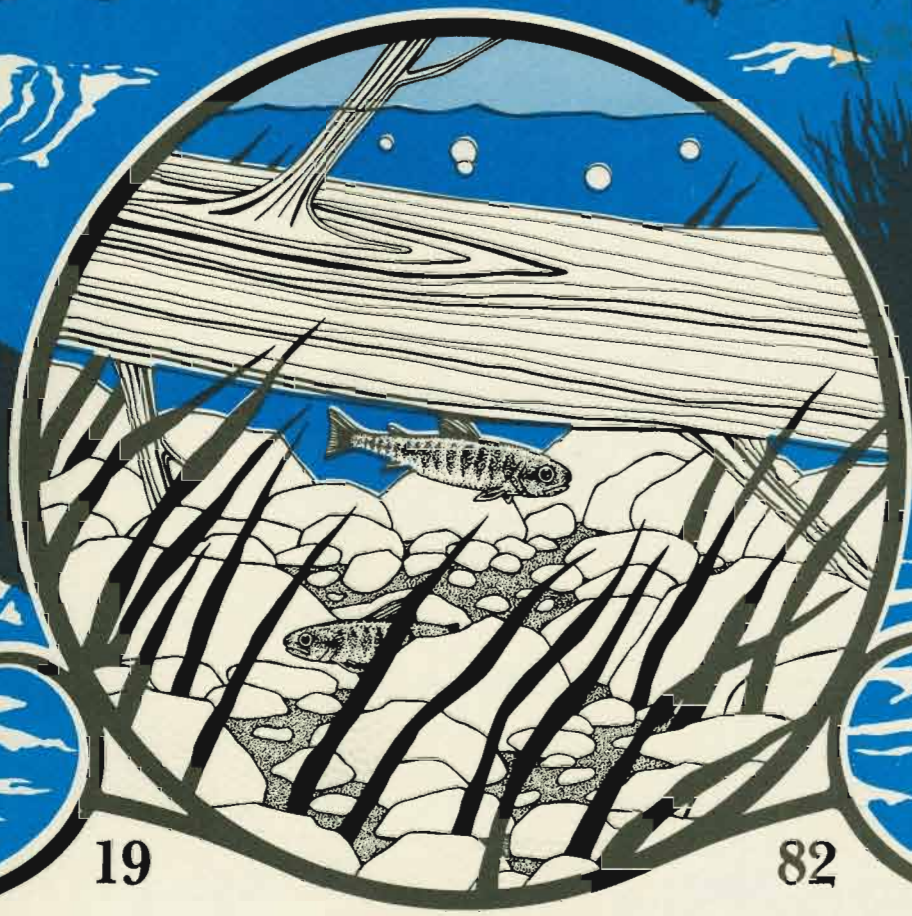
FLATHEAD



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FISH AND HABITAT INVENTORY OF STREAMS IN THE MIDDLE FORK OF THE FLATHEAD RIVER

Research Conducted by: MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
Sponsored by: ENVIRONMENTAL PROTECTION AGENCY

FISH AND HABITAT INVENTORY OF STREAMS IN THE MIDDLE FORK DRAINAGE OF THE FLATHEAD RIVER

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Sponsored By

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ACKNOWLEDGEMENTS

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INTRODUCTION

The maps, narratives and tables presented in this report summarize physical habitat and fish species information for tributaries to the Middle Fork of the Flathead River. Maps provide physical and biological sample site locations and stream reach information. The narratives briefly discuss channel and valley characteristics and fish population information. Additional information may be included in the narratives. Tables contain values for measured physical habitat and fish population parameters.

To assist in orientation, locations of tributary streams in the drainage (Figure 1) and a general summary of physical characteristics including a river kilometer index (Table 1) are provided. A legend for map symbols is presented in Figures 2 and 3.

The physical and biological data presented were collected from 1979-1982 during the Flathead River Basin Fisheries Study. Reported values represent a specific point in time, whether it be a summary of several years or a single survey date. Use of these data should be accompanied by the understanding that:

1) fluvial systems are dynamic and stream channels can change over a period of time altering their physical character as well as orientation,

2) fish populations in the upper Flathead drainage are migratory and while areas identified by our surveys were assuredly important, it was probable that stream reaches not identified as important during our "point-in-time" survey could have been important during another time of year,

3) fish habitat in stream reaches inventoried may have been previously degraded by land use activities and were not capable of supporting fish at their natural potential, and

4) juvenile fish populations may have been below carrying capacity in some reaches due to inadequate adult spawning escapements resulting from migration barriers in the stream channel, exploitation by anglers, natural phenomena such as catastrophic events, or other causes.

A major result of the Flathead River Basin Fisheries Study was the development of methods to identify relationships between habitat parameters and both important bull trout spawning areas and juvenile westslope cutthroat abundance (Graham et al. 1982, Fraley and Graham 1982). Bull trout spawning occurred in areas of low channel gradient (1 to 2%), with relatively small sustrate material (D-90 of 33-38 cm), and in larger stream channels (stream orders 3, 4 and 5) where temperatures and streamflows were suitable (mean maximum monthly summer temperatures less than 17.0^{o}C and streamflows large enough to keep the gravels free of anchor ice during the winter incubation period). Important cutthroat rearing areas could be identified by the presence of abundant cover (instream and overhead), relatively small D-90, and smaller stream channels (stream order 2 and 3).

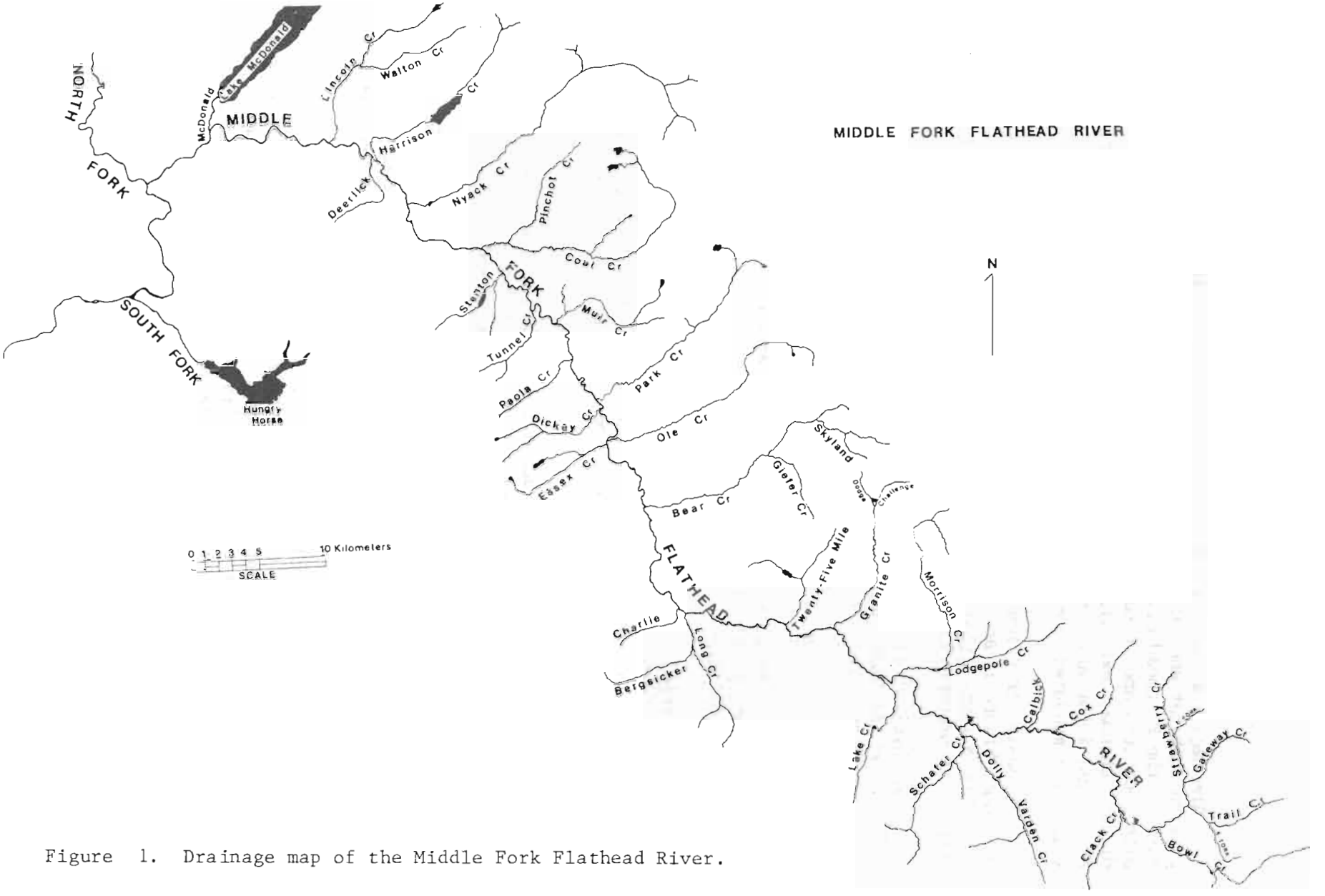

Figure 1. Drainage map of the Middle Fork Flathead River.

Table 1. Reach information and river km location for Middle Fork tributaries surveyed in 1979, 1980 and 1981.

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area (km^3)	Length (km)	Gradient (%)	Late summer flow (cfs)
McDonald Creek	7.4		440.1	---	---	150.0
		1	---	3.3	0.2	---
Lincoln Creek	18.7		93.5	---	---	23.9
		1	---	8.0	2.0	---
		2	---	8.0	3.0	---
Walton	----		24.4	---	---	---
		1	---	3.7	4.8	---
		2	---	3.2	2.5	---
Deerlick Creek	21.9		39.4	---	---	28.6
		1	---	5.1	0.2	---
Harrison Creek	22.5		69.8	---	---	47.5
		1	---	5.3	1.9	---
Nyack Creek	28.5		214.9	---	---	65.1
		1	---	11.4	0.2	---
		2	---	1.9	2.5	---
Coal Creek	37.6		144.1	---	---	42.4
		1	---	5.6	2.4	---
		2	---	12.5	0.7	---
		3	---	7.6	2.7	---
Pinchot	----		49.9	---	---	---
		1	---	1.8	4.5	---
		2	---	3.7	2.6	---
Stanton Creek	40.4		33.5	---	---	15.8
		1	---	2.4	3.5	---
Tunnel Creek	45.2		21.9	---	---	12.3
		1	---	1.4	4.2	---
		2	---	4.3	0.9	---
Muir Creek	49.2		34.8	---	---	7.4
		1	---	1.9	5.0	---
		2	---	2.4	3.8	---
		3	---	2.9	4.4	---

Table 1. (Continued).

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area (km^2)	Length (km)	Gradient (%)	Late summer flow (cfs)
Paola Creek	52.9		16.9	---	---	5.2
		1	---	1.2	9.6	---
Park Creek	58.4		101.6	---	---	22.2
		1	---	3.5	1.7	---
		2	---	8.4	0.9	---
		3	---	7.6	2.2	---
		4	---	3.2	4.5	---
Dickey Creek	59.4		23.3	---	---	3.3
		1	---	4.4	4.1	---
Ole Creek	63.2		119.5	---	---	33.6
		1	---	7.4	1.6	---
		2	---	4.0	1.1	---
		3	---	15.6	2.0	---
Essex Creek	63.6		26.6	---	---	0[1/]
		1	---	1.9	2.2	---
		2	---	1.6	8.3	---
Bear Creek	71.4		145.4	---	---	19.2
		1	---	5.9	1.8	---
		2	---	7.7	0.7	---
		3	---	10.1	2.6	---
Giefer	----		15.7	---	---	0.8
		1	---	3.7	2.5	---
Skyland	----		21.4	---	---	7.4
		1	---	3.4	3.1	---
Charlie Creek	82.0		27.2	---	---	0.7
		1	---	0.6	2.2	---
		2	---	2.9	3.7	---
		3	---	2.9	11.2	---
Long Creek	83.2		57.0	---	---	7.8
		1	---	2.7	1.1	---
		2	---	1.3	1.8	---
		3	---	4.6	5.5	---

Table 1. (Continued).

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area (km^2)	Length (km)	Gradient (%)	Late summer flow (cfs)
Bergsicker	----		22.8	---	---	1.1
		1	---	4.3	1.7	---
		2	---	1.8	2.5	---
Twenty-five Mile Creek	92.4		53.6	---	---	6.1
		1	---	1.0	6.6	---
		2	---	3.9	2.3	---
		3	---	4.9	4.9	---
Granite Creek	97.8		74.6	---	---	13.7
		1	---	7.9	1.7	---
		2	---	5.5	1.0	5.4
Challenge	----		18.9	---	---	1.1
		1	---	4.5	3.3	---
Dodge	----		11.1	---	---	0[1/]
		1	---	3.7	3.4	---
Lake Creek	103.0		19.4	---	---	21.4
		1	---	2.5	2.5	---
		2	---	4.9	0.7	---
Miner	----		19.5	---	---	---
		1	---	2.5	1.3	---
		2	---	1.9	3.3	---
Morrison Creek	106.0		133.1	---	---	28.5
		1	---	7.5	1.1	---
		2	---	3.8	2.3	---
		3	---	8.8	1.7	---
		4	---	2.3	5.2	---
Lodgepole	----		49.2	---	---	8.4
		1	---	6.5	1.1	---
		2	---	4.1	2.8	---
Whistler	----		10.1	---	---	2.6
		1	---	3.1	1.6	---

Table 1. (Continued).

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area (km^2)	Length (km)	Gradient (%)	Late summer flow (cfs)
Schafer Creek	114.6		126.4	---	---	20.3
		1	---	4.6	0.7	---
		2	---	1.1	1.3	---
		3	---	4.8	1.0	---
		4	---	3.7	5.5	---
Dolly Varden	----		68.4	---	---	14.7
		1	---	13.1	1.0	---
Argosy	----		15.4	---	---	3.8
		1	---	1.5	5.8	---
		2	---	3.7	2.7	---
W.F. Schafer	----		15.6	---	---	---
		1	---	3.3	3.8	---
Calbick Creek	122.4		21.7	---	---	2.5
		1	---	4.3	2.3	---
Cox Creek	125.2		51.	---	---	1.4
		1	---	3.3	0.6	---
		2	---	6.1	1.6	---
Clack Creek	137.7		36.57	---	---	9.9
		1	---	2.8	1.0	---
		2	---	2.7	1.0	---
		3	---	5.1	7.0	---
Bowl Creek	140.5		46.80	---	---	18.3
		1	---	2.6	1.0	---
		2	---	4.2	2.5	---
		3	---	1.6	1.0	---
		4	---	6.4	3.4	---
		5	---	2.4	3.8	---
Basin	---		25.25	---	---	4.1
		1	---	2.1	1.1	---
		2	---	6.6	1.1	---
		3	---	1.8	2.2	---

Table 1. (Continued).

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area(km^2)	Length (km)	Gradient (%)	Late summer flow (cfs)
Strawberry Creek	140 5		71.04	---	---	15.2
		1	---	4.9	0.7	---
		2	---	7.5	1.1	---
		3	---	5.1	1.9	---
		4	---	2.3	1.0	---
Trail	---		49.91	---	---	9.6
		1	---	7.7	1.6	---
		2	---	4.0	2.7	---
S.F. Trail	---		15.7	---	---	---
		1	---	4.8	3.8	---
Gateway	---		19.63	---	---	4.0
		1	---	2.5	2.9	---
		2	---	2.2	4.0	---
		3	---	1.8	4.8	---
		4	---	1.0	1.2	---
E.F. Strawberry	---		9.1	---	---	---
		1	---	3.0	5.2	---

1/ Creeks were dry at the mouth during late summer.

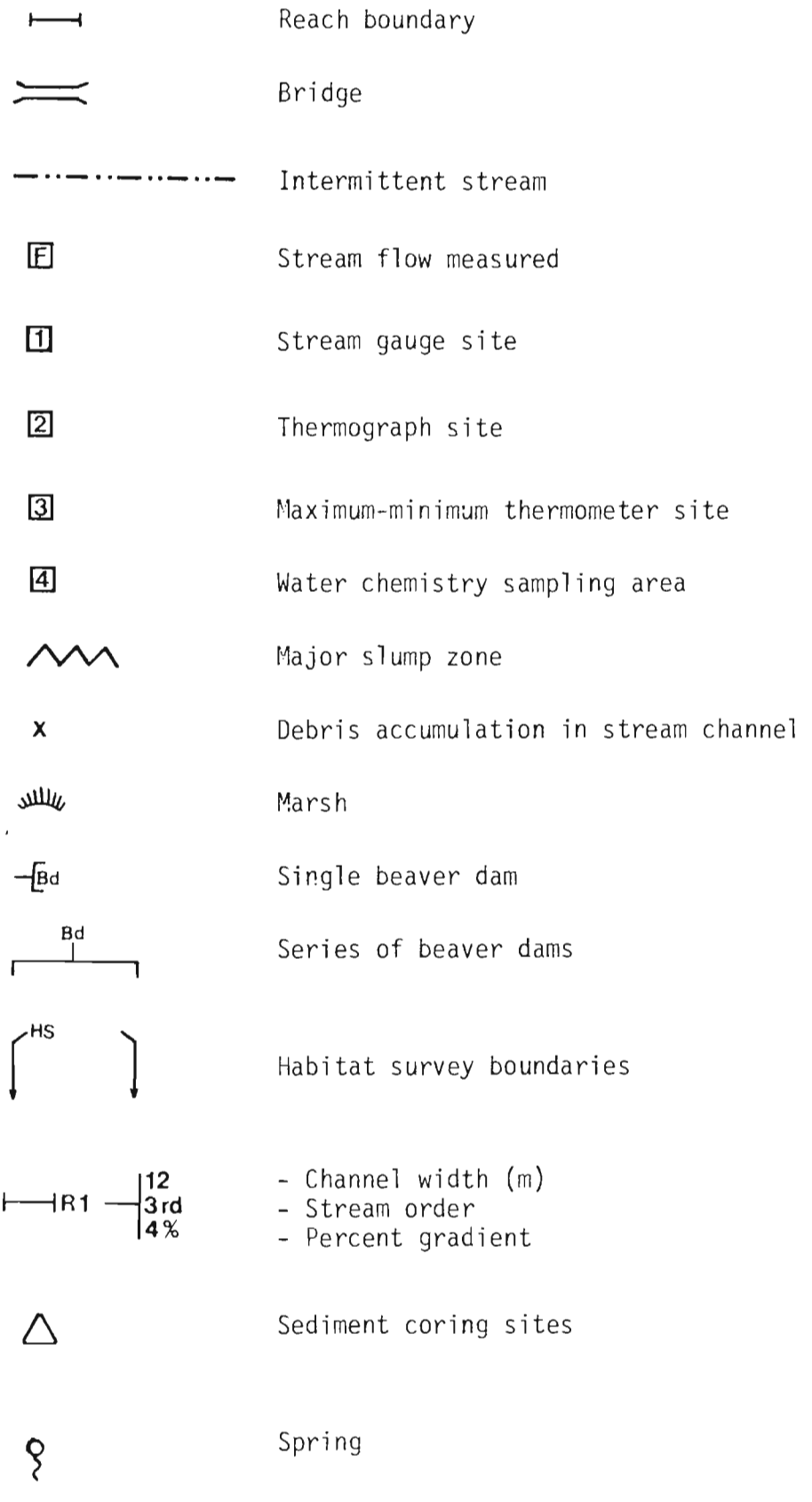

Figure 2. Legend for physical habitat map.

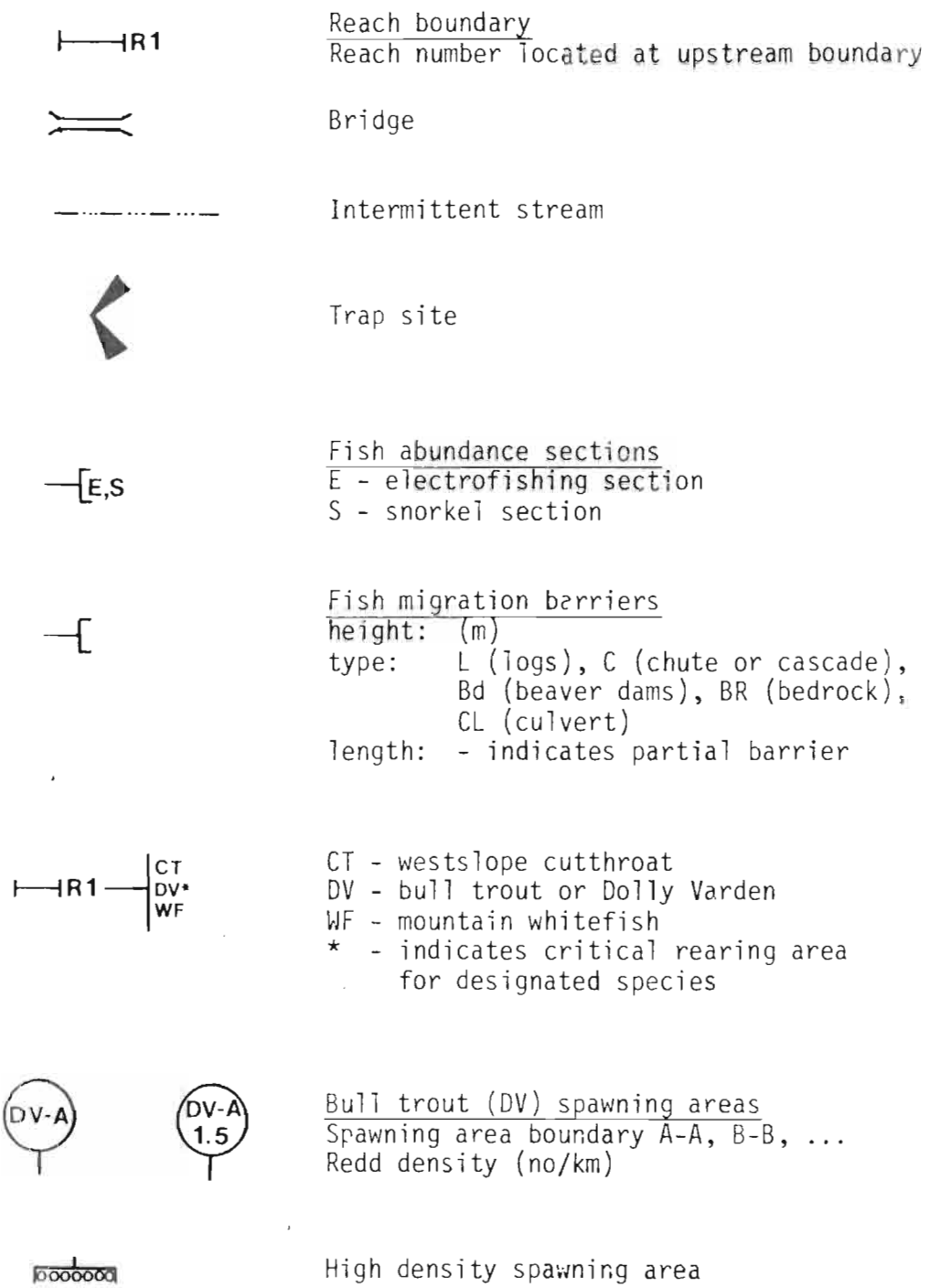

Figure 3. Legend for fish population map.

The Annual and completion reports prepared during the course of this study present further data on physical and chemical habitat parameters and biological information (Graham et al. 1980, Fraley et al. 1981, Shepard et al. 1982, Shepard and Graham 1983, Shepard et al. 1983). Definitions of the terminology used in habitat assessment and data collection methodologies are presented in a separate document (Montana Department of Fish, Wildlife and Parks 1983); however, the codes used in the stream habitat and fish population data tables for Confinement and Pattern are included here.

The following codes were used in the stream habitat and fish population data tables for Pattern and Confinement:

Pattern

S Straight - very little curvature within the reach

N Sinuous - slight curvature within a belt of less than approximately two channel widths

P Irregular - no repeatable pattern

C Irregular meander - a repeated pattern in vaguely present in the channel and the general valley trend is less than 90^{o}

R Regular meanders - characterized by a clearly repeated pattern

T Tortuous meanders - a more or less repeated pattern characterized by angles greater than 90^{o}

Confinement

E Entrenched - the streambank is in continuous contact (coincident with) valley walls

C Confined - in continuous or repeated contact at the outside of major meander bends

F Frequently confined by the valley wall

X Occasionally confined by the valley wall

U Unconfined - not touching the valley wall

N Not applicable (e.g., where no valley wall exists)

MCDONALD CREEK DRAINAGE

MCDONALD CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-19-81

This reach is a fifth order tributary to the Middle Fork. Average wetted width was 29.8 m and the mean depth was 0.79 m. Reach 1 was composed of 90% run and 10% pool areas. Low amounts of channel debris were present with 80% large and stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (12%) was provided by depth in most areas and by undercut banks at several locations. Stream gradient was less than 0.5% and the D-90 was 21 cm. The upper reach boundary was the point of the outflow from Lake McDonald at Apgar. Glacier Route 8 crossed just below Apgar and the Quarter Circle Bridge crossed approximately 50 m upstream from the confluence with the Middle Fork. Low gradient and the lakes presence influenced channel stability and high percentages of small substrate were present (80% gravels and fines).

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 25:1. The average valley width was approximately 1700 m. Reach 1 had a sinuous pattern and was unconfined.

Fish Populations: Date Surveyed: 8-19-81

Westslope cutthroat, rainbow and juvenile bull trout were observed along with mountain whitefish, redside shiners and largescale suckers. Migratory populations of cutthroat, bull trout and rainbow were noted in limited densities. Whitefish were by far the dominant species during the density estimate. This reach supported an average of 60,000 kokanee spawners from Flathead Lake annually from 1979 through 1982 and is the major spawning area for kokanee in the Flathead system.

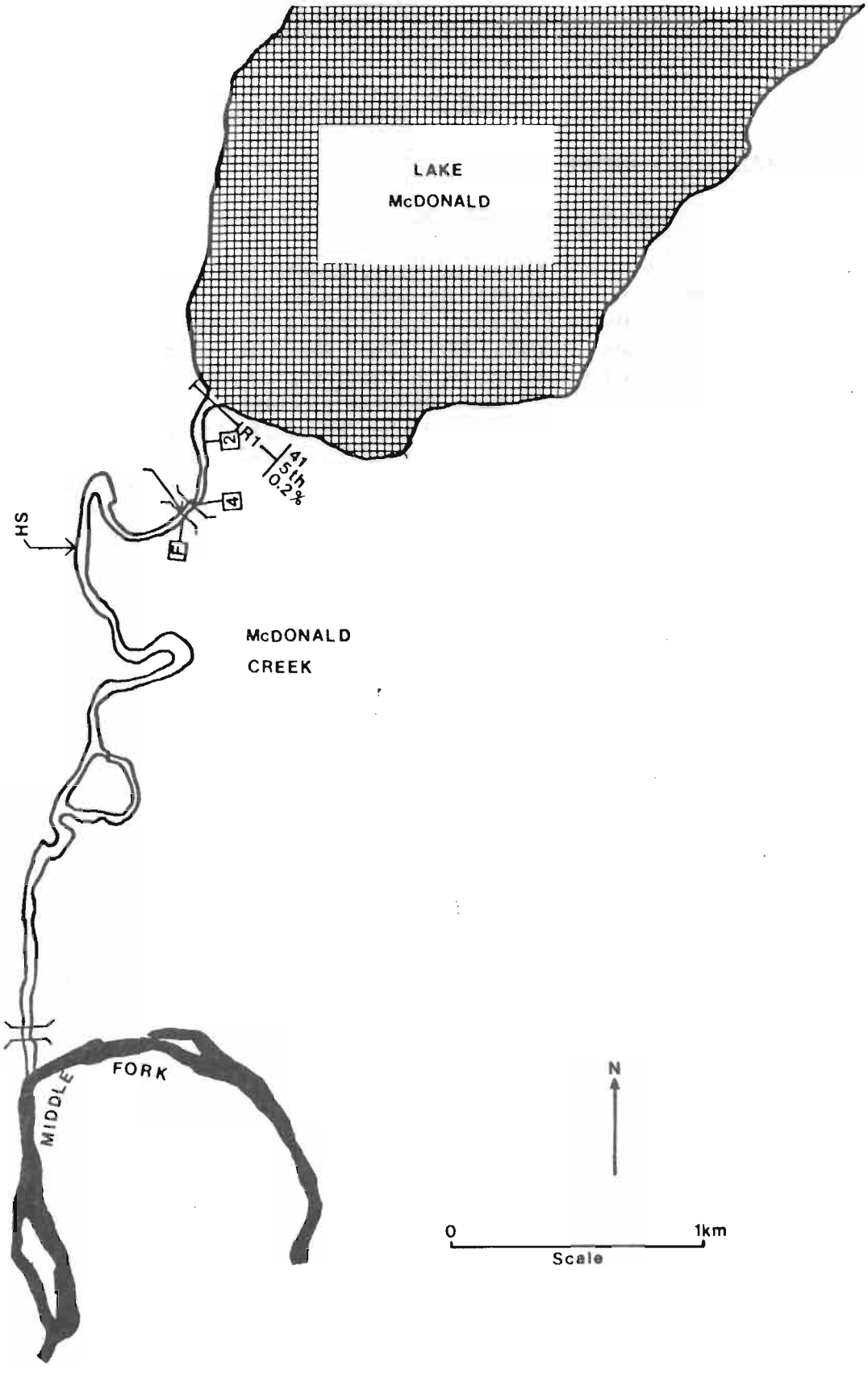

Figure 4. Physical habitat information for McDonald Creek.

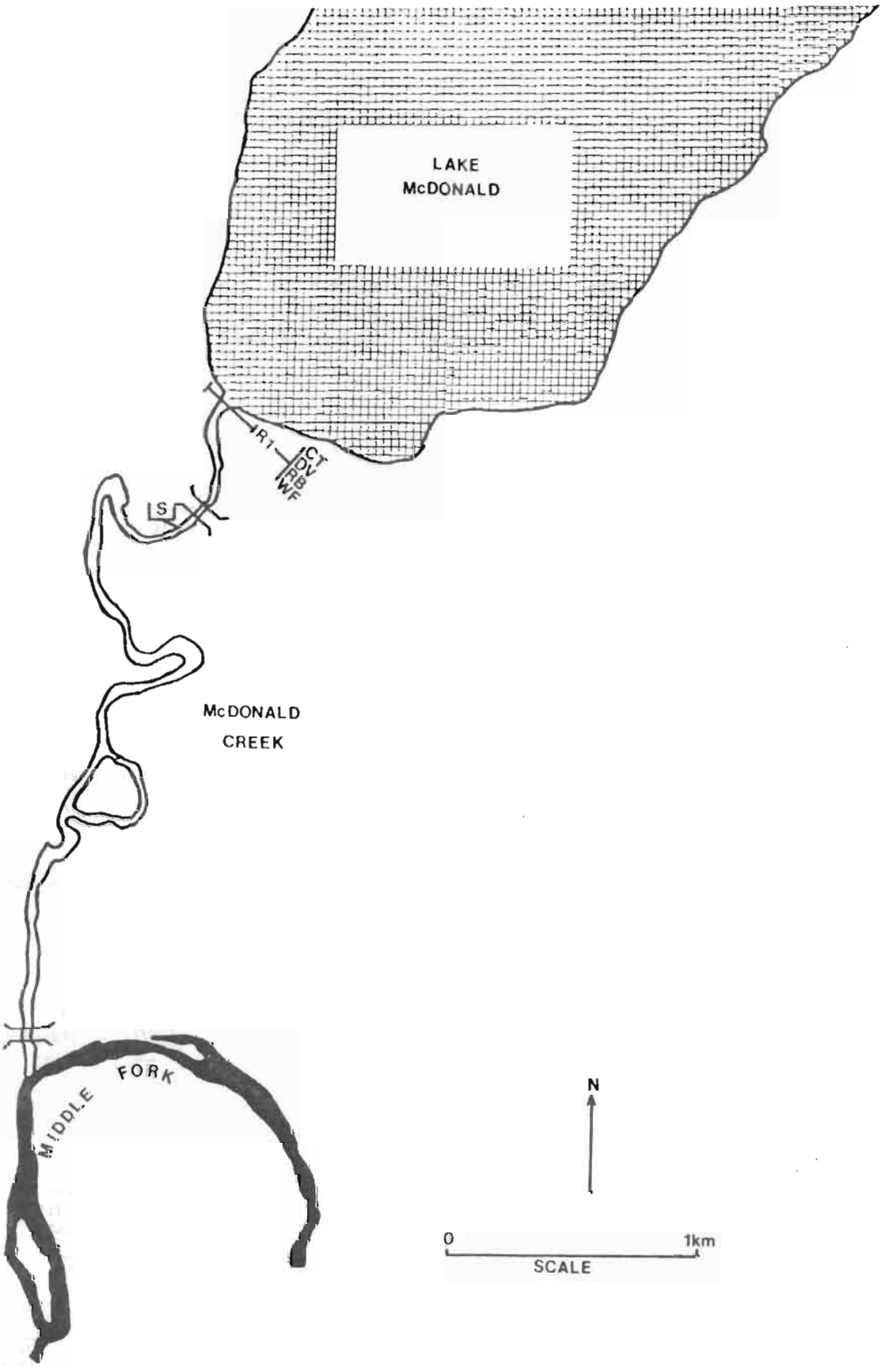

Figure 5. Fish population information for McDonald Creek.

Table 2. Stream habitat and fish population data for McDonald Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
McDonald	001	C7N	3.2	Middle Fork	Outlet of McDonald Lake	960.6	Junction w/ Middle Fork	954.6

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
05	440.1	29.8	.79	41	1700	30	Placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	N	Low	4.2	--	--	Low	3.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	90	0	0	100	0	0	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
15	65	19	1	0	21	0.2	70	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	80	1	1	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
105	51	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.1	0.2	0.4	0	0	0	0.1	P	A

LINCOLN CREEK DRAINAGE

LINCOLN CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-7-81

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 10.4 m and the mean depth was 0.28 m. This reach was composed of 78% run, 20% riffle and 2% pocketwater areas. Channel debris was low with half stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (20%) was provided by large substrate and turbulence. Stream gradient was 2.0% and the D-90 was 48 cm. There were several significant slumping areas in the lower 4.5 km and stream kms 4.8 through 5.8 were braided. The Boundary Trail in Glacier National Park crossed this reach at stream km 0.5, near the Lincoln Creek Snowshoe cabin operated by Glacier National Park.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 130 m. Reach 1 had an irregular pattern and was occasionally confined except for the lower 0.8 km, which was unconfined.

Fish Populations:

Westslope cutthroat, eastern brook trout, juvenile bull trout and mountain whitefish were observed. Large substrate probably restricted spawning potential here. Snorkel estimates showed all species were present in limited densities.

LINCOLN CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-6-81

Reach 2 is a third order tributary from Lincoln Lake downstream. Average wetted width was 8.2 m and the mean depth was 0.28 m. This reach was composed of 75% run, 18% pocketwater and 7% riffle areas. Moderate channel debris was present with 35% stable. Bank cover was moderate, with 19% of the wetted surface area shielded. Abundant instream cover (12%) was provided by large substrate, bedrock and debris. Stream gradient was 3.0% and the D-90 was 42 cm. Several slumping areas were present and there was a braided, beaver dam section near stream km 11.5. A meadow feature was present from km 11 to km 12 and the upper portion (from stream km 9.3 upstream) was steeper than the lower portion. Lincoln Lake was the upper boundary at stream km 10.0.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 3 to 5:1. The average valley width was 60 m. Reach 2 of Lincoln Creek had an irregular pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat, eastern brook trout, juvenile bull trout and mountain whitefish were observed. Westslope cutthroat trout were present in moderate densities. Substrate was generally too large for spawning, except in the meadow feature, where moderate juvenile populations of all fish species were observed.

Walton Creek Reach 1

Channel Characteristics: Date Surveyed: 8-5-81

Reach 1 is a third order tributary to Lincoln Creek up to its fork, where it becomes second order. Average wetted width was 6.8 m and the mean depth was 0.23 m. This reach was composed of 45% run, 40% pocketwater and 15% riffle areas. Channel debris was low with 45% large and stable. Bank cover was low and 10% of the wetted surface area was influenced by overhang. Moderate instream cover (18%) was provided by large substrate and turbulence and by debris in some areas. Stream gradient was 4.8% and the D-90 was 55 cm. Many slumping areas were present in the lower 2.4 km.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 75 m. Reach 1 had an irregular pattern and was frequently confined.

Fish Populations:

Westslope cutthroat, eastern brook trout and mountain whitefish were observed. Gradient and large substrate combined to limit spawning habitat.

Walton Creek Reach 2

Channel Characteristics: Date Surveyed: 8-4-81

Reach 2 is a second order tributary in the Lincoln Creek drainage. Average wetted width was 5.5 m and the mean depth was 0.16 m. The reach was composed of 90% run, 5% riffle and 5% pool areas. Channel debris was low and 40% was stable. Bank cover was moderate to high, with 23% of the wetted surface area influence by overhang. Moderate to high instream cover (23%) was provided by undercut banks and debris with substrate and depth forming cover at several locations. Stream gradient was 2.5% and the D-90 was 13 cm. Some sections were meadow-like and a beaver dam area was present at stream km 10.8.

Valley Characteristics:

The upper bank slope gradient was generally less than 30% and the valley to channel ratio was greater than 15:1. The average valley width was 250 m. Reach 2 had an irregular pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat, eastern brook trout and a mature bull trout were observed. Density estimates of westslope cutthroat trout indicated an important rearing area with 12.0 age I or older fish per 100 m^2 surface area. High percentages of gravel in the bed material provided good spawning conditions. Bull trout spawning may occur in this reach; however, no conformation is available.

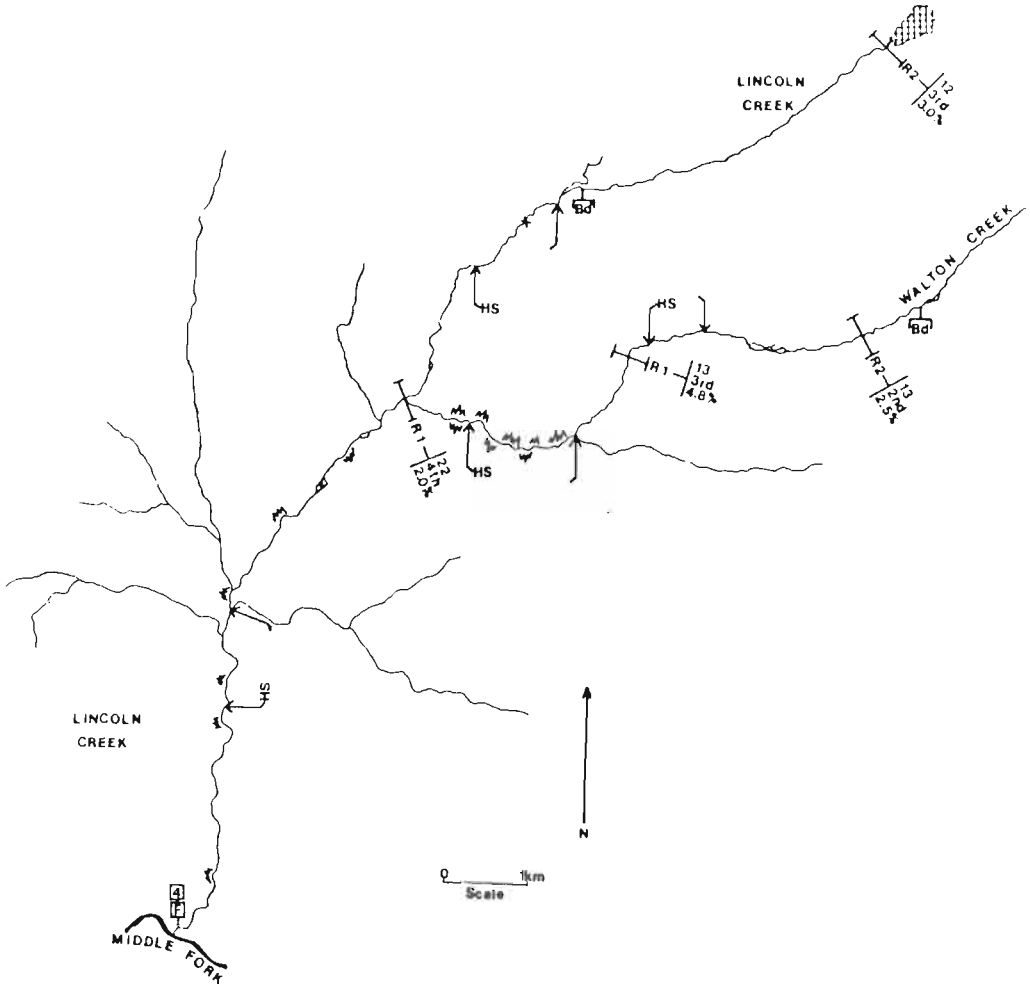

Figure 6. Physical habitat information for the Lincoln Creek drainage.

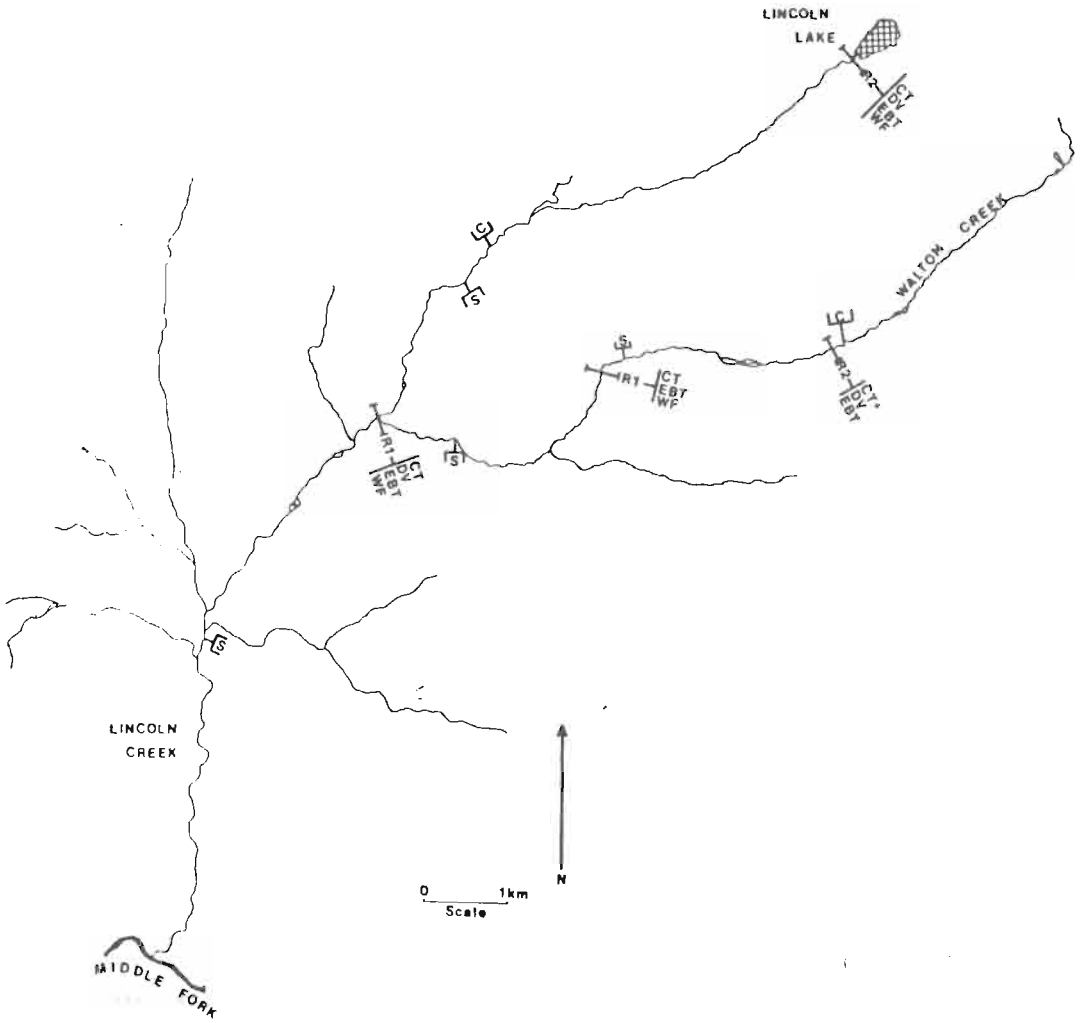

Figure 7. Fish population information for the Lincoln Creek drainage.

