Technical Completion Report

FISH ABUNDANCE UPSTREAM FROM DWORSHAK DAM FOLLOWING EXCLUSION OF STEELHEAD TROUT

by
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and
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June 1984

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Project WRIP/371404

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ABSTRACT

Fish abundance was determined by underwater fish counts in selected locations on twelve tributary streams of the North Fork Clearwater River, Idaho. Fish numbers, species composition and fish density were compared to results from previous studies of the watershed to determine what changes have occurred in the fish populations fifteen years after anadromous fish were excluded from the watershed by the construction of Dworshak Dam.

Rainbow trout, Salmo gairdneri, continue to be the most abundant species in most tributaries of the North Fork Clearwater River. Average fish densities have decreased markedly since the elimination of anadromous forms of rainbow trout (steelhead trout).

Historically, large numbers of juvenile steelhead trout utilized the habitat in the tributaries of the North Fork of the Clearwater River, but resident forms of rainbow and cutthroat trout, Salmo clarki, are not fully utilizing this space. Further studies to increase the potential for fish production are suggested, including evaluation of introducing adfluvial or later-maturing stocks of rainbow and cutthroat trout.

INTRODUCTION

Anadromous fish have been eliminated or reduced in many reaches of Idaho and the Northwest due to the building of dams. This project examines the effects of stream blockage on the production of fish upstream from a dam.

The North Fork of the Clearwater River in Idaho historically hosted one-third to one-half of the total Clearwater River production of anadromous rainbow trout (steelhead trout), Salmo gairdneri (Bjornn, 1977). The last complete spawning run of steelhead trout entered the North Fork of the Clearwater River in 1968. The following year more than 60% of the spawning run of steelhead trout were trapped at the base of newly constructed Dworshak Dam and moved to Dworshak National Fish Hatchery to begin hatchery propogation. All fish in the 1970 spawning run were trapped at the dam and taken to the hatchery. After the spawning season, the dam was closed and no anadromous fish have spawned in the North Fork drainage upstream from the dam since 1969.

In 1968, Idaho Department of Fish and Game personnel began a seven year study to monitor fish abundance and species composition in North Fork Clearwater River tributaries before and after exclusion of anadromous fish (Cannon 1971, 1972; Ball and Cannon 1974; Pettit 1976, 1977). After 1968, abundance of fish in tributaries upstream from Dworshak Dam declined abruptly. This decline was due primarily to reduced numbers of juvenile steelhead trout. By 1975 and 1976, there was some evidence that congeneric cutthroat trout (Salmo clarki) were increasing in abundance in the watershed. The question remained: could cutthroat trout utilize the habitat left vacant when anadromous trout were eliminated?

When anadromous rainbow trout (steelhead) are blocked from an area, often a resident population of rainbow trout remains (Simpson and Wallace 1982). It is not known whether these non-migratory fish are always present while anadromous forms are there, or if this is a morph that survives only in the absence of steelhead trout. The extent that these resident forms can utilize habitat previously occupied by juvenile stages of anadromous forms has not been quantified.

It was the purpose of this study to return to the North Fork of the Clearwater River watershed, establish fish monitoring sites, and quantify what changes in fish abundance and distribution had occurred in the nearly 15 years since anadromous fish passage was blocked.

METHODS

Tributaries to the North Fork Clearwater River were explored to establish underwater fish counting (snorkeling) transects. Transect selection was based on water clarity, access, and permanence for future study. One to four transects were located on each of 12 tributary streams to include shallow and deep pools and pocket water habitats (Figure 1) (Appendix). Transects were not established in lower portions of Orogrande, Beaver and Osier Creeks because the water was too turbid.

Between 8 August and 11 September, 33 transects were photographed, measured for length and width, described and snorkeled. Water temperature and time of day were recorded at the time of counting. Fish were enumerated by species and in most locations both rainbow and cutthroat trout were classified by size into three age classes: 0, I and II and older using approximate mean sizes of 60, 100, and 140 mm for age 0, I and II, respectively. These size categories were adjusted upward or downward slightly for temperature effects at lower and higher altitude streams.

Numbers of fish and surface area of each transect were used to calculate fish densities. All fish count data and transect measurements (length and width) from Idaho Department of Fish and Game studies of the region between 1968 to 1976 (Cannon 1971, 1972; Pettit 1976, 1977) were converted to fish densities for comparison with this study.

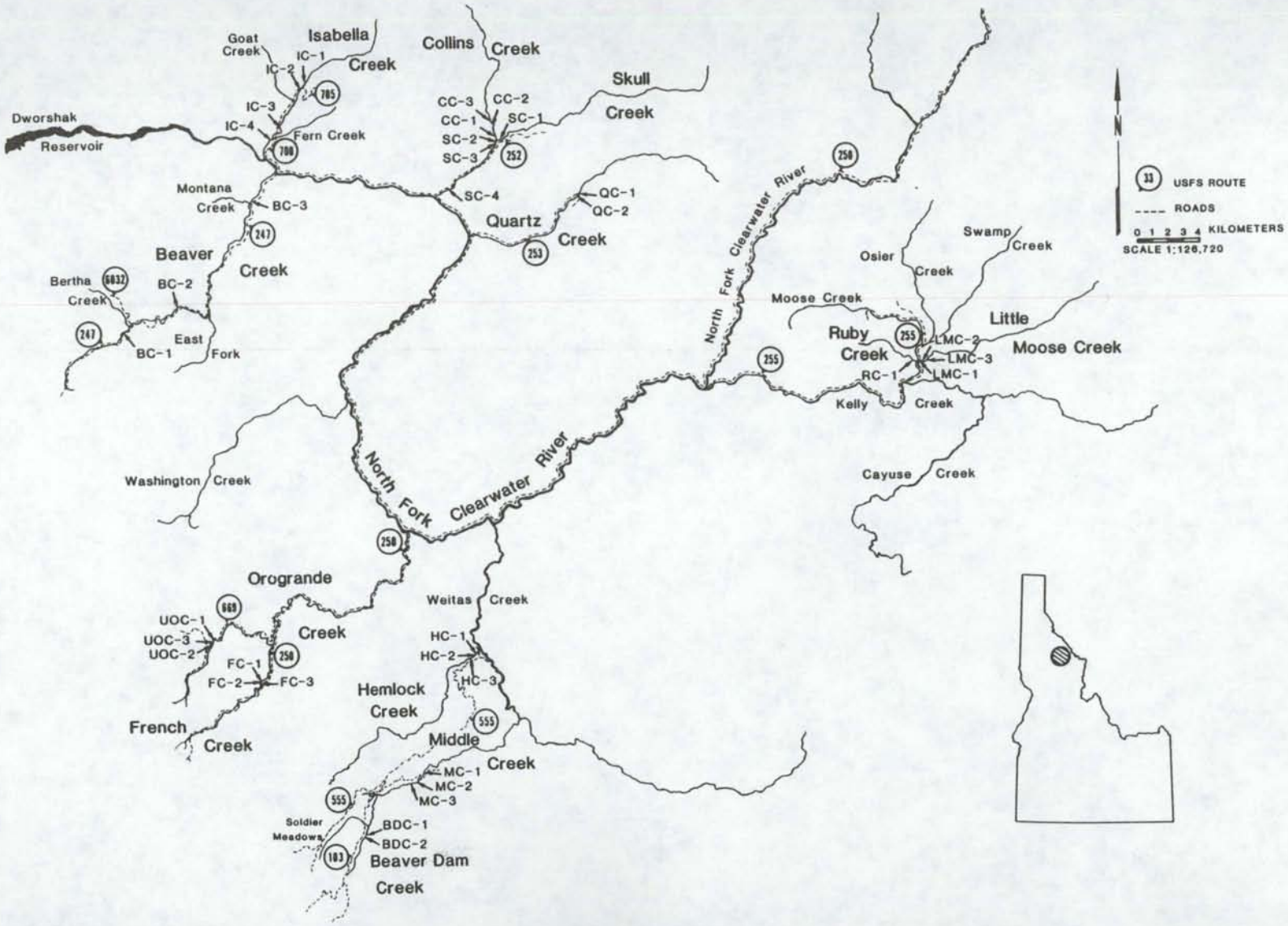

Figure 1. Location of transects established August to September 1983 in the North Fork Clearwater River drainage.

RESULTS

Eight species of fish were identified by underwater visual inspection in the transects (Table 1). Rainbow trout were most abundant, and were found in 82% of the transects. Cutthroat trout were present in 58% of the transects, but were present in low numbers. Other fish species observed included bull trout (Salvelinus confluentus), brook trout (Salvelinus fontinalis), mountain whitefish (Prosopium williamsoni), largescale sucker (Catostomus macrocheilus), torrent sculpin (Cottus rhotheus) and longnose dace (Rhinichthys cataractae). Since no collections of these fish species were made, identification was verified by known distribution (Simpson and Wallace 1982) and reports from studies by Idaho Department of Fish and Game (Pettit 1976).

Densities of all fish counted in the transects ranged from a high of 25.18 fish · 100 m^{-2} on Skull Creek to a low of 0.52 fish · 100 m^{-2} on Middle Creek (Table 2). Average densities for rainbow and cutthroat trout were 5.46 and 0.89 fish · 100 m^{-2}, respectively. Relative proportion of rainbow, cutthroat and rainbow-cutthroat hybrids varied between tributary sites in the lower drainage and those in the upper and middle drainage tributaries (Figure 2). Rainbow trout were the most abundant species in lower tributary transects and cutthroat trout were more abundant in some of the middle and upper tributaries. Hybrid trout were common in some middle and upper tributary transects.

Age 0, I and II and older rainbow trout constituted 26, 20 and 53%, respectively, of the fish counted. Many sites were without age 0 fish (Table 3).

Table 1. Fish species observed in 33 transects in the North Fork Clearwater River watershed, August and September 1983.

Common name	Scientific name	Fish counted	Transects containing at least one of each species	
			Number	Percent
Rainbow trout	*Salmo gairdneri*	388	27	83
Cutthroat trout	*Salmo clarki*	63	19	58
Cutthroat-Rainbow hybrids		14	4	12
Bull trout	*Salvelinus confluentus*	7	6	18
Brook trout	*Salvelinus fontinalis*	11	4	12
Mountain whitefish	*Prosopium williamsoni*	25	2	6
Torrent sculpin[a]	*Cottus rhotheus*	4	3	9
Largescale sucker[a]	*Catostomus macrocheilus*	4	1	3
Longnose dace	*Rhinichthys cataractae*	1	1	3

[a]Probable identity. No specimens were collected for verification.

