	--	--	--	0
	S-5	0	0	0	0	0	0	0	0	0	0	0	0
	S-6	0	0	0	0	0	0	0	0	0	0	0	0
	S-7	0	0	0	0	0	0	0	0	0	0	0	0
Prospector Creek to Red Ives Creek	S-8	0	0	0	0	0	0	0	0	0	0	0	0
	S-9	0	0	0	0	0	0	0	1	--	--	--	0
	S-10	0	0	0	0	0	0	0	0	0	0	0	0
	S-11	0	0	0	0	0	0	0	0	--	--	--	0
	S-12	0	0	0	0	0	1	1	1	0	0	0	0
	S-13	0	0	0	0	0	0	0	0	0	0	1	0
	S-14	0	0	0	0	0	0	0	0	0	1	0	0
	S-15	0	0	0	0	0	0	0	0	0	0	0	0
	S-16	0	0	0	0	0	1	0	0	0	0	0	0
	S-17	0	0	0	0	0	0	0	0	0	0	0	0
	S-18	0	0	0	0	0	0	0	0	0	0	0	0
	S-19	0	0	0	0	0	0	0	0	0	0	0	0
	S-20	0	0	0	0	0	0	0	0	0	0	0	0
	S-21	0	0	0	0	0	0	0	0	0	0	0	0
	S-22	0	1	1	0	0	0	0	0	0	0	0	0
Red Ives Creek to Ruby Creek.	S-23	0	0	0	0	0	0	0	0	--	--	--	0
	S-24	0	0	0	0	0	0	0	0	1	0	0	0
	S-25	0	0	0	0	0	0	0	0	0	1	0	0
	S-26	0	0	0	0	0	0	0	0	0	0	0	0
	S-27	0	0	0	1	1	0	0	0	0	0	0	0
	S-28	0	0	0	0	0	0	0	1	0	0	0	0
Calder to North Fork St Joe River	S-29	--	--	0	0	0	0	0	0	--	0	0	0
	S-30	--	--	0	0	0	0	0	0	--	0	0	0
	S-31	--	--	0	0	0	0	0	0	--	0	0	0
	S-32	--	--	0	0	0	0	0	0	--	0	0	0
Grey shading shows transects	S-33	--	--	0	0	0	0	0	0	--	0	0	0
That were snorkeled at different	S-34	--	--	1	0	0	0	0	0	--	0	0	0
Locations than other years.	S-35	--	--	0	0	0	0	0	0	--	--	0	0
	Total 1-28	0	1	1	1	4	2	1	3	1	2	1	0
	Total 29-35	--	--	1	0	0	0	0	0	--	0	0	0

Appendix H. Snorkel trend data collected from the Coeur d'Alene River basin, Idaho, from 1973 to 2003 used to evaluate the status of the fishery.

Transects and their associated numbers used to identify the different snorkel sites in the Coeur d'Alene River basin, Idaho, from 1973 to 2003. Notice how the transect numbers have changed over the years.

Transect Reach	1973	1980-1981	1987-1993	1994-1997	1998	2000-2001	2002	2003
N.F. Coeur d'Alene	23	Sec 1-8	23	23	38	NF-20	NF-20	NF-01
(S.F. Coeur d'Alene	23	Sec 1-8	23	23	38	NF-20	NF-20	NF-01 (slough)
to Prichard Creek)	22	Sec 1-7	22	22	37	NF-19	NF-19	NF-02
	21	Sec 1-6	21	21	36	NF-18	NF-18	NF-03
	20	Sec 1-5	20	20	35	NF-17	NF-17	NF-04
	19	Sec 1-4	19	19	34	NF-16	NF-16	NF-05
	18	Sec 1-3	18	18	23	NF-15	NF-15	NF-06
	17	Sec 1-2	17	17	22	NF-14	NF-14	NF-07
	16	Sec 1-1	16	16	21	NF-13	NF-13	NF-08
N.F. Coeur d'Alene	15	Sec 2-5	15	15	20	NF-12	NF-12	NF-09
(Prichard Creek to	14	Sec 2-4	14	14	19	--	--	NF-10
Yellow Dog Creek	13	Sec 2-3	13	13	18	NF-11	NF-11	NF-11
	12	Sec 2-2	12	12	17	--	--	NF-12
	11	Sec 2-1	11	11	16	NF-10	NF-10	NF-13
N.F. Coeur d'Alene	10	Sec 3-5	10	10	15	NF-9	NF-9	NF-14
(Yellow Dog Creek	9	Sec 3-4	9	9	14	NF-8	NF-8	NF-15
to Tepee Creek)	8	Sec 3-3	8	8	13	NF-7	NF-7	NF-16
	7	Sec 3-2	7	7	12	NF-6	NF-6	NF-17
	6	Sec 3-1	6	6	11	NF-5	NF-5	NF-18
N.F. Coeur d'Alene	34	Sec 8	34	34	1	NF-24	NF-24	NF-19
(Tepee Creek to	35	Sec 8	35	35	2	NF-25	NF-25	NF-20
Jordan Creek)	36	Sec 8	36	36	3	NF-26	NF-26	NF-21
	37	Sec 8	37	37	4	NF-27	NF-27	NF-22
	38	Sec 8	38	38	5	NF-28	NF-28	NF-23
L.N.F. Coeur d'Alene	33	Sec 5	33	1	1	LNF-10	LNF-10	LNF-01
(mouth to Laverne)	32	Sec 5	32	2	2	LNF-9	LNF-9	LNF-02
	31	Sec 5	31	3	3	LNF-8	LNF-8	LNF-03
	30	Sec 5	30	4	4	LNF-7	LNF-7	LNF-04
	29	Sec 5	29	5	5	LNF-6	LNF-6	LNF-05
	28	Sec 5	28	6	6	LNF-5	--	LNF-06
	27	Sec 6	27	7	7	LNF-4	LNF-4	LNF-07
	26	Sec 6	26	8	8	LNF-3	LNF-3	LNF-08
L.N.F. Coeur d'Alene	25	Sec 6	25	9	9	LNF-2	LNF-2	LNF-09
(Laverne Cr to Horse	24	Sec 6	24	10	10	LNF-1	LNF-1	LNF-10
Heaven)	--	Sec 6	101	11	11	--	LNF-B	LNF-11
	--	Sec 6	102	12	12	--	LNF-A	LNF-12
	--	Sec 6	104	13	13	--	--	LNF-13

Appendix H. (cont.)

