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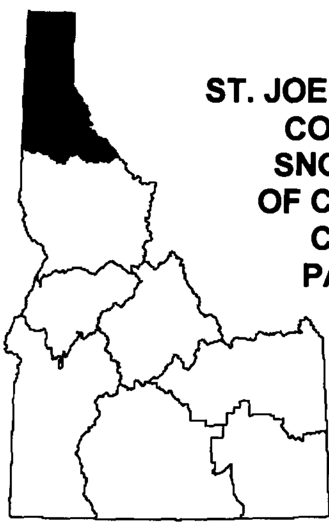

ST. JOE RIVER AND NORTH FORK COEUR D'ALENE RIVER SNORKEL SURVEYS USE OF COEUR D'ALENE RIVER CUTTHROAT TROUT PANHANDLE REGION

2004

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ST. JOE RIVER AND NORTH FORK COEUR D'ALENE RIVER SNORKEL SURVEYS

ABSTRACT

In July 2004, a total of 28 transects in the St. Joe River and 44 transects in the North Fork Coeur d'Alene River system were snorkeled to estimate trout and mountain whitefish *Prosopium williamsoni* abundance and their approximate size distribution. Mean densities of age one and older cutthroat trout *Oncorhynchus clarkii* were 1.29 fish/100 m^2 in the St. Joe River and 0.59 fish/100 m^2 in the North Fork Coeur d'Alene River system. Both rivers showed increasing trends in abundance of cutthroat trout following the declines observed after the 1996 and 1997 flood events and were approaching what was observed before the floods. Densities of cutthroat trout ≥300 mm in length were 0.52 fish/100 m^2 in the St. Joe River and 0.15 fish/100 m^2 in the Coeur d'Alene River. Both rivers showed increasing trends in abundance of cutthroat trout ≥ 300 mm following the declines observed after the 1996 and 1997 flood events and were at or near record highs in 2004.

Densities of mountain whitefish were 1.33 fish/100 m^2 in the St. Joe River and 2.47 fish/100 m^2 in the Coeur d'Alene River in 2004. Mean densities in the Coeur d'Alene River transects were 0.45 fish/100 m^2 for cutthroat trout and 3.13 fish/100 m^2 for mountain whitefish. Both rivers showed increasing trends in abundance of mountain whitefish following the declines observed after the 1996 and 1997 flood events.

Two rainbow trout *O. mykiss* were observed in the St. Joe River whereas 302 (0.20 fish/100 m^2) were observed in the Coeur d'Alene River during 2004. All rainbow trout were observed in the furthest downstream reaches of the St. Joe River (Transect 2), North Fork Coeur d'Alene River (Transects NF1-9) and Little North Fork Coeur d'Alene River (Transects 1-6). Rainbow trout were not stocked into any rivers or streams in the Panhandle Region since 2002. Consequently, these fish were either holdovers from earlier stockings or are offspring from natural reproduction.

Four bull trout *Salvelinus confluentus* were observed in the St. Joe River in 2004. This is the most bull trout that were observed while snorkeling since 1977. This coincides with a record high number of bull trout redds counted in the St. Joe watershed during 2004.

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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 (Fredericks et al. 1997). Evidence suggests fishing pressure for cutthroat trout has continued to increase in the Panhandle Region (Fredericks et al. 1997).

In the early 1900s, 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 1960s, 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 et al. 1970; Mink et al. 1971). As efforts were made to correct the reasons for 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.

Transects were established in the St. Joe River in 1969 and in the Coeur d'Alene River in 1973. 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 use 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 evaluate the status of the fishery the St. Joe River and North Fork Coeur d'Alene River system and assess how changes in fishing regulations, habitat and weather patters have influenced the fishery.

OBJECTIVES

1. Estimate salmonid density and trends in abundance in snorkeling transects in the St. Joe and Coeur d'Alene rivers and evaluate how changes in fishing regulations, habitat, and weather patterns have influenced the fishery.

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

3. Compile existing historic data from past snorkel surveys conducted on the St. Joe River and North Fork Coeur d'Alene River system.

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 (Nelson et al. 1996). These transects were selected based on fish holding capabilities, access, and permanence for future study. All combined, 35 snorkel transects occur in the St. Joe River spanning a total of 115 km of river (Figure 1). Coordinates for the location of each of these transects are displayed in Appendix A and photographs (taken in 2002 or 2003) of each of the samples locations are displayed in Appendix B. These photos not only show a picture of the transects, but also depict where snorkeling should start and end and the approximate length of stream that should be snorkeled. Photos of the original transects taken in 1969 can be viewed in DuPont et al. (In Press a), and provide a good comparison of if and how the sites have changed over the years. During 2004 we only snorkeled transects SJ01-SJ28 due to time and personnel limitations.

North Fork Coeur d'Alene River System

Thirty-eight snorkel transects in the North Fork 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 North Fork Coeur d'Alene River system 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.

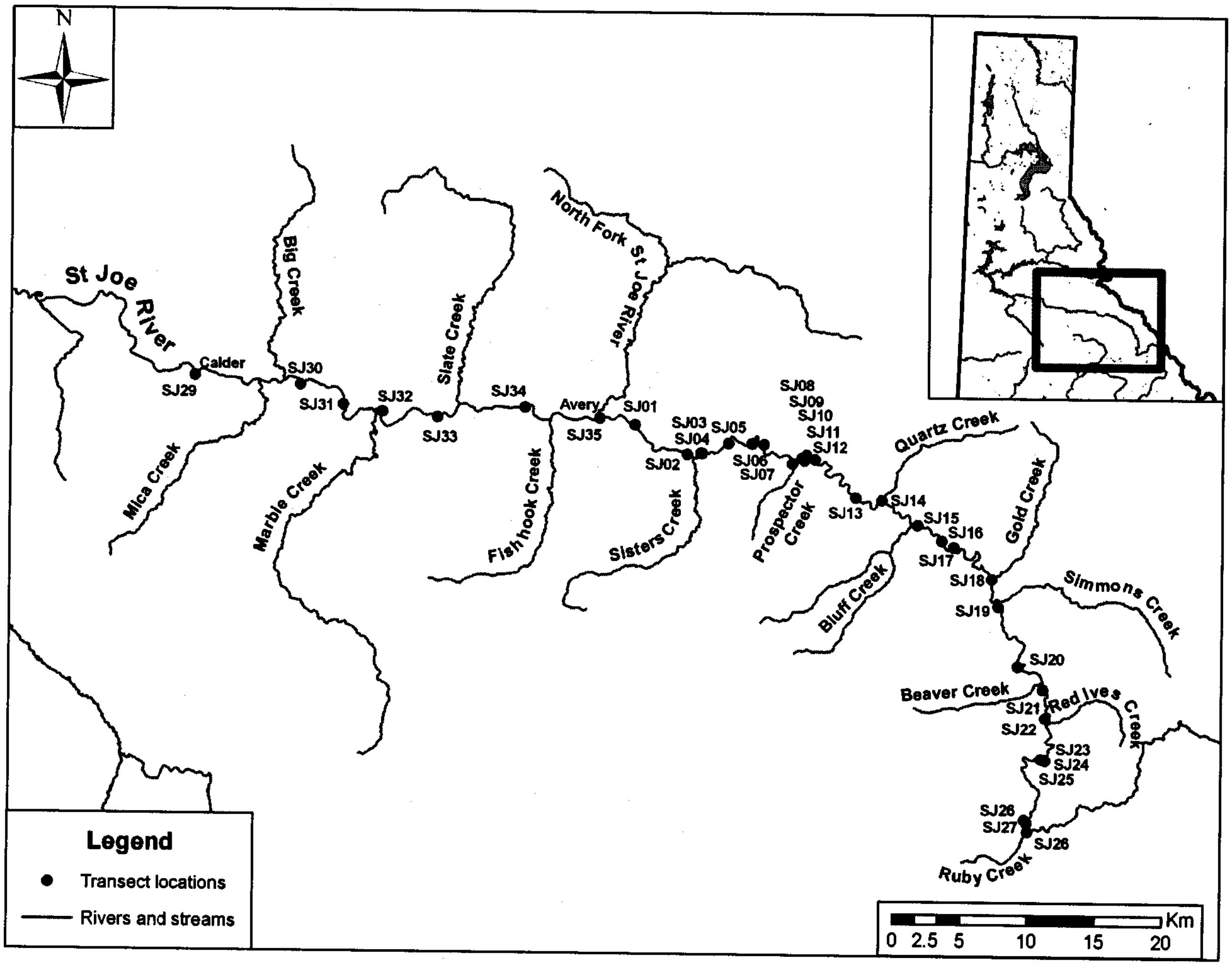


Figure 1. Location of snorkel transects on the St. Joe River, Idaho. Only transects 1-28 were snorkeled, during August 10-16, 2004.

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 (TP R1 & TP R2) were established during 2002 in the upstream portion of Tepee Creek where the U.S. 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 were snorkeled in the Coeur d'Alene basin during 2004 to 45, which spans about 138 km of river (Figure 2). 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 A and photographs (taken in 2002 through 2004) of each of the samples locations are displayed in Appendix C. These photos not only show a picture of the transects, but also depict where snorkeling should start and end and the approximate length of stream that should be snorkeled. Photos of the original transects taken in 1973 can be viewed in DuPont et al. (In Press a), 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 Little North Fork Clearwater River. Hopefully, this will eliminate confusion and prevent any changes in the numbering scheme in the future.

METHODS

Field Work

The methods described below were used during 2004 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 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 patters have influenced it.

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 prevents 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 estimates of fish lengths 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 is 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.

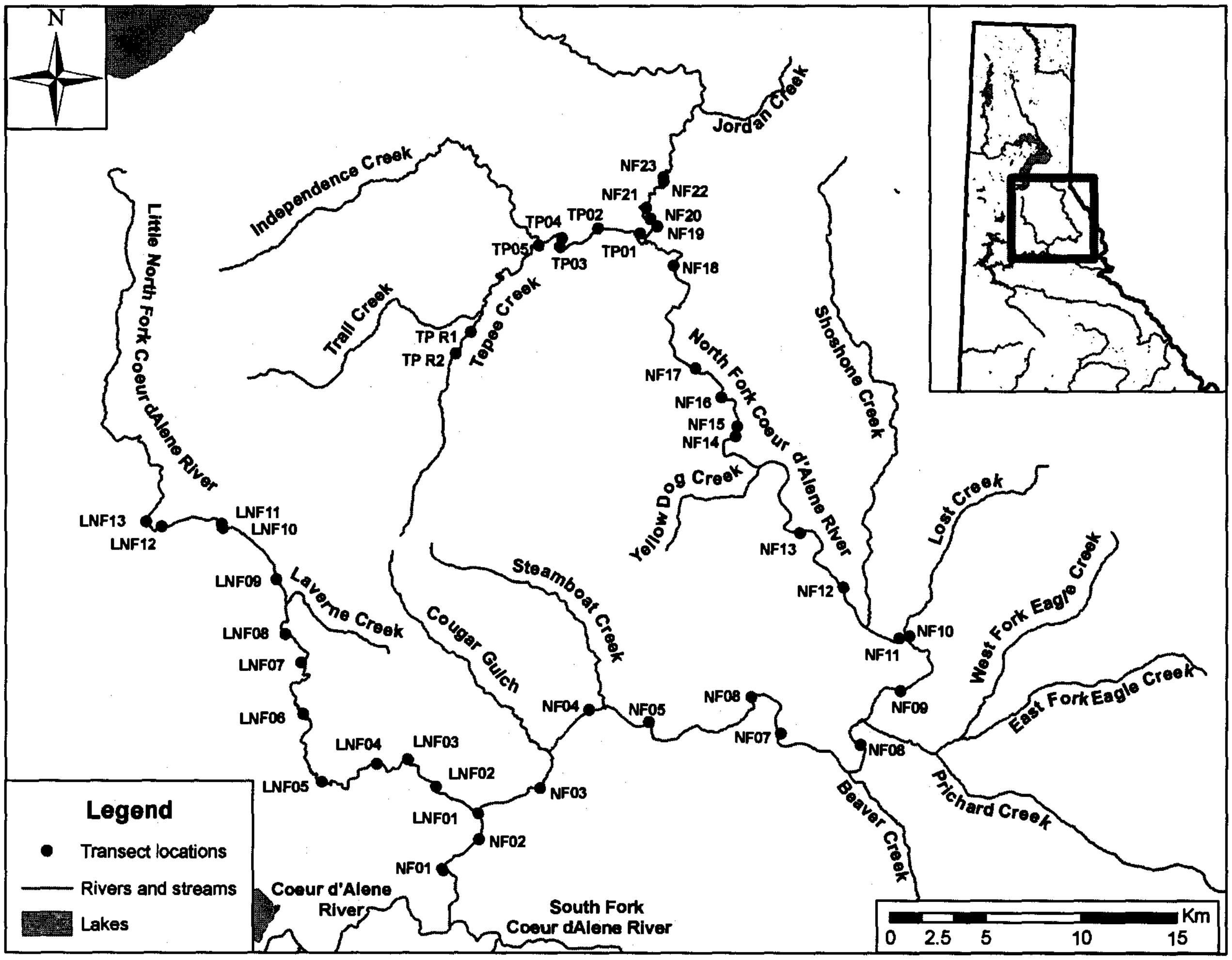


Figure 2. Location of transects snorkeled in the North Fork Coeur d'Alene River system, Idaho, during August 10-16, 2004.

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 plastic pipes 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, water temperature, and visibility (see Appendix D for data sheets we used). Research by Thurow (In Review) has found that the accuracy of snorkel counts can vary from year to year based on water temperature, flow, and visibility. They suggest correction factors should be developed based on these variables to make counts more comparable from year to year. To accomplish this, periodic efforts in the future should be made to calculate actual population estimates (mark/recapture efforts) for particular snorkel reaches. Over time differences between actual population estimates from snorkel counts can be modeled using temperature, flow, and visibility to develop a correction factor. Visibility should be measured by having a snorkeler move away from shore to the point they cannot see it any more. At this point, somebody on shore should measure the distance between the snorkeler and shore using a range finder. Temperature can be calculated using a handheld thermometer and flows can be downloaded off the internet from the nearest gauging station.

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 is not present 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 North Fork Coeur d'Alene River system was snorkeled during the first week in August whereas the St. Joe River was snorkeled the second week in August. These are the same dates these rivers have been consistently snorkeled since their start.

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 North Fork Coeur d'Alene River system 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 or extreme cold), 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 North Fork Coeur d'Alene River system, we conducted an 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-Significant-Difference Test to evaluate which stream reaches differed significantly. Fisher's Least-Significant-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

Twenty-eight transects were snorkeled in the St. Joe River from August 10-16, 2004. A total of 729 cutthroat trout, two rainbow trout *Oncorhynchus mykiss*, four bull trout *Salvelinus confluentus*, and 749 mountain whitefish *Prosopium williamsoni* were counted (Table 1). Cutthroat trout were observed in all of the 28 sites snorkeled. Densities of cutthroat trout (all size classes) at these transects ranged from 0.56 to 6.78 fish/100 m^2 with an overall average of 1.29 fish/100 m^2 (Table 1 and Table 2). About 40 percent of the cutthroat trout observed were estimated to be ≥300 mm in length and their overall density was calculated to be 0.52 fish/100 m^2 (Table 1 and Table 3).

ANOVA testing indicated that significant differences (p value = 0.059) in density of cutthroat trout occurred between stream reaches in the St. Joe River (Figure 3). Fisher's LSD test (Table 4) showed that there were significantly higher densities of cutthroat trout in the two reaches upstream of Prospector Creek (Prospector to Red Ives and Red Ives to Ruby Creek) than downstream of Prospector Creek (N.F. St. Joe to Prospector Creek). When we evaluated only cutthroat trout ≥300 mm, ANOVA testing indicated significant differences (p value = 0.048) in densities also occurred between stream reaches (Figure 3). Again, Fisher's LSD test (Table 4) showed that there were significantly higher densities of cutthroat trout ≥300 in the two reaches upstream of Prospector Creek than downstream of Prospector Creek.

Since 1969, transects in the St. Joe River have been snorkeled from the North Fork 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 lowest density (0.27 fish/100

m^2) of cutthroat trout (all sizes) was observed the first year these transects were snorkeled in 1969. In 1971, the observed density of cutthroat trout (all sizes) increased to 0.52 fish/100 m^2 (Figure 4). This increase coincides with a change in fishing regulations from a 15 fish limit for the entire river to where only three 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 4). From 1977 to 1980, cutthroat trout densities dropped to 0.88 fish/100 m^2, a 45% decline (Figure 4). The coldest winter recorded in St. Maries since 1950 was in the winter of 1978-1979 (Figure 5), which coincides with this decline. Fishing regulations became more restrictive during this time (Table 5) and extreme flow events were not observed (Figure 6). Following 1980, cutthroat trout densities increased to all time highs (~1.7 fish/100 m^2) and remained there until 1990 (Figure 4 and Table 2). From 1990 to 1994, cutthroat trout densities dropped to 1.18 fish/100 m^2, a 45% decline (Figure 4 and Table 2). The third coldest winter recorded in St. Maries since 1950 occurred in the winter of 1992-1993 (Figure 5) which coincides with this decline. No changes in fishing regulations or extreme flow events occurred during this same period (Table 4 and Figure 6). Following 1993, cutthroat trout densities increased to an all time high in 1995 (1.99 fish/100 m^2) and remained near there until 1997.

Table 1. Number and density (fish/100 m^2) of fish observed while snorkeling transects in the St. Joe River, Idaho, during August 10-16, 2004. Transects 29-35 (area that allows limited harvest) were not snorkeled due to time and personnel limitations.

Reach	Transect Number	Habitat Type	Length (m)	Average Width (m)	Area (m2)	Cutthroat trout Numbers Counted <300 mm	Cutthroat trout Numbers Counted ≥300 mm	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)
N.F. St. Joe River to Prospector Creek	SJ01	Run	51	42.80	2,183	11	10	21	0.96	0	0	40	1.83
	SJ02	Pool	131	27.25	3,570	11	9	20	0.56	2	0	90	2.52
	SJ03	Pool	92	13.60	1,251	9	9	18	1.44	0	0	17	1.36
	SJ04	Pool	70	14.40	1,008	6	3	9	0.89	0	0	25	2.48
	SJ05	Run	193	25.00	4,825	8	8	16	0.33	0	0	35	0.73
	SJ06	Pool	160	36.50	5,840	10	0	10	0.17	0	0	5	0.09
	SJ07	Run	131	27.60	3,616	11	6	17	0.47	0	0	36	1.00
Prospector Creek. To Red Ives Creek	SJ08	Pool	178	21.80	3,880	18	9	27	0.70	0	0	49	1.26
	SJ09	Pool	58	22.40	1,299	8	6	14	1.08	0	0	23	1.77
	SJ10	Pool	210	21.14	4,440	30	18	48	1.08	0	0	53	1.19
	SJ11	Pool	65	24.80	1,612	21	12	33	2.05	0	0	32	1.99
	SJ12	Pool	70	24.60	1,722	6	18	24	1.39	0	0	19	1.10
	SJ13	Run	117	24.80	2,902	20	5	25	0.86	0	0	32	1.10
	SJ14	Run	118	21.40	2,525	17	8	25	0.99	0	1	58	2.30
	SJ15	Run	117	13.80	1,615	27	10	37	2.29	0	0	10	0.62
	SJ16	Run	78	10.80	842	30	22	52	6.17	0	0	17	2.02
	SJ17	Run	124	11.20	1,389	44	18	62	4.46	0	0	22	1.58
	SJ18	Run	75	11.40	855	41	17	58	6.78	0	0	90	10.53
	SJ19	Run	42	17.80	748	24	5	29	3.88	0	0	10	1.34
	SJ20	Run	68	18.00	1,224	5	13	18	1.47	0	0	1	0.08
	SJ21	Pool	38	18.60	707	4	11	15	2.12	0	0	0	0.00
	SJ22	Pool	73	23.60	1,723	2	16	18	1.04	0	0	20	1.16
Red Ives Creek to Ruby Creek	SJ23	Run	40	14.50	580	15	4	19	3.28	0	0	4	0.69
	SJ24	Run	74	18.60	1,376	20	16	36	2.62	0	0	4	0.29
	SJ25	Run	60	18.00	1,080	13	8	21	1.94	0	1	2	0.19
	SJ26	Run	70	20.67	1,447	4	15	19	1.31	0	0	1	0.07
	SJ27	Pool	66	22.00	1,452	5	17	22	1.52	0	2	47	3.24
	SJ28	Run	48	12.80	614	14	2	16	2.60	0	0	7	1.14
Total	28 Sites	—	2,617	—	56,324	434	295	729	1.29	2	4	749	1.33

Table 2. Average densities (fish/100 m^2) of all sizes of cutthroat trout counted by reach during snorkel evaluations from 1969 to 2004 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982	1989	1990	1993	1994	1995	1996	1997	1998
Calder to North Fork St. Joe	—	—	—	—	—	—	—	—	—	—	—	—			0.07	0.23	0.16	0.14	0.15	0.09
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	0.18	0.22	0.47	0.33	0.79	0.33	0.18	0.12
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	2.44	2.79	2.13	1.66	2.56	2.42	2.79	1.05
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	2.41	4.05	1.17	1.39	2.58	2.57	1.13	1.44
All Transects - Entire River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.79	0.76	1.19	1.06	1.09	0.50
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	1.43	1.82	1.30	1.18	1.99	1.77	1.74	0.79

Reach	2000	2001	2002	2003	2004
Calder to North Fork St. Joe	—	0.22[c]	0.11	0.11	—
N.F. St. Joe to Prospector Cr.	0.46	0.52	0.52	0.80	0.50
Prospector Cr. to Red Ives Cr.	1.11	1.38	1.46	2.01	1.76
Red Ives Cr. to Ruby Cr.	1.06	1.19	0.93	1.76	2.03
All transects - Entire River	—	0.80[c]	0.64	0.90	—
Avery to Ruby Creek	0.88	1.02	1.00	1.51	1.29

[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 densities (fish/100 m^2) of cutthroat trout ≥ 300 mm counted by reach during snorkel evaluations from 1969 to 2004 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982	1989	1990	1993	1994	1995	1996	1997	1998
Calder to North Fork St. Joe	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02	0.05	0.02	0.03	0.00	0.01
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	0.02	0.09	0.08	0.02	0.05	0.07	0.01	0.01
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	0.44	0.95	0.69	0.46	0.40	0.56	0.16	0.08
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	0.81	0.88	0.72	0.47	0.70	0.76	0.13	0.26
All Transects - Entire River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.26	0.20	0.19	0.25	0.06	0.05
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	0.30	0.57	0.43	0.31	0.33	0.43	0.11	0.08

Reach	2000	2001	2002	2003	2004
Calder to North Fork St. Joe	—	0.02c	0.00	0.02	—
N.F. St. Joe to Prospector Cr.	0.12	0.04	0.07	0.17	0.20
Prospector Cr. to Red Ives Cr.	0.24	0.20	0.30	0.20	0.68
Red Ives Cr. to Ruby Cr.	0.18	0.11	0.24	0.41	0.95
All Transects - Entire River	—	0.10c	0.12	0.13	—
Avery to Ruby Creek	0.19	0.13	0.19	0.21	0.52

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

Table 4. Fishers Least-Significant-Difference Test matrices showing pairwise comparison probabilities of cutthroat trout densities (all sizes and ≥300 mm) between three stream reaches in the St. Joe River, Idaho during 2004. Shaded cells indicate which stream reaches had significantly different (p ≤0.10) cutthroat trout densities.

	All Sizes		
	N.F. St. Joe	Prospector	Red Ives
N.F. St. Joe	1.00		
Prospector	0.020	1.00	
Red Ives	0.086	0.776	1.00
	Cutthroat Trout ≥300 mm		
	N.F. St. Joe	Prospector	Red Ives
N.F. St. Joe	1.00		
Prospector	0.016	1.00	
Red Ives	0.078	0.748	1.00

Table 5. History of fishing regulations for cutthroat trout in the St. Joe River and Coeur d'Alene River, Idaho from 1941 to 2004.