Table 2. Fish numbers and density (fish · $100m^{-2}$) in each transect of the North Fork Clearwater River watershed August to September 1983.

Transect	Surface area (m^2)	Salmonids																Other species									
		Rainbow trout		Cutthroat trout		Rainbow - Cutthroat hybrid		Bull trout		Brook trout		Mountain whitefish		All salmonids		Sucker sp.		Long-nose dace		Sculpin sp.		All Fish species	
		n	Density	n	Density	n	Density	n	Density	n	Density	n	Density	n	Density	n	Density	n	Density	n	Density	n	Density
Beaver Creek																							
BC-1	160	3	1.88					1	0.63					4	2.50							4	2.50
BC-2	275	9	3.27	1	0.36			1	0.36					11	3.64							11	4.00
Isabella Creek																							
IC-1	136	5	3.68	1	0.74			1	0.74					7	5.15							7	5.15
IC-2	82	3	3.66											3	3.66							3	3.66
IC-3	228	10	4.39	2										10	4.39							10	4.39
IC-4	211	9	4.27	2	0.95							7	3.32	18	8.53							18	8.53
Collins Creek																							
CC-1	282	46	16.31											46	16.31							46	16.31
CC-2	366	17	4.64											17	4.64							17	4.64
CC-3	264	18	6.82											18	6.82							18	6.82
Skull Creek																							
SC-1	410	17	4.15					1	0.24					18	4.39							18	4.39
SC-2	373	27	7.24											27	7.24	4	1.10					31	8.31
SC-3	425	89	20.94									18	4.24	107	25.18							107	25.18
SC-4	922	13	1.41					1	0.11					14	1.52							14	1.52
Quartz Creek																							
QC-1	143	25	17.48					2	2.50					27	18.88							27	18.88
QC-2	143	10	7.00											10	7.00							10	6.99
Orogrande Creek																							
UOC-1	148	2	1.35							4	2.70			6	4.05							6	4.05
UOC-2	109	10	9.17	1	0.92					3	2.75			14	12.84							14	12.84
UOC-3	93									3	3.23			3	3.23							3	3.23
French Creek																							
FC-1	194	6	3.09	3	1.55	3	1.55			1	0.52			13	6.70							13	6.70
FC-2	119	13	10.92	2	1.68									15	12.61							15	12.61
FC-3	80	9	11.25	1	1.25									10	12.50							10	12.50
Hemlock Creek																							
HC-1	202	10	4.95	9	4.46									19	9.40			1	0.50	2	0.99	22	10.89
HC-2	206	4	1.94	2	0.97									6	2.91							6	2.91
HC-3	187	17	9.09	4	2.14									21	11.23							21	11.23
Beaver Dam Creek																							
BDC-1	43			2	4.65									2	4.65					1	2.33	3	6.98
BDC-2	48	2	4.17	8	16.67									10	20.83							10	20.83
Middle Creek																							
MC-1	192			1	0.52									1	0.52							1	0.52
MC-2	123					2	1.62							2	1.62							2	1.63
MC-3	88			11	12.50	5	5.68							16	18.18							16	18.18
Ruby Creek																							
RC-1	105	1	0.95	5	4.76	4	3.81							10	9.52							10	9.52
Little Moose Creek																							
LMC-1	352			4	1.4									4	1.14							4	1.14
LMC-2	182	4	2.20	2	1.10									6	3.30					1	0.55	7	3.85
LMC-3	212	9	4.25	2	0.94									11	5.19							11	5.19

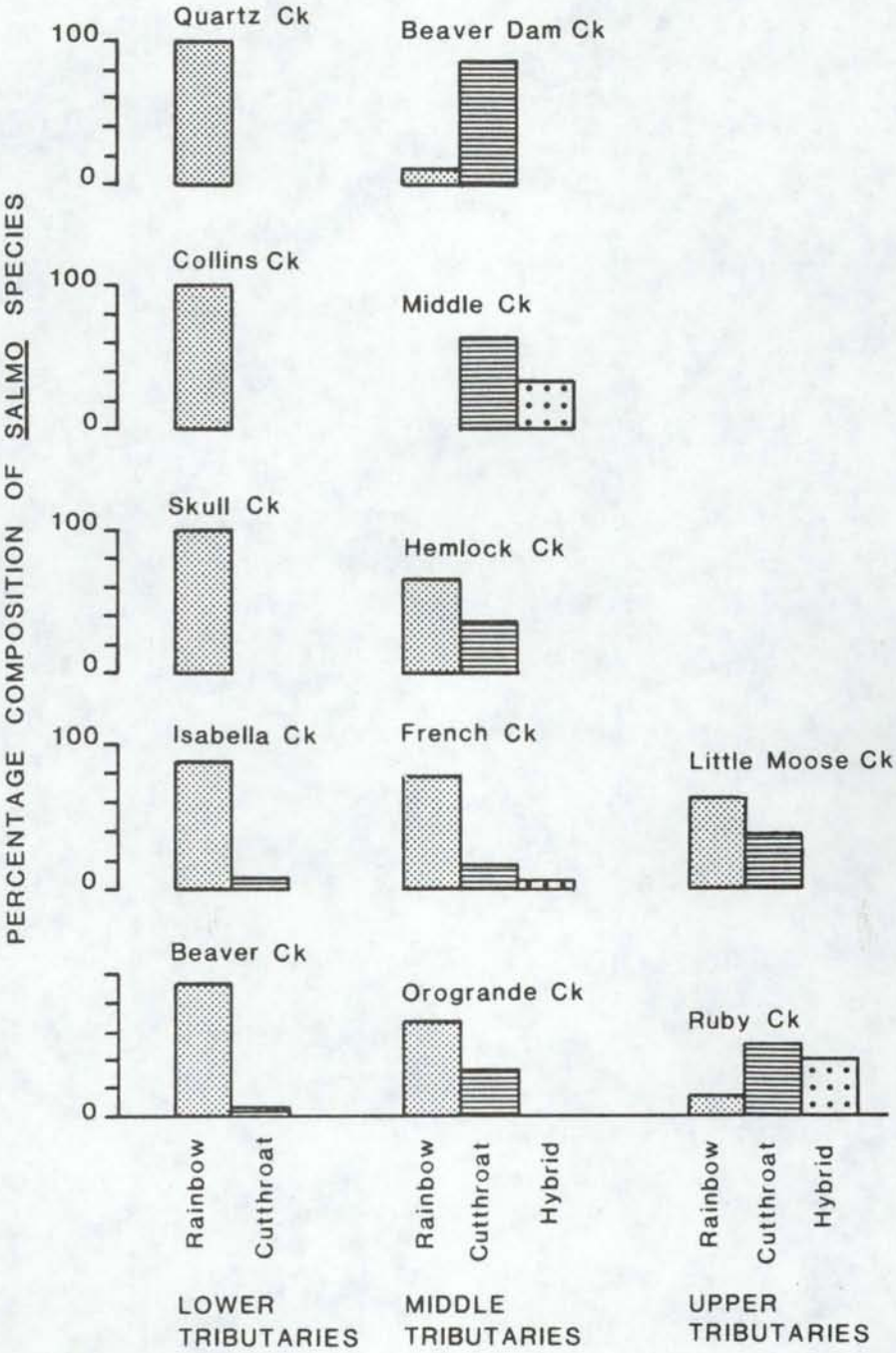

Figure 2. Relative proportion of Salmo gairdneri, Salmo clarki and their hybrid in transects of the North Fork Clearwater River, grouped by tributary location.

Table 3. Number of rainbow trout in each of three age classes, based on length, in transects of ten tributary creeks of the North Fork Clearwater River, August to September 1983.

	Age class		
Creek	0	I	II and older
Beaver	-	5	7
Collins	26	22	33
Skull	10	2	32
Orogrande	1	-	2
French	-	8	20
Hemlock	14	3	14
Beaver Dam	-	-	2
Middle	-	1	-
Ruby	-	-	1
Little Moose	6	3	4
Totals (%)	57 (26)	44 (20)	115 (53)

DISCUSSION

Cutthroat trout have not utilized fully the habitat vacated by steelhead trout since anadromous fish were excluded from the North Fork of the Clearwater River. Mean densities of rainbow trout in trend areas have decreased since 1968, but cutthroat trout numbers have not increased correspondingly (Figure 3). From 1968 to 1976, the percentage of rainbow trout at selected sites in the drainage decreased and investigators speculated that it might continue to decline (Pettit 1976). However, in the twelve tributaries studied in 1983, four of which were sampled in earlier years, the trend had reversed. Rainbow trout have continued to be the principal occupants of the drainage (Figure 4) although at reduced densities from the time when anadromous forms were present (Figure 3).

The apparent increase in numbers of rainbow trout between 1976 and 1983 may be due to an increased abundance of age 0 fish in 1983. In 1968, age class composition of rainbow trout in eight tributaries studied by Idaho Department of Fish and Game was nearly identical to that in their study sites in the nearby Lochsa River drainage, an unblocked anadromous fish stream. In both areas, age 0 fish constituted a large portion of the collections (Figure 5). By 1973, no fry were collected from Fish and Game trend areas in the North Fork, while the age class composition of rainbow trout in samples from the Lochsa River remained similar to that observed in 1968. In this 1983 study, age 0 fish made up 25% of the rainbow trout observed (Figure 5). The increase in age 0 fish abundance may be partly a consequence of snorkeling site selection. Idaho Fish and Game survey sites were located primarily in the lower portions of tributaries; whereas in this study transects were selected