Tepee Creek	5	Sec 4-5	5	5	10	--	TP-5	TP-1
	4	Sec 4-4	4	4	9	NF-4	TP-4	TP-2
	3	Sec 4-3	3	3	8	NF-3	TP-3	TP-3
	2	Sec 4-2	2	2	7	NF-2	TP-2	TP-4
	1	Sec 4-1	1	1	6	NF-1	TP-1	TP-5
Tepee Creek	--		--	--	--	--	TP-rehab1	TP-rehab1
Rehab Area	--		--	--	--	--	TP-rehab2	TP-rehab2

Appendix I. Global Position System coordinates for snorkel sites in the St. Joe River, Coeur d'Alene River and Little North Fork Clearwater River, Idaho. Coordinates were collected in UTM zone 11 format and the map datum was set at NAD27 CONUS.

St Joe River

Transect	Easting	Northing	Elevation
SJ01	593640	5233167	2537 ft
SJ02	597654	5231156	2613 ft
SJ03	598667	5231307	2677 ft
SJ04	598754	5231287	2680 ft
SJ05	600706	5232126	2665 ft
SJ06	602449	5232176	2698 ft
SJ07	603341	5232178	2717 ft
SJ08	605527	5230873	2797 ft
SJ09	606547	5231533	2825 ft
SJ10	606244	5231279	2830 ft
SJ11	606405	5231139	2835 ft
SJ12	607181	5231246	2845 ft
SJ13	610394	5228526	2948 ft
SJ14	612324	5228426	3027 ft
SJ15	615062	5226714	3101 ft
SJ16	616902	5225646	3157 ft
SJ17	617807	5225211	3220 ft
SJ18	620731	5223048	3375 ft
SJ19	621318	5220981	3408 ft
SJ20	622945	5216593	3697 ft
SJ21	624887	5214977	3725 ft
SJ22	625161	5212869	3755 ft
SJ23	625310	5209677	3819 ft
SJ24	625195	5209730	3822 ft
SJ25	624990	5209758	3829 ft
SJ26	623940	5205252	3918 ft
SJ27	624125	5205022	3925 ft
SJ28	624201	5204344	3940 ft
SJ29	560751	5235297	2125 ft
SJ30	568595	5234964	2254 ft
SJ31	571823	5233630	2274 ft
SJ32	574772	5233247	2175 ft
SJ33	578901	5233016	2248 ft
SJ34	585397	5234051	2363 ft
SJ35	591008	5233502	2499 ft

Appendix I. Continued.

Coeur d'Alene River

Transect	Easting	Northing	Elevation (ft)
NF01	555457	5270056	2160
NF01(slough)	555417	5270108	2160
NF02	557272	5271703	2175
NF03	560383	5274513	2198
NF04	562779	5278672	2230
NF05	565969	5278176	2250
NF06	571294	5279668	2290
NF07	572903	5277841	2322
NF08	577131	5277444	2375
NF09	579100	5280301	2415
NF10	579457	5283229	2455
NF11	578945	5283082	2462
NF12	575900	5285585	2495
NF13	573482	5288331	2540
NF14	569924	5293197	2638
NF15	569991	5293731	2644
NF16	569114	5295235	2665
NF17	567689	5296719	2688
NF18	566330	5302002	2765
NF19	565065	5303695	2803
NF20	565415	5303956	2818
NF21	564786	5304894	2845
NF22	565683	5306287	2893
NF23	565636	5306508	2900
LNF01	557178	5273053	2175
LNF02	554924	5274377	2202
LNF03	553380	5275727	2222
LNF04	551753	5275453	2243
LNF05	548928	5274398	2283
LNF06	547814	5277858	2352
LNF07	547607	5280546	2420
LNF08	546749	5282037	2470
LNF09	546160	5284827	2520
LNF10	543261	5287400	2622
LNF11	543207	5287617	2628
LNF12	540088	5287366	2717
LNF13	539236	5287576	2748
TP01	564519	5303607	2805
TP02	562306	5303758	2836
TP03	560331	5302731	2869
TP04	560439	5303183	2872
TP05	559224	5302784	2885
TP REHAB1	555828	5298099	3010
TP REHAB2	555090	5296965	3037

Appendix I. Continued.

Little North Fork Clearwater River

Transect	Easting	Northing	Elevation
1	600292	5201855	2414 ft
2	600584	5202093	2445 ft
3	601022	5202637	2251 ft
4	601431	5203158	2489 ft
5	601733	5203535	2490 ft
6	601947	5204330	2497 ft
7	602270	5204636	2510 ft
8	602438	5204741	2654 ft
9	602758	5205236	2661 ft
10	602806	5205519	2665 ft
11	602579	5205936	2673 ft
12	602020	5206137	2464 ft
13	601969	5206229	2384 ft
14	601480	5207825	2769 ft
15	601179	5207865	2773 ft
16	600945	5208650	2833 ft
17	600929	5208693	2839 ft
18	600769	5209065	2820 ft
19	600715	5209089	2822 ft
20	600254	5210236	2934 ft
21	599991	5210461	2947 ft
22	599124	5210544	3027 ft
23	598982	5210590	3034 ft
24	598678	5210840	3065 ft
25	597544	5210930	3180 ft
26	597489	5210791	3190 ft
27	597146	5211042	3200 ft
28	596736	5211244	3260 ft
29	596514	5211479	3275 ft
30	595721	5212079	3325 ft
31	595149	5212518	3345 ft
32	595274	5212760	3355 ft
33	594495	5213847	3448 ft
34	593840	5213827	3480 ft
35	593505	5213821	3507 ft
36	592723	5214352	3580 ft
37	592382	5214266	3611 ft
38	591919	5214375	3630 ft
39	591214	5214329	3680 ft
40	589904	5213787	3785 ft
41	589781	5213330	3835 ft
42	589355	5213119	3872 ft
43	588725	5213560	3905 ft
44	588077	5213153	3976 ft
45	587572	5213059	4025 ft
46	586479	5212661	4125 ft
47	586237	5212597	4136 ft
48	585887	5212831	4181 ft