	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	Catch-and-release
	Coeur d'Alene River		
Year	CdA Lake to Yellow Dog Creek	Yellow Dog Creek to Headwaters (NF CdA)	Laverne Creek to Headwaters (LNF CdA)
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	Catch-and-release
2000-2004	2 fish, none between 8"-16"	Catch-and-release	Catch-and-release

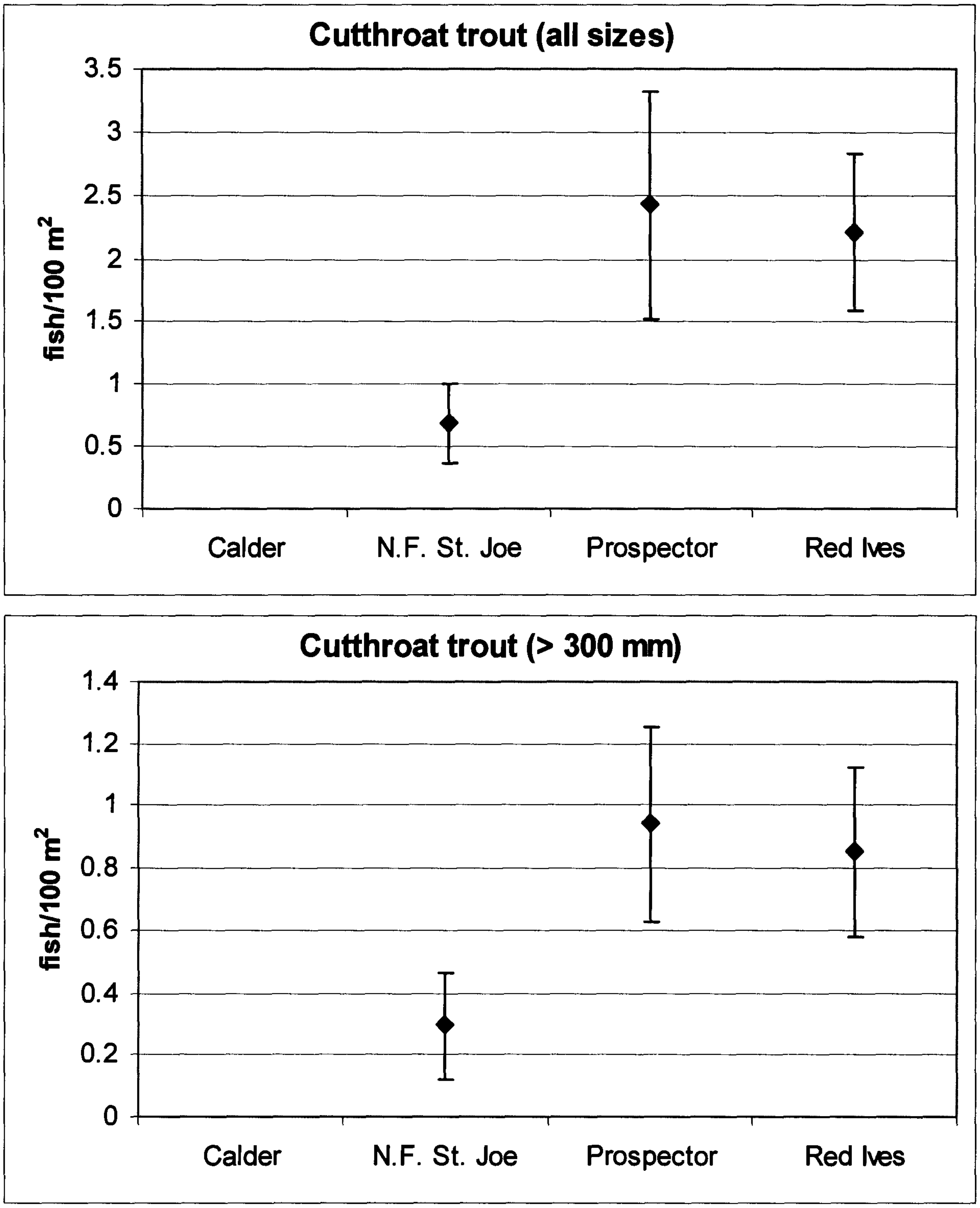
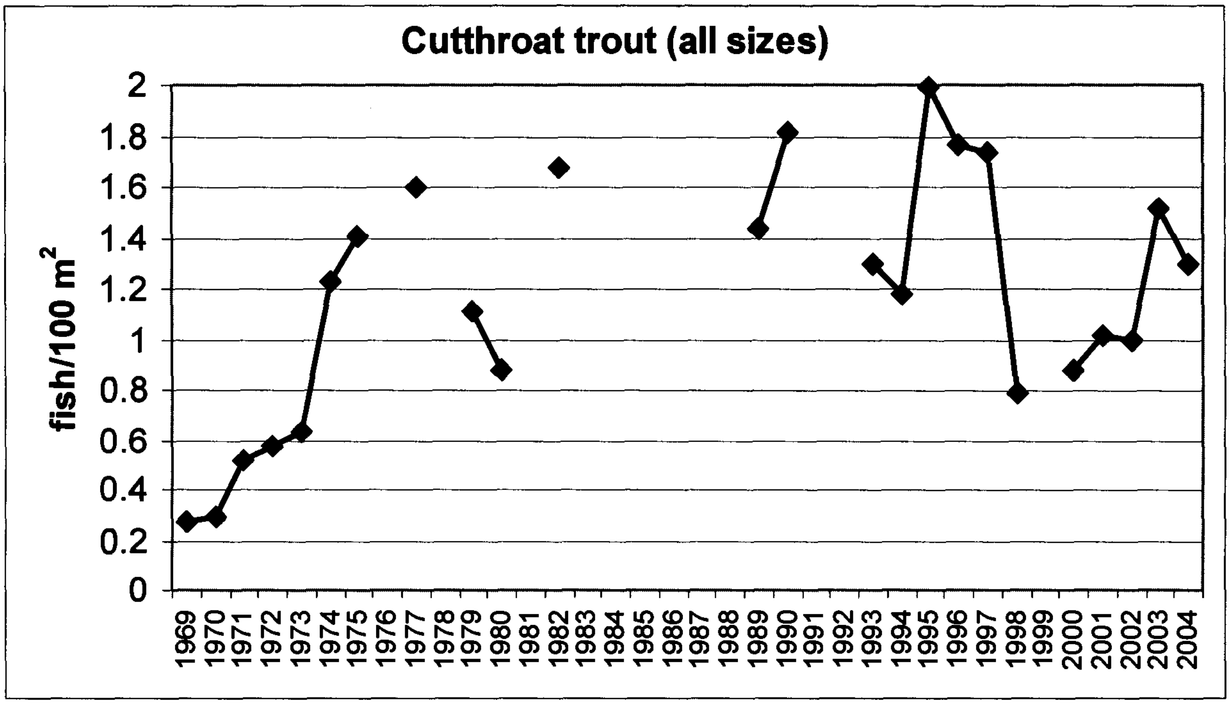


Figure 3. Average cutthroat trout densities and 90% confidence intervals (all sizes and only those ≥300 mm) determined from snorkeling three different reaches in the St. Joe River, Idaho, during 2004.



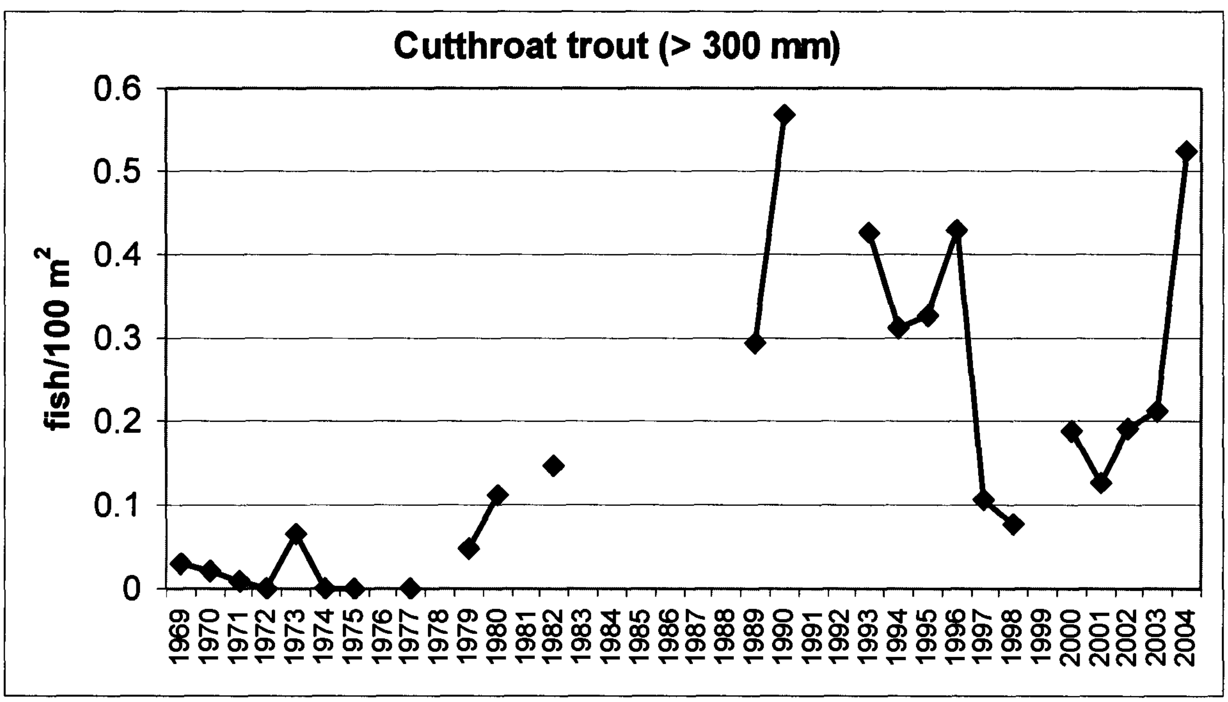


Figure 4. Average densities (fish/100 m^2) of all size classes of cutthroat trout and cutthroat trout ≥300 mm observed while snorkeling the St. Joe River, Idaho, between the North Fork St. Joe River and Ruby Creek from 1969 to 2004. Arrows signify when significant changes occurred in cutthroat trout fishing regulations. Refer to Table 5 to see how regulations changed in these particular years.

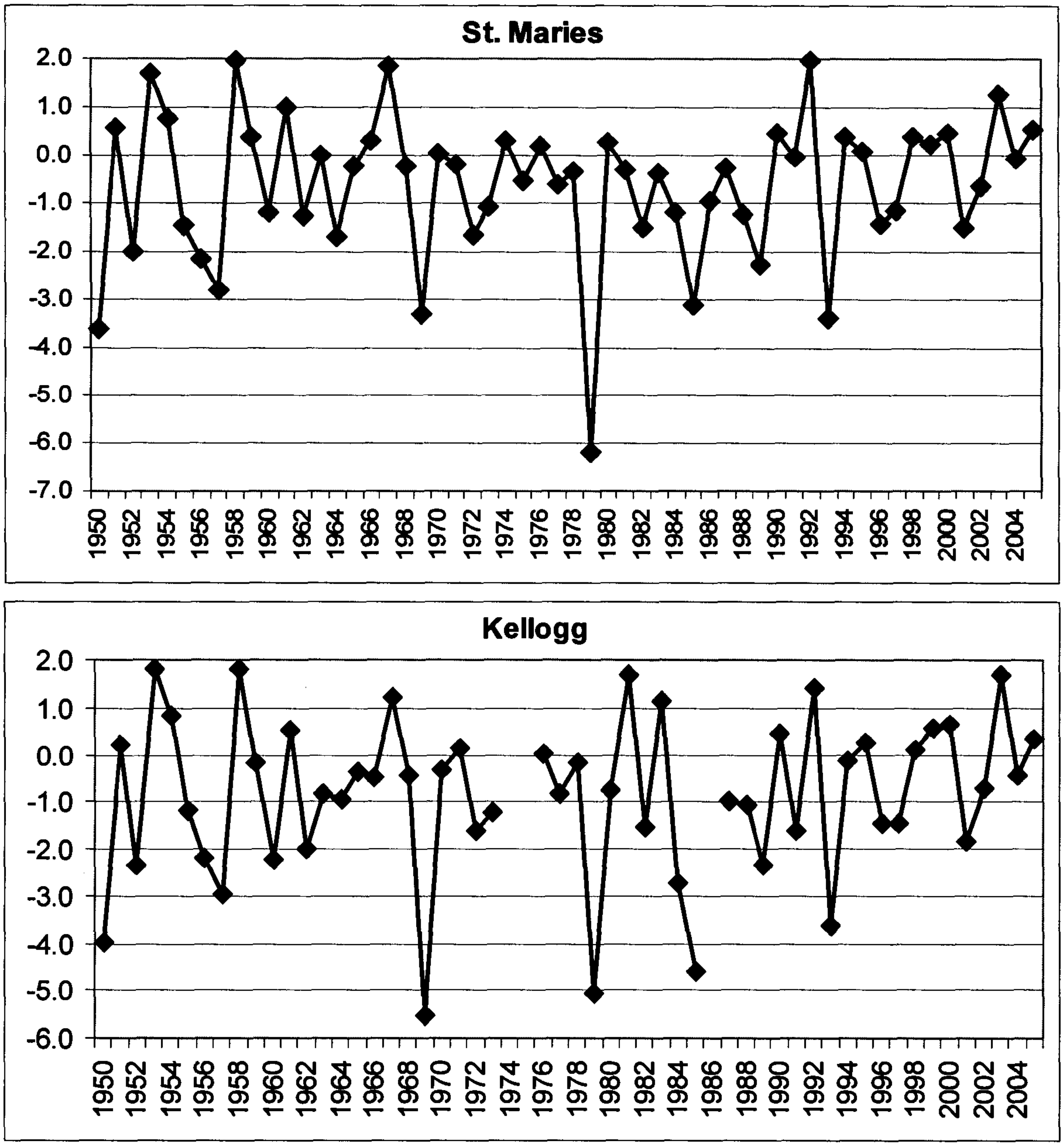
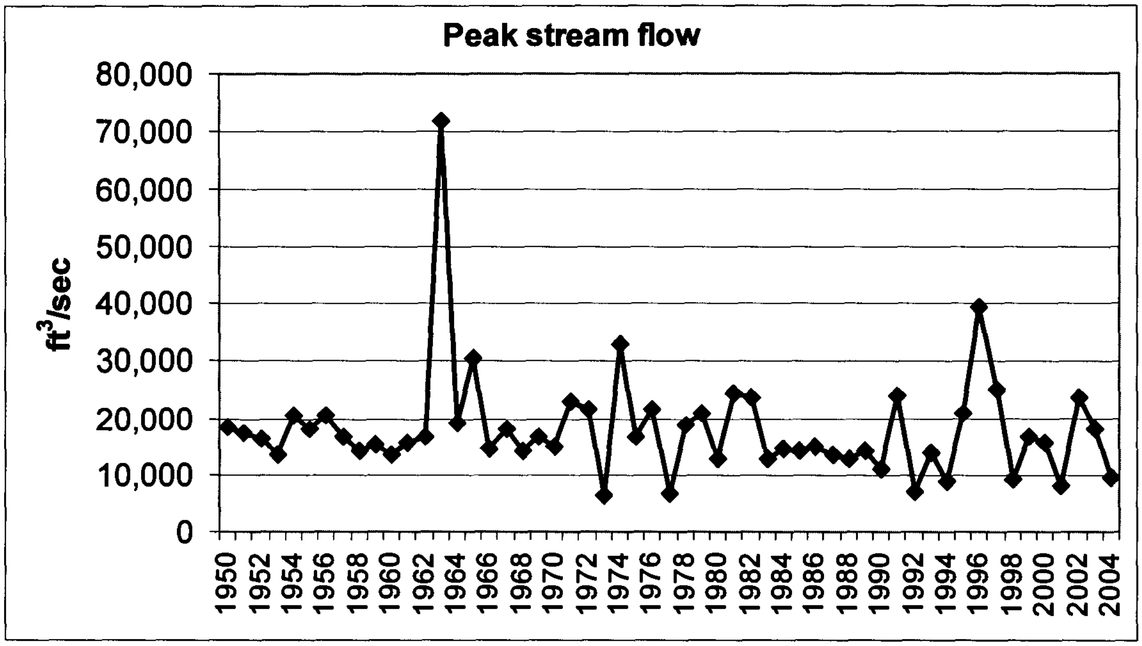


Figure 5. Average air temperature (°C) during winter (Dec-Feb) from 1950 to 2004 in St. Maries and Kellogg, Idaho.



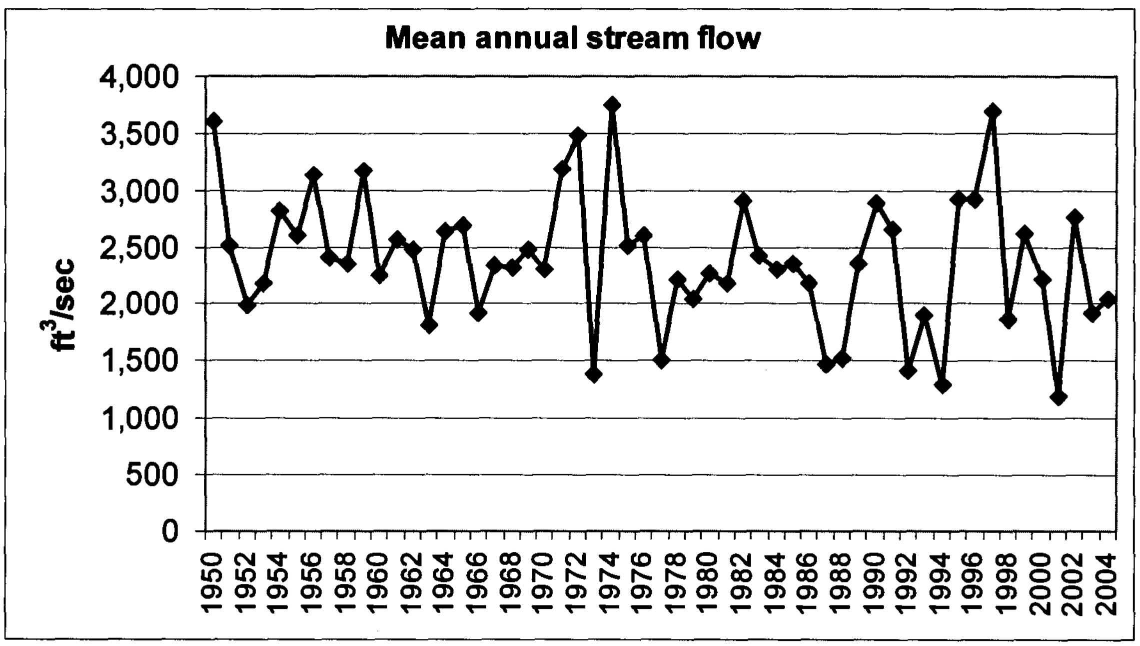


Figure 6. Peak stream flow and mean annual stream flow documented by USGS for the St. Joe River, Idaho, at Calder from 1950 to 2004.

When we evaluated trends that occurred for cutthroat trout ≥300 mm in length during this same time period (1969-1997), the trend was different that what was observed for all sizes of fish. From 1969 to 1977 the density of cutthroat trout ≥300 mm declined to the point where none were counted between 1974 and 1977 (Table 3 and Figure 4). 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 6 fish harvest with no more than 2 over 16 inches downstream of Prospector Creek; Table 5). 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 4). 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 4). 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 4). No changes in fishing regulations occurred around this time, but two significant flood events occurred. 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 increased steadily. The 2004 cutthroat trout density (all sizes) was close to what was observed prefloods, and densities of cutthroat trout ≥300 mm had reached the point where only once before were higher densities ever observed (Table 2 and 3 and Figure 4).

Mountain whitefish were counted in 27 of the 28 transects snorkeled during 2004 and were the most numerous fish observed (Table 1). The highest density of mountain whitefish (1.59 fish/100 m^2) was observed in the reach between Prospector Creek and Red Ives Creek (Table 6). The overall mean density of mountain whitefish observed during 2004 (1.33 fish/100 m^2) was down from 2003 (Table 6 and Figure 7). Mountain whitefish experienced a similar decline in density as cutthroat trout following the floods of 1996 and 1997. Mountain whitefish densities have rebounded since the floods and in 2004 were similar to preflood observations (Table 6 and Figure 7).

The two rainbow trout that were counted during 2004 were observed in Transect SJ02 near 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).

In 2004, four bull trout were counted in snorkel transects. This is the most bull trout counted since the 1977 (Figure 9).

North Fork Coeur d'Alene River System

Forty-three transects were snorkeled in the North Fork Coeur d'Alene River system on August 3-5, 2004. A total of 871 cutthroat trout, 302 rainbow trout, 2 brook trout *Salvelinus fontinalis*, and 3,650 mountain whitefish were counted (Table 8). Cutthroat trout were observed in 42 of the 43 transects snorkeled. Densities of cutthroat trout (all size classes) in these transects ranged from 0.00 to 3.18 fish/100 m^2 with an overall average of 0.59 fish/100 m^2 (Tables 8). About 25% of the cutthroat trout observed were estimated to be ≥300 mm in length and their overall density was calculated to be 0.15 fish/100 m^2.

Table 6. Average densities (fish/100 m^2) of mountain whitefish counted by reach during snorkel surveys from 1969 to 2004 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982	1989	1990	1993	1994	1995	1996	1997	1998
Calder to N.F. St Joe River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.60	0.18	0.34	0.88	0.44	0.10
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]	0.70	1.13	0.40	2.12	1.29	1.03	0.27	1.39
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]	2.17	2.01	2.11	0.65	1.67	1.02	0.47	0.80
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]	1.32	2.22	0.66	1.03	1.73	1.60	0.35	0.38
Average for All Sites	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.95	0.75	1.03	1.01	0.41	0.60
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]	1.42	1.65	1.20	1.19	1.56	1.11	0.39	0.94

Reach	2000	2001	2002	2003	2004
Calder to N.F. St Joe River	—	1.25e	0.33	0.80	—
NF St Joe to Prospector Cr.	0.51	0.33	0.75	2.38	1.11
Prospector C. to Red Ives Cr.	0.55	1.22	1.22	1.87	1.59
Red Ives Cr. to Ruby Cr.	0.47	0.56	0.37	1.12	0.99
Average for All Sites	—	0.92e	0.68	1.47	—
NF St Joe to Ruby Creek	0.53	0.79	0.92	1.98	1.33

[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.

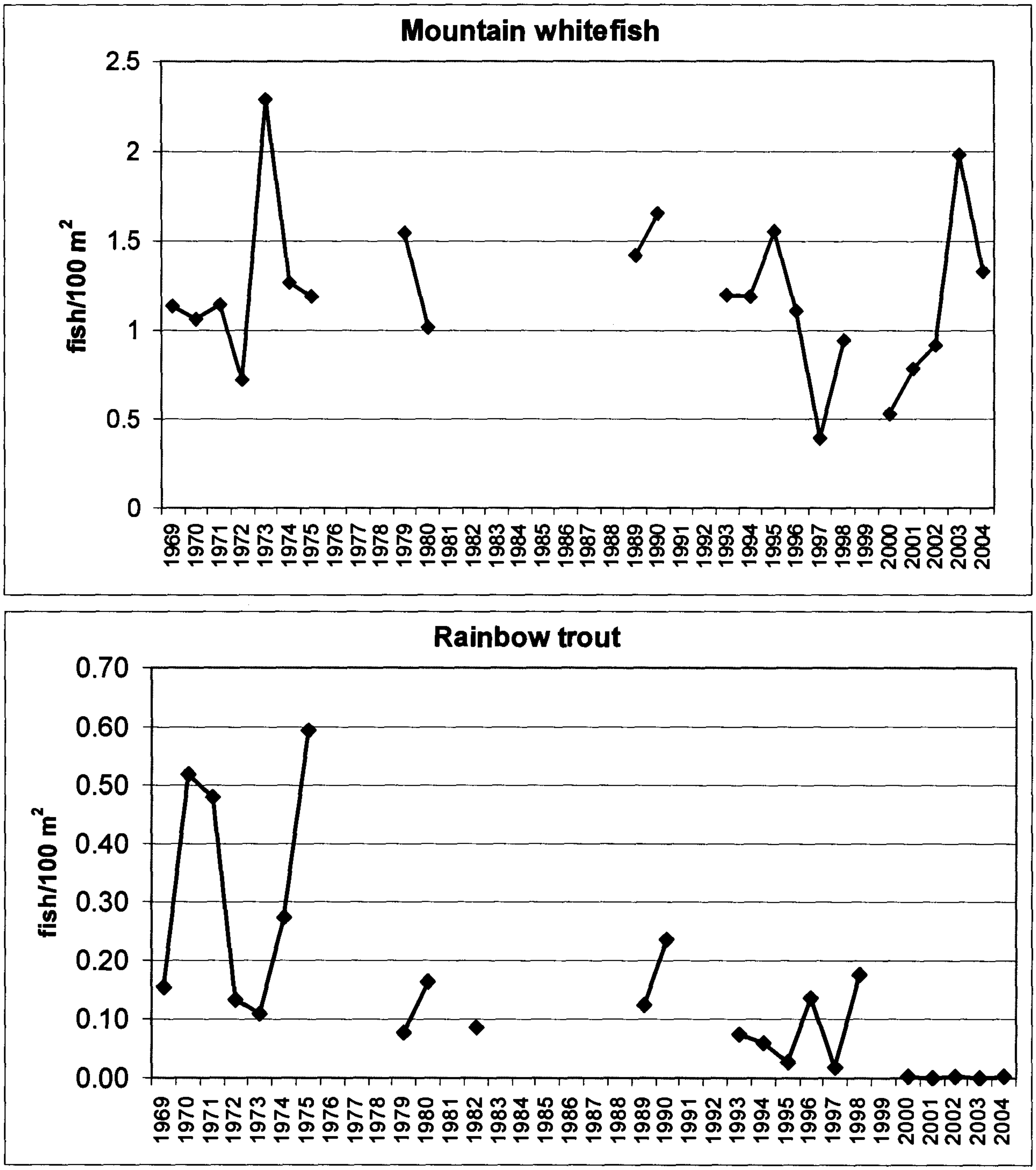


Figure 7. Average densities of mountain whitefish and rainbow trout (fish/100 m^2) observed while snorkeling the St. Joe River, Idaho, between the North Fork St. Joe River and Ruby Creek from 1969 to 2004.

Table 7. Average densities (fish/100 m^2) of rainbow trout counted by reach during snorkel evaluations from 1969 to 2004 in the St. Joe River, Idaho.

Reach	1969	1970	1971	1972	1973	1974	1975	1976	1977	1979	1980	1982	1989	1990	1993	1994	1995	1996	1997	1998
Calder to N.F. St Joe River	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.14	0.10	0.21	0.20	0.03	0.15
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	0.28	0.43	0.15	0.10	0.07	0.37	0.06	0.46
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	0.00	0.10	0.01	0.05	0.01	0.03	0.00	0.05
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	0.00	0.00	0.01	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
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	0.12	0.23	0.07	0.06	0.03	0.14	0.02	0.17

Reach	2000	2001	2002	2003	2004
Calder to N.F. St Joe River	—	0.23c	0.04	0.03	—
NF St Joe to Prospector Cr.	0.00	0.00	0.01	0.00	0.01
Prospector C. to Red Ives Cr.	0.00	0.00	0.00	0.00	0.00
Red Ives Cr. to Ruby Cr.	0.00	0.00	0.00	0.00	0.00
Average for All Sites	0.00	0.06c	0.02	0.01	—
NF St Joe to Ruby Creek	0.00	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.

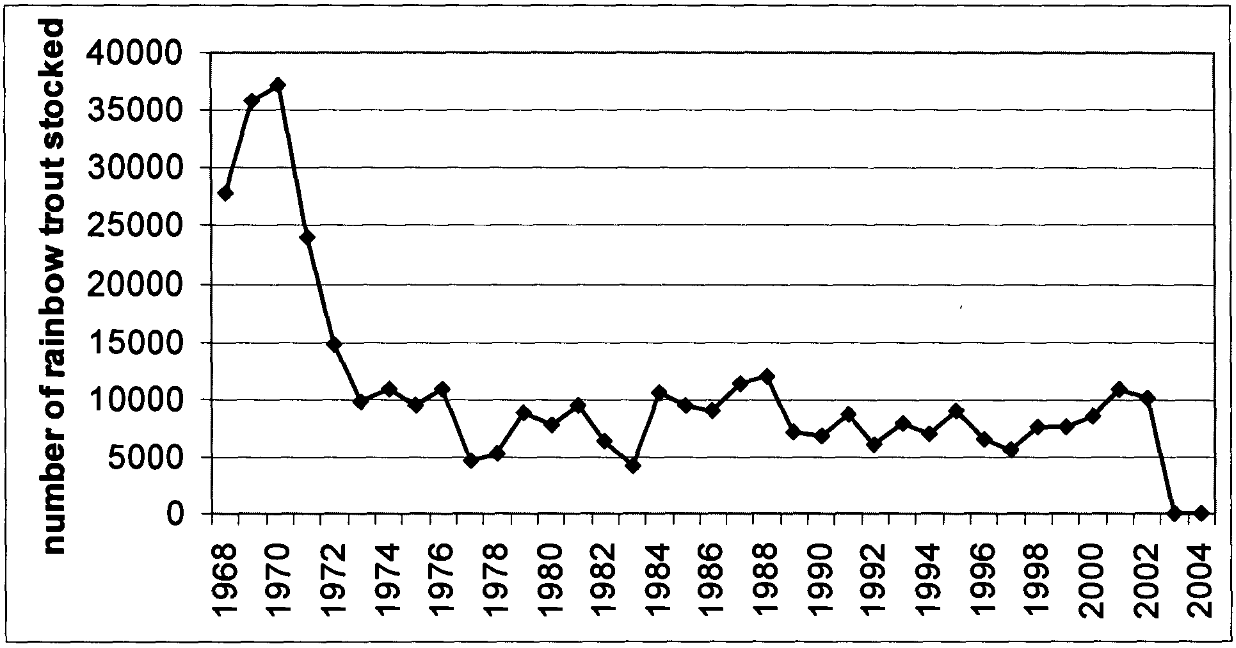


Figure 8. Number of rainbow trout >150 mm in length stocked in the St. Joe River, Idaho between 1968 and 2004.