Table 3. Stream habitat and fish population data for Lincoln Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lincoln Cr.	001	C70	5.0	Middle Fork	Junction w/ Walton Cr.	1155.2	Junction w/ Middle Fork	997.1

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	93.5	10.4	.28	22	130	6	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	.68	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	78	20	2	0	0	0	100	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
15	35	35	15	0	48	2.0	102	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	50	1	1	20

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
130	56	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.1	0.7	0	0	0.1	0	P	P

Table 4. Stream habitat and fish population data for Lincoln Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lincoln	002	C7P	5.0	Middle Fork	Outlet of Lincoln Lake	1395.4	Junction w/ Walton Cr.	1155.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	8.2	.28	12	60	05	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	--	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	75	7	18	7	7	7	79	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
25	30	20	24	1	42	3.0	84	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	35	16	23	27

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age 1	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.3	0.5	2.2	0	0	0.1	0.1	P	P

Table 5. Stream habitat and fish population data for Walton Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Walton Cr.	001	C7Q	3.7	Lincoln Creek	1st trib on North at km 3.7	1331.5	Junction w/ Lincoln Cr.	1155.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	24.4	6.8	.23	13	75	06	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Moderate	--	--	--	Low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	45	15	40	0	4	16	80	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	20	35	35	0	55	4.8	98	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Low	Low	45	7	10	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.1	0.8	2.4	0	0	0	0	P	P

Table 6. Stream habitat and fish population data for Walton Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Walton Cr.	002	C7R	3.2	Lincoln Cr.	Mouth of Canyon at km 6.9	1410.6	1st trib on N. at km 3.7	1331.5

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
02	--	5.5	.16	13	250	19	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	--	---	--	Nil	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	90	5	0	43	43	14	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
25	45	25	5	0	13	2.5	113	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	40	18	23	23

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	3.1	4.1	4.7	--	--	--	--	A	P

DEERLICK CREEK DRAINAGE

DEERLICK CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-20-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 10.6 m and the mean depth was 0.36 m. This reach was composed of 84% run, 8% riffle and 8% pool areas. Channel debris was low, with half stable. Bank cover was moderate, with 16% of the stream surface area shielded. High amounts of instream cover were provided by rip-rap and natural substrate, along with brushy, undercut banks. Stream gradient was less than 0.5% and the D-90 was 18 cm. Some braiding occurred along the reach. Highway #2 crossed at stream km 1.0 and a private road crossed at stream km 2.4. There were several beaver dam areas and the reach was strongly spring influenced.

Valley Characteristics:

The upper bank slope was generally less than 30% and the valley to channel ratio was greater than 40:1. The average valley width was approximately 500 m. Reach 1 had an irregular pattern and was occasionally confined.

Fish Populations:

Eastern brook trout, juvenile bull trout, mountain whitefish and kokanee were present in this reach. A population estimate in spring of 1981 showed 77 age I or older brook trout per 100 m of stream length. Juvenile bull trout were present in limited densities. Seasonally, this area is important as a kokanee spawning area. Redd counts during 1981 and 1982 enumerated 202 and 24 kokanee redds, respectively.

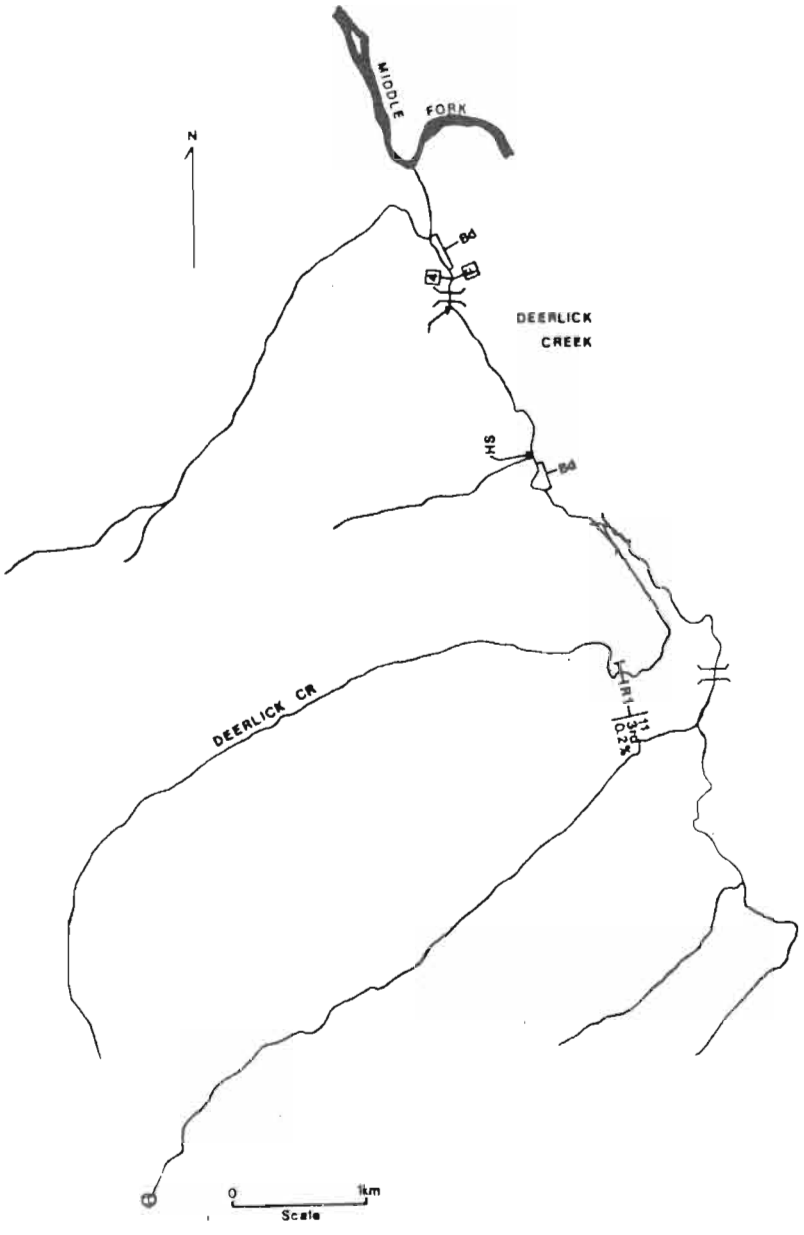

Figure 8. Physical habitat information for Deerlick Creek.

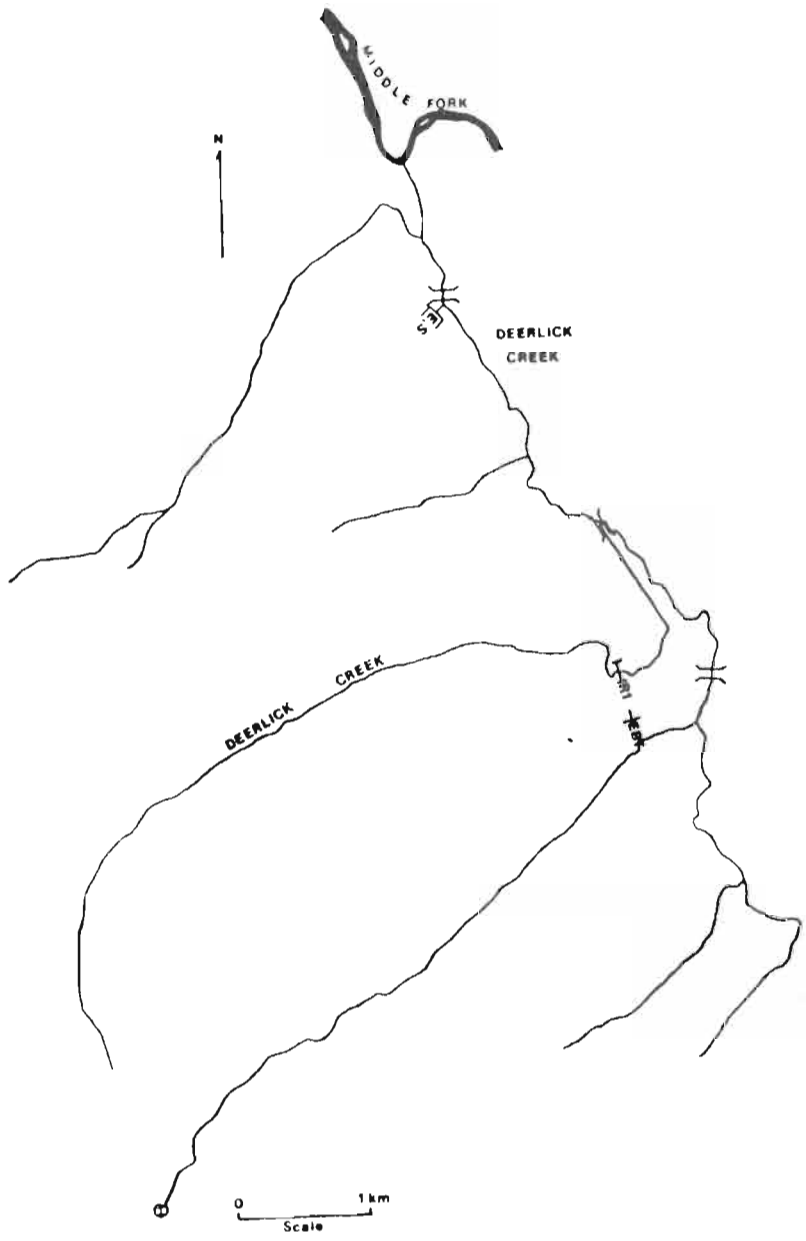

Figure 9. Fish population information for Deerlick Creek.

Table 7. Stream habitat and fish population data for Deerlick Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Deer Lick Cr.	001	C7S	4.4	Middle Fork	1.6 km above Hwy. crossing	1021.4	Junction w/ Middle Fork	1009.3

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	39.4	10.6	.36	11	500	45	Placid, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	.81	--	--	Low	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	84	8	0	50	50	0	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
40	40	20	0	0	18	0.2	71	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	50	16	16	28

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
225	118	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	P

HARRISON CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-10-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 11.3 m and the mean depth was 0.41 m. This reach was composed of 50% run, 32% pocketwater and 18% riffle areas. Channel debris was low and 60% was stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Abundant instream cover (28%) was provided by large substrate, turbulence and debris. Stream gradient was 1.9% and the D-90 was 69 cm. The lower 0.5 km was slough-like and some braiding occurred. A beaver dam section was present from the mouth up to the Boundary Trail crossing at km 1.0. Many slumping areas were present and a large debris jam was located at km 6.6. The outflow from Harrison Lake formed the upper boundary.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 30 m. Reach 1 had an irregular pattern and was frequently confined.

Fish Populations:

Westslope cutthroat, eastern brook trout and mountain whitefish were observed in limited densities. The large susbstrate and canyon-like nature limited spawning potential; however, the reach may have served as a migration corridor between Harrison Lake and the Middle Fork. Brook trout spawning occurred in the lower 0.5 km of the reach.

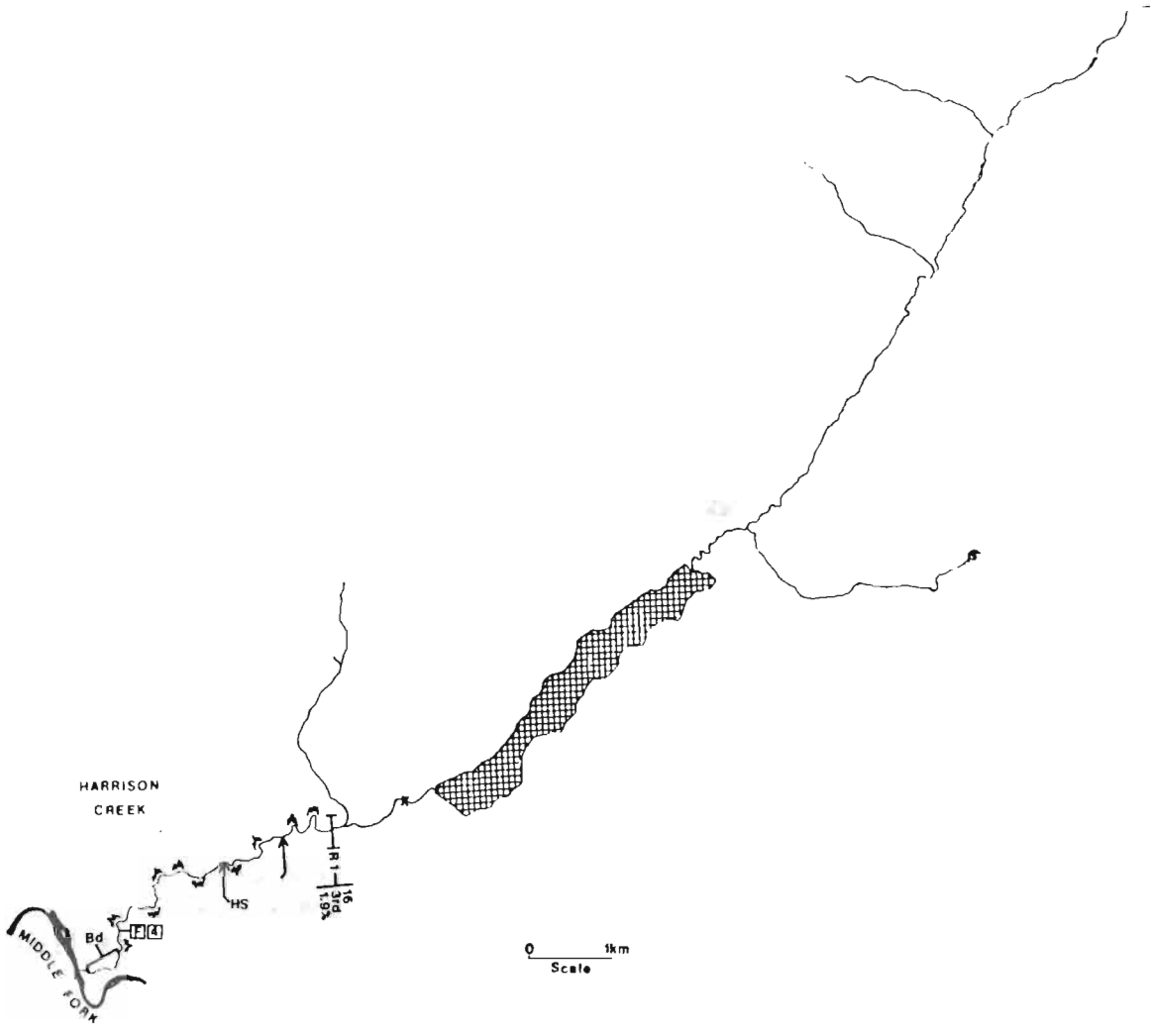

Figure 10. Physical habitat information for Harrison Creek.

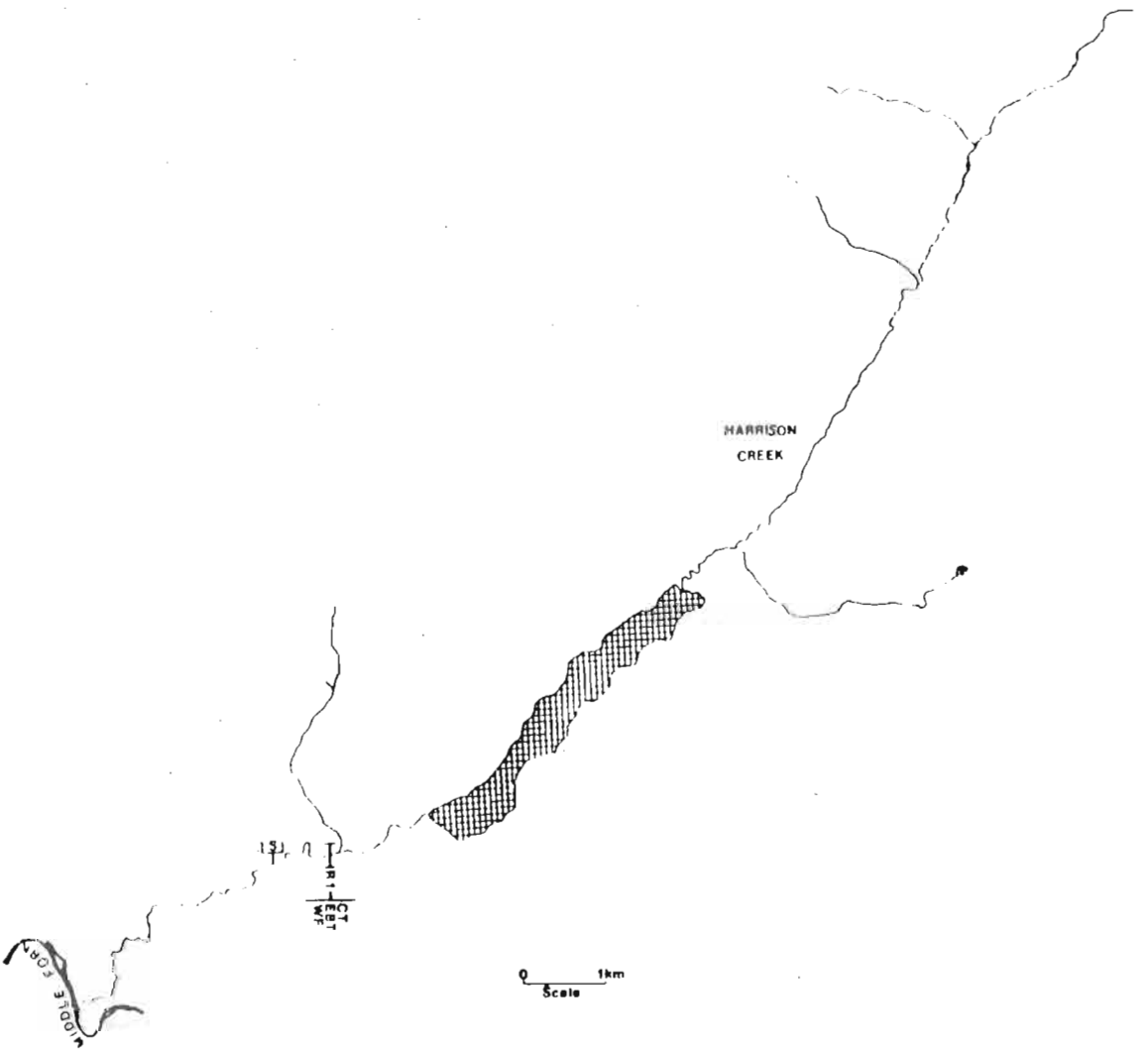

Figure 11. Fish population information for Harrison Creek.

Table 8. Stream habitat and fish population data for Harrison Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Harrison Cr.	001	C7T	5.3	Middle Fork	5.3 km above mouth	1106.6	Junction w/ Middle Fork	1003.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	69.8	11.3	.41	16	30	03	Tumbling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	1.3	--	16	Low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	50	18	32	0	0	0	100	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	25	32	33	0	69	1.9	94	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	60	1	1	28

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
105	46	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.1	0	0.5	0	0	0	0	P	P

NYACK CREEK DRAINAGE

NYACK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-18-81

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 17.9 m and the mean depth was 0.54 m. This reach was composed of 93% run and 7% pool areas. Channel debris was moderate with 20 percent stable. Bank cover was low, with 6% of the wetted surface area influenced by overhang. Moderate instream cover (12%) was provided by undercut banks and debris. Stream gradient was 0.2% and the D-90 was 20 cm. The lower 3 kms were slough-like, with high percentages of fine substrate. A debris jam section was present from stream km 5.0 to 7.0 and braiding was common. Mass wasting potential was low and the Boundary Trail crossed at stream km 1.0.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 10:1. The average valley width was 400 m. Reach 1 had an irregular meandering pattern and was unconfined.

Fish Populations:

Bull trout were the only fish species observed. Juvenile bull trout were present during our density estimate and spawning site inventories enumerated 7, 7 and 6 bull trout redds during 1980, 1981 and 1982, respectively. Nyack Creek was closed to fishing by Glacier National Park Regulations in 1972.

NYACK CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-17-81

Reach 2 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 18 m and the mean depth was 0.66 m. This reach was composed of 86% run and 14% riffle areas. Low amounts of channel debris were present with 5% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (18%) was provided by large substrate, turbulence and depth. Stream gradient was 2.5% and the D-90 was 86 cm. A bedrock canyon contained several chutes and a 10 m falls at stream km 12.5.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was less than 2:1. The average valley width was 29 m. Reach 2 had an irregular pattern and was frequently confined by canyon-like walls. The portion from stream km 12.0 to 13.0 was entrenched in bedrock.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Westslope cutthroat were present in low densities and whitefish were by far the most numerous species observed. Both juvenile and mature bull trout were present and spawning has been observed below the barrier falls. Spawning site inventories enumerated 7, 7 and 17 bull trout redds during 1980, 1981 and 1982, respectively. Redd density in the high use area during the 1981 and 1982 surveys was 7.0 and 8.5 redds per km, respectively. Nyack Creek was closed to fishing by Glacier National Park regulations in 1972.

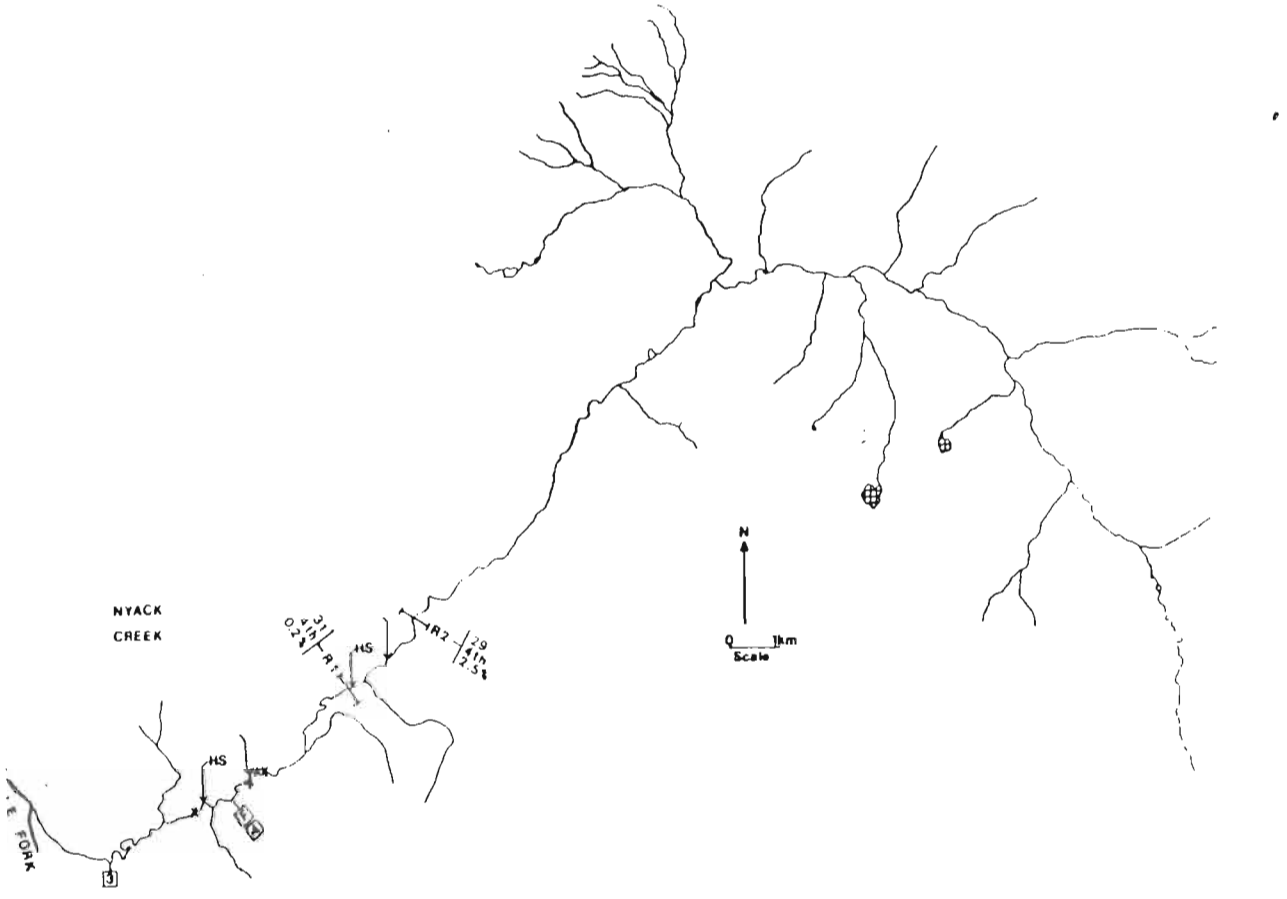

Figure 12. Physical habitat information for Nyack Creek.

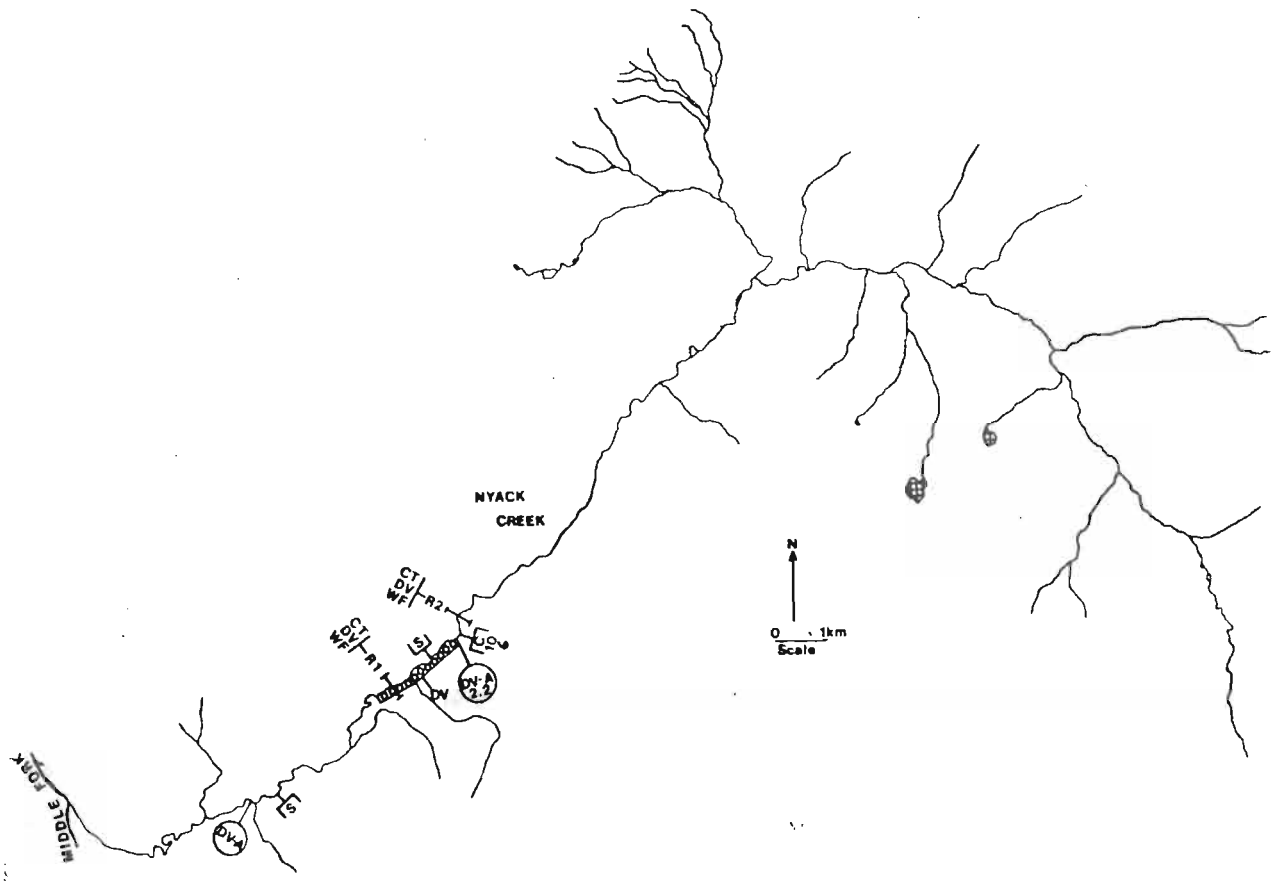

Figure 13. Fish population information for Nyack Creek.

Table 9. Stream habitat and fish population data for Nyack Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Nyack Cr.	001	C7U	11.4	Middle Fork	11.4 km above mouth	1045.8	Junction w/ Middle Fork	1021.4

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	214.9	17.9	.54	31	400	13	Rolling, Placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	1.8	--	--	Low	3.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	93	0	0	80	20	0	0	0

% fines	% bed material gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	55	15	0	0	20	0.2	99	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Moderate	20	4	6	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
220	111	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
5	0.4	80	7	0.6	81	0	0	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0	0	0.1	0	0	A	A

Table 10. Stream habitat and fish population data for Nyack Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Nyack Cr.	002	C7V	1.9	Middle Fork	Falls at km 13.3	1094.4	11.4 km above mouth	1045.8

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	--	18.0	.66	29	30	01	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Nil	--	--	--	Low	2.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	86	14	0	67	0	0	33	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
15	35	40	5	5	86	2.5	88	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	5	1	1	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
9	04.7	80	7	03.6	81	23	12.1	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0.1	0	0	0.1	0.1	P	A

COAL CREEK DRAINAGE

COAL CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-13-81

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 10.1 m and the mean depth was 0.39 m. This reach was composed of 59% run, 30% pocketwater, 9% riffle and 2% pool areas. Channel debris was low, with 20% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate to high instream cover (24%) was provided by large substrate, turbulence and depth. Stream gradient was 2.4% and the D-90 was 84 cm. Many high slumping banks were observed and bedrock was present in the streambed at several locations. Glacier National Park's Boundary Trail crossed just above the mouth and the Pinchot Creek trail crossed just above the junction of Pinchot Creek at km 2.8.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 100 m. Reach 1 had an irregular pattern and was frequently confined by bedrock walls.

Fish Populations:

Westslope cutthroat, bull trout, brook trout and mountain whitefish were observed. Cutthroat and bull trout were present in limited densities and brook trout were the most numerous species observed. This section provided a migration corridor for adfluvial bull trout utilizing upper Coal Creek and possibly Pinchot Creek for spawning. Coal Creek was closed to fishing by Glacier National Park regulations in 1972.

COAL CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-12-81

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 12.5 m and the mean depth was 0.46 m. This reach was composed of 57% run and 43% pool areas. Moderate channel debris was present with 35% stable. Bank cover was moderate, with 18% of the wetted surface area influenced by overhang. High instream cover (28%) was provided by debris and aquatic vegetation, along with depth. Stream gradient was 0.7% and the D-90 was 16 cm. Many large pools were present and small substrate predominated (over 90% fines and gravels). Beaver dam areas were present near stream kms 8.5 and 13.5 and braiding occurred at these locations. Glacier National Park's Coal Creek trail crossed at km 10.1.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 2 had an irregular meandering pattern and was occasionally confined

in the upstream portion.

Fish Populations:

Westslope cutthroat, juvenile and adult bull trout, brook trout and mountain whitefish were observed. All fish species were present in moderate densities with brook trout the most numerous species. Substrate composition of Reach 2 provided excellent spawning habitat for the species present, and spawning by adfluvial bull trout and resident brook trout has been documented. Glacier National Park regulations closed this reach to fishing in 1972.

COAL CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-11-81

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 10.6 m and the mean depth was 0.37 m. This reach was composed of 44% run, 34% pocketwater, 17% riffle and 5% pool areas. Channel debris was moderate, with 40% stable. Bank cover was low, with 6% of the wetted surface area shielded. Moderate instream cover (17%) was provided by substrate, turbulence and debris. Stream gradient was 2.7 percent and the D-90 was 81 cm. Several bedrock-cascade sections were present above stream km 20, forming partial migration barriers. A large debris accumulation was also present at stream km 20. A higher gradient section containing several chute falls formed a complete barrier at km 25.5. The majority of the substrate was cobble or larger (60%).

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 50 m. Reach 3 had an irregular pattern and was frequently confined.

Fish Populations:

Westslope cutthroat, bull trout and eastern brook trout were observed. All species were present in low to moderate densities. Substrate size may limit spawning by the species present. Coal Creek was closed to fishing by Glacier National Park regulations in 1972.

Pinchot Creek Reach 1

Channel Characteristics: Date Surveyed: 8-13-81

Reach 1 is a third order tributary to Coal Creek. Average wetted width was 6.5 m and the mean depth was 0.40 m. This reach was composed of 60% run and 40% pocketwater areas. Moderate to high channel debris was present, with 25% stable. Bank cover was low, with 9% of the wetted surface area influenced by overhang. Moderate instream cover (21%) was provided by substrate, turbulence, debris and depth. Stream gradient was 4.5% and the D-90 was 101 cm. Many slumping areas were observed and a cascade section was present near the mouth. Large substrate predominated

the bed material and bedrock was also present.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 25 m. Reach 1 had an irregular pattern and was occasionally confined. The unmaintained Pinchot Creek trail paralleled the east bank.

Fish Populations:

Westslope cutthroat, juvenile bull trout, eastern brook trout and mountain whitefish were observed. Density estimates showed this reach to be an important rearing area for juvenile bull trout with 2.6 age I or older fish per 100 m^2 surface area. A bedrock cascade formed a partial barrier to upstream migration near the mouth. The Coal Creek drainage was closed to fishing in 1972.

Pinchot Creek Reach 2

Channel Characteristics: Date Surveyed: 8-14-82

Reach 2 is a third order tributary in the Coal Creek drainage. Average wetted width was 7.2 m and the mean depth was 0.27 m. This reach was composed primarily of riffle-run habitat (86% run, 14% riffle), with a trace of pocketwater areas present. Moderate channel debris was present, with 10% stable. Bank cover was moderate, with 13% of the wetted surface influenced by overhang. Moderate instream cover (16%) was provided by substrate, turbulence and depth. Stream gradient was 2.6% and the D-90 was 31 cm. Some braiding occurred below the mouth of Peril Creek and a 4 m barrier falls was present above Peril Creek at stream km 5.5. The Pinchot Creek Trail crossed at km 2.2 and continued along the west bank to just opposite the mouth of Peril Creek.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 2:1. The average valley width was 50 m. Reach 2 had an irregular meandering pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. Cutthroat were present in moderate densities, and several fish larger than 300 mm were noted. Juvenile bull trout were present in limited densities. A barrier falls was observed at stream km 5.5 above which no fish population work was conducted. Mature bull trout were observed in the pool below this falls.

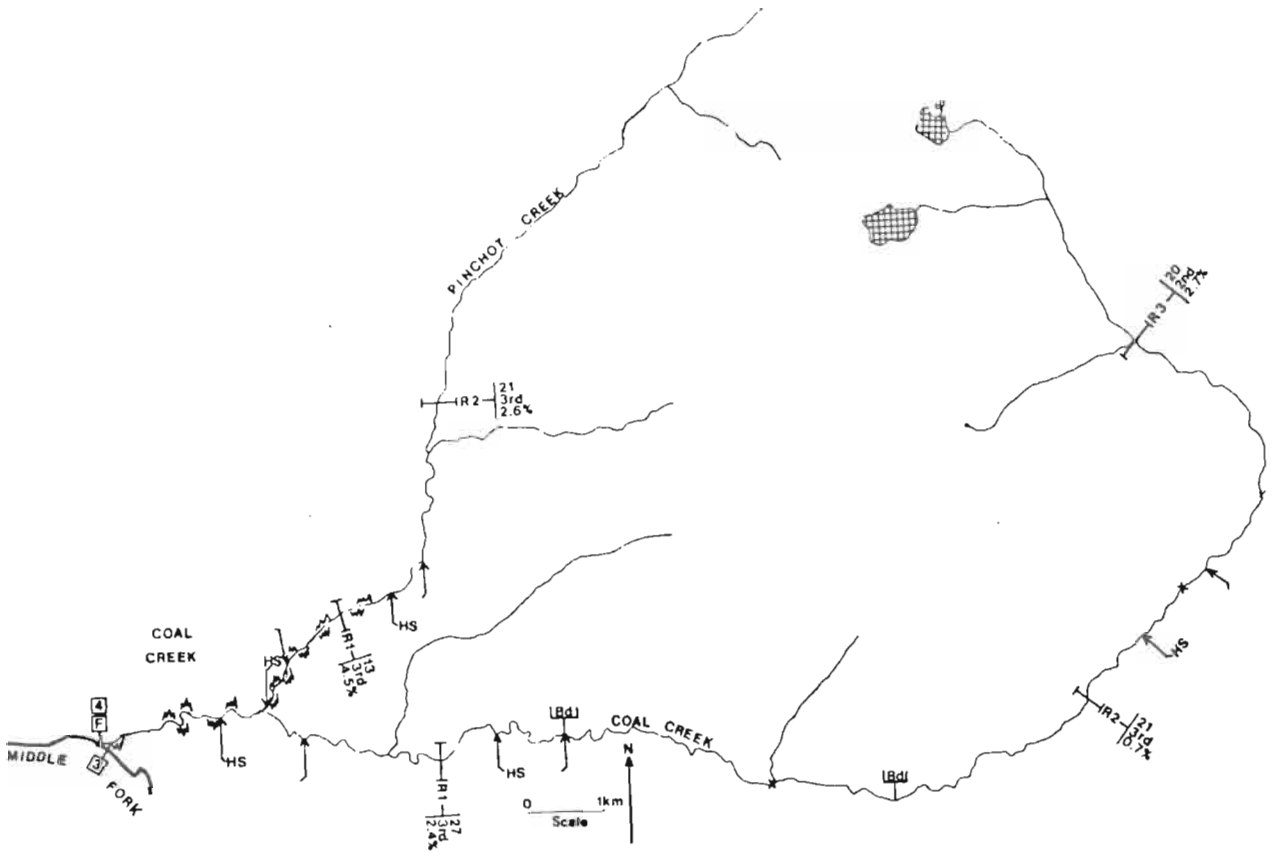

Figure 14. Physical habitat information for the Coal Creek drainage.

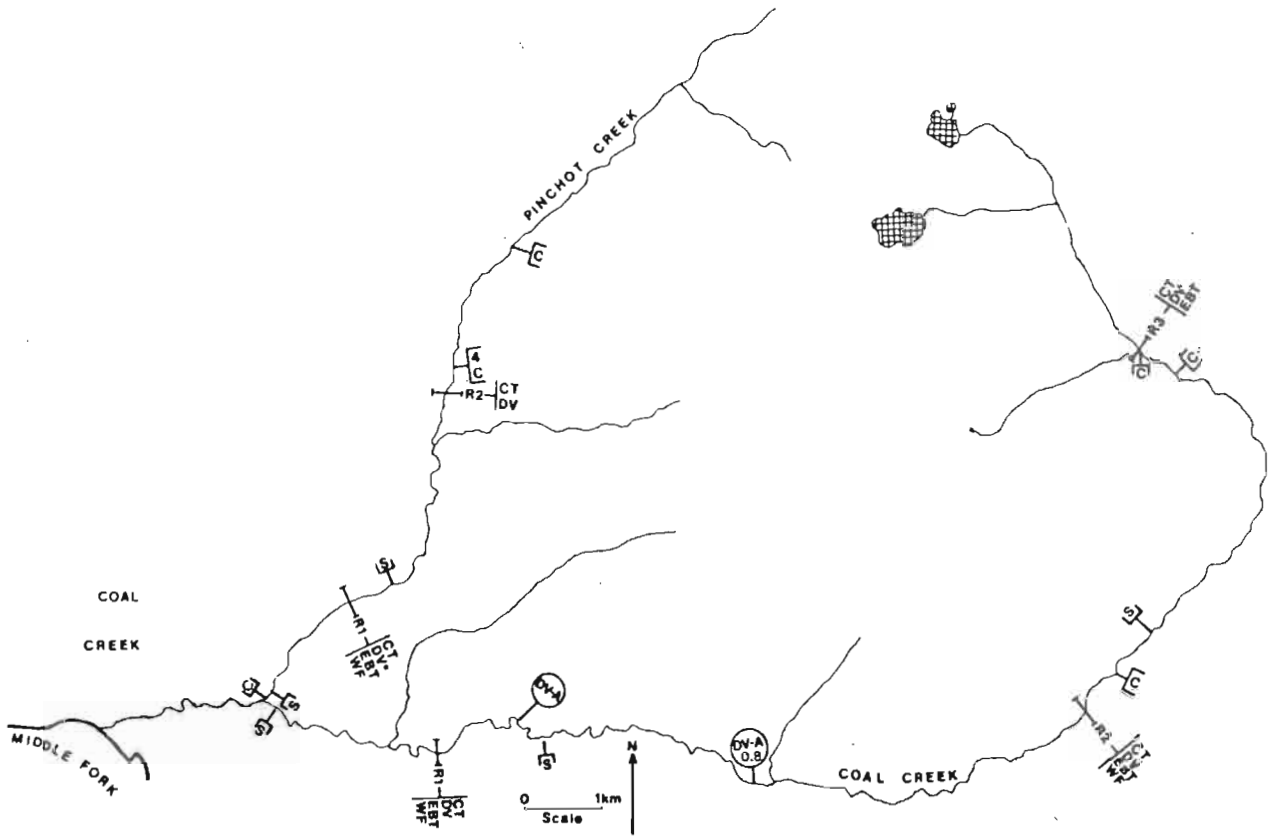

Figure 15. Fish population information for the Coal Creek drainage.

Table 11. Stream habitat and fish population data for Coal Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Coal Cr.	001	C7W	5.6	Middle Fork	1 km above trib at km 4.8	1167.4	Junction w/ Middle Fork	1033.6

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	144.1	10.1	.39	27	100	01	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	1.2	--	19	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	59	9	30	0	4	17	79	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
7	15	28	36	14	84	2.4	101	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	20	1	1	24

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
125	53	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.4	0.8	0	0.1	0.1	0	P	P

Table 12. Stream habitat and fish population data for Coal Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Coal Cr.	002	C7X	12.5	Middle Fork	1 km below falls at km 18.7	1228.2	1 km above trib at km 4.8	1143.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	12.5	.46	21	100	05	Rolling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Moderate	--	--	--	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
43	57	0	0	43	38	19	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
55	42	3	0	0	16	0.7	108	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	35	6	18	28

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
4	0.3	81	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0.2	0.5	1.7	0.6	0.1	0.2	0.4	0.2	P	P

Table 13. Stream habitat and fish population data for Coal Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Coal Cr.	003	C7Y	7.6	Middle Fork	Trib from W. at km 25.7	1434.9	1 km below falls at km 18.7	1228.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	10.6	.37	20	50	02	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	--	--	--	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	44	17	34	9	18	0	73	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
15	25	32	23	5	81	2.7	87	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	40	7	6	17

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.3	0.8	0.6	0	0	0.1	0.7	A	A

Table 14. Stream habitat and fish population data for Pinchot Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Pinchot Cr.	001	C7Z	1.8	Coal Cr.	1.8 km above mouth	1167.4	Junction w/ Coal Cr.	1088.3

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	49.9	6.5	.40	13	25	02	Rolling, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	--	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	0	60	40	0	0	9	91	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
5	20	25	40	10	101	4.5	92	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	Moderate	25	4	9	21

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.4	1.3	0.7	0	0.4	2.0	0.2	P	A

Table 15. Stream habitat and fish population data for Pinchot Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Pinchot	002	C71	3.9	Coal Cr.	3 km below Falls	1265.0	1.8 km above mouth	1167.4

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	7.2	.27	21	50	2	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Moderate	--	--	--	Nil	0.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	86	14	0	0	0	0	100	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
12	38	38	12	0	31	2.6	91	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	10	8	13	16

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	1.3	2.6	1.9	0	0.2	0	0	A	A

STANTON CREEK DRAINAGE

STANTON CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-16-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 10.2 m and the mean depth was 0.41 m. This reach was composed of 50% riffle, 27% run, 18% pocketwater and 5% pool areas. Channel debris was low, and 75% was large and stable. Bank cover was moderate, with 18% of the wetted surface shielded. Moderate to high instream cover (24%) was provided by large substrate and turbulence and by depth in some areas. Stream gradient was 3.5% and the D-90 was 92 cm. Several slumping areas were present and Highway 2 and the Burlington Northern railroad crossed at stream km 0.5. The Highway 2 culvert formed a partial barrier to upstream migration. Outflow from Stanton Lake formed the upper boundary, where a 200 m slough-like channel provided good spawning habitat.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 30 m. Reach 1 had an irregular pattern and was frequently confined with sections of entrenchment.

Fish Populations:

Westslope cutthroat, eastern brook trout and mountain whitefish were observed in limited densities. Approximately 0.6 km above the Highway 2 crossing, a 2 m water fall formed a partial barrier to upstream migration. A cutthroat tagged in the upper portion of Reach 1 was subsequently caught in Stanton Lake suggesting use of this reach by spawners from the lake.