Appendix J. Snorkel trend data collected from the Coeur d'Alene River basin, Idaho, from 1973 to 2003 used to evaluate the status of the fishery.

Transects and their associated numbers used to identify the different snorkel sites in the Coeur d'Alene River basin, Idaho, from 1973 to 2003.

Transect Reach	1973	1980-1981	1987-1993	1994-1997	1998	2000-2001	2002	2003
N.F. Coeur d'Alene	23	Sec 1-8	23	23	38	NF-20	NF-20	NF-01
(S.F. Coeur d'Alene	23	Sec 1-8	23	23	38	NF-20	NF-20	NF-01 (slough)
to Prichard Creek)	22	Sec 1-7	22	22	37	NF-19	NF-19	NF-02
	21	Sec 1-6	21	21	36	NF-18	NF-18	NF-03
	20	Sec 1-5	20	20	35	NF-17	NF-17	NF-04
	19	Sec 1-4	19	19	34	NF-16	NF-16	NF-05
	18	Sec 1-3	18	18	23	NF-15	NF-15	NF-06
	17	Sec 1-2	17	17	22	NF-14	NF-14	NF-07
	16	Sec 1-1	16	16	21	NF-13	NF-13	NF-08
N.F. Coeur d'Alene	15	Sec 2-5	15	15	20	NF-12	NF-12	NF-09
(Prichard Creek to	14	Sec 2-4	14	14	19	--	--	NF-10
Yellow Dog Creek	13	Sec 2-3	13	13	18	NF-11	NF-11	NF-11
	12	Sec 2-2	12	12	17	--	--	NF-12
	11	Sec 2-1	11	11	16	NF-10	NF-10	NF-13
N.F. Coeur d'Alene	10	Sec 3-5	10	10	15	NF-9	NF-9	NF-14
(Yellow Dog Creek	9	Sec 3-4	9	9	14	NF-8	NF-8	NF-15
to Tepee Creek)	8	Sec 3-3	8	8	13	NF-7	NF-7	NF-16
	7	Sec 3-2	7	7	12	NF-6	NF-6	NF-17
	6	Sec 3-1	6	6	11	NF-5	NF-5	NF-18
N.F. Coeur d'Alene	34	Sec 8	34	34	1	NF-24	NF-24	NF-19
(Tepee Creek to	35	Sec 8	35	35	2	NF-25	NF-25	NF-20
Jordan Creek)	36	Sec 8	36	36	3	NF-26	NF-26	NF-21
	37	Sec 8	37	37	4	NF-27	NF-27	NF-22
	38	Sec 8	38	38	5	NF-28	NF-28	NF-23
L.N.F. Coeur d'Alene	33	Sec 5	33	1	1	LNF-10	LNF-10	LNF-01
(mouth to Laverne)	32	Sec 5	32	2	2	LNF-9	LNF-9	LNF-02
	31	Sec 5	31	3	3	LNF-8	LNF-8	LNF-03
	30	Sec 5	30	4	4	LNF-7	LNF-7	LNF-04
	29	Sec 5	29	5	5	LNF-6	LNF-6	LNF-05
	28	Sec 5	28	6	6	LNF-5	--	LNF-06
	27	Sec 6	27	7	7	LNF-4	LNF-4	LNF-07
	26	Sec 6	26	8	8	LNF-3	LNF-3	LNF-08
L.N.F. Coeur d'Alene	25	Sec 6	25	9	9	LNF-2	LNF-2	LNF-09
(Laverne Cr to Horse	24	Sec 6	24	10	10	LNF-1	LNF-1	LNF-10
Heaven)	--	Sec 6	101	11	11	--	LNF-B	LNF-11
	--	Sec 6	102	12	12	--	LNF-A	LNF-12
	--	Sec 6	104	13	13	--	--	LNF-13
Tepee Creek	5	Sec 4-5	5	5	10	--	TP-5	TP-1
	4	Sec 4-4	4	4	9	NF-4	TP-4	TP-2
	3	Sec 4-3	3	3	8	NF-3	TP-3	TP-3
	2	Sec 4-2	2	2	7	NF-2	TP-2	TP-4
	1	Sec 4-1	1	1	6	NF-1	TP-1	TP-5
Tepee Creek	--		--	--	--	--	TP-rehab1	TP-rehab1
Rehab Area	--		--	--	--	--	TP-rehab2	TP-rehab2

Surface area of stream (m^2) snorkeled during trend surveys to evaluate the fishery in the Coeur d'Alene River, Idaho, from 1973 to 2003.