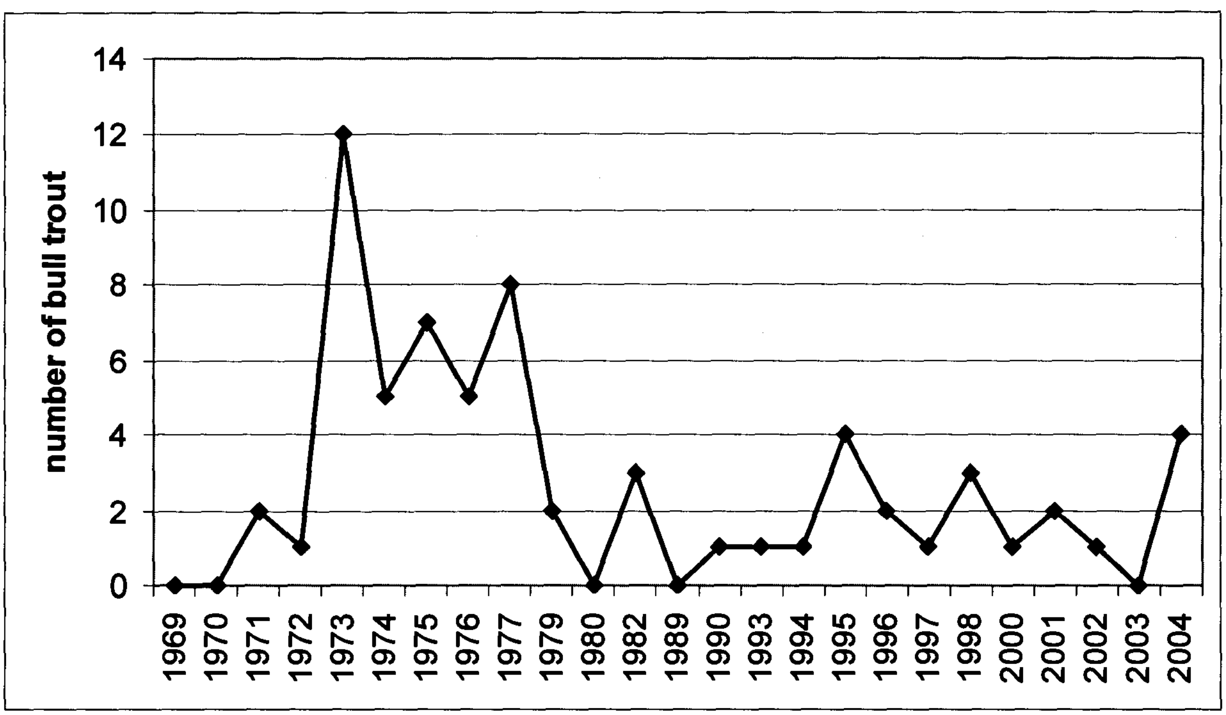


Figure 9. Number of bull trout counted while snorkeling transects in the St. Joe River, Idaho, from 1969 to 2004.

Table 8. Numbers and densities (fish/100 m^2) of fish observed while snorkeling transects in the North Fork Coeur d'Alene River system, Idaho, during August 3-5, 2004.

Reach	Transect #	Habitat Type	Area (m^2)	Cutthroat Trout: Number Counted >300 mm	Cutthroat Trout: Number Counted all sizes	Cutthroat Trout: Density (fish/100 m^2)	Rainbow Trout: Number Counted	Rainbow Trout: Density (fish/100 m^2)	Brook Trout Counted	Mountain Whitefish: Number Counted	Mountain Whitefish: Density (fish/100 m^2)
Lower North Fork Coeur d'Alene (Limited Harvest Allowed)	NF-01	Pool	4,736	6	53	1.12	75	1.58	0	140	2.96
	NF-01 (slough)	Slough	1,203	11	15	1.25	5	0.42	0	250	20.78
	NF-02	Pool	6,406	5	22	0.34	10	0.16	0	400	6.24
	NF-03	Pool	8,832	13	55	0.62	50	0.57	0	380	4.30
	NF-04	Pool	8,541	0	16	0.19	17	0.20	0	295	3.45
	NF-05	Pool	6,144	7	34	0.55	44	0.72	0	175	2.85
	NF-06	Pool	7,210	11	35	0.49	29	0.40	0	200	2.77
	NF-07	Pool	5,184	6	38	0.73	23	0.44	0	650	12.54
	NF-08	Pool	4,814	8	49	1.02	3	0.06	0	110	2.28
	NF-09	Pool	12,791	20	87	0.68	13	0.10	0	49	0.38
	NF-10	Pool/Run	6,144	10	32	0.52	14	0.23	0	226	3.68
	NF-11	Run	10,733	3	3	0.03	5	0.05	0	3	0.03
	NF-12	Run	5,658	1	1	0.02	0	0.00	0	0	0.00
	NF-13	Run	2,803	1	2	0.07	0	0.00	0	0	0.00
N. F. Cd'A (Catch-and-Release)	NF-14	Pool	3,698	10	29	0.78	0	0.00	0	47	1.27
	NF-15	Pool	3,100	10	34	1.10	0	0.00	0	250	8.06
	NF-16	Run	4,118	5	9	0.22	0	0.00	0	1	0.02
	NF-17	Glide	8,004	24	85	1.06	0	0.00	0	195	2.44
	NF-18	Pool	1,411	2	21	1.49	0	0.00	0	150	10.63
	NF-19	Pool	714	4	6	0.84	0	0.00	0	0	0.00
	NF-20	Pool	1,014	3	8	0.79	0	0.00	0	0	0.00
	NF-21	Pool	1,056	4	23	2.18	0	0.00	0	25	2.37
	NF-22	Pool	940	7	15	1.60	0	0.00	0	0	0.00
	NF-23	Run	441	0	1	0.23	0	0.00	0	0	0.00
Tepee Creek (Catch-and-Release)	TP-01	Pool	1,608	16	28	1.74	0	0.00	0	2	0.12
	TP-02	Riffle/Run	4,327	5	5	0.12	0	0.00	0	0	0.00
	TP-03	Pool	1,540	1	5	0.32	0	0.00	0	0	0.00
	TP-04	Run	1,123	6	20	1.78	0	0.00	0	0	0.00
	TP-05	Pool	1,175	5	25	2.13	0	0.00	0	100	8.51
	TP R1	Pool/Riffle	1,260	0	19	1.51	0	0.00	0	0	0.00
	TP R2	Pool/Riffle	1,485	1	11	0.74	0	0.00	0	0	0.00
L.N.F. Cd'A (Limited Harvest Allowed)	LNF-01	Pool	678	1	2	0.29	0	0.00	0	0	0.00
	LNF-02	Run	2,850	2	2	0.07	3	0.11	0	0	0.00
	LNF-03	Pool	2,269	0	2	0.09	1	0.04	0	1	0.04
	LNF-04	Pool/Run	945	0	7	0.74	5	0.53	0	0	0.00
	LNF-05	Pool	2,804	1	1	0.04	0	0.00	0	1	0.04
	LNF-06	Pool	1,912	2	15	0.78	4	0.21	2	0	0.00
	LNF-07	Pool	1,276	0	1	0.08	0	0.00	0	0	0.00
	LNF-08	Pool	1,088	0	1	0.09	0	0.00	0	0	0.00

Table 8. Continued.

L.N.F. Cd'A (Catch-and-Release)	LNF-09	Run	714	0	0	0.00	0	0.00	0	0	0.00
	LNF-10	Pool/Run	1,560	2	12	0.77	0	0.00	0	0	0.00
	LNF-11	Run	1,375	3	11	0.80	0	0.00	0	0	0.00
	LNF-12	Pool/Riffle	943	4	30	3.18	1	0.11	0	0	0.00
	LNF-13	Run	995	1	1	0.10	0	0.00	0	0	0.00
Total	43 sites	—	147,623	221	871	0.59	302	0.20	2	3,650	2.47

ANOVA testing indicated that significant differences (p value = 0.095) in density of cutthroat trout occurred between stream reaches in the North Fork Coeur d'Alene River system (Figure 10). Fisher's LSD test showed that two stream reaches (lower Little N.F. Coeur d'Alene and Prichard Cr. to Yellow Dog Cr.) in the limited harvest areas have lower densities of cutthroat trout than many of the reaches in the catch-and-release areas (Table 9 and Figure 10). When we evaluated only cutthroat trout ≥300 mm, ANOVA testing also showed that there were significant differences (p value = 0.005) in densities between stream reaches (Figure 10). Fisher's LSD test (Table 9) showed that cutthroat trout densities in stream reaches in the catch-and-release areas tended to be higher than densities in most of the streams reaches in the limited harvest areas (Table 9 and Figure 10).

Transects in the North Fork Coeur d'Alene River system have been snorkeled since 1973. Plotting the average density of cutthroat trout in various reaches in this river system over time shows how cutthroat trout abundance has changed in response to changes in fishing regulations, extreme climatic events, and fish stocking. The lowest average densities of cutthroat trout (all sizes) observed in transects located on the main North Fork Coeur d'Alene River occurred 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) in the North Fork Coeur d'Alene River increased steadily until 1997 to the point where densities were about double what was observed between 1972 and 1981 (Figure 11 and Table 10). 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, one fish >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 11). 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) in the main North Fork Coeur d'Alene River were observed during 1997 and in 1998 (Figure 11 and Tables 10-11). 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 increased steadily. In fact, the density of cutthroat trout ≥300 mm in length in 2004 was the highest ever recorded and represented about 26% of the cutthroat trout observed in the North Fork (Figure 11 and Tables 10-11). Cutthroat trout <300 mm have not seen this dramatic of an increase since their decline in 1998, but their densities have been increasing steadily (Figure 11).

From 1973 to 2004, there have been three different winters (78-79, 84-85 and 92-93) where the average air temperature in Kellogg, Idaho was <-3.5°C (Figure 5). Winter air temperatures <-3° C in St. Maries, Idaho coincided with drops in cutthroat trout densities the following summer. This was not observed in the North Fork Coeur d'Alene River.

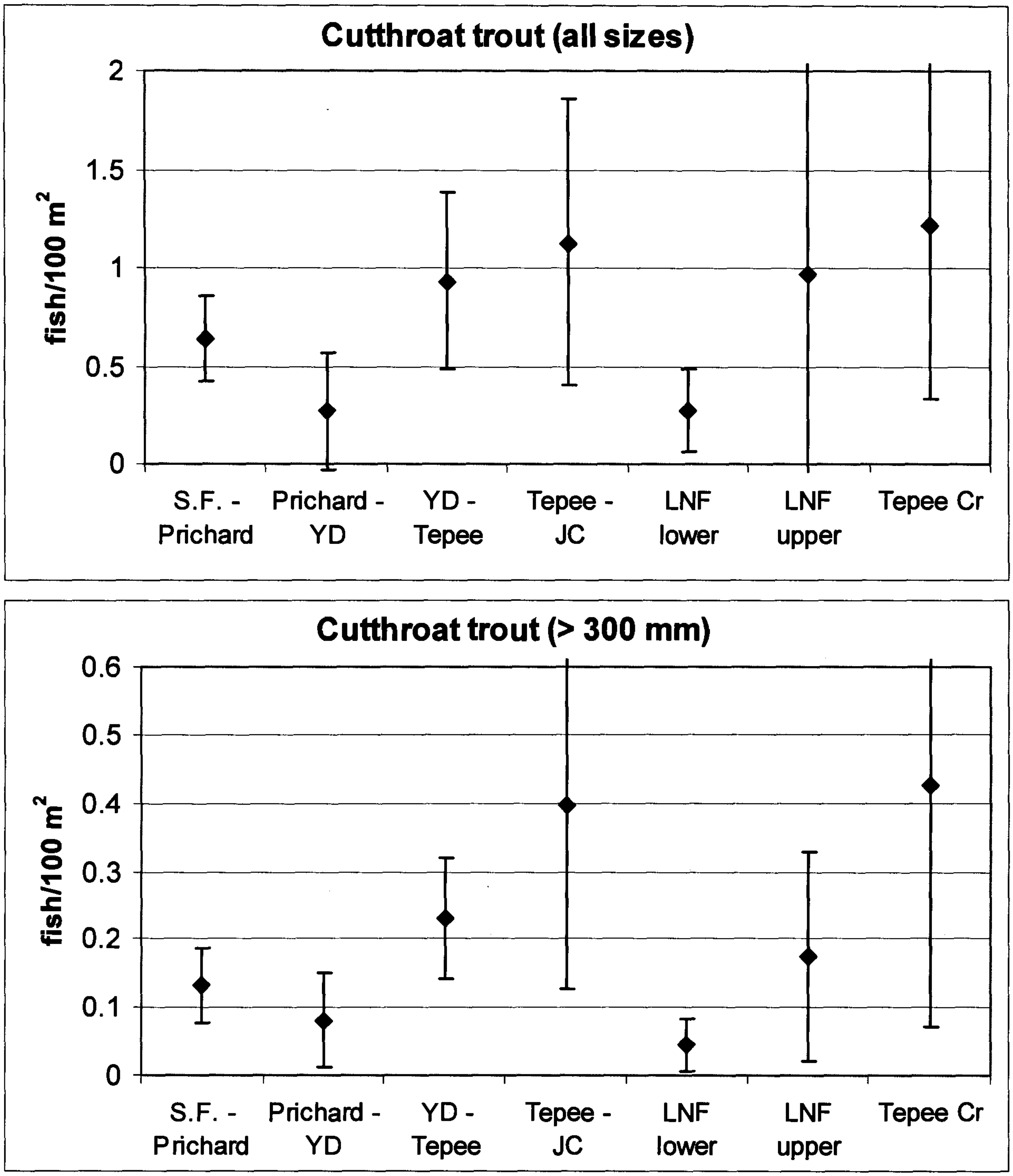


Figure 10. Average densities (fish/100 m^2) of cutthroat trout and 90% confidence intervals (all sizes and only fish ≥300 mm) observed while snorkeling transects in seven different reaches in the North Fork Coeur d'Alene River watershed, Idaho during 2004.

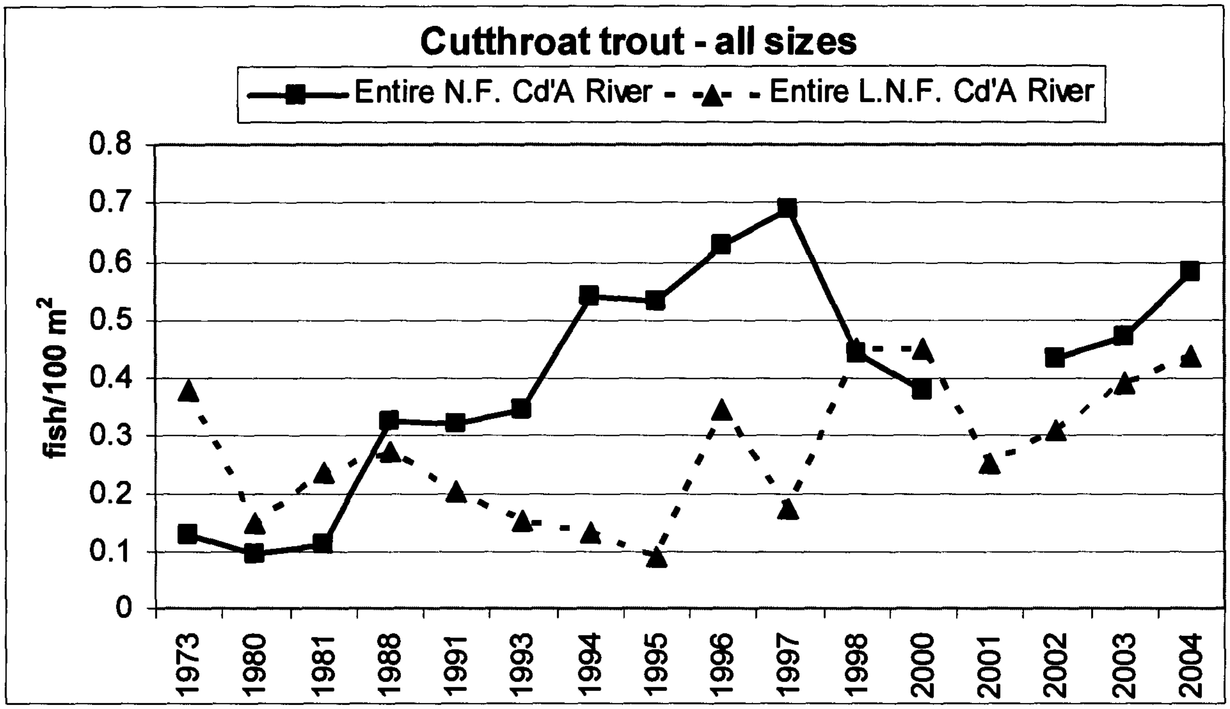
Table 9. Fishers Least-Significant-Difference Test matrices showing pairwise comparison probabilities of cutthroat trout densities (all sizes and ≥300 mm) between seven stream reaches in the North Fork Coeur d'Alene River system, Idaho during 2004. Shaded cells indicate which stream reaches had significantly different ($p \leq 0.10$) cutthroat trout densities.

All Sizes	SF - Prich	Prich-YD	YD-Tepee	Tepee-JC	LNF Lower	LNF Upper	Tepee
SF CdA– Prichard Cr	1						
Prich-Yellow Dog Cr	0.334	1					
YD Cr-Tepee Cr	0.444	0.123	1				
Tepee Cr-Jordan Cr	0.204	0.048	0.642	1			
LNF lower	0.283	0.982	0.093	0.031	1		
LNF upper	0.385	0.103	0.925	0.710	0.075	1	
Tepee Creek	0.135	0.030	0.499	0.832	0.018	0.560	1

≥300 mm	SF – Prich	Prich-YD	YD-Tepee	Tepee-JC	LNF Lower	LNF Upper	Tepee
SF CdA– Prichard Cr	1						
Prich-Yellow Dog Cr	0.614	1					
YD Cr-Tepee Cr	0.344	0.194	1				
Tepee Cr-Jordan Cr	0.015	0.009	0.158	1			
LNF lower	0.337	0.733	0.079	0.002	1		
LNF upper	0.687	0.415	0.621	0.060	0.216	1	
Tepee Creek	0.007	0.005	0.095	0.787	0.001	0.033	1

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 10 and 11). From 1996 to 2004 densities (all size classes) increased slowly, although they were only slightly higher in 2004 (0.44 fish/100 m^2) than was observed in 1973 (0.38 fish/100 m^2). Densities of cutthroat trout ≥300 mm fluctuated near zero until 2002, and in 2004, the highest densities (0.08 fish 100/m^2) were recorded for this size of fish (Figure 11 and Table 11).

During 2004, an average density of 1.09 cutthroat trout/100 m^2 (all size classes combined) and 0.04 cutthroat trout/100 m^2 for fish ≥300 mm was observed at these sites. The density of smaller cutthroat trout was higher in the rehab area than what we observed in most of the other stream reaches we snorkeled, whereas the density of larger fish matches the lowest density of all the stream reaches we snorkeled (Tables 10 and 11). The densities of cutthroat trout observed in 2004 in the rehab area did not differ appreciably from what was observed in 2002 when we first snorkeled this reach.



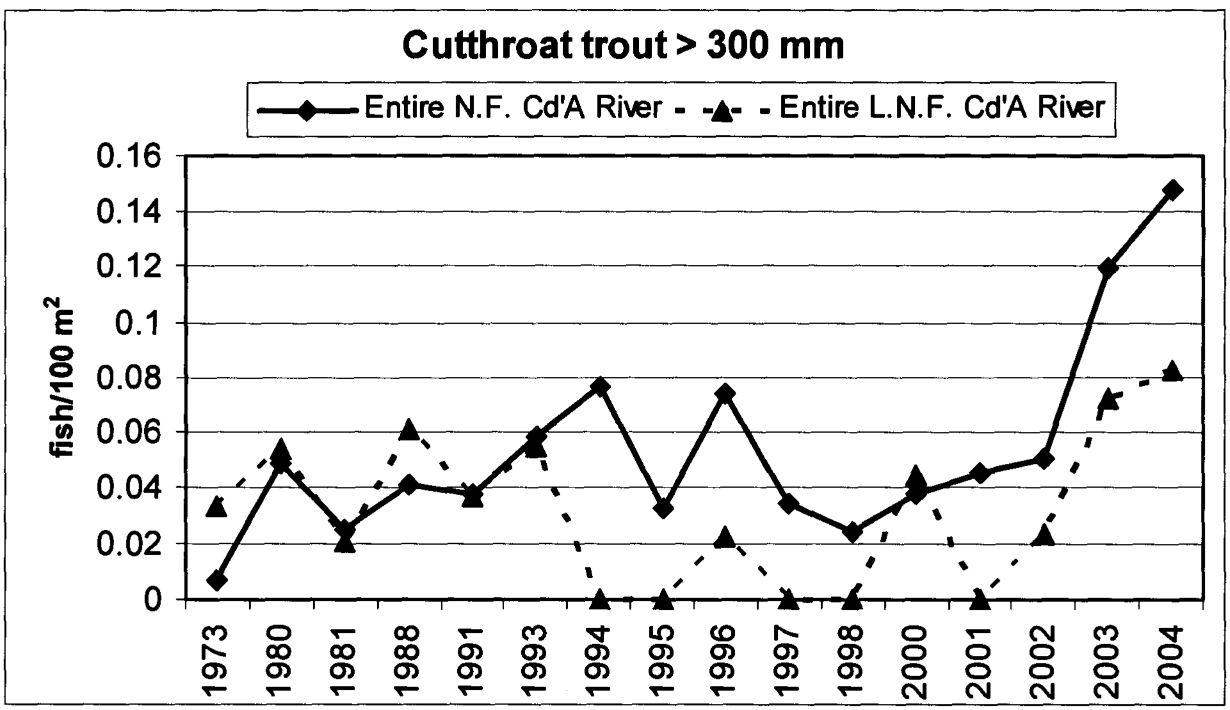


Figure 11. Average densities (fish/100 m^2) of all size classes of cutthroat trout and cutthroat trout ≥300 mm observed while snorkeling transects in the North Fork Coeur d'Alene River (N.F. Cd'A) and Little North Fork Coeur d'Alene River (L.N.F. Cd'A), Idaho, from 1973 to 2004. Arrows signify when significant changes occurred in the cutthroat trout fishing regulations. Refer to Table 5 to see how regulations changed in these particular years.

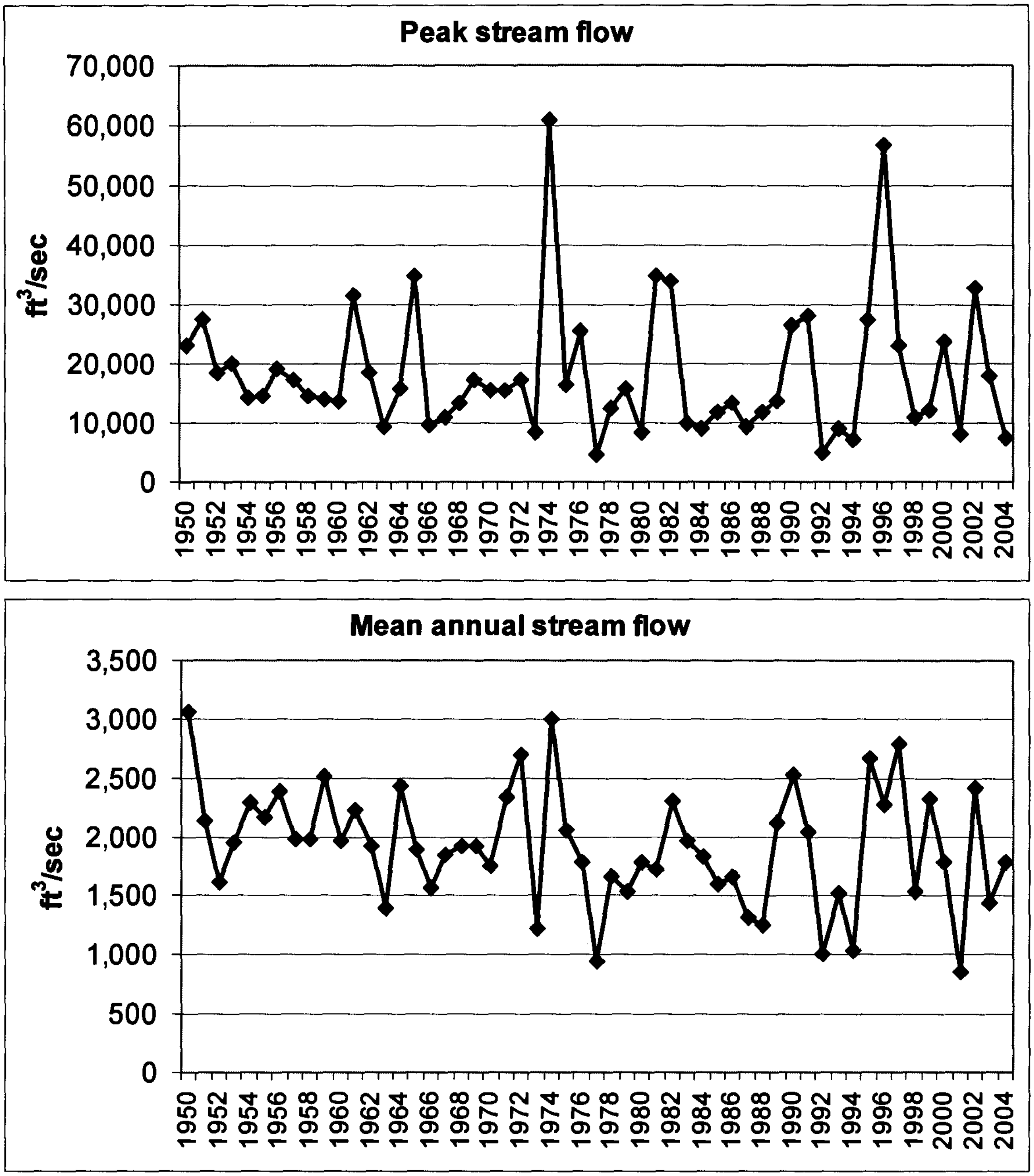


Figure 12. Peak stream flow and mean annual stream flow documented by USGS for the North Fork Coeur d'Alene River, Idaho, at Enaville from 1950 to 2004.

Table 10. Average densities (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 2004.

River Section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004
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	—	0.28	0.41	0.60
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	—	0.49	0.30	0.33
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	—	0.54	0.78	0.88
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	1.27
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	0.22
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	0.97
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	0.85
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	—	0.43	0.47	0.58
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	0.44
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	—	0.44	0.46	0.58
All Limited Harvest Areas	0.10	0.02	0.02	—	0.04	0.15	0.32	0.25	0.31	0.28	0.35	0.36	0.28	—	0.29	0.36	0.45
All Catch-and-Release Areas	0.51	0.41	0.53	—	0.81	0.76	0.25	0.94	0.72	0.90	1.08	0.89	0.65	—	0.89	0.73	0.92
Tepee Creek Rehab Area	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.87	0.00	1.09

Table 11. Average densities (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 2004.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004
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	—	0.01	0.10	0.13
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	—	0.04	0.09	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	—	0.12	0.21	0.25
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	0.43
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	0.04
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	0.18
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	0.34
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	0.12	0.15
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	0.08
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	—	0.06	0.12	0.15
All Limited Harvest Areas	0.00	0.01	0.01	—	0.01	0.02	0.06	0.02	0.01	0.02	0.00	0.01	0.02	—	0.01	0.09	0.10
All Catch-and-Release Areas	0.04	0.17	0.15	—	0.10	0.11	0.07	0.20	0.10	0.12	0.10	0.06	0.11	—	0.18	0.19	0.28
Tepee Creek Rehab Area	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.05	0.00	0.04

Table 12. Average densities (fish/100 m2) 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 2004.