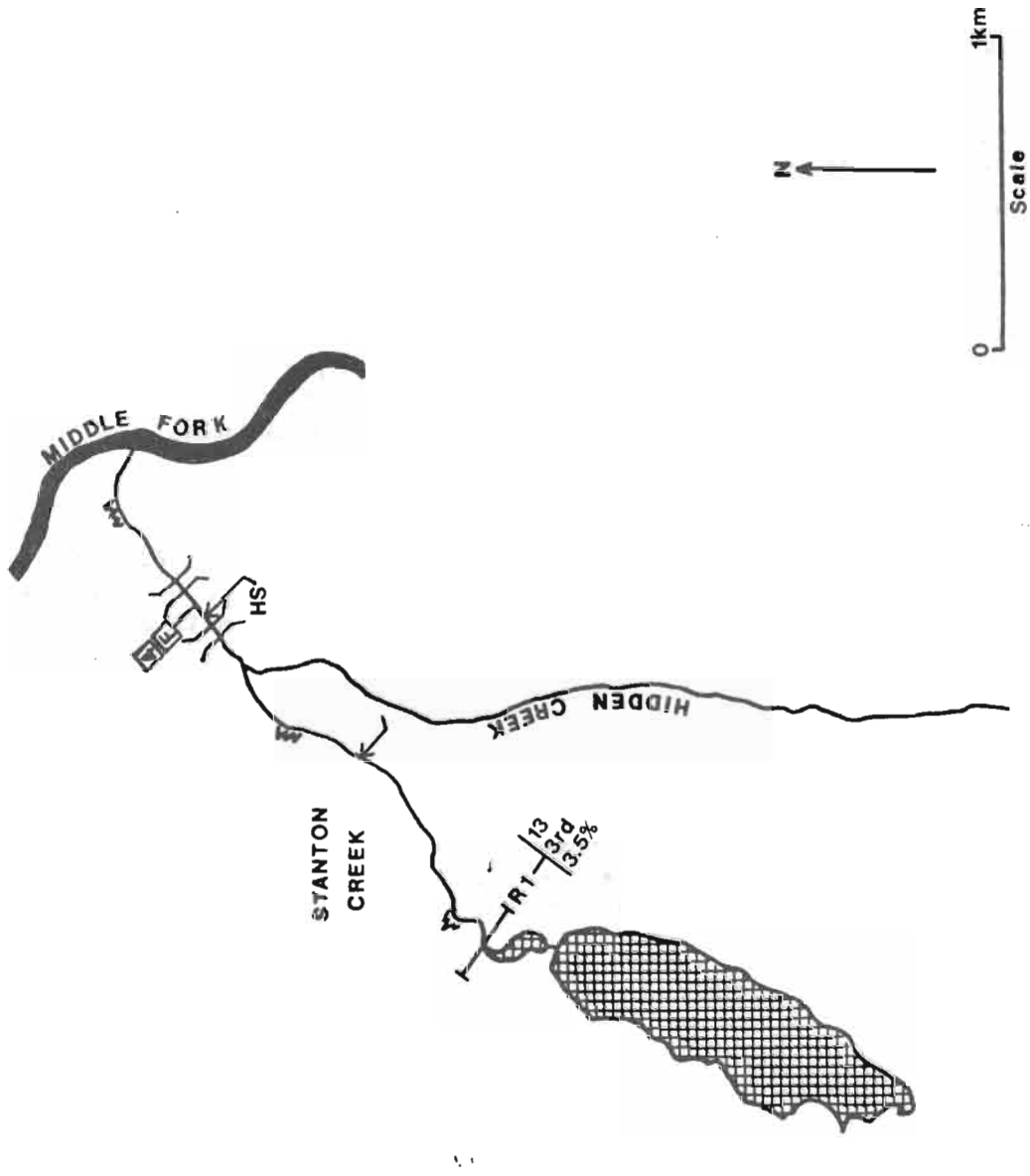

Figure 16. Physical habitat information for Stanton Creek.

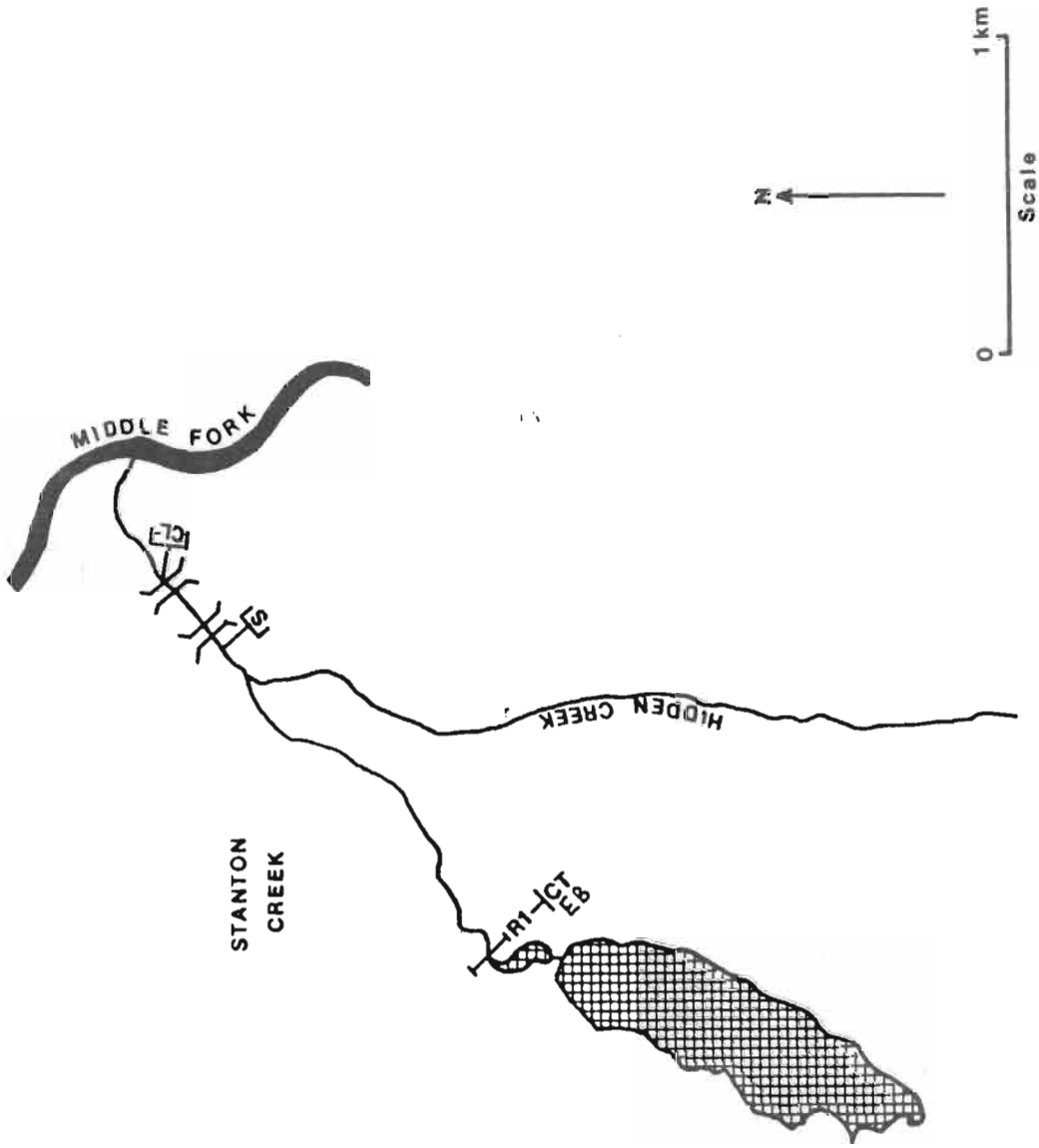

Figure 17. Fish population information for Stanton Creek.

Table 16. Stream habitat and fish population data for Stanton Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Stanton Cr.	001	C72	2.4	Middle Fork	Stanton Lake outlet	1143.0	Junction w/ Middle Fork	1057.9

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	33.6	10.2	.41	13	30	02	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	.44	--	--	Low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	27	50	18	6	0	6	88	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	25	25	39	I	92	3.5	89	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	75	15	20	24

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
185	92	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0.6	0.2	0	0	0	0	A	P

TUNNEL CREEK DRAINAGE

TUNNEL CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-17-81

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 7.9 m and the mean depth was 0.36 m. This reach was composed of 49% run, 45% pocketwater, 5% riffle and 1% pool areas. Moderate channel debris was present, with 60% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. High amounts of instream cover (34%) were provided by large substrate and debris. Stream gradient was 4.2% and the D-90 was 44 cm. Several slumping areas were present and streambed and banks contained high percentages of bedrock in many locations. Highway 2 and the Burlington Northern railroad crossed near stream km .64. The Highway 2 culvert formed a barrier to upstream migration. Forest Service roads 1637-1638 crossed just at the upper reach break.

Valley Characteristics:

The upper bank slope was 40 to 50% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 75 m. Reach 1 had an irregular pattern and was frequently confined.

Fish Populations:

Westslope cutthroat trout were observed in limited densities. The Highway 2 culvert formed a barrier to all upstream migration; however, migratory fish were present in Tunnel Creek historically.

TUNNEL CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-29-82

Reach 2 is a fourth order tributary. Average wetted width was 10.8 m and the mean depth was 0.50 m. This reach was composed of 90% run, 8% pool and 2% riffle areas. Channel debris was moderate, with 75% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (16%) was provided by depth, debris and undercut banks. Stream gradient was 0.9 percent and the D-90 was 9 cm. There were many beaver dams scattered throughout this area creating pond-like sections.

Valley Characteristics:

The upper bank slope was generally less than 30% and the valley to channel ratio was approximately 20:1. The average valley width was 250 m. Reach 2 had an irregular meandering pattern and was unconfined. A meadow section was present from the reach stream breakup to km 5.1, where heavy timber closed in on each bank.

Fish Populations:

Westslope cutthroat were the only fish species observed. Most deep, placid runs were silted in, but clean gravels were present in flowing areas. Historically, migratory fish were present in Tunnel Creek.

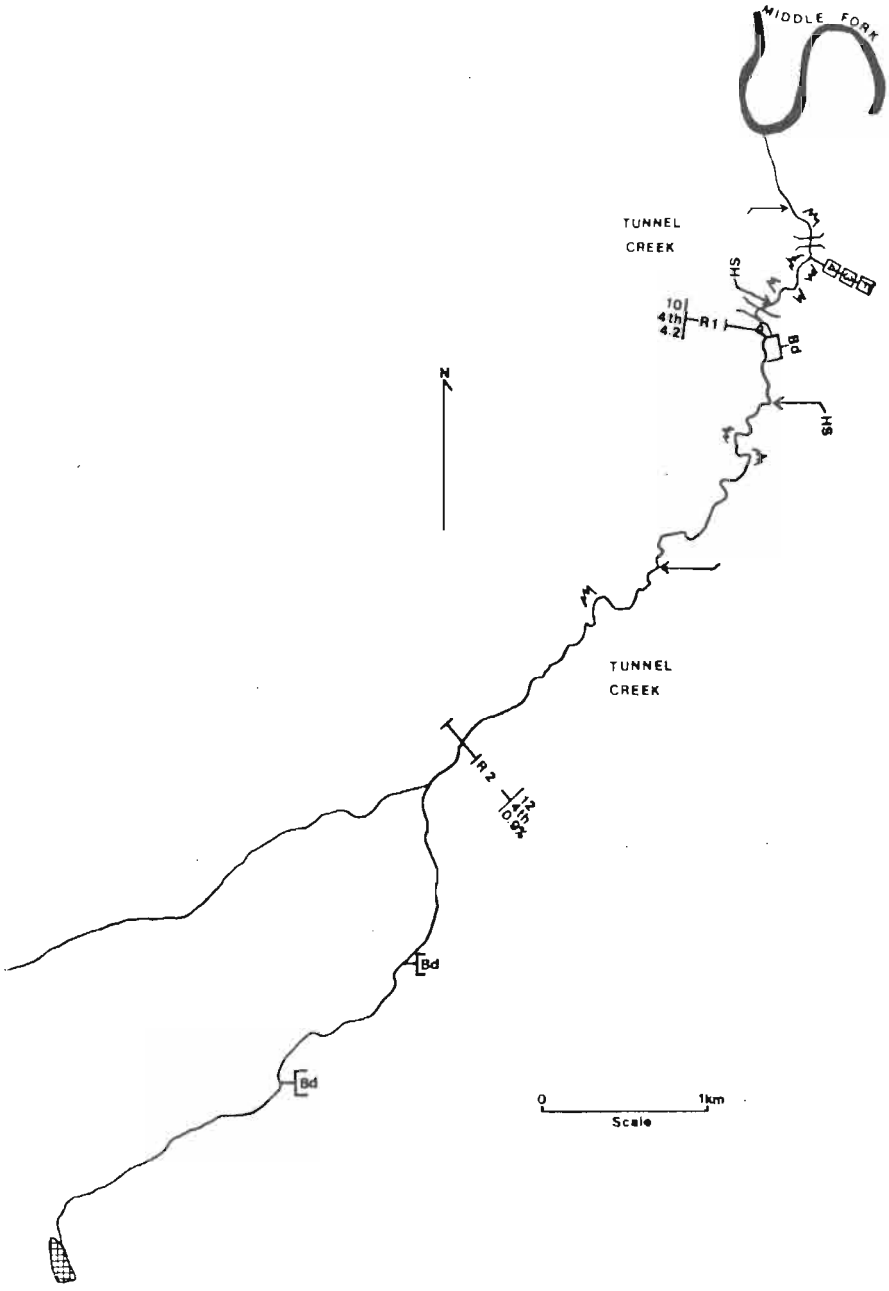

Figure 18. Physical habitat information for Tunnel Creek.

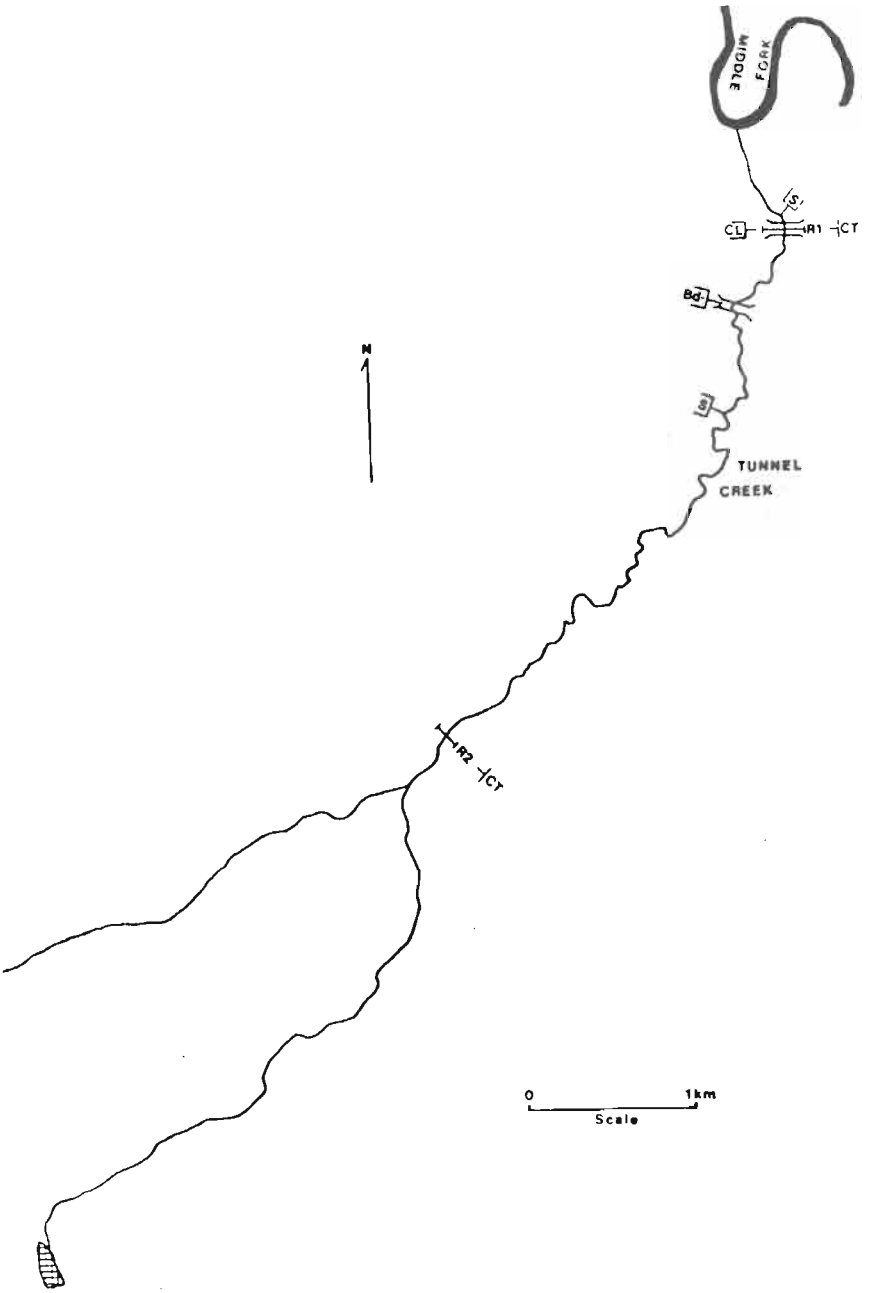

Figure 19. Fish population information for Tunnel Creek.

Table 17. Stream habitat and fish population data for Tunnel Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Tunnel Cr.	001	C73	1.4	Middle Fork	Quarry Road Crossing	1130.9	Junction w/ Middle Fork	1070.1

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	21.9	7.9	.36	10	75	07	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Nil	.34	--	14	Low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	49	5	45	15	0	23	62	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
15	10	10	15	50	44	4.2	92	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Low	Moderate	60	3	3	34

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
160	89	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.1	0	0	0	0	A	A

Table 18. Stream habitat and fish population data for Tunnel Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Tunnel	002	C74	4.3	Middle Fork	0.4 km below fork	1173.4	Quarry Road Crossing	1130.8

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	--	10.8	.50	12	250	20	Swirling, Placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Nil	--	--	14	Low	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	90	2	0	27	27	46	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
80	20	0	0	0	9	0.9	78	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Nil	Moderate	75	1	3	16

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.1	0	0	0	0	C	A	A

MUIR CREEK DRAINAGE

MUIR CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-30-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 5.4 m and the mean depth was 0.22 m. This reach was composed of 52% pocketwater, 29% run, 14% riffle and 5% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Moderate to high instream cover (25%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 5.0% and the D-90 was 106 cm. Slight braiding was observed near the mouth and Glacier National Park's Boundary Trail crossed at stream km 0.5.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was less than 2:1. The average valley width was 20 m. Reach 1 had an irregular pattern and was confined by the canyon walls.

Fish Populations:

Westslope cutthroat trout were observed in good numbers. A density estimate of 11.6 age I or older cutthroat per 100 m^2 surface area indicated an important rearing area. Several fish approaching the 300 mm size were observed. A single adfluvial bull trout was observed; however, no juvenile bull trout were observed. Muir Creek was closed to fishing by Glacier National Park regulations in 1972.

MUIR CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-30-81

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 5.9 m and the mean depth was 0.17 m. This reach was composed of 43% run, 38% pocketwater, 14% riffle and 5% pool areas. Channel debris was low, with half large and stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. High instream cover (31%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 3.8% and the D-90 was 68 cm. Some mass wasting was observed and the stream channel was braided at several locations.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 50 m. Reach 2 had an irregular pattern and was occasionally confined. The Fielding-Coal Creek trail paralleled the North bank from stream km 3.6 to the upper reach break at km 4.3.

Fish Populations:

Westslope cutthroat trout were observed in moderate densities, with 5.3 age II or older fish per 100 m^2 surface area. No other fish species was observed.

MUIR CREEK REACH 3

Channel Characteristics: Date Surveyed 7-29-81

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 4.6 m and the mean depth was 0.18 m. This reach was composed of 45% riffle, 30% pocketwater and 25% run areas. Channel debris was low, with 25% stable. Bank cover was low, with 8% of the wetted surface area influenced by overhang. Moderate to high instream cover (23%) was provided by substrate, turbulence, debris and exposed roots of bank vegetation. Stream gradient was 4.4% and the D-90 was 48 cm. Some mass wasting was observed and a bedrock cascade section was noted at stream km 4.3. The Fielding-Coal Creek trail crossed at the upper reach break (stream km 7.2).

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 2:1. The average valley width was 28 m. Reach 3 had a sinuous pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat trout were the only species observed. A density estimate showed 19.6 age I or older cutthroat per 100 m^2 surface area. This was the highest density reach in the lower Middle Fork drainage. Muir Creek was closed to fishing by Glacier National Park regulations in 1972.

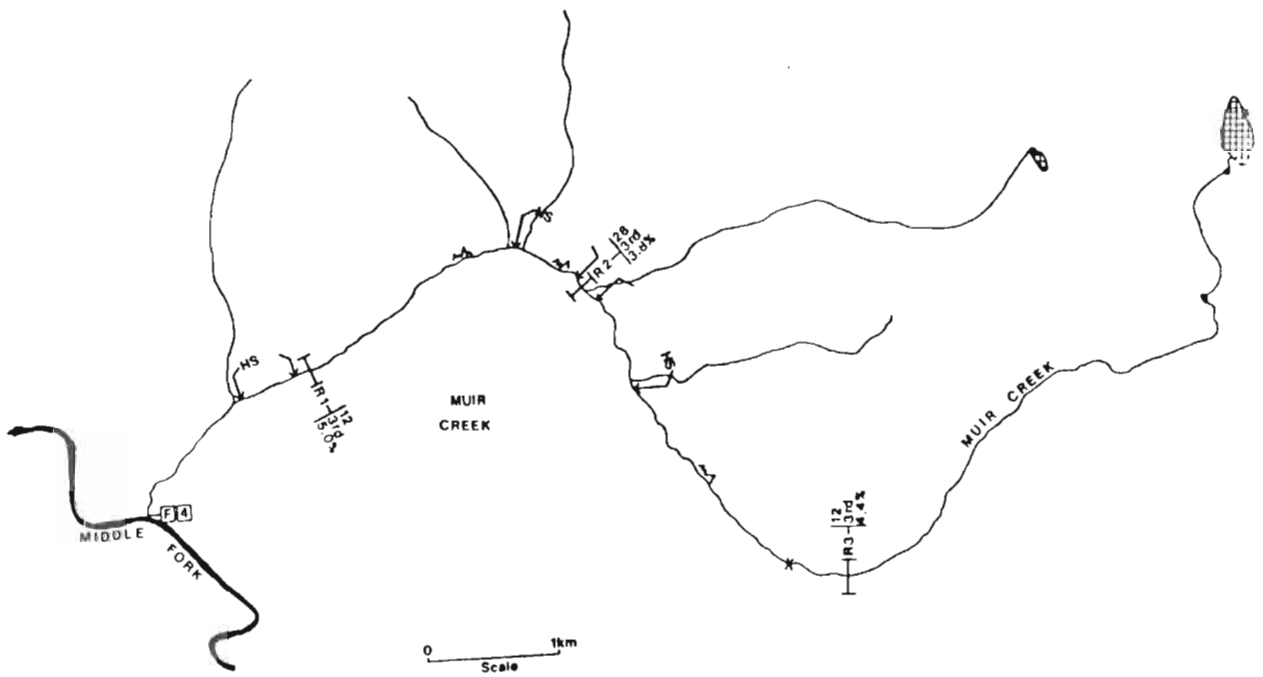

Figure 20. Physical habitat information for Muir Creek.

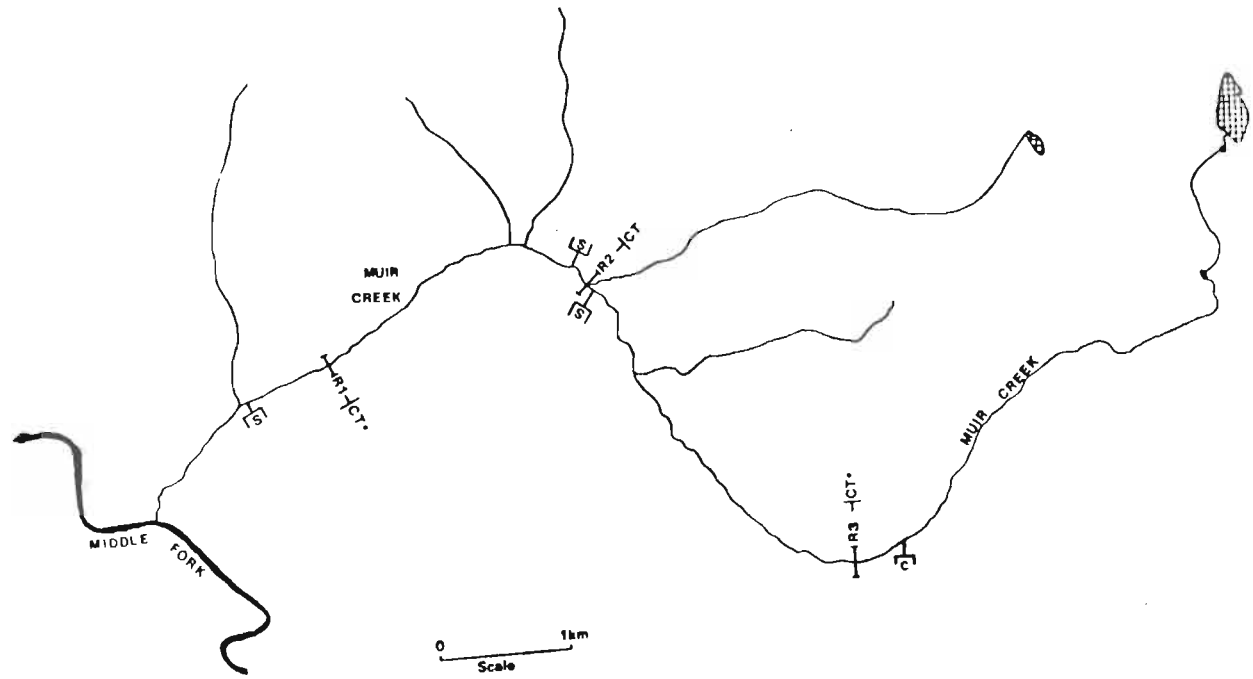

Figure 21. Fish population information for Muir Creek.

Table 19. Stream habitat and fish population data for Muie Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Muir Cr.	001	C75	1.9	Middle Fork	Above 1st trib from So.	1179.5	Junction w/ Middle Fork	1082.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	34.8	5.4	.22	12	20	2	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Low	. 20	--	--	Low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	29	14	52	4	22	4	70	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	15	30	30	15	106	5.0	87	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	10	5	25

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
150	71	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	1.7	9.9	0	0	0	0.1	A	A

Table 20. Stream habitat and fish population data for Muir Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Muir Cr.	002	C76	2.4	Middle Fork	4th, 1st order trib on No.	1270.7	Above 1st trib from S.	1179.5

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	5.9	.17	28	50	02	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	--	--	--	Low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	43	14	38	0	7	7	86	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	20	40	30	0	68	3.8	98	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	50	5	5	31

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	1.8	3.5	0	0	0	0	A	A

Table 21. Stream habitat and fish population data for Muir Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Muir Cr.	003	C77	2.9	Middle Fork	.4 km above falls at 6.7 km	1398.4	4th first order trib on No.	1270.7

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	4.6	.18	12	28	02	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Low	--	--	--	Nil	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	25	45	30	0	0	0	100	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
15	27	35	18	5	48	4.4	93	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	25	12	8	23

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	2.6	8.6	8.4	0	0	0	0	A	A

PAOLA CREEK DRAINAGE

PAOLA CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-17-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 7.1 m and the mean depth was 0.34 m. This reach was composed of 67% riffle, 18% pool and 15% pocketwater areas. Channel debris was low, and the majority (80%) was large and stable. Bank cover was moderate, with 18% of the wetted surface area influenced by overhang. High instream cover (27%) was provided by large substrate, debris and turbulence. Stream gradient was 9.6% and the D-90 was 88 cm. Several slumping areas were present and many cascading sections were observed. The Burlington Northern railroad and Highway 2 crossed at stream km 0.3. Forest Service Road 1638 crossed at the upper reach break and formed a barrier to upstream migration. Paola Creek braids over a wide gravel bar near its junction with the Middle Fork.

Valley Characteristics:

The upper bank slope was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 50 m. Reach 1 had an irregular pattern and was frequently confined. Portions of both stream banks have been clearcut near stream km 0.8.

Fish Populations: Date Surveyed: 7-21-81

Juvenile bull trout were the only fish species observed. Results of a population estimate made in spring of 1981 showed 26 age I and older bull trout per 100 m of stream length.

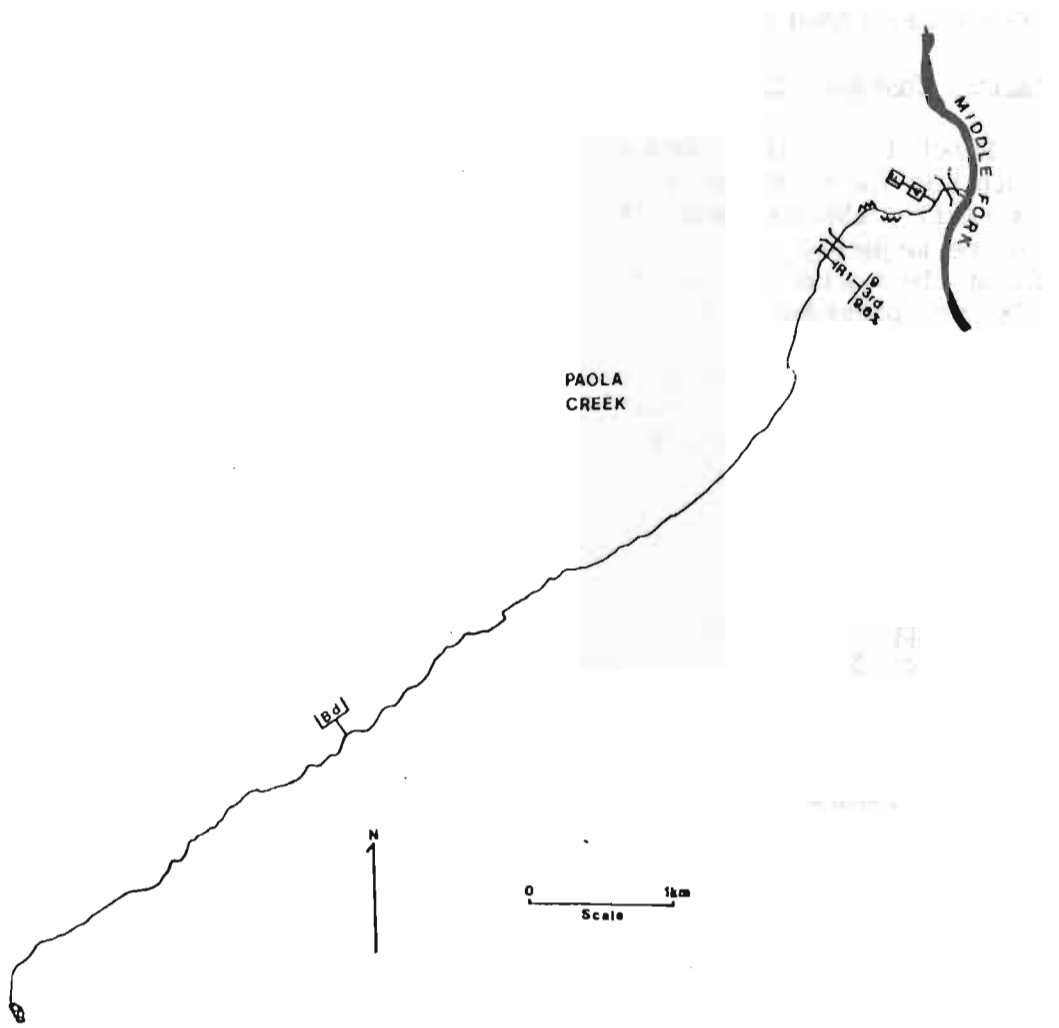

Figure 22. Physical habitat information for Paola Creek.

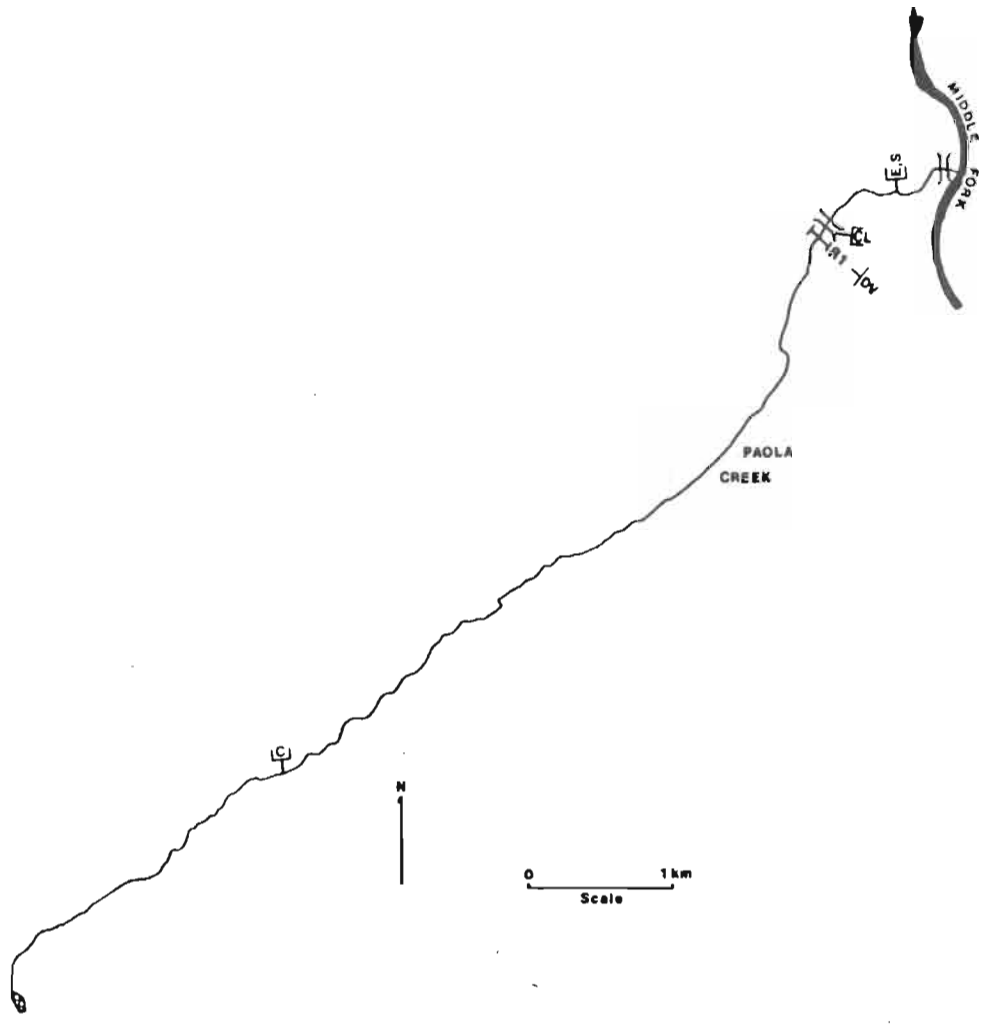

Figure 23. Fish population information for Paola Creek.

Table 22. Stream habitat and fish population data for Paola Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Paola Cr.	001	C78	1.2	Middle Fork	Paola Cr. Rd. culvert	1203.8	Junction w/ Middle Fork	1088.3

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	16.9	7.1	.34	9	50	05	Tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	.15	--	--	Low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
18	0	67	15	9	27	18	46	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	20	20	50	0	88	9.6	94	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Low	80	37	18	27

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
170	91	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0	0	0.2	0.2	0.4	A	A

PARK CREEK DRAINAGE

PARK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-7-81

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 9.9 m and the mean depth was 0.68 m. This reach was composed of 42% run, 37% pocketwater, 18% pool and 3% riffle areas. Channel debris was low, with 20% stable. Bank cover was low, with 9% of the wetted surface area shielded. High instream cover (29%) was provided by substrate, turbulence, depth and occasionally by debris. Stream gradient was 1.7% and the D-90 was 110 cm. Some mass wasting was observed in the lower portion and a cascade area was present at stream km 1.8. Just above the cascade a large log jam was present across the entire channel up to 3 m in height. Glacier National Park's Boundary Trail crossed just above the mouth.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 30 m. Reach 1 had an irregular pattern and was entrenched by rock walls. The Park Creek Trail ran along the top of the east canyon wall.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. All species were present in low to moderate densities. Reach 1 served as a migration corridor for adfluvial bull trout which spawned in the upper reaches. Park Creek was closed to fishing by Glacier National Park regulations in 1972.

PARK CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-4-81

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 10.4 m and the mean depth was 0.33 m. This reach was composed of 60% run, 25% riffle and 15% pool areas. Channel debris was moderate, with 20% stable. Bank cover was moderate, with 14% of the wetted surface area influenced by overhang. Moderate instream cover (13%) was provided by substrate, turbulence and debris. Stream gradient was 0.9% and the D-90 was 25 cm. Several braided areas occurred in lower-gradient meadow sections where gravel deposition was occurring on point bars. The Park Creek trail followed the east bank and a campground with a patrol cabin was located near the Fielding-Coal Creek trail crossing (stream km 8.0).

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 10:1. The average valley width was 405 m. Reach 2 had a sinuous pattern and was unconfined. The Park Creek trail

followed the south bank.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. All species were present in low to moderate densities. Adfluvial bull trout spawning has been documented and redd counts conducted during 1981 enumerated seven redds. Bull trout redd density in the high use area was 6.0 redds per km. Park Creek was closed to fishing in 1972 by Glacier National Park regulations.

PARK CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-4-81

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 9.9 m and the mean depth was 0.23 m. This reach was composed of 47% run, 31% riffle, 20% pocketwater and 2% pool areas. Channel debris was low, with 30% stable. Bank cover was low with 8% of the wetted surface area shielded. Moderate instream cover (14%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 2.2% and the D-90 was 65 cm. Several slumping areas were present and slight braiding occurred. A major fork was observed at stream km 19.2 and the upper reach break was located here. The majority of flow came from the west fork; however, cascade barriers were present 0.5 km above the junction on this fork.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 70 m. Reach 3 had a sinuous pattern and was occasionally confined. The Park Creek trail followed the east bank.

Fish Populations: Date Surveyed: 8-6-81

Westslope cutthroat and juvenile bull trout were observed in moderate densities. Spawning by adfluvial bull trout has been documented here.

PARK CREEK REACH 4

Channel Characteristics: Date Surveyed: 8-5-81

Reach 4 is a second order tributary in the Middle Fork drainage. Average wetted width was 7.2 m and the mean depth was 0.33 m. This reach was composed of 43% pool, 33% pocketwater, 19% run and 5% riffle areas. Moderate to high channel debris was present, with 20% stable. Bank cover was low, with less than 10% of the wetted surface area influenced by overhang. Moderate to high instream cover (25%) was provided by substrate, turbulence, depth and debris. Stream gradient was 4.5% and the D-90 was 89 cm. Several bedrock areas formed cascades and falls in the lower portions and a permanent log jam was present at stream km 19.8. A 4 m falls formed a barrier at stream km 20.0.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 30 m. Reach 4 had a sinuous pattern and was generally confined. A patrol cabin and campsite were located on the east bank near the Two Medicine Pass-Park Creek trail junction (stream km 21.1). The Park Creek trail crossed at km 21.6 and continued on to Lake Isabel in the headwaters.

Fish Populations:

Westslope cutthroat trout were observed in moderate densities. A 4 m falls formed a migration barrier at stream km 20.0; however, cutthroat trout were present above the falls. These fish may have outmigrated from the cutthroat population in Lake Isabel.

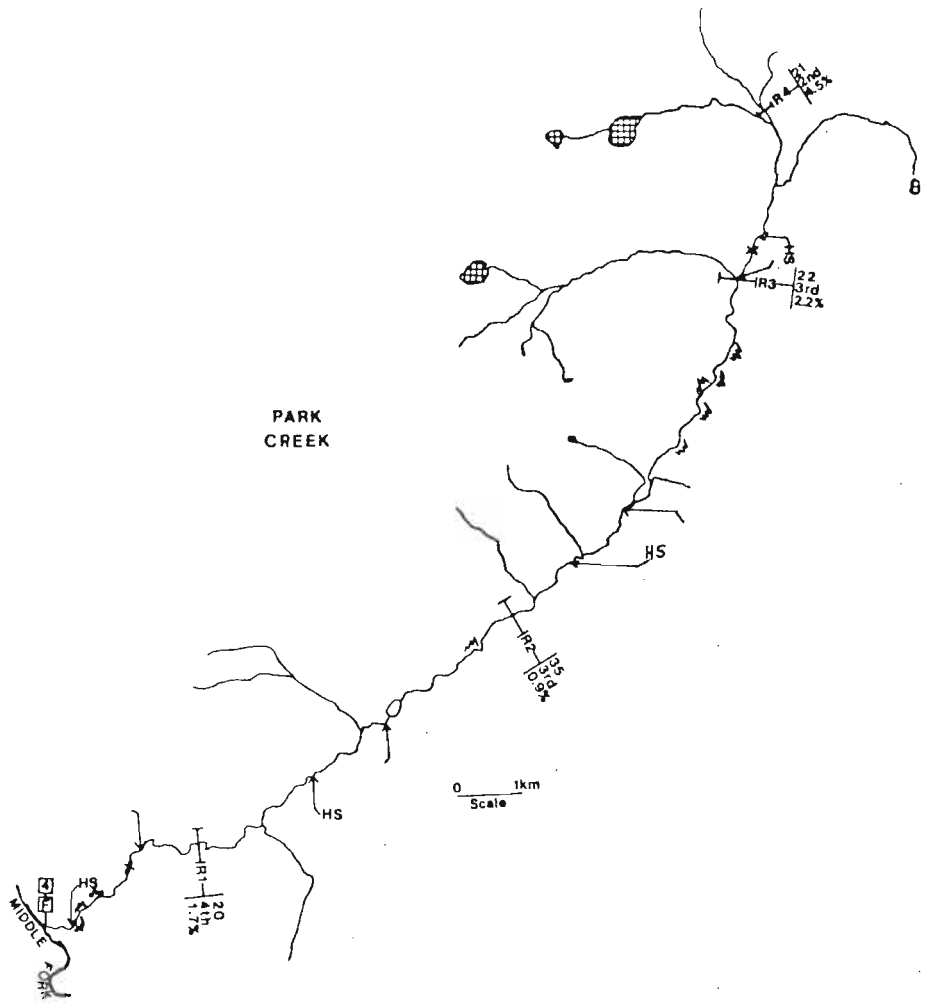

Figure 24. Physical habitat information for Park Creek.

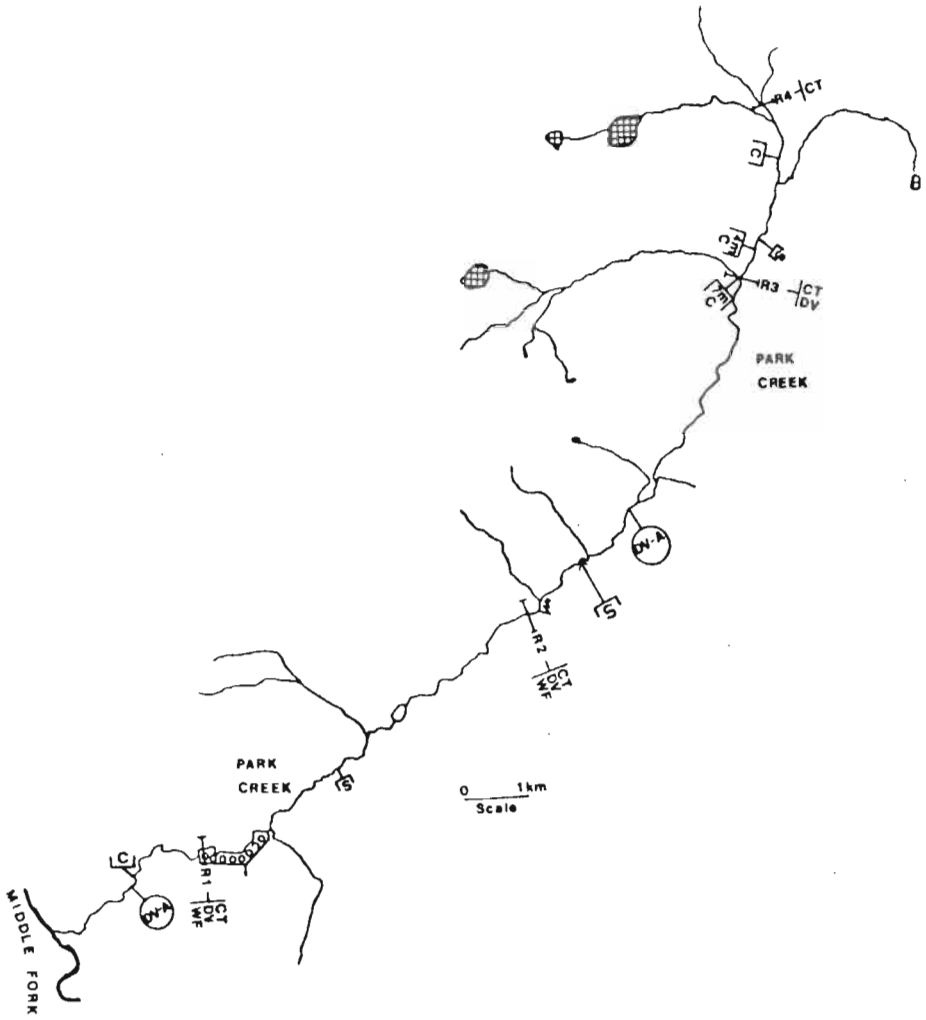

Figure 25. Fish population information for Park Creek.