		Surface area (m^2) of stream snorkeled															
Stream reach	Transect-	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur d'Alene	NF-01	3,596	3,596	3,596	--	3,596	3,596	3,867	5,112	5,112	1,789	3,226	3,960	4,480	4,617	7,473	4,250
(S.F. Coeur	NF-01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,280
to Prichard Creek)	NF-02	3,852	3,852	3,852	--	--	3,852	8,190	4,400	4,400	3,656	4,643	1,850	4,230	4,172	9,547	6,940
	NF-03	2,848	2,848	2,848	--	2,848	2,848	6,450	7,055	7,055	2,300	6,268	3,999	4,355	4,451	8,700	7,951
	NF-04	6,056	6,056	6,056	--	--	6,056	8,063	4,370	4,370	2,055	2,865	9,120	6,118	6,240	9,788	7,619
	NF-05	5,579	5,579	5,579	--	5,579	5,579	4,005	5,225	5,225	2,884	2,673	5,760	5,872	4,830	11,191	5,783
	NF-06	2,506	2,506	2,506	--	--	2,506	7,279	5,775	5,775	4,004	2,906	5,760	3,224	3,317	6,765	6,622
	NF-07	2,549	2,549	2,549	--	2,549	2,549	3,082	4,242	4,242	3,232	4,996	4,996	4,128	5,108	6,456	5,940
	NF-08	3,699	3,699	3,699	--	--	3,699	4,125	4,035	4,035	2,323	2,923	4,901	3,900	3,600	5,198	6,843
N.F. Coeur d'Alene	NF-09	7,178	7,178	7,178	--	7,178	7,178	7,242	6,013	6,013	4,826	5,172	4,436	11,868	7,585	5,890	9,990
(Prichard Creek to	NF-10	6,566	6,566	6,566	--	--	6,566	6,080	3,940	3,940	4,414	4,107	5,844	--	--	--	8,372
Yellow Dog Creek	NF-11	7,685	7,685	7,685	--	7,685	7,685	10,167	8,757	8,757	3,707	3,363	5,113	18,920	1,238	4,017	6,823
	NF-12	3,370	3,370	3,370	--	--	3,370	5,953	2,268	2,268	2,268	3,744	3,318	--	--	--	4,545
	NF-13	3,664	3,664	3,664	--	3,664	3,664	6,665	1,560	1,560	1,931	2,751	2,198	6,570	--	4,260	2,617
N.F. Coeur d'Alene	NF-14	2,326	2,326	2,326	2,326	2,326	2,326	4,256	3,906	3,906	2,576	2,576	2,970	5,610	2,763	2,970	3,127
(Yellow Dog	NF-15	2,842	2,842	2,842	2,842	2,842	2,842	3,360	2,109	2,109	1,864	2,145	2,433	3,468	2,825	2,880	1,935
to Tepee Creek)	NF-16	1,928	1,928	1,928	1,928	1,928	1,928	1,899	1,311	1,311	1,224	2,124	2,184	2,208	1,674	3,180	4,113
	NF-17	3,128	3,128	3,128	3,128	3,128	3,128	1,188	718	718	618	929	855	1,581	914	5,225	8,197
	NF-18	1,832	1,832	1,832	1,832	1,832	1,832	2,228	1,739	1,739	1,743	1,976	1,188	1,907	1,752	1,976	1,476
N.F. Coeur d'Alene	NF-19	899	899	899	899	899	899	1,040	1,812	1,812	3,220	760	990	424	353	425	398
(Tepee Creek to	NF-20	457	457	457	457	457	457	347	418	418	816	1,309	551	429	341	596	812
Jordan Creek)	NF-21	721	721	721	721	721	721	1,615	599	599	435	613	455	1,078	1,404	759	953
	NF-22	586	586	586	586	586	586	--	918	492	827	978	770	969	1,457	1,392	1,045
	NF-23	844	844	844	844	844	844	--	835	835	1,477	724	2,155	1,005	976	657	479
L.N.F. Coeur	LNF-01	1,244	1,244	1,244	--	1,244	1,244	1,625	1,935	1,575	667	2,753	1,250	1,460	1,625	2,442	1,123
(mouth to Laverne)	LNF-02	1,850	1,850	1,850	--	--	1,850	2,353	3,010	2,380	1,010	1,434	4,350	2,724	2,190	2,844	3,861
	LNF-03	1,819	1,819	1,819	--	1,819	1,819	2,443	5,875	3,995	1,425	1,425	3,200	1,928	4,239	2,106	2,183
	LNF-04	954	954	954	--	--	954	587	322	322	1,548	968	3,200	556	963	730	930
	LNF-05	2,446	2,446	2,446	--	2,446	2,446	2,820	1,312	1,312	2,318	1,871	1,395	640	911	1,654	2,763
	LNF-06	1,736	1,736	1,736	--	--	1,736	1,685	1,260	1,510	--	2,030	1,600	784	2,965	--	1,669
	LNF-07	2,239	2,239	2,239	--	2,239	2,239	1,775	1,046	831	1,251	1,251	1,285	2,256	2,189	592	1,092
	LNF-08	850	850	850	--	--	850	1,550	1,190	1,580	1,440	720	767	2,070	1,800	6,865	1,104
L.N.F. Coeur	LNF-09	1,088	1,088	1,088	--	592	1,088	1,829	900	780	1,539	832	1,176	2,086	1,970	728	720
(Laverne Cr to	LNF-10	555	555	555	--	--	555	1,470	1,434	1,320	850	1,536	1,255	1,222	1,342	1,350	1,408
Heaven)	LNF-11	--	--	--	--	338	338	--	814	885	367	603	816	--	--	1,788	1,120
	LNF-12	--	--	--	--	507	507	--	1,058	720	383	581	646	--	--	640	825
	LNF-13	--	--	--	--	677	677	--	508	819	761	--	689	--	--	--	580
Tepee Creek	TP-1	1,082	1,082	1,082	1,082	--	1,082	3,108	2,211	2,211	3,912	1,852	2,107	--	--	1,654	1,604
	TP-2	1,219	1,219	1,219	1,219	1,219	1,219	2,163	2,713	2,713	1,986	1,638	1,750	4,085	1,802	3,354	3,600
	TP-3	1,098	1,098	1,098	1,098	1,098	1,098	1,311	1,214	1,214	1,079	2,586	871	1,397	1,434	1,262	1,080
	TP-4	587	587	587	587	587	587	767	1,672	1,672	1,395	2,822	882	2,100	508	1,210	1,092
	TP-5	574	574	574	574	574	574	1,121	672	672	929	--	845	667	756	1,164	1,420
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	870	818
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	975	1,196

Length (m) of stream snorkeled during trend surveys to evaluate the fishery in the Coeur d'Alene River, Idaho, from 1973 to 2003.

