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

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INTRODUCTION

The maps, narratives and tables presented summarize physical habitat and fish species information for tributaries of the North Fork of the Flathead River. Maps provide sample site locations and pertinent reach information. Narratives briefly describe stream habitat and fish population information. Occasionally, additional information may be included in the narratives. Tables contain values for physical habitat and fish population parameters measured. 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 can be found in Figures 2 and 3.

The data collected spans several years during the Flathead River Basin Fisheries Study (1979-1982) and 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 critical 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 (i.e., catastrophic events) or other causes.

A major benefit of the study was development of our ability 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 D-90 (33 to 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°C and streamflows large enough to keep the gravels free of anchor ice during the winter incubation period).

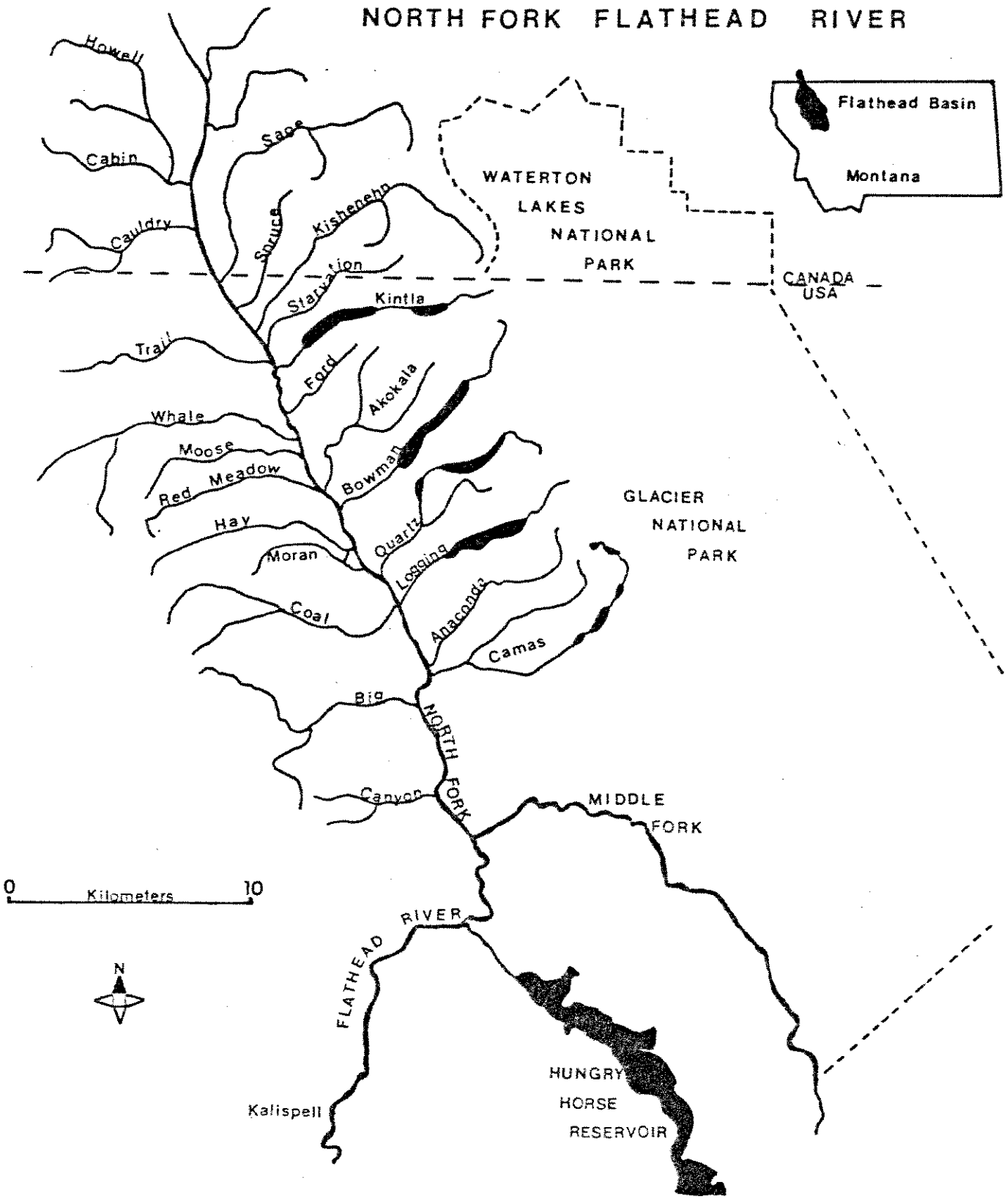

Figure 1. Drainage map of the North Fork Flathead River showing major tributaries.

Table 1. Reach information and river km location (distance above Middle Fork confluence) for North Fork tributaries surveyed in 1979, 1980 and 1981.

Drainage	Distance above M.F. confluence (km)	Reach	Drainage area (km^2)	Length (km)	Gradient (%)	Flow at survey (cfs)	Late summer flow (cfs)
Canyon Creek	8.5		75.9	14.2	3.9	----	----
		1	----	6.3	3.7	21.7	----
		2	----	7.9	4.0	10.3	----
McGinnis			16.8	7.5	3.7	----	----
		1	----	1.3	8.9	0.7	----
		2	----	6.2	2.6	----	----
Kimmerly			18.5		----	----	----
		1		4.2	9.8	6.94	----
Big Creek	24.3		212.5	21.8	2.5	----	39.0
		1		10.4	1.5	39.0	----
		2		7.9	2.3	24.8	----
		3		3.5	5.5	15.1	----
Langford			12.4	3.2	3.3	----	----
		1		1.2	3.0	1.4	----
		2		2.0	3.5	----	----
Hallowatt			42.1	12.7	1.1	----	16.3
		1		4.1	1.7	----	----
		2		8.7	4.5	9.8	----
Werner			10.3	----	----	----	----
		1		3.2	8.0	1.6	----
Kletomus			14.0	----	----	----	----
		1		5.6	7.3	2.7	----
Skookoleel			22.7	8.0	8.5	----	----
		1		4.6	6.9	----	----
		2		3.4	10.8	3.3	----
Nicola			13.6	----	----	----	----
		1		6.3	7.6	2.7	----

Table 1. (continued)

Drainage	Distance above M.F. confluence (km)	Reach	Drainage area (km^2)	Length (km)	Gradient (%)	Flow at survey (cfs)	Late summer flow (cfs)
Camas Creek	29.4		207.2	20.7	0.7	----	----
		1		3.7	1.1	26.4	----
		2		8.3	1.0	16.4	----
		3		8.7	0.1	19.8	----
Dutch			71.2	18.0	4.1	----	----
		1		7.6	1.8	10.5	----
		2		5.5	2.0	10.6	----
		3		4.9	10.1	7.1	----
Anaconda Creek	29.8		90.1	24.5	4.4	----	----
		1		18.4	2.0	7.3	----
		2		6.1	11.7	3.6	----
Logging Creek	38.8		125.4	----	----	----	28.9
		1		7.2	1.6	60.1	----
Coal Creek	38.9		211.5	31.2	1.9	----	36.6
		1		10.1	1.2	29.3	----
		2		8.4	1.0	20.1	----
		3		10.5	2.2	1.3	----
		4		2.2	7.5	1.2	----
Cyclone			34.9	6.5	2.1	----	----
		1		2.5	1.5	1.9	----
		2		4.0	3.0	1.5	----
Dead Horse			25.2	7.3	4.5	----	----
		1		6.1	3.8	6.8	----
		2		1.2	7.9	3.3	----
South Fork Coal			34.4	11.0	4.5	----	----
		1		9.0	3.0	3.0	----
		2		2.0	11.1	1.7	----

Table 1. (continued)

Drainage	Distance above M.F. confluence (km)	Reach	Drainage area (km^2)	Length (km)	Gradient (%)	Flow at survey (cfs)	Late summer flow (cfs)
Mathias			13.2	4.3	6.2	----	----
		1		1.5	2.4	2.8	----
		2		2.8	8.0	1.9	----
Quartz Creek	43.4		108.8	----	----	----	----
		1		10.1	2.0	80.3	----
Cummings			36.6	----	----	----	----
		1		11.8	6.6	5.2	----
Hay Creek	46.2		111.6	27.3	2.4	----	14.8
		1		10.7	1.5	21.3	----
		2		7.2	1.5	14.4	----
		3		7.5	3.4	8.6	----
		4		1.9	7.6	1.0	----
Moran Creek			23.6	11.4	5.2	----	5.0
		1		7.1	3.9	6.7	----
		2		1.4	7.6	2.9	----
		3		1.8	5.5	1.9	----
		4		1.0	8.5	3.2	----
Bowman	53.9		177.9	----	----	----	----
		1		8.2	1.7	44.5	----
Akokala Creek	54.4		115.0	16.8	2.2	----	----
		1		8.0	1.4	9.9	----
		2		8.8	2.9	----	----
Parke			12.1	7.8	6.6	----	----
		1		1.8	4.9	7.3	----
		2		4.6	4.9	10.4	----
		3		1.4	14.4	----	----

Table 1. (continued)

Drainage	Distance above M.F. confluence (km)	Reach	Drainage area (km^2)	Length (km)	Gradient (%)	Flow at survey (cfs)	Late summer flow (cfs)
Long Bow			13.5	----	----	----	----
		1		6.4	12.3	7.3	----
Red Meadow	59.2		76.8	29.9	2.0	----	16.7
		1		7.7	2.2	16.7	----
		2		19.0	0.9	12.4	----
		3		3.2	7.6	0.8	----
Moose Creek	64.2		48.0	21.5	2.9	----	5.9
		1		5.2	2.6	10.8	----
		2		4.9	3.5	9.2	----
		3		11.4	2.8	6.7	----
Whale Creek	66.0		165.6	25.4	1.0	----	55.3
		1		13.9	1.1	58.8	----
		2		11.5	0.7	25.8	----
Shorty			48.0	9.1	3.0	----	----
		1		4.5	0.9	18.6	----
		2		4.6	5.0	7.8	----
Ford Creek	70.6		32.4	12.8	7.3	----	2.1
		1		6.9	3.4	3.2	----
		2		2.1	2.9	1.7	----
		3		3.8	17.0	1.7	----
Kintla Creek	78.7		101.5	----	----	----	----
		1		3.5	1.7	125.5	----
Trail Creek	80.4		197.1	27.1	2.3	----	42.8
		1		11.3	1.2	42.8	----

Table 1. (continued)

Drainage	Distance above M.F. confluence (km)	Reach	Drainage area (km^2)	Length (km)	Gradient (%)	Flow at survey (cfs)	Late summer flow (cfs)
Ketchican			26.4	8.2	3.0	----	----
		1		3.0	0.5	1.1	----
		2		1.5	4.9	1.5	----
		3		3.7	3.1	0.9	----
Yakinikak[1/]			139.1	15.7	3.1	----	----
		1		3.0	1.4	33.5	----
		2		3.2	1.7	23.8	----
		3		3.3	1.5	15.1	----
		4		3.6	1.3	16.2	----
		5		2.7	10.7	8.0	----
Tuchuck			25.7	----	----	----	----
		1		6.5	1.6	8.1	----
Starvation Creek	82.2		21.8	11.2	2.7	----	8.94
		1		8.0	3.1	17.1	----
		2		3.2	1.8	13.4	----
Kishenehn Creek	85.0		10.2	----	----	----	42.1
		1		8.7	1.5	67.4	----
Spruce Creek	87.7		15.1	5.5	2.3	----	----
		1		2.0	1.8	2.4	----
		2		3.5	2.6	4.2	----
Sage Creek	91.2		1.6	----	----	----	31.8
		1		2.1	0.2	48.3	----

[1/] Yakinikak Creek is named Trail Creek where it resurfaces as a spring 11.3 km above its confluence with the North Fork Flathead River.