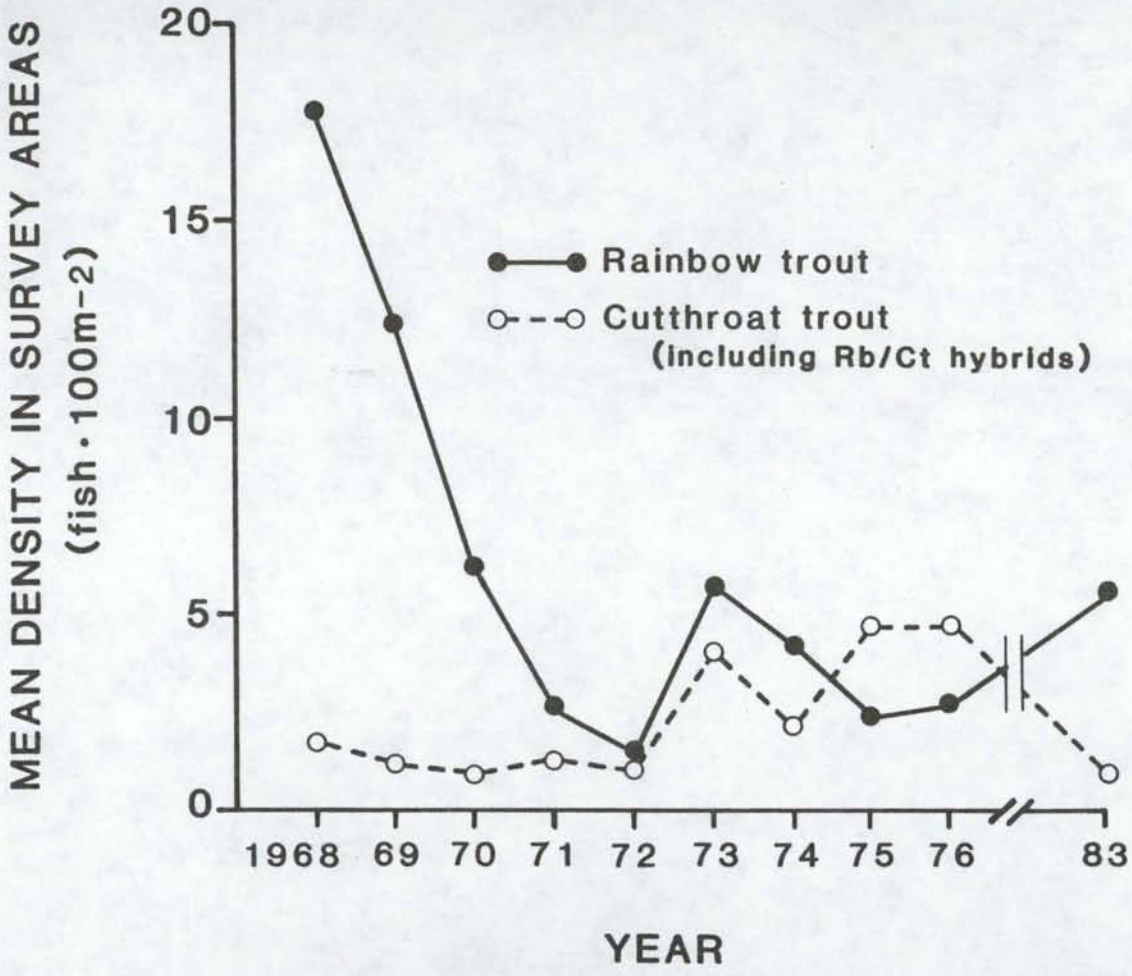

Figure 3. Mean density of Salmo species at selected monitoring sites in the North Fork Clearwater River drainage. Mean densities for 1968-1976 are from studies conducted by Idaho Department of Fish and Game of eight sites from eight tributaries. Data for 1983 are from 33 transects on a total of 12 tributaries (this study).

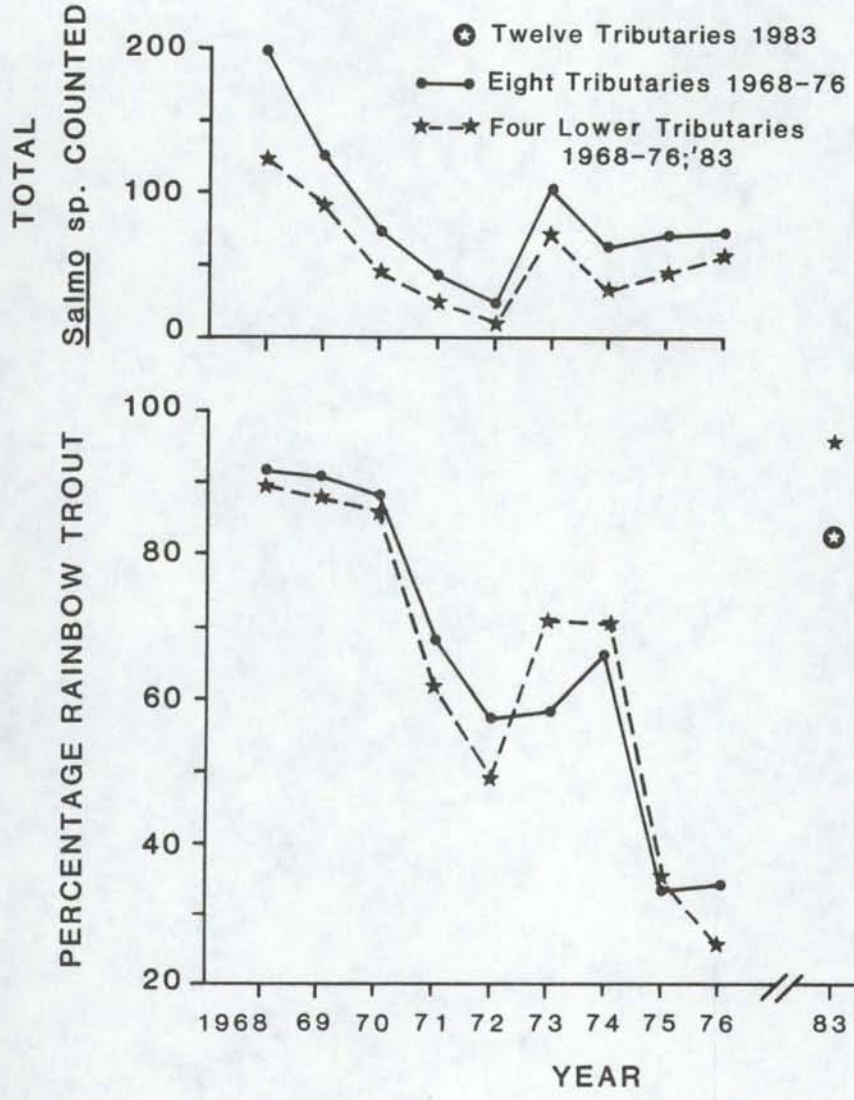

Figure 4. Total number of fish of the genus Salmo and percentage rainbow trout observed in Idaho Fish and Game trend areas (1968-1976) and this study (1983). Total number of fish observed are not reported for 1983 because size and location of sampling areas differed.

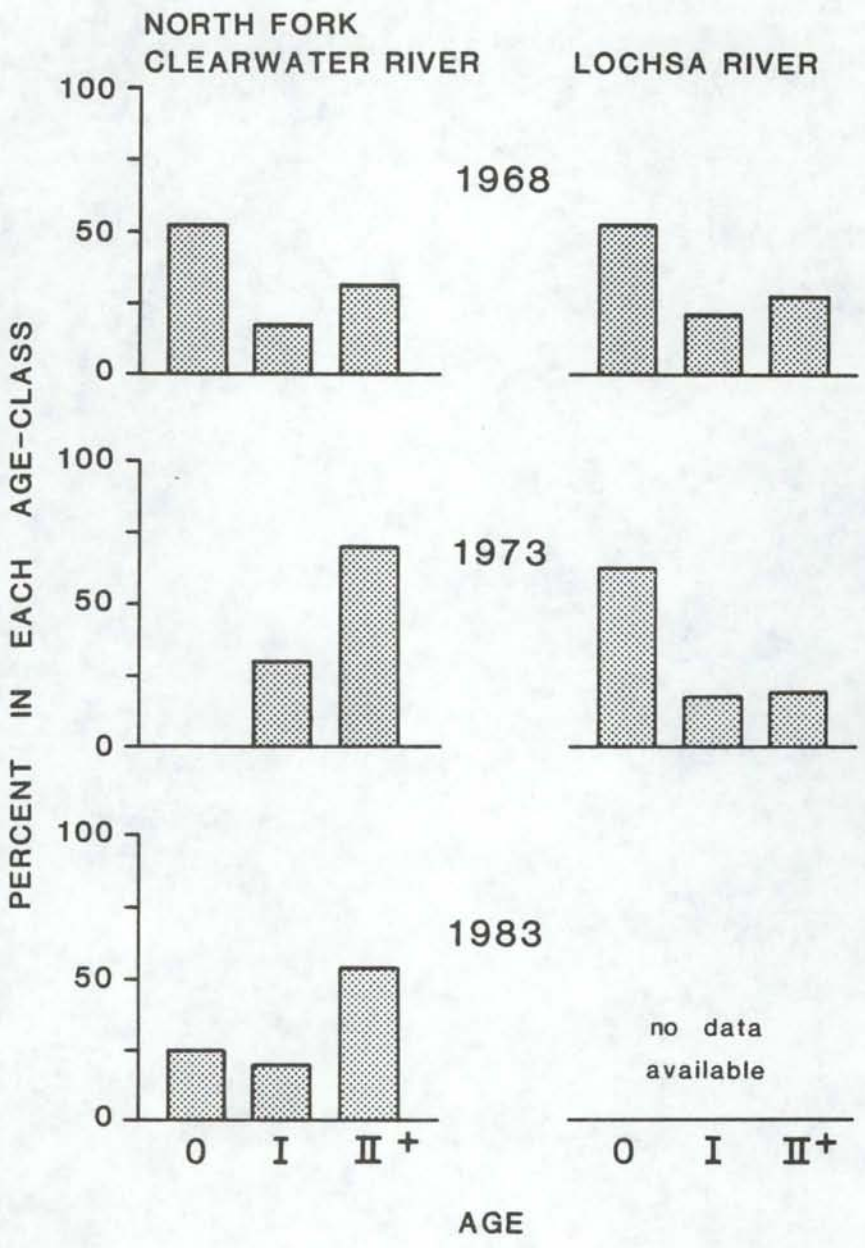

Figure 5. Age class composition of rainbow trout observed in all trend areas of the North Fork Clearwater River and of nearby Lochsa River, before, five and fifteen years after anadromous fish were excluded from the North Fork drainage.

in both upper and lower portions. But when anadromous forms of rainbow trout were present in 1968, these same lower portions studied by Idaho Department of Fish and Game contained large numbers of age 0 fish and had overall fish densities that were much higher (Figure 3).