		Length (m) of stream snorkeled															
Stream reach	Transect-	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur d'Alene	NF-01	101	101	101	--	101	101	95	180	180	89	114	110	160	171	245	150
(S.F. Coeur	NF-01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	80
to Prichard Creek)	NF-02	108.2	108.2	108.2	--	--	108.2	180	110	110	91	91	50	100	103	183	191
	NF-03	80	80	80	--	80	80	150	170	170	109	109	129	134	138	182	230
	NF-04	170.1	170.1	170.1	--	--	170.1	205	115	115	75	75	160	140	160	209	205
	NF-05	156.7	156.7	156.7	--	156.7	156.7	121	190	190	110	110	160	212	230	308	230
	NF-06	70.4	70.4	70.4	--	--	70.4	212	165	165	111	111	160	104	107	172	215
	NF-07	71.6	71.6	71.6	--	71.6	71.6	115	140	140	106	106	106.3	139	147	181	180
	NF-08	103.9	103.9	103.9	--	--	103.9	103.9	104	104	79	79	130	100	100	138	188
N.F. Coeur d'Alene	NF-09	214.9	214.9	214.9	--	214.9	214.9	214.9	185	185	108	108	108.2	230	185	155	270
(Prichard Creek to	NF-10	196.6	196.6	196.6	--	--	196.6	196.6	200	200	154	154	153.8	--	--	--	273
Yellow Dog Creek	NF-11	230.1	230.1	230.1	--	230.1	230.1	305	315	315	102	102	117	440	50	151	230
	NF-12	100.9	100.9	100.9	--	--	100.9	190	120	120	120	120	140	--	--	--	202
	NF-13	109.7	109.7	109.7	--	109.7	109.7	155	60	60	67	67	66.6	146	--	142	89
N.F. Coeur d'Alene	NF-14	90.5	90.5	90.5	90.5	90.5	90.5	140	180	180	115	115	110	170	130	128	134
(Yellow Dog	NF-15	110.6	110.6	110.6	110.6	110.6	110.6	120	95	95	65	85	92.5	102	113	90	73
to Tepee Creek)	NF-16	75	75	75	75	75	75	90	95	95	87	87	91	96	93	150	175
	NF-17	121.7	121.7	121.7	121.7	121.7	121.7	82.5	63	63	72	62	47.5	85	63	190	291
	NF-18	71.3	71.3	71.3	71.3	71.3	71.3	95	95	95	111	130	60	102	91	95	82
N.F. Coeur d'Alene	NF-19	44.5	44.5	44.5	44.5	44.5	44.5	105	120	120	166	48	66	26	30	25	27
(Tepee Creek to	NF-20	22.6	22.6	22.6	22.6	22.6	22.6	22.6	47	47	60	57	38	33	39	53	70
Jordan Creek)	NF-21	35.7	35.7	35.7	35.7	35.7	35.7	78	35	35	38	48	29	77	72	41	55
	NF-22	29	29	29	29	29	29	--	60	60	52	50	52	51	67	72	55
	NF-23	41.8	41.8	41.8	41.8	41.8	41.8	--	72	72	90	50	126	67	71	49	38
L.N.F. Coeur	LNF-01	73.2	73.2	73.2	--	73.2	73.2	62.5	75	75	57		50	100	100	66	72
(mouth to Laverne)	LNF-02	108.8	108.8	108.8	--	--	108.8	130	140	140	67		150	120	120	60	199
	LNF-03	107	107	107	--	107	107	195.4	235	235	84		160	189	173	90	90
	LNF-04	56.1	56.1	56.1	--	--	56.1	38.1	23	23	76		160	67	70	60	75
	LNF-05	143.9	143.9	143.9	--	143.9	143.9	143.9	82	82	93		90	80	81	88	130
	LNF-06	102.1	102.1	102.1	--	--	102.1	104	100	100	--		80	112	154	--	71
	LNF-07	131.7	131.7	131.7	--	131.7	131.7	71	55	55	75		68	141	139	74	91
	LNF-08	50	50	50	--	--	50	100	100	100	60		35	75	75	152	60
L.N.F. Coeur	LNF-09	98	98	98	--	98	98	103.9	50	50	95		60	114	111	41	45
(Laverne Cr to	LNF-10	50	50	50	--	--	50	88	88	88	91		77	94	91	90	110
Heaven)	LNF-11	--	--	--	--	30.48	30.48	--	55	55	27		60	--	--	110	80
	LNF-12	--	--	--	--	60.96	60.96	--	72	72	51		64	--	--	50	66
	LNF-13	--	--	--	--	60.96	60.96	--	63	64	63		61	--	--	--	50
Tepee Creek	TP-1	74.1	74.1	74.1	74.1	74.1	74.1	187.3	189	189	130	130	128.5	--	--	106	99
	TP-2	83.5	83.5	83.5	83.5	83.5	83.5	53.5	155	155	83	83	70	215	106	172	225
	TP-3	75.2	75.2	75.2	75.2	75.2	75.2	85	82	82	76	122	67	89	94	83	90
	TP-4	40.2	40.2	40.2	40.2	40.2	40.2	56	110	110	75	137	58	105	35	112	113
	TP-5	39.3	39.3	39.3	39.3	39.3	39.3	63	40	40	54	--	50	31	36	49	71
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	150	159
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	130	184

Number of cutthroat trout counted (all size classes) during trend surveys to evaluate the fishery in the Coeur d'Alene River basin, Idaho, from 1973