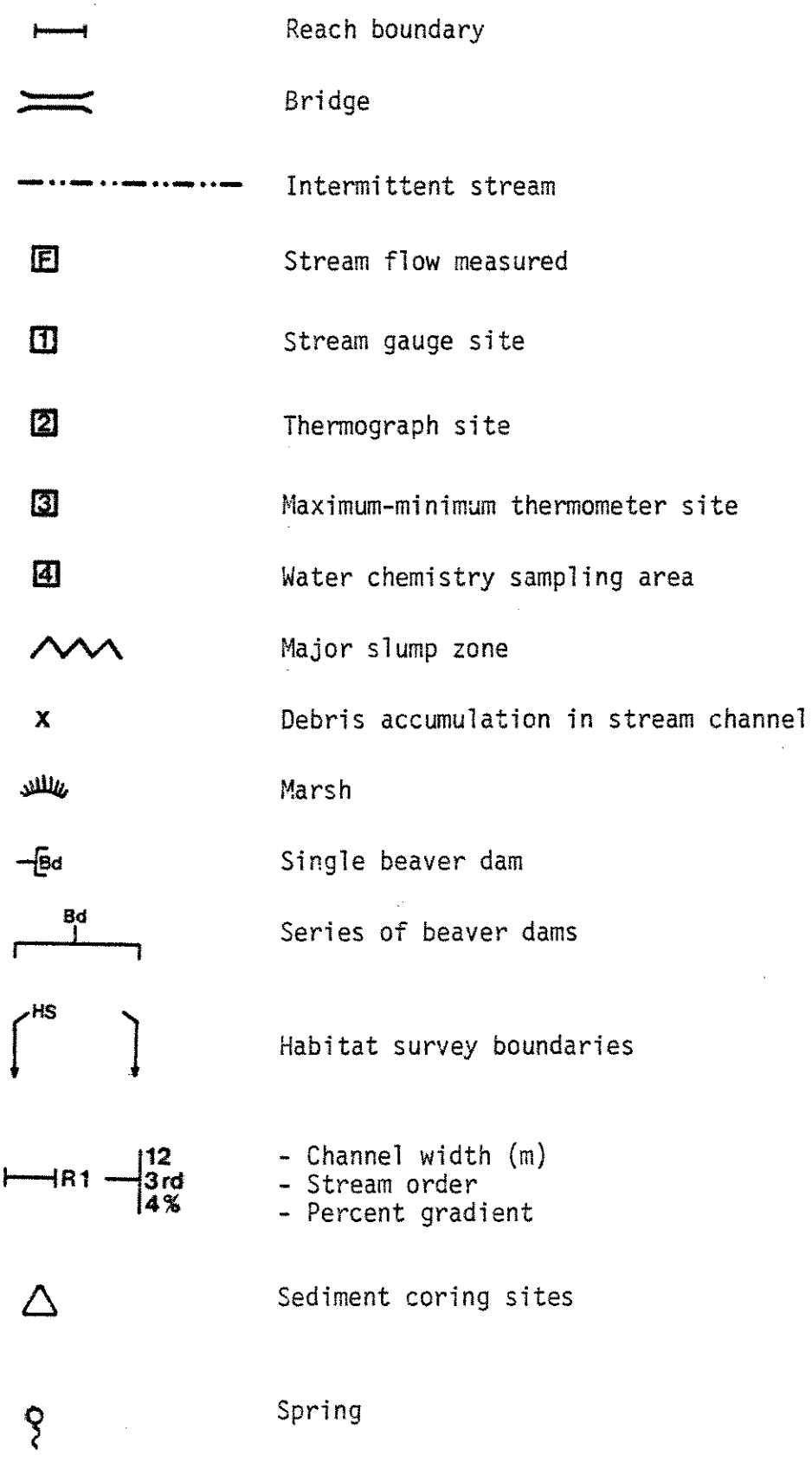

Figure 2. Legend for physical habitat map.

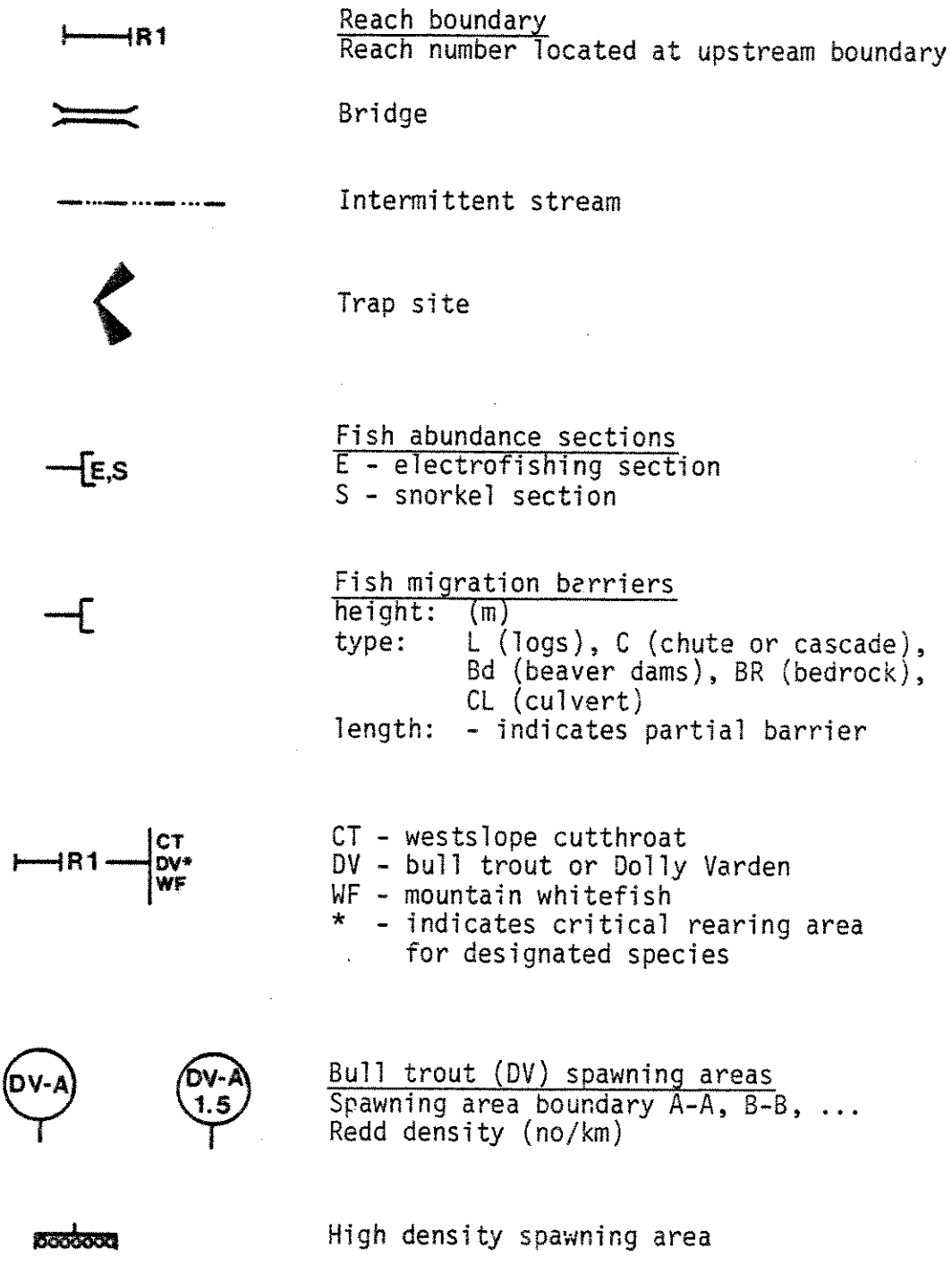

Figure 3. Legend for fish population map.

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).

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 is vaguely present in the channel and the general valley trend is less than 90°

R Regular meanders - characterized by a clearly repeated pattern

T Tortuous meanders - a more or less repeated pattern characterized by angles greater than 90°

Confinement

E Entrenched - the stream bank 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)

For further information on physical and chemical habitat parameters, biological information, and collection methodologies, consult the annual and completion reports prepared during the course of this study (Graham et al. 1980, Fraley et al. 1981, Shepard et al. 1982, Shepard and Graham 1983, Montana Department of Fish, Wildlife and Parks 1983).

CANYON CREEK DRAINAGE

CANYON CREEK REACH I

Channel Characteristics: Date surveyed: 9-3-80 (Figure 4)

Reach I of Canyon Creek is a fourth order tributary. Average wetted width was 6.0 m in the lower portion and 7.6 m in the upper segment. The average depth was 30 cm. The reach contained 30% run, 60% riffle, no pools and 10% pocketwater. Low to moderate amounts of channel debris were present with 30% being stable. Very little instream or bank cover was present. The channel gradient was 3.7% and the D-90 was 80 cm. There was a 3 m falls located 400 m above the mouth.

Valley Characteristics:

The upper bank slope gradient was 60% in the lower portion (below the falls) and 40-60% above the falls. The valley to channel ratio was 1.5:1 from the mouth to the falls and 1.75:1 from the falls upstream. The channel was confined to entrenched in the lower segment and frequently confined above the falls. The channel pattern was irregular.

Fish Populations: (Figure 5)

Bull trout and westslope cutthroat were present in Reach I. Bull trout were present only below the falls. There may be very limited spawning by adfluvial bull trout below the falls. Resident westslope cutthroat were present above and below the falls. The presence of sculpins has not been documented, but it is possible they are present below the falls.

CANYON REACH II

Channel Characteristics: Date surveyed: 9-3-80 (Figure 4)

Reach II is a third order tributary in the lower portion and becomes intermittent in the upper end. Average wetted width was 5.2 m and the mean depth was 23 cm. The reach was composed of 65% run, 30% riffle, 3% pool, and 2% pocketwater. Low amounts of debris were present in the floodplain with 30% being stable. Bank cover was less than 10% and the instream cover was moderate. Channel gradient was 4.0% and the D-90 was 33.5 cm.

Fish Populations: (Figure 5)

No fish were observed in Reach II.

McGinnis Creek

Channel Characteristics: Date surveyed: 9-3-80 (Figure 4)

McGinnis Creek is a third order tributary in Canyon Creek drainage. Average wetted width was 2 m and the average depth was 20 cm. McGinnis Creek was composed of 55% riffle, 30% run, 9% pocketwater and 6% pool. Channel debris was moderate with 40% being stable. Vegetation provided low to moderate bank cover, while instream cover was moderate. Stream gradient was 8.9% and the D-90 was 75 m. The reach had a 15 m falls located 1 km above the mouth.

Valley Characteristics:

The upper bank slope gradient was 40-60%. Active slumps which contributed appreciable sediment to the creek were found in the lower half of the reach. The valley to channel ratio was 3:1 and the average valley width was 10 m. McGinnis Creek was entrenched and confined and stream pattern was irregular.

Fish Population: (Figure 5)

Westlope cutthroat, bull trout, and mountain whitefish were observed in this creek. The 15 m falls formed a fish barrier. The above species were present below this falls. Densities of juvenile bull trout showed the section below the falls to be an important rearing area with 1.5 age I or older bull trout per 100 m^2 of surface area.

Kimmerly Creek Reach 1

Channel Characteristics: Date surveyed: 9-3-80 (Figure 4)

Kimmerly Creek is a third order tributary in Canyon Creek drainage. Average wetted width was 5.4 m, and the average depth was 21 cm. Kimmerly Creek was composed of 75% riffle, 20% run, 4% pocketwater, and 1% pool. Low amounts of channel debris were present with half being stable. Instream cover and bank cover were moderate. Stream gradient was 9.8% and the D-90 was 27 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 10:1. The average valley width was 100 m. Kimmerly Creek was occasionally confined and had an irregular pattern.

Fish Population: (Figure 5)

Westslope cutthroat were observed in this reach. Spawning and rearing of resident fish occurred here.