Species composition in snorkel transects in Weitas Creek (middle North Fork drainage) counted by U.S. Forest Service personnel from 1981 to 1983 (Murphy 1984) revealed fluctuating trends in relative abundance of cutthroat and rainbow trout. Rainbow trout, probably descendents of anadromous steelhead that formerly spawned in the drainage, were occupying significant portions of Weitas Creek. In the lower transects of Weitas Creek, the density of rainbow trout was higher than that of cutthroat. Differences in abundance were attributed by Forest Service personnel in part to the greater susceptibility of cutthroat than rainbow trout to angling pressure (Johnson 1977). Combined densitites of cutthroat and rainbow trout observed by Forest Service personnel (0.48 to 1.36 fish $\cdot$ 100 m^{-2} over the three year study) were less than one-fourth the densities we observed in Weitas Creek. Forest Service sites in Weitas Creek were located in larger streams of the drainage and rainbow and cutthroat trout constituted only 10 to 21% of the fish observed in the transects. The dominant fish species was mountain whitefish. In our study, mountain whitefish were present in only 6% of the transects (Table 1, Table 2).

Elimination of anadromous fish from the North Fork of the Clearwater River has reduced the overall density of fish in tributaries of the watershed. Resident cutthroat and residualized rainbow trout are not fully utilizing the habitat that was once occupied by juvenile steelhead. Experimental studies of the behavior and habitat require-

ments of the endemic juvenile and adult rainbow and cutthroat trout should be conducted to determine if, for example, a portion of these residualized rainbow trout still emigrate downstream like smolts. Furthermore, other stocks of rainbow or cutthroat trout that could more fully utilize the tributaries and even use the reservoir such as adfluvial or later-maturing stocks should be evaluated carefully for potential introduction into the drainage.

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APPENDIX

LOCATION, DESCRIPTION, AND SNORKEL COUNTS OF FISH IN TRANSECTS ESTABLISHED IN THE NORTH FORK CLEARWATER RIVER WATERSHED AUGUST AND SEPTEMBER 1983.

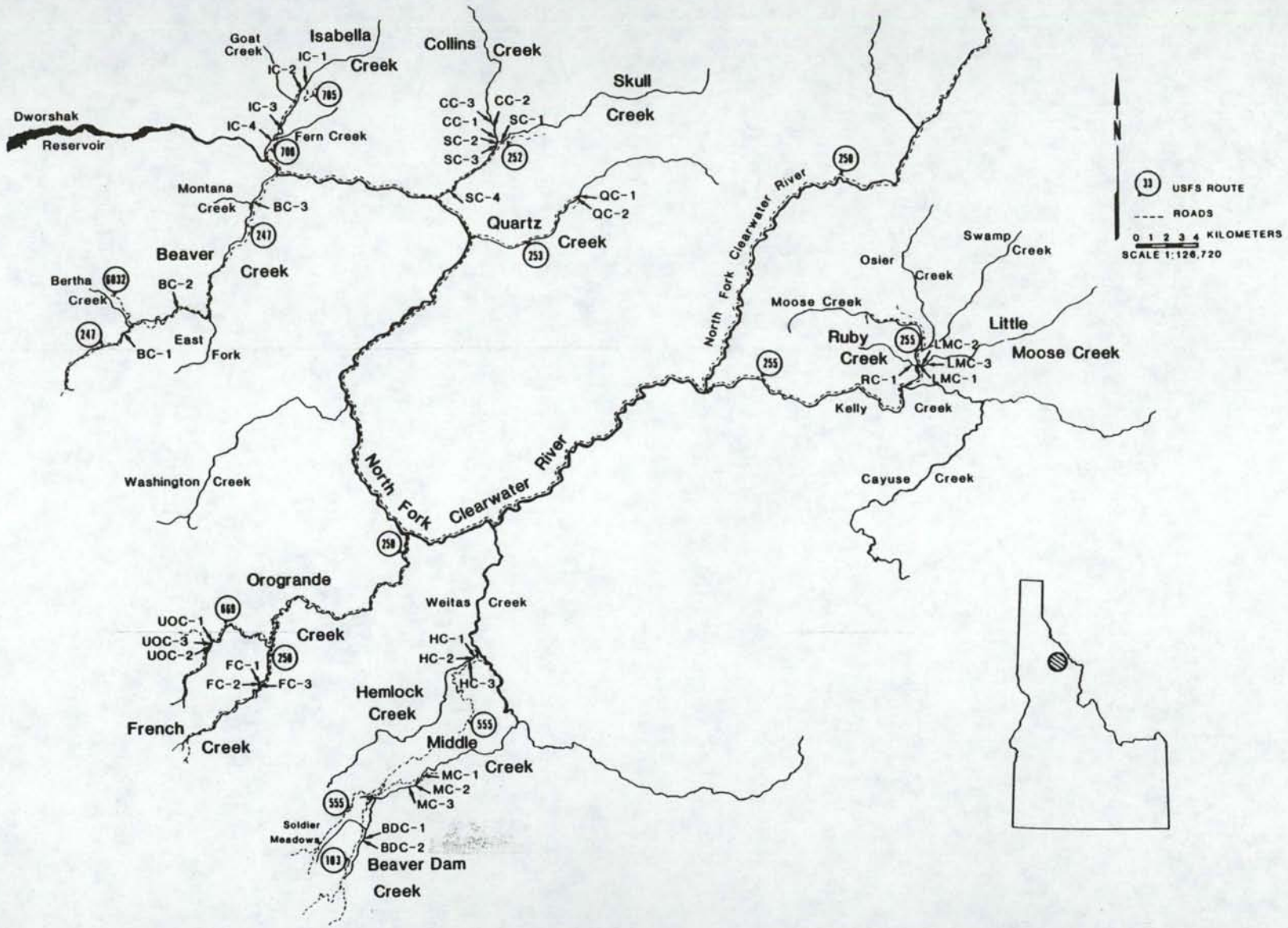


Figure 1. Location of transects established August to September 1983 in the North Fork Clearwater River drainage.

LOWER TRANSECTS

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Beaver Creek

tributary to:
North Fork Clearwater

transect code
BC-1

USGS 1:24,000 quad
Brown's Rock

distance from next downstream station:
4.5 km

distance from next upstream station:
None

site description:

Shallow pool 27 m upstream from the culvert at Road 6032 entering from West at Bertha Creek, 6.4 Km (4 miles) North from Beaver Creek Divide along Road 247 from Headquarters.

$\bar{x}$ width	length	surface area
5.5 m	29 m	160 m^2

Fish Abundance

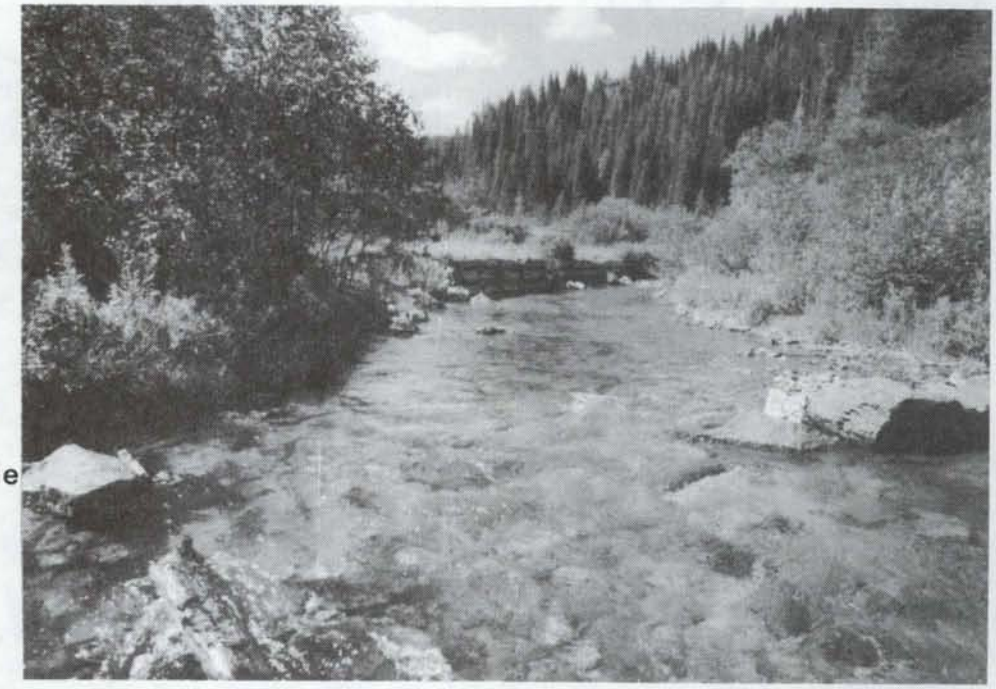
Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-12-83	1345	14	-	3		-	-	-	1 bull trout
9-9-83	1400	9	-	1	1	-	-	-	1 bull trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Beaver Creek

tributary to:
North Fork Clearwater

transect code
BC-2



USGS 1:24,000 quad
Thompson Pt.

distance from next downstream station:
None

distance from next upstream station:
4.5 km

site description:

Pool area 1.7 km (1.1 mile) upstream from mouth of East Fork. Beaver Creek flows along West side of Road 247 from Headquarters. Two boulders along log revetment form upstream transect boundary. Downstream boundary is riffle area below revetment with boulders on west bank (right side, looking upstream) coming out 1/3 distance into stream.

$\bar{x}$ width	length	surface area
6.4 m	43 m	275 m^2

Fish Abundance

Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-12-83	1455	17	-	9		-	-	-	1 bull trout
9-9-83	1530	10	-	4	4	-	-	1	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Isabella Creek

tributary to:
North Fork Clearwater

transect code
IC-1

USGS 1:24,000 quad
Mallard Peak

distance from next downstream station:
55 m

distance from next upstream station:
None

site description:

Small pool and pocket water area 46 m upstream from uppermost bridge over Isabella Creek. This last bridge is 1.6 road km (1 mile) upstream from Goat Creek. Upstream boundary is narrow rapids, flanked by large boulders on either shore. Hourglass constriction in mid transect with white water and lowermost boundary is a white water drop over small boulders.

$\bar{x}$ width	length	surface area
5.5 m	24.7 m	136 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-13-83	1500	14	-	5		-	1		1 bull trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Isabella Creek

tributary to:
North Fork Clearwater

transect code
IC-2

USGS 1:24,000 quad
Mallard Peak

distance from next downstream station:
2 km

distance from next upstream station:
55 m

site description:

Two small pools approximately 9 m downstream from the uppermost bridge of Isabella Creek. Upstream boundary is defined by large boulders on both banks. Two smaller groups of boulders are located nearly midway in the length of the reach. Both are closest to west bank (left side, looking upstream). The lower boundary is a small drop with larger boulders on the east bank.