		Cutthroat trout observed (all size classes)															
Stream reach	Transect-2003	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur d'Alene	NF-01	2	0	0	--	0	0	56	18	30	21	0	1	18	10	69	7
(S.F. Coeur d'Alene	NF-01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30
to Prichard Creek)	NF-02	1	0	1	--	--	0	28	16	26	32	0	0	2	18	4	6
	NF-03	1	2	2	--	1	0	29	16	30	8	5	1	5	0	1	20
	NF-04	2	0	0	--	--	1	32	5	0	6	6	38	23	4	4	9
	NF-05	0	0	0	--	2	0	40	11	0	0	7	47	20	18	0	23
	NF-06	0	1	0	--	--	25	23	16	18	0	4	8	62	38	21	46
	NF-07	10	3	1	--	4	19	38	14	66	10	31	21	14	95	19	26
	NF-08	2	0	1	--	--	10	8	29	21	36	53	15	5	9	66	51
N.F. Coeur d'Alene	NF-09	7	0	1	--	1	5	9	25	21	7	6	8	17	45	33	30
(Prichard Creek to	NF-10	3	0	3	--	--	23	15	34	6	4	77	67	--	--	--	64
Yellow Dog Creek	NF-11	0	0	0	--	0	2	4	3	3	0	0	6	30	0	35	0
	NF-12	3	0	0	--	--	3	1	0	2	--	1	4	--	--	--	3
	NF-13	0	0	3	--	2	7	1	2	11	0	1	1	2	--	1	0
N.F. Coeur d'Alene	NF-14	2	0	13	76	108	42	10	41	74	75	29	14	7	20	8	20
(Yellow Dog Creek	NF-15	6	15	8	29	5	35	21	65	60	57	85	7	23	80	22	30
to Tepee Creek)	NF-16	13	4	3	2	15	17	4	10	2	3	8	4	31	27	0	3
	NF-17	4	7	4	10	4	7	2	0	1	1	11	12	7	8	38	86
	NF-18	4	11	6	10	1	41	8	50	17	1	33	24	25	38	19	8
N.F. Coeur d'Alene	NF-19	12	11	14	4	1	0	0	0	1	7	17	9	3	3	3	0
(Tepee Creek to	NF-20	1	2	5	45	5	0	2	1	1	10	1	18	5	1	23	14
Jordan Creek)	NF-21	1	5	10	4	1	4	6	8	0	3	22	19	24	24	29	22
	NF-22	16	3	4	7	0	--	--	21	1	38	19	0	24	18	31	8
	NF-23	0	6	1	22	9	--	--	30	16	21	23	12	2	0	6	1
L.N.F. Coeur	LNF-01	13	2	0	--	3	0	3	1	0	2	0	0	10	3	2	14
(mouth to Laverne)	LNF-02	6	0	0	--	--	0	1	2	0	0	6	8	11	3	7	13
	LNF-03	0	0	0	--	0	0	0	0	0	3	1	7	0	1	2	2
	LNF-04	8	0	0	--	--	0	0	0	0	0	0	6	1	0	8	5
	LNF-05	3	3	0	--	4	2	0	0	0	0	0	7	0	0	0	2
	LNF-06	6	0	0	--	--	1	18	0	6	--	21	34	19	29	--	7
	LNF-07	2	--	--	--	1	9	2	0	0	7	0	2	3	0	1	1
	LNF-08	5	0	3	--	--	--	3	2	0	0	0	3	1	11	3	0
L.N.F. Coeur	LNF-09	8	0	2	--	1	0	0	0	0	11	0	0	1	0	0	0
(Laverne Cr to	LNF-10	5	17	30	--	--	18	1	8	8	16	0	4	25	4	14	0
Heaven)	LNF-11	--	--	--	--	0	2	--	2	2	7	0	10	--	--	20	10
	LNF-12	--	--	--	--	0	1	--	5	0	1	0	13	--	--	10	14
	LNF-13	--	--	--	--	18	0	--	7	0	0	--	3	--	--	--	8
Tepee Creek	TP-1	38	4	0	--	--	--	8	1	1	1	35	66	--	--	37	24
	TP-2	0	0	3	2	1	4	0	7	7	0	3	0	4	0	2	3
	TP-3	0	0	0	1	0	1	6	0	0	0	2	6	7	2	8	0
	TP-4	0	0	6	5	2	1	2	0	0	0	0	1	1	2	6	1
	TP-5	0	5	6	3	1	5	0	2	3	1	--	7	9	7	20	11
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15	0
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	0

Number of cutthroat trout counted (≥ 300 mm) during trend surveys to evaluate the fishery in the Coeur d'Alene River basin, Idaho, from 1973 to 2003.