River section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004
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	4.90
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	0.73
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	3.16
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	0.60
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	0.01
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	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	1.04
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	3.06
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	0.01
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	2.52
Tepee Creek Rehab	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00

Mountain whitefish were observed in 22 snorkel transects in the North Fork Coeur d'Alene River system and densities ranged from 0.00 to 20.78 fish/100 m^2 with a mean density of 2.5 fish/100 m^2 (Table 8). The highest densities of mountain whitefish were observed in the lower North Fork Coeur d'Alene River, with few observed upstream of Tepee Creek or in the Little North Fork Coeur d'Alene River (Tables 8 and 12). The average density of mountain whitefish observed in the North Fork Coeur d'Alene River has fluctuated greatly since 1973 (Table 12 and Figure 13). Low densities of mountain whitefish (1980-81, 1993 and 1997; Figure 13) were observed the year following cold winter periods (winters of 1978-79, 1984-85, 1992-1993; Figure 5), or floods (1996 and 1997; Figure 12). Densities of mountain whitefish rebounded within two or three years to densities observed prior to their decline (Figure 13). Mountain whitefish densities have remained at >2.3 fish/100 m^2 in the North Fork Coeur d'Alene River since it recovered from the floods of 1996 and 1997.

Rainbow trout were observed in 17 snorkel transects during 2004. All but one of the rainbow trout were observed in the most downstream reaches where harvest is allowed (Tables 8 and 13). Densities of rainbow trout observed at each transect ranged from 0.00 to 1.58 fish/100 m^2, with an overall average density of 0.20 fish/100 m^2. About 26% of the trout observed in all the transects we snorkeled were rainbow trout, and in the downstream reaches where limited harvest is allowed, 39% of the observed trout were rainbow trout. Of the 302 rainbow trout observed, 62 (21%) were estimated to be ≥300 mm in length. Between 1991 and 2004, the average density of rainbow trout has remained relatively constant in the North Fork Coeur d'Alene River system (Table 13 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.

St. Joe River Versus The North Coeur d'Alene River System

The catch-and-release areas in both the St. Joe River and North Fork Coeur d'Alene River systems have been snorkeled consistently since 1993 allowing direct year to year comparisons in density of cutthroat trout. From 1993 to 1997 cutthroat trout densities (all transects combined) were about two to four times higher (excluding 1994) in the St. Joe River than the North Fork Coeur d'Alene River system (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 North Fork Coeur d'Alene River system was very similar. Since 1998, cutthroat trout densities in the St. Joe River and the North Fork Coeur d'Alene River system have increased and not until 2003 (2004 for cutthroat trout ≥300 mm) did densities of cutthroat trout in the St. Joe River began exceeding those seen in the North Fork Coeur d'Alene River system by more than 40% (Figure 15). Densities of cutthroat trout ≥300 mm in length have reached or were near all-time highs in the catch-and-release areas in both the St. Joe River and North Fork Coeur d'Alene River system in 2004.

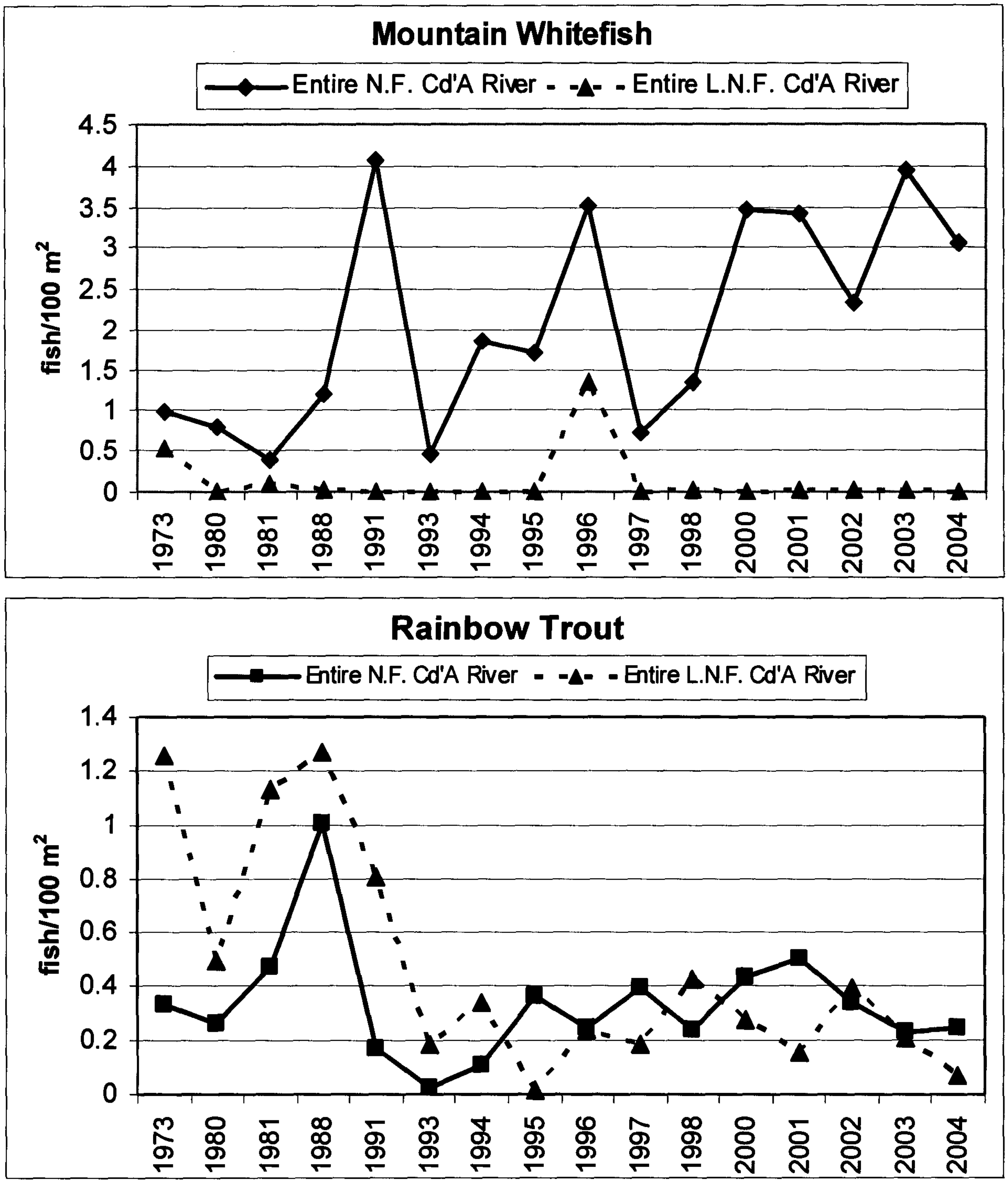


Figure 13. Average densities (fish/100 m^2) of mountain whitefish and rainbow trout observed while snorkeling transects in the North Fork Coeur d'Alene River (N.F. Cd'A) and Little North Fork Coeur d'Alene River (L.N.F. Cd'A), Idaho from 1973 to 2004.

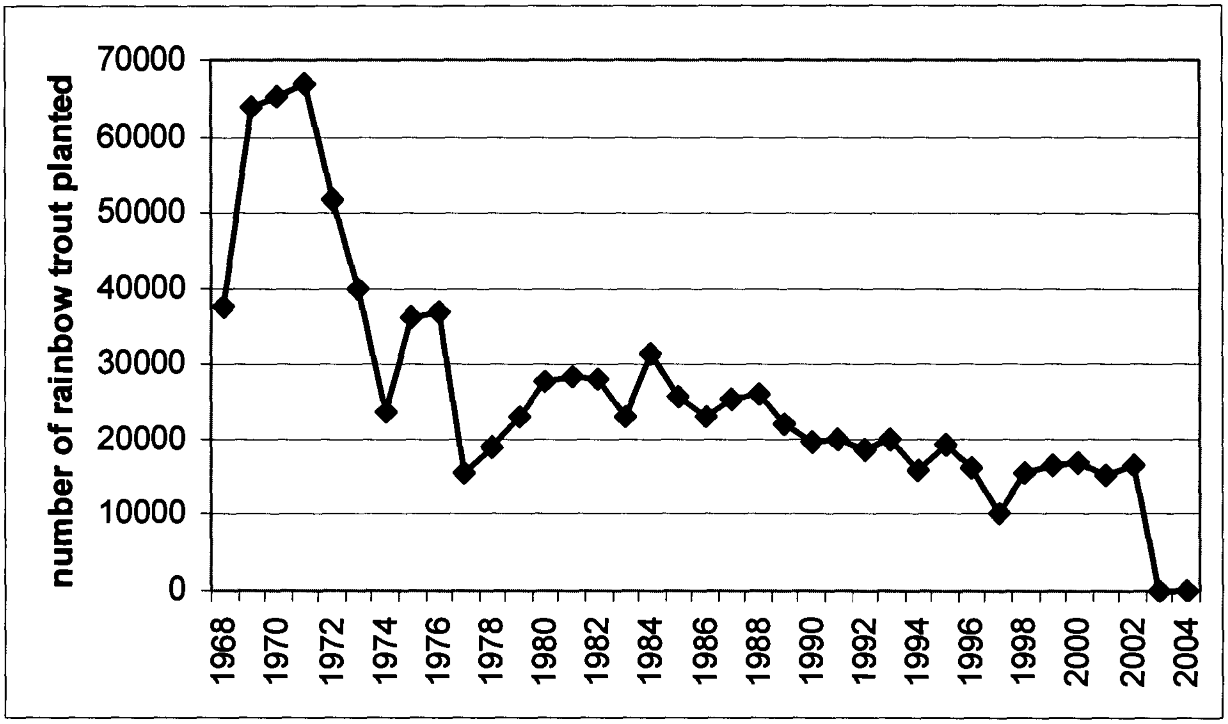


Figure 14. Number of rainbow trout >150 mm in length stocked in the North Fork Coeur d'Alene River system, Idaho between 1968 and 2003.

The average densities of cutthroat trout (all size classes) in the St. Joe River (1.29 fish/100 m^2) were more than two times higher than what was observed in the North Fork Coeur d'Alene River system (0.59 fish/100 m^2) during 2004. The most downstream transects (29-35) in the St. Joe River were not snorkeled in 2005, which consistently have the lowest cutthroat trout densities in this river. Exclusion of these sites will result in a higher overall density estimate in the St. Joe River. These densities were significantly different based on a T-test evaluation (p value <0.001). ANOVA testing indicated that the average density of cutthroat trout (all sizes) were significantly different (p value = 0.001) between three stream reaches in the St. Joe River and seven in the North Fork Coeur d'Alene River. The highest average densities of cutthroat trout (all size classes) were observed in the catch-and-release areas with the highest densities occurring in the two upstream reaches in the St. Joe River (Figure 16). Fisher's LSD testing 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 River system except in Tepee Creek and between Tepee Creek and Jordan Creek (Table 14).

The density of cutthroat trout ≥300 mm observed in the St. Joe River (0.52 fish/100 m^2) transects was about 3.5 times higher that what was observed in the North Fork Coeur d'Alene River system (0.15 fish/ 100 m^2) during 2004. Again, exclusion of the most downstream snorkel sites in the St. Joe River results in a higher overall density estimate. The densities of cutthroat trout ≥300 mm in the St. Joe River and North Fork Coeur d'Alene River system were significantly different based on a T-test evaluation (p value <0.001). ANOVA testing also indicated that the average densities of cutthroat trout >300 mm were significantly different (p value <0.001) between three stream reaches in the St. Joe River and seven in the North Fork Coeur d'Alene

River system. The highest average densities of cutthroat trout ≥300 mm were observed in the catch-and-release areas with the highest densities occurring in the two upstream reaches in the St. Joe River (Figure 16). Fisher's LSD testing showed that there were significantly higher densities of cutthroat trout ≥300 mm in the two upstream reaches of the St. Joe River than any of the stream reaches in the North Fork Coeur d'Alene River system (Table 14).

Table 13. Average densities (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 2004.

River Section	1973	1980	1981	1987	1988	1991	1993	1994	1995	1996	1997	1998	2000	2001	2002	2003	2004
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	0.48
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	0.08
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	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	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	0.09
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	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	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	0.25
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	0.07
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	0.21
Tepee Creek Rehab	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00

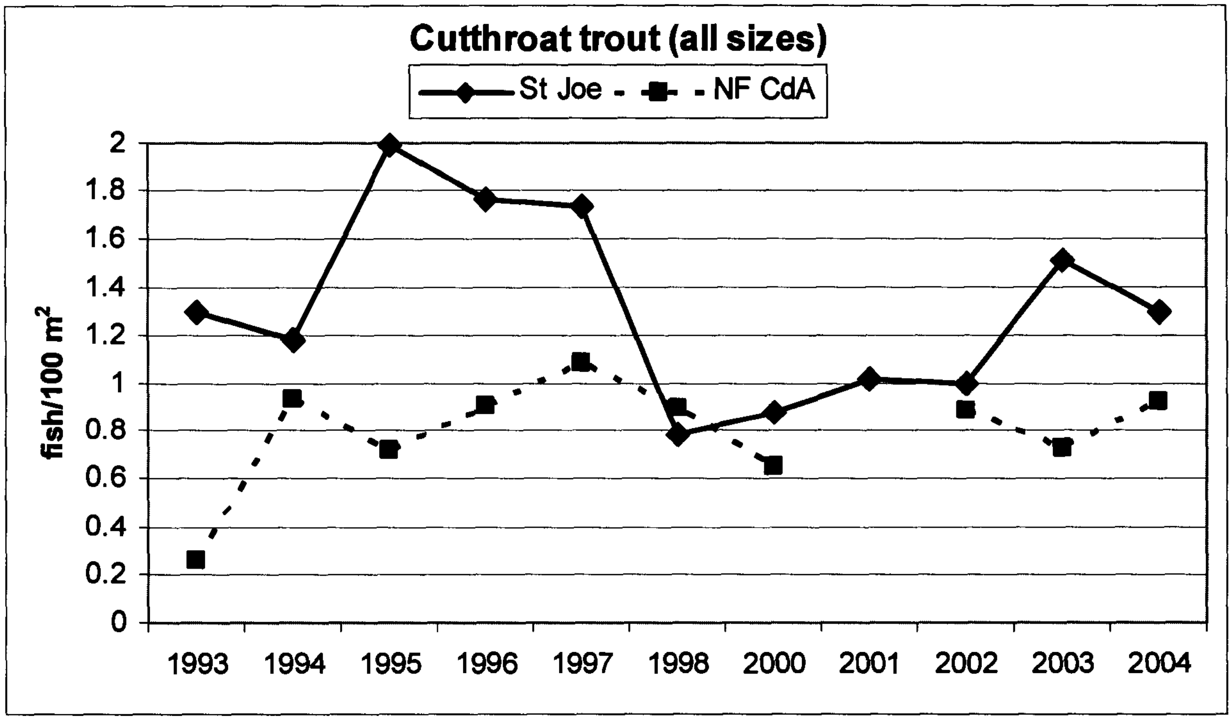
Table 14. Fishers Least-Significant-Difference Test matrix of pairwise comparison probabilities of cutthroat trout densities (all size classes and ≥300 mm) between seven stream reaches in the North Fork Coeur d'Alene River system and four from the St. Joe River basin, Idaho, during 2004. Shaded cells indicate which stream reaches had significantly different ($p \leq 0.10$) cutthroat trout densities.

All Size Classes

	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										
Prichard-YD	0.561	1									
YD-Tepee	0.646	0.35	1								
Tepee-JC	0.443	0.226	0.78	1							
LNF lower	0.518	0.989	0.306	0.184	1						
LNF upper	0.602	0.322	0.955	0.824	0.278	1					
Tepee	0.364	0.182	0.685	0.899	0.143	0.727	1				
Calder	—	—	—	—	—	—	—	—			
NF St. Joe	0.928	0.519	0.713	0.504	0.474	0.668	0.421	—	1		
Prospector	0.001	0.000	0.012	0.028	0.000	0.014	0.041	—	0.001	1	
Red Ives	0.011	0.006	0.063	0.114	0.002	0.071	0.147	—	0.017	0.695	1

≥300 mm

	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										
Prichard-YD	0.811	1									
YD-Tepee	0.652	0.534	1								
Tepee-JC	0.231	0.196	0.498	1							
LNF lower	0.648	0.872	0.396	0.112	1						
LNF upper	0.849	0.698	0.815	0.363	0.554	1					
Tepee	0.182	0.156	0.421	0.898	0.084	0.3	1				
Calder	—	—	—	—	—	—	—	—			
NF St. Joe	0.417	0.343	0.779	0.651	0.212	0.594	0.555	—	1		
Prospector	0.000	0.000	0.001	0.008	0.000	0.000	0.012	—	0.000	1	
Red Ives	0.001	0.001	0.009	0.052	0.000	0.005	0.07	—	0.011	0.643	1



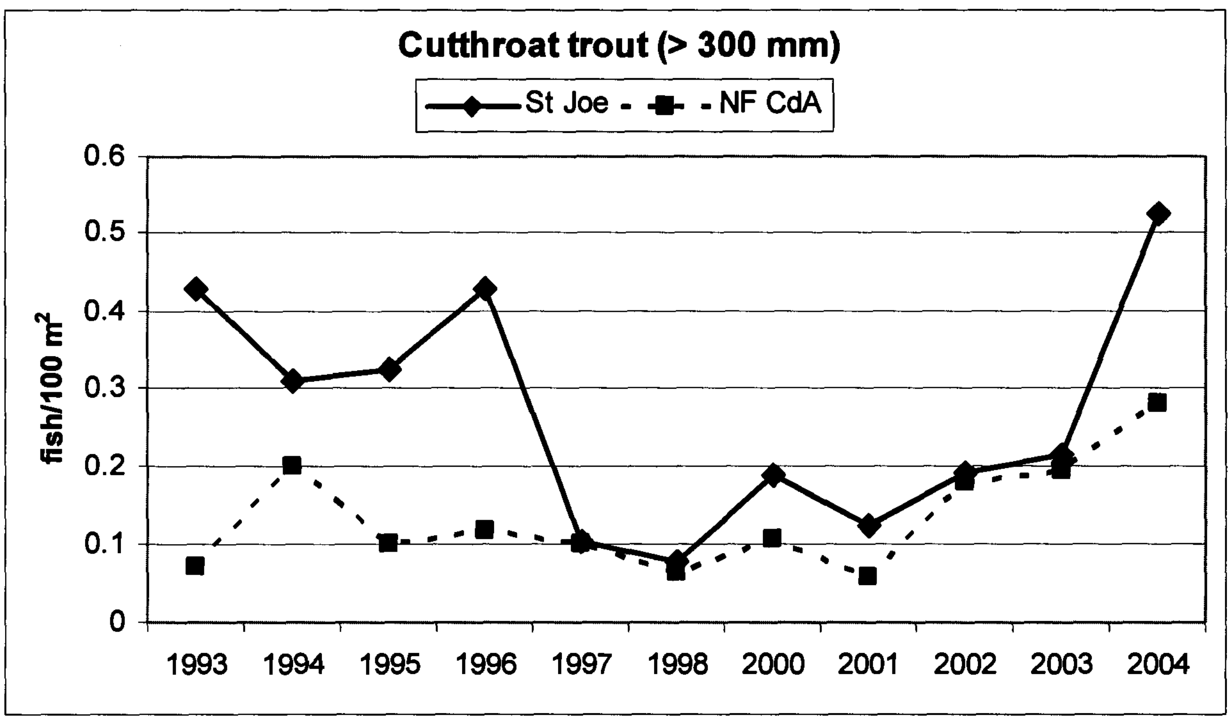
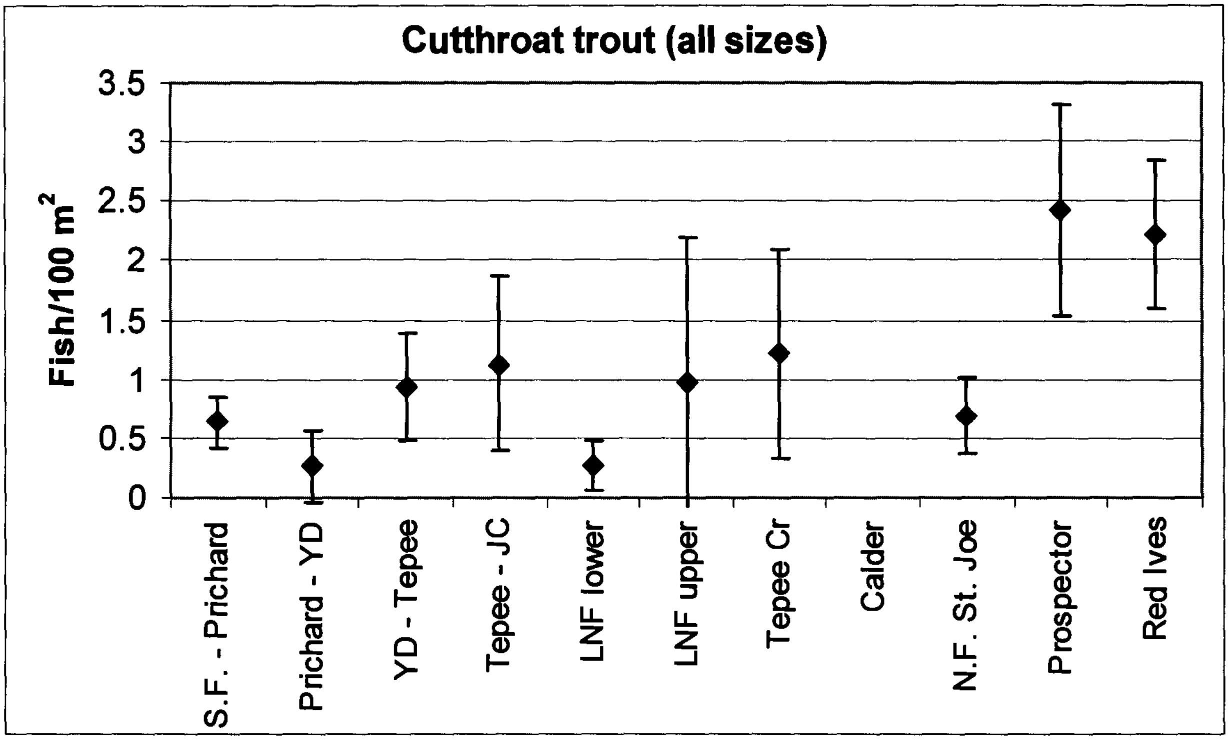


Figure 15. Average densities (fish/100 m^2) of cutthroat trout (all sizes and only fish ≥300 mm) observed while snorkeling transects in the catch-and-release areas of the St. Joe River (North Fork St. Joe River to Ruby Creek, 28 transects) and North Fork Coeur d'Alene River system (Upstream of Yellow Dog Creek in the North Fork and upstream of Laverne Creek in the Little North Fork, 20 transects), Idaho from 1993 to 2004.



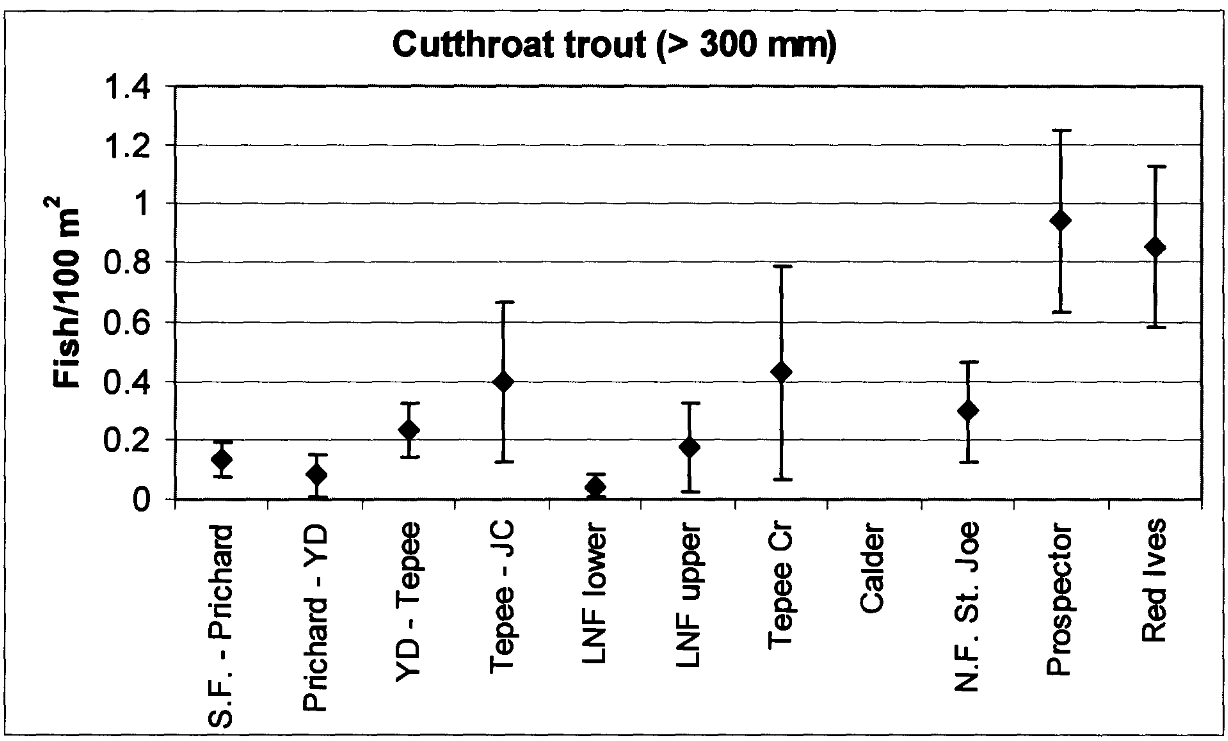


Figure 16. Average densities (fish/100 m2) of cutthroat trout and 90% confidence intervals (all sizes and only fish ≥300 mm) observed while snorkeling seven different reaches in the North Fork Coeur d'Alene River and four different stream reaches in the St. Joe River, Idaho during 2004.

DISCUSSION

Cutthroat Trout

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 (no size restriction) for the entire river to where only 3 fish ≥13 inches 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 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. It appears that survival of cutthroat trout ≥330 mm decreased, during this time period, because harvest was focused on a limited number of large fish. Prior to the 13 inch minimum size limit, the same angler may have kept smaller fish to eat. Apparently, fishing pressure was high enough that once cutthroat trout reached the legal size (330 mm) they were cropped off. Talking to anglers who fished during this period, it was uncommon to catch a legal sized fish (≥13 in), although you would catch numerous smaller fish throughout the day. Because it was difficult to catch a cutthroat trout ≥330 mm, anglers would often be forced to kill fish close to the minimum length if they wanted fish to eat (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 (~6 fold increase from 1969 to 1977) to the point that anglers 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. Changes in fishing regulations also occurred during 1977, reducing the number of fish you could harvest downstream of Prospector Creek from essentially 10 fish to 6 fish, only 2 >16 inches.