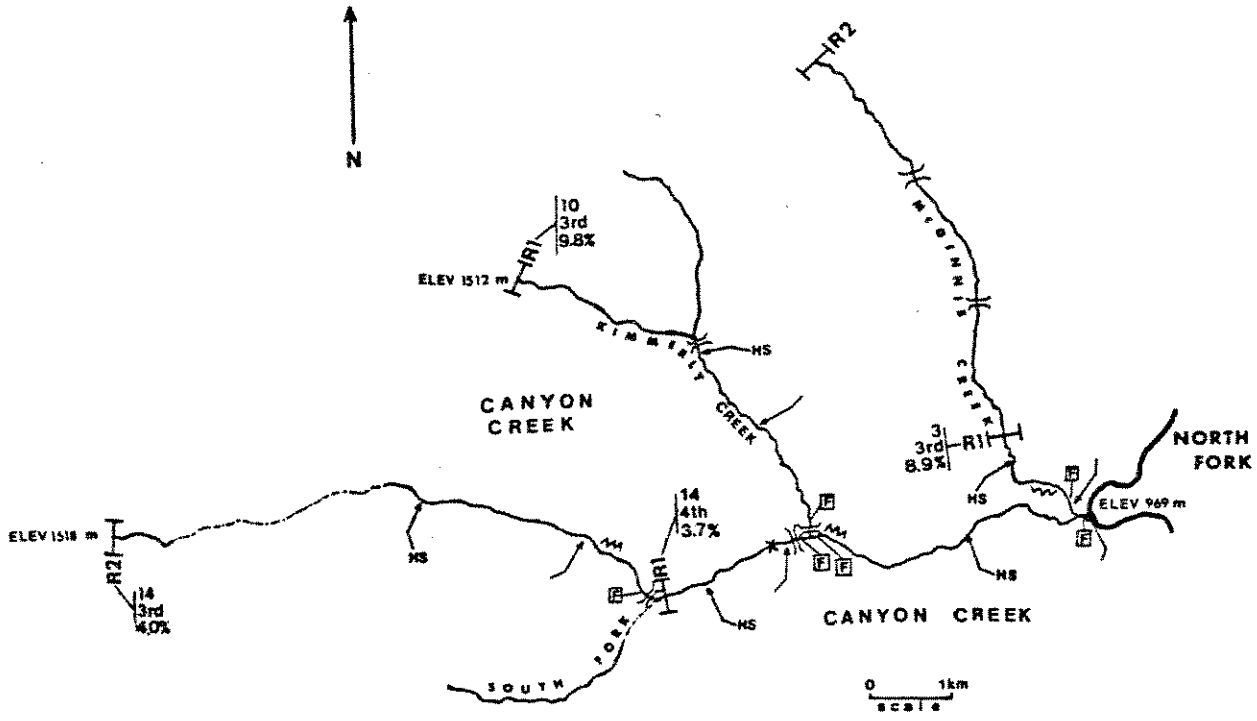

Figure 4. Location of physical habitat parameters by reach for the Canyon Creek drainage.

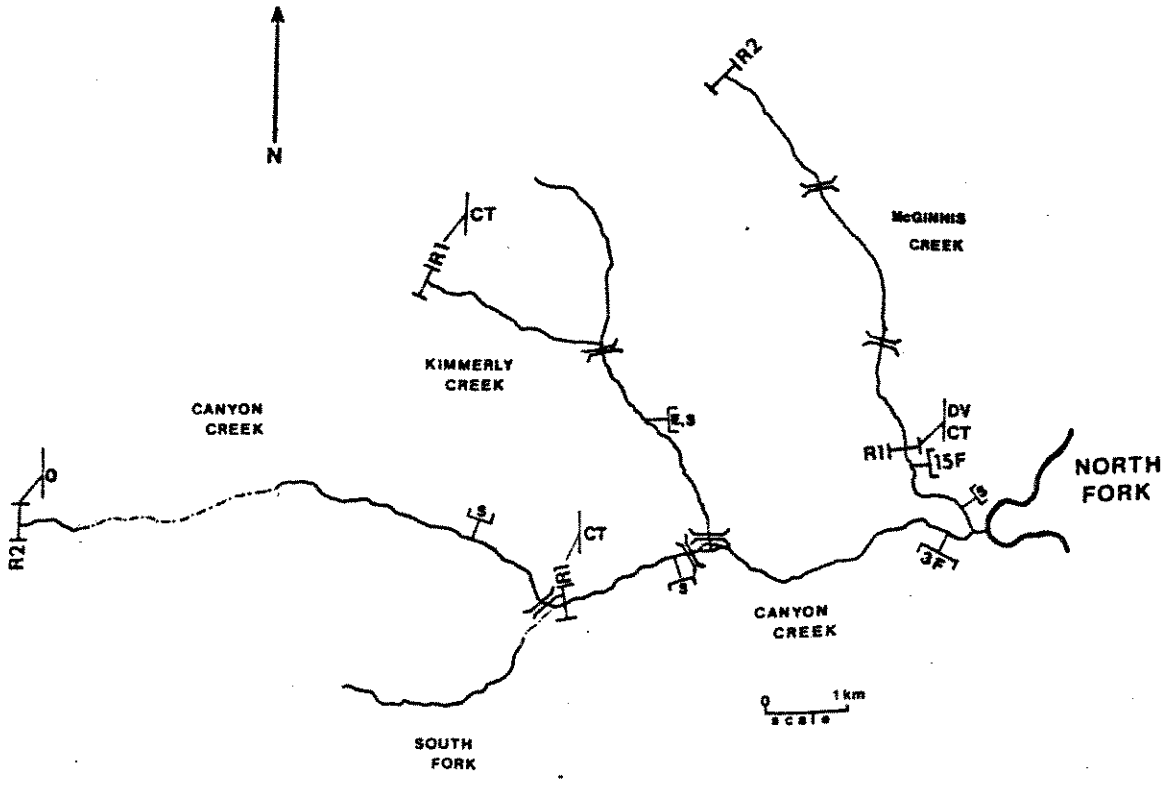

Figure 5. Fish population information by reach for the Canyon Creek drainage.

Table 2. Stream habitat and fish population data for Canyon 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)
Canyon Creek	001	DAI	6.3	North Fork	2.2 km from mouth of Kimmerly	1201	mouth	969

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	75.9	7.6	.31	14	75	5	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)
F	N	low	0.61	0.45	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	30	60	10	0	0	0	0	100

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	30	20	0	80	3.7	97	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	30	1	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)
--	--	--	--	--	--	--	--	--	--

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0.2	0.8	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	2	25	0	0	0	0

Table 3. Stream habitat and fish population data for Canyon 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)
Canyon Creek	002	DAH	7.9	North Fork	headwaters	1518	2.2 km from mouth of Kimmerly	1201

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	--	5.2	.23	14	275	20	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	P	low	0.29	0.30	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	63	30	2	6	17	33	44	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	33	4.0	82	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	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	0	0	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 4. Stream habitat and fish population data for McGinnis 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)
McGinnis Creek	001	DAG	1.3	North Fork	Falls	1080.0	mouth	960.0

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	16.8	2.0	.20	3	10	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	P	low	--	0.02	--	moderate	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
6	30	55	9	4	12	20	64	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	20	20	10	20	75	8.9	113	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	10	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0.7	2.3	0	0	0	1.5

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	8	72	0	0	0	69

Table 5. Stream habitat and fish population data for Kimmerly 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)
Kimmerly Creek	001	DAF	4.2	North Fork	headwaters	1512	mouth	1109

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	18.5	5.4	.21	10	100	10	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)
--	--	--	--	0.20	--	low	0.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	20	75	4	0	0	17	83	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	30	20	0	27	9.8	66	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	1	11	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	1.9	5.3	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	23	165	0	0	0	0

BIG CREEK DRAINAGE

BIG CREEK REACH I

Channel Characteristics: Date surveyed: 9-3-79 (Figure 6)

Big Creek Reach I is a fourth order tributary in the North Fork drainage. Average wetted width was 14 m and the average depth was 30 cm. This reach was composed of 40% riffle, 40% run, 11% pool, and 9% pocketwater. Low amounts of channel debris were present with 30% being stable. Instream and bank cover were low. Stream gradient was 1.5% and the D-90 was 40 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 8:1. Near the mouth of Langford Creek some steep wasting banks over 70 m high and 100 m long were the major features. The average valley width was 150 m. The reach was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 7)

Westslope cutthroat trout, bull trout, mountain whitefish and sculpins were observed in this reach. This reach had low fish densities. Migratory cutthroat and bull trout utilized the area as a migration corridor to upstream spawning areas.

BIG CREEK REACH II

Channel Characteristics: Date surveyed: 9-3-79 (Figure 6)

Reach II of Big Creek is a third order tributary down to Skookoleel Creek were it becomes fourth order. Average wetted width was 14 m and the mean depth was 30 cm. The reach was composed of 50% run, 30% riffle, 15% pool and 5% pocketwater. Low amounts of channel debris were present with 30% being stable. Bank cover was low and instream cover was moderate. Stream gradient was 2.3% and the D-90 was 40 cm. Several slumping areas were present affecting stream compaction and imbeddedness downstream. A lower gradient, smaller substrate area was present above Skookoleel Creek.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 4.5:1. The average valley width for the lower portion was 150 m, while the upper portion averaged 80 m. The reach was occasionally confined in the lower portion and unconfined in the upper portion. Pattern was sinuous to irregular.

Fish Populations: (Figure 7)

Bull trout, westslope cutthroat and sculpins were found in Reach II. Densities estimates showed this reach was an important rearing area for juvenile bull trout with 3.6 age I or older fish per 100 m^2 surface area. Spawning by migratory bull trout has been documented in Reach II and four years of redd counts showed an average of 22 redds annually.

BIG CREEK REACH III

Channel Characteristics: Date surveyed: 9-3-79 (Figure 6)

Big Creek Reach III is a third order tributary in the North Fork drainage. Average wetted width was 3 m with an average depth of 15 cm. This reach was composed of 60% riffle, 30% run, 6% pocketwater and 4% pool. Low amounts of channel debris were present with 30% being stable. Instream cover was low and bank vegetation was moderate. Stream gradient was 5.5% and the D-90 was 65 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 3:1. The average valley width was 15 m. The reach was confined and often entrenched and had an irregular pattern. Some slumping occurred along old road cuts.

Fish Populations: Date surveyed: 9-15-79 (Figure 7)

Bull trout were the only fish observed in this section. A 150 m section of the reach was electrofished yielding 43 juvenile bull trout.

Langford Creek Reach I

Channel Characteristics: Date surveyed: 8-30-79 (Figure 6)

Reach I of Langford Creek is a second order tributary to Big Creek. Wetted width averaged 2.5 m and mean depth was 15 cm. The reach consisted primarily of run (70%), while riffle, pool and pocketwater made up 10%, 4% and 16%, respectively. There was a large amount of debris present with 30% being stable. The channel had abundant cover and was overgrown with alder. Abundant instream cover was provided by debris. The channel gradient was 3.0% and the D-90 was 10 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30%, and the valley to channel ratio was 7.5:1. The average valley width was 30 m. The channel was unconfined and had a meandering pattern.

Fish Populations: (Figure 7)

Bull trout, westslope cutthroat, and sculpins were observed in Reach I. This was an important rearing area for cutthroat trout and provided spawning for adult migratory cutthroat. This reach had one of the highest cutthroat densities observed at 40.4 cutthroat per 100 m^2 surface area. Overall, this reach provided excellent spawning and rearing areas for cutthroat and rearing for juvenile bull trout.

Langford Reach II

Channel Characteristics: Date surveyed: 8-30-79 (Figure 6)

Reach II of Langford Creek begins at the outlet of Mud Lake and is a second order tributary. Average wetted width was 1.6 m and the average depth was 10 cm. Runs made up the majority of the reach (80%), with 10% riffle, 3% pool and 7% pocketwater. There was a large amount of debris present with 10% being stable. The channel had a high percentage of the wetted surface covered by bank vegetation, predominantly alder, and instream cover was high. Channel gradient was 3.5% and the D-90 was 13 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30%, and the valley to channel ratio was 4:1. The average valley width was 12 m. The channel was occasionally confined by valley walls and had an irregular meandering pattern.

Fish Populations: (Figure 7)

Bull trout, westslope cutthroat, and sculpins were observed in Reach II. This was an important rearing area for cutthroat trout and provided spawning habitat for migratory cutthroat. The cutthroat density of 74.4 fish per 100 m^2 was one of the highest recorded. The reach also provided rearing areas for juvenile bull trout.