Table 23. Stream habitat and fish population data for Park Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Park Cr.	001	C79	3.5	Middle Fork	3.5 km above mouth	1179.5	Junction w/ Middle Fork	1118.7

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	101.6	9.9	.68	20	30	02	Broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Nil	.62	--	16	Low	2.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
18	42	3	37	22	16	9	53	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
7	12	13	38	30	110	1.7	74	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Low	20	13	9	29

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
150	67	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
3	0.8	81	0	0	82	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.2	0.4	0.7	0	0.1	0	0.1	P	A

Table 24. Stream habitat and fish population data for Park Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Park Cr.	002	C8A	8.4	Middle Fork	4.3 km above Fielding Tr. Crossing	1252.5	3.5 km above mouth	1179.5

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	10.4	.33	35	405	12	Placid, Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	N	Moderate	--	--	--	Low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
15	60	25	0	24	38	38	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
27	52	20	1	0	25	0.9	106	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Moderate	Moderate	20	8	14	13

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
7	00.8	81	0	0	82	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.6	2.6	0.6	0	0	0.2	0.2	P	A

Table 25. Stream habitat and fish population data for Park Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Park Cr.	003	C8B	7.6	Middle Fork	Upper forks at 19.3 km	1422.7	4.3 km above Fielding Tr. Crossing	1252.5

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	9.9	.23	22	70	03	Placid, Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Moderate	--	--	--	Low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	47	31	20	0	0	15	85	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
7	25	42	25	1	65	2.2	98	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Moderate	Low	30	2	8	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	3.4	1.3	0.4	0	0.2	0	0	A	A

Table 26. Stream habitat and fish population data for Park Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Park Cr.	004	C8C	3.2	Middle Fork	3.2 km above upper forks	1568.6	Upper forks at 19.3 km	1422.7

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
02	--	7.2	.33	21	30	02	Rolling, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Low	--	--	--	Low	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
43	19	5	33	25	25	0	50	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	% gravel	% rubble	% boulder	%bedrock				
5	13	20	57	5	89	4.5	81	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	High	Moderate	20	1	7	25

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	1.1	3.2	0	0	0	0	A	A

DICKEY CREEK DRAINAGE

DICKEY CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-16-81

Reach 1 is a second order tributary to the Middle Fork. Average wetted width was 5.8 m and the mean depth was 0.28 m. This reach was composed of 37% run, 33% pocketwater, 19% riffle and 11% pool areas. Channel debris was low; however, 75% was large and stable. Bank cover was low, with 10% of the wetted surface area shielded. Moderate instream cover was provided by large substrate and turbulence. Stream gradient was 4.1% and the D-90 was 68 cm. Several slumping areas were present and cascade-bedrock sections formed migration barriers at several points. U.S. Highway 2 and the Burlington Northern railroad crossed near the mouth.

Valley Characteristics:

The upper bank slope was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 50 m. Reach 1 had an irregular pattern and was frequently confined.

Fish Populations:

Eastern brook trout were observed; however, barriers exist within .8 km of the mouth. Juvenile bull trout were observed downstream from the lowermost barrier in limited densities.

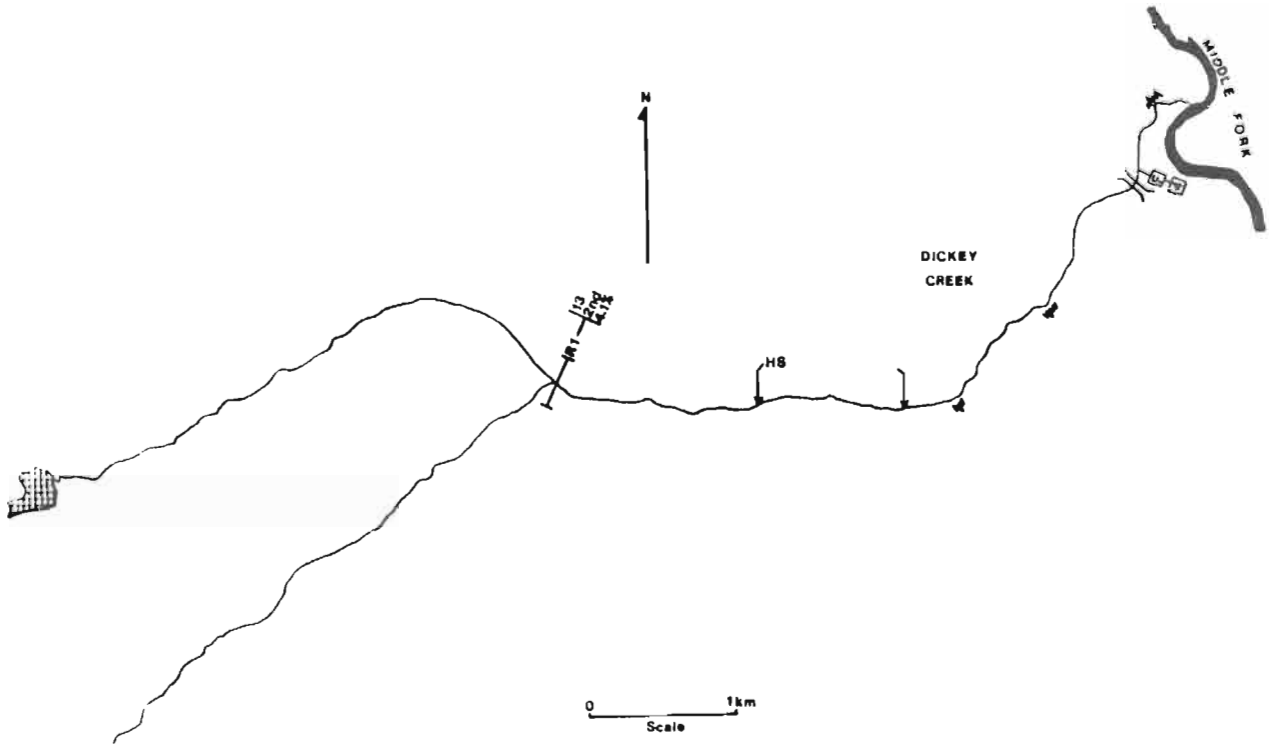

Figure 26. Physical habitat information for Dickey Creek.

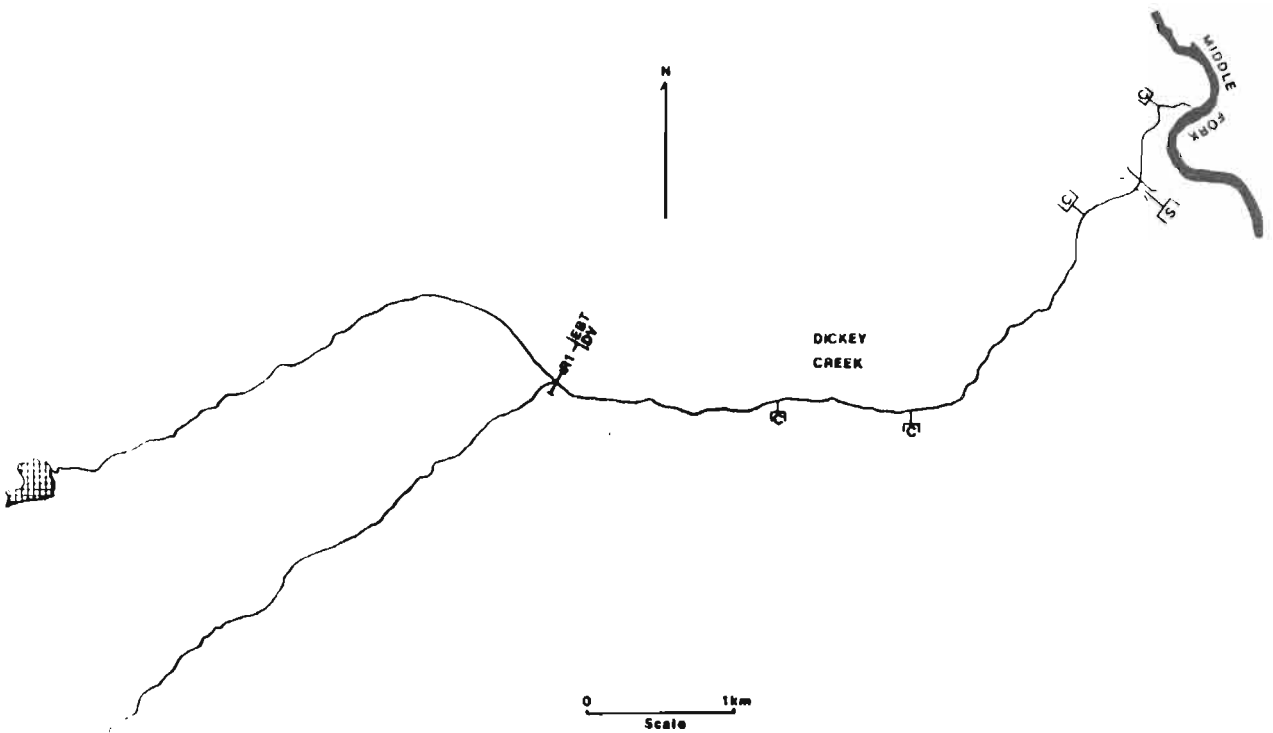

Figure 27. Fish population information for Dickey Creek.

Table 27. Stream habitat and fish population data for Dickey Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Dickey Cr.	001	C8D	4.4	Middle Fork	1st intermittent trib. on So.	1301.1	Junction w/ Middle Fork	1118.7

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
02	23.3	5.8	.28	13	50	04	Rolling, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Low	.09	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
11	37	19	33	0	18	19	63	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	10	8	7	65	68	4.1	58	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Low	75	7	10	--

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
200	116	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	A

OLE CREEK DRAINAGE

OLE CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-14-81

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 10.2 m and the mean depth was 0.44 m. This reach was composed of 45% run, 45% pocketwater, 7% riffle and 3% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Moderate instream cover (22%) was provided by substrate, turbulence, depth and debris. Stream gradient was 1.6% and the D-90 was 151 cm. Several slumping banks were present in the lower portion and the Boundary trail crossed 0.4 km above the mouth.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 50 m. Reach 1 had an irregular pattern and was generally confined. The Ole Creek trail followed the North bank.

Fish Populations: Date Surveyed: 8-13-81

Westslope cutthroat, juvenile and adult bull trout eastern brook trout and mountain whitefish were observed. Densities of juvenile bull trout indicated an important rearing area with 4.1 age I or older bulls per 100 m^2 surface area. Stream trapping data showed adult bull trout use Reach 1 as a migration corridor to spawning areas in the upper reaches. An out-migration of juvenile bull trout and cutthroat was also observed. Glacier National Park regulations closed Ole Creek to fishing in 1972.

OLE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-11-81

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 9.6 m and the mean depth was 0.20 m. This reach was composed of 62% run, 30% riffle, 5% pool and 3% pocketwater areas. Channel debris was low, with 30% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Moderate instream cover (15%) was provided by substrate, turbulence, cutbanks and some debris. Stream gradient was 1.1% and the D-90 was 31 cm. Several slumping banks were observed and some braiding occurred. A portion became intermittent during late summer of 1981. The Fielding-Coal Creek trail crossed at stream km 11.2.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 2 had an irregular pattern and was unconfined. The Ole Creek trail ran along the north side of the stream.

Fish Populations: Date Surveyed: 8-9-81

Westslope cutthroat, juvenile bull trout and mountain whitefish were observed. Densities of juvenile bull trout showed an important rearing area with 1.7 age I or older bulls per 100 m^2 surface area. Spawning by adfluvial bull trout has been documented with an average of 30 redds enumerated annually during three years of survey. Bull trout redd density in the high use portion of this reach was 9.5 redds per km during the 1981 redd survey. Westslope cutthroat were present in moderate densities and spawning by migratory fish is suspected in high water channels and tributary drainages. Glacier National Park regulations closed Ole Creek to fishing in 1972.

OLE CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-11-81

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 9.3 m and the mean depth was 0.29 m. This reach was composed of 65% run, 25% riffle and 10% pocketwater areas. Low to moderate channel debris was present, with 25% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (14%) was provided by substrate, turbulence, debris and depth. Stream gradient was 2.0% and the D-90 was 45 cm. Many slumping banks were observed and several sections were braided. A low gradient feature was present from km 14.7 to 15.7 and a short rock canyon was noted from stream km 16.3 to 17.1. A large spring and barrier falls were observed just above the mouth of Debris Creek (stream km 26.9). A 1.5 km portion below the falls was intermittent during late summer flows in 1981. The Ole Creek trail crossed at km 16.0 and continued up the east bank, through the campground at Ole Lake and on to Firebrand Pass on the Continental Divide.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 150 m. Reach 3 had an irregular pattern and was occasionally confined at several points.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. A density estimate indicated an important bull trout rearing area, with 3.2 age I or older bulls per 100 m^2 surface area. Spawning by adfluvial bull trout has been documented. Cutthroat were present in moderate densities. Ole Creek was closed to fishing by Glacier National Park regulations in 1972.

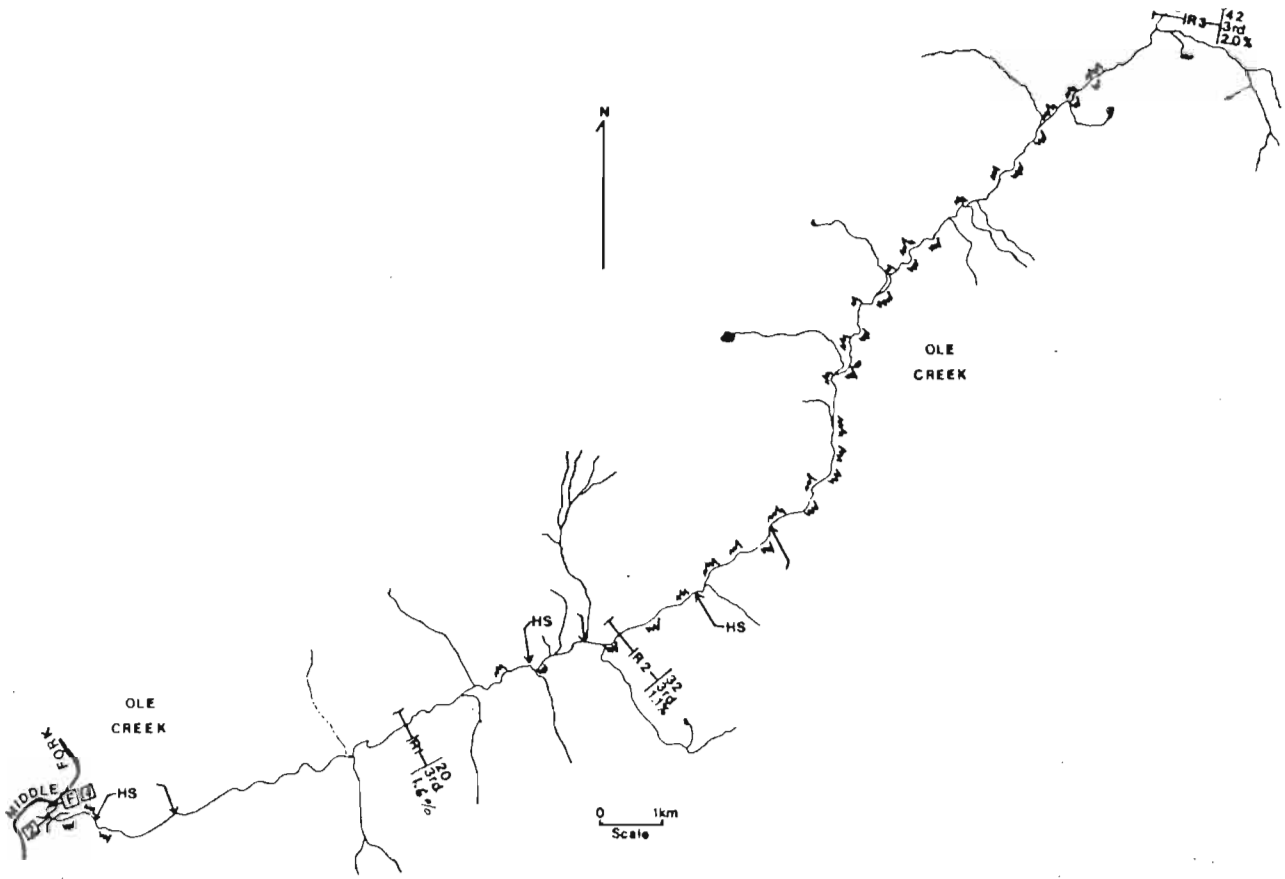

Figure 28. Physical habitat information for Ole Creek.

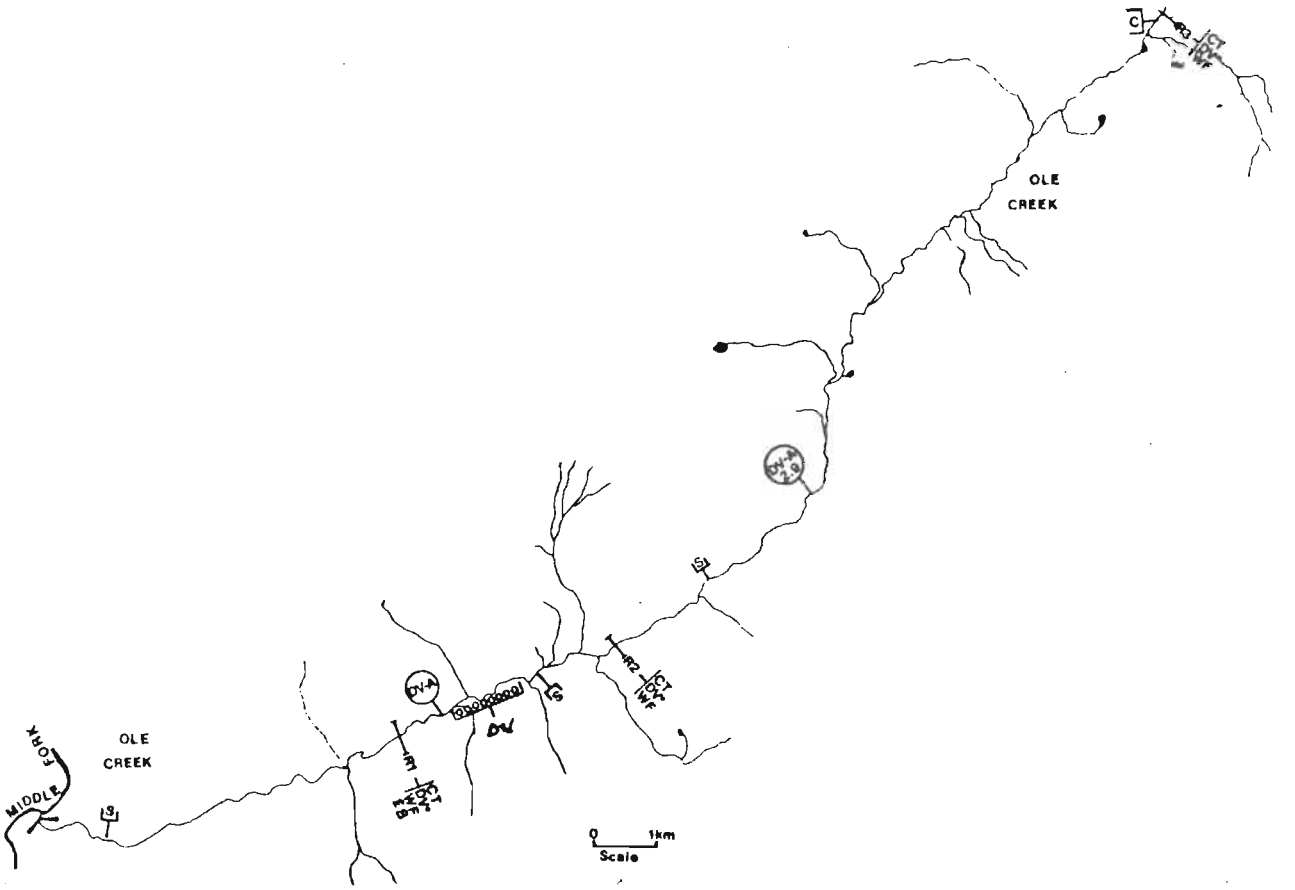

Figure 29. Fish population information for Ole Creek.

Table 28. Stream habitat and fish population data for Ole Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Ole Cr.	001	C8E	7.4	Middle Fork	End of canyon 7.4 km above mouth	1256.6	Junction w/ Middle Fork	1136.9

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	119.5	10.2	.44	20	50	03	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Nil	.95	--	17	Low	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	45	7	45	50	0	0	50	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	15	25	30	10	151	1.6	107	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	1	5	22

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
170	76	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.4	1.2	0	1.6	0.6	1.8	P	P

Table 29. Stream habitat and fish population data for Ole Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Ole Cr.	002	C8F	4.0	Middle Fork	.2 km above Fielding Tr. Crossing	1301.1	End of canyon 7.4 km above mouth	1258.6

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	9.6	.20	32	200	06	Broken, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	Moderate	--	--	--	Low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	62	30	3	12	25	50	13	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
15	35	30	20	0	31	1.1	107	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	30	1	5	15

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
19	4.7	80	19	04.7	81	51	12.8	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.7	1.2	2.9	0	0.3	0.7	0.7	P	A

Table 30. Stream habitat and fish population data for Ole Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Ole Cr.	003	C8G	15.6	Middle Fork	Falls above Debris Cr.	1617.3	.2 km above Fielding Tr. Crossing	1301.1

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
03	--	9.3	.29	42	150	04	Broken, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	High	--	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	65	25	10	0	0	0	100	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
15	24	40	20	1	45	2.0	106	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Low	25	1	1	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
4	00.3	81	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.6	2.6	1.5	0	0.8	1.6	0.8	P	A

ESSEX CREEK DRAINAGE

ESSEX CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-24-81

Reach 1 is a second order tributary to the Middle fork. Average wetted width was 6.3 m and the mean depth was 0.21 m. This reach was composed of 42% run, 33% riffle, 17% pocketwater and 8% pool areas. Low to moderate channel debris was present, with 60% stable. Bank cover was moderate, with 16% of the wetted surface area influenced by overhang. High instream cover (30%) was provided by substrate, debris, rooted vegetation and undercut banks. Stream gradient was 2.2% and the D-90 was 36 cm. No slumping or braiding was observed. The community of Essex utilized this creek as a water supply. The downstream portion was dewatered during low flows. U.S. Highway 2 and the Burlington Northern railroad crossed near the mouth and the Essex Creek road paralleled the middle portions of the reach.

Valley Characteristics:

The upper bank slope was generally less than 30% and the valley to channel ratio was greater than 15:1. The average valley width was 250 m. Reach 1 had an irregular pattern and was generally unconfined with occasional points of confinement. A clearcut was located on the north side from stream km 1 to stream km 2.

Fish Populations: Date Surveyed: 8-4-81

Westslope cutthroat trout was the only fish species observed. A density estimate of over 17 age I or older fish per 100 m^2 surface area indicated an important rearing area for cutthroat trout. A population of 95 age II or older (>75 mm) cutthroat per 100 m of stream length was estimated by electrofishing. Westslope cutthroat spawning was observed in a small high water overflow channel with spring influence, in the clearcut area (stream km 1.5).

ESSEX CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-28-81

Reach 2 is a second order tributary. Average wetted width was 8.4 m and the mean depth was 0.20 m. This reach was composed of 43% run, 26% riffle, 18% pool and 13% pocketwater areas. Moderate channel debris was present, with 30% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. High instream cover was provided by large substrate, turbulence and debris. Stream gradient was 8.2% and the D-90 was 39.5 cm. High percentages of bedrock made D-90 measurements questionable and cascade areas formed migration barriers at several points.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 100 m. Reach 2

had an irregular pattern and was frequently confined. A portion of both banks had been clearcut from approximately stream km 2.4 to stream km 3.2.

Fish Populations:

Due to the presence of many barriers to upstream migration, no fish density or species composition work was conducted. Almeda Lake, in the headwaters, has been planted with westslope cutthroat and outmigration may occur.

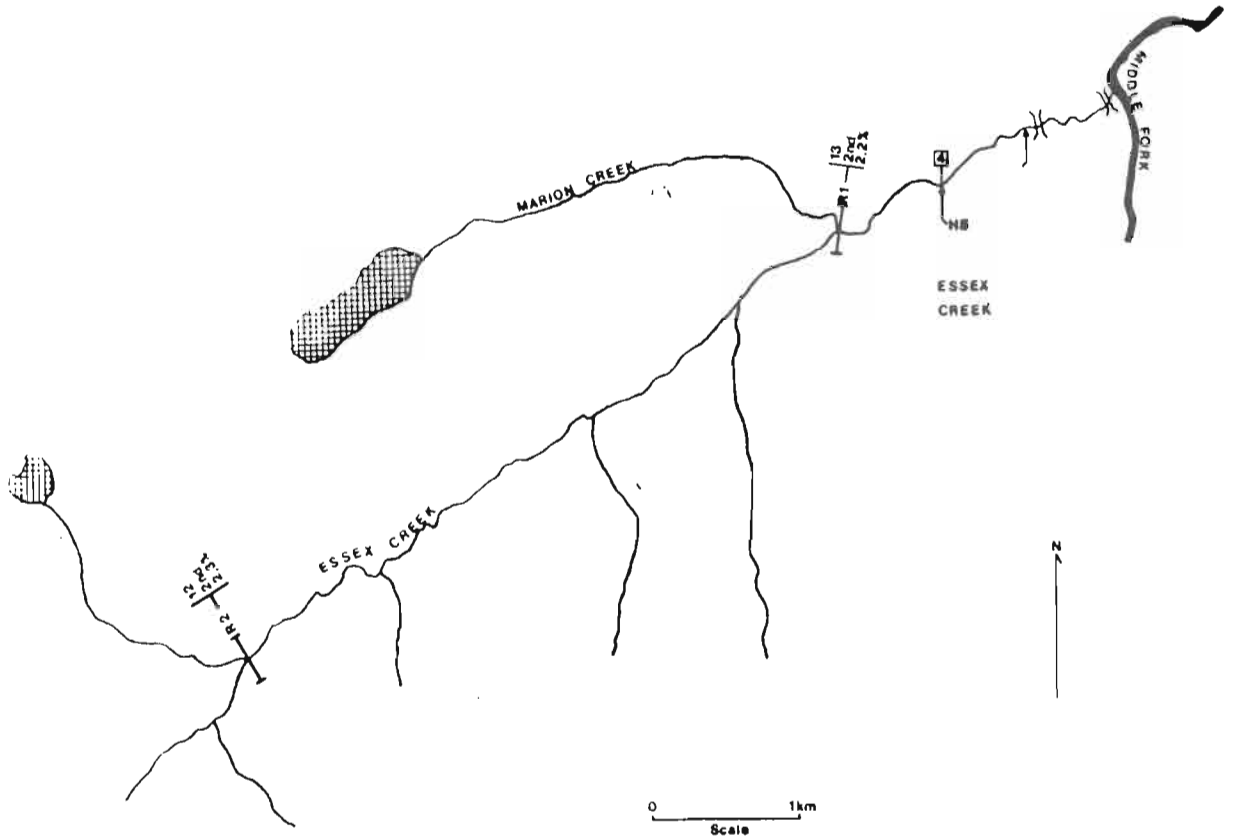

Figure 30. Physical habitat information for Essex Creek.

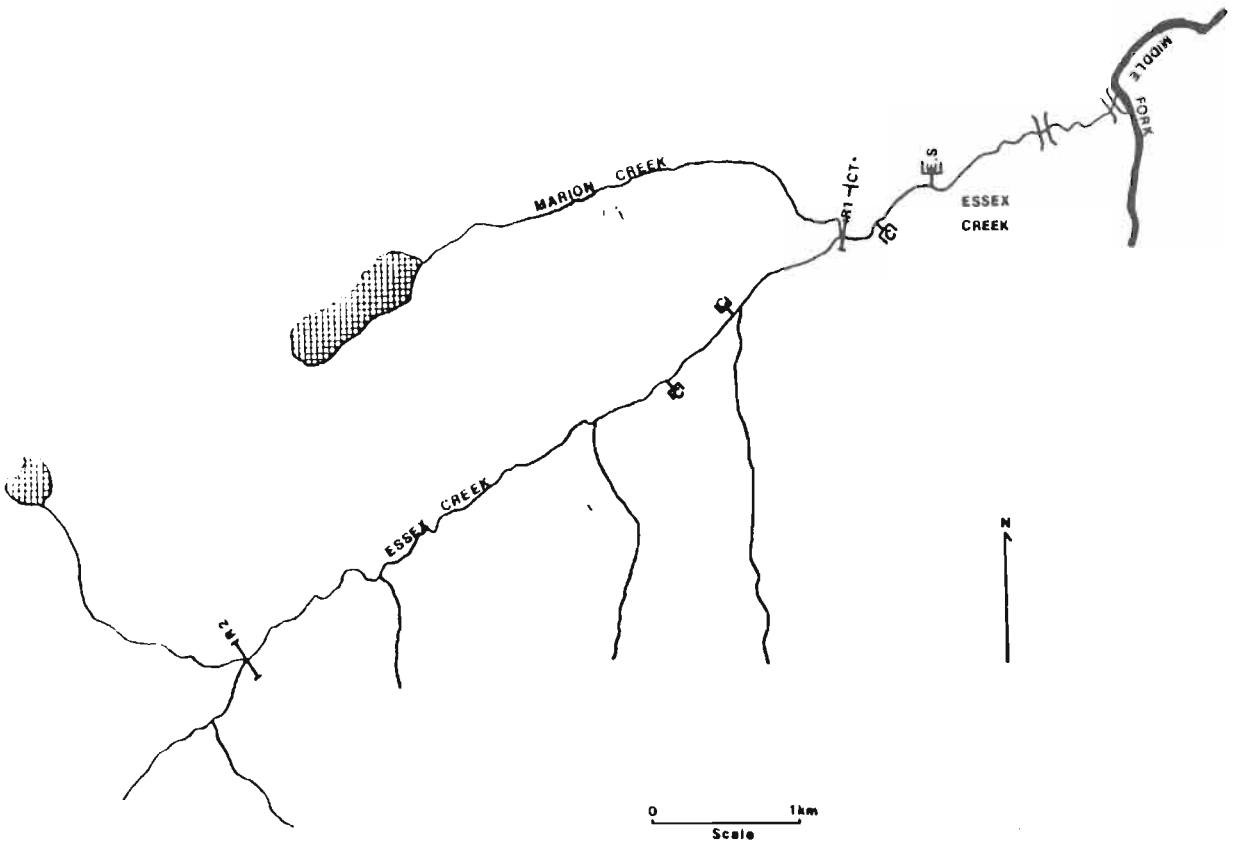

Figure 31. Fish population information for Essex Creek.

Table 31. Stream habitat and fish population data for Essex Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Essex	001	C8H	.19	Middle Fork	Junction w/ Marion Cr.	1216.0	RxR Crossing	1173.4

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
02	26.6	6.3	.21	13	250	19	Swirling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	Low	--	--	14	Nil	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	42	33	17	2?	23	15	29	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	28	42	19	1	36	2.2	84	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Low	60	12	16	30

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	3.3	6.6	7.3	0	0	0	0	A	A

Table 32. Stream habitat and fish population data for Essex Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Essex Cr.	002	C8I	1.6	Middle Fork	4.1 km above mouth	1353.3	Junction w/ Marion Cr.	1216.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
02	--	8.4	.20	12	100	08	Tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Nil	--	--	--	--	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
18	43	26	13	8	15	40	37	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
1	5	8	12	74	40	8.2	54	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Moderate	30	5	1	--

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	A

BEAR CREEK DRAINAGE

BEAR CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-31-81

Reach 1 is a fifth order tributary to the Middle Fork. Average wetted width was 10.3 m and the mean depth was 0.47 m. This reach was composed of 48% run, 29% pocketwater and 23% riffle areas. Low channel debris was present, with only a trace stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (19%) was provided by rip-rap, natural substrate and occasionally by turbulence or depth. Stream gradient was 1.8% and the D-90 was 67 cm. Several major slumping areas were present and the proximity of Highway 2 affected channel configuration at several points.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 200 m. Reach 1 had an irregular pattern and was occasionally confined by the Burlington Northern railroad grade, or by rip-rap along Highway 2.

Fish Populations: Date Surveyed: 8-5-81

Westslope cutthroat, juvenile and adult bull trout, eastern brook trout and mountain whitefish were observed. A density estimate indicated an important rearing area for juvenile bull trout (2.8 age I or older fish per 100 m^2 surface area). Trapping results showed the area to be a migration corridor for adfluvial bull trout and migratory westslope cutthroat trout.

BEAR CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-27-81

Reach 2 is a fifth order tributary. Average wetted width was 9 m and the mean depth was 0.28 m. This reach was predominantly riffle-run habitat (35% riffle, 54% run), with 10% pool areas. Low channel debris was present, with 20% stable. Bank cover was low, with less than 5% of the wetted surface area shielded. Moderate instream cover (16%) was provided by substrate, turbulence and occasionally by depth and rooted vegetation. Stream gradient was 0.9% and the D-90 was 23 cm. Reach 2 was braided and an off-channel beaver dam area was present downstream from Snowslip. Highway 2 crossed just below the mouth of Giefer Creek.

Valley Characteristics

The upper bank slope gradient was less than 30% and the valley to channel ratio was generally greater than 10:1. The average valley width was 480 m. Reach 2 had a sinuous pattern and was unconfined.

Fish Populations: Date Surveyed: 7-31-81

Westslope cutthroat, juvenile and adult bull trout, eastern brook trout, mountain whitefish and sculpins were observed. Adfluvial bull trout spawning was documented with an average of 15 redds enumerated annually during three years of survey. Redd density in the 1981 high use area was 6.0 bull trout redds per km. This reach also contained the highest eastern brook trout density observed (6.4 per 100 m^2) with several fish approaching 300 mm in length.

BEAR CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-29-81

Reach 3 is a third order tributary downstream to Skyland Creek where it becomes fourth order. Average wetted width was 7.5 m and the mean depth was 0.22 m. This reach was composed of 53% run, 32% riffle, 10% pocketwater and 5% pool areas. Low channel debris was present, with 25% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (12%) was provided by substrate and turbulence. Stream gradient was 2.6% and the D-90 was 38 cm. Reach 3 is paralleled by Highway 2 and channel configuration was affected at many locations. A cascade-bedrock section was present below the mouth of Skyland Creek which formed a partial barrier during low flows. The Highway 2 culvert at the Skyland Road intersection formed an upstream barrier during the entire year.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 75 m. Reach 3 had an irregular pattern and was frequently confined.

Fish Populations: Date Surveyed: 7-31-81

Westslope cutthroat, juvenile bull trout, eastern brook trout and mountain whitefish were observed. Juvenile bull trout densities were high although no spawning has been observed here. A partial barrier was present downstream from Skyland Creek which may prevent upstream migration during low flows. Stream trapping data suggested a migratory cutthroat population. The Highway 2 culvert at the Skyland Road formed a barrier to upstream migration during the entire year. Above this culvert fisheries potential was extremely low due to high gradient and low flow.

Giefer Creek Reach 1

Channel Characteristics: Date Surveyed: 7-25-81

Reach 1 is a fourth order tributary to Bear Creek. Average wetted width was 4.8 m and the mean depth was 0.17 m. This reach was predominantly riffle-run habitat (47% riffle, 40% run), with 12% pocketwater and a trace of pool areas. Channel debris was low, with 10% stable. Bank cover was low, with 4% of the wetted surface area shielded.

Abundant instream cover (27%) was provided by substrate and turbulence, along with undercut banks. Stream gradient was 2.5% and the D-90 was 26 cm. Reach 1 was braided occasionally and a beaver dam area was present below the mouth of Mule Creek. Several slumping areas were present above the mouth of Mule Creek. The lower 0.5 km of this reach was channelized in 1982.

Valley Characteristics:

The upper bank slope gradient was generally less than 30% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 150 m. Reach 1 had an irregular pattern and was unconfined.

Fish Populations: Date Surveyed: 7-26-81

Westslope cutthroat, bull trout, eastern brook trout, mountain whitefish and sculpins were observed. Trapping results showed an outmigration of cutthroat, juvenile bull trout and eastern brook trout into Bear Creek during June and July. Large numbers of outmigrants indicated an important rearing area for migratory fish. An electrofishing estimate conducted in July enumerated 27 westslope cutthroat, 19 eastern brook trout and 7 juvenile bull trout per 100 m of stream length. An electrofishing estimate conducted on a tributary stream (Stannard Creek) enumerated 33 westslope cutthroat, 32 eastern brook trout and 22 juvenile bull trout per 100 m of stream length.

Skyland Creek Reach 1

Channel Characteristics: Date Surveyed: 7-25-81

Reach 1 is a fourth order tributary to Bear Creek, in the Middle Fork drainage. Average wetted width was 6.1 m and the mean depth was 0.28 m. This reach was composed of 49% run, 40% pocketwater, 10% pool and a trace of riffle areas. Channel debris was moderate, with half stable. Bank cover was moderate, with 11% of the wetted surface area influenced by overhang. Moderate to high instream cover (25%) was provided by large substrate turbulence and debris. Stream gradient was 3.1% and the D-90 was 53 cm. Skyland Creek had several cascade sections and slumping areas in the downstream portion. The upper portion of the reach was followed by the Skyland road.

Valley Characteristics:

The upper bank slope was 40 to 60% and the valley to channel ratio varied from 0 to 2 1. The average valley width was 30 m. Reach 1 had an irregular pattern and was generally entrenched.

Fish Populations: Date Surveyed 7-26-81

Westslope cutthroat and juvenile bull trout were observed. A density estimate of 3.4 age I or older bull trout per 100 m^2 surface area indicated an important rearing area, although no bull trout spawning has been observed here.

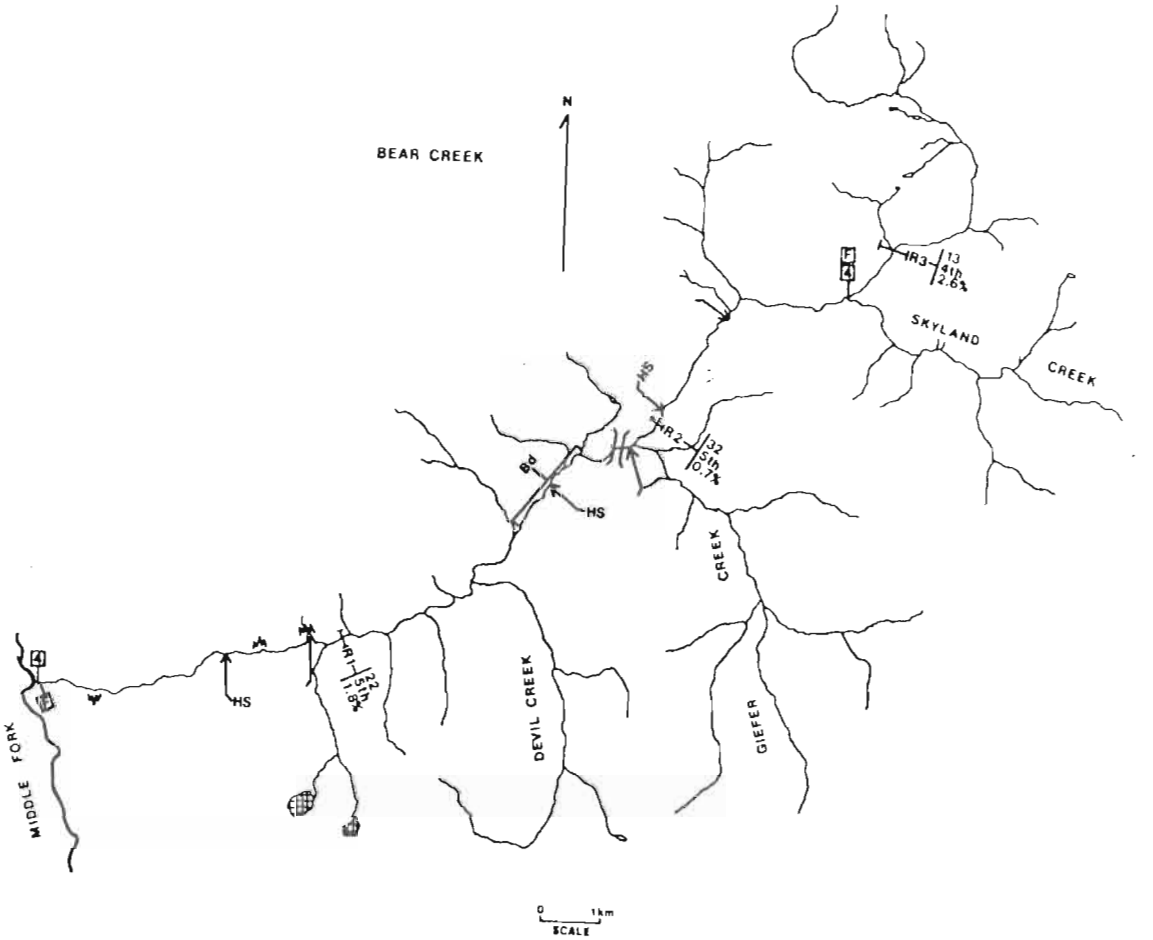

Figure 32. Physical habitat information for Bear Creek.

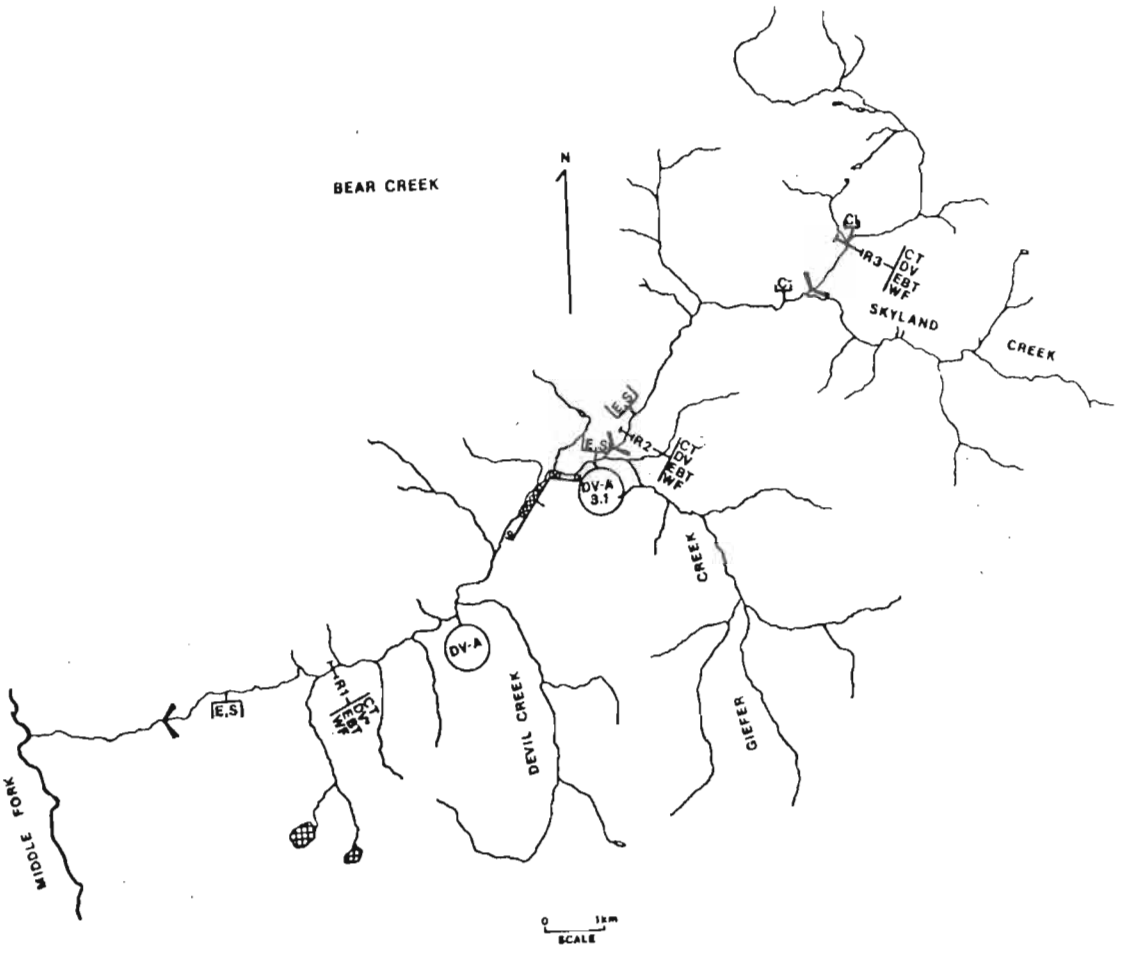

Figure 33. Fish population information for Bear Creek.