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 did not lead to increases in the overall density of cutthroat trout in the St. Joe River; however, it 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 ≥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. This data show how restrictive fishing regulations must be to protect larger cutthroat trout in heavily fished systems. Appreciable numbers of cutthroat trout ≥300 mm were not observed in the St. Joe River until the regulations were set to catch-and-release in the upstream reaches and a 1 fish >14 in daily harvest in the downstream reaches. It is also important to realize that most cutthroat trout in the St. Joe River migrate upstream into the catch-and-release areas in the summer to avoid high water temperatures (Hunt and Bjornn 1992; Fredericks et al. 2002a). In doing so, most fish are protected by catch-and-release regulations throughout the summer. Cutthroat trout are considered an easy fish to catch (Trotter 1987) which may be a result of evolving in unproductive waters where aggressive feeding must occur to obtain adequate food supplies (Rieman and Apperson 1989). In addition, Dwyer (1990) found that westslope cutthroat trout were the easiest to catch of three different subspecies of cutthroat trout. Lewynsky (1986) found that cutthroat trout are significantly more vulnerable to angling than rainbow trout. When exposed to similar fishing regulations, higher catch rates of cutthroat trout could lead to a dominance of rainbow trout where they occupy the same waters (Lewynsky 1986). The aggressive feeding habits that cutthroat trout display may indicate why such restrictive fishing regulations must occur to sustain desirable numbers of larger cutthroat trout in heavily fishing waters.

Between 1977 and 1997, two noticeable declines (40-50% decrease) in the density in cutthroat trout were observed (1979 and 1993). Both of these declines occurred the year after unusually cold winters (winters of 1978-1979 and 1992-1993). Others have also found winter to be a major period of fish mortality based largely on the severity of the winter and subsequent losses of stored energy (Reimers 1963; Hunt 1969; Whitworth and Strange 1983). High fish mortality during periods of extreme cold have been attributed to frazil ice (Tack 1938), loss of or destruction of habitat through anchor ice formation and hanging ice dams (Maciolek and Needham 1952; Brown 1999; Brown et al. 2000), and depletion of energy reserves (Cunjack and Power 1987; Shuter and Post 1990). Long extended cold periods appear to have the most impact on smaller fish (Shuter and Post 1990; Meyer and Griffith 1997). Shutter and Post (1990) claim that smaller fish tend to be less tolerant of starvation conditions because they exhaust their energy stores sooner. However, following the winter of 1992-93 declines in density of cutthroat trout ≥300 mm in the St. Joe River were similar to what was observed for fish <300 mm. Often during intense cold periods ice dams form potentially backing up water for miles. When these ice dams break, they can scour the river bottom and damage riparian vegetation (Beltaos 1995). Presumably, these types of events would have impacts on all sizes of fish. We are not aware if this type of event happened during the winter of 1992-93.

A dramatic decline (55% decline) in cutthroat trout density was also observed in 1997 and 1998 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, fishing regulations or unusually cold winter temperatures. 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 more 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 was observed in 2004 in the St. Joe River was near what was observed before the floods (1.29 fish/100 m^2). This density estimate for all size classes of cutthroat trout in 2004 was down from 2003. However, we believe this decline was more the result of decreased visibility, which was present during 2004 and does not represent an actual decline in cutthroat trout density. Warm water temperatures coupled with low flows likely resulted in the increased algae growth that occurred in the river making smaller fish more difficult to see while snorkeling. Densities of cutthroat trout ≥300 mm have increased steadily since the decline after the floods to the point where we observed the second highest densities ever recorded in 2004. We attribute the steady increase in cutthroat trout density since 1998 to a series of mild winters and an absence of extreme flow events.

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 8 and 16 inches have to be released. Previously, fish over 14 inches could be harvested. We believe these more restrictive regulations on cutthroat trout also contributed to rapid improvement in fish densities since the floods.

The highest densities of cutthroat trout (all size classes and fish ≥300 mm) in 2004 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 St. Joe River 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 occurred between these 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). This information is substantiated by our snorkel data as during the warmest years the highest densities of cutthroat trout were observed the furthest upstream.

The change in fishing regulations do appear to be making a difference in the fishery as the highest densities of cutthroat trout ≥300 mm ever observed were between the North Fork St. Joe River and Prospector Creek in 2004. This reach of stream has been managed as catch-and-release since 2000. For the 12 years prior to this (1988-1999), 1 fish >14 inches could be harvested a day. This data once again show just how restrictive fishing regulations must be to result in improvements in numbers of larger cutthroat trout.

During snorkel surveys, it appeared that more large cutthroat trout were seen where access to the river was difficult. These areas 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 Press b). Many of the pools we snorkeled near the road appear to be fished almost every day. Schill et al. (1986) found in the Yellowstone River (catch-and-release regulations) that cutthroat trout were captured on average about 10 times a year resulting in an annual exploitation of about 3%.

North Fork Coeur d'Alene River System

Snorkel surveys in the North Fork Coeur d'Alene River system first occurred in 1973. From 1973 to 1997, an increasing trend in cutthroat trout density (all sizes combined) was apparent in the in North Fork Coeur d'Alene River system. 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 a). 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, fishing regulations or unusually cold winters. 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). Densities of cutthroat trout have steadily increased since 1998 but in 2004 were still below what was observed before the floods. We did record a big spike in cutthroat trout density in 2001 that appeared out of place. Closer evaluation of this data revealed that inexperienced snorkelers collected this data and that they skipped several sites on the North Fork Coeur d'Alene River where low densities are typically observed and did not snorkel the entire length of all transects. For this reason, we believe this data is misleading and is not reported. This shows the importance of using trained snorkelers and making every effort to duplicate techniques and areas snorkeled as has occurred in the past.

Declines in densities of cutthroat trout were not observed throughout the North Fork Coeur d'Alene River system following unusually cold winters as was observed in the St. Joe River. However, when we examine cutthroat trout densities in the upstream catch-and-release areas, the two lowest densities recorded (1980 and 1993) occurred following unusually cold winters. These same drops were not observed in both years in the limited harvest areas. This may suggest a couple things. First, water temperature in the higher elevation transects gets colder during winter, and consequently, cutthroat trout using these areas may experience higher mortality following unusually cold winters. Others have reported winter to be a major period of fish mortality based largely on the severity of the winter and subsequent losses of stored energy (Reimers 1963; Hunt 1969; Whitworth and Strange 1983). The other thing that may be going on is better overwinter habitat occurs in the downstream reaches. Work by DuPont et al. (In Press b) has found that there are more deep, slow pools accompanied by wide floodplains in the downstream transects than the upstream transects, habitat characterized by many as good overwinter habitat (Thurow 1976; Lewynsky 1986; Bjornn and Reiser 1991; Hunt and Bjornn 1992; Schmetterling 2001).

Snorkel surveys in the North Fork Coeur D'Alene River system 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. Based on telemetry work on cutthroat trout ≥300 mm a combination of factors appeared to be playing a role in their suppression including, noncompliance with fishing regulations, degraded or loss of coldwater refugia, degraded or loss of overwinter habitat, and degraded summer rearing habitat (DuPont et al. In Press b). In 2003 and 2004 we observed increases in the density of cutthroat trout ≥300 mm in both the North Fork Coeur d'Alene and Little North Fork Coeur d'Alene rivers to the point that they were the highest ever recorded 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 (1998-2004) and a lack of flood events may have increased survival of these larger adult fish. In fact, the warmest seven consecutive winters on record in Kellogg was from 1998-2004. Future surveys will indicate whether this increase in the number of large cutthroat trout is a temporary or long-term trend and how average or below average winter temperatures will effect cutthroat trout densities.

The highest densities of cutthroat trout in the North Fork Coeur d'Alene River system 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. Similar percentages of pool and run habitat occurred in the catch-and-release areas as the limited harvest areas, although the depths of pools and runs tended to be deeper than in the limited harvest areas (DuPont et al. In Press b). 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, DuPont et al. (In Pres b) found in the North Fork Coeur d'Alene River system that many cutthroat migrate downstream of catch-and-release areas after spawning and do not migrate upstream during warm summer months. In addition, relatively high densities of cutthroat trout (521 to 444 fish/km) were found to occur in the free flowing reach of the Coeur d'Alene River (downstream of the South Fork) with about half of these fish >250 mm (Fredericks et al. 2002 b, 2003). These findings suggest that habitat or upstream migrations towards cooler temperatures cannot explain for the higher densities of fish in the catch-and-release areas.

It is believed that angling pressure has increased in the North Fork Coeur d'Alene River system, 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. However, work conducted by DuPont et al. (In Press b) suggests that high fishing pressure coupled with illegal harvest is suppressing the cutthroat trout fishery in many of the limited harvest areas. On the North Fork Coeur d'Alene River downstream of Prichard Creek annual exploitation was estimated at 69% for cutthroat trout ≥300 mm during 2003 – an area where a harvest fishery was traditionally provided by stocking of rainbow trout. Snorkel surveys in 2004 show that densities of smaller cutthroat trout (<150 mm) were actually higher in the limited harvest (LH) area than the catch-and-release (C&R) areas, but this difference reverses and becomes greater the larger the cutthroat trout we evaluated. For example densities for cutthroat trout <225 mm were 1.5 times higher in the C&R area than the LH area, 1.8 times higher for cutthroat trout <300 mm, 2.7 times higher for fish >300 mm, 2.8 times higher for fish >375 mm, and 7.9 times higher for fish >450 mm. It appears that although both the C&R and LH areas start with similar densities of small cutthroat trout, higher mortality rates in the LH area are resulting in significantly lower densities once they reach desirable sizes for anglers to catch.

Exploitation may not be the only reason lower densities of cutthroat trout occur in the LH area than the C&R area. Rainbow trout could play a role as they represent about 39% of the trout in the LH area and <1% in the C&R area. Rainbow trout have been found to displace cutthroat trout in many areas through competition and hybridization (Behnke 1992). Cutthroat trout are known to be hybridizing with rainbow trout in the Coeur d'Alene River system. However, it appears that despite a long history of rainbow trout stocking, there are likely some reproductive isolating mechanisms helping to limit hybridization and introgression between these two species (either pre- or post-isolating mechanisms) in the Coeur d'Alene River basin (DuPont et al. In Press c). Starting in 2003, no rainbow trout were stocked in any free flowing waters in the Panhandle Region of Idaho. Not surprisingly, this cessation of stocking corresponded with declines in the densities of rainbow trout observed in 2003 and 2004. Cutthroat trout densities on the other hand increased in the LH area in 2003 and 2004 and for the first time since 1993 were significantly higher than rainbow trout densities (Figure 17). We cannot say for certain that this increase in cutthroat trout densities is due to not stocking rainbow trout because we also observed an increase in cutthroat trout densities in C&R areas suggesting that other factors may be playing a role. Angler harvest can give an advantage to rainbow trout over cutthroat trout. Cutthroat trout are considered an easy fish to catch (Trotter 1987); and Lewynsky (1986) found that cutthroat trout are significantly more vulnerable to angling than rainbow trout. When exposed to similar fishing regulations, higher catch rates of cutthroat trout could lead to a dominance of rainbow trout where they occupy the same waters (Lewynsky 1986). Fishing regulations since 2000 allowed a daily harvest of six rainbow trout of any size whereas only two cutthroat trout (none between 8 and 16 inches) could be harvested in the LH area. If anglers comply with fishing the regulations, exploitation should not be a reason that leads to a dominance of rainbow trout over cutthroat trout in the LH area.

Telemetry worked conducted by DuPont et al. (In Press b) in the Coeur d'Alene River watershed found that larger cutthroat trout are grouping in areas where colder water occurs during warm summer months. One of these areas where fish concentrated during the heat of the summer was located at snorkel Transect NF01-slough. This particular backwater had water temperatures around 5°C cooler than the main river channel during 2004. The highest density of cutthroat trout in all the LH areas was observed at this particular site (1.25 fish/100 m^2). The warmer the water temperature, the more the cutthroat trout appear to congregate in this cold-water sanctuary. The summer of 2003 was an unusually hot year, and the highest density of all the transects was observed in this slough.

St. Joe River versus The North Fork Coeur d'Alene River System

From 1993 to 1997, cutthroat trout densities were usually two to three times higher in the C&R area of the St. Joe River than what was observed in the C&R area of the North Fork Coeur d'Alene River system. However, after the flood and higher water events in 1996 and 1997, declines in cutthroat trout densities were observed. Declines in density were much greater in the St. Joe River than in the North Fork Coeur d'Alene River system. 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 sidewalls with little to no floodplain. During flood events on the St. Joe River, there are few areas for the river to spread out 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 high flows, mortality could be significant.

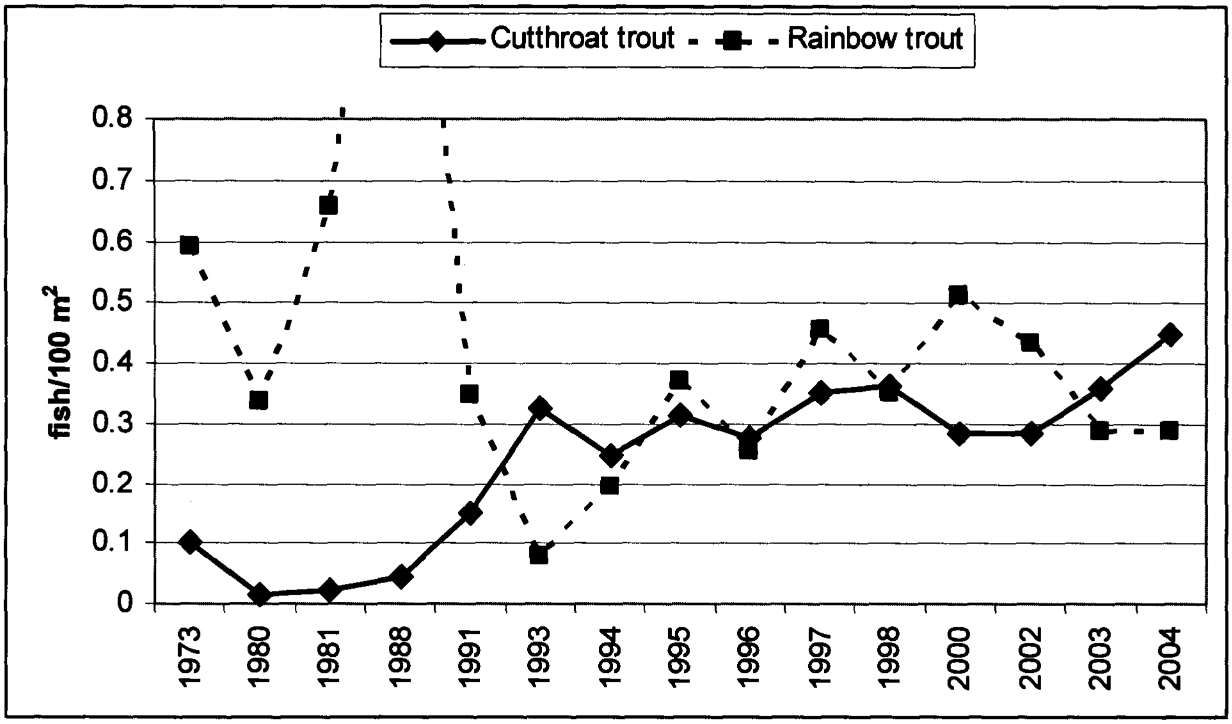


Figure 17. Average densities (fish/100 m^2) of all sizes of cutthroat trout and rainbow trout observed when snorkeling transects in the limited harvest areas of the North Fork Coeur d'Alene River system (downstream of Yellow Dog Creek in the North Fork and downstream of Laverne Creek in the Little North Fork), Idaho from 1973 to 2004.

The 1996 flood occurred during the winter. The North Fork Coeur d'Alene River system has many areas with wide floodplains where floodwater can spread out, reducing its energy, and cutthroat trout in the North Fork Coeur d'Alene River system have been found to move to areas with wider floodplains during winter (DuPont et al. In Press b). Floodplains can provide refugia where fish can avoid fast, turbulent water that will quickly rob them of their winter energy reserves (Brown et al. 2001; DuPont et al. In Press b).

In 1998, the densities of cutthroat trout observed were actually higher in the C&R area of the North Fork Coeur d'Alene River system than the C&R area of the St. Joe River (0.89 fish/100 m^2 vs. 0.79 fish/100 m^2, respectively). Since 1998 the densities of cutthroat trout increased at a faster rate in the St. Joe River than in the North Fork Coeur d'Alene River system. The faster recovery of cutthroat trout in the St. Joe River may suggest that factors such as reduced habitat quality are suppressing the cutthroat trout numbers in the North Fork Coeur d'Alene River system. Findings by DuPont et al. (In Press b) indicate that many of the pools and runs in the C&R area of the North Fork Coeur d'Alene River system are shallower than cutthroat trout prefer. Locals claim that pools have become shallower or have filled in with sediment in the C&R areas of the North Fork Coeur d'Alene River system when logging and road building increased (1960-1980). Fishing mortality could also be an issue, although it would have to be illegal harvest as these comparisons are between the C&R areas. Schill and Kline (1995) reported that illegal harvest of cutthroat trout in 1993 was low (<3% of anglers) in the C&R areas of both the St. Joe River and North Fork Coeur d'Alene River, although slightly higher in the North Fork Coeur d'Alene River. DuPont et al. (In Press b) also reported that illegal harvest in C&R areas of the North Fork Coeur d'Alene River system was low. Densities of cutthroat trout ≥300 mm in length have reached or were near all-time highs in the catch-and-release areas in both the St. Joe River and North Fork Coeur d'Alene River system in 2004, although densities were about twice as high in the St. Joe River.

Mountain Whitefish—Our snorkel surveys showed that mountain whitefish densities had remained fairly steady in the St. Joe River from 1969 until 1997, then 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 about what was observed before the floods. 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 contributed to the recovery of this fishery.

Based on our snorkel surveys, the density of mountain whitefish in the North Fork Coeur d'Alene River system has gone through a series of ups and downs since 1973. Many of the down years occur immediately after unusually cold winters (1979-1980; 1992-1993) or flood events (1996). Despite drops in density by 75% to 85%, the whitefish population typically bounced back in about three years. Since 2000, the average whitefish density has remained relatively high in the North Coeur d'Alene River system. There has not been any unusually cold winters or flood events since 1997.

Snorkel observations indicated that mountain whitefish densities in the North Fork Coeur d'Alene River system were more than double what was observed in the St. Joe River during 2004. Most mountain whitefish in the North Fork of the Coeur d'Alene River system were observed in the large, deep pools and runs in the more downstream transects. The lower St. Joe River (downstream of the North Fork) was not snorkeled in 2004, which has habitat more similar to where higher densities of mountain whitefish were observed in the North Fork Coeur d'Alene River system. Interestingly, in 2003 when the lower St. Joe River was snorkeled, this is where the lowest density of mountain whitefish was observed.

Rainbow Trout—Rainbow trout were observed in the most downstream reaches of the St. Joe River (Transect 2), North Fork Coeur d'Alene River (Transects NF1-9) and Little North Fork Coeur d'Alene River (Transects 1-6). Rainbow trout were not stocked into any rivers or streams in the Panhandle Region after 2002. Consequently, these fish were either holdovers from earlier stockings or are offspring from natural reproduction.

In the St. Joe River, only two rainbow trout were observed and indicate very little natural reproduction and overwinter survival is occurring. In the LH area of the North Fork Coeur d'Alene River system, about 40% of the trout are rainbow trout. Based on these snorkel surveys and other work conducted in the North Fork Coeur d'Alene River system, it appears that a natural reproducing rainbow trout population exists in the North Fork Coeur d'Alene River downstream of Shoshone Creek and downstream of Laverne Creek in the Little North Fork Coeur d'Alene River. Others have also found introduced rainbow trout to be more abundant in the lower reaches of streams where cutthroat trout occur (Paul and Post 2001; Sloat et al. 2005). Some have suggested that the ability of rainbow trout to survive prolonged exposure to temperatures >20°C and to grow over a wider range of temperatures helps explain why rainbow trout are often located in the lower reaches of streams and cutthroat trout in the upper reaches (Bear et al. 2005). Where the warmest water temperatures occur in the North Fork Coeur d'Alene River system (between transects 8-13) is not where the highest densities of rainbow trout occurred.

Although water temperature certainly influences the distribution of rainbow trout, other factors obviously play a role. Differences in geomorphology within the North Fork Coeur d'Alene River system may also be influencing the distribution of rainbow trout. The further upstream you go in North Fork Coeur d'Alene River system the more canyon like, the steeper the grade and the fewer floodplains become. Cutthroat trout that spend the summer in the upstream reaches of the North Fork migrate to areas (often >15 km downstream) where the river is slower, deeper, and has a wider floodplain to overwinter (DuPont et al. In Press b). Cutthroat trout evolved over thousands of years to develop these migrations to maximize their survival. Introduced rainbow trout don't have this adaptation and may explain why they don't exist in the upstream reaches. Moller and VanKirk (2003) found that rainbow trout in the South Fork Snake River appear to have a competitive advantage over Yellowstone cutthroat trout *Oncorhynchus clarkii bouvierii* where flows were less flashy (lower peak flows and higher low flows). They speculate these types of flows provide better rearing conditions for first year rainbow trout that occur in the main river. The wider floodplains that occur in the lower reaches of the North Fork Coeur d'Alene River system likely moderate flows by dispersing flows across the floodplain during high flow periods and releasing groundwater during low periods. The area with the widest and most intact floodplain occurs downstream of the South Fork Coeur d'Alene River in the Coeur d'Alene River. Rainbow trout represent about 10% of the trout species in this reach of river (Fredericks et al. 2003), whereas they represent over 30% of the trout species upstream of the South Fork Coeur d'Alene River. Water temperatures and fishing mortality are lower downstream of the South Fork Coeur d'Alene River than upstream (DuPont et al. In Press c). Likely a combination of water temperature, geomorphology and fishing pressure all play a role in the distribution and abundance of rainbow trout in the North Fork Coeur d'Alene River system.

The apparent difference in survival of rainbow trout in the St. Joe River versus the North Fork Coeur d'Alene River system probably has to do with difference in the two rivers' geomorphology. As mentioned earlier, the St. Joe River is more canyon like, has a steeper grade and fewer floodplain areas than occurs in the North Fork Coeur d'Alene River system. Consequently, for rainbow trout to survive throughout a year in the St. Joe River they would have to go through a more complex and longer migration than they would in the North Fork Coeur d'Alene River. Many cutthroat trout that spend the summer upstream of Avery in the St. Joe River migrate over 50 km downstream to overwinter near Calder where the river is slower, deeper and has a wider floodplain (Hunt and Bjornn 1992; Fredericks et al. 2002b). 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 helps explain whey they don't exist upstream of Avery. In the North Fork Coeur d'Alene River system, especially in the limited harvest areas, cutthroat trout migrate <5 km between summer and winter habitat (DuPont et al. In Press c). These types of migrations would be more realistic for an introduced rainbow trout.

The stream reaches in the North Fork Coeur d'Alene River system with the lowest cutthroat trout densities (limited harvest areas) had the highest densities of rainbow trout during 2005. If we combine the densities of these two species, the average trout density in the limited harvest reaches was not much below what we saw in the catch-and-release areas (0.86 fish/100m^2 vs. 1.23 fish/100 m^2). This may suggest that 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 have decreased in the North Fork Coeur d'Alene River, although their decline has been minimal since 2003. The initial decline was likely a response from when rainbow trout were no longer being stocked into all flowing waters within the Panhandle starting in 2003. The current fishing regulations allow six rainbow trout of any size to be harvested from the Coeur d'Alene River. These regulations do not appear to be causing the abundance of rainbow trout to decline, although they may be keeping the rainbow trout population from increasing. These regulations may be causing the size of the rainbow trout to decline as anglers regularly comment on how the size of the rainbow trout they catch has become much smaller over the years. 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.

Bull Trout—Four bull trout were observed in the St. Joe River in 2004. This is the most bull trout that were observed while snorkeling since 1977. Although it's difficult to speculate on trends in bull trout abundance based on such low numbers, it does coincide with a record high number of bull trout redds counted in the St. Joe watershed during 2004 (redd counts were initiated in 1992).

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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APPENDICES

Appendix A. Global Position System coordinates for snorkel sites in the North Fork Coeur d'Alene River and South Fork Coeur d'Alene River, Idaho. Coordinates are in Latitude and Longitude (decimal degrees) and the map datum is WGS 84.

Transect	Latitude	Longitude	Elevation
St Joe River			
SJ01	47.2471962890	-115.763607910	2537 ft
SJ02	47.2285146990	-115.711014570	2613 ft
SJ03	47.2297264970	-115.697611613	2677 ft
SJ04	47.2295324081	-115.696459880	2680 ft
SJ05	47.2367872990	-115.670490920	2665 ft
SJ06	47.2369639890	-115.647466750	2698 ft
SJ07	47.2368401890	-115.635680290	2717 ft
SJ08	47.2247552490	-115.607116440	2797 ft
SJ09	47.2305249998	-115.593488254	2825 ft
SJ10	47.2282905424	-115.597551153	2830 ft
SJ11	47.2270018855	-115.595461299	2835 ft
SJ12	47.2278406290	-115.585177480	2845 ft
SJ13	47.2028386690	-115.543425540	2948 ft
SJ14	47.2016127290	-115.517972720	3027 ft
SJ15	47.1857365690	-115.482284750	3101 ft
SJ16	47.1758053490	-115.458282250	3157 ft
SJ17	47.1717387090	-115.446457310	3220 ft
SJ18	47.1517486190	-115.408463070	3375 ft
SJ19	47.1330471690	-115.401284640	3408 ft
SJ20	47.0932772990	-115.381040160	3697 ft
SJ21	47.0783715990	-115.355904430	3725 ft
SJ22	47.0593610190	-115.352888620	3755 ft
SJ23	47.0306169815	-115.351806818	3819 ft
SJ24	47.0311197090	-115.353306710	3822 ft
SJ25	47.0314086290	-115.355990180	3829 ft
SJ26	46.9910656090	-115.371039040	3918 ft
SJ27	46.9889651090	-115.368668390	3925 ft
SJ28	46.9828531090	-115.367860790	3940 ft
SJ29	47.2702202890	-116.197872050	2125 ft
SJ30	47.2664561390	-116.094239880	2254 ft
SJ31	47.2541057390	-116.051780000	2274 ft
SJ32	47.2503322890	-116.012886210	2175 ft
SJ33	47.2477685990	-115.958366630	2248 ft
SJ34	47.2562681890	-115.872335690	2363 ft
SJ35	47.2505829090	-115.798306220	2499 ft
North Fork Coeur d'Alene River			
NF01	47.5834313096	-116.263508093	2160
NF01(slough)	47.5839027664	-116.264033691	2160
NF02	47.5980975390	-116.239150740	2175
NF03	47.6230913690	-116.197393280	2198
NF04	47.6602863990	-116.164915750	2230

Appendix A. Continued.