Hallowat Creek Reach I

Channel Characteristics: Date surveyed: 9-1-79 (Figure 6)

Reach I of Hallowat Creek is a fourth order tributary to Big Creek. Average wetted width was 6.0 m, the mean depth was 17 cm, and a maximum depth of 150 cm was recorded. The reach consisted of 40% run, 40% riffle, 6% pool and 14% pocketwater. There was a moderate amount of debris with 20% being stable. Bank cover was low and little instream cover was present. Channel gradient was 1.7% and the D-90 was 30 cm. One major slump zone was located within the reach.

Valley Characteristics:

The upper bank slope had a gradient of less than 30%, and the valley to channel ratio was 7:1. The average valley width was 70 m. The channel was occasionally confined by valley walls and pattern was irregular.

Fish Populations: (Figure 7)

Bull trout, westslope cutthroat, and sculpins were observed in this reach. Both migratory westslope cutthroat and bull trout utilized this reach for spawning. An average of 14 bull trout redds were enumerated annually during four years of survey. Both juvenile bull and cutthroat trout rearing was provided.

Hallowat Creek Reach II

Channel Characteristics: Date surveyed: 9-1-79 (Figure 6)

Reach II of Hallowat Creek contains the upper segment of the creek and is a third order stream. Average wetted width was 5.0 m and the mean depth was 19 cm. The reach had 30% run, 50% riffle, 8% pool and 12% pocketwater. There was very little debris present. Bank cover was limited; however, large boulders were common and provided instream cover. The channel gradient was 4.5% and the bed material was predominantly bedrock illustrated by the large D-90 (75 cm). Some beaver activity was noted and numerous cascades were observed.

Valley Characteristics:

The upper bank slope gradient was 40-60%, and the valley to channel ratio was 6:1. The average valley width was 30 m. The channel was frequently confined by valley walls and pattern was sinuous.

Fish Populations: (Figure 7)

Bull trout, westlsope cutthroat trout, mountain whitefish and sculpins were observed in this reach. Spawning by adfluvial bull trout has been documented here.

Werner Creek Reach I

Channel Characteristics: Date surveyed: 9-3-79 (Figure 6)

Werner Creek is a second order tributary to Hallowat Creek. Average wetted width was 6 m, and the average depth was 25 cm. Werner Creek contained 40% run, 30% riffle, 25% pocketwater and 5% pool areas. Channel debris was moderate with 30% stable and of large size. Vegetation provided

abundant bank cover, while instream cover was moderate. Stream gradient was 8.0% and the D-90 was 60 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 8:1. The average valley width was 80 cm. Werner Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 7)

Westslope cutthroat and bull trout were observed in this creek. Bull trout were found only below the Hallowat Creek Road. Fish densities were moderate for westslope cutthroat and low for bull trout. Log and debris jams near the mouth made upstream migration difficult during periods of low flow and the Hallowat Road culvert may have been a barrier at low flows.

Kletomus Creek Reach I

Channel Characteristics: Date surveyed: 9-1-79 (Figure 6)

Kletomus Creek is a third order tributary to Hallowat Creek. Average wetted width was 3 m and the average depth was 13 cm. Kletomus Creek contained 60% riffle, 30% run, 7% pool and 3% pocketwater. Channel debris was moderate, with only 20% stable. Bank cover and instream cover were moderate. Stream gradient was 7.3% and the D-90 was 40 cm. Several 1 m - 2 m high log jams and rock cascades were found which may impede upstream movement of spawning bull trout.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was 7:1. The average valley width was 45 m. Kletomus Creek was frequently confined and had an irregular pattern.

Fish Populations: (Figure 7)

Westslope cutthroat and bull trout were observed in this creek. Migratory westslope cutthroat and bull trout probably utilize this creek for spawning and rearing.

Skookoleel Creek Reach I

Channel Characteristics: Date surveyed: 8-31-79 (Figure 6)

Skookoleel Creek Reach I is a third order tributary in Big Creek drainage. Average wetted width was 8 m and the average depth was 12 cm.

Reach I of Skookoleel Creek was composed of 40% pocketwater, 30% run, 20% riffle and 10% pool. Channel debris was moderate with 30% being stable. Overhanging vegetation provided abundant bank cover, while instream cover was moderate. Stream gradient was 6.9% and the D-90 was 90 cm.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio was 2:1. The average valley width was 25 m. Skookoleel Creek was occasionally confined and had an irregular pattern. Braiding, split channels, and wasted banks were common.

Fish Populations: (Figure 7)

Westslope cutthroat trout were observed in this reach. Resident westslope cutthroat were present, and it was unknown whether migratory cutthroat used the area. Fish densities were low. Bull trout were also observed.

Skookoleel Creek Reach II

Channel Characteristics: Date surveyed: 8-31-79 (Figure 6)

Skookoleel Creek Reach II is a second order tributary in Big Creek drainage. Average wetted width was 4 m and the average depth was 12 cm. This reach contained 60% riffle, 30% run, 6% pocketwater, and 4% pool. Channel debris was moderate, with very little being stable (10%). Bank vegetation provided limited cover, while instream cover was high. Stream gradient was 10.8%, and the D-90 was 25 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 12:1. The average valley width was 100 m. Skookoleel Creek was unconfined and had an irregular pattern.

Fish Populations: (Figure 7)

Westslope cutthroat, probably residents, were observed in this creek.

Nicola Creek Reach I

Channel Characteristics: Date surveyed: 8-31-79 (Figure 6)

Nicola Creek is a second order tributary in Big Creek drainage. Average wetted width was 5 m, and the average depth was 20 cm. Nicola Creek contained 50% riffle, 30% run, 12% pocketwater, and 8% pool. Channel debris was moderate, with 20% being stable. Overhanging vegetation

provided abundant bank cover, while instream cover was low. Stream gradient was 7.6% and the D-90 was 58 cm. Several partial barriers to upstream migration were present in the form of log jams and rock cascades up to 2 m high.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 10:1. The average valley width was 80 m. Nicola Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 7)

Westslope cutthroat and bull trout were observed in the creek, mainly near the mouth. Resident westslope cutthroat were identified, and overall fish densities were low in the creek.

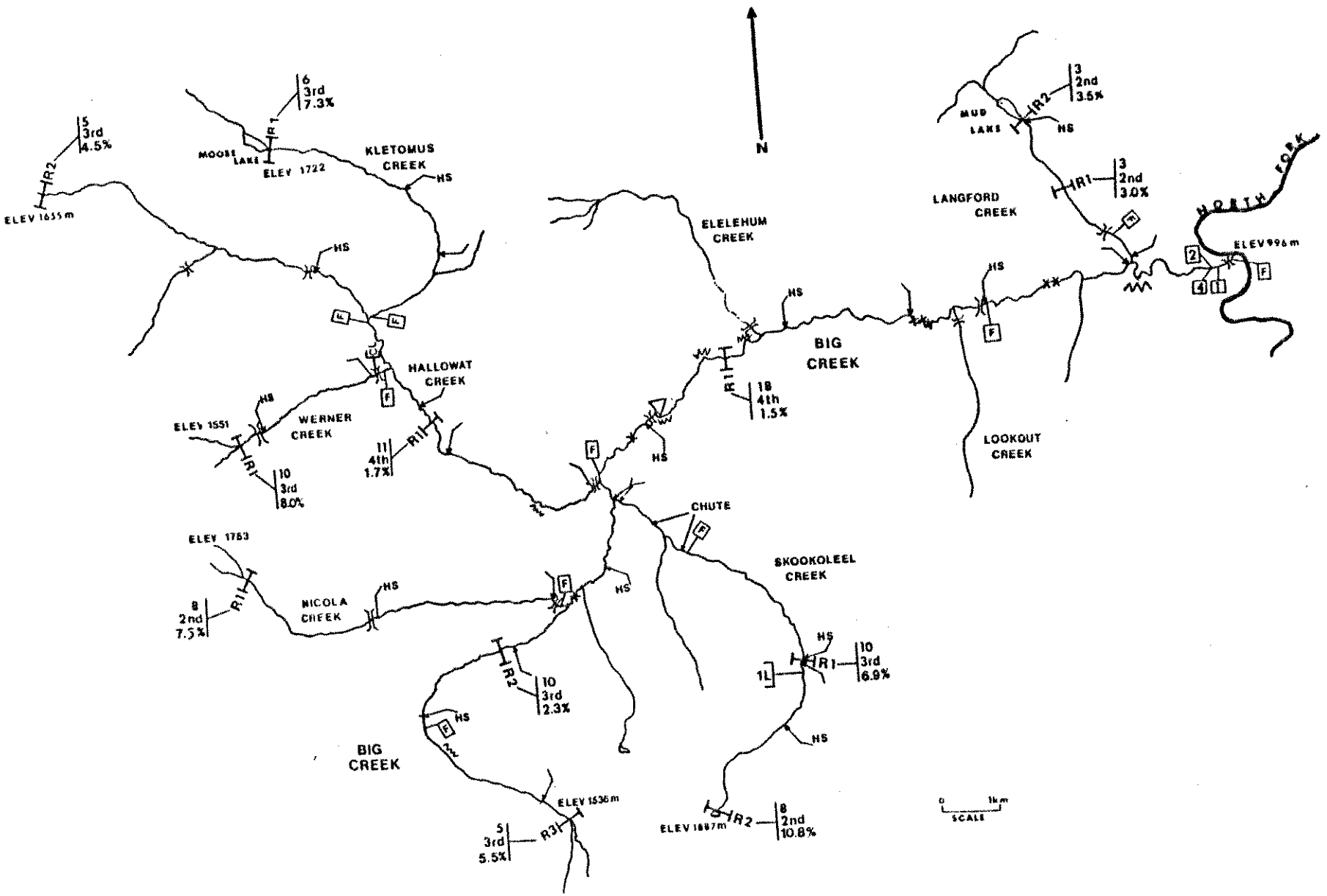

Figure 6. Location of physical habitat parameters by reach for the Big Creek drainage.

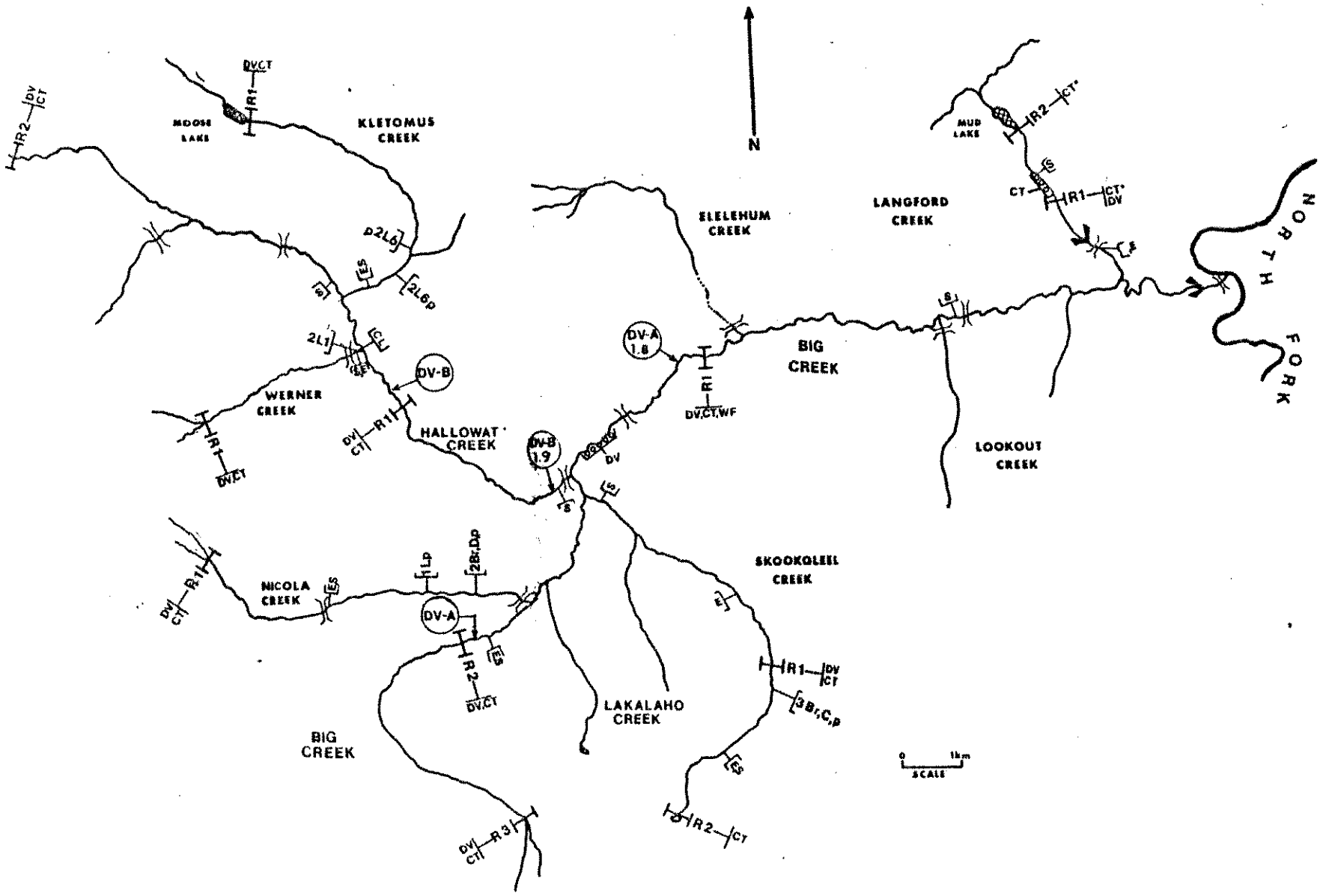

Figure 7. Fish population information by reach for the Big Creek drainage.