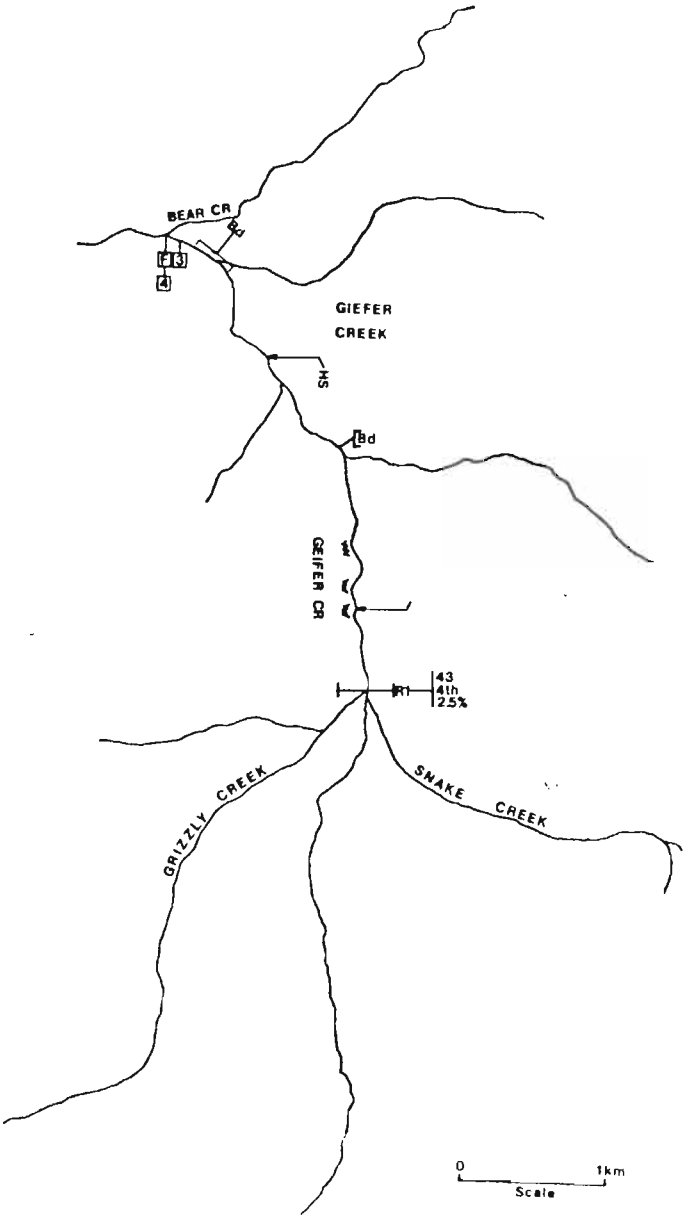

Figure 34. Physical habitat information for Giefer Creek.

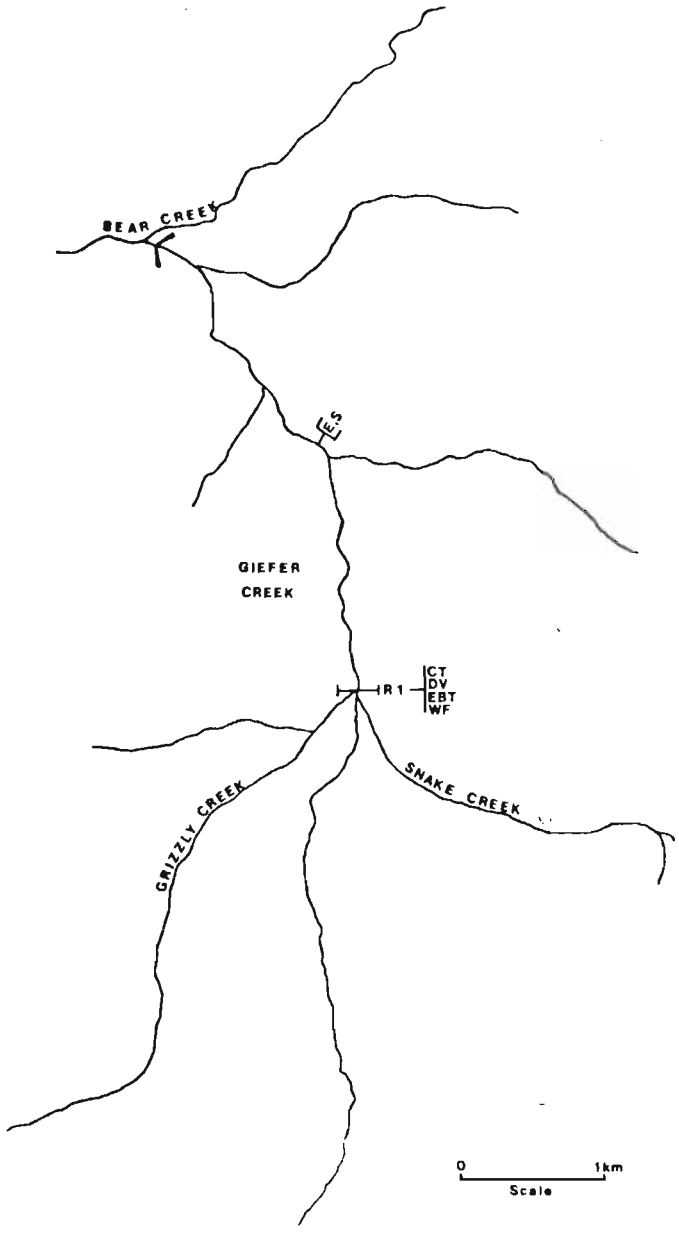

Figure 35. Fish population information for Giefer Creek.

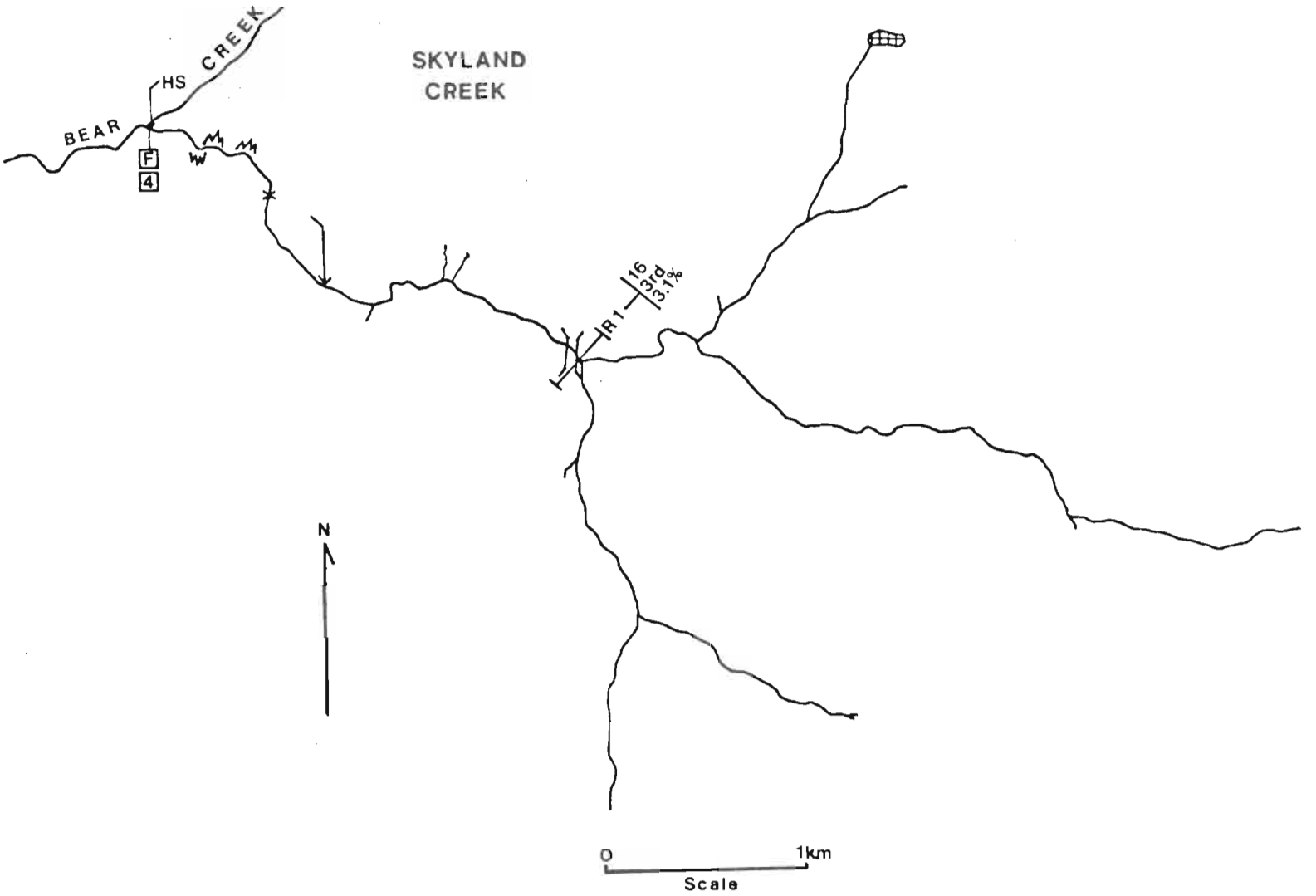

Figure 36. Physical habitat information for Skyland Creek.

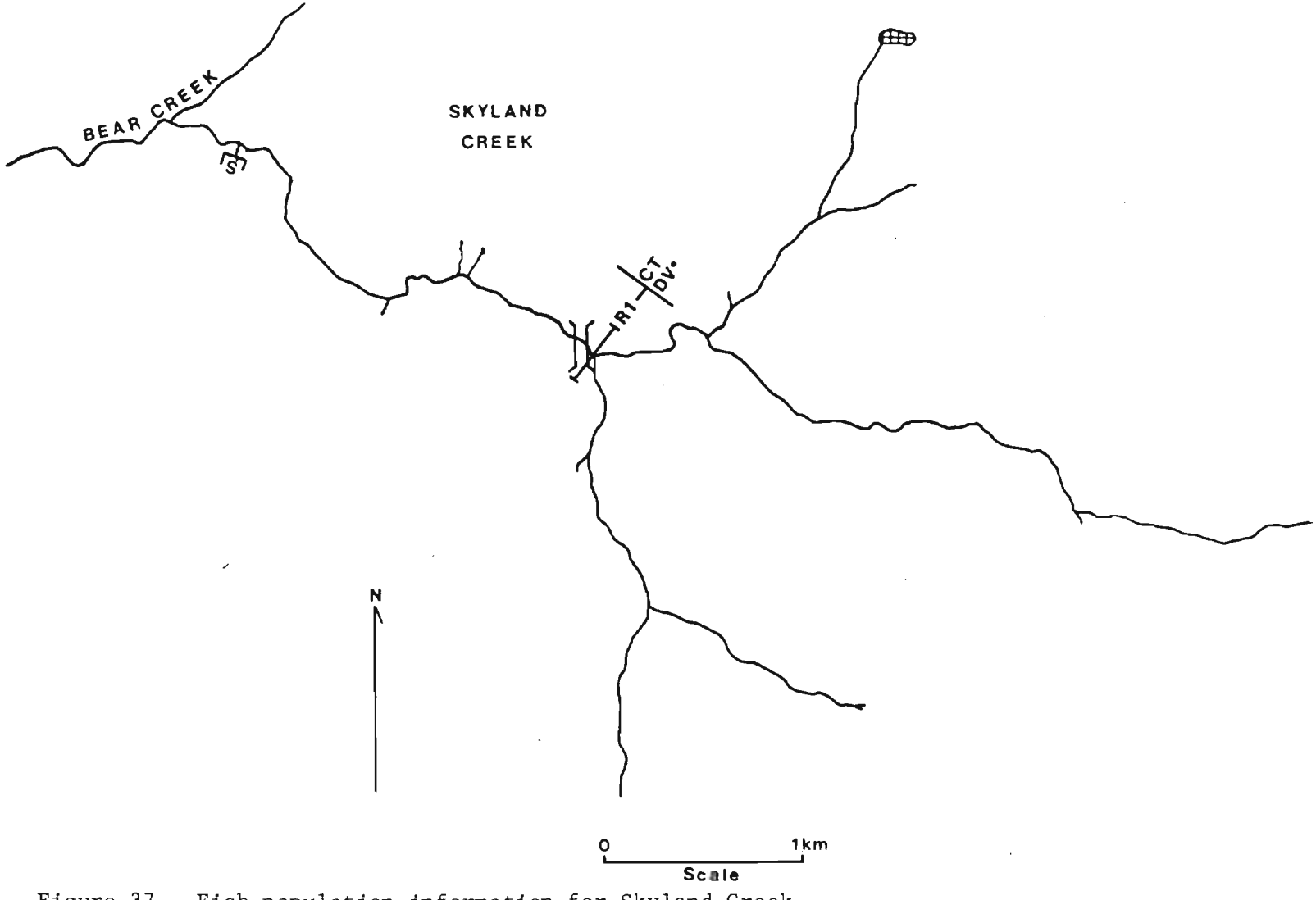

Figure 37. Fish population information for Skyland Creek.

Table 33. Stream habitat and fish population data for Bear Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bear Cr.	001	C8J	5.9	Middle Fork	5.9 km above mouth	1285.9	Junction w/ Middle Fork	1179.5

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
05	145.4	10.3	.47	22	200	03	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	.54	--	--	Moderate	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	48	23	29	0	10	0	90	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	15	32	41	2	67	1.8	92	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Low	0	1	1	19

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
240	131	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0.3	0	0	0.1	2.7	P	P

Table 34. Stream habitat and fish population data for Bear Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bear Cr.	002	C8K	7.7	Middle Fork	.8 km above Giefer Cr.	1352.8	5.9 km above mouth	1285.9

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
05	--	9.0	.28	32	480	>10	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	N	Moderate	--	--	18	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	54	36	0	70	20	10	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
48	32	15	5	0	23	0.9	104	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	20	2	3	16

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
9	2.1	80	12	1.6	81	23	11.5	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	1.5	0.1	0.5	0	0.2	0.1	0.2	P	P

Table 35. Stream habitat and fish population data for Bear Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bear Cr.	003	C8L	10.1	Middle Fork	1st RxR xing below summit	1617.3	.8 km above Giefer Cr.	1352.8

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	--	7.5	.22	13	75	06	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Nil	--	--	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	53	32	10	0	55	0	45	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
15	20	36	26	3	38	2.6	75	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	25	1	1	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
255	114	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0.3	0.3	0	0.1	0.3	0.7	P	P

Table 36. Stream habitat and fish population data for Giefer Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Giefer Cr.	001	C8M	3.7	Bear Cr.	Junction w/ Snake Cr.	1434.9	Junction w/ Bear Cr.	1343.7

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	29.1	4.8	.17	43	150	03	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	Low	.022	--	--	Low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	40	47	12	6	6	19	69	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
16	28	43	13	0	26	2.5	89	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	6	4	27

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
240	133	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.2	1.6	2.3	0	0	0	0.4	A	P

Table 37. Stream habitat and fish population data for Skyland Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Skyland Cr.	001	C8N	3.4	Bear Creek	Junction w/ W.F. Skyland Cr.	1562.6	Junction w/ Bear Cr.	1459.2

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
04	21.6	6.1	.28	16	30	02	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Low	.21	--	--	Low	.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	49	1	40	0	11	19	70	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
12	22	30	35	1	53	3.1	98	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	50	5	11	25

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
305	98	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age 1	Age II	Age III+		
0	0.4	0.3	0.5	0	0.8	1.5	1.1	A	A

CHARLIE CREEK DRAINAGE

CHARLIE CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-20-79

Reach 1 is a second order tributary to the Middle Fork. Average wetted width was 7.0 m and the mean depth was o.25 m. This reach was composed of 50% riffle, 40% run, 5% pocketwater and 5% pool areas. Channel debris was low with 30% stable. Bank cover was low to moderate, with 10% of the wetted surface area influenced by overhang. Moderate instream cover (20%) was provided by substrate, turbulence and depth. Stream gradient was 2.2% and the D-90 was 20 cm. Some mass wasting was observed and several debris jams were noted. A 0.2 km bedrock area was present just above a closely spaced pair of waterfalls at stream km 0.4. The Long Creek Trail crossed just above the mouth.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 9 m. Reach 1 had a sinuous pattern below the bedrock area and was straight above. The channel was frequently confined by steep valley walls and the Charlie Creek trail ran along the north side of the valley.

Fish Populations: Date Surveyed: 7-21-79

Westslope cutthroat and bull trout were observed. A density estimate indicated an extremely important rearing area for juvenile bull trout with 6.3 age I or older fish per 100 m^2 surface area. Adfluvial bull trout migrate through this reach to spawning areas in the upper reaches of Charlie Creek.

CHARLIE CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-19-79

Reach 2 is a second order tributary in the Middle Fork drainage. Average wetted width was 4.0 m and the mean depth was o.25 m. This reach was composed of 50% riffle, 30% run, 16% pool areas and 4% pocketwater areas. Channel debris was moderate, with 10% stable. Bank cover was moderate, with 20% of the wetted surface area influence by overhang. Moderate to high instream cover (25%) was provided by substrate, turbulence, depth and debris. Stream gradient was 3.7% and the D-90 was 10 cm. The low banks were generally steep, but stabilized by heavy vegetation and occasional braiding was noted. A bedrock cascade area was located at stream km 3.9.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 10:1. The average valley width was 60 m. Reach 2

had a sinuous pattern and was generally unconfined. The Charlie Creek trail ran along the north bank.

Fish Populations: Date Surveyed: 7-21-79

Westslope cutthroat and bull trout were observed. Density estimates indicated an extremely important rearing area for juvenile bull trout, with 8.7 age I or older fish per 100 m^2 surface area. Spawning by adfluvial bull trout has also been documented here.

CHARLIE CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-19-79

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 4.0 m and the mean depth was 0.43 m. This reach was composed of 59% riffle, 40% pool and a trace of run areas. Channel debris was moderate, with 20% stable. Bank cover was moderate, with 20% of the wetted surface area influenced by overhang. Instream cover was provided by substrate, turbulence, debris and occasionally by depth. Stream gradient was 11.2% and the D-90 was 20 cm; however, considerable bedrock made D-90 measurements difficult and likely too low. Slight mass wasting was observed and many cascade areas were present with bedrock in both the bed and banks.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 15 m. Reach 3 had a sinuous pattern and was frequently confined. Access to this reach was difficult and no maintained trail was present.

Fish Populations:

Westslope cutthroat were observed while conducting the habitat survey. No fish density work was completed here, so bull trout presence was not confirmed.

LONG CREEK DRAINAGE

LONG CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-3-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 8.7 m and the mean depth was 0.28 m. This reach was composed of 86% run, 7% riffle, 5% pool and 2% pocketwater areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (17%) was provided by substrate, turbulence and occasionally by debris. Stream gradient was 1.1% and the D-90 was 103 cm. Mass wasting banks were common and several large log jams were observed.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 4:1. The average valley width was 100 m. Reach 1 had a sinuous pattern and was generally confined. The Long Creek trail followed the west stream bank and crossed just below the upper reach break.

Fish Populations: Date Surveyed: 9-6-80

Bull trout were the only fish species observed during density estimates; however, westslope cutthroat and mountain whitefish were noted while conducting other surveys. Adfluvial bull trout migrate through this reach to spawning areas in the upper reaches. Long Creek was closed to fishing by state regulations in 1962.

LONG CREEK REACH 2

Channel Characteristics: Date Surveyed: 9-3-80

Reach 2 is a second order tributary in the Middle Fork drainage. Average wetted width was 4.4 m and the mean depth was 0.16 m. This reach was composed of 82% run, 9% pool and 9% riffle areas. Channel debris was moderate, with 10% stable. Bank cover was moderate, with 14% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by substrate, turbulence, undercut banks and debris. Stream gradient was 1.8% and the D-90 was 33 cm. Slight mass wasting was observed and channel braiding occurred at many locations. Several log jams were also noted above the mouth of Bergsicker Creek. The Bergsicker Creek trail crossed at stream km 3.4.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was approximately 15:1. The average valley width was 500 m. Reach 2 had an irregular meandering pattern and was unconfined. The Long Creek trail ran along the east bank, through the valley opposite the mouth of Bergsicker Creek.

Fish Populations: Date Surveyed: 9-6-80

Westslope cutthroat and bull trout were observed. Juvenile bull trout were present in moderate to high densities and spawning by adfluvial bull trout has been documented here. Long Creek was closed to fishing in 1962 by state regulations.

LONG CREEK REACH 3

Channel Characteristics: Date Surveyed: 9-5-80

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 6.1 m and the mean depth was 0.16 m. This reach was composed of 81% run, 12% riffle and 7% pool areas. Channel debris was low with a trace stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (13%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 5.5% and the D-90 was 52 cm. Several slumping areas were noted and three large log jams were observed.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 100 m. Reach 3 had an irregular pattern and was frequently confined by the valley walls. The Long Creek trail paralleled the east bank to the headwaters area, then crossed over to the west side.

Fish Populations:

Westslope cutthroat and bull trout were observed. Density estimates indicated an important rearing area for juvenile bull trout, with 1.9 age I or older fish per 100 m^2 surface area. Spawning by adult bull trout has also been documented. Long Creek was closed to fishing by state regulations in 1962.

Bergsicker Creek Reach 1

Channel Characteristics: Date Surveyed: 8-1-79

Reach 1 is a second order tributary to Long Creek. Average wetted width was 4.0 m and the mean depth was 0.12 m. This reach was composed of 40% run, 30% riffle, and 30% pool areas. Channel debris was moderate, with 20% stable. Bank cover was low to moderate, with 10% of the wetted surface area shielded. Moderate instream cover (16%) was provided by substrate, turbulence and occasionally by depth and debris. Stream gradient was 1.7% and the D-90 was 25 cm. An intermittent section was present near stream km 1.6 and the Bergsicker Creek trail crossed approximately midway in the reach. A 7 m barrier falls formed the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 20:1. The average valley width was 150 m. Reach 1 had a sinuous pattern and was occasionally confined.

Fish Populations: Date Surveyed: 8-2-79

Westslope cutthroat and juvenile bull trout were observed in low densities. The Long Creek drainage was closed to fishing by state regulations in 1962.

Bergsicker Creek Reach 2

Channel Characteristics: Date Surveyed: 8-2-79

Reach 2 is a second order tributary in the Long Creek drainage. Average wetted width was 4.5 m and the mean depth was 0.15 m. This reach was composed of 50% riffle, 30% run and 15% pool and 5% pocketwater areas. Channel debris was moderate, with 20% stable. Bank cover was high, with 30% of the wetted surface area influenced by overhang. Instream cover was provided by substrate turbulence and debris. Stream gradient was 2.5% and the D-90 was 25 cm. Several slumping banks were observed and the lower reach break was formed by a 7 m falls.

Valley Characteristics:

The upper bank slope gradient was approximately 40% and the valley to channel ratio was 10:1. The average valley width was 70 m. Reach 2 had a sinuous pattern and was occasionally confined. The Bergsicker Creek trail paralleled the north stream bank.

Fish Populations: 8-1-79

No fish were observed during density surveys conducted above the 7 m barrier falls. Bergsicker Lake, in the headwaters, was planted with cutthroat in 1969; however, subsequent surveys yielded no evidence of surviving fish. Due to this information, no fish density or habitat surveys were conducted in the headwaters reach of Bergsicker Creek.

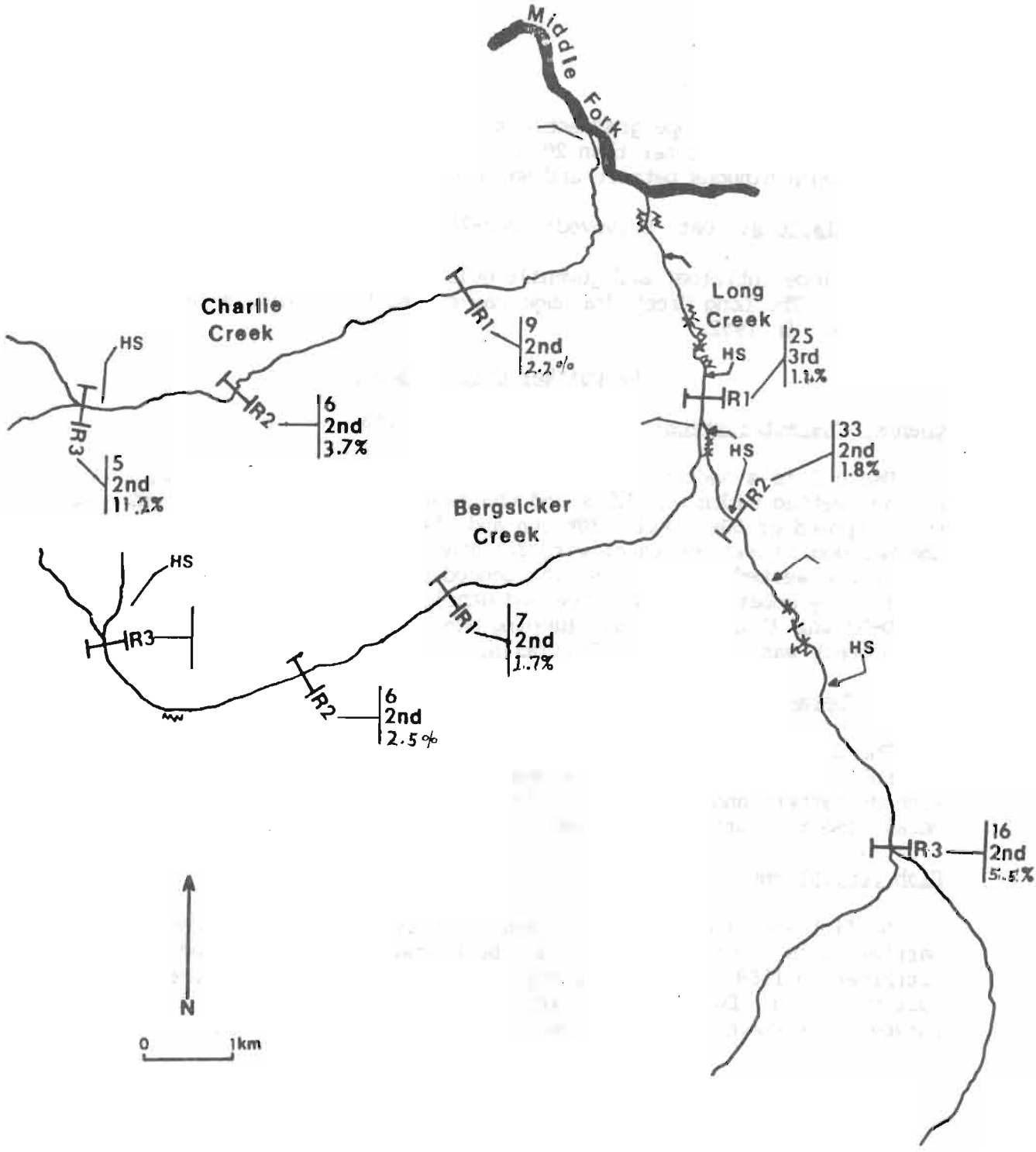

Figure 38. Physical habitat information for Charlie and Long Creek drainages.

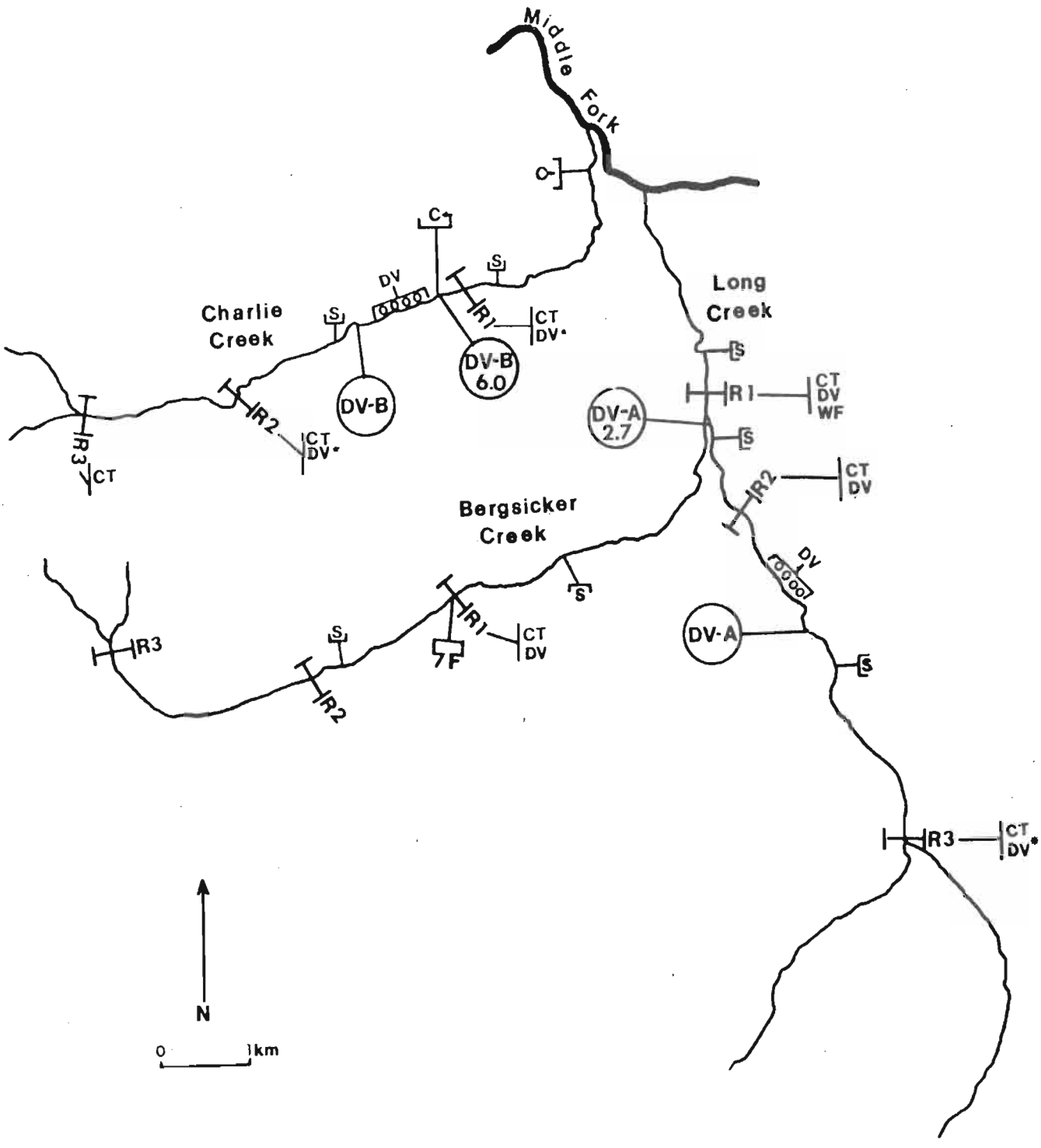

Figure 39. Fish population information for Charlie and Long Creek drainages.

Table 38. Stream habitat and fish population data for Charlie Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Charlie Cr.	001	DC0	2.9	Middle Fork	2.8 km above mouth	1284.0	Mouth	1224.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	27.2	7.0	.25	9	50	1	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	N	Low	.02	--	--	Nil	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	40	50	5	70	10	0	10	10

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	20	33	16	1	20	2.2	102	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	30	10	10	20

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
3	1.1	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0.5	1.0	2.0	1.0	1.5	5.6	0.7	0	A	A

Table 39. Stream habitat and fish population data for Charlie Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Charlie Cr.	002	DCN	2.8	Middle Fork	5.6 km above mouth	1396.0	2.8 km above mouth	1290.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	4.0	.25	6	60	10	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	N	Low	--	--	--	Nil	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
16	30	50	4	40	20	20	10	10

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
30	30	26	13	1	10	3.7	97	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Moderate	10	10	20	25

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.3	0	4.5	4.2	2.5	A	A

Table 40. Stream habitat and fish population data for Charlie Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Charlie Cr.	003	DCM	2.0	Middle Fork	Headwaters	1620.0	5.6 km above mouth	1396.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	4.0	.43	5	15	3	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	N	Low	--	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
40	1	59	0	20	20	20	20	20

% bed material					D-90	%		
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	Stability rating	Bank form
40	20	5	5	30	20	11.2	107	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Moderate	20	1	20	0

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	A

Table 41. Stream habitat and fish population data for Long Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Long Cr.	001	DD6	2.7	Middle Fork	.1 km above Trail Ford	1304.0	Mouth	1274.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	57.0	8.7	.28	25	100	4	Broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Low	.22	--	--	Low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	86	7	2	20	20	40	10	10

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
30	32	16	21	1	103	1.1	108	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	1	2	17

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0	0	0	0.2	0	A	A

Table 42. Stream habitat and fish population data for Long Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Long Cr.	002	DD7	1.3	Middle Fork	Mouth of canyon above Bergsicker	1329.0	.1km above Trail Ford	1304.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	4.4	.16	33	500	15	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	High	--	--	--	Low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
9	82	9	0	13	27	40	10	10

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	46	23	1	0	33	1.8	104	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Moderate	Moderate	10	10	14	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
2	1.5	80	15	11.5	79	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0.2	0	0.2	0.5	0	0.2	0.7	0.3	A	A

Table 43. Stream habitat and fish population data for Long Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Long Cr.	003	DD8	4.6	Middle Fork	Headwaters	1585.0	Mouth canyon above Bersicker	1329.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	6.1	.16	16	100	6	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Nil	--	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	81	12	0	0	0	100	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
32	48	18	2	0	52	5.5	95	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Low	Low	0	3	2	13

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	79	5	1.1	80	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.2	0.5	0.1	0	0.6	0.4	0.9	A	A

Table 44. Stream habitat and fish population data for Bergsicker Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bersicker Cr.	001	DCQ	4.2	Long Creek	4.2 km above Long Creek	1368.0	Junction w/ Long Creek	1296.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	22.8	4.0	.12	7	70	10	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Moderate	--	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
24	30	40	6	40	20	20	10	10

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	40	28	11	1	25	1.7	89	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Moderate	20	1	10	16

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.6	0	0	0.4	0	A	A

Table 45. Stream habitat and fish population data for Bergsicker Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bergsicker Cr.	002	DCP	1.9	Long Creek	6.1 km above Long Creek	1416.0	4.2 km above Long Creek	1368.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	4.5	.15	6	70	10	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Moderate	--	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
15	30	50	5	20	20	30	20	10

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	50	20	9	1	25	2.5	86	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Moderate	20	10	30	0

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0	0	0	0	0	A	A

TWENTY-FIVE MILE CREEK DRAINAGE

TWENTY-FIVE MILE CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-21-79

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 10.0 m and the mean depth was 0.25 m. This reach was composed of 60% pocketwater, 29% riffle, 10% run and a trace of pool areas. Channel debris was low, with 40% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Instream cover was provided by substrate, turbulence and depth. Stream gradient was 6.6% and the D-90 was 60 cm. High incidence of bedrock made exact D-90 measurements difficult. Braiding occurred where the floodplain widened at the mouth. Banks in the upper portion were largely steep and mass wasting was noted. A waterfalls was located 0.5 km above the mouth and the Big River trail crossed at stream km 0.3.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 20 m. Reach 1 had a straight pattern and was generally confined.

Fish Populations:

Westslope cutthroat were observed while conducting the habitat survey. No fish density work was completed due to reach length (1.0 km) and the presence of a barrier falls midway in the reach.

TWENTY-FIVE MILE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-21-79

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 7.0 m and the mean depth was 0.15 m. This reach was composed of 70% run, 20% riffle, 5% pool and 5% pocketwater areas. Channel debris was nil to low. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Instream cover was provided by substrate, turbulence and occasionally by depth. Stream gradient was 2.3% and the D-90 was 22 cm. Braiding occurred and the channel became intermittent at several locations. The Giefer-Twenty-five Mile Creek trail crossed at stream km 1.8 and again at km 5.4.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 80 m. Reach 2 had a sinuous pattern and was occasionally confined. The Twenty-five Mile Creek trail paralleled this reach and the junction with Moose Creek drainage was located near km 4.8.

Fish Populations:

Westslope cutthroat were observed during the habitat survey. No fish density work was conducted due to large areas being intermittent.

TWENTY-FIVE MILE CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-20-79

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 2.5 m and the mean depth was 0.11 m. This reach was composed of 60% riffle, 30% run, 8% pocketwater and 2% pool areas. Channel debris was moderate, with 40% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (18%) was provided by substrate, turbulence and occasionally by debris or depth. Stream gradient was 4.9% and the D-90 was 46 cm. Clay was present in the bed material at several locations and a dry section was observed near the junction of Ear Creek. A barrier falls was present above Ear Creek and the trail crossed at stream km 7.7.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 16 m. Reach 3 had a sinuous pattern and was generally confined. A portion of the east side of the valley was clear cut in the mid-1960's when approximately 12 million board feet of timber was removed.

Fish Populations: Date Surveyed: 8-21-79

Westslope cutthroat were the only fish species observed. A density estimate indicated an important rearing area for juvenile cutthroat with 13.7 age I or older fish per 100 m^2 surface area.

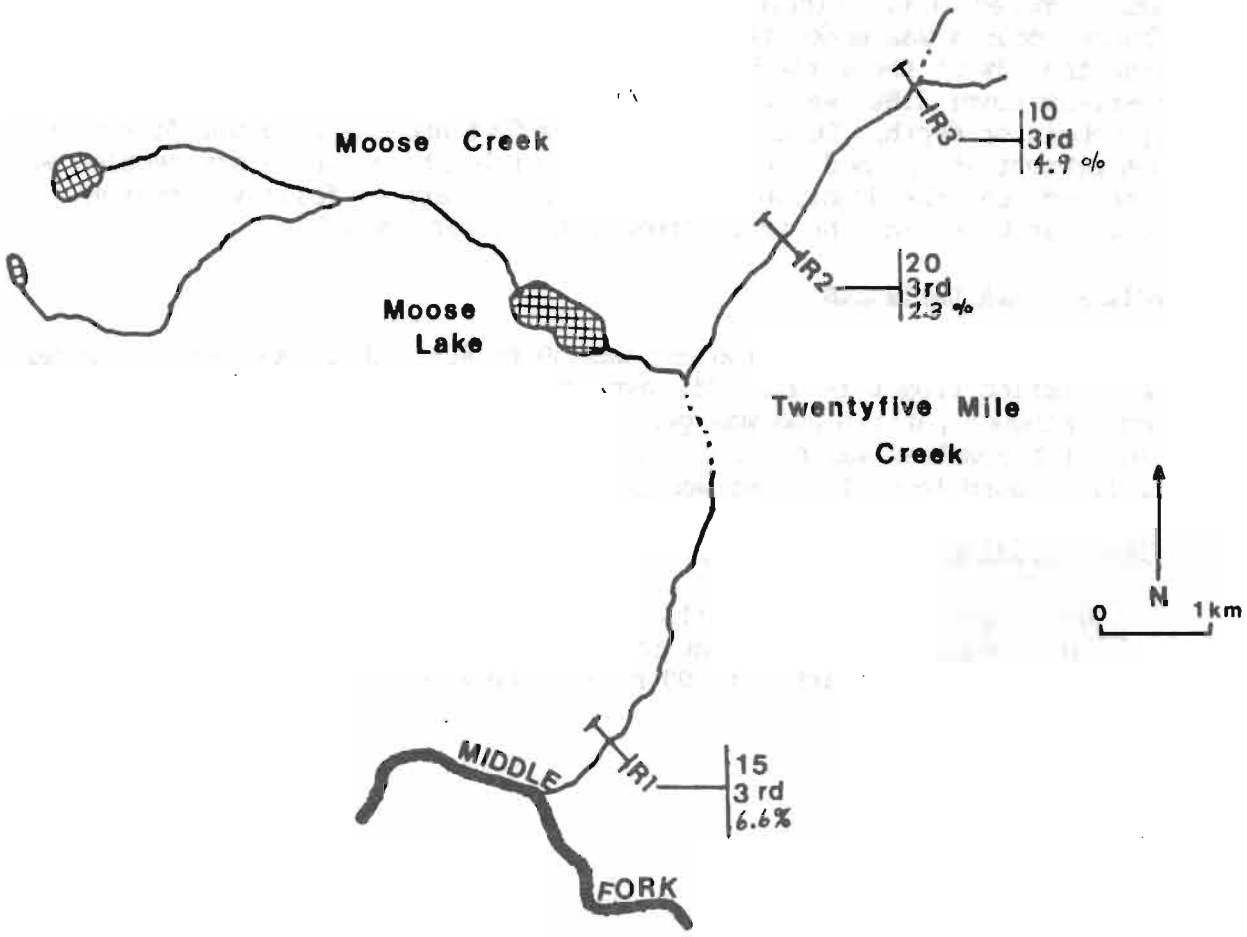

Figure 40. Physical habitat information for Twenty-five Mile Creek.

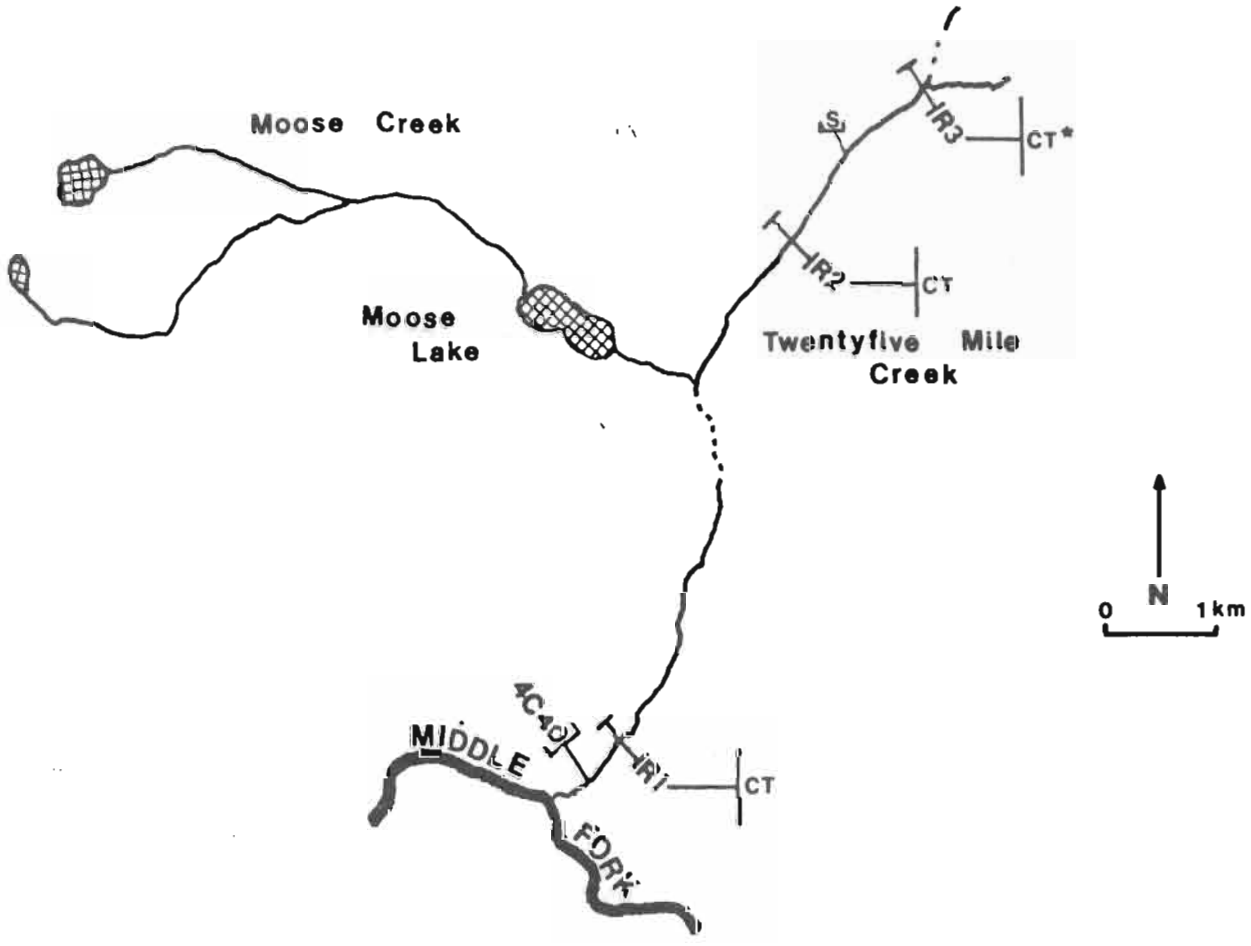

Figure 41. Fish population information for Twenty-five Mile Creek.