Transect	Latitude	Longitude	Elevation
North Fork Coeur d'Alene River, continued.			
NF05	47.6555075390	-116.122508930	2250
NF06	47.6683620290	-116.051353870	2290
NF07	47.6517464090	-116.030235580	2322
NF08	47.6476927346	-115.974008062	2375
NF09	47.6731529590	-115.947287090	2415
NF10	47.6994508330	-115.941997337	2455
NF11	47.6981889689	-115.948838883	2462
NF12	47.7210683064	-115.988983228	2495
NF13	47.7460557290	-116.020762020	2540
NF14	47.7902211490	-116.067433880	2638
NF15	47.7950221390	-116.066453620	2644
NF16	47.8086489290	-116.077928940	2665
NF17	47.8221527690	-116.096722760	2688
NF18	47.8698222390	-116.114066010	2765
NF19	47.8874945590	-116.126008880	2803
NF20	47.8911150318	-116.131135122	2818
NF21	47.8959927190	-116.134283240	2845
NF22	47.9084303790	-116.122064190	2893
NF23	47.9104295490	-116.122662990	2900
LNF01	47.6102457690	-116.240224130	2175
LNF02	47.6223549569	-116.270057576	2202
LNF03	47.6346269590	-116.290432570	2222
LNF04	47.6322947790	-116.312127450	2243
LNF05	47.6230192806	-116.349840873	2283
LNF06	47.6542351663	-116.364287453	2352
LNF07	47.6784352613	-116.366764331	2420
LNF08	47.6919056990	-116.378035280	2470
LNF09	47.7170544290	-116.385589630	2520
LNF10	47.7403984490	-116.423973130	2622
LNF11	47.7423587290	-116.424672940	2628
LNF12	47.7402961383	-116.466309514	2717
LNF13	47.7422381090	-116.477646150	2748
TP01	47.8844407890	-116.138037080	2805
TP02	47.8860222790	-116.167622010	2836
TP03	47.8769626190	-116.194171360	2869
TP04	47.8810230590	-116.192663280	2872
TP05	47.8775494390	-116.208969770	2885
TP R1	47.8357018590	-116.254984330	3010
TP R2	47.8255609290	-116.264991310	3037

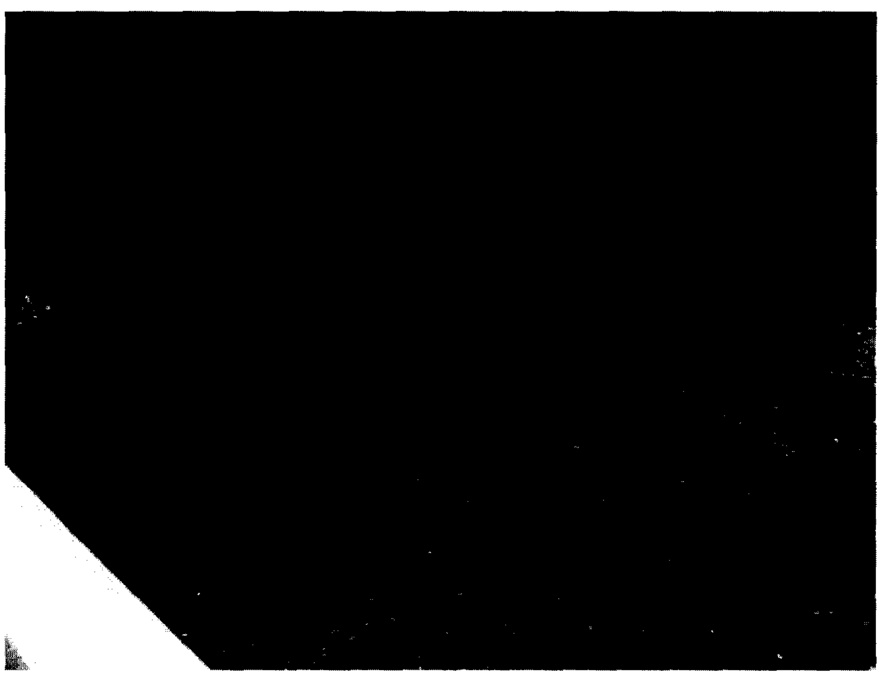
Appendix B. Photographs depicting locations of transects, starting (green dot) and stopping (red dot) points and approximate distance of stream to snorkel in the St. Joe River, Idaho. These photos were taken in 2002 and 2003.

SJ29
At Fish & Game sign below Calder Ck. Start at old fence line. 200m

SJ30
Just below Huckleberry Campground. 200m

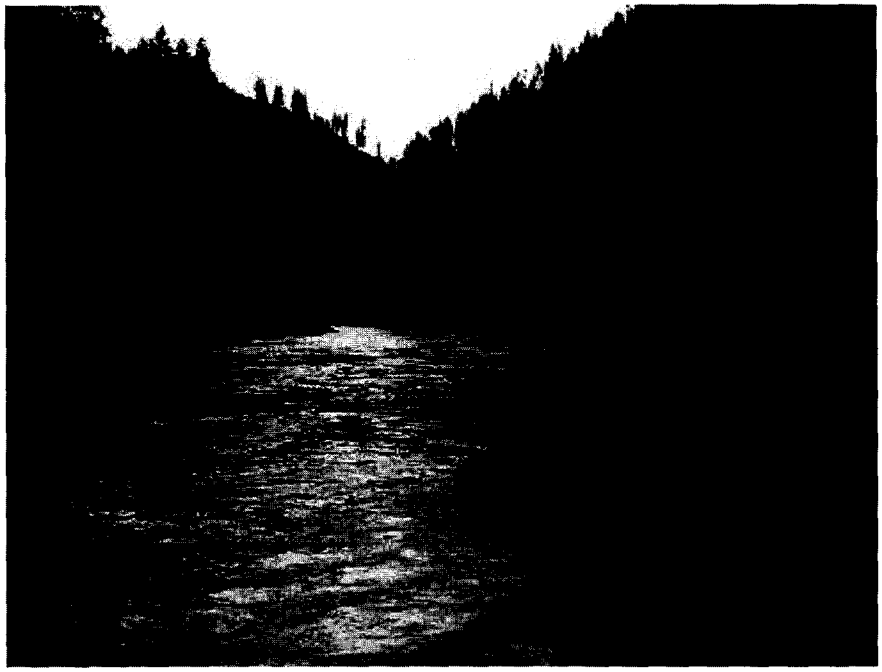
Appendix B. Continued

SJ31
Just downstream of M.P. 32 and Spring Creek (Private residence at top of site) 200m



SJ32
Below bridge next to highway maintenance shop; 300m above Marble Ck. 200m

Appendix B. Continued



SJ33
Access from road on south side of river – mile marker 4. 140m

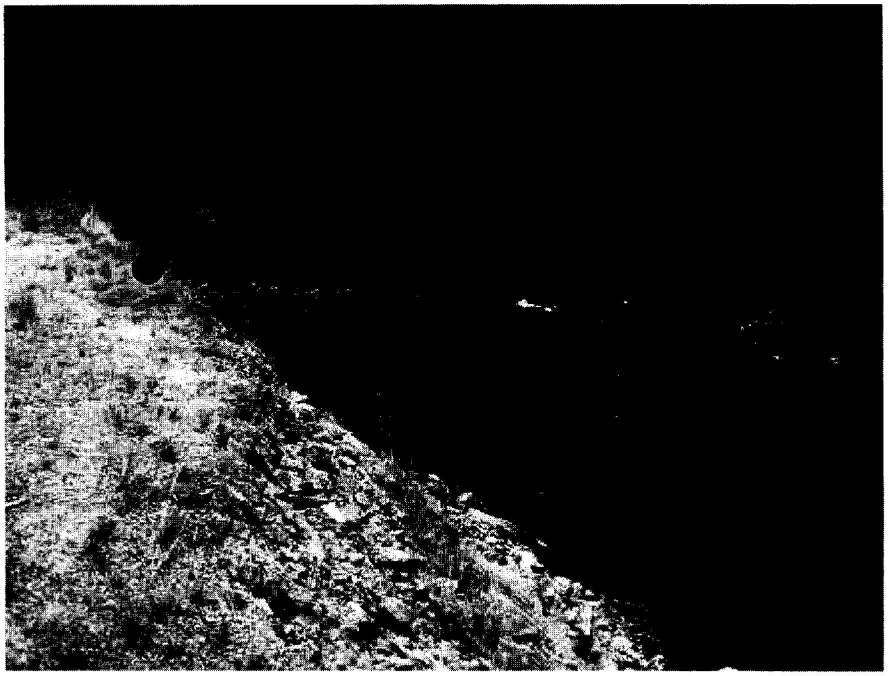
SJ34
Access from road on south side of river - Start at Storm Creek culvert. 100m

Appendix B. Continued.

SJ35
Start at confluence with North Fork St. Joe River. 130m

SJ1
Start at culvert (Coddington Gulch). 90m

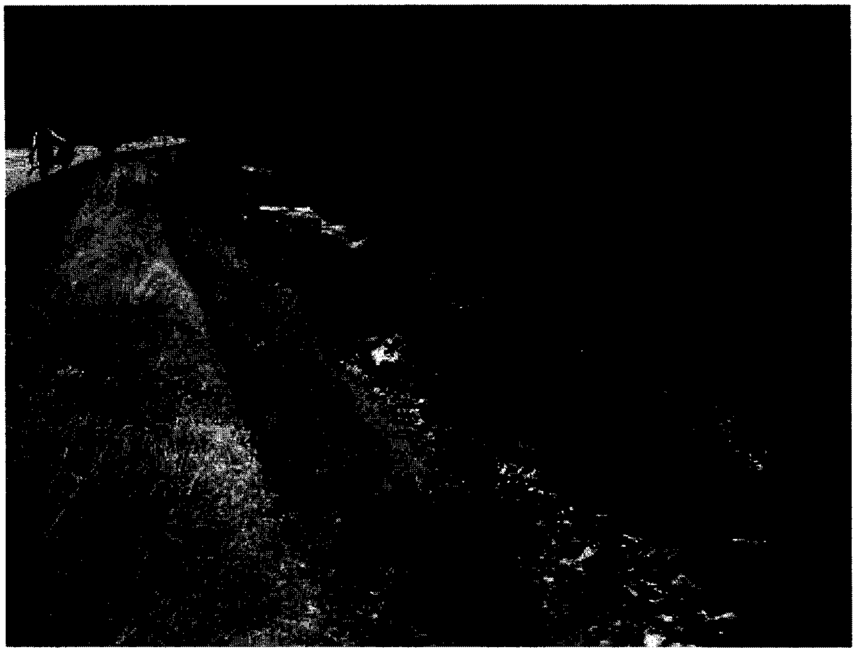
Appendix B. Continued.



SJ2 (upstream end)

SJ2 (downstream end)
Cable crossing just downstream of Skookum Creek. 140m

Appendix B. Continued.



SJ3
M.P. 53.2; Steep gorge; 0.6 miles upstream of Sisters Creek. 80m

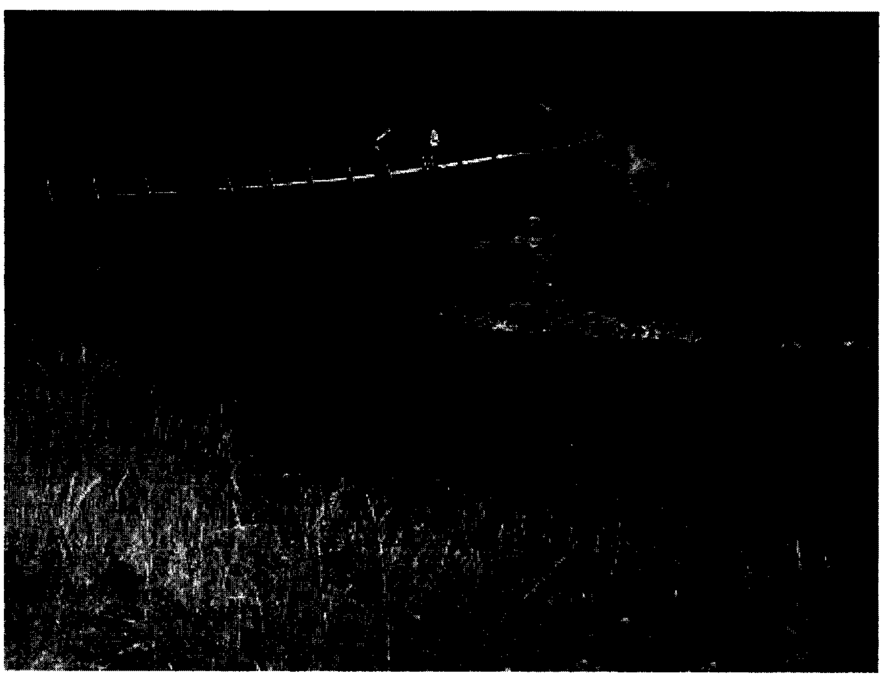
SJ4
Immediately upstream of SJ3. 75m

Appendix B. Continued.

SJ5
50 m downstream of Tourist Road - M.P. 55. 150m

Appendix B. Continued.

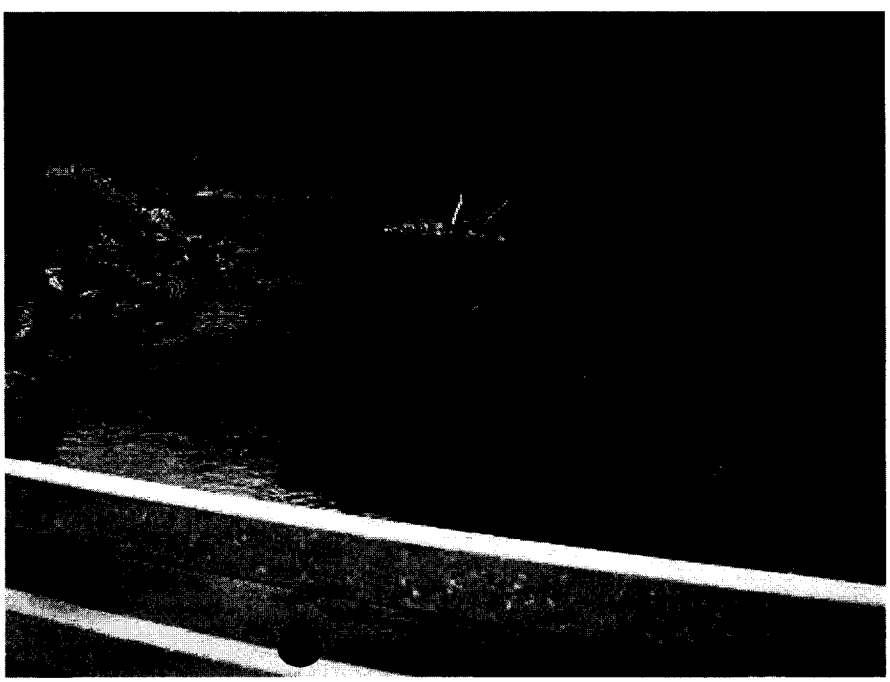
SJ6 (upstream end)



SJ6 (downstream end)
Turner Trail Bridge – 300 m upstream from Turner Flat Camp Ground. 200m

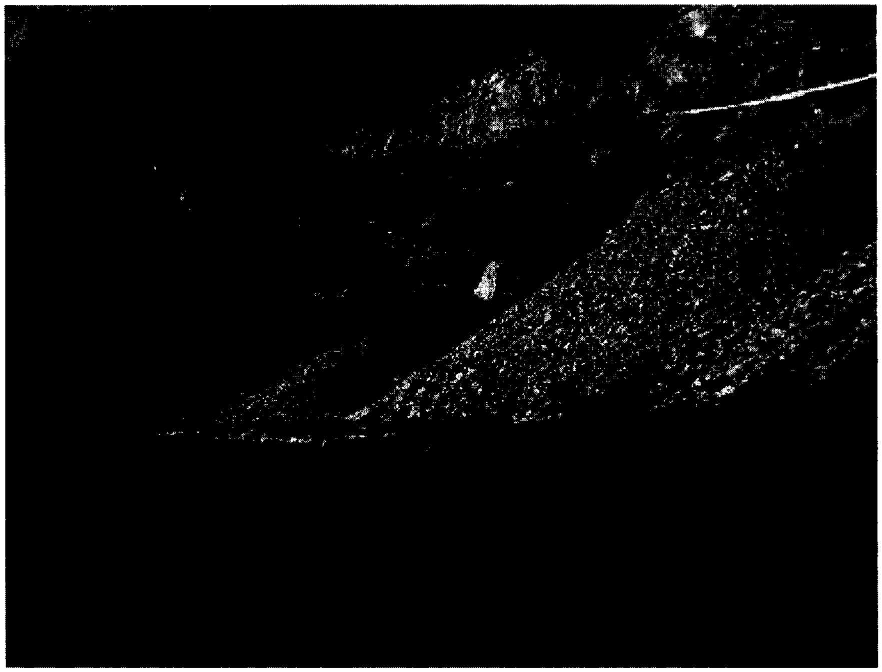
Appendix B. Continued.

SJ7
Start at confluence of Bird Ck and St. Joe. 140m



SJ8
Prospector Road Bridge. 130m

Appendix B. Continued.

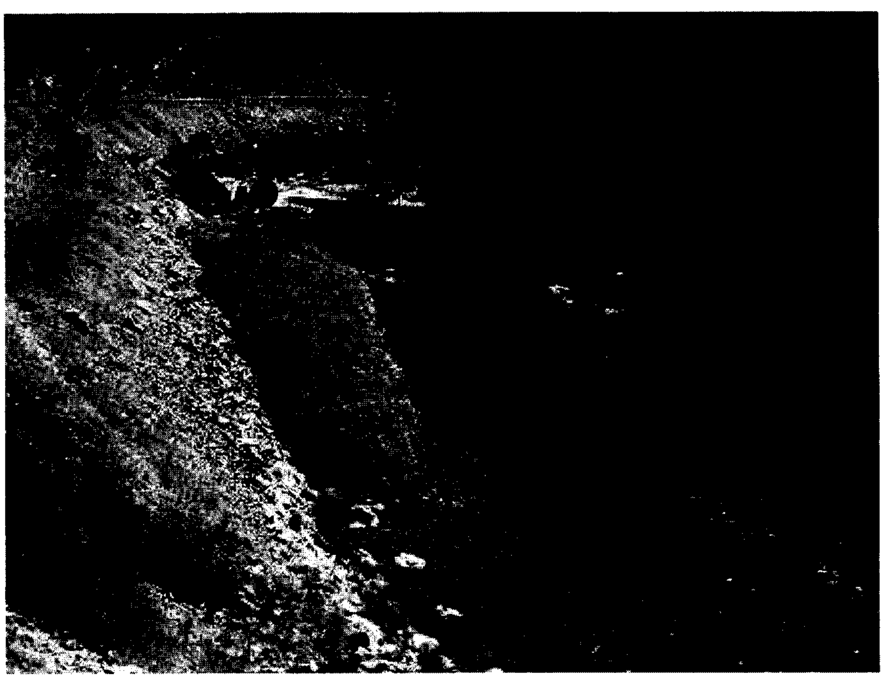


SJ9
About 0.5 mile upstream of Bottle Creek. 80m

SJ10
About 300 m upstream from SJ9. 250m

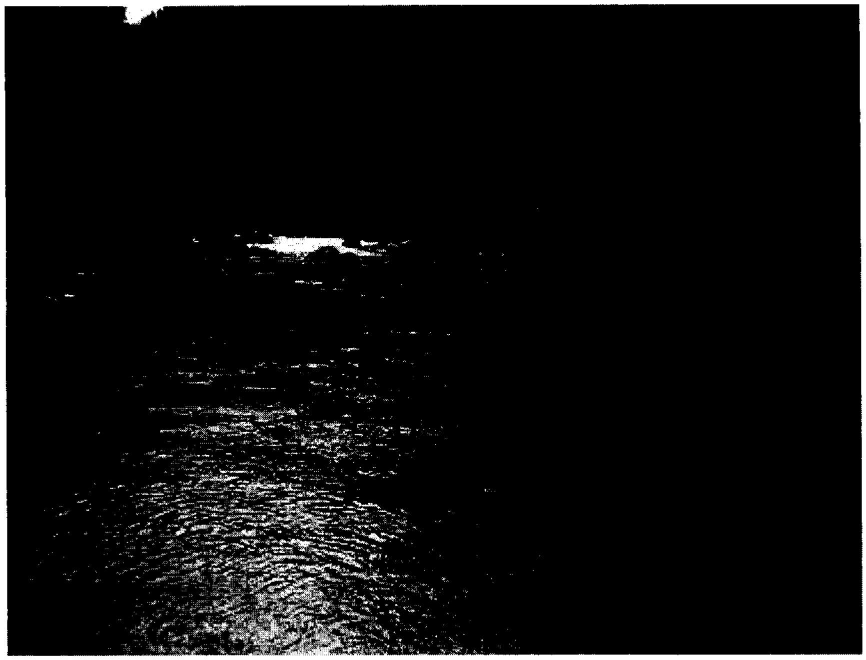
Appendix B. Continued.

SJ11
About 100 m upstream from transect SJ10

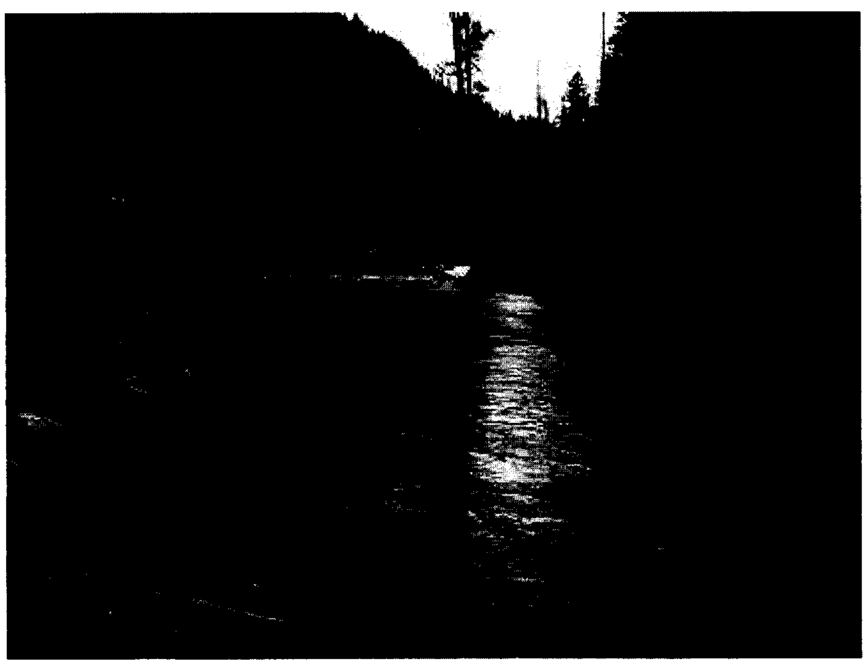


SJ12
About 0.4 miles upstream from Hardpan Creek; Mile post 61.1. 100m

Appendix B. Continued.

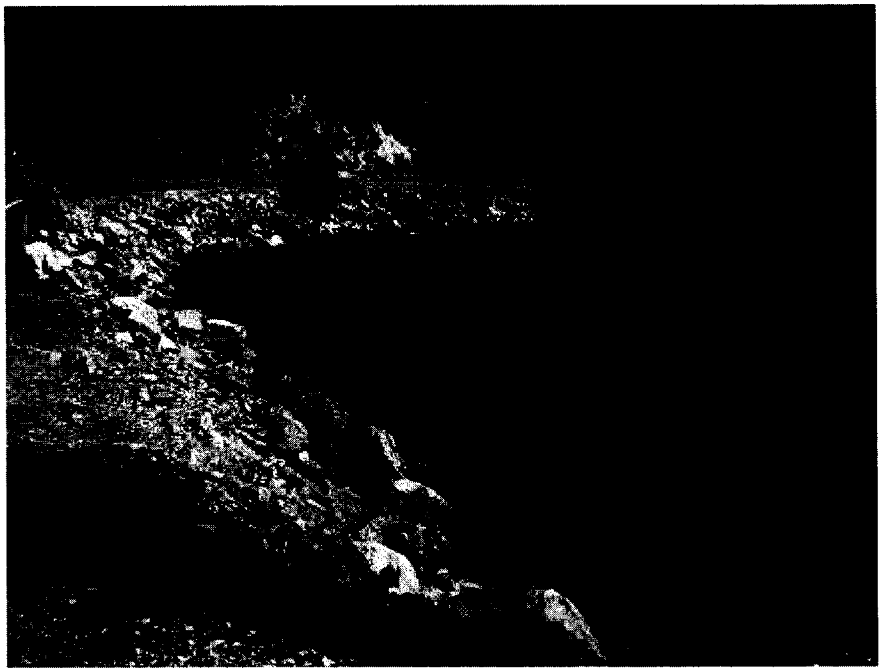


SJ13
Mile marker 65/66. about 0.4 miles upstream from Bennett Creek. 115m



SJ14
Start at Quartz Creek. Mile Marker 67. 104m

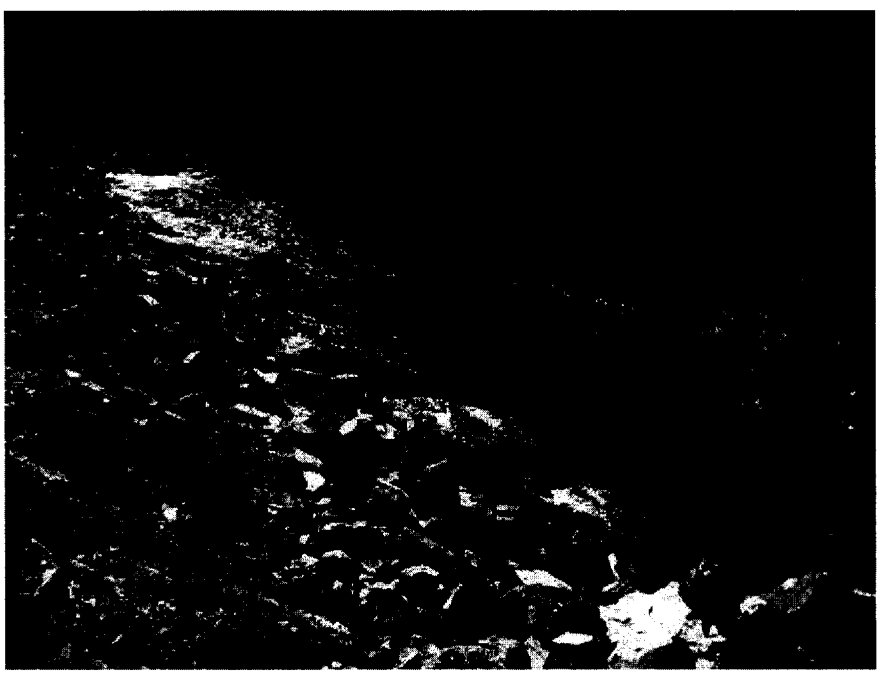
Appendix B. Continued.



SJ15
0.4 miles upstream from Bluff Ck. Mile Marker 106m

Appendix B. Continued.

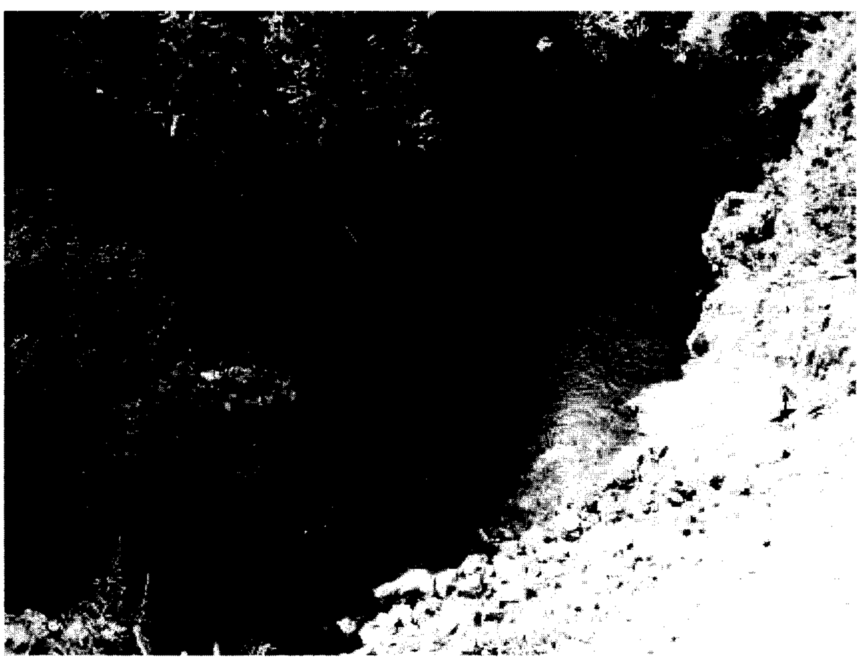
SJ16 (upstream end)



SJ16 (downstream end)
Niagara Creek enters opposite road. 150m

Appendix B. Continued.