		Cutthroat trout observed (≥ 300 mm)															
Stream reach	Transect-2003	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur	NF-01	0	0	0	--	0	0	16	0	0	1	0	0	0	3	2	2
(S.F. Coeur	NF-01 (slough)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	16
to Prichard Creek)	NF-02	0	0	1	--	--	0	2	1	1	5	0	0	0	3	3	0
	NF-03	0	2	0	--	1	0	1	1	0	0	0	1	0	0	0	3
	NF-04	0	0	0	--	--	0	4	0	0	1	0	0	0	0	2	0
	NF-05	0	0	0	--	0	0	10	0	0	0	0	0	0	1	0	3
	NF-06	0	1	0	--	--	1	2	2	0	0	1	0	4	1	0	9
	NF-07	0	3	1	--	0	1	2	0	1	0	0	0	0	2	0	10
	NF-08	0	0	1	--	--	0	0	0	1	1	0	0	0	1	1	9
N.F. Coeur	NF-09	0	0	0	--	1	1	5	2	1	1	0	0	1	5	4	4
(Prichard Creek to	NF-10	0	0	1	--	--	4	2	6	1	0	0	3	--	--	--	23
Yellow Dog Creek	NF-11	0	0	0	--	0	0	1	0	0	0	0	1	4	0	2	0
	NF-12	0	0	0	--	--	1	0	0	0	--	1	1	--	--	--	1
	NF-13	0	0	0	--	0	2	0	0	1	0	0	1	0	--	0	0
N.F. Coeur	NF-14	0	0	0	1	8	2	1	3	2	6	6	0	0	0	0	5
(Yellow Dog	NF-15	1	6	4	4	1	3	1	11	2	5	5	0	0	4	6	8
to Tepee Creek)	NF-16	0	1	1	1	0	2	1	1	1	0	0	0	4	0	0	1
	NF-17	0	3	0	4	1	1	1	0	0	0	0	0	3	0	9	23
	NF-18	2	5	0	4	0	8	1	15	2	0	0	2	4	3	4	3
N.F. Coeur	NF-19	0	4	4	4	0	0	0	0	0	3	3	2	2	0	0	0
(Tepee Creek to	NF-20	0	2	1	20	3	0	1	1	1	1	0	2	2	0	3	2
Jordan Creek)	NF-21	1	4	3	4	0	2	6	5	0	2	4	3	7	2	6	4
	NF-22	1	1	1	4	0	--	--	5	1	8	1	0	4	2	7	3
	NF-23	0	4	0	12	5	--	--	6	10	6	1	2	0	0	1	0
L.N.F. Coeur	LNF-01	0	1	0	--	3	0	1	0	0	0	0	0	0	0	0	0
(mouth to	LNF-02	0	0	0	--	--	0	1	0	0	0	0	0	2	0	0	7
	LNF-03	0	0	0	--	0	0	0	0	0	1	0	0	0	0	0	0
	LNF-04	1	0	0	--	--	0	0	0	0	0	0	0	0	0	0	0
	LNF-05	0	1	0	--	0	1	0	0	0	0	0	0	0	0	0	0
	LNF-06	0	0	0	--	--	0	2	0	0	--	0	0	2	0	--	0
	LNF-07	0	--	--	--	1	5	2	0	0	0	0	0	1	0	0	0
	LNF-08	1	0	0	--	--	--	3	0	0	0	0	0	0	0	0	0
L.N.F. Coeur	LNF-09	1	0	2	--	1	0	0	0	0	0	0	0	0	0	0	0
(Laverne Cr to	LNF-10	2	6	1	--	--	0	1	0	0	0	0	0	2	0	3	0
Heaven)	LNF-11	--	--	--	--	0	0	--	0	0	1	0	0	--	--	1	1
	LNF-12	--	--	--	--	1	0	--	0	0	1	0	0	--	--	1	6
	LNF-13	--	--	--	--	0	0	--	0	0	0	--	0	--	--	--	0
Tepee Creek	TP-1	1	1	0	0	--	--	6	1	1	0	7	3	--	--	17	8
	TP-2	0	0	3	2	1	1	0	7	7	0	0	0	2	0	0	2
	TP-3	0	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0
	TP-4	0	0	6	4	0	1	1	0	0	0	0	1	1	1	2	1
	TP-5	0	1	6	3	1	5	0	0	0	0	--	0	1	0	0	3
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	0

Number of mountain whitefish counted during trend surveys to evaluate the fishery in the Coeur d'Alene River basin, Idaho, from 1973 to 2003.

		Mountain whitefish observed															
Stream reach	Transect-2003	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur d'Alene	NF-01	4	0	0	--	200	188	24	280	250	750	70	54	250	176	198	160
(S.F. Coeur	NF-01	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400
d'Alene	(slough)																
to Prichard Creek)	NF-02	35	202	6	--	--	250	29	53	300	107	1	168	350	125	284	170
	NF-03	23	52	1	--	0	190	20	161	200	4	60	10	175	177	130	187
	NF-04	25	101	10	--	--	1000	70	200	53	84	0	62	1,000	166	367	570
	NF-05	10	5	8	--	0	0	22	1	20	36	30	0	45	98	210	94
	NF-06	3	4	0	--	--	44	0	23	78	72	0	24	275	188	197	265
	NF-07	75	80	30	--	250	300	25	220	100	125	50	95	385	527	450	1500
	NF-08	55	8	0	--	--	49	13	37	18	55	0	10	200	128	60	94
N.F. Coeur d'Alene	NF-09	15	1	2	--	2	10	12	12	20	128	8	5	55	18	26	87
(Prichard Creek to	NF-10	75	5	31	--	--	345	65	105	0	65	100	103	--	--	--	180
Yellow Dog Creek	NF-11	40	0	1	--	4	0	29	29	0	0	0	8	30	0	20	0
	NF-12	0	0	0	--	--	0	0	0	0	--	0	3	--	--	--	0
	NF-13	0	0	0	--	0	0	0	0	5	0	0	2	0	--	0	0
N.F. Coeur d'Alene	NF-14	75	1	3	0	0	70	22	124	60	115	55	67	57	66	24	73
(Yellow Dog		200	81	125	100	75	450	60	100	50	178	60	232	200	186	150	232
Creek	NF-15																
to Tepee Creek)	NF-16	30	0	0	0	0	25	18	0	1	8	1	0	0	0	0	0
	NF-17	80	0	26	25	6	0	0	0	0	97	0	0	1	0	51	185
	NF-18	0	60	52	36	50	120	39	30	50	7	25	45	170	145	120	72
N.F. Coeur d'Alene	NF-19	0	0	0	0	0	0	0	0	0	0	0	8	0	0	9	0
(Tepee Creek to	NF-20	0	0	0	0	0	0	0	0	0	0	0	130	0	0	0	0
Jordan Creek)	NF-21	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	5
	NF-22	0	0	0	0	0	--	--	26	100	75	0	0	5	30	16	0
	NF-23	0	0	0	0	4	--	--	35	0	1	0	0	0	0	0	0
L.N.F. Coeur		20	1	0	--	2	0	0	0	0	0	0	0	0	4	3	0
d'Alene	LNF-01																
(mouth to Laverne)	LNF-02	0	0	0	--	--	0	0	0	0	50	0	0	0	0	2	0
	LNF-03	0	0	3	--	0	0	0	0	0	19	0	0	0	2	0	2
	LNF-04	4	0	3	--	--	0	0	0	0	0	0	0	0	0	0	0
	LNF-05	3	0	10	--	0	0	0	0	0	70	0	3	0	0	0	4
	LNF-06	0	0	0	--	--	0	0	0	0	--	0	1	0	0	--	0
	LNF-07	50	--	--	--	0	0	0	0	0	20	0	0	0	0	0	0
	LNF-08	0	0	0	--	--	--	0	0	0	23	0	0	0	0	0	0
L.N.F. Coeur		0	0	0	--	0	0	0	0	0	0	0	0	0	0	0	0
d'Alene	LNF-09																
(Laverne Cr to		0	0	0	--	--	0	0	0	0	0	0	0	0	0	0	0
Horse	LNF-10																
Heaven)	LNF-11	--	--	--	--	0	0	--	0	0	0	0	0	--	--	0	0
	LNF-12	--	--	--	--	0	0	--	0	0	0	0	0	--	--	0	0
	LNF-13	--	--	--	--	0	0	--	0	0	0	--	0	--	--	--	0
Tepee Creek	TP-1	0	0	0	0	--	--	0	0	0	50	0	13	--	--	18	10
	TP-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	TP-3	0	0	0	0	0	0	5	0	0	100	0	0	0	2	8	0
	TP-4	0	12	0	0	0	0	0	0	0	85	0	0	0	0	16	0
	TP-5	0	0	0	0	0	0	0	0	0	14	--	0	30	47	37	45
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0