$\bar{x}$ width	length	surface area
6.4 m	12.8 m	28 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II	Other species
8-13-83	1530	14	-	3		-	-	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Isabella Creek

tributary to:
North Fork Clearwater

transect code
IC-3

USGS 1:24,000 quad
Sheep Mtn.

distance from next downstream station:
700 m

distance from next upstream station:
2 km

site description:

Pool area located alongside rock ledge and road (west bank of left side looking upstream) approximately 0.6 km (0.4 mi) upstream from the first bridge over Isabella Creek. Several large submerged boulders in stream bounded upstream by constricted white water and downstream by riffle.

$\bar{x}$ width	length	surface area
11.9 m	9.2 m	228 m^2

Fish Abundance

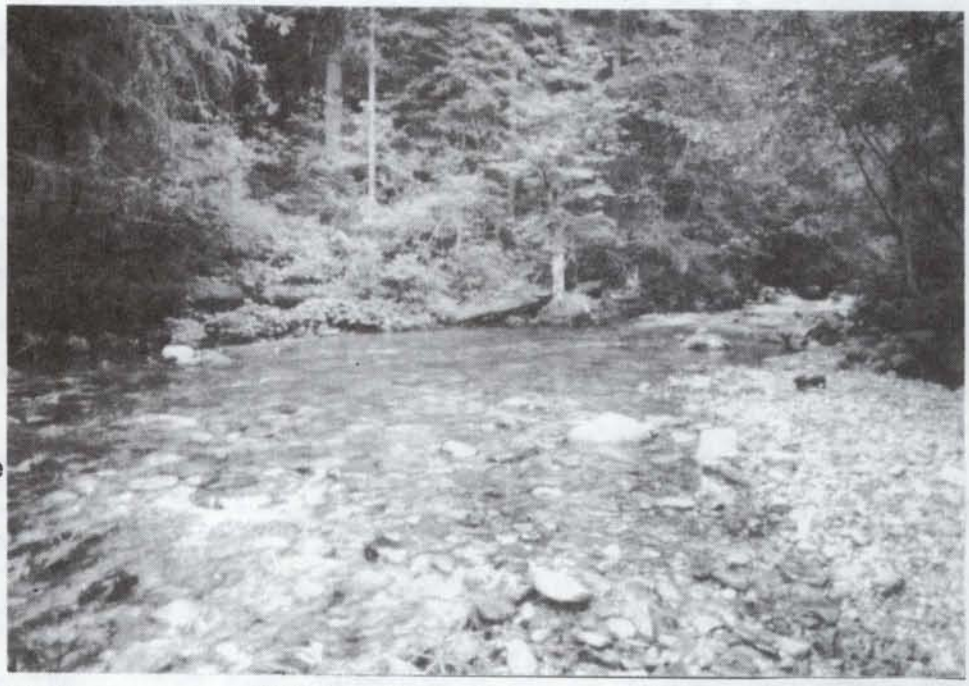
Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II	Other species
				8					
8-13-83	1620	15	2			-	-	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Isabella Creek

tributary to:
North Fork Clearwater

transect code
IC-4



USGS 1:24,000 quad
Sheep Mtn.

distance from next downstream station:
None

distance from next upstream station:
700 m

site description:

Shallow pool located down pathway past unimproved campsite just below bridge over Fern Creek (first bridge along Isabella Creek on Road 700 moving upstream). Logs and some overhanging vegetation are along the west bank. Bounded upstream by white water and boulders and downstream by riffle area.

$\bar{x}$ width	length	surface area
11 m	19.2 m	211 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead			Cutthroat Trout			Other species
			0	I	II+	0	I	II+	
8-13-83	1520	16	-	9		-	2		7 white-fish

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Collins Creek

tributary to:
Skull Creek

transect code:
CC-1

USGS 1:24,000 quad
The Nub

distance from next downstream station:
SC-2, 100 m

distance from next upstream station:
600 m

site description:

First large pool approximately 100 m upstream from confluence with Skull Creek. Pathways from Skull Creek run on both east and west sides of Collins Creek to this point. Large boulders constrict uppermost end of pool. Sand and gravel substrate on west bank slopes down to a deep pool. Riffle area defines downstream boundary.

$\bar{x}$ width	length	surface area
11 m	25.6 m	282 m^2

Fish Abundance

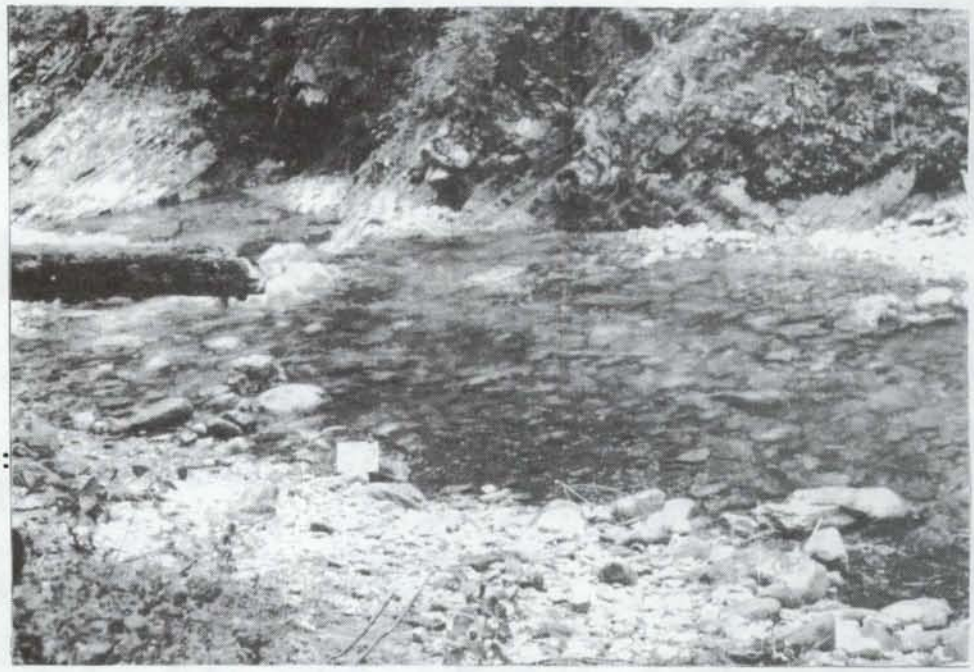
Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
8-14-83	1300	13	11	4	31	-	-	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Collins Creek

tributary to:
Skull Creek

transect code:
CC-2



USGS 1:24,000 quad
The Nub

distance from next downstream station:
950 m

distance from next upstream station:
400 m

site description:
Pool approximately 1.1 km upstream from confluence with Skull Creek. Follow trail that begins on the east side of Collins Creek at junction of Skull Creek. After fording creek the third time (trail is now on the west side of stream or lefthand side, looking upstream) a side trail leads to a campside and transect is just adjacent to the camp. Both banks are steep but not more than 3.5 m (10 feet) high. Pool area is bordered upstream by large boulders and constricted passageway. Bedrock angles into creek on east bank. Large log overhangs west bank.

$\bar{x}$ width	length	surface area
11.8 m	31 m	366 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
9-10-83	1200	9	6	11	0	-	-	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Collins Creek

tributary to:
Skull Creek

transect code:
CC-3

USGS 1:24,000 quad
Pole Mtn.

distance from next downstream station:
400 m

distance from next upstream station:
None

site description:

Pool area approximately 1.5 km upstream from confluence with Skull Creek. Follow trail alongside Collins Creek, fording creek three times. Transect upstream of the fourth crossing of the stream as the trail moves to the east side (right-hand side looking upstream). This area is nearly 2 pools, with large boulders defining the uppermost section and a large, long log overhanging the lowermost section.

$\bar{x}$ width	length	surface area
9 m	29.3 m	264 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
9-10-83	1130	9	9	7	2	-	-	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Skull Creek

tributary to:
North Fork Clearwater

transect code:
SC-1

USGS 1:24,000 quad
The Nub

distance from next downstream station:
27 m

distance from next upstream station:
None

site description:

Pocket water area just upstream from confluence of Skull and Collins Creeks. Large boulders create separated areas in the stretch of stream. Overhanging tree roots and instream logs provide cover along north side of stream. Rubble and cobble substrate predominate.

$\bar{x}$ width	length	surface area
12.8 m	32 m	410 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
8-14-83	1325	14	1	-	16	-	-	2	1 bull trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Skull Creek

tributary to:
North Fork Clearwater

transect code:
SC-2

USGS 1:24,000 quad
The Nub

distance from next downstream station:
200 m

distance from next upstream station:
27 m

site description:

Long and shallow pool at confluence of Skull and Collins Creeks. Small boulders and cobble to sand on substrate. Upstream boundaries defined by small boulders at mouth of Collins Creek and nearly 90° bend to upstream continuation of Skull Creek. Down stream boundary is riffle area and slight narrowing of stream.

$\bar{x}$ width	length	surface area
8.2 m	41 m	336 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
8-14-83	1230	14	9	2	16	-	-	-	4 suckers

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Skull Creek

tributary to:
North Fork Clearwater

transect code:
SC-3

USGS 1:24,000 quad
The Nub

distance from next downstream station:
None

distance from next upstream station:
200 m

site description:

Two contiguous pools adjacent to campspot approximately 200 m downstream from the confluence of Collins Creek. West bank with large rock outcropping and boulders in stream. Each pool with boulders and riffles at upstream boundary. East bank has small gravel and path to campground.