Table 6. Stream habitat and fish population data for Big 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)
Big Cr.	001	DBF	10.4	North Fork	1 km above Elelehum Cr.	1158	junction with North Fork Flathead River	996.0

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	212.5	14.0	.30	18	150	8	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	1.10	1.45	14	low	1.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
11	40	40	9	20	9	25	46	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
30	30	20	10	10	40	1.5	99	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	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)
--	--	1.06	.005	0.15	24.3	0.63	--	--	2.2

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	0.0	80	6	0.8	79	1	0.1	81

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull 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

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	3	0	0	0	0

Table 7. Stream habitat and fish population data for Big 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)
Big Cr.	002	DBE	7.9	North Fork	1.5 km above Nicola Cr.	1344	1 km above Elelehum Cr.	1158

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	--	5.0	.44	10	150	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)
X	P	low	--	0.70	--	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
15	50	30	5	5	5	15	75	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	50	20	20	0	50	23	99	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	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)
--	--	--	--	--	--	--	--	--	--

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
15	2.3	80	6	0.9	79	23	3.3	81

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0.7	0.1	0.1	0.1

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	1	1	2	5

Table 8. Stream habitat and fish population data for Big 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)
Big Cr.	003	DAC	3.5	North Fork	Headwaters	1536	1.5 km above Nicola Cr.	1344

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	--	3.0	.15	5	15	3	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	--	0.43	--	low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
4	30	60	6	0	0	0	100	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
10	20	30	30	10	65	5.5	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	30	10	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 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 9. Stream habitat and fish population data for Langford 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)
Langford Creek	001	DBD	1.2	North Fork	.5 km above Big Cr. Rd.	1082	mouth	1045

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	12.4	2.5	.15	3	12	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)
U	R	low	--	0.04	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
4	70	10	16	2	8	11	79	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	60	10	10	0	10	3.0	69	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	moderate	high	30	30	80	40

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2.7	1.8	0	38.6	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3	12	0	1204	0	0	0	0

Table 10. Stream habitat and fish population data for Langford 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)
Langford Creek	002	DAD	2.0	North Fork	Mud Lake	1143	.5 km above Big Cr. Rd.	1082

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	--	1.6	.10	3	12	3	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	--	--	--	low	0.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	80	10	7	0	0	25	75	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
40	40	10	10	0	13	3.5	84	steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	moderate	high	10	20	90	35

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
5.0	0.0	13.5	60.9	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
6	0	163	1900	0	0	0	0

Table 11. Stream habitat and fish population data for Hallowat 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)
Hallowat Creek	001	DBC	4.1	North Fork	4.1 km from mouth	1266	junction with Big Creek	1198

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	42.1	7.0	.27	11	80	8	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	--	--	16	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
6	40	40	14	0	17	14	69	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	30	25	10	5	50	1.7	86	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	medium	30	1	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)
--	--	--	--	--	--	--	--	--	--

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
8	1.9	80	2	0.5	79	14	3.5	81

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	0	0.6	0	0	0.8	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	2	0	1	0	0	37

Table 12. Stream habitat and fish population data for Hallowat 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)
Hallowat Creek	002	DBB	8.7	North Fork	4 km above last bridge	1655	4.1 km from mouth	1266

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	--	5.0	.19	5	30	6	broken

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	30.0	.28	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	30	50	12	2	6	28	64	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	20	20	20	30	85	4.5	91	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	low	nil	20	1	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 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	9	0

Table 13. Stream habitat and fish population data for Werner 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)
Werner Creek	001	DA8	3.2	North Fork	headwaters	1551	junction with Hallowat	1287

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	10.3	6.0	.25	10	80	8	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	P	low	--	0.04	--	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	40	30	25	0	3	13	84	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	15	15	10	60	8.0	81	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	20	30	26

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	0.5	1.7	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	6	53	0	0	0	0

Table 14. Stream habitat and fish population data for Kletomas 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)
Kletomas Creek	001	DAE	5.6	North Fork	Moose Lake	1772	junction with Hallowat	1312

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	14.1	3.0	.13	6	45	8	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	P	low	--	0.82	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	30	60	3	0	0	15	85	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	10	10	20	40	7.3	95	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	low	moderate	20	10	20	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull 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	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	9	0	0	0	0

Table 15. Stream habitat and fish population data for Skookoleel 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)
Skookoleel Creek	001	DA9	4.6	North Fork	4.6 km from mouth	1521	junction with Big Creek	1204

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	22.7	8.0	.12	10	25	3	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	low	--	0.09	9	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	30	20	40	1	3	18	78	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	20	30	10	20	90	6.9	86	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	50	20	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	0	0	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 16. Stream habitat and fish population data for Skookoleel 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)
Skookoleel Creek	002	DBA	3.4	North Fork	Lake at headwaters	1887	4.8 km from mouth	1521

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	.12	8	100	12	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	--	--	9	low	0.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
4	30	60	6	0	0	0	45	55

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
20	20	30	10	20	25	10.8	86	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	1	10	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
--	--	--	--	--	--	--	--	--

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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 17. Stream habitat and fish population data for Nicola 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)
Nicola Creek	001	DA7	6.3	North Fork	headwaters	1753	mouth	1274

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	13.6	5.0	.20	8	80	10	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	--	0.82	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	30	50	12	1	7	29	63	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	20	17	3	58	7.6	87	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	20	50	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
0	0	0	0	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

CAMAS CREEK DRAINAGE

CAMAS CREEK REACH I

Channel Characteristics: Date surveyed: 8-6-80 (Figure 8)

Camas Creek Reach I is a fourth order tributary in the North Fork drainage. Average wetted width was 12 m and the average depth was 32.5 cm. This reach was composed of 60% run and 40% riffle. Channel debris was low, with 50% being stable. Bank and instream cover were both low. Stream gradient was 1.1% and the D-90 was 40 cm. Two major slump zones appeared at 1.5 and 2.0 kilometers below the upper reach break.

Valley Characteristics:

The upper bank slope was 30-40% and the valley to channel ratio was 4:1. The average valley width was 150 m. Camas Creek was occasionally confined and had an irregular meandering pattern.

Fish Populations: (Figure 9)

Westslope cutthroat, mountain whitefish and sculpins were observed in this reach. In addition, suckers and northern squawfish were observed. Both resident and migratory cutthroat populations were present.

CAMAS CREEK REACH II

Channel Characteristics: Date surveyed: 8-6-80 (Figure 8)

Camas Creek Reach II is a third order tributary in the North Fork drainage. Average wetted width was 12 m and the average depth was 22 cm. Reach II was composed of 48% run, 37% riffle, 15% pocketwater and a trace pool. Channel debris was low with 25% being stable. Overhanging vegetation provided only slight bank cover, while instream cover was moderate. Stream gradient was 1% and the D-90 was 69 cm. Two major slump zones were present 1.5 kilometers below the upper reach break and a debris accumulation was present just below the lower slump.

Valley Characteristics:

The upper bank slope was 30-40% and the valley to channel ratio was 3:1. The average valley width was 60 m. Reach II was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 9)

Westslope cutthroat, mountain whitefish and sculpins were observed in this reach. In addition, redside shiners and suckers were observed. Both resident and migratory cutthroat populations were present.

CAMAS CREEK REACH III

Channel Characteristics: Date surveyed: 8-6-80 (Figure 8)

Camas Creek Reach III is a second order tributary in the North Fork drainage. Average wetted width was 17 m and the average depth was 22 cm. Reach III was composed of 100% run. Channel debris was low, with 90% being stable. Bank and instream cover were both low. Stream gradient was 0.1% and the D-90 was 1 cm. Stream bed material was mostly fines (80%) and 20% organic material.

Valley Characteristics:

The upper bank slope was 30% and the valley to channel ratio was 20:1. The average valley width was 400 m. Reach III was unconfined and had an irregular pattern. Nearly all of this reach was located in a broad grassy meadow.

Fish Populations: (Figure 9)

Westslope cutthroat and sculpins were observed in this reach. Both resident and migratory cutthroat populations were present. Underwater visibility was poor due to cloudy water conditions.

Dutch Creek Reach I

Channel Characteristics: Date surveyed: 8-26-80 (Figure 8)

Dutch Creek Reach I is a third order tributary in the Camas Creek drainage. Average wetted width was 8.8 m, and the average depth was 22 cm. This reach was composed of 57% run, 37% riffle, 3% pool and 3% pocketwater. Channel debris was low with 10% being stable. Bank cover was low and instream cover was moderate. Stream gradient was 1.8% and the D-90 was 23 cm. Three different major slump zones appeared in the lower end of this reach.

Valley Characteristics:

The upper bank slope was 30% and the valley to channel ratio was 14:1. The average valley width was 200 m. Reach I of Dutch Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 9)

Westslope cutthroat, mountain whitefish, and sculpins were observed in this reach. Both resident and migratory cutthroat populations were present.

Dutch Creek Reach II

Channel Characteristics: Date surveyed: 8-26-80 (Figure 8)

Dutch Creek Reach II is a second order tributary in the Camas Creek drainage. Average wetted width was 6.6 m and the average depth was 25 cm. Reach II was composed of 47% riffle, 45% run, 5% pool and 3% pocketwater. Channel debris was low with 30% being stable. Bank and instream cover were both moderate. Stream gradient was 2.0% and the D-90 was 60 cm. Three different major slump zones appeared in the lower two kilometers of this reach.

Valley Characteristics:

The upper bank slope was 30-40% and the valley to channel ratio was 8:1. The average valley width was 100 m. Dutch Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 9)

Westslope cutthroat and sculpins were observed in this reach. Density estimates showed this reach was an important rearing area for cutthroat trout with 12.2 cutthroat per 100 m^2 surface area. Both resident and migratory populations were present.

Dutch Creek Reach III

Channel Characteristics: Date surveyed: 8-26-80 (Figure 8)

Dutch Creek Reach III is a second order tributary in the Camas Creek drainage. Average wetted width was 7.6 m and the average depth was 24 cm. Reach III was composed of 53% run, 26% pocketwater, 16% riffle and 5% pool. Channel debris was low with 30% being stable. Bank cover was low, while instream cover was moderate. Stream gradient was 10.1% and the D-90 was 104 cm. Small cascades structured by large boulders were characteristic of the reach.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 3:1. The average valley width was 50 m. Reach III was frequently confined and had an irregular pattern. A 1 km feature at the lower end of Reach III was braided, had a gradient less than 1% and a D-90 of 24 cm.