Table 46. Stream habitat and fish population data for Twenty-five Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Twenty-five Cr.	001	DCU	1.0	Middle Fork	1 km above mouth	1362.0	Mouth	1296.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	53.6	10.0	.25	15	20	1	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	S	Nil	0.17	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	10	29	60	0	0	0	50	50

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	20	40	20	10	60	6.6	104	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Bedrock	Nil	Low	40	3	3	0

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	A

Table 47. Stream habitat and fish population data for Twenty-five Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Twenty-five Cr.	002	DCT	5.4	Middle Fork	1 km above Moose Cr.	1487.0	1 km above mouth	1362.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	7.0	.15	20	80	3	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Moderate	--	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	70	20	5	27	27	46	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
20	40	28	12	0	22	2.3	90	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Aggrading	Fluvial	Low	Nil	20	2	3	0

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	A	A

Table 48. Stream habitat and fish population data for Twenty-five Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Twenty-five Creek	003	DCS	2.0	Middle Fork	Ear Creek	1585.0	1 km above Moose Cr.	1487.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	2.5	.11	10	16	2	Tumbling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Low	--	.04	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	30	60	8	2	3	25	50	20

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
30	30	28	11	1	46	4.9	90	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	40	3	3	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age 1	Age II	Age III+		
0	5.7	5.0	3.0	0	0	0	0	A	A

GRANITE CREEK DRAINAGE

GRANITE CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-5-80

Reach 1 is a fourth order tributary to the Middle Fork. Average wetted width was 8.6 m and the mean depth was 0.31 m. This reach was composed of 46% riffle, 26% pocketwater, 26% run and 4% pool areas. Channel debris was low, with 20% stable. Bank cover was low, with only a trace of overhanging vegetation. Moderate instream cover (20%) was provided by substrate, turbulence and depth. Stream gradient was 1.7% and the D-90 was 62 cm. Channel braiding occurred and bedrock was noted in the bank and streambed at several points. The Granite Creek trail crossed in several locations.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 5:1. The average valley width was 180 m. Reach 1 had an irregular meandering pattern and was frequently confined.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Adfluvial bull trout spawning and migration has been documented here. A density estimate of 2.1 age I or older bull trout per 100 m^2 surface area indicated an important rearing area. Migratory cutthroat presence has also been noted. Granite Creek was closed to fishing by state regulations in 1962.

GRANITE CREEK REACH II

Channel Characteristics: Date Surveyed: 9-4-80

Reach II is a fourth order tributary. Average wetted width was 6.4 m and the mean depth was 0.31 m. This reach was composed of 44% riffle, 41% run and 15% pool areas. Channel debris was moderate, with 30% stable. Bank cover was low to moderate, with 10% overhang. Moderate instream cover (12%) was provided by debris, substrate and depth. Stream gradient was 1.0% and the D-90 was 27 cm. Several debris jams were observed and a section was intermittent during the survey. Beaver activity was observed near the lower reach break.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 2 had an irregular meandering pattern and was occasionally confined. Large areas were clear cut in the 1960's and an additional harvest of 2.8 million board feet is tentatively planned for 1983. The Granite Creek Trail paralleled the stream to the Twenty-five Mile Creek road.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Spawning by adfluvial bull trout has been documented with an average of 24 redds enumerated annually during four years of survey. A high use bull trout spawning area was observed below the dry section, containing densities of 11.2 redds per km. Migratory cutthroat were also noted here. Granite Creek was closed to fishing by state regulations in 1962.

Challenge Creek Reach 1

Channel Characteristics: Date Surveyed: 8-18-79

Reach 1 is a third order tributary to Granite Creek. Average wetted width was 4.0 m and the mean depth was 0.15 m. This reach was composed of 50% run, 40% riffle and 10% pool areas. Channel debris was moderate, with 30% stable. Bankcover was moderate with 20% of the wetted surface influenced by overhang. Moderate to high instream cover (25%) was provided by substrate, turbulence and debris. Stream gradient was 3.3% and the D-90 was 27 cm. Many debris jams were observed and slight braiding occurred. The Skyland Creek road crossed at Challenge cabin affecting channel configuration and stability.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 35 m. Reach 1 had a straight pattern and was occasionally confined. Challenge cabin was located at km 0.6 and an unmaintained trail ran along the north bank. Approximately 5.1 million board feet of timber was taken from this drainage in 1969 and an additional harvest of 1.3 million board feet is tentatively planned for 1983.

Fish Populations: Date Surveyed: 9-23-80

Westslope cutthroat, juvenile bull trout and mountain whitefish were observed. Migratory and resident cutthroat were present in high densities (13.9 age I or older fish per 100 m^2 surface area), indicating an important rearing area. Electrofishing estimates in 1981 and 1982 enumerated 61 and 78 age II or older cutthroat per 100 m of stream length, respectively. A substantial amount of spawning by migratory and resident cutthroat has been documented here. The Granite Creek drainage was closed to fishing by state regulations in 1962.

Dodge Creek Reach 1

Channel Characteristics: Date Surveyed: 8-15-79

Reach 1 is a third order tributary to Granite Creek. Average wetted width was 2.0 m and the mean depth was 0.10 m. This reach was composed of 40% riffle, 50% run, and 10% pool areas. Channel debris was moderate, with 20% stable. Bank cover was low to moderate, with 10% of the wetted surface area influenced by overhang. Instream cover was provided by substrate,

turbulence and debris. Stream gradient was 3.4% and the D-90 was 13 cm. The bed material of this stream was quite unstable. A major slump occurred during spring of 1982 closing the Skyland road for several weeks. A section near the mouth was intermittent during the survey. The Twenty-five Mile road crossed at km 0.7.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 25 m. Reach 1 had a straight pattern and was occasionally confined. The Skyland road ran along the east bank through several areas which were clearcut in 1966.

Fish Populations:

Westslope cutthroat and bull trout were observed. Migratory and resident populations were noted and cutthroat spawning occurred. A population estimate made on 6-21-81 enumerated approximately 50 age II or older cutthroat per 100 m of stream length. The Granite Creek drainage was closed to fishing by state regulations in 1962.

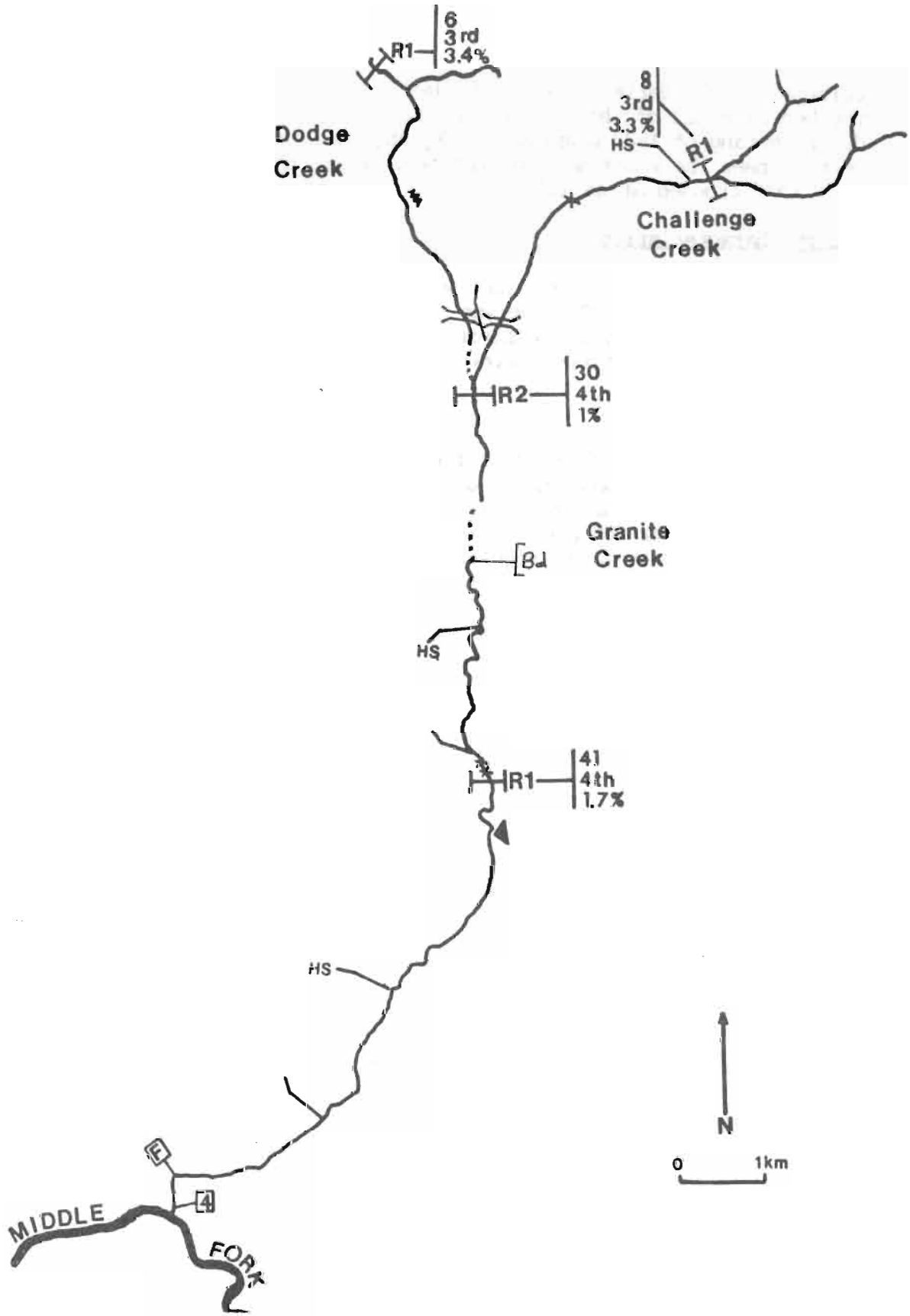

Figure 42. Physical habitat information for the Granite Creek drainage.

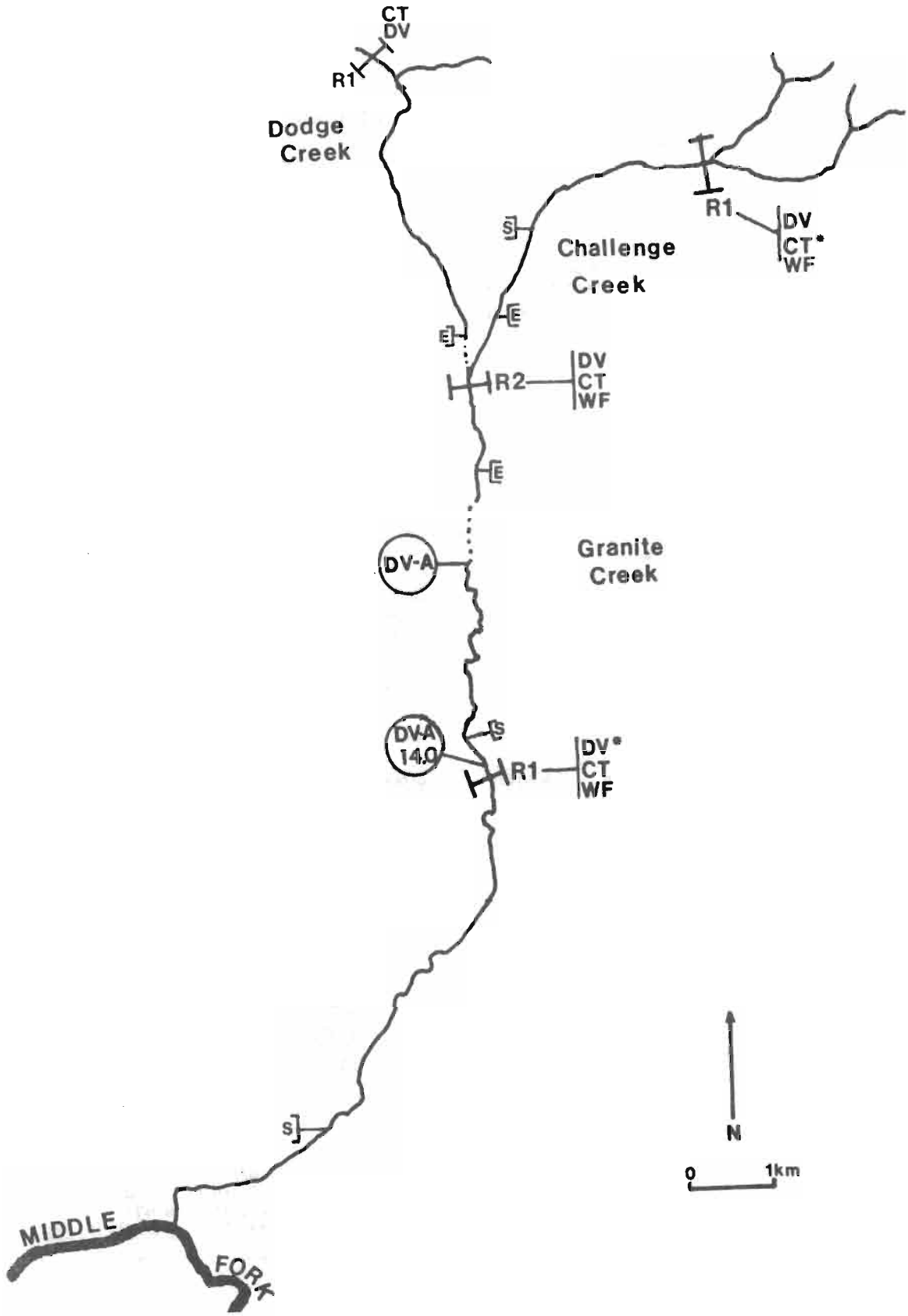

Figure 43. Fish population information for the Granite Creek drainage.

Table 49. Stream habitat and fish population data for Granite Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Granite Cr.	001	DD0	7.9	Middle Fork	7.9 km above mouth	1440.0	Mouth	1320.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	74.6	8.6	.31	41	180	5	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	C	Low	0.39	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
4	24	46	26	0	29	6	65	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	20	50	20	0	62	1.7	102	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Low	20	1	1	20

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
160	118	0.65	.003	--	33.1	.108	1.1	--	1.3

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age 1	Age II	Age III+	Age 0	Age 1	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.5	0	0	0.7	1.4	P	A

Table 50. Stream habitat and fish population data for Granite Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Granite Cr.	002	DDP	5.5	Middle Fork	Junction of Dodge and Challenge Cr.	1500.0	7.9 km above mouth	1440.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	--	6.4	.31	30	200	7	Rolling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Low	--	--	--	Nil	1.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
15	41	44	0	22	45	33	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	50	29	1	0	27	1.0	95	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	30	1	10	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
34	6.2	80	14	2.5	81	34	6.2	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.2	0	1.3	0.1	0	0.2	0	P	A

Table 51. Stream habitat and fish population data for Challenge Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Challenge Cr.	001	DCR	4.5	Granite Creek	Headwaters	1670.0	Junction w/ Dodge Cr.	1524.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	18.9	4.0	.15	8	35	4	Tumbling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Low	.03	--	--	Nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	50	40	0	5	5	20	70	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
40	30	20	10	0	27	3.3	93	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Moderate	30	1	20	25

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
1.3	3.8	4.5	5.1	0	0	0	0.3	P	A

Table 52. Stream habitat and fish population data for Dodge Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Dodge Cr.	001		3.7	Granite Creek	3.7 km above mouth	1647.7	Mouth	1518.5

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	11.1	2.0	.10	6	25	04	Placid, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	Nil	--	--	--	Low	.40

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	30	40	0	0	0	0	70	30

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
40	40	15	5	0	13	3.4	91	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Nil	Moderate	20	10	10	--

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
--	--	--	--	--	--	--	--	--	--

LAKE CREEK DRAINAGE

LAKE CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-7-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 6.8 m and the mean depth was 0.45 m. This reach was composed of 65% pocketwater, 20% run, 10% pool and 5% riffle areas. Channel debris was moderate, with 20% stable. Bank cover was low with 10% of the wetted surface area influenced by overhang. High instream cover (30%) was provided by depth, turbulence, substrate and debris. Stream gradient was 2.9% and the D-90 was 121 cm. The lower 0.4 km was a lower gradient, meadow stream which paralleled the Middle Fork. At stream km 1.5 the reach enters a canyon with a 8.5 m falls at the upper end (stream km 2.0).

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 6:1. The average valley width was 70 m. Reach 1 had an irregular pattern and was generally entrenched. The westside trail followed the slope above the western bank and crossed just below the upper reach break.

Fish Populations:

Above the barrier falls at stream km 2.0, westslope cutthroat were the only fish species observed. Below the falls, westslope cutthroat, juvenile and adult bull trout and mountain whitefish were observed. Spawning by adfluvial bull trout has been documented below the barrier.

LAKE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-26-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 8.6 m and the mean depth was 0.17 m. This reach was composed of 66% run, 14% pool, 14% riffle and 6% pocketwater areas. Channel debris was low, with 30% stable. Bank cover was low, with 8% of the wetted surface area influenced by overhang. Moderate instream cover (23%) was provided by substrate, undercut banks and turbulence. Stream gradient was 0.7% and the D-90 was 31 cm. The upper boundary was the outflow from Scott Lake, therefore, channel stability was increased. Banks were undercut but appeared stable due to the moderate discharge from the lake. Due to turbidity, underwater visibility was reduced to approximately 3 m. Some channel braiding occurred in swampy, meadow-like areas. The Flotilla Lake trail crossed just below the outlet of Scott Lake.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 80 m. Reach 2 had an irregular pattern and was occasionally confined. The Lake

Creek trail ran along the east bank and an outfitter's camp was located in the valley downstream from Scott Lake.

Fish Populations:

Westslope cutthroat were the only fish species observed. These fish are thought to be progeny of a 1941 plant in Scott Lake.

Miner Creek Reach 1

Channel Characteristics: Date Surveyed: 8-25-80

Reach 1 is a third order tributary flowing into Scott Lake. Average wetted width was 3.3 m and the mean depth was 0.18 m. This reach was composed of 70% run, and 30% pool areas. Channel debris was low, with 40% stable. Bank cover was low with 6% of the wetted surface area influenced by overhang. Moderate instream cover (21%) was provided by substrate, undercut banks and debris. Stream gradient was 1.3% and the D-90 was 14 cm. The downstream portion was located in the marshy area above Scott Lake, where some beaver activity was observed.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 25:1. The average valley width was 250 m. Reach 1 had an irregular pattern and was unconfined. The Miner Creek trail ran along the east bank and crossed just below the upper reach break.

Fish Populations:

Westslope cutthroat trout were the only fish species observed. Low densities of age III+ fish were present.

Miner Creek Reach 2

Channel Characteristics: Date Surveyed: 8-25-80

Reach 2 is a second order tributary in the Lake Creek drainage. Average wetted width was 3.6 m and the mean depth was 0.14 m. This reach was composed of 55% run, 40% pocketwater and 5% pool areas. Channel debris was low, with less than 5% stable. Bank cover was moderate, with 19% of the wetted surface area shielded. High instream cover (39%) was provided by substrate, turbulence and debris. Stream gradient was 3.3% and the D-90 was 61 cm. A portion of the lower reach was entrenched in bedrock with numerous cascades present.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was greater than 10:1. The average valley width was 100 m. Reach 2 had an irregular pattern and was generally confined to entrenched. The Miner Creek Trail ran along the east bank through the headwaters area and on to the Spotted Bear-Schafer Creek Trail north of Whitcomb Peak.

Fish Populations:

Westslope cutthroat trout were the only fish species observed. Age III+ fish were present in low to moderate densities.

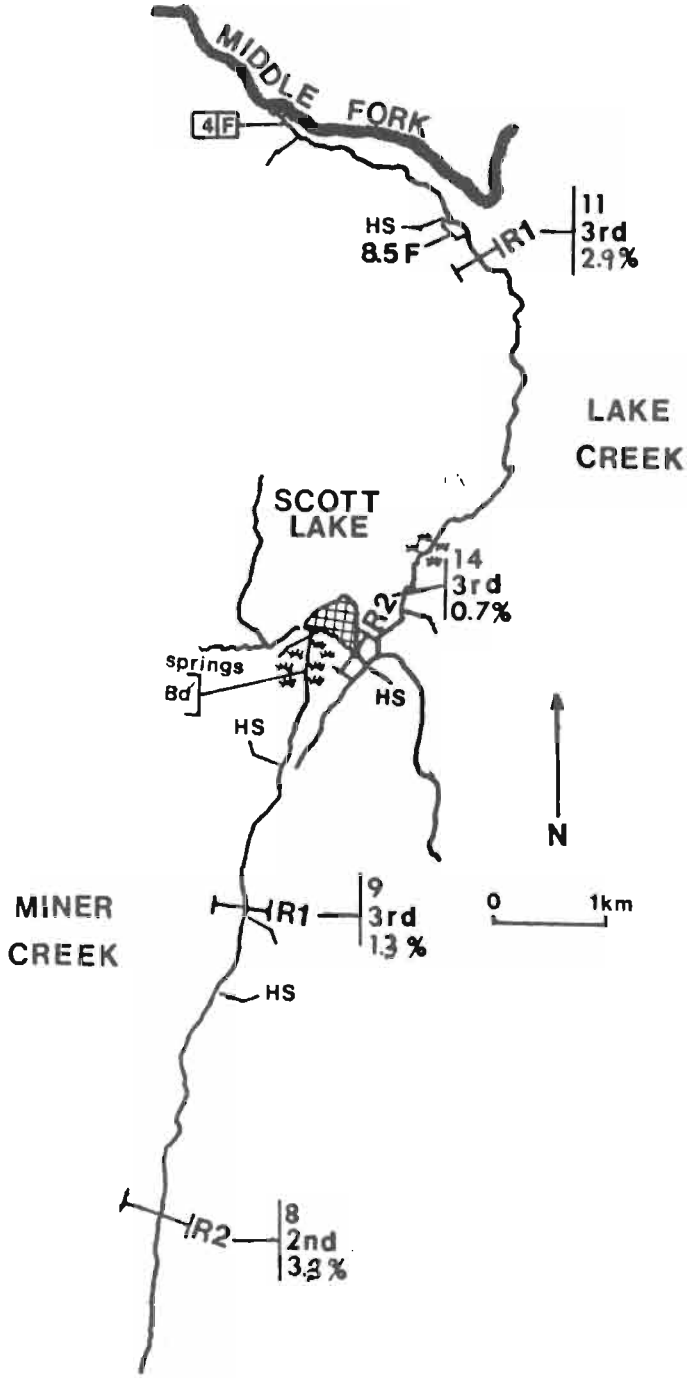

Figure 44. Physical habitat information for the Lake Creek drainage.

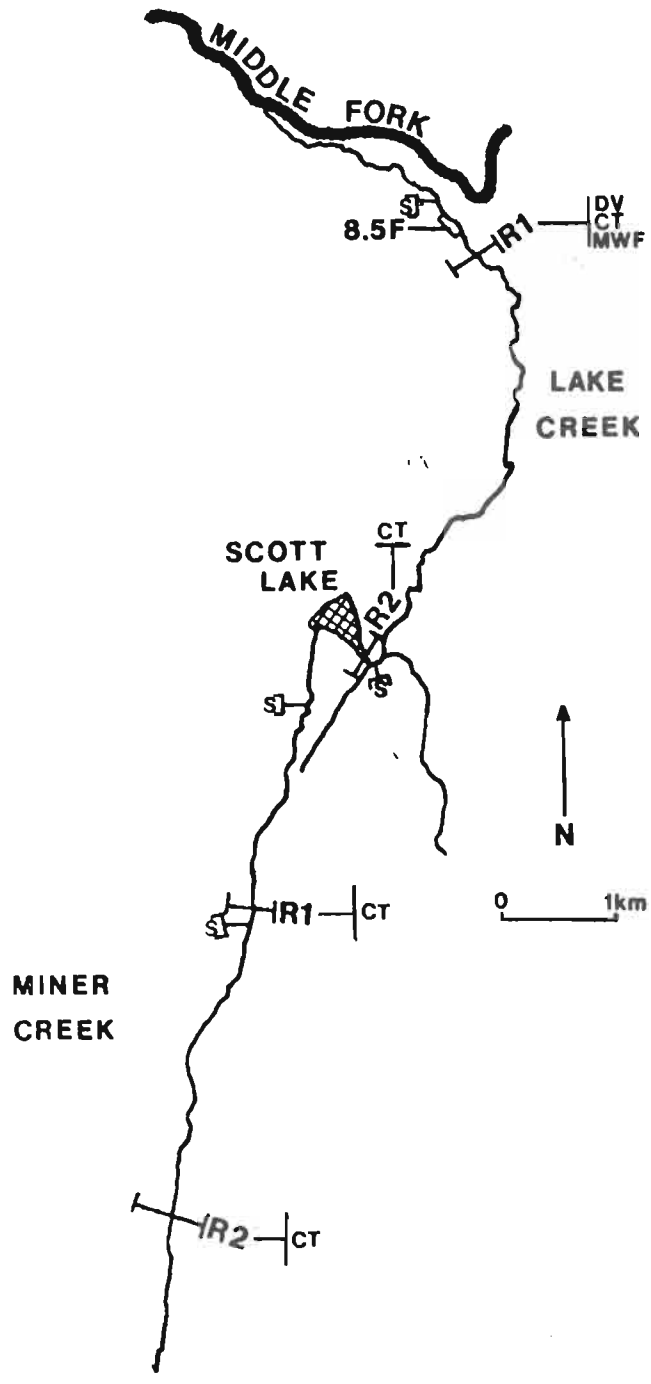

Figure 45. Fish population information for the Lake Creek drainage.

Table 53. Stream habitat and fish population data for Lake Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lake Cr.	001	DDH	2.5	Middle Fork	2.5 km above mouth	1440.0	Mouth	1367.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	19.4	6.8	.45	11	70	6	Rolling, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Low	0.61	--	--	Low	3.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	20	5	65	25	0	25	50	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	10	40	39	1	121	2.9	70	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	20	10	10	30

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
48	34	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
1	0.3	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.3	2.1	0	0	0	0	A	A

Table 54. Stream habitat and fish population data for Lake Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lake Cr.	002	DDG	4.9	Middle Fork	Scott Lake	1478.0	2.5 km above mouth	1440.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	8.6	.17	14	80	6	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	--	--	--	Moderate	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
14	66	14	6	0	60	35	5	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	60	29	1	0	31	0.7	72	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Low	30	7	8	23

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.5	0	0	0	0	A	A

Table 55. Stream habitat and fish population data for Miner Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Miner Cr.	001	DDF	2.5	Lake Cr.	Fork 2.5 km above Scott Lake	1510.0	Scott Lake	1478.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	19.5	3.3	.18	9	250	29	Placid, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	Low	--	--	--	Low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
30	70	0	0	28	43	29	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
60	39	1	0	0	14	1.3	84	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	40	0	6	21

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	1.3	0	0	0	0	A	A

Table 56. Stream habitat and fish population data for Miner Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Miner Cr.	002	DDE	3.0	Lake Creek	Headwaters	1608.0	Fork 2.5 km above Scott Lake	1510.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	3.6	.14	8	100	13	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Low	--	--	--	Low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	55	0	40	30	34	20	16	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	30	20	20	20	61	3.3	68	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Low	1	29	19	39

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	2.8	0	0	0	0	A	A

MORRISON CREEK DRAINAGE

MORRISON CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-6-80

Reach 1 is a fourth order tributary upstream to Lodgepole Creek, where it becomes third order. Average wetted width was 10.5 m and the mean depth was 0.29 m. This reach was composed of 60% run, 25% pool, 14% riffle and a trace of pocketwater areas. Channel debris was low, with 20% stable. Bank cover was low, with less than 3% overhang. Low to moderate instream cover (10%) was provided by substrate, turbulence, depth, and occasional debris or undercut bank. Stream gradient was 1.1% and the D-90 was 39 cm. The lower 1.5 km had steep wasting banks with some bedrock present. The Big River Trail crossed near the mouth and the Morrison Creek Trail crossed twice (stream kms 3.0 and 6.8).

Valley Characteristics:

The upper bank slope gradient was 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 1 had an irregular pattern and was occasionally confined, especially the downstream end. Several debris jams were present and beaver activity was noted in a braided area near the upper reach break. The Lodgepole drainage entered near stream km 4.8 and the valley widened in this area.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Spawning by adfluvial bull trout has been documented with an average of 26 redds enumerated annually during four years of survey. A high density spawning area contained 7.3 redds per km during the 1980 survey. Migratory and resident cutthroat were noted. Morrison Creek drainage was closed to fishing by state regulations in 1962.

MORRISON CREEK REACH 2

Channel Characteristics: Date Surveyed: 9-7-80

Reach 2 is a third order tributary. Average wetted width was 10.0 m and the mean depth was 0.25 m. This reach was composed of 50% run, 20% pool, 20% pocketwater and 10% riffle areas. Channel debris was moderate, with 20% stable. Bank cover was low, with less than 5% overhang. Moderate instream cover (24%) was provided by substrate, turbulence and debris. Stream gradient was 2.3% and the D-90 was 54 cm. Many slumping banks were present and channel braiding occurred in the upper end. The new Morrison Creek trail crossed at the upper reach break.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 3:1. The average valley width was 70 m. Reach 2 had an irregular meandering pattern and was generally confined by steep

banks. The Morrison Creek trail ran along the east bank.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Spawning by adfluvial bull trout has been documented and the area served as a migration corridor to high use spawning areas upstream. A density estimate of 4.0 age I or older bull trout per 100 m^2 surface area indicated an important rearing area. Low densities of age III+ cutthroat were observed.

MORRISON CREEK REACH 3

Channel Characteristics: Date Surveyed: 9-9-80

Reach 3 is a third order tributary. Average wetted width was 5.7 m and the mean depth was 0.24 m. This reach was composed of 51% run, 31% riffle, 10% pocketwater and 8% pool areas. Channel debris was moderate, with 40% stable. Bank cover was low, with 8% overhang. Moderate instream cover (18%) was provided by substrate, turbulence and debris. Stream gradient was 1.7% and the D-90 was 43 cm. Several wasting banks were present and a large debris jam area occurred near stream km 16.0. The old Morrison Creek trail crossed several times in the braided section below the old trail head.

Valley Characteristics

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 4:1. The average valley width was 75 m. Reach 3 had an irregular pattern and was occasionally confined. A narrow canyon was present from stream km 15.8 upstream to km 17.5, where the channel was entrenched and concentrations of debris were present. Portions of the upper valley were clear cut in 1966.

Fish Populations:

Westslope cutthroat and bull trout were observed. Spawning by adfluvial bull trout was documented with an average of 25 redds enumerated annually during four years of survey. A high use spawning area contained 7.5 redds per km during the 1980 survey. Densities of 7.8 age I or older bull trout per 100 m^2 surface area indicated an important rearing area. Moderate densities of cutthroat were observed and several fish 300-350 mm were present.

MORRISON CREEK REACH 4

Channel Characteristics: Date Surveyed: 9-10-80

Reach 4 is a third order tributary. Averge wetted width was 4.3 m and the mean depth was 0.18 m. This reach was composed of 54% run, 25% riffle, 20% pocketwater and a trace of pool areas. Channel debris was moderate, with 25% stable. Bank cover was low, with 9% of the wetted surface influenced by overhang. Moderate instream cover (13%) was provided by

substrate, turbulence and debris. Stream gradient was 5.2% and the D-90 was 52 cm. Several debris jams were noted and cascade areas were present at two locations. The Puzzle Creek road crossed at stream km 20.5.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 3:1. The average valley width was 40 m. Reach 4 had a sinuous pattern and was frequently confined. The lower section was clearcut on both banks in 1966. A tributary drainage (Puzzle Creek) was logged in 1969 when 12.4 million board feet were harvested.

Fish Populations:

Bull trout were the only species observed. A density estimate of 1.3 age I or older bull trout per 100 m^2 surface area indicated an important rearing area. Electrofishing estimates enumerated an average of 91 age I or older bull trout per 100 m of stream length over three years of survey. Limited spawning by adfluvial bull trout was documented here. The Puzzle Creek drainage was also a rearing area for cutthroat and bull trout.

Lodgepole Creek Reach 1

Channel Characteristics: Date Surveyed: 8-22-80

Reach 1 is a third order tributary to Morrison Creek. Average wetted width was 6.2 m and the mean depth was 0.29 m. This reach was composed of 57% run, 22% pool, 20% riffle and 1% pocketwater areas. Channel debris was moderate to high, with 30% stable. Bank cover was moderate, with 11% of the wetted surface area influenced by overhang. Moderate instream cover (22%) was provided by undercut banks, debris and substrate. Stream gradient was 1.1% and the D-90 was 21 cm. Several major slumping areas were present and a large log jam was located at stream km 0.7. The channel was braided in several areas and a large beaver dam was located at km 1.3. Whistler Creek joined Reach 1 at stream km 3.3.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was approximately 30:1. The average valley width was 500 m. Reach 1 had an irregular meandering pattern and was unconfined. The Lodgepole Creek trail ran along the north bank.

Fish Populations: Date Surveyed: 8-23-80

Westslope cutthroat, bull trout, mountain whitefish and sculpins were observed. Spawning by adfluvial bull trout has been documented with an average of 22 redds enumerated annually during four years of survey. The high use portion contained 8.1 bull trout redds per km during the 1980 count. The Morrison Creek drainage was closed to fishing by state regulations in 1962.

Lodgepole Creek Reach 2

Channel Characteristics. Date Surveyed 8-20-80

Reach 2 is a third order tributary upstream to Drumming Creek, where it becomes second order. Average wetted width was 4.2 m and the mean depth was 0.28 m. This reach was composed of 50% run, 20% pool, 20% pocketwater and 10% riffle areas. Channel debris was high with 35% stable. Bank cover was high, with 28% of the wetted surface area shielded. High instream cover (31%) was provided by debris, substrate, turbulence and undercut banks. Stream gradient was 2.8% and the D-90 was 35 cm. Several wasting banks were observed and a 300 m windthrow area was noted in the channel near stream km 6.9. The Calbick Creek trail crossed at stream km 7.7 and Drumming Creek joins Lodgepole Creek at km 8.0.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 70 m. Reach 2 had a sinuous pattern and was occasionally confined. The Lodgepole Creek trail ran along the northwest bank, then followed Drumming Creek through the headwaters.

Fish Populations: Date Surveyed 8-22-80

Westslope cutthroat and bull trout were observed in moderate densities. The drainage was closed to fishing by state regulations in 1962.

Whistler Creek Reach 1

Channel Characteristics: Date Surveyed: 8-20-80

Reach 1 is a second order tributary to Lodgepole Creek. Average wetted width was 3.0 m and the mean depth was 0.16 m. This reach was composed of 60% run, 20% pool, 15% riffle and 5% pocketwater areas. Channel debris was moderate, with 15% stable. Bank cover was moderate, with 22% of the wetted surface area influenced by overhang. High instream cover (29%) was provided by undercut banks, debris and substrate. Stream gradient was 1.6% and the D-90 was 25 cm. Undercut banks were stabilized by rooted vegetation and several log jams were present. Some channel braiding occurred in the lower portion and the Lodgepole Creek trail crossed at stream km 0.6.

Valley Characteristics.

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was greater than 30:1. The average valley width was 200 m. Reach 1 had a sinuous pattern and was unconfined. The Whistler Creek trail followed the west bank approximately to the midway point, then crossed and continued into the headwaters.

Fish Populations: Date Surveyed: 8-21-80

Westslope cutthroat trout and juvenile bull trout were observed. Densities of juvenile bull trout indicated an important rearing area, with 7.2 age I or older bull trout per 100 m^2 surface area. Mature bull trout were also observed, but spawning here has not been documented. Morrison Creek drainage was closed to fishing in 1962.

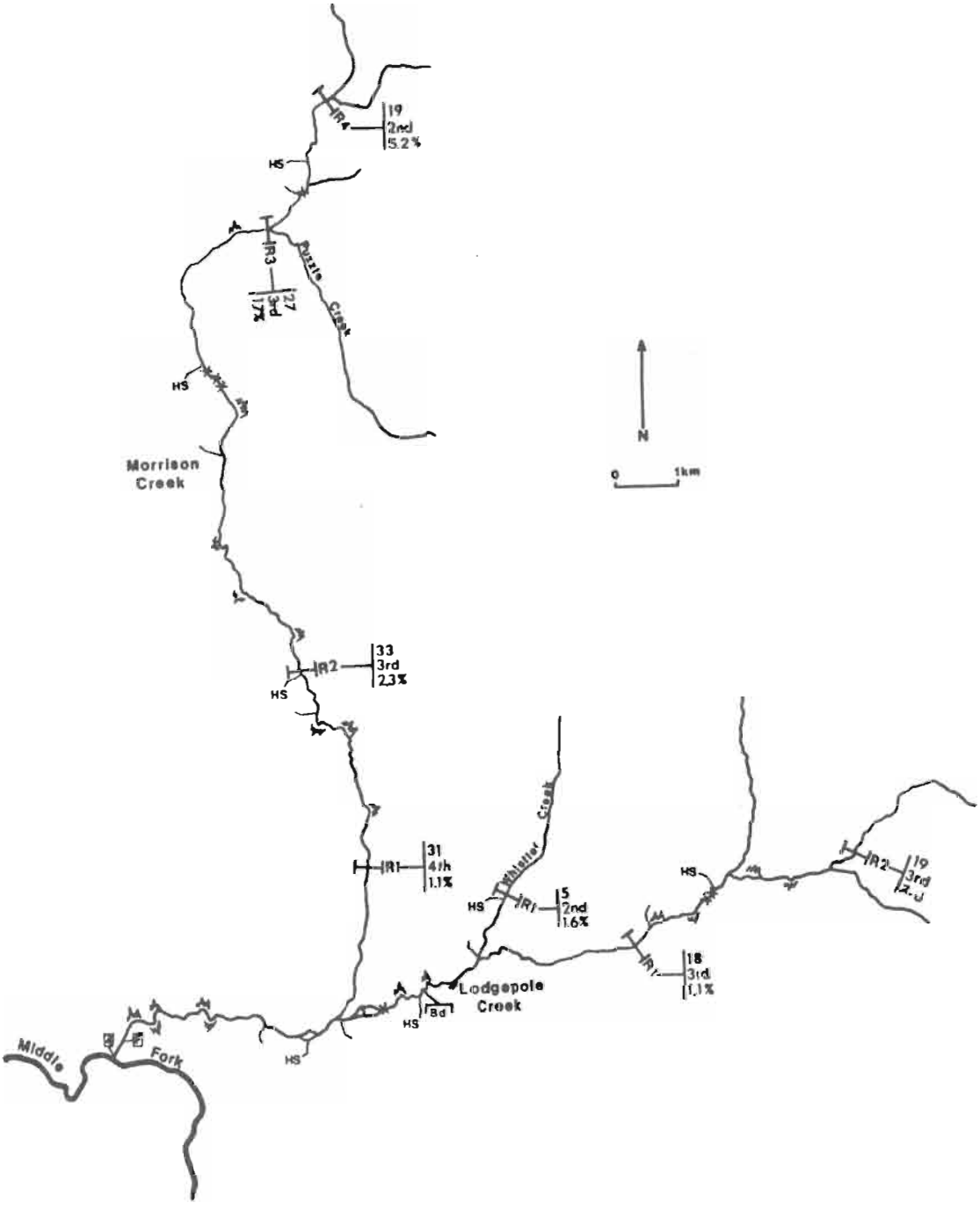

Figure 46. Physical habitat information for the Morrison Creek drainage.

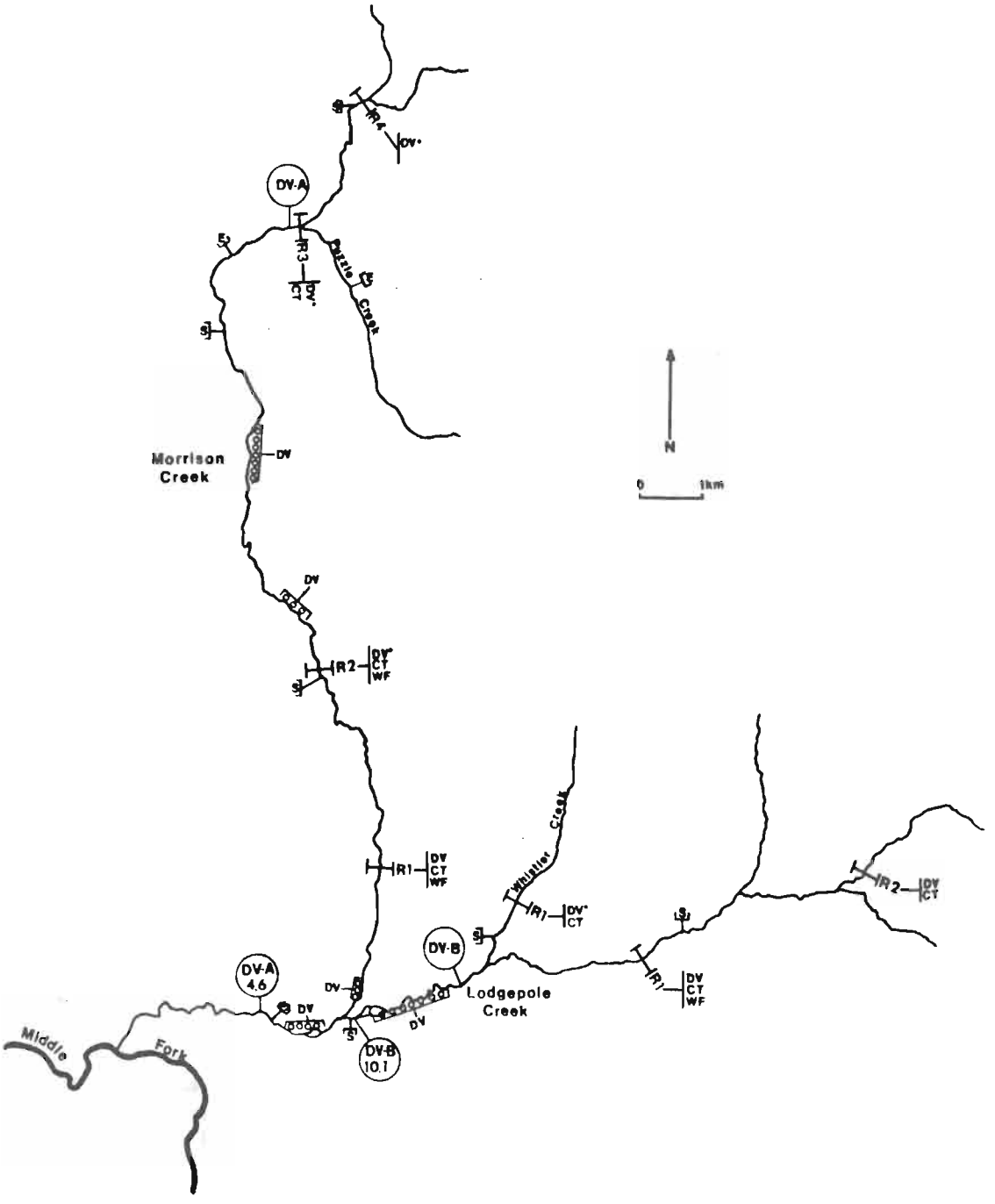

Figure 47. Fish population information for the Morrison Creek drainage.