SJ17 (upstream end)



SJ17 (downstream end)
0.4 miles upstream of Tumbledown Creek. 150m

Appendix B. Continued.

SJ18
Between Gold Creek and Gold Creek Cabin. Mile marker 76. 70m

SJ19
0.3 miles upstream from Simmons Creek. 51m

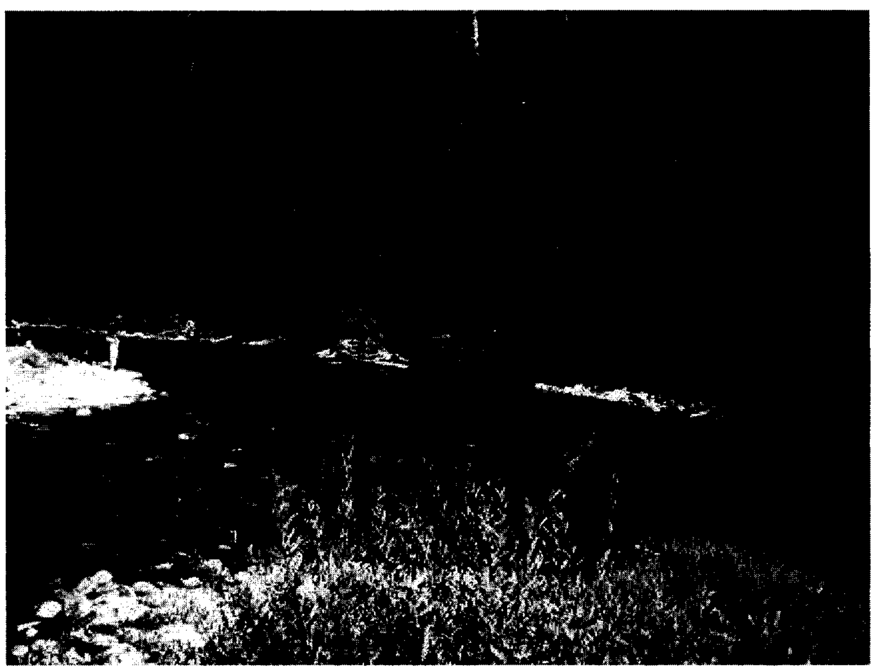
Appendix B. Continued.

SJ20
About 0.2 miles above Wahoo Creek. 80m

SJ21
0.4 miles upstream of Beaver Creek. 35m

Appendix B. Continued.

SJ22
Just across from Red Ives ranger station. 75m



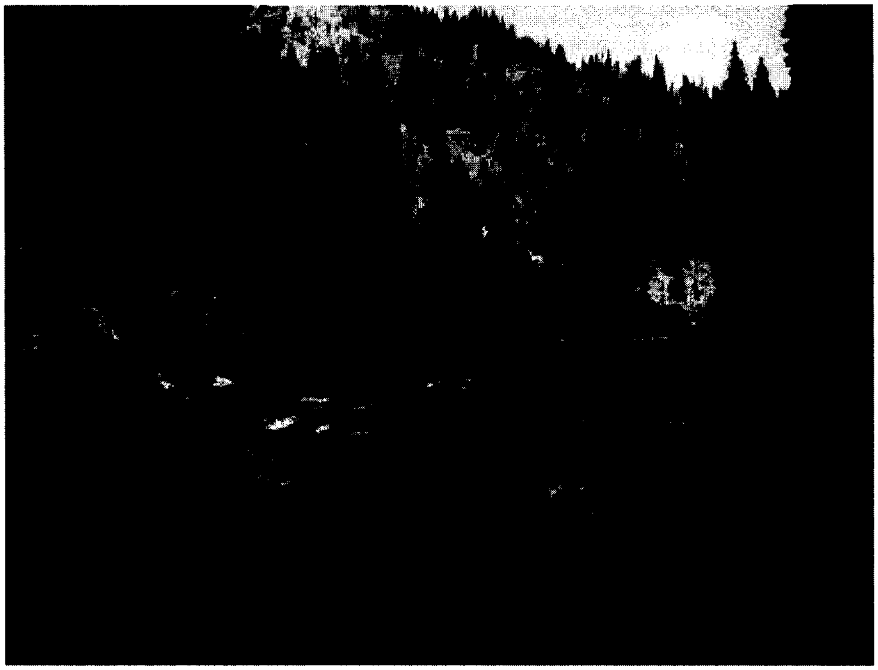
SJ23
0.1 miles downstream from Game Creek. 50m

Appendix B. Continued.

SJ24
50 m upstream of SJ23. 65m

SJ25
About 100 m upstream from Game Ck. 60m

Appendix B. Continued.



SJ26
Opposite horse corral at St. Joe Lodge. 80m

SJ27
About 300 m upstream from St. Joe Lodge. 60m

Appendix B. Continued.

SJ28
Start at confluence of Ruby Creek. 60m

Appendix C. Photographs depicting locations of transects, starting (green dot) and stopping (red dot) points and approximate distance of stream to snorkel in the Coeur d'Alene River, Idaho. These photos were taken in 2002 - 2004.

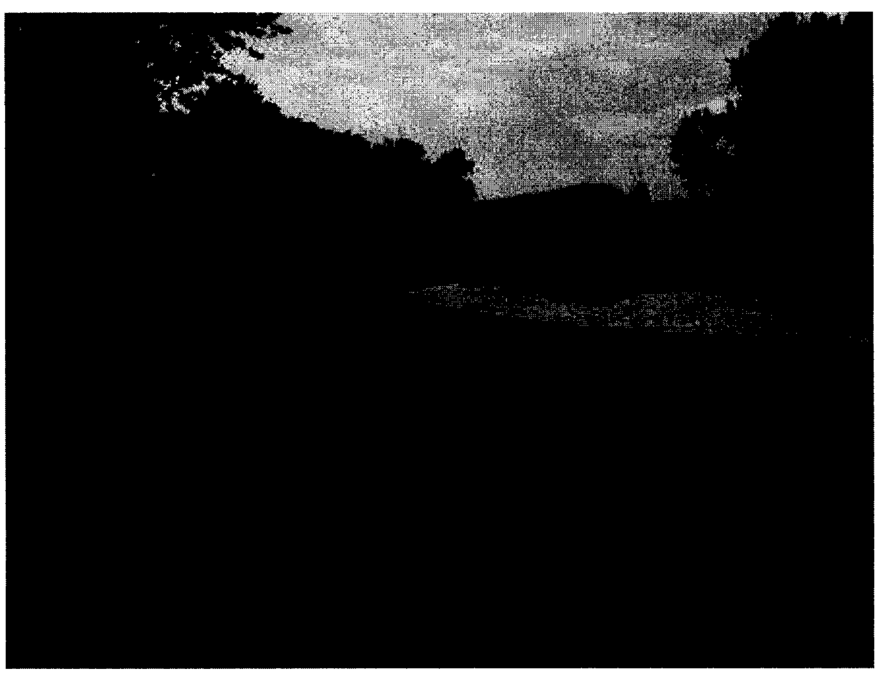
North Fork Coeur d'Alene River Snorkel Transects - 2004

NF01 Slough
80 m

NF01
Freeman Eddy - Access from West Side Road about 1.5 miles upstream from steel bridge. 150 m

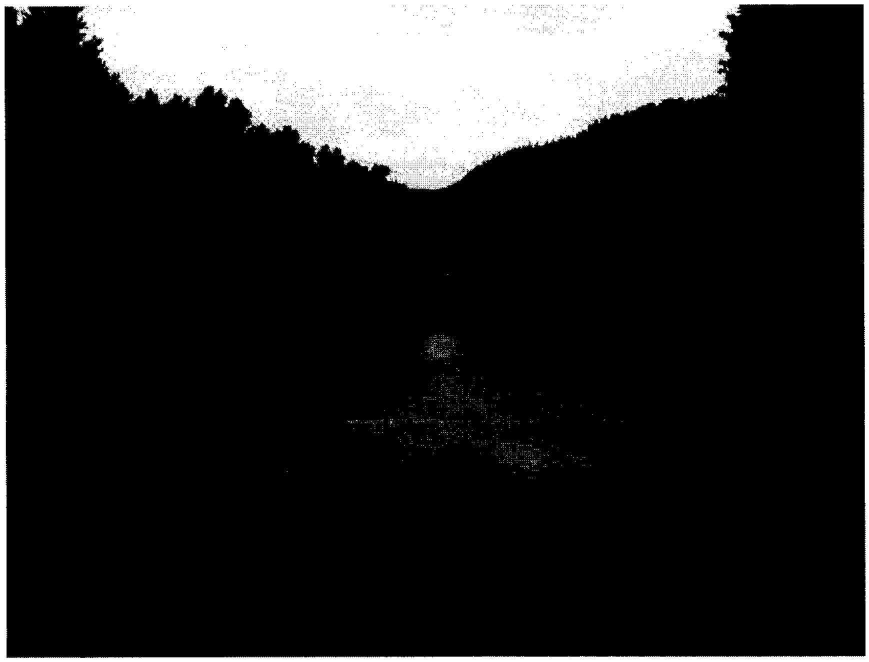
Appendix C. Continued.

NF02
Accessed from East side road about 2.7 miles below N. Fork Bridge. 191 m



NF03
Deadman's Eddy - Accessed from East Side Road about 0.1 miles above Thomas Ck. 230 m

Appendix C. Continued.



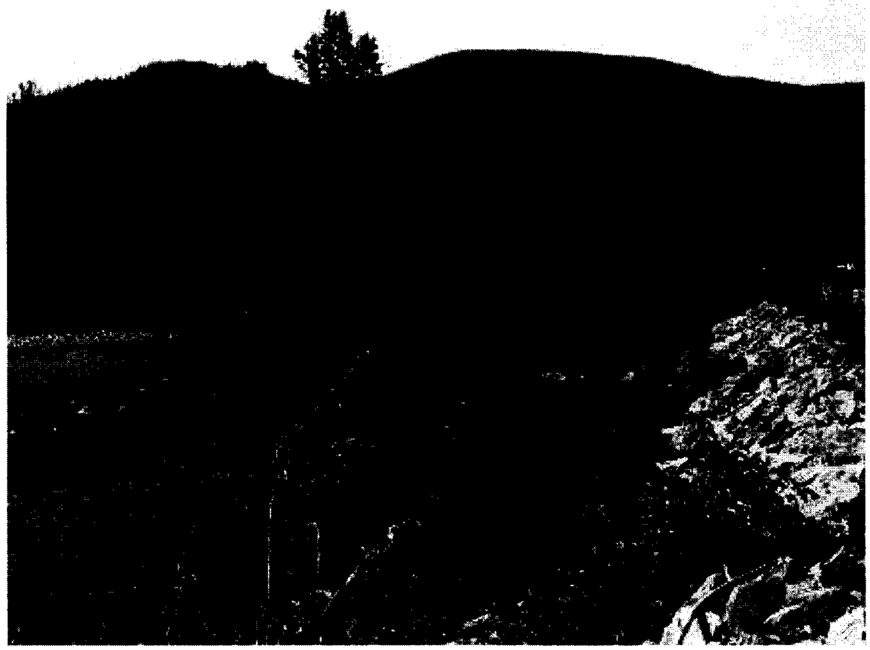
NF04
Simmons Draw - Accessed from West Side Road about 0.5 miles below Steamboat Ck. 205m

Appendix C. Continued.

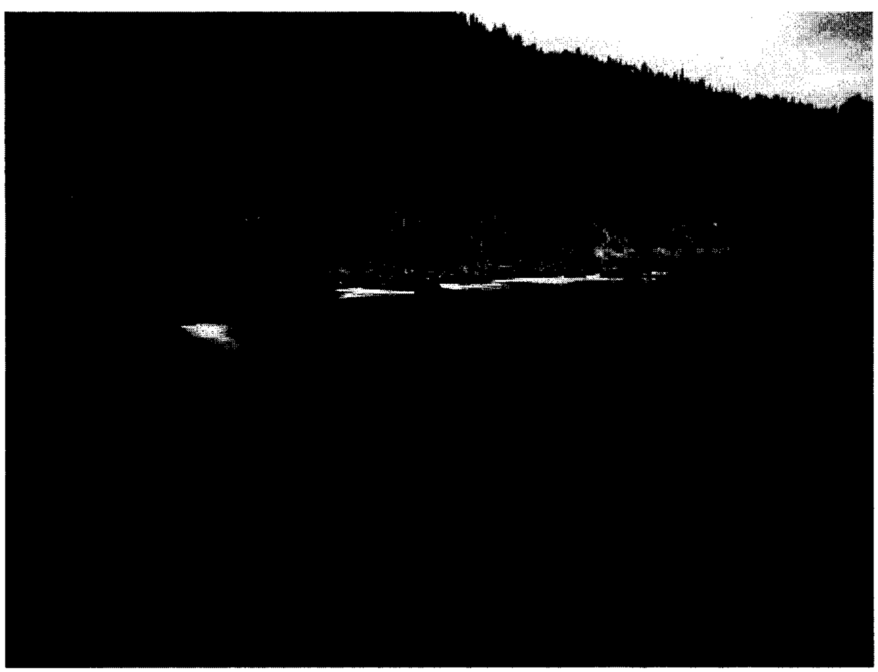
NF05 (looking up)

NF05 (looking down)
Castle Rock - Accessed from West Side Road about 1.6 miles below Silver Creek.

Appendix C. Continued.



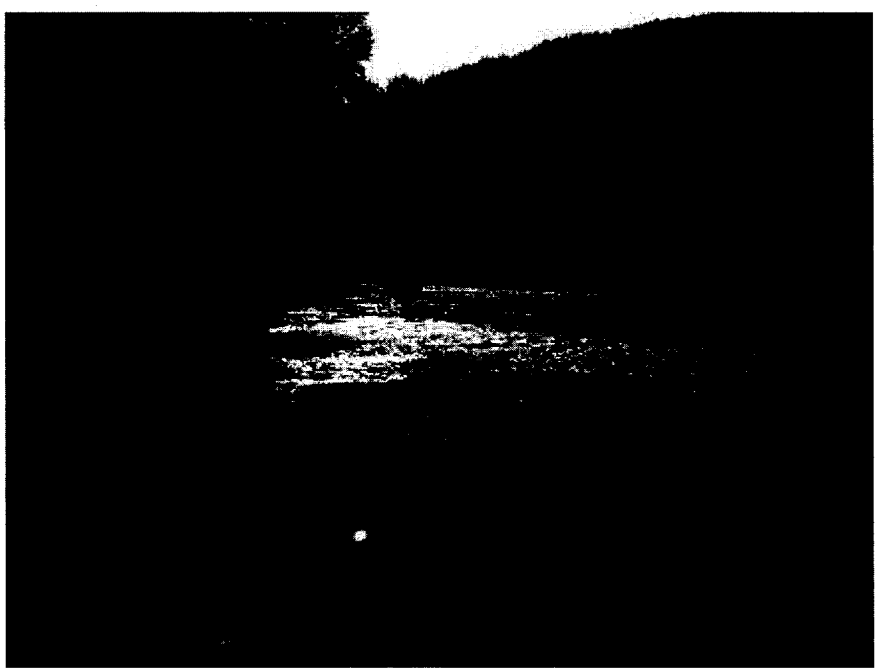
NF06
Accessed from West Side Road about 0.7 miles below Brown Ck. 172m



NF07
The Rock – Accessed from West Side Road just downstream of Steel Bridge. 181m

Appendix C. Continued.

NF08
Prichard Bridge - 1 mile below Prichard Creek. 138m



NF09
3 miles below Lost Creek Bridge. 155m

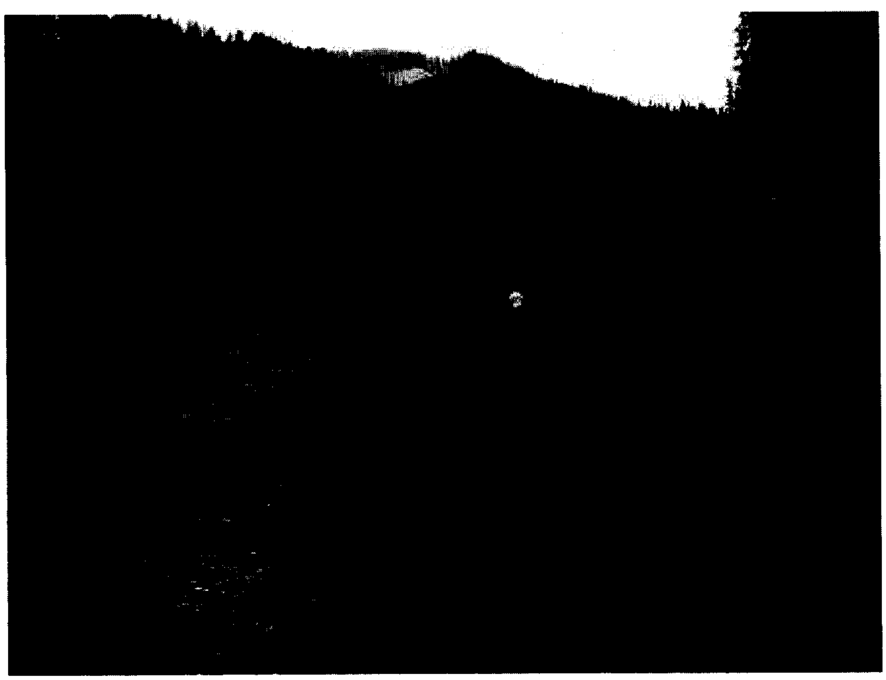
Appendix C. Continued.

ONF10
About 200 m downstream from the confluence with Lost Creek. 273 m

NF11
0.4 miles above Lost Creek Bridge. Starts at big flat rock in middle of river. 230 m

Appendix C. Continued.

ONF12
About 1.6 miles upstream of Shoshone Creek. 202m



NF13
4 miles above Shoshone Ck. just below Devil's Elbow. 89 m

Appendix C. Continued.

North Fork Coeur d'Alene River
Beginning of Catch and Release Section

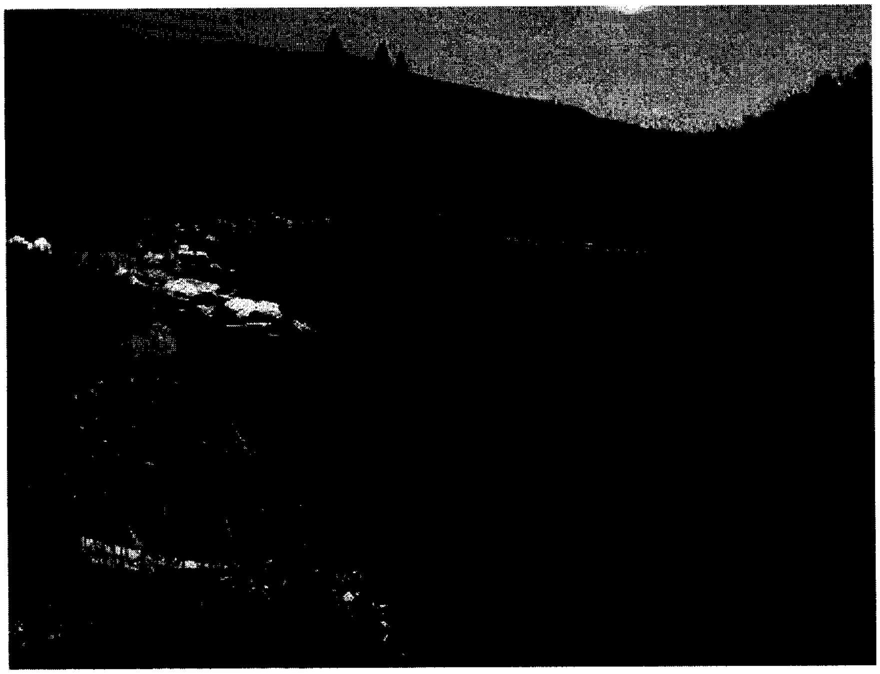
NF14
1 mile below Flat Creek just above bridge. 134 m

Appendix C. Continued.

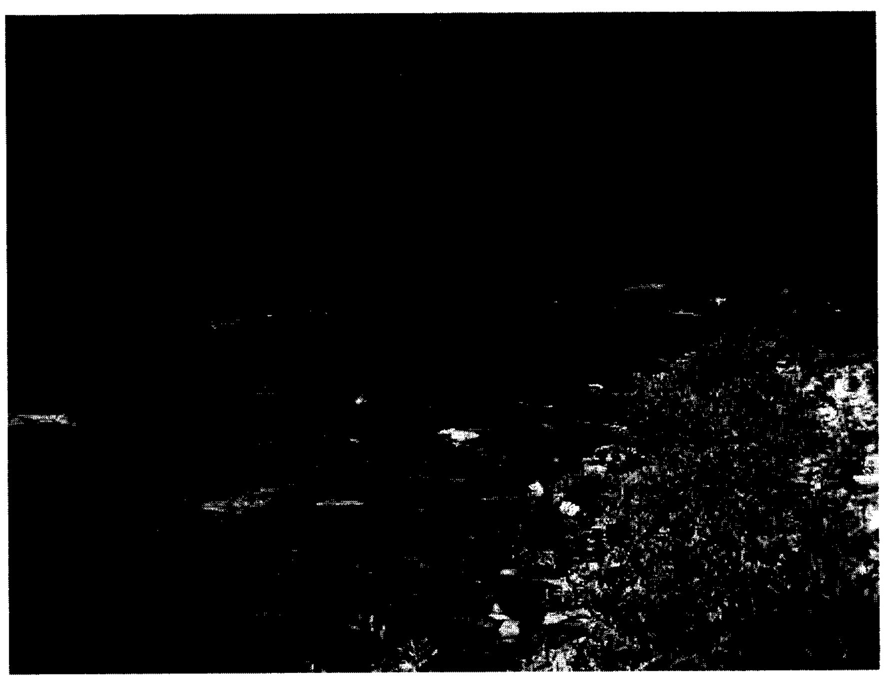
NF15
0.6 miles below Flat Creek. 73 m

NF16
0.6 miles above Flat Creek and 1.5 miles below Big Hank Meadow. 175 m

Appendix C. Continued.



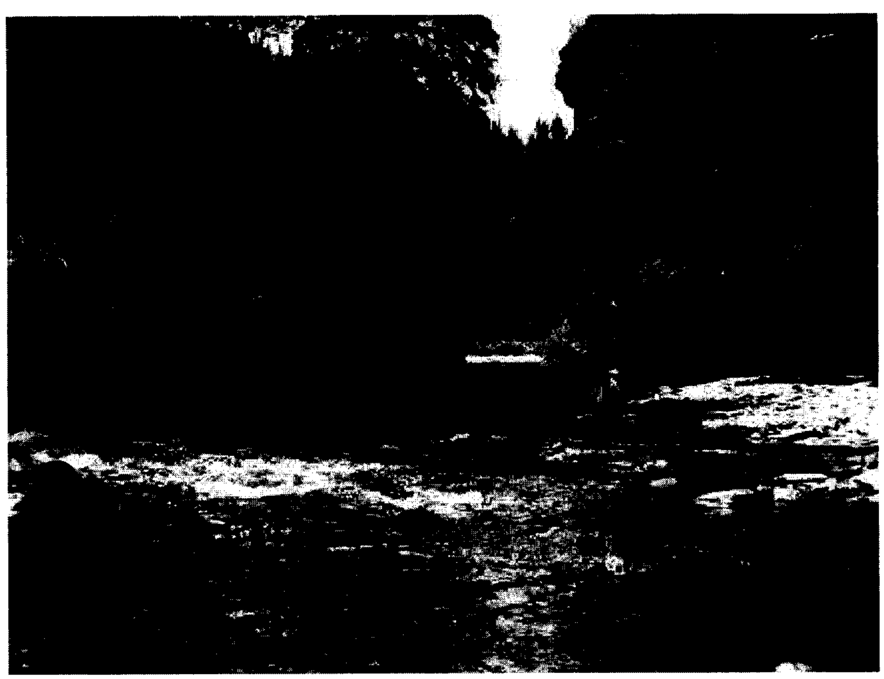
NF17
Big Hank Meadow (New Site in 2002 - River shifted) 291 m.



NF18
Just below Cinnamon Ck. Walk down from pullout below creek. 82 m

Appendix C. Continued.

NF19 (This site was changed due to channel shifting)
Just above bridge. Park at interpretive pullout. 27 m



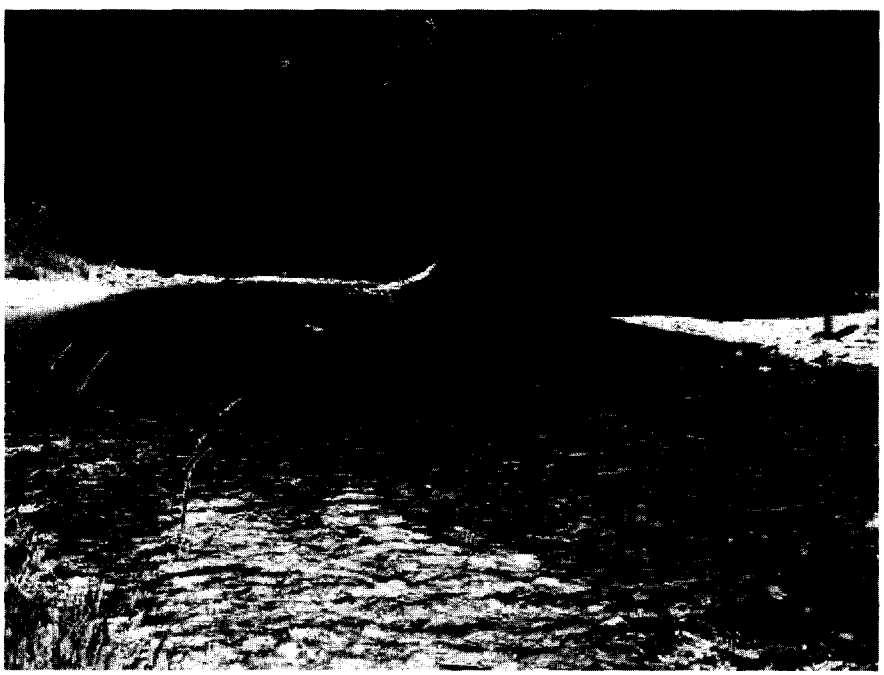
NF20 is now NF19
At section where stream splits about 0.5 miles up from bridge. 70 m

Appendix C. Continued.

New site NF20
Upstream of site NF19 by about 300 m. 65m

Appendix C. Continued.