Fish Populations: (Figure 9)

Westslope cutthroat and sculpins were observed in this reach. Both resident and migratory cutthroat populations were present. The feature at the lower end of Reach III was a prime rearing and spawning area for cutthroat trout.

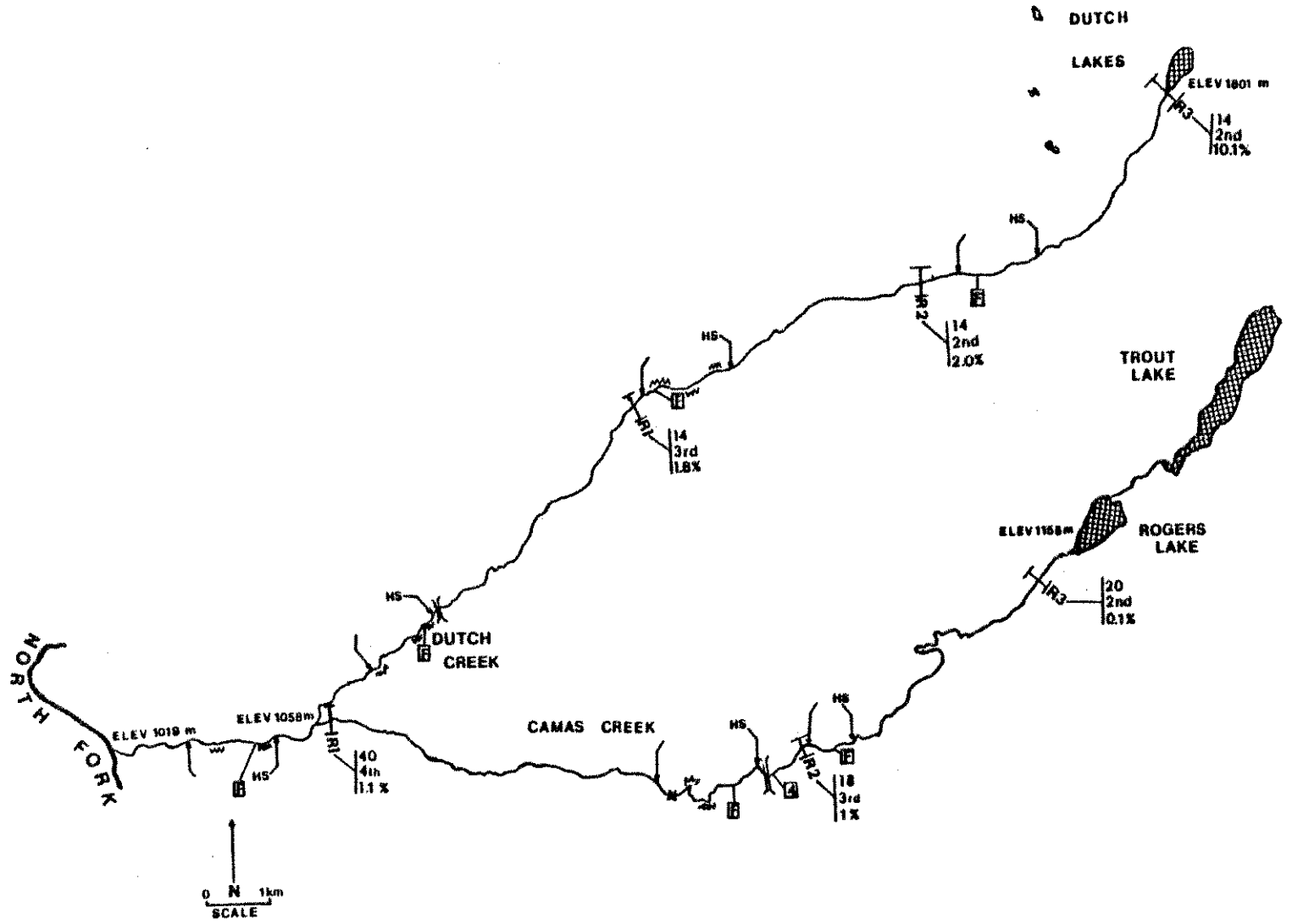

Figure 8. Location of physical habitat parameters by reach for Camas and Dutch Creeks.

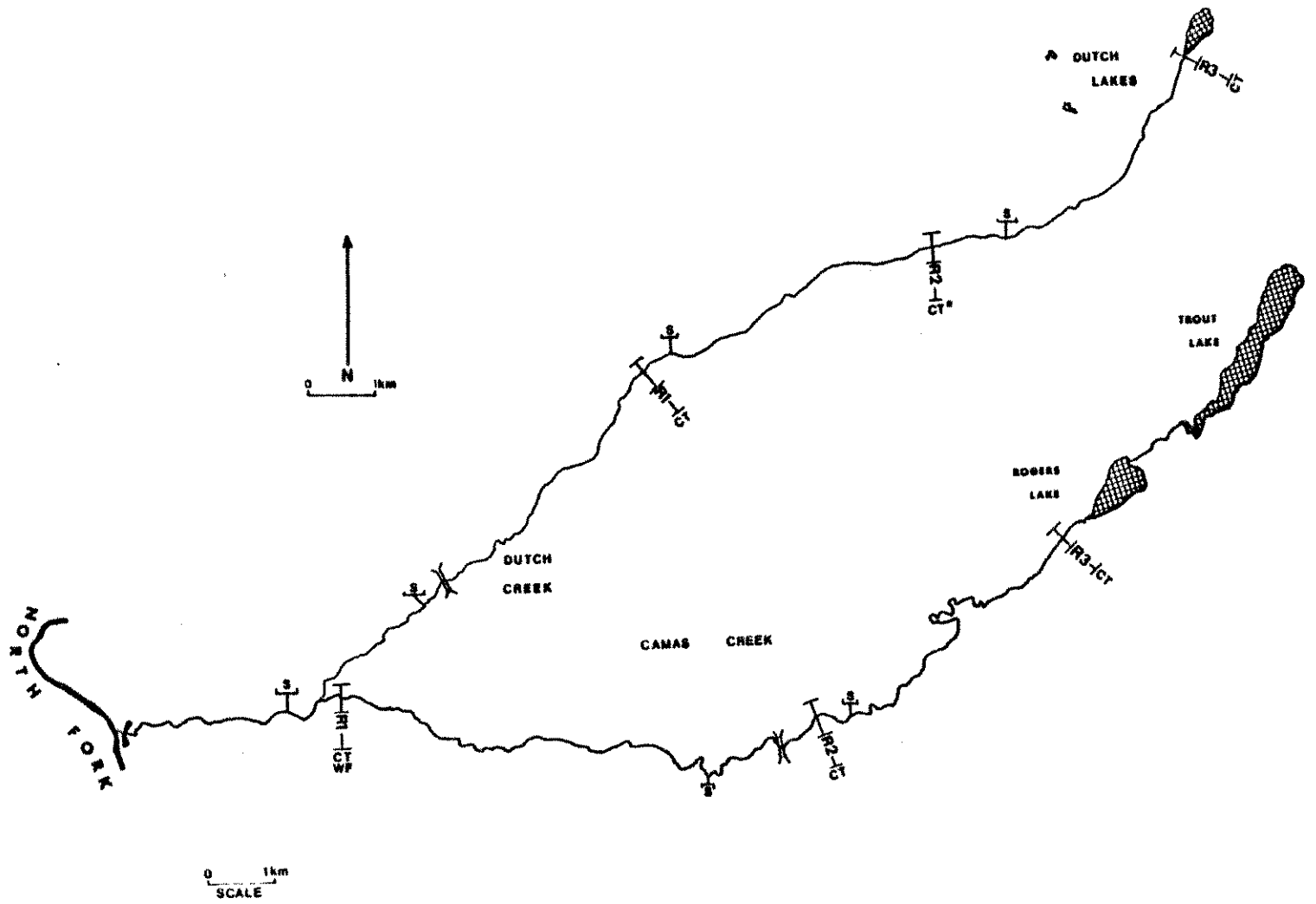

Figure 9. Fish population information by reach for Camas and Dutch Creeks.

Table 18. Stream habitat and fish population data for Camas 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)
Camas Cr.	001	DBW	3.7	North Fork	.2 km up from mouth Dutch Creek	1060	mouth	1019

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	207.2	17.0	.32	40	150	4	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	C	low	--	0.75	0	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	60	40	0	0	0	100	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
17	30	43	10	0	40	1.1	88	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	50	1	2	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)
40	35	1.36	.011	--	10.0	.027	0.7	--	0.7

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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.2	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	0	0	0	0	0	0	0

Table 19. Stream habitat and fish population data for Camas 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)
Camas Cr.	002	DBV	8.3	North Fork	2 km up from Rt 7 Bridge	1143	.2 km up from mouth Dutch Creek	1060

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	55.4	12.1	.22	18	60	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	P	low	--	0.46	24	moderate	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	48	37	14	5	11	6	78	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	30	20	0	69	1.0	80	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	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)
40	35	--	--	--	--	--	--	--	--

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0.2	0.7	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	2	22	0	0	0	0

Table 20. Stream habitat and fish population data for Camas 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)
Camas Cr.	003	DBU	8.7	North Fork	Rogers Lake	1155	2 km up from Rt. 7 Bridge	1143

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	1.50	20	400	20	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	P	moderate	--	0.56	--	high	2.5

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

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
100	0	0	0	0	1	0.1	63	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	90	1	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 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 21. Stream habitat and fish population data for Dutch 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)
Dutch Creek	001	DB2	7.6	North Fork	4.7 km up from Rt. 7 bridge	1195	mouth	1085

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	71.2	8.8	.22	14	200	14	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	--	0.29	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	57	37	3	6	31	19	44	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
30	40	20	10	0	23	1.8	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	low	10	10	3	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2.1	1.5	2.3	5.2	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2	10	28	162	0	0	0	0

Table 22. Stream habitat and fish population data for Dutch 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)
Dutch Creek	002	DB1	5.5	North Fork	10.2 km up from Rt. 7 Road	1304	4.7 km up from Rt. 7 bridge	1195

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	--	6.6	.25	14	100	7	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	P	moderate	-	0.30	--	nil	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	45	47	3	0	29	29	42	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	40	30	20	0	60	2.0	94	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	16	15	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	
								Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+		
10.6	5.7	3.8	2.7	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
12	39	46	84	0	0	0	0

Table 23. Stream habitat and fish population data for Dutch 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)
Dutch Creek	003	DBZ	4.9	North Fork	Dutch Lake	1801	10.2 km up from Rt. 7 road	1304

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	--	5.0	.24	14	50	4	broken

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	moderate	--	0.20	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	53	16	26	0	13	12	75	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	30	20	30	0	104	10.1	82	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	30	3	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 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.7	0	1.3	1.6	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	0	16	50	0	0	0	0

ANACONDA CREEK DRAINAGE

ANACONDA CREEK REACH I

Channel Characteristics: Date surveyed: 8-8-80 (Figure 10)

Anaconda Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 7.6 m and the average depth was 20 cm. Reach I of Anaconda Creek was made up of 55% run, 30% riffle, 11% pocketwater and 4% pool. Channel debris was low, with 35% being stable. Overhanging vegetation provided slight bank cover, while instream cover was moderate. Stream gradient was 2.0%, and the D-90 was 38 cm. The lower 1.5 km of this reach was a marsh area partially formed by beaver activity.

Valley Characteristics:

The upper bank slope was 30-40% and the reach had a valley to channel ratio of 3:1. The average valley width was 75 m. Reach I was occasionally confined and had an irregular meandering pattern.

Fish Populations: (Figure 11)

Westslope cutthroat, mountain whitefish, longnose suckers and sculpins were observed in this reach. This reach was an important cutthroat rearing area supporting migratory and resident populations at a density of 10.5 age I or older fish per 100 m^2 surface area.

ANACONDA CREEK REACH II

Channel Characteristics: Date surveyed: 8-9-80 (Figure 10)

Anaconda Creek Reach II is a second order tributary in the North Fork drainage. Average wetted width was 5.4 m and average depth was 15.5 cm. Reach II consisted of 90% riffle, 5% run and 5% pocketwater. Channel debris was low with 30% being stable. Overhanging vegetation provided only a trace of bank cover while instream cover was moderate. Stream gradient was 11.7% and the D-90 was 44 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 2:1. The average valley width was 20 m. Anaconda Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 11)

Westslope cutthroat trout and sculpins were observed in Reach II.