$\bar{x}$ width	length	surface area
13.7 m	31 m	425 m^2

Fish Abundance

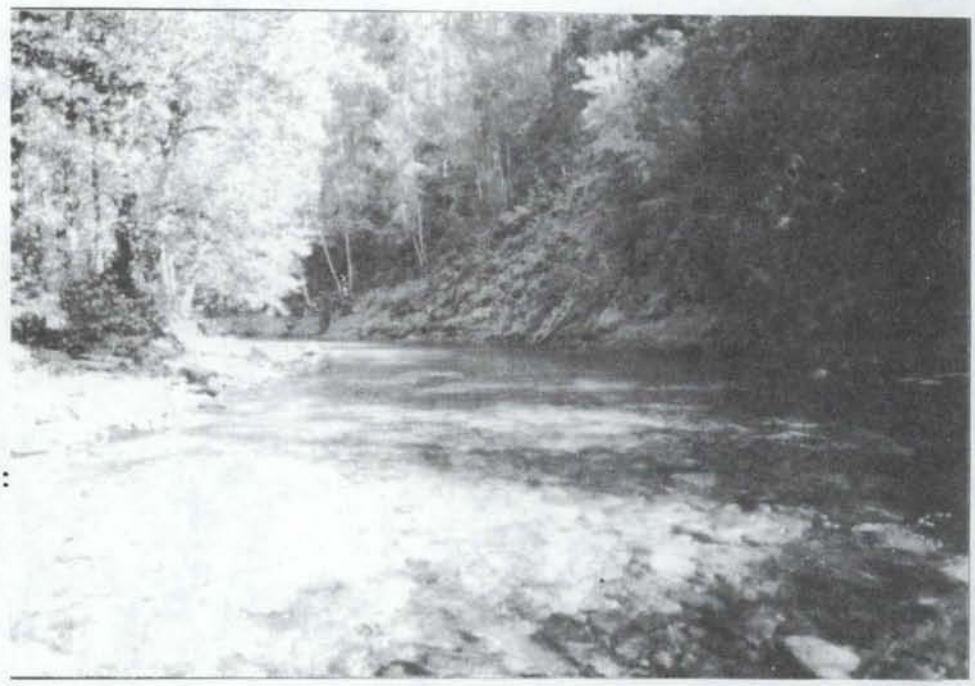
Date	Hour	Water temp. °C	Rainbow/Steelhead			Cutthroat Trout			Other species
			0	I	II+	0	I	II	
8-8-83	-	16		89		-	-	-	18 white-fish

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Skull Creek

tributary to:
North Fork Clearwater

transect code:
SC-4



USGS 1:24,000 quad
The Nub

distance from next downstream station:
None

distance from next upstream station:
4.1 km

site description:
Shallow pool reach at lowermost portion of stream approximately 1 km (0.6 mile) up from creek mouth just below Pear Creek confluence. Mostly cobble bottom with some small boulders. Riffles at upstream and downstream boundaries.

$\bar{x}$ width	length	surface area
16 m	57.6 m	922 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead O	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout O	Cutthroat Trout I	Cutthroat Trout II	Other species
8-8-83				13		-	-	-	1 bull trout
8-14-83	1500	16							

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Quartz Creek

tributary to:
North Fork Clearwater

transect code:
QC-1

USGS 1:24,000 quad
Elizabeth Lake

distance from next downstream station:
1 m

distance from next upstream station:
None

site description:

Pool at uppermost bridge of Road 253 along Quartz Creek, approximately 8.8 km (5.5 miles) above mouth of creek. Pool begins under the road bridge. The upper limits of the pool are defined by boulders and white water. The lower limits are a riffle area beyond the trail coming down from the road along the west bank.

$\bar{x}$ width	length	surface area
8.2 m	17.4 m	143 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II	Other species
8-8-83	1400	-		25		-	-	-	2 bull trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Quartz Creek

tributary to:
North Fork Clearwater

transect code:
QC-2

USGS 1:24,000 quad
Elizabeth Lake

distance from next downstream station:
None

distance from next upstream station:
1 m

site description:

Pocket water area just downstream from transect pool below road bridge (QC-1). Three sections divided by white water riffles. Substrate with many small boulders. Lower most boundary defined by large rocks at line perpendicular to stream bank. Uppermost boundary is riffle area with large log debris on west bank near foot path.

$\bar{x}$ width	length	surface area
8.2 m	17.4 m	143 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead			Cutthroat Trout			Other species
			0	I	II+	0	I	II	
8-8-83	1400	-		10		-	-	-	-

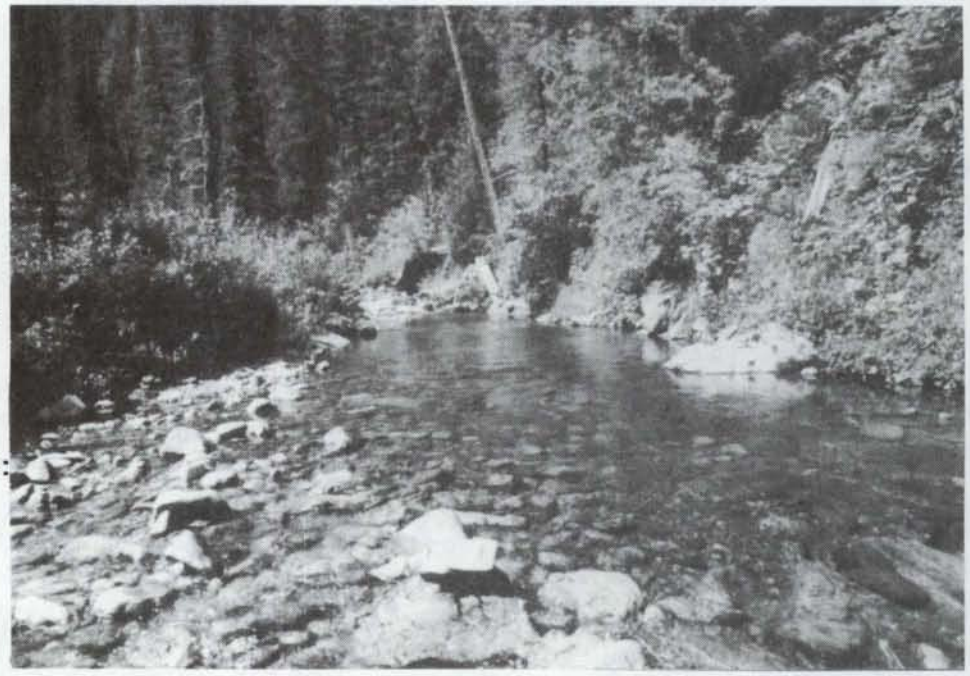
MIDDLE TRANSECTS

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
French Creek

tributary to:
Orogrande Creek

transect code:
FC-1



USGS 1:24,000 quad
Larch Butte

distance from next downstream station:
110 m

distance from next upstream station:
None

site description:

Pool and pocket water 2.25 km (1.4 miles) upstream from mouth of French Creek. Bordered by riffles and large boulders at upstream end. Sandy shallow on road side (south bank). Riffle at downstream end fans out.

$\bar{x}$ width	length	surface area
6.5 m	29.8 m	194 m^2

Fish Abundance

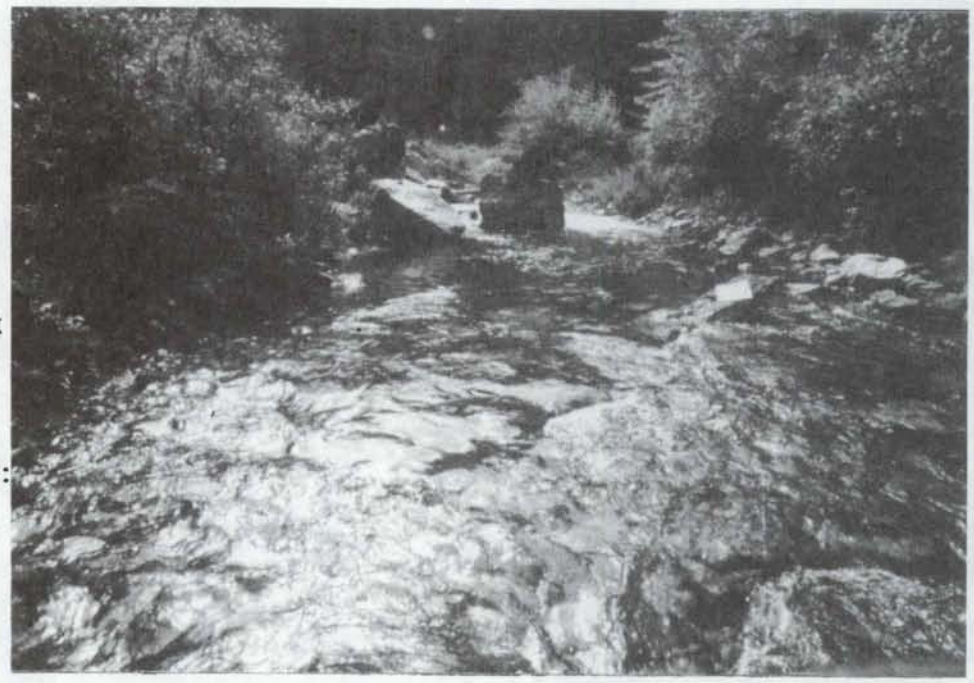
Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-26-83	1200	13.5	-	2	7	-	1	2	brook trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
French Creek

tributary to:
Orogrande Creek

transect code:
FC-2



USGS 1:24,000 quad
Larch Butte

distance from next downstream station:
110 m (by road)

distance from next upstream station:
37 m

site description:

Pool and pocket water area directly alongside road, 2.36 km (1.5 miles) upstream from the mouth of French Creek. Area is bordered upstream by large (2.2 m wide) cubeshaped rock and smaller rocks and riffle.

$\bar{x}$ width	length	surface area
7.3 m	16.3 m	119 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead			Cutthroat Trout			Other species
			0	I	II+	0	I	II+	
8-26-83	1305	14	-	1	9	-	1	1	3 "II+" hybrid rainbow-cutthroat trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
French Creek

tributary to:
Orogrande Creek

transect code:
FC-3

USGS 1:24,000 quad
Larch Butte

distance from next downstream station:
37 m (by road)

distance from next upstream station:
None

site description:

Pocket water and pool area 2.40 km (1.5 miles) upstream from the mouth of French Creek. Large logs and cut bank are along north bank opposite road. Riffles and small boulders border upstream and downstream limits of transect.