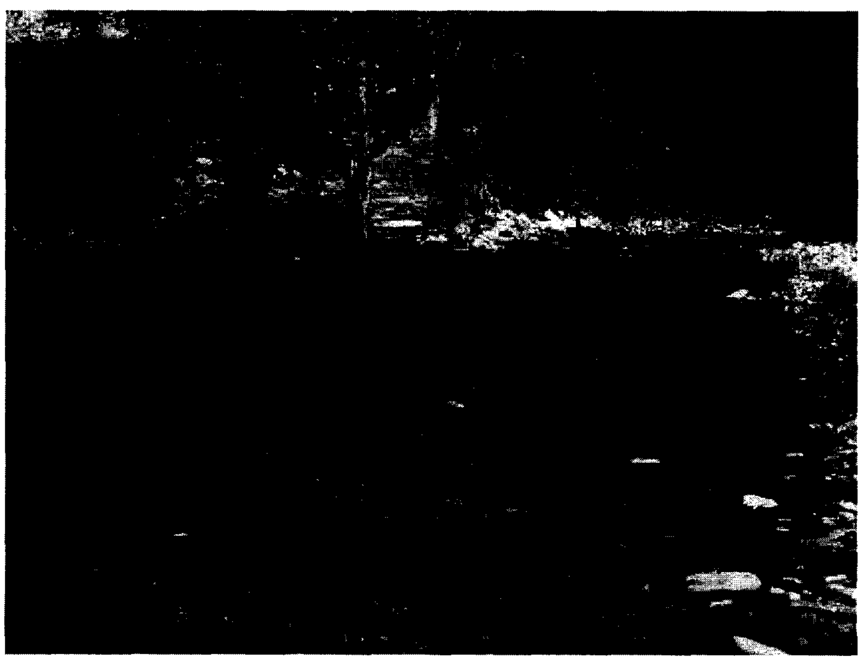
NF 21 (from above)



NF21
About 1.6 miles upstream from bridge in roadless area. 41m

Appendix C. Continued.

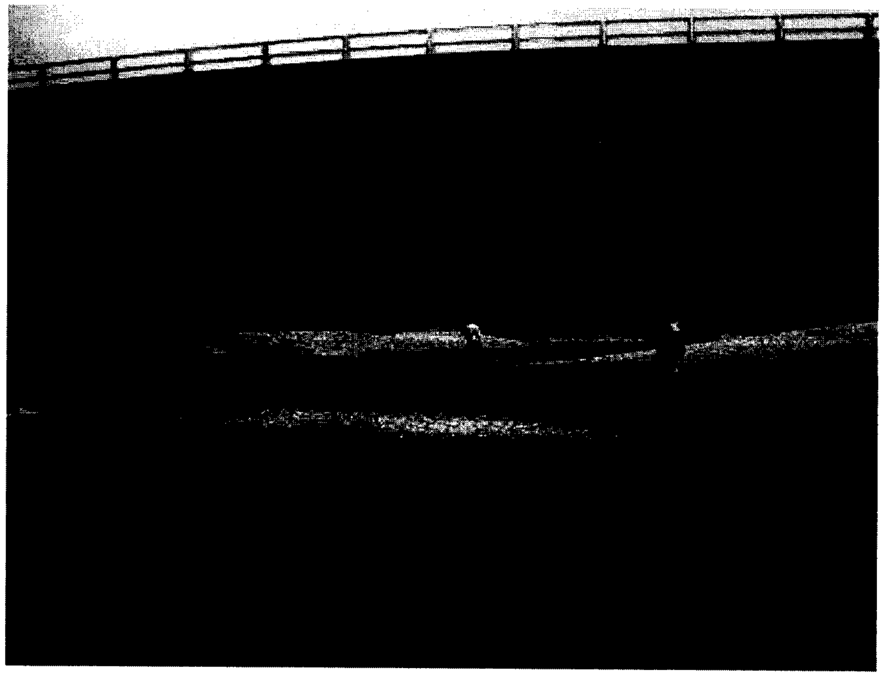
NF22
Roadless area about 3 miles up from bridge. 55 m



NF23
About 3.1 miles upstream from bridge in roadless area. New site in 2002 - Moved downstream 75m due to pool filling. 38 m

Appendix C. Continued.

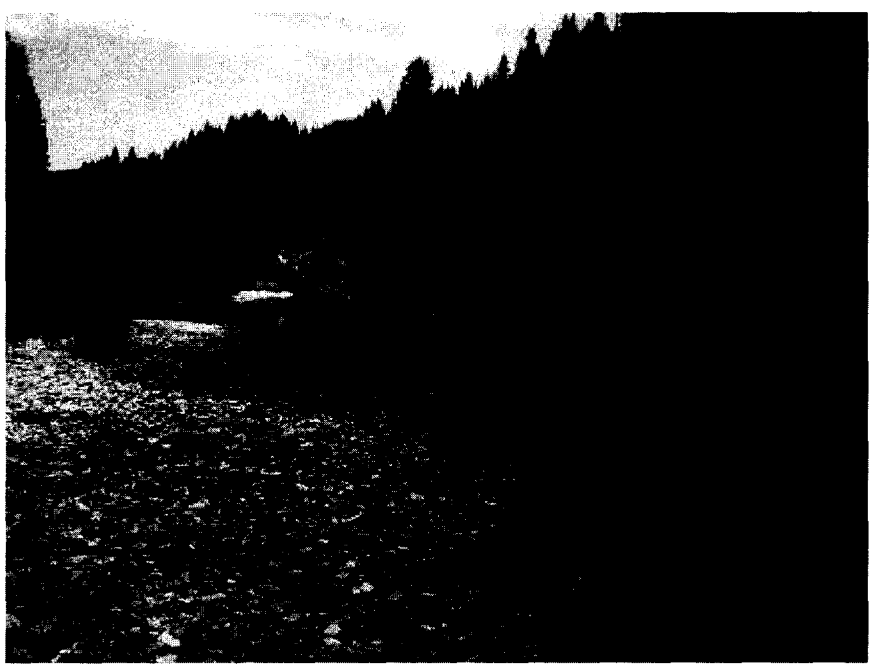
Little North Fork Coeur d'Alene River



LNF01
Just above bridge at mouth of Little North Fork. 66m

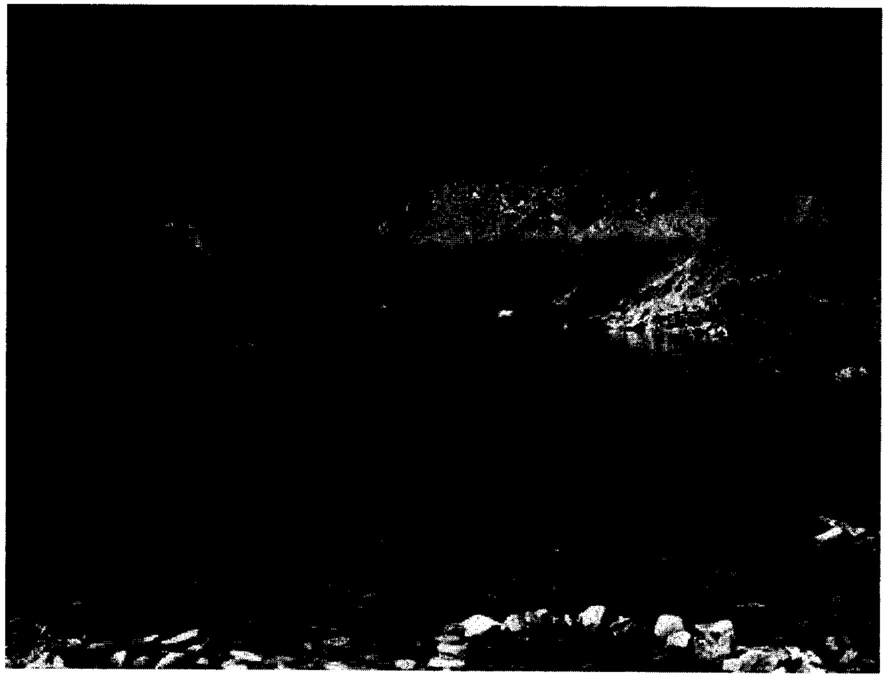
Appendix C. Continued.

LNF02 (looking downstream)

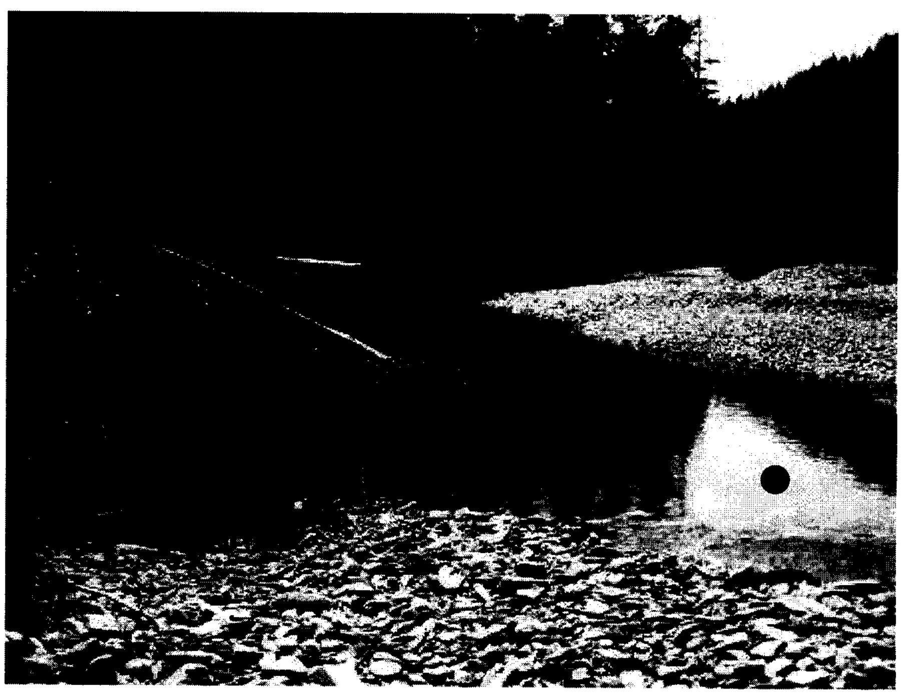


LNF02 (looking upstream)
1.0 mile below Bumblebee Campground Road. 128m

Appendix C. Continued.



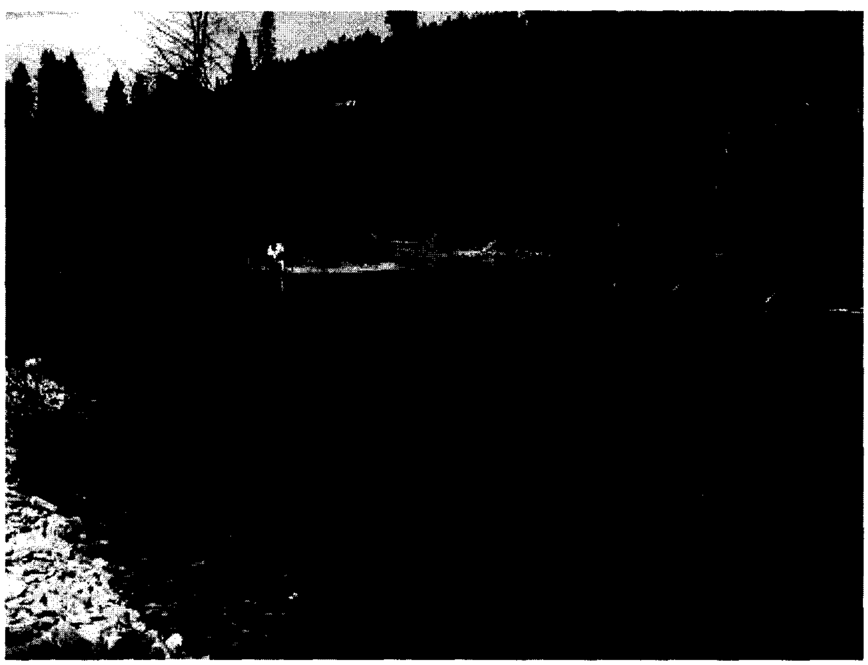
LNF03
0.6 miles above Bumblebee Campground Rd. just below Little Bumblebee Ck 90m



LNF04
0.8 miles below LNF6 and 1.2 miles above Little Bumblebee Creek. 75 m

Appendix C. Continued.

LNF05



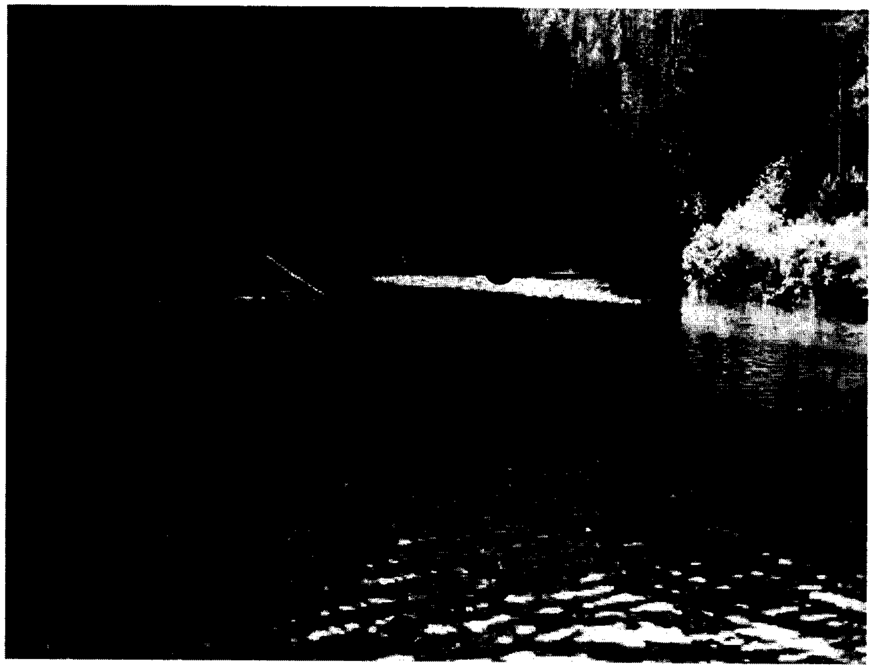
LNF05 (looking up side channel)
200 m downstream of old Owl Creek turnoff (old dirt road). Just upstream from Little Tepee Creek.
130 m

Appendix C. Continued.

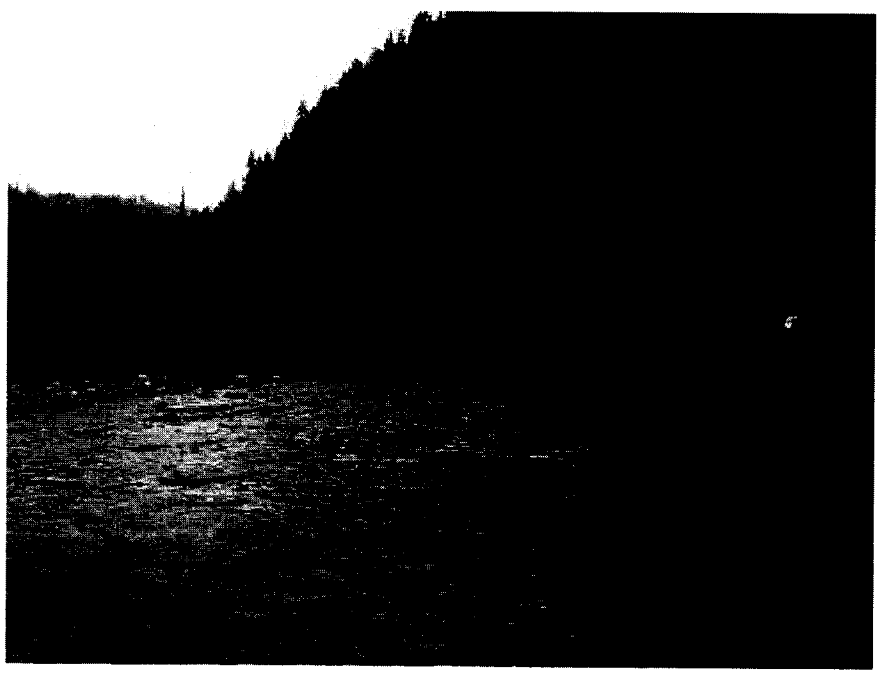
LNF06
Take F.S. road 413 to Breakwater bridge. 71 m.

LNF07
About 2.5 miles below Laverne Ck. Hike about 250 m down from road. 91m

Appendix C. Continued.



LNF08
1.2 miles below Laverne Creek Bridge. 152m



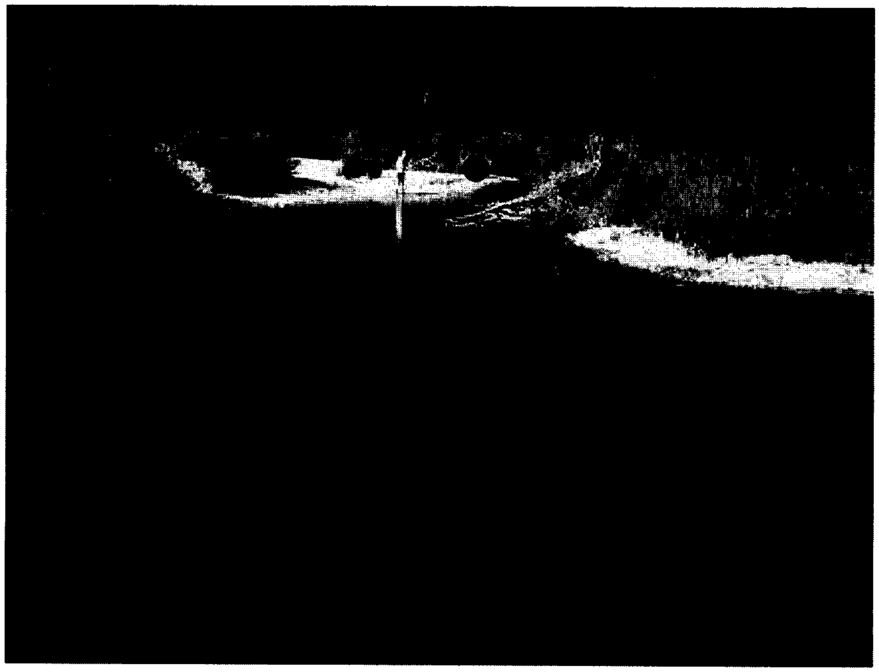
LNF09
0.1 miles below Lieberg Creek. 41m

Appendix C. Continued.

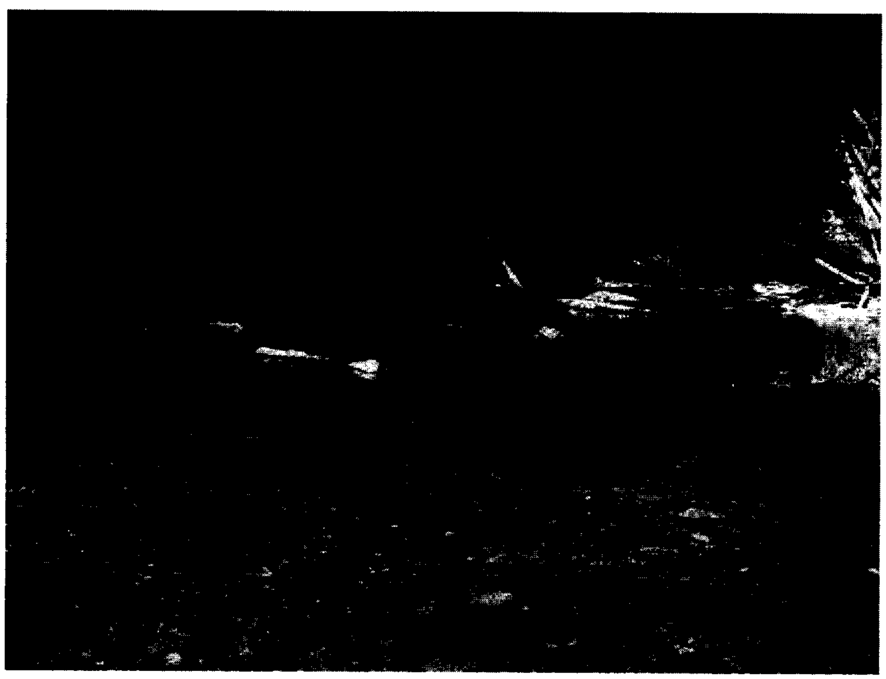
LNF10
Old Splash Dam Historical Site (pullout with interpretive sign). 110m

LNF11
0.1 miles below Bootjack Creek culvert – 250 m upstream from splash-dam. 90m

Appendix C. Continued.



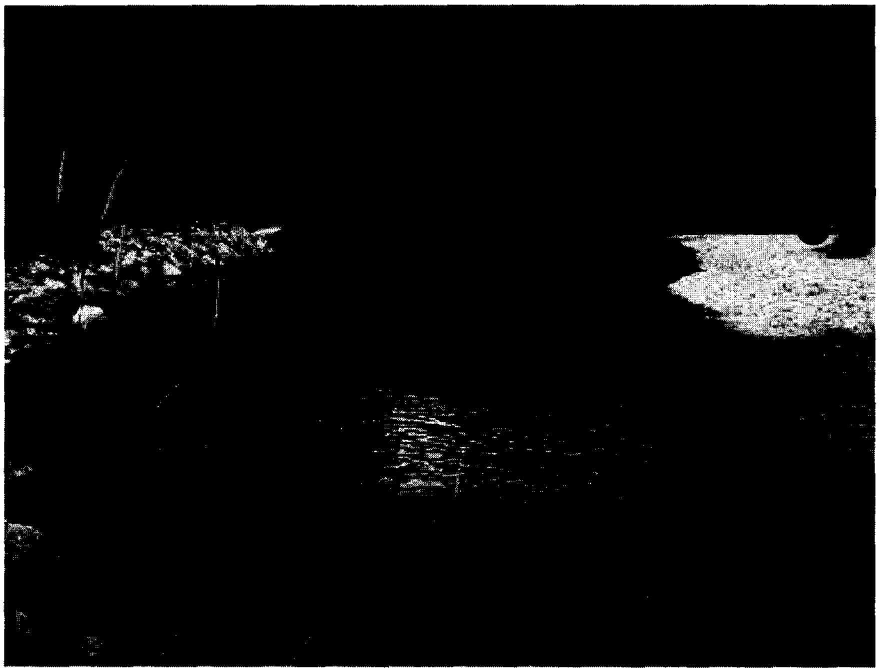
LNF12
Confluence of Skookum Creek – 0.25 miles downstream of F.S. road 612. 66 m



LNF13
Take pull out 0.4mi upstream from F.S. road 612. Transect begins at flat rock to tail end of run. 50m

Appendix C. Continued.

Tepee Creek



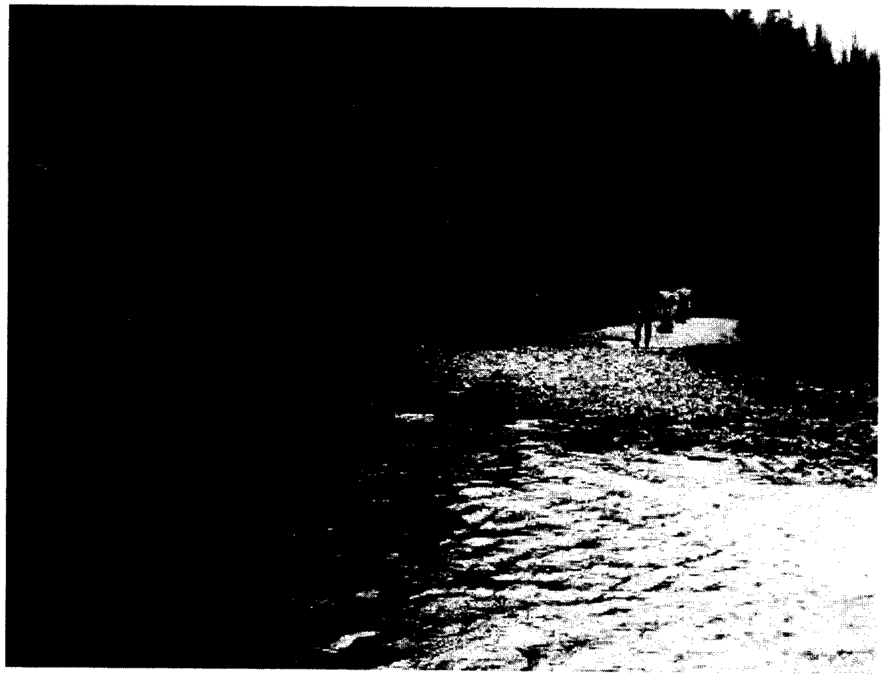
TP01
Accessed through private property – near mouth of TP Creek beside where trailers are usually parked. 100 m

Appendix C. Continued.

TP02 (Looking upstream)

TP02 (Looking downstream)
Winton Creek enters the middle of this site. 225 m

Appendix C. Continued.



TP03
About 0.2 miles upstream from Plant Creek. 90 m

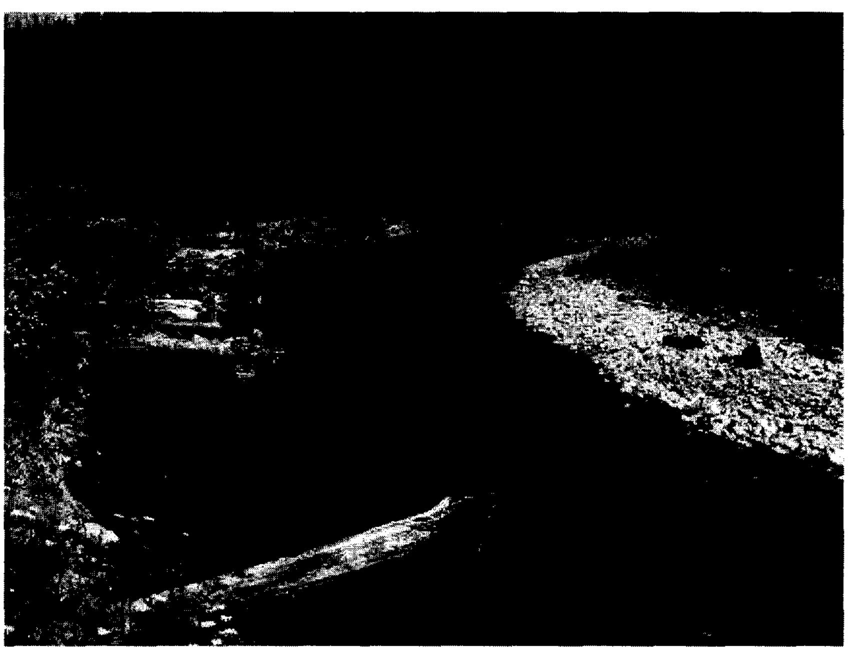
TP04
About 1.0 road mile downstream from Independence Creek. 112m

Appendix C. Continued.

TP05
Confluence of Independence Creek and Tepee Creek. 60 m.

Appendix C. Continued.

TP REHAB1
New Site. Hike upstream from bridge above airport and snorkel first two meander bends with roots on bank (rehab area). 150m



TP REHAB2
New Site. Snorkel the two most upstream meander bends with rootwads (of the rehab area). Access this transect from the bridge at upstream end of the rehab area. 150m

Appendix D. Data sheet used when collecting information during snorkel surveys in the St. Joe River and Coeur d'Alene River, Idaho, during 2004.

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)

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William D. Horton
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