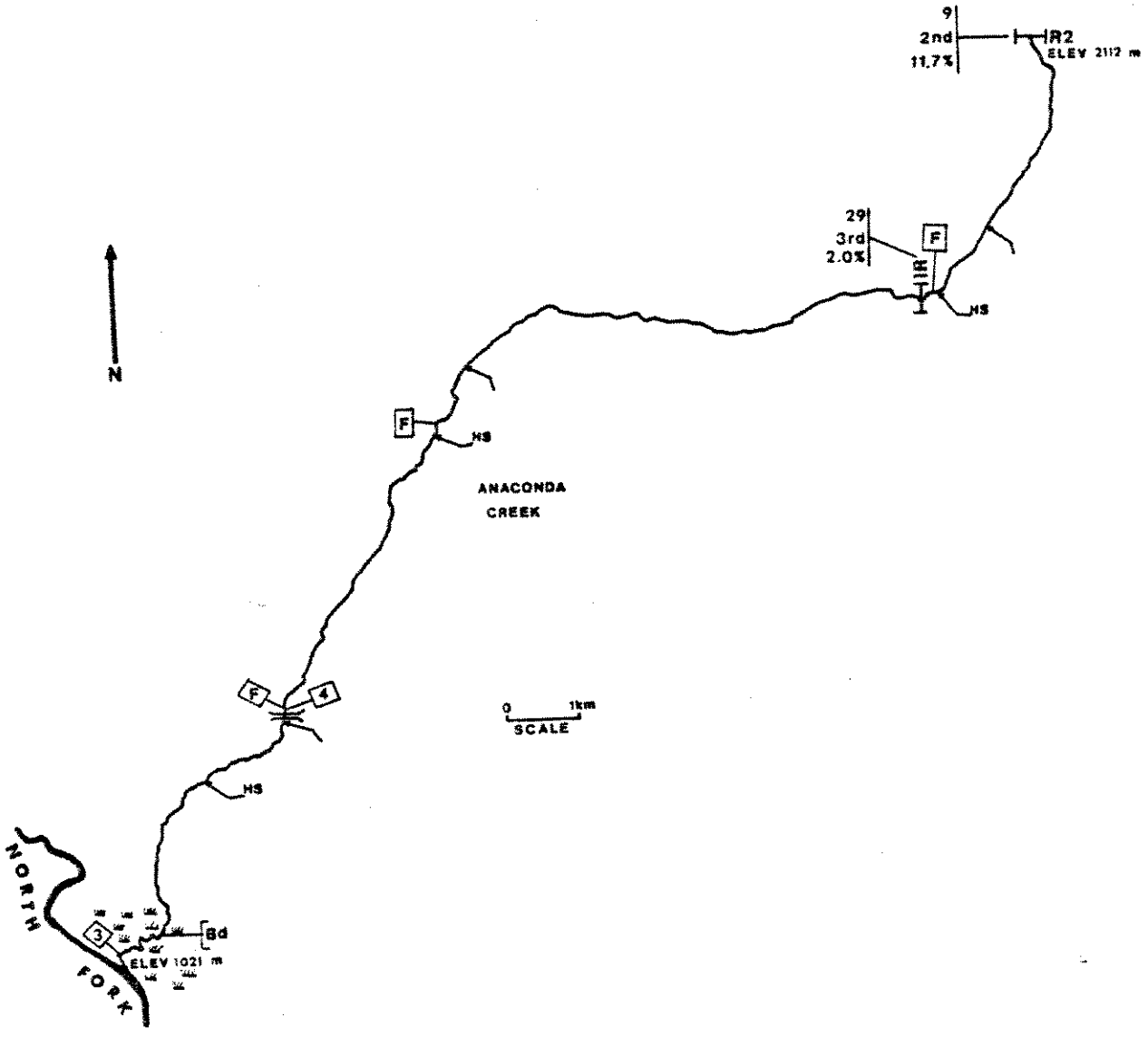

Figure 10. Location of physical habitat parameters by reach for Anaconda Creek.

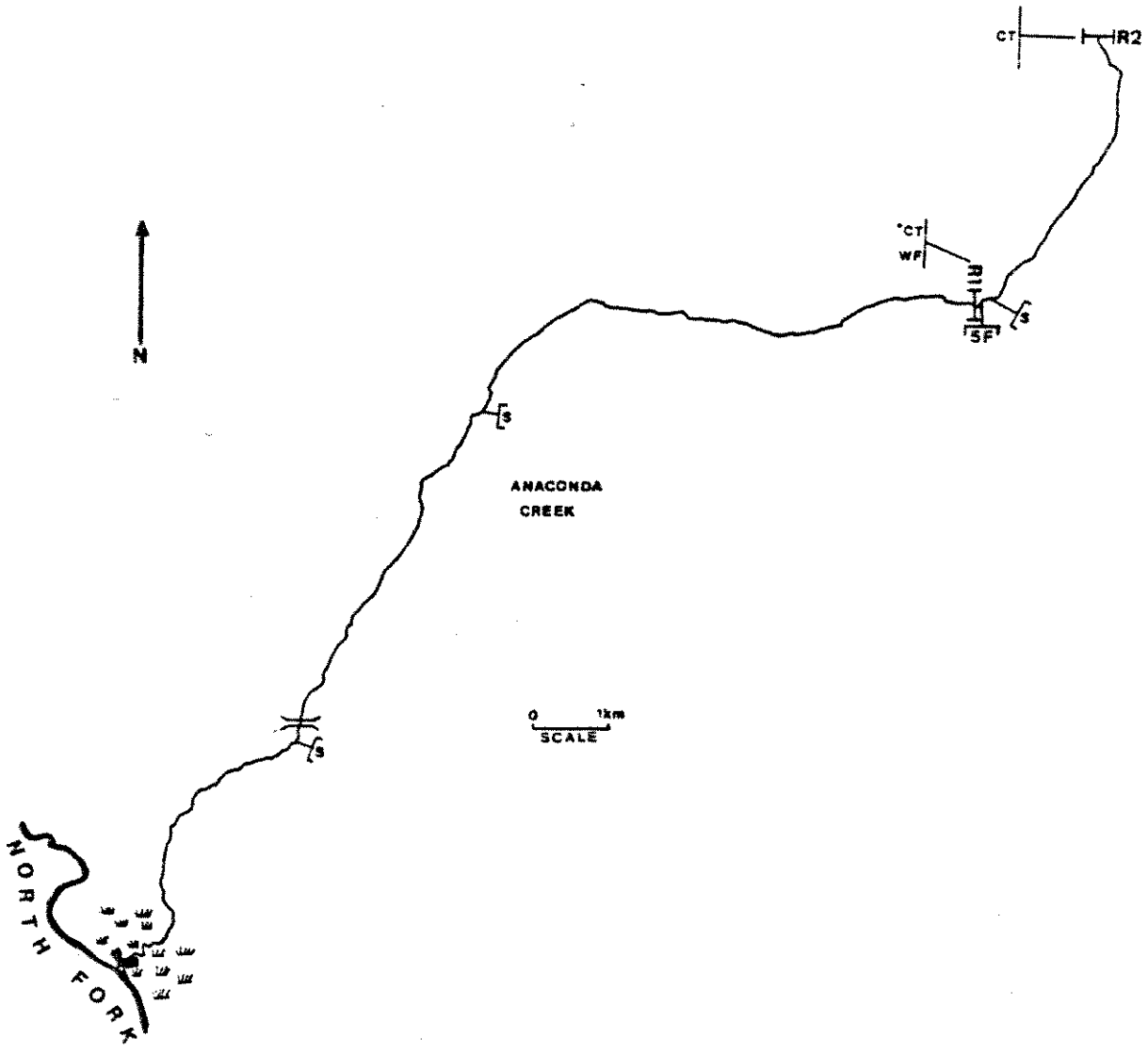

Figure 11. Fish population information by reach for Anaconda Creek.

Table 24. Stream habitat and fish population data for Anaconda 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)
Anaconda Creek	001	DB5	18.4	North Fork	Falls 19 km up from mouth	1399	mouth	1021

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	101.5	7.2	.18	29	75	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	P	moderate	0.21	0.21	21	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	54	38	3	11	45	22	22	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
30	40	20	10	0	38	2.0	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	35	6	6	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)
33	19	1.20	.007	--	5.8	.017	1.8	--	0.9

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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3.2	3.6	3.8	3.1	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
4	24	46	97	0	0	0	0

Table 25. Stream habitat and fish population data for Anaconda 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)
Anaconda Creek	002	DB4	6.1	North Fork	Anaconda Lake	2112	Falls 19 km up from mouth	1399

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	--	5.4	.16	9	20	2	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	P	moderate	--	0.10	--	low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	5	90	5	0	0	17	83	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	40	30	19	1	44	11.7	95	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	3	3	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
--	--	--	--	--	--	--	--	--

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	0.5	2.6	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	6	81	0	0	0	0

LOGGING CREEK DRAINAGE

LOGGING CREEK REACH I

Channel Characteristics: Date surveyed: 8-21-80 (Figure 12)

Reach I of Logging Creek is a third order tributary to the North Fork. Average wetted width was 10.3 m with an average depth of 33.5 cm. This reach contained 32% run, 61% riffle and 7% pocketwater. Channel debris was low with 50% being stable. Very little bank cover was present and instream cover was low to moderate. Channel gradient was 1.6% and the D-90 was 34.9 cm. Logging Creek originated from Logging Lake located 7.5 km above the mouth.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 10:1. The average valley width was 175 m. The channel was entrenched and had an irregular pattern.

Fish Populations: (Figure 13)

Cutthroat trout, mountain whitefish, largescale suckers, longnose suckers, redside shiners, sculpins, squawfish and bull trout were observed in this reach. Cutthroat (2.6 per 100 m^2) and suckers were the most abundant species. Suckers are known to spawn in this reach. Numerous juvenile cutthroat trout were trapped moving downstream indicating this creek may be used by migratory cutthroat stocks. Only one juvenile bull trout was trapped moving downstream and none were seen in snorkeling transects.

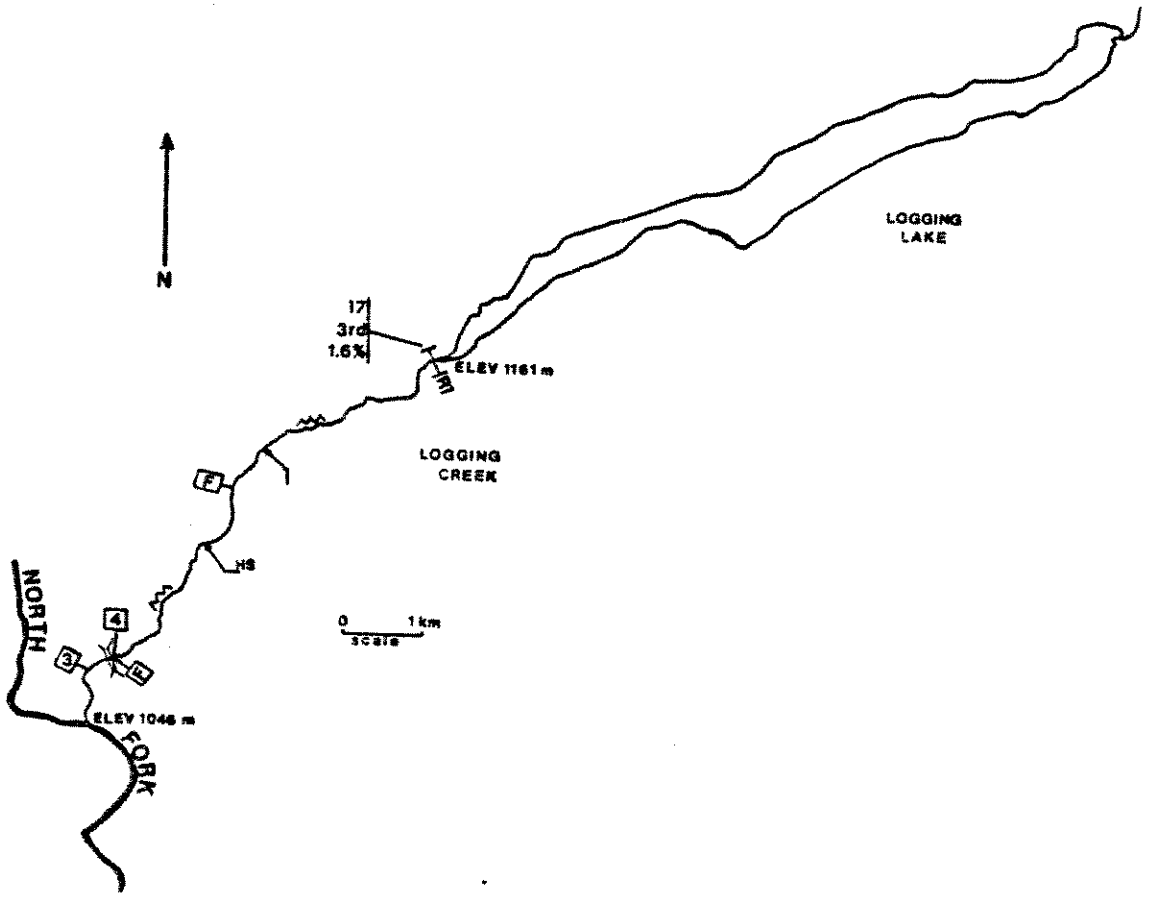

Figure 12. Location of physical habitat parameters by reach for Logging Creek.