$\bar{x}$ width	length	surface area
6.6 m	12.1 m	80 m^2

Fish Abundance

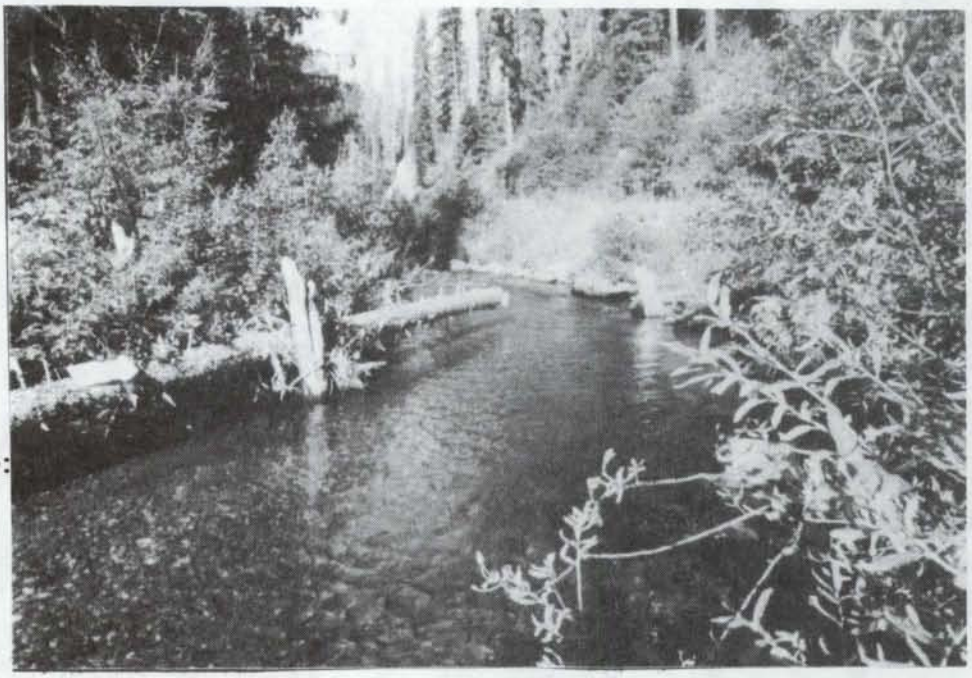
Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-26-83	1345	14	-	5	4	-	1	-	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Orogrande Creek

tributary to:
North Fork Clearwater

transect code:
UOC-1



USGS 1:24,000 quad
French Mt.

distance from next downstream station:
None

distance from next upstream station:
46 m

site description:

Shallow pool (run) at bend in creek and road 3.8 miles from French Saddle (Road 250) on road 669. Bottom substrate primarily cobble and some sand. Large log overhanging bend midway in transect on south bank. Riffles form boundary upstream and downstream of site. Old log road joins Road 669 just upstream from site.

$\bar{x}$ width	length	surface area
5.1 m	29.1 m	148 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
8-26-83	900	10.5	1	-	1	-	-	-	4 brook trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Orogrande Creek

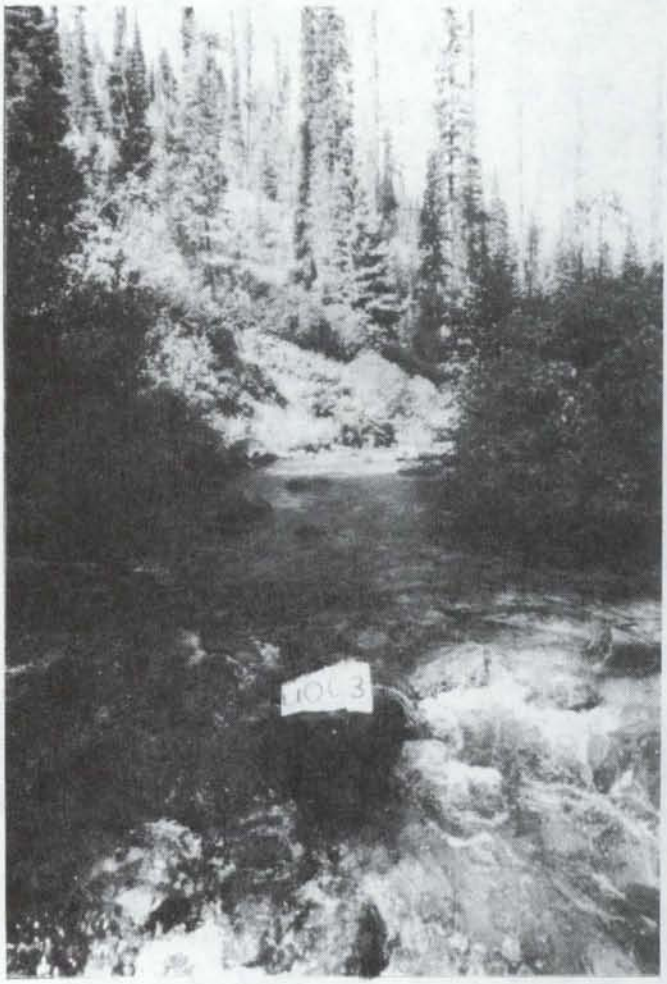
tributary to:
North Fork Clearwater

transect code:
UOC-3

USGS 1:24,000 quad
French Mt.

distance from next downstream station:
46 m

distance from next upstream station:
46 m



site description:

Pocket water area bounded downstream by small boulder in center of stream and riffle. Overhanging brush on roadside. Upstream boundary is sandy riffle area.

$\bar{x}$ width	length	surface area
6.5 m	14.3 m	93 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II	Other species
8-26-83	0930	11	-	-	-	-	-	-	3 brook trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Orogrande Creek

tributary to:
North Fork Clearwater

transect code:
UOC-2

USGS 1:24,000 quad
French Mt.

distance from next downstream station:
46 m

distance from next upstream station:
None

site description:
Pool area very near Road 669 approximately 6.4 km (4 miles) from French Saddle. Two large trees lie from road to creek at upstream boundary.

$\bar{x}$ width	length	surface area
6.1 m	17.8 m	109 m^2

Fish Abundance

Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
8-26-83	1015	12	-	-	1	-	-	1	2 brook trout

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Hemlock Creek

tributary to:
Weitas Creek

transect code:
HC-1

USGS 1:24,000 quad
Lean to Point

distance from next downstream station:
None

distance from next upstream station:
153 m

site description:

Pool and shallow area at bend in stream approximately 137 m upstream from washed-out bridge at mouth of Hemlock Creek. Transect site is bounded upstream and downstream by riffles. Logs abut upstream boundary on south bank (lefthand side looking upstream).

$\bar{x}$ width	length	surface area
8.5 m	23.8 m	202 m^2

Fish Abundance

Date	Hour	Water emp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
8-25-83	0900	13	4	1	5	1	3	5	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Hemlock Creek

tributary to:
Weitas Creek

transect code:
HC-2

USGS 1:24,000 quad
Lean to Point

distance from next downstream station:
153 m

distance from next upstream station:
434 m

site description:

Run, small pool and pocket water approximately 290 m upstream from washed-out bridge at mouth of Hemlock Creek. Bounded upstream by large logs in creek and downstream by riffle. Site has no tree or shrub canopy over creek.

$\bar{x}$ width	length	surface area
6.0 m	34.3 m	206 m^2

Fish Abundance

Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
8-25-83	1015	14	2	-	2	1	-	1	2 sculpins 1 dace

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Hemlock Creek

tributary to:
Weitas Creek

transect code:
HC-3

USGS 1:24,000 quad
Lean to Point

distance from next downstream station:
434 m

distance from next upstream station:
None

site description:

2 pool and 3 pocket water areas. 724 m upstream from washed out bridge at creek mouth. Rock with tree growing out of it located on south bank (right bank looking upstream).

$\bar{x}$ width	length	surface area
8.3 m	22.5 m	187 m^2

Fish Abundance

Date	Hour	Water emp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-25-83	1130	14	8	2	7	-	1	3	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Beaver Dam Creek

tributary to:
Middle Creek

transect code:
BDC-1

USGS 1:24,000 quad
Snowy Summit

distance from next downstream station:
None

distance from next upstream station:
225 m

site description:

Shallow pool (or knee deep run) approximately 69 m above the lower end of a meadow on Beaver Dam Creek, 0.8 km (0.5 mile) upstream from the Soldier Meadows culvert or 3.8 km (2.4 mile) downstream from Beaver Dam Saddle on Road 103. Flanked on both sides by double hemlock trees.

$\bar{x}$ width	length	surface area
3.5 m	12.4 m	43 m^2

Fish Abundance

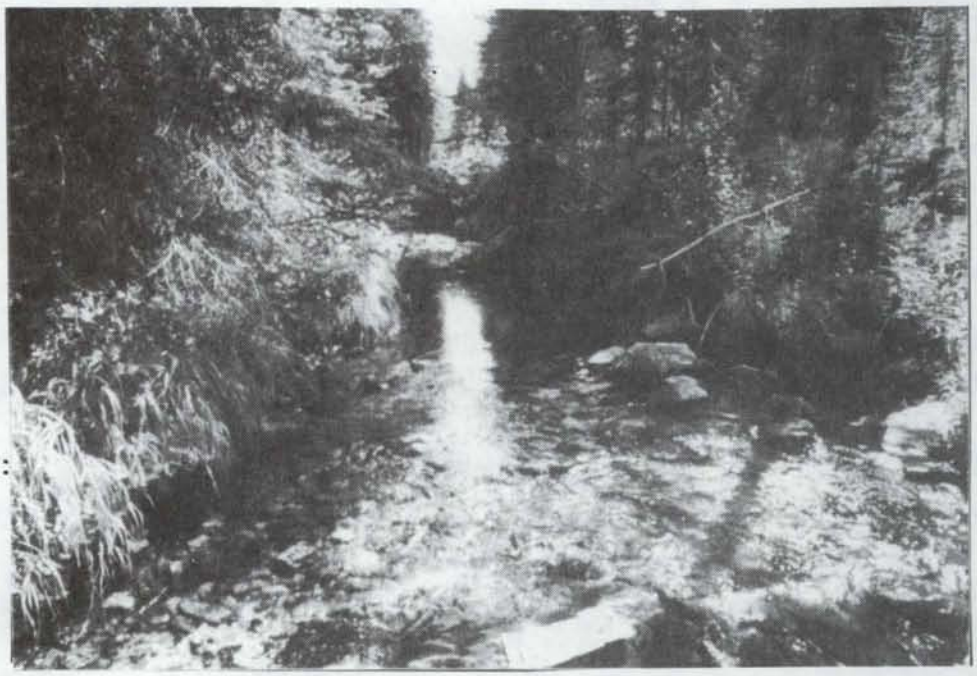
Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II	Cutthroat Trout 0	I	II+	Other species
8-24-83	1350	14	-	-	-	-	-	2	1 sculpin

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Beaver Dam Creek

tributary to:
Middle Creek

transect code:
BDC-2



USGS 1:24,000 quad
Snowy Summit

distance from next downstream station:
225 m

distance from next upstream station:
None

site description:

Shallow pool and pocket water aproximately 3.5 km (2.2 mile) from Beaver Dam Saddle on Road 103. Bounded by riffles upstream and downstream. Large boulder along downstream boundary near east bank (left looking upstream).