Table 57. Stream habitat and fish population data for Morrison Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Morrison Cr.	001	DC7	7.5	Middle Fork	1.1 km below Star Creek	1452.0	Mouth	1368.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	133.1	10.5	.29	31	200	7	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	0.81	--	--	Low	1.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
25	60	14	1	12	50	38	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	40	20	9	1	39	1.1	93	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Low	20	9	1	10

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
220	138	0.82	.006	--	50.1	.113	1.5	--	10.4

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
32	4.3	80	24	3.2	81	37	4.9	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0.2	0	0.2	0.3	0.3	P	A

Table 58. Stream habitat and fish population data for Morrison Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Morrison Creek	002	DC6	3.8	Middle Fork	.1 km below Crescent Cr.	1536.0	1.1 km below Star Creek	1452.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	10.0	.25	33	70	3	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	C	Moderate	--	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	50	10	20	0	40	55	5	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	50	30	9	1	54	2.3	93	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	MOderate	20	26	3	24

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
4	1.1	80	0	0	81	13	3.4	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.7	0	0.5	1.1	2.4	P	A

Table 59. Stream habitat and fish population data for Morrison Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Morrison Creek	003	DC5	8.8	Middle Fork	Mouth Puzzle Creek	1680.0	.1 km below Crescent Cr.	1536.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	5.7	.24	27	75	4	Swirling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	High	--	--	--	Low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	51	31	10	0	40	55	5	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	40	30	9	1	43	1.7	100	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	Moderate	40	13	8	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
39	4.4	80	8	0.9	81	34	3.9	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.6	3.0	0	0	2.7	5.1	A	A

Table 60. Stream habitat and fish population data for Morrison Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Morrison Cr.	004	DC4	2.3	Middle Fork	Headwaters	1800.0	Mouth Puzzle Cr.	1680.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	4.3	.18	19	40	3	Rolling,tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	N	Moderate	--	--	--	Low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	54	25	20	0	20	70	10	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	30	30	19	1	52	5.2	91	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	Moderate	25	18	9	13

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	0	0	81	2	.87	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0	0.4	0.5	0.5	0.3	A	A

Table 61. Stream habitat and fish population data for Lodgepole Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lodgepole Creek	001	DDD	6.5	Morrison Cr.	6.5 km above Morrison Cr.	1500.0	Junction w/ Morrison Cr.	1428.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	49.2	6.2	.29	18	500	28	Swirling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	.24	--	--	Low	1.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
22	57	20	1	21	48	31	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
45	35	16	4	0	21	1.1	92	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	Moderate	30	15	11	22

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
340	134	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
14	2.2	80	18	2.8	81	23	3.5	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.1	0.4	0	0.3	0.1	0	P	A

Table 62. Stream habitat and fish population data for Lodgepole Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lodgepole Creek	002	DDC	4.1	Morrison Cr.	1.4 km above Drumming Cr.	1646.0	6.5 km above Morrison Cr.	1530.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	4.2	.28	19	70	4	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	N	High	--	--	--	Low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	50	10	20	0	50	40	10	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	40	20	10	0	35	2.8	97	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	High	35	7	28	31

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0.2	0.8	2.3	1.2	0	0.2	0	0.2	A	A

Table 63. Stream habitat and fish population data for Whistler Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Whistler Creek	001	DDB	3.1	Lodgepole Creek	Headwaters	1500.0	Junction w/ Lodgepole Cr.	1452.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	12.0	3.0	.16	5	200	33	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	N	Low	.07	--	--	Low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	60	15	5	8	31	56	5	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
15	55	20	10	0	25	1.6	83	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Moderate	Moderate	15	37	22	29

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.2	1.2	0	0.5	5.5	1.2	A	A

SCHAFER CREEK DRAINAGE

SCHAFER CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-13-80

Reach 1 is a fourth order tributary from the Middle Fork upstream to the junction of Dolly Varden Creek, where it becomes third order. Average wetted width was 7.5 m and the mean depth was 0.36 m. This reach was composed of 44% run, 42% riffle, 9% pool and 5% pocketwater areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 5% of the wetted surface area influenced by overhang. Low instream cover (<10%) was provided by substrate, turbulence and depth. Stream gradient was 0.7% and the D-90 was 13 cm. Several slumping areas were present and many high water channels and springs were observed. Beaver activity was observed from stream km 4.0 to 5.0 and a portion was intermittent during low flows. A 1 m bedrock falls was located 0.4 km above Dolly Varden Creek. The Schafer Creek trail crossed at stream km 4.3.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 1 had an irregular meandering pattern and was occasionally confined. Several outfitter camps were located on the west bank.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat, bull trout and mountain whitefish were observed. Whitefish were the most numerous species present during the density survey. Spawning by adfluvial bull trout has been documented and the high use portion contained 5.3 bull trout redds per km during the 1980 redd survey.

SCHAFER CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-12-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 7.1 m and the mean depth was 0.32 m. This reach was composed of 56% pocketwater, 32% run and 12% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with 6% of the wetted surface area shielded. Moderate instream cover (11%) was provided by substrate, turbulence and aquatic vegetation. Stream gradient was 1.3% and the D-90 was 38 cm. Several slumping areas were observed and the Schafer Creek trail crossed twice.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 150 m. Reach 2 had a sinuous pattern and was frequently confined by canyon walls.

Fish Populations:

Westslope cutthroat trout and mountain whitefish were observed in low densities. Beaver activity and an intermittent section during late summer flows probably prevented adult bull trout from moving into this reach.

SCHAFER CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-11-80

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 6.2 m and the mean depth was 0.25 m. This reach was composed of 65% run, 20% pool and 15% riffle areas. Channel debris was low, with 30% stable. Bank cover was low, with 10% of the wetted surface area influenced by overhang. Moderate instream cover (20%) was provided by substrate, undercut banks and debris. Stream gradient was 1.0% and the D-90 was 24 cm. Some areas of mass wasting were observed and many log jams were present in the floodplain. Slight beaver activity was also noted just below the mouth of Capitol Creek and a 0.5 km section above Rambler Creek was intermittent during fall of 1980.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was greater than 30:1. The average valley width was 500 m. Reach 3 had an irregular meandering pattern and was generally unconfined. The Schafer Creek Trail ran along the east bank and the Capitol Mountain Trail joined the Schafer Creek Trail near stream km 7.2.

Fish Populations: Date Surveyed: 7-13-80

Westslope cutthroat trout were observed in moderate densities.

SCHAFER CREEK REACH 4

Channel Characteristics: Date Surveyed: 7-13-80

Reach 4 is a third order tributary from the reach break up to the West Fork of Schafer Creek, where it becomes second order. Average wetted width was 4.0 m and the mean depth was 0.13 m. This reach was composed of 45% run, 25% riffle, 20% pocketwater and 10% pool areas. Channel debris was low, with 80% stable. Bank cover was moderate to high, with 25% of the wetted surface area influenced by overhang. Moderate instream cover (17%) was provided by substrate, turbulence and aquatic vegetation. Stream gradient was 5.5% and the D-90 was 41 cm. Several bedrock cascades were present and formed barriers 0.4 km above the West Fork of Schafer Creek.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was approximately 15:1. The average valley width was 100 m. Reach 4 had an irregular pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat trout were observed in moderate densities. No fish population data were collected above the falls at stream km 13.2.

Dolly Varden Creek Reach 1

Channel Characteristics: Date Surveyed: 7-13-80

Reach 1 is a third order tributary to Schafer Creek. Average wetted width was 10.0 m and the mean depth was 0.37 m. This reach was composed of 55% run, 25% riffle, 17% pool and 3% pocketwater areas. Channel debris was moderate, with 17% stable. Bank cover was low, with 7% of the wetted surface area influenced by overhang. Moderate instream cover (13%) was provided by substrate, debris and undercut banks. Stream gradient was 1.0% and the D-90 was 20 cm. Several slumping areas were observed and some channel braiding occurred in lower gradient, meadow-like sections. Beaver activity also backed up several small areas and caused braiding. A barrier falls was located at the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 175 m. Reach 1 had an irregular meandering pattern and was generally unconfined with an occasional steep bank on one side. The Dolly Varden Creek Trail followed the west bank and the Chair Mountain Trail junction was located near stream km 3.7. A large, off-channel beaver dam area formed a swampy meadow with several ponds near stream km 7.1.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat, bull trout, mountain whitefish and sculpins were observed. During July, surveys showed mountain whitefish to be the most numerous fish species present, with cutthroat and juvenile bull trout observed in extremely low densities. However, in a September survey, juvenile bull trout were observed in very high densities. This suggests that Dolly Varden Creek may be seasonally important for juvenile bull trout. Spawning by adfluvial bull trout has also been documented with an average of 27 redds enumerated annually during four years of survey.

Argosy Creek Reach 1

Channel Characteristics: Date Surveyed: 7-11-80

Reach 1 is a second order tributary to Dolly Varden Creek. Average wetted width was 5.4 m and the mean depth was 0.22 m. This reach was composed of 45% run, 39% riffle, 10% pocketwater and 6% pool areas. Channel debris was moderate, with 20% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (19%) was provided by substrate and turbulence. Stream gradient was 5.8% and the D-90 was 65 cm. Several low wasting banks were observed and scattered log jams caused channel braiding to occur. A bedrock cascade

area was present near the upper break where the stream turned approximately 45 degrees to the northeast.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 2:1. The average valley width was 50 m. Reach 1 had an irregular pattern and was confined to entrenched. The Argosy Creek Trail followed the north bank.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat and juvenile bull trout were observed in low to moderate densities. A large, new log jam just above the mouth may prevent adult bull trout from moving into Argosy Creek.

Argosy Creek Reach 2

Channel Characteristics: Date Surveyed: 7-11-80

Reach 2 is a second order tributary in the Dolly Varden Creek drainage. Average wetted width was 3.8 m and the mean depth was 0.10 m. This reach was composed of 49% run, 44% riffle and 7% pool areas. Channel debris was low, with 20% stable. Bank cover was low, with 10% of the wetted surface area shielded. Moderate instream cover (18%) was provided by substrate, turbulence, debris and depth. Stream gradient was 2.7% and the D-90 was 25 cm. A large log jam was located 0.5 km above the lower reach break and the majority of substrate was suitable for spawning (60% fines and gravels).

Valley Characteristics:

The upper bank slope gradient was approximately 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 100 m. Reach 2 had an irregular meandering pattern and was unconfined. The Argosy Creek trail followed the north bank and an outfitter's camp was located near stream km 3.2.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat and juvenile bull trout were observed. Density estimates showed an important rearing area for cutthroat, with 11.4 age I or older fish per 100 m^2 surface area. Cutthroat spawning may also occur in this reach. Spawning by adfluvial bull trout has not been documented although several adult fish have been observed and juvenile bull trout were present in moderate densities.

West Fork Schafer Creek

Channel Characteristics: Date Surveyed: 7-14-80

Reach 1 is a third order tributary up to the first major fork, where it becomes second order. Average wetted width was 5.8 m and the mean depth was 0.19 m. This reach was composed of 40% riffle, 30% run, 25% pool and

5% pocketwater areas. Channel debris was low, with 10% stable. Bank cover was low, with 5% of the wetted surface area influenced by substrate, turbulence and depth. Stream gradient was 3.8% and the D-90 was 38 cm. Some mass wasting was noted and bedrock banks entrenched a large section. A cascade section was present at stream km 2.0 and channel braiding occurred in several locations.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 75 m. Reach 1 had an irregular pattern and was generally entrenched. The Schafer Creek trail followed the north bank and crossed just above the cascade section.

Fish Populations:

Westslope cutthroat were the only fish species observed and were present in moderate densities.

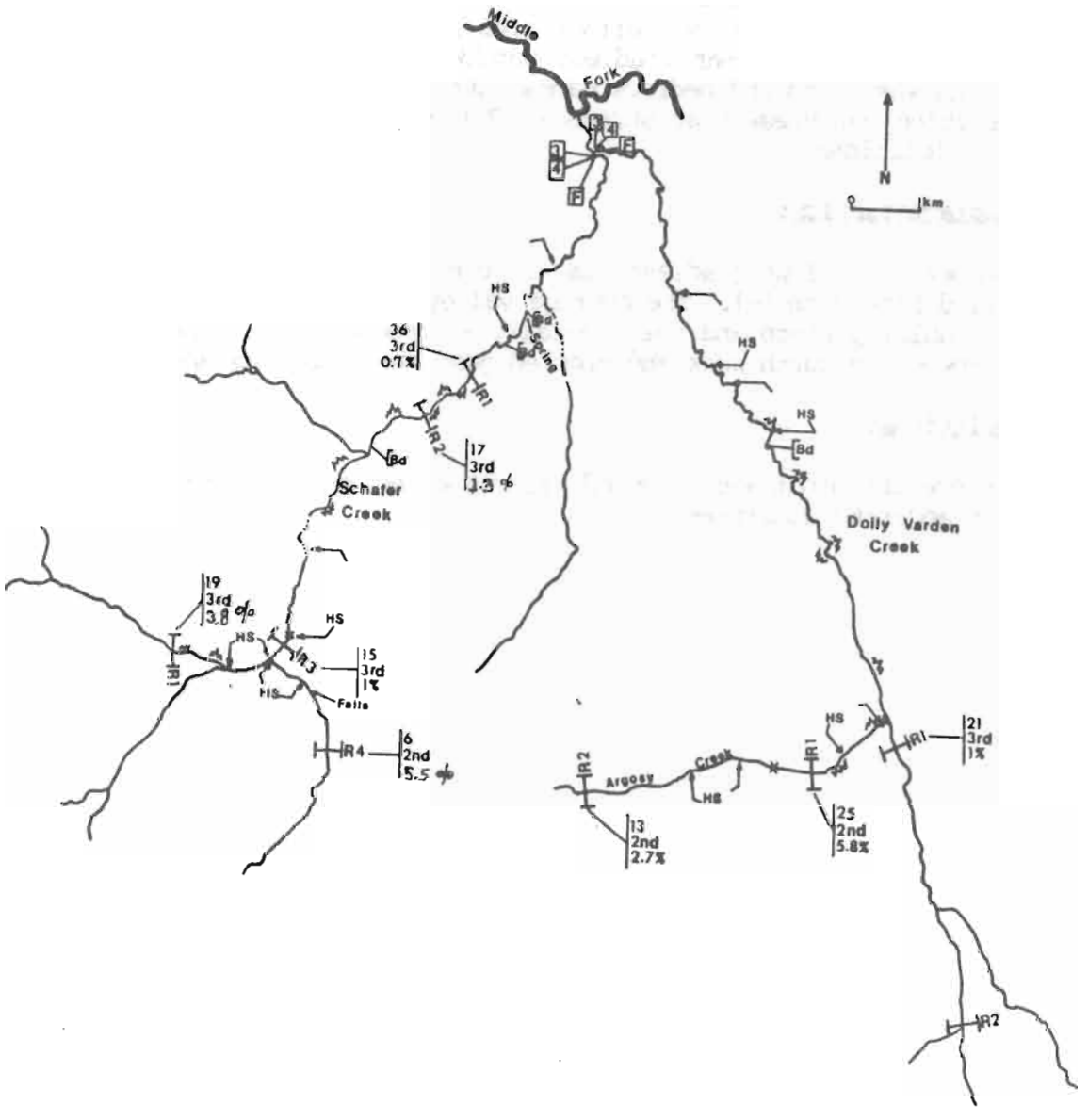

Figure 48. Physical habitat information for the Schafer Creek drainage.

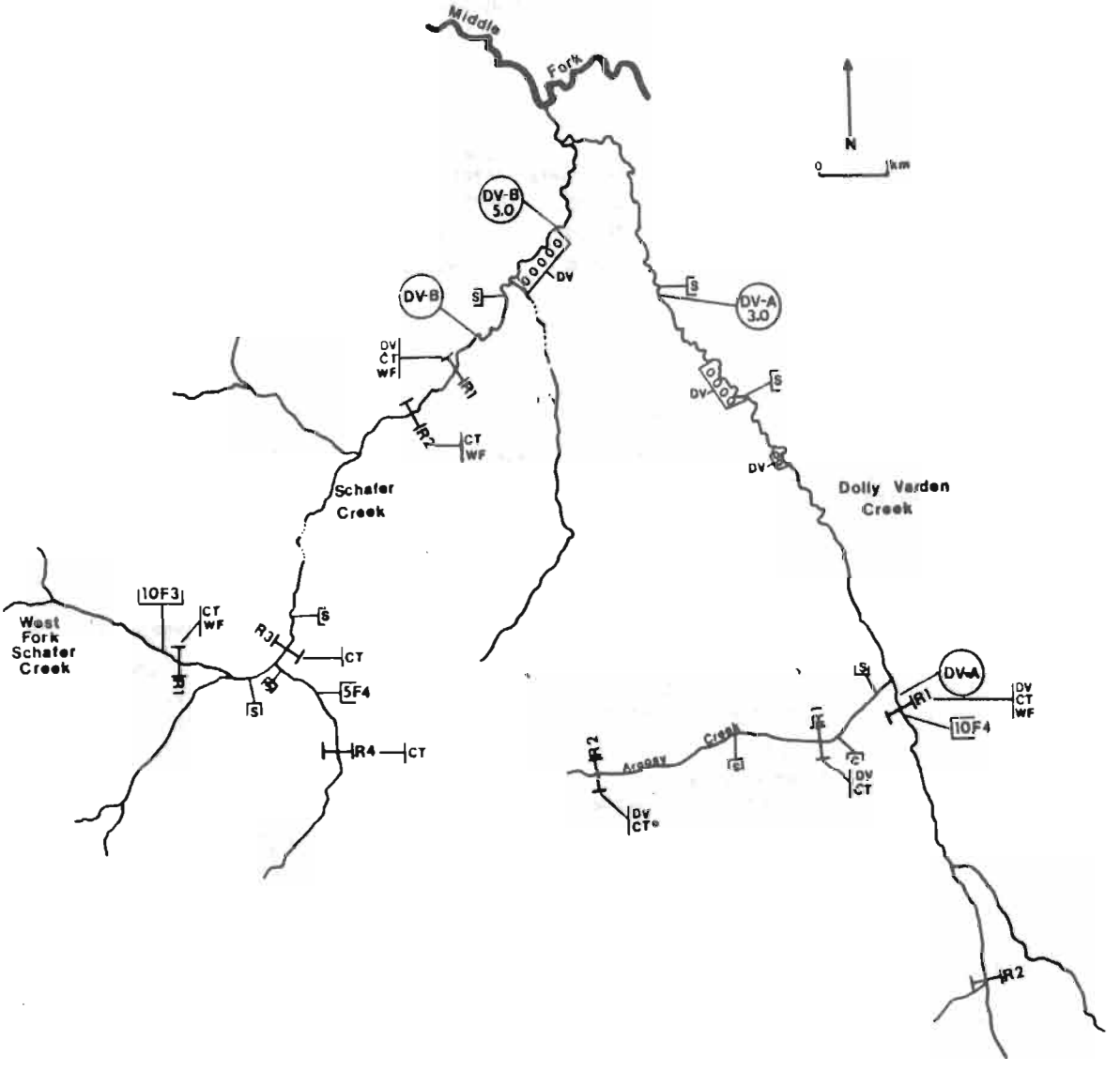

Figure 49. Fish population information for the Schafer Creek drainage.

Table 64. Stream habitat and fish population data for Schafer Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	001	DDN	4.6	Middle Fork	.15 km below Rouge Cr.	1498.0	Mouth	1464.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	126.4	7.5	.36	36	200	6	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Moderate	.57	--	18	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
9	44	42	5	4	40	40	16	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
35	35	24	5	1	13	0.7	101	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	3	4	7

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
75	51	0.85	.003	--	16.6	.033	--	--	5.6

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
10	2.2	80	12	2.6	81	17	3.7	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.1	0	0	0.1	0	0	0	P	A

Table 65. Stream habitat and fish population data for Schafer Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	002	DDM	1.1	Middle Fork	1 km above Rouge Creek	1512.0	.15 km below Rouge Creek	1498.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	7.1	.32	17	150	9	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	N	Low	--	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
12	32	0	56	0	8	33	59	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	28	37	14	1	38	1.3	84	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	3	6	11

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	79	0	0	80	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.1	0.5	1.1	0	0	0	0	P	A

Table 66. Stream habitat and fish population data for Schafer Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	003	DD4	4.8	Middle Fork	.4 km below W.F. junction	1560.0	1 km above Rouge Cr.	1511.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	6.2	.25	15	500	33	Swirling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	--	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	65	15	0	35	30	25	5	5

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
5	53	39	3	0	24	1.0	106	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	30	10	10	20

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
1	0.2	79	0	0	80	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0.8	3.1	0	0	0	0	A	A

Table 67. Stream habitat and fish population data for Schafer Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	004	DD5	3.7	Middle Fork	Headwaters	1768.0	.4 km below W.F. junction	1564.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	4.0	.13	6	100	15	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Nil	--	--	--	Nil	0.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	45	25	20	0	5	65	15	5

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
25	35	25	15	0	41	5.5	95	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Nil	Low	80	25	25	17

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	1.3	1.7	0.9	0	0	0	0	A	A

Table 68. Stream habitat and fish population data for Dolly Varden Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Dolly Varden Creek	001	DDA	13.1	Schafer Cr.	.5 km above Argosy Cr.	1560.0	Junction w/ Schafer Cr.	1452.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	68.4	10.0	.37	21	175	8	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Moderate	0.36	--	18	Nil	1.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
17	55	25	3	28	28	36	8	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
27	55	17	1	0	20	1.0	103	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	17	7	7	13

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
200	151	0.64	.003	--	43.5	.112	--	--	5.1

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
21	1.8	80	31	2.4	81	36	2.7	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0.1	0.1	0	0	0	0	P	A

Table 69. Stream habitat and fish population data for Argosy Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Argosy Creek	001	DC9	1.5	Dolly Varden Creek	1.5 km above Dolly Varden Creek	1650.0	Junction w/ Dolly Varden Creek	1560.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	15.4	5.4	.22	25	50	2	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Low	.11	--	--	Low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
6	45	39	10	20	0	75	5	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	30	20	20	10	65	5.8	84	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	20	1	1	19

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age 1	Age II	Age III+	Age 0	Age 1	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.2	1.0	0	0	0	0.4	A	A

Table 70. Stream habitat and fish population data for Argosy Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Argosy Creek	002	DC8	3.7	Dolly Varden Creek	Headwaters	1750.0	1.5 km above Dolly Varden Creek	1650.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	3.8	.10	13	100	7	Placid, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	--	--	--	Nil	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	49	44	0	0	33	67	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
20	40	29	10	1	25	2.7	87	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Colluvial	Moderate	Low	20	30	10	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	2.2	7.9	1.3	0	0.9	0.2	0	A	A

Table 71. Stream habitat and fish population data for W.F. Schafer Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
W.F. Schafer Creek	001	DDL	3.2	Schafer Cr.	3.2 km above main Schafer Cr.	1707.0	Junction w/ Schafer Cr.	1585.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	10.0	5.8	.19	19	75	4	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Low	--	--	--	Low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
25	30	40	5	15	30	25	15	15

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	50	39	1	0	38	3.8	87	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Bedrock	Low	Low	10	5	5	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.7	2.2	2.6	0	0	0	0	A	A

CALBICK CREEK DRAINAGE

CALBICK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-22-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 3.9 and the mean depth was 0.15 m. This reach was composed of 60% run, 20% pool and 20% riffle areas. Channel debris was moderate, with half large and stable. Bank cover was high, with 29% of the wetted surface area influenced by overhang. Low instream cover (9%) was provided by undercut banks, debris and algae. Stream gradient was 2.3% and the D-90 was 29 cm. Several slumping areas were observed and many large log jams extended across the entire channel. The Big River Trail crossed 1.2 km above the mouth and the Calbick Creek Trail crossed at stream km 2.9, then continued up the western fork of Calbick Creek and into the Lodgepole Creek drainage.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 25:1. The average valley width was 250 m. Reach 1 had an irregular meandering pattern and was generally unconfined with occasional points of confinement.

Fish Populations: Date Surveyed: 8-26-80

Westslope cutthroat and juvenile bull trout were observed in moderate densities. Cutthroat spawning may occur, but documentation is not currently available. Low, late summer flows probably limit spawning by adfluvial bull trout.

COX CREEK DRAINAGE

COX CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-21-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 6.2 m and the mean depth was 0.20 m. This reach was composed of 55% run, 35% pool and 10% riffle areas. Channel debris was low, with half stable. Bank cover was moderate with 22% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by undercut banks, depth and debris. Stream gradient was 0.6% and the D-90 was 13 cm. Many log jams were observed and a beaver dam formed a migration barrier during low flows. Portions became intermittent during late summer and fall. The Big River trail crossed just below the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 50:1. The average valley width was approximately 1000 m in the lower portion and somewhat narrower in the upstream end. Reach 1 has an irregular meandering pattern and was unconfined. The valley wall on the south side was the south bank of the Middle Fork River.

Fish Populations: Date Surveyed: 8-25-80

Westslope cutthroat trout were the only fish species observed and were present in low densities.

COX CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-22-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 5.5 m and the mean depth was 0.18 m. This reach was composed of 75% run, 18% riffle, 5% pool and 2% pocketwater areas. Channel debris was low, with none stable. Bank cover was low, with 5% of the wetted surface area shielded. Moderate instream cover (12%) was provided by substrate, turbulence, algae and undercut banks. Stream gradient was 1.6% and the D-90 was 45 cm. Several slumping banks were observed and some channel braiding occurred. The Cox Creek trail crossed 1.0 km below Wapiti Park, then continued up the west bank.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 5:1. The average valley width was 250 m. Reach 2 had an irregular pattern and was occasionally confined.

Fish Populations: Date Surveyed: 8-25-80

Westslope cutthroat trout and sculpins were observed. A density estimate indicated an important rearing area for cutthroat, with 10.3 age I or older fish per 100 m^2 surface area. Cutthroat spawning may also occur.

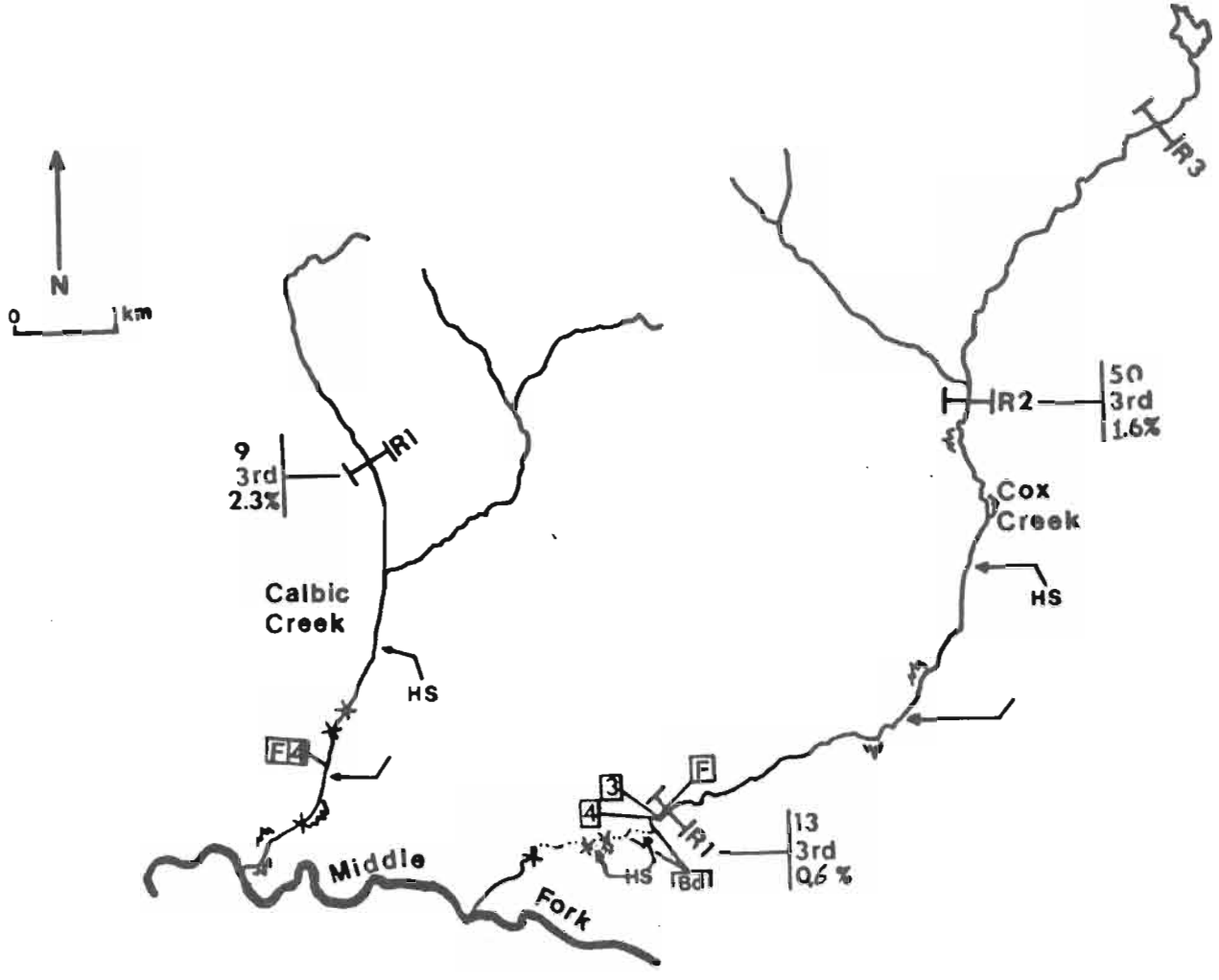

Figure 50. Physical habitat information for Calbick and Cox Creek drainages.

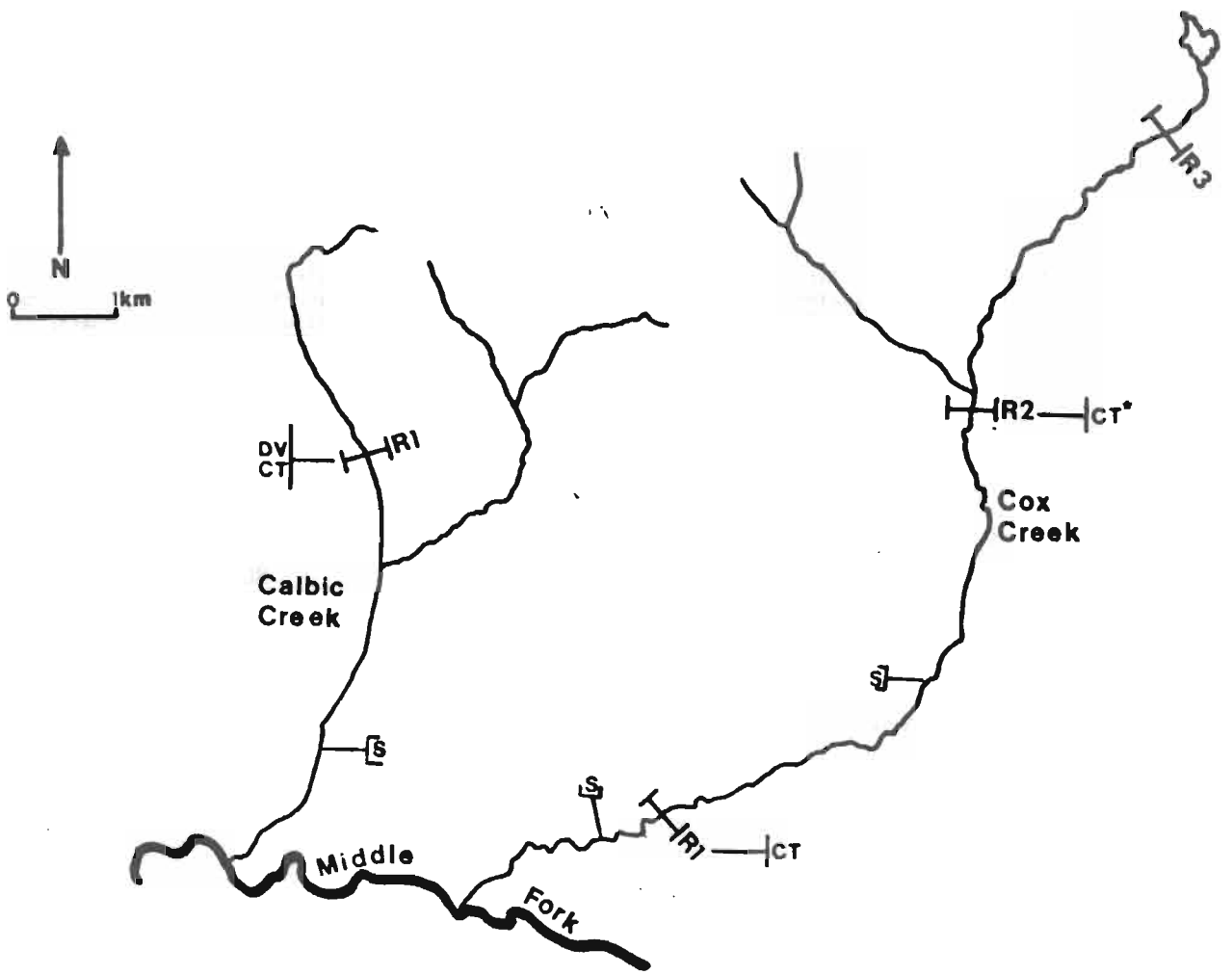

Figure 51. Fish population information for Calbick and Cox Creek drainages.

Table 72. Stream habitat and fish population data for Calbick Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Calbick Creek	001	DD3	4.3	Middle Fork	4.3 km above mouth	1585.0	Mouth	1487.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	21.7	3.9	.15	9	250	27	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	.07	--	--	Nil	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	60	20	0	0	20	80	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
69	20	10	1	0	29	2.3	128	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Moderate	50	31	29	9

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
240	126	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	2.4	4.1	0.6	0	0.6	0	0	A	A

Table 73. Stream habitat and fish population data for Cox Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Cox Cr.	001	DD1	3.3	Middle Fork	3.3 km above mouth	1529.0	Mouth	1509.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	51.7	6.2	.20	13	1000	75	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	.04	--	21	Low	1.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
35	55	10	0	14	24	62	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
67	30	3	0	0	13	0.6	119	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	50	22	22	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
145	102	0.83	.006	--	29.5	.075	0.7	--	15.8

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.1	0.3	0	0	0	0	A	A

Table 74. Stream habitat and fish population data for Cox Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Cox Cr.	002	DD2	6.1	Middle Fork	.2 km below Burnt Cr.	1609.0	3.3 km above mouth	1509.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	5.5	.18	50	250	5	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	--	--	--	Low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	75	18	2	0	25	75	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
50	31	15	4	0	45	1.6	89	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	0	4	5	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	-

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
1.1	1.1	2.7	6.5	0	0	0	0	A	A

CLACK CREEK DRAINAGE

CLACK CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-26-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 7.4 m and the mean depth was 0.22 m. This reach was composed of 56% run, 29% pool and 15% riffle areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 10% of the wetted surface area influenced by overhang. Low instream cover was provided by substrate, turbulence and debris. Stream gradient was 1.0% and the D-90 was 27 cm. A beaver dam area was present near the upper boundary and the Pentagon-Clack Creek Trail followed the bank along the upper half of Reach 1.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was generally greater than 15:1. The average valley width was 350 m. Reach 1 had a regular meandering pattern and was frequently confined at bends by steep banks.

Fish Populations:

Only mountain whitefish were observed during the density estimate; however, several cutthroat were noted during the habitat survey. Adfluvial bull trout utilized this reach for spawning and redd surveys enumerated an average of seven redds annually during four years of survey.

CLACK CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-25-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 21 m and the mean depth was 0.56 m. This reach was composed of 47% run, 36% pool and 17% riffle areas. Channel debris was low, with 85% in the form of stable beaver dams or lodges. Bank cover was low, with less than 3% of the stream surface area shielded. Low instream cover (5%) was provided by depth and beaver debris. Stream gradient was 1.0% and the D-90 was 8.5 cm. The entire reach was meadow-like and inundated by beaver dams. The majority of the bank and bed materials were gravel sized or smaller (100% of the bed and 99% of the bank). The Clack Creek trail crossed at stream km 5.5 and there was a dry section at this location during low flows.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 500 m. Reach 2 had an irregular meandering pattern and was generally unconfined.

Fish Populations:

No fish were observed during the density estimate; however, westslope cutthroat and mountain whitefish were observed during the habitat survey.

CLACK CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-24-80

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 5.1 m and the mean depth was 0.17 m. This reach was composed of 73% run, 15% pocketwater, 7% pool and 5% riffle areas. Channel debris was low, with half stable. Bank cover was moderate, with 11% of the wetted surface area influenced by overhang. High instream cover (30%) was provided by substrate, turbulence, aquatic vegetation and debris. Stream gradient was 7.0% and the D-90 was 55 cm. Bedrock was present in the bank and streambed and several cascade areas were observed.

Fish Populations: Date Surveyed: 7-25-80

Westslope cutthroat were the only species observed during density estimates; however, juvenile bull trout and mountain whitefish were observed during the habitat survey.

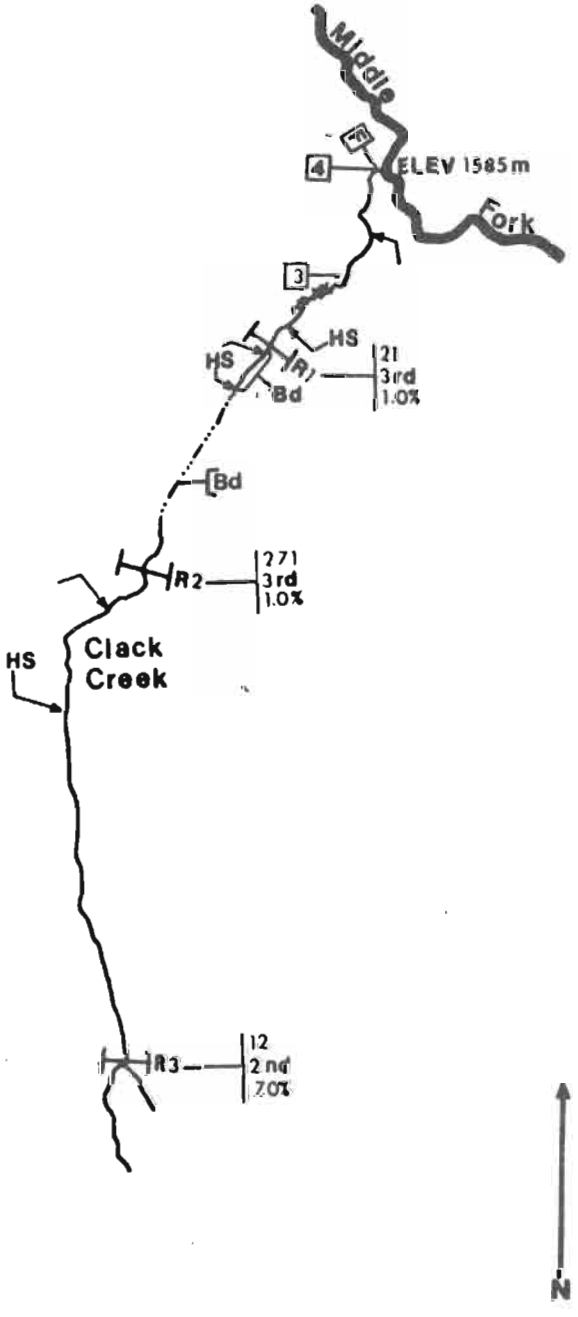

Figure 52. Physical habitat information for Clack Creek.

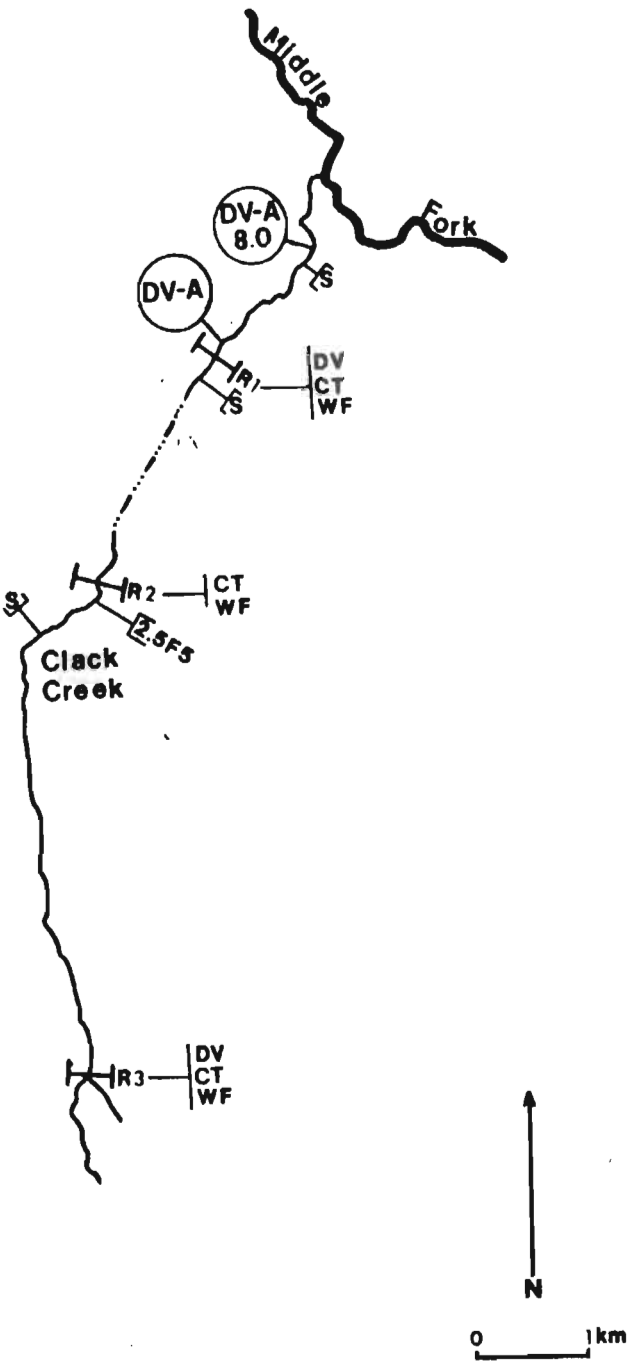

Figure 53. Fish population information for Clack Creek.

Table 75. Stream habitat and fish population data for Clack Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Clack Cr.	001	DDX	2.8	Middle Fork	2.8 km above mouth	1621.5	Mouth	1585.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	36.6	7.4	.22	21	350	17	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	R	Low	0.28	--	14	Nil	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
29	56	15	0	34	26	37	2	1

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	40	25	5	0	27	1.0	121	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	10	5	9	10

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
200	140	0.77	.002	--	41.7	.101	1.7	--	1.9

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
10	3.6	80	7	2.5	81	7	2.5	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0	0	0	0	0	P	A

Table 76. Stream habitat and fish population data for Clack Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Clack Cr.	002	DDY	2.7	Middle Fork	1.9 km above Trail Ford	1645.9	2.8 km above mouth	1621.5

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	20.8	.56	271	500	2	Placid, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	--	--	--	Nil	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
36	47	17	0	20	10	70	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
64	35	1	0	0	8	1.0	99	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Nil	Low	85	1	2	<5

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0	0	0	0	0	A	A

Table 77. Stream habitat and fish population data for Clack Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Clack Cr.	003	DDZ	5.1	Middle Fork	Headwaters	1987.0	1.9 km above Trail Ford	1645.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	5.1	.17	12	200	16	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Low	--	--	--	Nil	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	73	5	15	8	4	60	14	14

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
18	48	22	12	0	55	7.0	97	Flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Fluvial	Low	Low	50	11	11	30

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.6	0	0	0	0	A	A

BOWL CREEK DRAINAGE

BOWL CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-28-80

Reach 1 is a fourth order tributary which joins with Strawberry Creek to form the Middle Fork. Average wetted width was 9.8 m and the mean depth was 0.25 m. This reach was composed of 76% run and 24% riffle areas. Channel debris was low, with 20% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. High instream cover (33%) was provided by aquatic vegetation, debris and substrate. Stream gradient was 1.0% and the D-90 was 39 cm. Several slumping areas were observed and bedrock was occasionally present in the bed and bank material.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 1 had a sinuous pattern and was confined. The Bowl-Divide trail ran along the east bank.

Fish Populations:

Westslope cutthroat and mountain whitefish were observed. Both species were present in limited densities. Spawning by adfluvial bull trout has been documented here.

BOWL CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-27-80

Reach 2 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 7.4 m and the mean depth was 0.24 m. This reach was composed of 74% run, 16% riffle, and 10% pool areas. Moderate to high channel debris was present, with 10% stable. Bank cover was moderate to high, with 25% of the wetted surface area influenced by overhang. Moderate instream cover (23%) was provided by substrate, undercut banks, debris and aquatic vegetation. Stream gradient was 2.5% and the D-90 was 35 cm. Many log jams were present and braiding was observed. Some slumping areas were noted and bedrock was occasionally present in the bed material.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 175 m. Reach 2 had an irregular pattern and was generally confined by canyon walls. The Bowl-Divide trail runs along the north bank.

Fish Populations: Date Surveyed: 7-28-80

Westslope cutthroat and mountain whitefish were observed in low densities. Adfluvial bull trout utilized Reach 2 for spawning and redd counts enumerated an average of 14 redds annually, during four years of survey. Bull trout redd density in the 1980 high use area was 7.4 redds per km.

BOWL CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-29-80

Reach 3 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 7.9 m and the mean depth was 0.51 m. This reach was composed of 58% pool, 25% run, 11% riffle and 5% pocketwater areas. Channel debris was moderate, with 30% stable. Bank cover was moderate, with 15% of the wetted surface area shielded. Moderate instream cover (12%) was provided by undercut banks, depth and some debris. Stream gradient was 1.0% and the D-90 was 22 cm. Log jams and beaver activity caused substantial braiding to occur and backed up large areas forming the high percentage of pools. The upper reach break was located at the junction of Basin Creek.