Stream reach	Transect-2003	Rainbow trout observed															
		1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003
N.F. Coeur d'Alene	NF-01	3	2	10	--	88	5	4	--	41	37	49	9	55	23	0	13
(S.F. Coeur d'Alene	NF-01 (slough)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2
to Prichard Creek)	NF-02	5	1	15	--	--	0	10	21	44	13	1	6	7	14	73	12
	NF-03	11	36	25	--	21	6	0	7	40	5	110	29	27	46	26	52
	NF-04	13	42	26	--	--	34	0	12	31	7	7	40	42	25	34	18
	NF-05	8	7	12	--	200	0	0	17	27	4	22	51	25	37	50	15
	NF-06	31	7	22	--	--	11	0	0	21	0	0	10	96	25	61	77
	NF-07	15	19	29	--	150	8	1	2	29	34	27	16	128	105	31	34
	NF-08	20	24	42	--	--	2	1	5	14	12	14	10	4	0	64	21
N.F. Coeur d'Alene	NF-09	60	19	36	--	5	10	0	0	5	1	8	0	5	10	0	4
(Prichard Creek to	NF-10	45	5	65	--	--	18	3	18	25	3	15	11	--	--	--	0
Yellow Dog Creek	NF-11	16	2	1	--	2	0	0	0	0	0	0	1	7	0	0	0
	NF-12	11	3	16	--	--	20	0	0	0	0	0	0	--	--	--	0
	NF-13	6	4	13	--	19	8	0	0	2	0	0	0	1	0	0	0
N.F. Coeur d'Alene	NF-14	2	0	7	3	2	5	0	0	2	17	0	0	1	4	0	0
(Yellow Dog Creek	NF-15	2	8	19	10	2	0	0	0	0	3	1	1	0	9	0	0
to Tepee Creek)	NF-16	0	7	4	0	0	0	0	0	0	0	0	0	0	1	0	0
	NF-17	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0
	NF-18	0	4	5	0	0	0	0	0	0	0	0	0	0	0	0	0
N.F. Coeur d'Alene	NF-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(Tepee Creek to	NF-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jordan Creek)	NF-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	NF-22	0	0	0	0	0	--	--	0	0	0	0	0	0	0	0	0
	NF-23	0	0	0	0	0	--	--	--	0	0	0	0	0	0	0	0
L.N.F. Coeur d'Alene	LNF-01	23	15	7	--	78	0	3	2	0	0	1	6	9	11	15	13
(mouth to Laverne)	LNF-02	34	24	72	--	--	8	10	21	0	0	7	13	19	8	8	11
	LNF-03	4	5	31	--	14	75	2	32	3	1	9	30	8	12	27	0
	LNF-04	60	9	26	--	--	1	18	0	0	0	6	43	0	0	17	14
	LNF-05	32	0	15	--	29	34	0	8	0	0	1	0	1	0	0	1
	LNF-06	21	19	9	--	--	9	0	8	0	0	6	0	2	0	--	0
	LNF-07	7	--	--	--	3	3	0	0	0	0	0	0	5	0	0	0
	LNF-08	2	0	4	--	--	--	0	0	0	8	0	0	0	0	12	1
L.N.F. Coeur d'Alene	LNF-09	2	1	0	--	0	0	0	0	0	24	0	0	0	0	0	0
(Laverne Cr to Horse	LNF-10	0	0	3	--	--	1	0	0	0	0	0	0	0	0	6	0
Heaven)	LNF-11	--	--	--	--	0	0	--	0	0	0	0	0	--	--	0	0
	LNF-12	--	--	--	--	1	0	--	0	0	0	0	0	--	--	0	0
	LNF-13	--	--	--	--	0	0	--	--	0	0	0	0	--	--	--	1
Tepee Creek	TP-1	0	0	2	0	--	--	0	0	0	0	0	0	--	--	0	0
	TP-2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TP-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TP-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TP-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tepee Creek	TP-rehab1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0
Rehab Area	TP-rehab2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0	0

Submitted by:

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