$\bar{x}$ width	length	surface area
4 m	11.9 m	48 m^2

Fish Abundance

Date	Hour	Water emp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-24-83	1430	14	-	-	2	-	1	7	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Middle Creek

tributary to:
Weitas Creek

transect code:
MC-1

USGS 1:24,000 quad
Weitas Butte

distance from next downstream station:
None

distance from next upstream station:
685 m

site description:

Pocket water and pool area approximately 410 m below the bridge across Middle Creek on Road 103. Bridge is located approximately 4.8 km (3 mi) off of Road 555 (Lean to Ridge Road) near Savage Camp. Side channel on north bank (left looking downstream) not included in count area. Transect begins at edge of island and runs to pocket water area just upstream from the large log barrier across stream.

$\bar{x}$ width	length	surface area
6 m	32 m	192 m^2

Fish Abundance

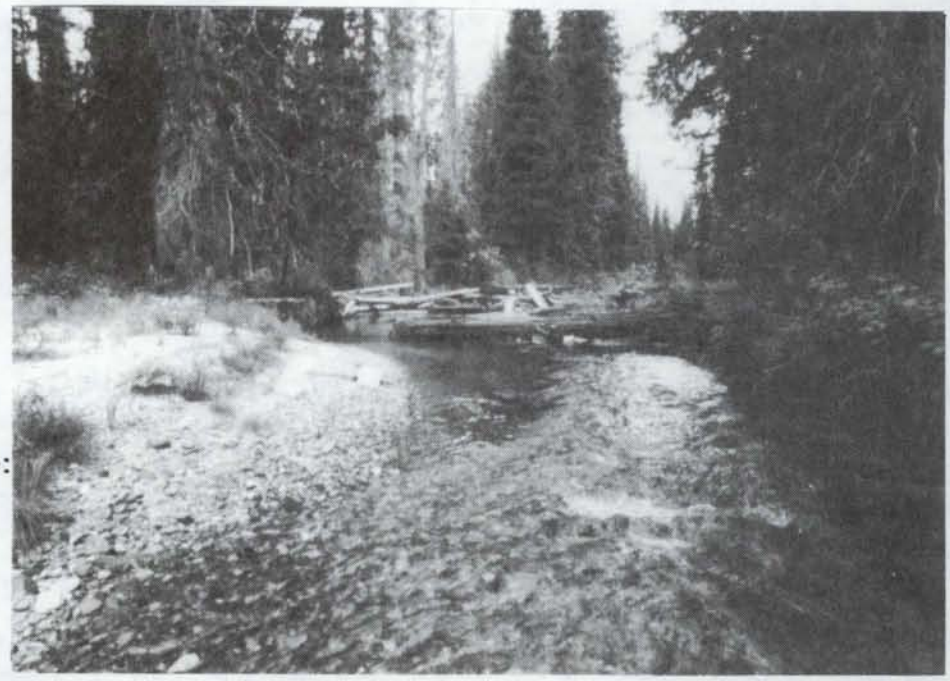
Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-24-83	0945	10	-	-	-	-	-	1	-

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Middle Creek

tributary to:
Weitas Creek

transect code:
MC-2



USGS 1:24,000 quad
Snowy Summit

distance from next downstream station:
685 m

distance from next upstream station:
155 m

site description:

2 pools and 2 shallow areas approximately 275 m above the bridge across Middle Creek. Upstream and downstream boundaries are constricted. Downstream boundary is a large log jam. Upstream boundary is small boulder in stream center and logs overhanging the cutting bank opposite sand and cobble bar.

$\bar{x}$ width	length	surface area
6.6 m	19.8 m	131 m^2

Fish Abundance

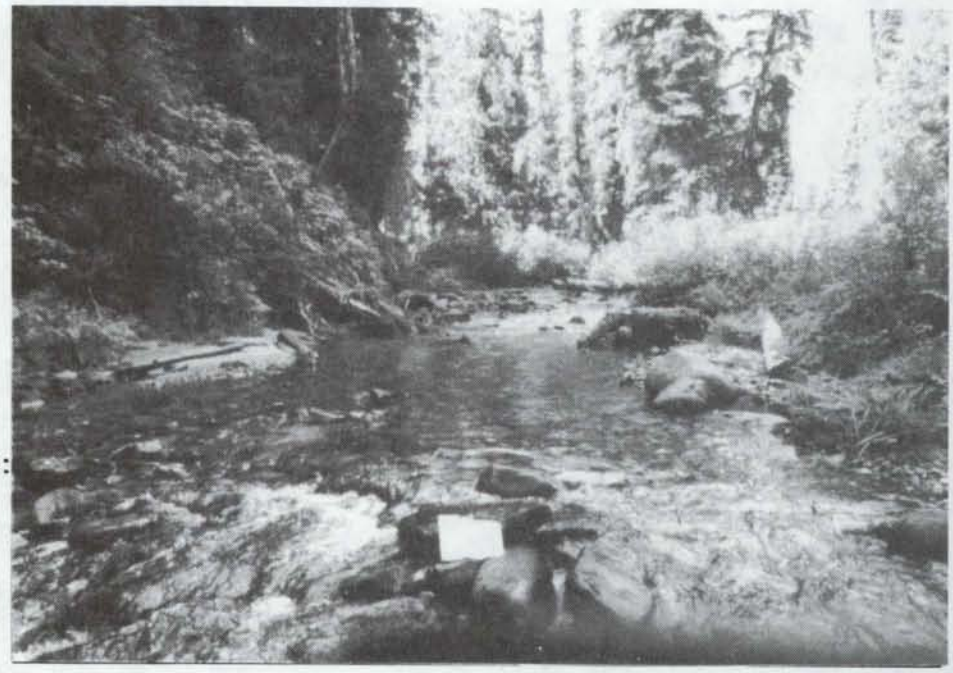
Date	Hour	Water Temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-24-83	1100	11	-	1	-	-	3	12	1 "I" and "II+" rainbow cutthroat hybrid

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Middle Creek

tributary to:
Weitas Creek

transect code:
MC-3



USGS 1:24,000 quad
Snowy Summit

distance from next downstream station:
155 m

distance from next upstream station:
None

site description:

Shallow pool or run approximately 400 m upstream from Middle Creek Bridge. Bounded upstream by overhanging logs and riffle. Large boulders in center of creek and a riffle form the downstream boundary.

$\bar{x}$ width	length	surface area
6.9 m	12.7 m	88 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	Rainbow/Steelhead I	Rainbow/Steelhead II+	Cutthroat Trout 0	Cutthroat Trout I	Cutthroat Trout II+	Other species
8-24-83	1145	11.5	-	-	-	-	3	8	3 "I" and 2 "II+" rainbow cutthroat hybrids

UPPER TRANSECTS

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Ruby Creek

tributary to:
Moose Creek

transect code:
RC-1

USGS 1:24,000 quad
Gorman Hill

distance from next downstream station:
None

distance from next upstream station:
None

site description:
Series of 4 tiny pools or pocket water areas on a U-shaped bend in Ruby Creek just downstream from a steep gradient area, approximately 210 m upstream from the creek mouth following the trail alongside Ruby Creek. The trail closely follows the creek at this point. The uppermost pool boundary is marked by log bridging across bank to bank. The lowermost boundary is also marked by a log across the creek and riffle area below.

$\bar{x}$ width	length	surface area
3.5 m	30 m	105 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
9-11-83	1300	11	-	-	1	-	-	5	4 "II+" rainbow cutthroat hybrids

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Little Moose Creek

tributary to:
Moose Creek

transect code:
LMSC-1

USGS 1:24,000 quad
Gorman Hill

distance from next downstream station:
None

distance from next upstream station:
100 m

site description:

Four pool area just about 15 m upstream from cabin and bridge near mouth of creek. Trail follows north side (left side, looking upstream). Transect is located near bend. Large boulders and bedrock on south bank especially at upstream boundary of transect. Riffle area defines uppermost boundary. Lowermost boundary is shallow run with large rock midstream.

$\bar{x}$ width	length	surface area
11 m	32 m	352 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead O	Rainbow/Steelhead I	Rainbow/Steelhead II	Cutthroat Trout O	Cutthroat Trout I	Cutthroat Trout II+	Other species
9-11-83	1100	10	-	-	-	3*	-	1	-

*Could have been rainbow.

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Little Moose Creek

tributary to:
Moose Creek

transect code:
LMSC-2

USGS 1:24,000 quad
Gorman Hill

distance from next downstream station:
100 m

distance from next upstream station:
435 m

site description:

Pool and pocket water area approximately 150 m up trail that follows creek on north bank. Rock face on south side is fairly steep and well vegetated with brush. Large curved boulders deface upstream boundary of transect. Gravel, cobble island on north bank extends latter half of transect finally narrowing and journey into a riffle that forms downstream boundary. A large log alongside north bank also defines site.

$\bar{x}$ width	length	surface area
10 m	18.2 m	182 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
9-11-83	1200	10.5	1	1	2	-	-	2	1 sculpin

NORTH FORK CLEARWATER RIVER TRIBUTARY TRANSECTS

stream:
Little Moose Creek

tributary to:
Moose Creek

transect code:
LMSC-3

USGS 1:24,000 quad
Gorman Hill

distance from next downstream station:
435 m

distance from next upstream station:
None

site description:

Shallow pool and pocket water area approximately 550 m upstream from cabin and bridge at mouth of creek. Follow trail to its end and ford creek twice to pass rock face abutment on north side. Site is 45 m (50 paces) above very large log across stream. Transect is bounded on uppermost section by a very large boulder at south bank. Upstream the creek is braided around on island of low shrub brush. The downstream portion of the transect is defined by a large log that forms a mini dam.

$\bar{x}$ width	length	surface area
13.7 m	15.5 m	212 m^2

Fish Abundance

Date	Hour	Water temp. °C	Rainbow/Steelhead 0	I	II+	Cutthroat Trout 0	I	II+	Other species
9-11-83	1245	11	5	2	2	-	-	2	-