Valley Characteristics:

The upper bank slope gradient was approximately 30% and the valley to channel ratio was greater than 20:1. The average valley width was 350 m. Reach 3 had a irregular pattern and was generally unconfined with occasional short sections being restricted by steep banks. The Bowl-Divide trail ran along the northeast bank and an outfitter's camp was located at Grizzly Park.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. All species were present in moderate densities. Spawning by adfluvial bull trout has been documented here.

BOWL CREEK REACH 4

Channel Characteristics: Date Surveyed: 7-24-80

Reach 4 is a third order tributary in the Middle Fork drainage. Average wetted width was 4.6 m and the mean depth was 0.21 m. This reach was composed of 33% pocketwater, 30% pool, 30% run and 7% riffle areas. Channel debris was moderate, with 30% stable. Bank cover was high, with 41% of the wetted surface area influenced by overhang. Moderate instream cover (12%) was provided by debris, substrate and turbulence. Stream gradient was 3.4% and the D-90 was 36 cm. Several large log jams were observed and channel braiding occurred. Several bedrock cascades were also present.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 80 m. Reach 4 had an irregular pattern and was entrenched. The Bowl-Divide trail followed the north stream bank.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. Both species were present in low densities. Several bull trout redds were observed during 1980; however, large substrate limits the spawning habitat available.

BOWL CREEK REACH 5

Channel Characteristics: Date Surveyed: 7-25-80

Reach 5 is a second order tributary in the Middle Fork drainage. Average wetted width was 3.2 m and the mean depth was 0.24 m. This reach was composed of 50% pool, 25% run, 20% riffle and 5% pocketwater areas. Channel debris was moderate, with half stable. Bank cover was moderate, with approximately 20% of the wetted surface area shielded. Moderate instream cover (14%) was provided by debris, undercut banks, substrate and depth. Stream gradient was 3.8% and the D-90 was 15 cm. The Bowl-Divide trail followed the north bank to the uppermost fork where it crossed and climbed to Teton Pass on the Continental Divide. Substrate composition provided good spawning habitat during spring; however, low flows probably limit fall spawning.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was generally greater than 10:1. The average valley width was 150 m. Reach 5 had an irregular meandering pattern and was unconfined. This reach flowed through scattered meadow areas, where dry highwater overflow channels were observed.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed in low densities. Low water temperatures (44°F on 7-25-80), low summer flows and partial barriers probably limit fisheries potential.

Basin Creek Reach 1

Channel Characteristics: Date Surveyed: 7-29-80

Reach 1 is a third order tributary to Bowl Creek. Average wetted width was 5.8 m and the mean depth was 0.28 m. This reach was composed of 40% pool, 35% pocketwater, 15% run and 10% riffle areas. Channel debris was low to moderate, with half stable. Bank cover was moderate, with 13% of the wetted surface area shielded. Moderate instream cover (15%) was

provided by substrate, turbulence, and debris. Stream gradient was 1.1% and the D-90 was 34 cm. Log jams were present causing braided areas. Basin Creek Trail crossed at stream km 0.8.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was greater than 20:1. The average valley width was 250 m. Reach 1 had an irregular pattern and was occasionally confined.

Fish Populations: Date Surveyed: 7-28-80

Westslope cutthroat, juvenile bull trout, mountain whitefish and sculpins were observed. Density estimates indicated Reach 1 was an important rearing area, with 11.7 age I or older cutthroat per 100 m^2 surface area.

Basin Creek Reach 2

Channel Characteristics: Date Surveyed: 7-28-80

Reach 2 is a third order tributary in the Bowl Creek drainage. Average wetted width was 4.8 m and the mean depth 0.50 m. This reach was composed of 73% pool, 14% run and 13% riffle areas. Channel debris was low, with 20% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Low instream cover (11%) was provided by depth, or by debris and cut banks resulting from beaver activity. Stream gradient was 1.1% and the D-90 was 8.0 cm. This reach was located in a meadow with extensive marshy areas and beaver dams. Substrate was predominantly fines and gravels. The Basin Creek trail crossed several times near the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the reach had a valley to channel ratio which was greater than 25:1. The average valley width was 325 m. Reach 2 of Basin Creek had a tortuous meandering pattern and was unconfined throughout its length.

Fish Populations: Date Surveyed: 7-26-80

Westslope cutthroat, juvenile bull trout, mountain whitefish and sculpins were observed in this reach. Cutthroat were present in moderate densities (6.7 age I or older fish per 100 m^2 surface area). Several beaver dams over 1 m in height may have been migration barriers during low flows.

Basin Creek Reach 3

Channel Characteristics: Date Surveyed: 7-27-80

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 3.3 m and the mean depth was 0.28 m. This reach

was composed of 54% pool, 33% pocketwater and 13% riffle areas. Channel debris was moderate, with half stable. Bank cover was moderate, with 16% of the wetted surface area influenced by overhang. Moderate instream cover (17%) was provided by substrate, turbulence and depth. Stream gradient was 2.2% and the D-90 was 29 cm. The D-90 measurement may be low due to the presence of bedrock. Several bedrock cascades were present and a 4 m falls formed a migration barrier near the midway point. The unmaintained Basin Creek trail parallels the north bank along most of the reach, then swings due south crossing near the headwaters.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 50 m. Reach 3 had an irregular pattern and was generally confined by the valley walls.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. A density estimate indicated an important rearing area for cutthroat trout, with 13.5 age I or older fish per 100 m^2 of surface area. Tag return information showed the cutthroat present were mainly resident fish. A 4 m falls was present at stream km 9.3, above which no fish were observed.

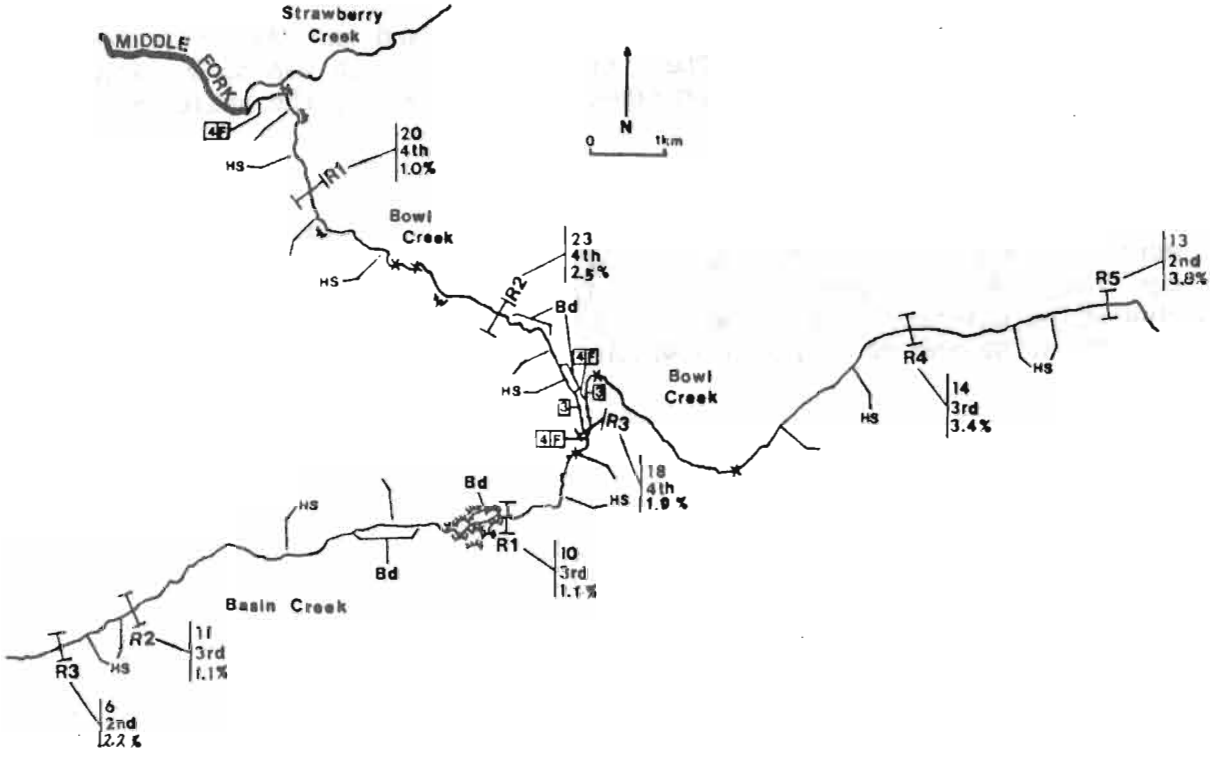

Figure 54. Physical habitat information for the Bowl Creek drainage.

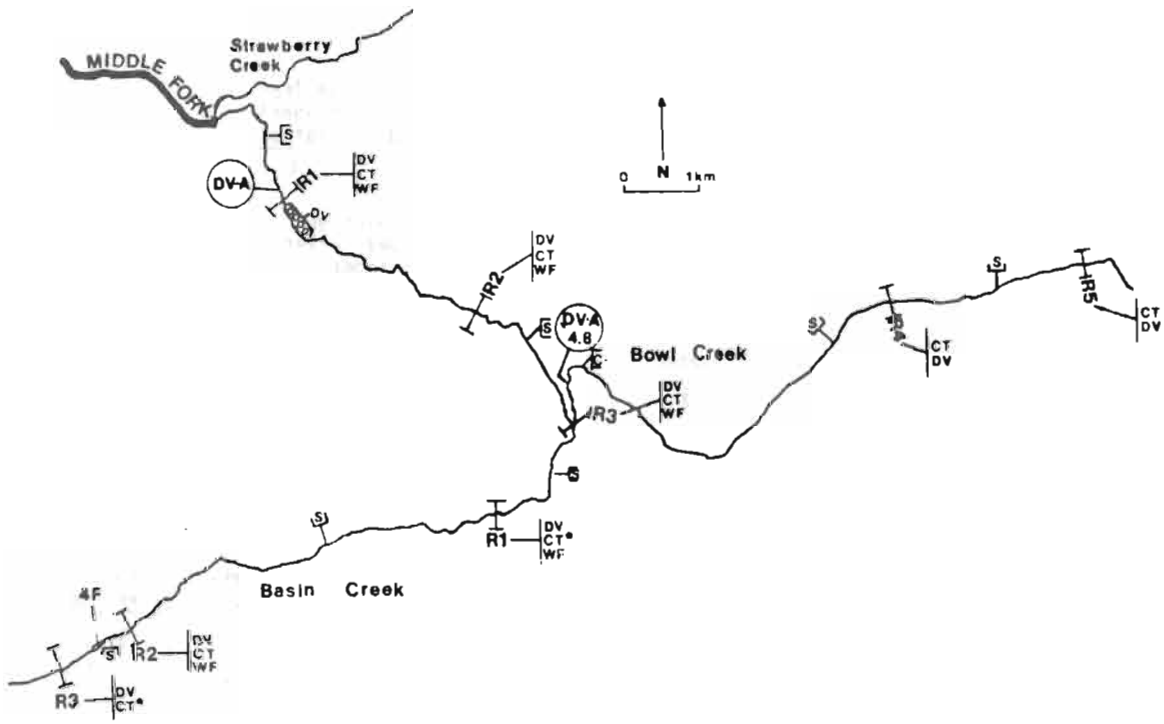

Figure 55. Fish population information for the Bowl Creek drainage.

Table 78. Stream habitat and fish population data for Bowl Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bowl Cr.	001	DDQ	2.6	Middle Fork	.6 km below Scalp Cr.	1620.0	Mouth at Strawberry Creek	1596.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	46.8	9.8	.25	20	100	5	Broken, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Nil	0.52	--	--	Nil	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	76	24	0	67	0	33	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
25	20	43	12	0	39	1.0	86	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Colluvial	Low	Low	20	4	3	33

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
185	134	0.80	.003	--	38.5	.114	1.6	--	3.9

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	2	0.8	81	10	3.8	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	.24	0	0	0	0	0	A	A

Table 79. Stream habitat and fish population data for Bowl Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bowl Cr.	002	DDR	4.2	Middle Fork	2.9 km below Basin Creek	1728.0	.6 km below Scalp Creek	1620.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	--	7.4	.24	23	175	10	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	High	--	--	--	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	74	16	0	22	32	42	4	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	36	20	14	0	35	2.5	125	Undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	High	10	25	25	23

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
19	4.5	80	5	1.2	81	0	0	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.3	0	0	0	0	P	A

Table 80. Stream habitat and fish population data for Bowl Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bowl Cr.	003	DDS	1.6	Middle Fork	.1 km above Basin Creek	1756.0	2.9 km below Basin Creek	1740.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	--	7.9	.51	18	350	21	Rolling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
0	P	Moderate	--	--	--	Low	1.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
58	26	11	5	21	54	21	4	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
12	40	43	5	0	22	1.0	85	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	30	16	15	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
7	4.4	80	3	1.9	81	9	5.6	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0.1	1.0	1.2	2.4	0	0.2	0.4	0.2	P	A

Table 81. Stream habitat and fish population data for Bowl Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bowl Cr.	004	DDT	6.4	Middle Fork	6.5 km above Basin Creek	1975.0	.1 km above Basin Creek	1756.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	4.6	.21	14	80	5	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Low	0.19	--	15	Nil	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
30	30	7	33	2	50	20	28	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	20	50	20	0	36	3.4	80	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	30	8	41	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
195	145	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
3	0.5	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.3	0	0.6	0	0	0.1	0.3	A	A

Table 82. Stream habitat and fish population data for Bowl Creek, Reach 5.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bowl Cr.	005	DDU	2.4	Middle Fork	Headwaters	2067.0	6.5 km above Basin Creek	1975.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	3.2	.24	13	150	12	Rolling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	--	--	--	Low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
50	25	20	5	0	20	77	3	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
23	60	17	0	0	15	3.8	74	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Moderate	50	22	19	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.1	0	0	0	0	0.1	A	A

Table 83. Stream habitat and fish population data for Basin Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Basin Cr.	001	DDK	2.1	Bowl Creek	2.1 km above Bowl Creek	1780.0	Junction w/ Bowl Creek	1756.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	25.3	5.8	.28	10	250	25	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	0.12	--	21	Moderate	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
40	15	10	35	17	22	30	31	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
60	20	10	10	0	34	1.1	73	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	50	10	13	15

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
175	125	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0.4	3.0	4.2	4.5	0	0.1	0	0	P	A

Table 84. Stream habitat and fish population data for Basin Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Basin Creek	002	DDJ	6.6	Bowl Creek	8.7 km above Bowl Creek	1850.0	2.1 km above Bowl Creek	1780.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	4.8	.50	11	325	30	Placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	T	Moderate	--	--	20	Nil	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
73	14	13	0	8	49	43	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
42	57	1	0	0	8	1.1	87	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	20	3	5	1

Water chemistry data

Cond. (umhos/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
1.2	1.3	3.4	2.0	0	0	0.5	0.1	P	A

Table 85. Stream habitat and fish population data for Basin Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Basin Creek	003	DDI	1.8	Bowl Creek	Headwaters	1890.0	8.7 km above Bowl Creek	1850.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	---	3.3	.28	6	50	8	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	P	Low	--	---	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
54	0	13	33	10	20	45	25	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	15	35	20	20	29	2.2	63	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Saprolite	Moderate	Moderate	50	16	16	17

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.2	1.4	11.9	0	0	0	0.7	A	A

STRAWBERRY CREEK DRAINAGE

STRAWBERRY CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-10-80

Reach 1 is a fourth order tributary which joins Bowl Creek to form the Middle Fork. Average wetted width was 13.4 m and the mean depth was 0.53 m. This reach was composed of 46% pool, 29% riffle, 15% run and 10% pocketwater areas. Channel debris was low, with 40% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Low instream cover (9%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 0.7% and the D-90 was 39 cm. Some mass wasting was observed and the Bowl-Divide trail crossed at stream km 0.9. A log jam was present at stream km 4.9 and the upper reach break was located at the junction of Trail Creek at km 5.3.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 5:1. The average valley width was 300 m. Reach 1 had an irregular meandering pattern and was occasionally confined at several bends. The Strawberry Creek trail followed the north bank and an unmaintained trail crossed the upper end and lead up the Trail Creek drainage.

Fish Populations:

Westslope cutthroat, juvenile and adult bull trout, mountain whitefish and sculpins were observed. All species were present in low densities; however, good numbers of cutthroat were observed while conducting bull trout redd surveys in October. Adfluvial bull trout spawning has been documented, with an average of 11 redds enumerated annually during four years of survey.

STRAWBERRY CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-9-80

Reach 2 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 10.2 m and the mean depth was 0.22 m. This reach was composed of 63% run, 18% riffle, 14% pool and 5% pocketwater areas. Moderate channel debris was present, with 25% stable. Bank cover was low, with approximately 3% of the wetted surface area influenced by overhang. Moderate instream cover (18%) was provided by substrate, debris, algae and depth. Stream gradient was 1.1% and the D-90 was 38 cm. Several log jams were observed and beaver activity caused channel braiding in two locations. Several slumping banks were present.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 2

had an irregular pattern and was occasionally confined by steep banks. The Strawberry Creek Trail crossed at stream km 8.2, just above the mouth of Gateway Creek, then followed the east bank up to the reach break at the East Fork of Strawberry Creek.

Fish Populations: Date Surveyed: 8-10-80

Westslope cutthroat, bull trout, sculpins and a sucker were observed. Cutthroat and juvenile bull trout were present in moderate densities. Spawning by adfluvial bull trout has been documented here.

STRAWBERRY CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-24-80

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 5.3 and the mean depth was 0.21 m. This reach was composed of 67% run, 20% riffle, and 13% pool areas. Channel debris was low, with only 2% stable. Bank cover was low, with 2% of the wetted surface area influenced by overhang. Moderate instream cover (13%) was provided by substrate, turbulence and depth. Stream gradient was 1.9% and the D-90 was 86 cm. Several slumping banks were observed and scattered bedrock areas were present in the streambed. Several old log jams were also noted, probably dating back to the 1964 flood. The Strawberry Creek trail crossed at stream km 17.8 and an outfitter's camp was located near this crossing.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 3 had a sinuous pattern and was generally confined by rock walls.

Fish Populations:

Westslope cutthroat and bull trout were observed in low densities during the survey; however, good numbers of cutthroat were observed while conducting bull trout redd surveys in October. Spawning by adfluvial bull trout has been documented here.

STRAWBERRY CREEK REACH 4

Channel Characteristics: Date Surveyed: 8-24-80

Reach 4 is a third order tributary in the Middle Fork drainage. Average wetted width was 4.3 m and the mean depth was 0.23 m. This reach was composed of 50% pool, 45% run and 5% riffle areas. Channel debris was low, with 70% large and stable. Bank cover was low, with 6% of the wetted surface area shielded. Low instream cover was provided by debris, depth and substrate. Stream gradient was 1.0% and the D-90 was 42 cm. Numerous log jams were present and several pools had large boulders. Substrate size and average depth provided excellent spawning habitat.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 50:1. The average valley width was 700 m. Reach 4 had an irregular meandering pattern and was occasionally confined at bends by the valley wall on one side. This reach was meadow-like in character with occasional stands of timber on the streambanks. The Strawberry Creek trail followed the west bank on its way to Badger Pass on the Continental Divide.

Fish Populations:

Westslope cutthroat and bull trout were observed. A density estimate indicated an important rearing area for juvenile bull trout, with 3.3 age I or older fish per 100 m^2 surface area. Spawning by adfluvial bull trout has been documented with an average of nine redds enumerated annually during three years of survey.

Trail Creek Reach 1

Channel Characteristics: Date Surveyed: 8-8-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 7.1 m and the mean depth was 0.36 m. This reach was composed of 44% pocketwater, 28% riffle, 18% pool and 10% run areas. Channel debris was moderate, with 40% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by depth, debris, substrate and turbulence. Stream gradient was 1.6% and the D-90 was 41 cm. Several large log jams were observed and three bedrock cascade areas were present. The channel was braided and actively migrating through heavy debris from stream km 3.8 to 4.2 and a large spring entered from the north canyon wall at km 6.2. An unmaintained trail ran up the drainage and crossed at several points.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1; however, a portion was bounded by high canyon walls from km 5.6 to the upper reach break at km 7.4. The average valley width was 170 m in the lower reach and somewhat narrower in the canyon. Reach 1 had an irregular pattern and was occasionally confined through the lower portions and confined in the canyon area. An outfitter's camp was located at Grimsley Park near stream km 2.8.

Fish Populations:

Westslope cutthroat and juvenile and adult bull trout were observed. A density estimate indicated an important rearing area for juvenile bull trout, with 1.6 age I or older fish per 100 m^2 surface area. Spawning by adfluvial bull trout has been documented with an average of 29 redds enumerated annually during three years of survey. The 1980 high use portion contained approximately six bull trout redds per km.

Trail Creek Reach 2

Channel Characteristics: Date Surveyed: 8-6-80

Reach 2 is a third order tributary in the Strawberry Creek drainage. Average wetted width was 3.1 m and the mean depth was 0.20 m. This reach was composed of 40% run, 30% pool and 30% riffle areas. Channel debris was moderate, with 40% stable. Bank cover was moderate, with 21% of the wetted surface area influenced by overhang. Moderate instream cover (11%) was provided by substrate, debris and undercut banks. Stream gradient was 2.7% and the D-90 was 24 cm. Beaver activity was observed causing depositional areas (silt and sand) to be mixed in with the cobble-boulder substrate of higher gradient areas. Jeff Creek enters at stream km 7.6 and the uppermost fork was located at km 9.6. During 1980, a 1 km section was intermittent below the mouth of Jeff Creek.

Valley Characteristics:

The upper bank slope gradient was generally less than 30% and the valley to channel ratio was approximately 17:1. The average valley width was 150 m. Reach 2 had an irregular pattern and was occasionally confined. An unmaintained trail followed the stream channel up to a small flat near the upper forks.

Fish Populations: Date Surveyed: 8-7-80

Westslope cutthroat and bull trout were observed. Both species were present in low densities. A falls was observed at stream km 8.1 and formed a partial barrier. Low flow and low water temperature combine to limit fish populations here.

South Fork Trail Creek Reach 1

Channel Characteristics: Date Surveyed: 8-9-80

Reach 1 is a second order tributary to Trail Creek. Average wetted width was 2.1 m and the mean depth was 0.28 m. This reach was composed of 45% pool, 40% pocketwater and 15% riffle areas. Channel debris was high, with 60% stable. Bank cover was high, with 38% of the wetted surface area shielded. Moderate instream cover (12%) was provided by debris, substrate, turbulence and depth. Stream gradient was 3.8% and the D-90 was 30 cm. Numerous high water overflow channels were observed and some channel braiding occurred.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 12:1. The average valley width was 120 m. Reach 1 had an irregular pattern and was frequently confined. An unmaintained trail lead up the South Fork drainage, then swung west over Mount May and down into Bowl Creek at Grizzly Park.

Fish Populations:

Westslope cutthroat were the only species observed and were present in moderately high densities. Some cutthroat spawning may to take place in the overflow channels present.

Gateway Creek Reach 1

Channel Characteristics: Date Surveyed: 8-7-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 4.5 m and the mean depth was 0.19 m. This reach was composed of 57% run, 26% riffle, 10% pocketwater and 7% pool areas. Channel debris was high, with 20% stable. Bank cover was moderate, with 16% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by substrate, turbulence and debris. Stream gradient was 2.9% and the D-90 was 51 cm. High incidence of downed timber formed log jams, causing channel braiding to occur. In several locations, new channel migration was evident.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 1 had an irregular pattern and was occasionally confined. The Big River Trail followed the north bank.

Fish Populations: Date Surveyed: 8-9-80

Westslope cutthroat and bull trout were observed. Juvenile bull trout were observed in moderate densities and adfluvial adults were noted; however, no bull trout spawning has been documented in Gateway Creek.

Gateway Creek Reach 2

Channel Characteristics: Date Surveyed: 8-7-80

Reach 2 is a third order tributary in the Strawberry Creek drainage. Average wetted width was 3.6 m and the mean depth was 0.19 m. This reach was composed of 36% pocketwater, 32% riffle, 23% run and 9% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 3% of the wetted surface shielded. Low instream cover (6%) was provided by substrate and turbulence. Stream gradient was 4.0% and the D-90 was 76 cm. Slumping areas were common through Gateway Gorge and some areas of bedrock were present. A 2 m falls was observed at stream km 3.7.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was approximately 2:1. The average valley width was 50 m. Reach 2 had an irregular pattern and was entrenched in a v-shaped canyon. Canyon walls were over 1,000 feet vertical at the highest point. The Big River Trail ran along the north side of the canyon.

Fish Populations: Date Surveyed: 8-8-80

Westslope cutthroat were the only species observed. The 2 m falls at km 3.7 may be a migration barrier to bull trout, as none were observed in Gateway Creek above this point.

Gateway Creek Reach 3

Channel Characteristics: Date Surveyed: 8-6-80

Reach 3 is a second order tributary down to the fork at Sabadoh Cabin, where it becomes third order. Average wetted width was 2.9 and the mean depth was 0.13 m. This reach was composed of 55% run, 30% pocketwater and 15% riffle. Channel debris was low, with only 5% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Low instream cover (9%) was provided by substrate, turbulence and algae. Stream gradient was 4.8% and the D-90 was 56 cm. Many slumping banks were present and two trail crossings were located just above the lower reach break (stream km 3.6 and km 3.7).

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was approximately 7:1. The average valley width was 75 m. Reach 3 had a sinuous pattern and was generally confined by steep banks. Sabadoh Cabin was located at the upper end of Gateway Gorge, along the East Fork Strawberry Creek trail. The Big River trail was located on the South Bank.

Fish Populations: Date Surveyed: 8-8-80

Westslope cutthroat trout were the only fish species observed. A density estimate indicated an important rearing area, with 10.5 age I or older cutthroat per 100 m^2 surface area.

Gateway Creek Reach 4

Channel Characteristics: Date Surveyed: 8-6-80

Reach 4 is a second order tributary draining Big River Meadows. Average wetted width was 3.3 m and the mean depth was 0.23 m. This reach was composed of 65% run, 25% pool and 10% riffle areas. Channel debris was extremely low, with none stable. Bank cover was low, with 8% of the wetted surface area shielded. Extremely high instream cover (80%) was provided by a dense growth of algae and by undercut banks and exposed roots. Stream gradient was 1.2% and the D-90 was 16 cm. The majority of this reach had low, steep banks and silty bed. Banks were somewhat stabilized by a thick growth of grasses and low shrubs.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to

channel ratio was approximately 50:1. The average valley width was 200 m; however, the upper end was much wider (500 m). Reach 4 had an irregular meandering pattern and was unconfined. The Big River trail ran along the south bank through the meadow and on to Gateway Pass on the Continental Divide.

Fish Populations: 8-8-80

Westslope cutthroat were the only fish species observed. A density estimate indicated an extremely important rearing area with 27.2 age I or older fish per 100 m^2 surface area. This was the highest density found in any Middle Fork tributary reach. Most fish observed were relatively small in size (<180 mm). Westslope cutthroat spawning has been documented in riffle areas here.

East Fork Strawberry Creek Reach 1

Channel Characteristics: Date Surveyed: 8-10-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 2.9 m and the mean depth was 0.13 m. This reach was composed of 49% run, 30% pocketwater, 20% pool, and a trace (1%) of riffle areas. Channel debris was moderate, with only 5% stable. Bank cover was low, with 7% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by substrate, turbulence and undercut bedrock ledges. Stream gradient was 5.2% and the D-90 was 63 cm. Bedrock was present in the bank and bed material and formed many cascading sections. The Strawberry Creek Trail crossed just above the mouth and the East Fork Trail crossed at stream km 1.4.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 30 m. Reach 1 had an irregular pattern and was entrenched by rock walls.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. A density estimate indicated an important rearing area for cutthroat, with 11.7 age I or older fish per 100 m^2 of surface area. Juvenile bull trout were also present in moderate to high densities below a 2 m cascading falls at stream km 0.6. No bull trout were observed above this falls.

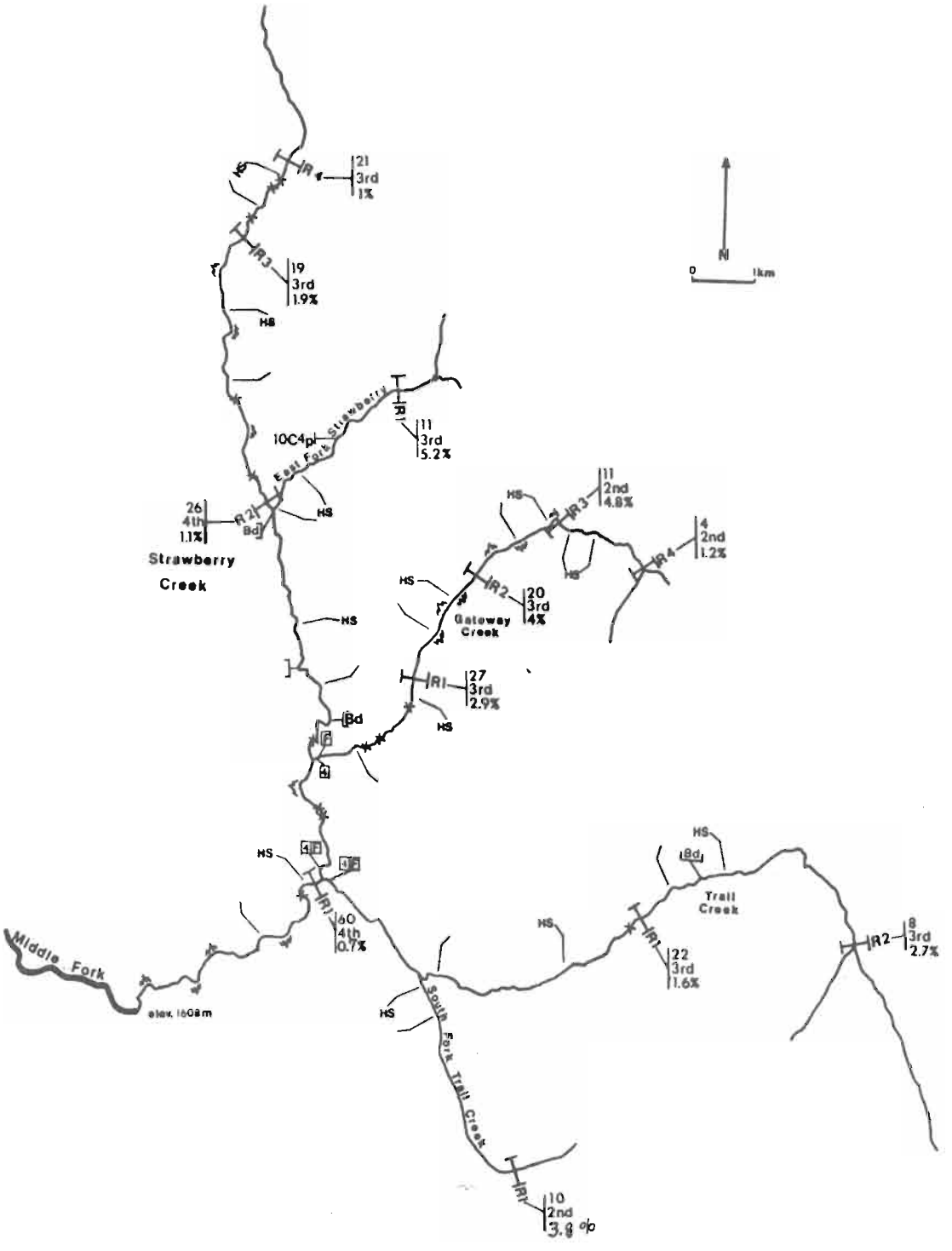

Figure 56. Physical habitat information for the Strawberry Creek drainage.

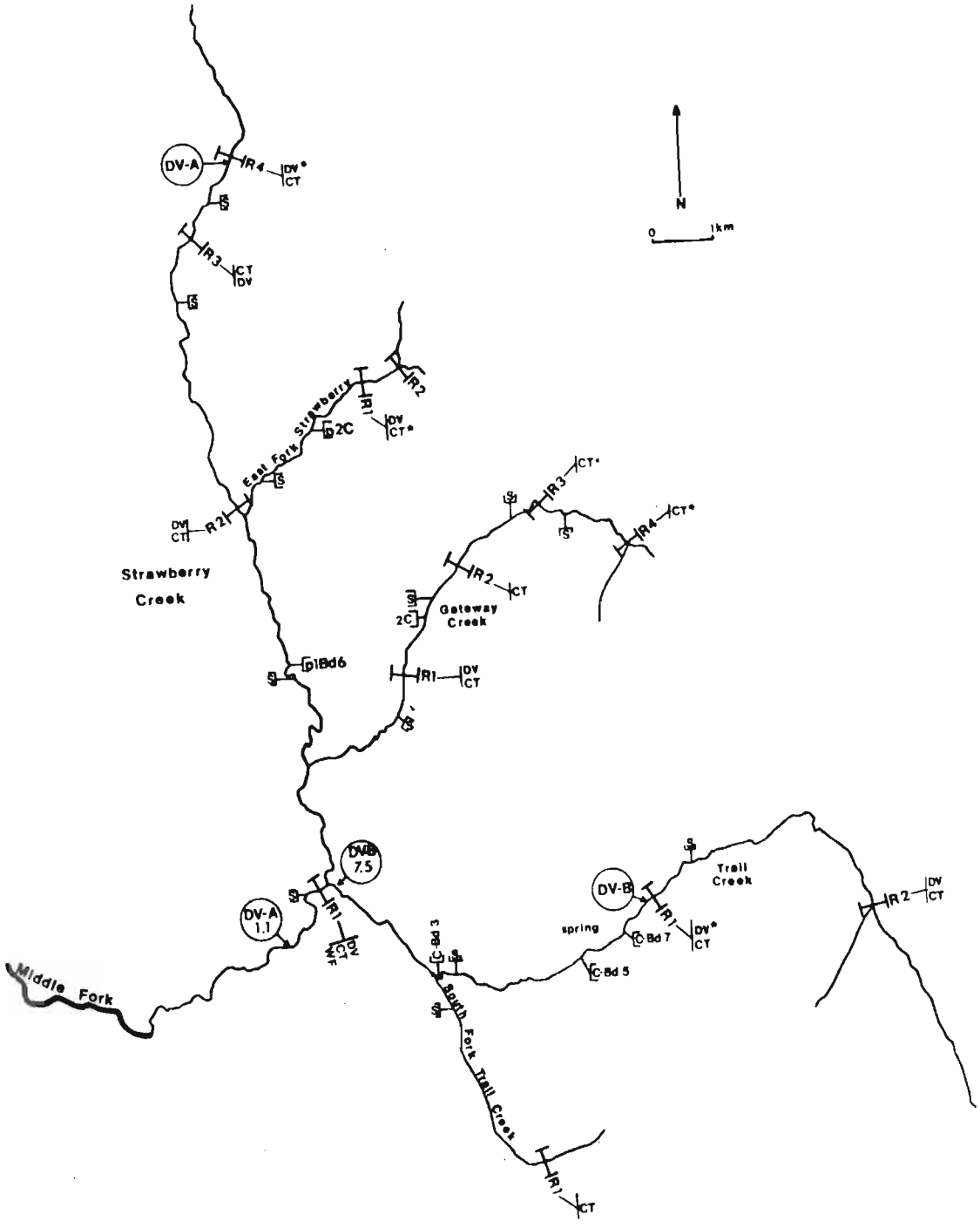

Figure 57. Fish population information for the Strawberry Creek drainage.

Table 86. Stream habitat and fish population data for Strawberry Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Strawberry Creek	001	DCZ	4.9	Middle Fork	Mouth of Trail Creek	1658.0	Junction w/ Bowl Creek	1623.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	71.0	13.4	.53	60	300	5	Rolling, placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Moderate	0.43	--	--	Low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
46	15	29	10	29	43	28	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	40	30	20	0	39	0.7	117	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	40	1	1	9

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
240	146	0.87	.004	--	52.8	.105	2.3	--	13.3

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
4	0.2	80	15	3.1	81	12	2.4	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0.1	0	0	0	0.1	P	A

Table 87. Stream habitat and fish population data for Strawberry Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Strawberry Creek	002	DCY	7.5	Middle Fork	.1 km above E.F. Strawberry Creek	1737.0	Mouth of Trail Creek	1658.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
4	--	10.2	.22	26	200	8	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	--	--	--	Low	1.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
14	63	18	5	25	33	42	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	40	20	9	1	38	1.1	99	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	Moderate	25	2	3	18

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
9	0.8	80	3	0.4	81	8	1.1	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0.7	2.6	2.0	0	0.2	0.2	0.3	A	A

Table 88. Stream habitat and fish population data for Strawberry Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Strawberry Creek	003	DCX	5.1	Middle Fork	7.2 km above E.F. Strawberry Creek	1829.0	.1 km above E.F. Strawberry Creek	1737.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	5.3	.21	19	100	5	Rolling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Nil	--	--	--	Low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
13	67	20	0	8	0	67	25	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
38	17	10	15	20	86	1.9	102	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Low	2	2	2	13

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	0	0	81	1	0.2	82

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0	0.1	0	0	0.2	0	A	A

Table 89. Stream habitat and fish population data for Strawberry Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Strawberry Creek	004	DCW	2.3	Middle Fork	Headwaters	1854.0	5.2 km above E.F. Strawberry Creek	1829.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	4.3	.23	12	700	60	Rolling, swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	C	Low	--	--	--	Low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
50	45	5	0	7	27	66	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
49	32	9	10	0	42	1.0	105	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	70	7	6	8

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
4	1.7	80	3	1.3	81	18	7.8	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.2	0.4	0	0	0.2	3.1	0	A	A

Table 90. Stream habitat and fish population data for Trail Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Trail Creek	001	DC3	7.7	Strawberry Creek	.3 km below Jeff Creek	1752.0	Mouth at Strawberry Creek	1632.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	49.9	7.1	.36	22	170	8	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Moderate	0.27	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
18	10	28	44	6	14	62	18	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
8	17	34	40	1	41	1.6	106	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	40	5	5	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
210	158	0.78	.004	--	45.7	.153	1.3	--	4.7

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
31	4.0	80	26	3.4	81	30	3.9	82

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
0	0	0	0.3	0.7	0.4	0.7	0.5	A	A

Table 91. Stream habitat and fish population data for Trail Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Trail Creek	002	DC2	4.0	Strawberry Creek	Headwaters	1860.0	.3 km below Jeff Creek	1752.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	3.1	.20	8	150	17	Placid, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	Low	--	--	--	Low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
30	40	30	0	0	9	91	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	35	40	5	0	24	2.7	77	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Moderate	40	23	21	11

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0.3	0	0.8	0	0	0	0.3	A	A

Table 92. Stream habitat and fish population data for S.F. Trail Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
S.F. Trail Creek	001	DC1	4.8	Trail Creek	Headwaters	1860.0	Junction w/ Trail Creek	1680.0

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	8.0	2.1	.28	10	120	12	Rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	Moderate	--	--	--	Nil	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
45	0	15	40	0	10	70	20	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	30	40	18	2	30	3.8	72	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	High	60	34	38	12

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	-

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	4.0	2.2	1.6	0	0	0	0	A	A

Table 93. Stream habitat and fish population data for Gateway Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	001	DDV	2.5	Strawberry Creek	.15 km below Shin Creek	1743.5	Mouth at Strawberry Creek	1670.3

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	19.6	4.5	.19	27	100	4	Swirling, rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
X	P	High	0.11	--	--	Low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	57	26	10	0	50	50	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
15	50	20	10	5	51	2.9	100	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	High	High	20	15	16	14

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total Carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
275	163	0.54	.003	0.02	59.3	.194	1.8	--	21.4

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.5	0.3	0	0.4	0.5	0.2	A	A

Table 94. Stream habitat and fish population data for Gateway Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	002	DDW	2.2	Strawberry Creek	2 km above Shin Creek	1828.8	.15 km below Shin Creek	1743.5

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	--	3.6	.19	20	50	2	Tumbling, broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Moderate	--	--	--	Nil	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
9	23	32	36	0	33	67	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	20	10	10	40	76	4.0	97	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Colluvial	Moderate	Low	10	1	1	6

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	0.4	1.3	0	0	0	0	A	A

Table 95. Stream habitat and fish population data for Gateway Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	003	DAA	1.8	Strawberry Creek	3.8 km above Shin Creek	1914.1	2 km above Shin Creek	1828.8

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	2.9	.13	11	75	7	Broken, tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
C	N	Moderate	--	--	--	Nil	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	55	15	30	0	0	40	60	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
30	30	15	20	5	56	4.8	104	Repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Low	Low	5	1	1	9

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0.6	3.3	4.0	3.2	0	0	0	0	A	A

Table 96. Stream habitat and fish population data for Gateway Creek, Reach 4.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	004	DAB	1.1	Strawberry Creek	Headwaters	1926.3	3.8 km above Shin Creek	1914.1

Physical Habitat data

Stream order	Drainage area(km^2)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
2	--	3.3	.23	4	200	50	Placid

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m^3/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	C	Low	--	--	--	Nil	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
25	65	10	0	0	50	50	0	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
45	53	2	0	0	16	1.2	85	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Stable	Organic Fluvial	Low	Nil	0	0	8	80

Water chemistry data

Cond. (umohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout				Other species	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
2.0	1.8	18.7	6.7	0	0	0	0	A	A

Table 97. Stream habitat and fish population data for E.F. Strawberry Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
E.F. Strawberry Cr.	001	DCV	3.0	Strawberry Creek	3 km above Strawberry Creek	1902.0	Junction w/ Strawberry Creek	1740.0

Physical Habitat data

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley-channel ratio	Flow characteristics
3	10.0	2.9	.13	11	30	3	Tumbling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
E	P	Low	--	--	--	Nil	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
20	49	1	30	0	20	80	0	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
25	25	15	5	30	63	5.2	100	Steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
Failing	Fluvial	Moderate	Moderate	5	16	7	14

Water chemistry data

Cond. (µmohs/cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	NO_3^- (mg/l)	Ca^{++} (mg/l)	Mg^{++} (mg/l)	Na^+ (mg/l)	K^+ (mg/l)	SO_4 (mg/l)
--	--	--	--	--	--	--	--	--	--

Spawning data

Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
0	0	80	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout				Other species	
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+	Mountain Whitefish	Eastern Brk trout
0	0	2.1	9.6	0	0	0.6	0.8	A	A

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APPENDIX A

Number caught, angler hours, number measured, minimum length, maximum length and mean length of westslope cutthroat trout captured during Department angling surveys of Middle Fork tributaries during 1980 and 1981.

Stream Name	Code #	Stream Name	Code #
McDonald	08-4630	Lake	08-3956
Lincoln	08-4170	Miner	08-4780
Walton	08-7630	Morrison	08-4940
Deerlick	08-2080	Lodgepole	08-4240
Harrison	08-3290	Whistler	08-7760
Nyack	08-5130	Schafer	08-6160
Coal	08-1630	Dolly Varden	08-2280
Pinchot	08-5530	Argosy	08-0300
Stanton	08-6980	W.F. Schafer	08-7670
Tunnel	08-7440	Calbick	08-1080
Muir	08-4950	Cox	08-1740
Paola	08-5340	Clack	08-1500
Park	08-5365	Bowl	08-0820
Dickey	08-2180	Basin	08-0500
Ole	08-5150	Strawberry	08-7020
Essex	08-2620	Trail	08-7320
Bear	08-0540	S.F. Trail	08-6700
Giefer	08-2960	Gateway	08-2940
Skyland	08-6420	E.F. Strawberry	08-2460
Charlie	08-1400	Dodge	08-2260
Long	08-4280		
Bersicker	08-0640		
Twenty-five Mile	08-7480		
Granite	08-3080		
Challenge	08-1420		

APPENDIX B

State water code numbers for each Middle Fork tributary surveyed.

Stream name	Number caught	Angler hours	Number measured	Minimum length (mm)	Maximum length (mm)	$\bar{x}$ Length (mm)
Lincoln	41	5	40	128	282	177
Walton	29	---	28	121	190	158
Coal	78	8.8	78	110	244	168
Pinchot	36	4.0	36	112	300	196
Stanton	12	2.0	12	104	280	179
Muir	167	14.5	53	102	265	173
Park	60	3.5	60	122	258	185
Ole	87	11.0	75	132	330	209
Essex	24	4.0	11	147	325	224
Giefer	5	1.0	5	114	203	150
Granite	15	3.5	15	220	325	265
Dodge	3	1.0	3	122	260	206
Challenge	42	4.0	34	123	335	210
Lake	4	---	4	230	280	254
Morrison	6	5.5	4	255	310	293
Lodgepole	4	2.0	3	120	162	143
Schafer	30	6.0	30	105	228	153
Dolly Varden	6	13.0	3	187	248	217
Cox	15	6.0	12	135	216	176
Bowl	24	4.0	24	101	250	146
Basin	75	6.0	75	75	202	134
Strawberry	8	4.0	4	135	310	192
Trail	10	3.0	9	120	240	180
Gateway	1	1.5	1	252	252	252