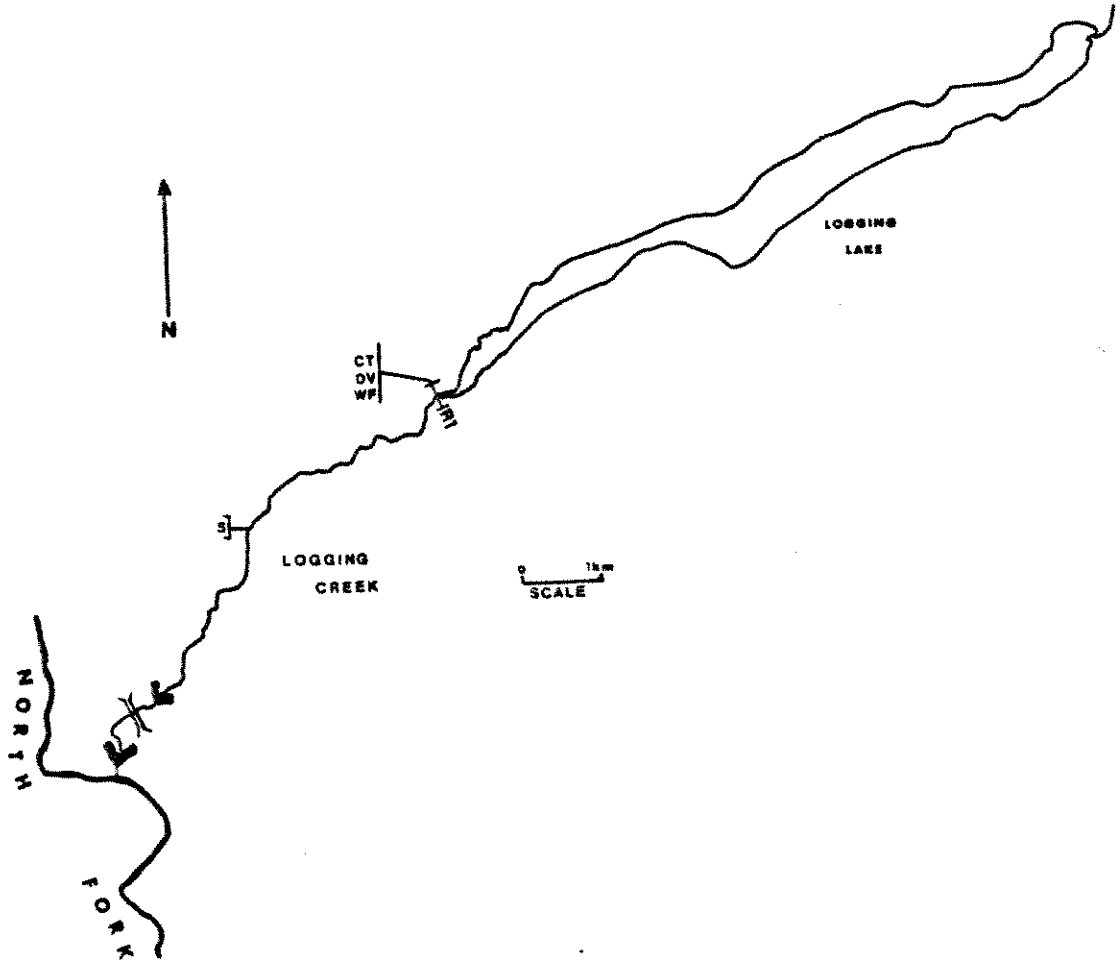

Figure 13. Fish population information by reach for Logging Creek.

Table 26. Stream habitat and fish population data for Logging 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)
Logging Creek	001	DEC	7.2	North Fork	Logging Lake	1161.0	mouth	1046.0

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	4.5	11.0	.34	17	175	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)
E	P	moderate	.82	1.7	22	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	30	63	7	0	0	25	75	0

% bed material					D-90		Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	rating	form
20	30	30	19	1	35	1.6	105	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	50	10	10	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)
25	23	1.04	.008	0.00	6.4	1.7	1.0	0.17	0.6

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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3.2	.9	1.0	.7	--	--	--	--

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3.5	6.2	12.2	21.8	--	--	--	--

COAL CREEK DRAINAGE

COAL CREEK REACH I

Channel Characteristics: Date surveyed: 9-4-79 (Figure 14)

Coal Creek Reach I is a fourth order tributary to the North Fork. Average wetted width was 15 m and the average depth was 29 cm. This reach was composed of 60% riffle, 30% run, 6% pocketwater and 4% pool. Channel debris was low, with only a trace being stable. Overhanging vegetation provided low bank cover and instream cover was low. Stream gradient was 1.2% and the D-90 was 46 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 20:1. The average valley width was 200 m. Reach I was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Bull trout, westslope cutthroat, mountain whitefish, shorthead sculpins and slimy sculpins were observed in this reach. Migratory cutthroat and bull trout utilized Reach I as a migration corridor to upstream spawning areas and the upper reach break was located just below a high density bull trout spawning area. Low density populations of juvenile bull trout and resident cutthroat were noted.

COAL CREEK REACH II

Channel Characteristics: Date surveyed: 9-14-79 (Figure 14)

Coal Creek Reach II is a fourth order tributary in the North Fork drainage. Average wetted width was 11.5 m and the average depth was 31 cm. Reach II was composed of 50% run, 20% riffle, 10% pool and 10% pocketwater. Channel debris was moderate with 20% being stable. Overhanging vegetation provided low bank cover and instream cover was low. Stream gradient was 1.0% and the D-90 was 33 cm. Some beaver activity was noted below the Dead Horse Creek Bridge.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 10:1. The average valley width was 200 m. This reach was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Bull trout, westslope cutthroat and sculpins were observed. This reach was extremely important for bull trout spawning and contained two high density spawning areas. In 1979, a density of 6.6 redds per kilometer was found in the high use area. An average of 46 bull trout redds were enumerated annually during four years of survey.

COAL CREEK REACH III

Channel Characteristics: Date surveyed: 9-11-79 (Figure 14)

Coal Creek Reach III is a third order tributary in the North Fork drainage. Average wetted width was 7.5 m and the average depth was 18 cm. This reach was composed of 60% run, 30% riffle, 7% pocketwater and 3% pool. Channel debris was moderate with 30% being stable. Instream cover was moderate to high and overhanging vegetation provided low bank cover. Stream gradient was 2.2% and the D-90 was 40 cm.

Valley Characteristics:

The upper bank slope was 30-40% and the valley to channel ratio was 12:1. The average valley width was 100 m. The reach was unconfined to occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Bull trout, westslope cutthroat and sculpins were observed in this reach. Density estimates showed Reach III to be an important rearing area for juvenile bull trout with 1.6 age I or older fish per 100 m^2 surface area.

COAL CREEK REACH IV

Channel Characteristics: Date surveyed: 9-12-79 (Figure 14)

Coal Creek Reach IV is a second order tributary in the North Fork drainage. Average wetted width was 4 m and the average depth was 8 cm. This reach consisted of 50% run, 40% riffle, 8% pocketwater and 2% pool. Channel debris was low with 30% being stable. Instream cover and bank cover were low. Stream gradient was 7.5% and the D-90 was 40 cm. Many chutes and cascades were created by imbedded logs and boulders.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 3:1. The average valley width was 20 m. This reach was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Bull trout, westslope cutthroat, and sculpins were observed. It was possible both migratory cutthroat and bull trout utilized the lower portion of this reach for spawning. A considerable number of resident cuttthroat were also found in this reach.

Cyclone Creek Reach I

Channel Characteristics: Date surveyed: 9-5-79 (Figure 14)

Cyclone Creek Reach I is a third order tributary in the Coal Creek drainage. Average wetted width was 1.2 m and the average depth was 10 cm. Reach I was composed of 60% run, 30% riffle, 8% pocketwater and 2% pool. Channel debris was low with 40% being stable. Overhanging stream vegetation provided moderate bank cover and instream cover was moderate. Gradient was 1.5% and the D-90 was 20 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 140:1. The average valley width was 500 m. Cyclone Creek was generally unconfined, but was confined for short distances. The stream pattern was sinuous.

Fish Populations: (Figure 15)

Bull trout, westslope cutthroat, mountain whitefish, and shorthead sculpins were observed. Migratory and resident cutthroat utilized Reach I for spawning and rearing. Density estimates of 12.9 age I or older cutthroat indicated an important rearing area.

Cyclone Creek Reach II

Channel Characteristics: Date surveyed: 9-20-79 (Figure 14)

Cyclone Creek Reach II is a third order tributary in the Coal Creek drainage. Average wetted width was 3 m and the average depth was 20 cm. This reach consisted of 60% run, 30% riffle, 7% pocketwater and 3% pool. Channel debris was low with 100% being stable. Overhanging vegetation provided abundant bank cover and instream cover was low. Stream gradient was 3% and the D-90 was 35 cm. A major slump zone occurred near the midway point of the reach.

Valley Characteristics:

The upper bank slope gradient was 30-40%, and the valley to channel ratio was 6:1. The average valley width was 40 m. This reach was frequently confined and had a sinuous pattern.

Fish Populations: (Figure 15)

Westslope cutthroat and sculpins were found in Reach II. Migratory and resident cutthroat utilized Reach II for spawning and rearing. Density estimates of 36.3 age I or older cutthroat per 100 m^2 surface area indicate an extremely important rearing area.

Dead Horse Creek Reach I

Channel Characteristics: Date surveyed: 9-18-79 (Figure 14)

Dead Horse Creek Reach I is a third order tributary in the Coal Creek drainage. Average wetted width was 3.5 m and the average depth was 17 cm. This reach was composed of 60% riffle, 30% run, 8% pocketwater and 2% pool. Channel debris was moderate with 20% being stable. A large area of blowdown increased debris levels in the stream for about 2 km in the upstream portion. Overhanging vegetation and instream cover were moderate. Stream gradient was 3.8% and the D-90 was 37 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 3:1. The average valley width was 32 m. This reach was frequently confined and had an irregular pattern.

Fish Populations: (Figure 15)

Westslope cutthroat were observed in this reach. A good population of small, resident cutthroat was present.

Dead Horse Creek Reach II

Channel Characteristics: Date surveyed: 9-17-79 (Figure 14)

Dead Horse Creek Reach II is a second order tributary in the Coal Creek drainage. Average wetted width was 2 m and the average depth was 13 cm. This reach was composed of 40% riffle, 40% run, 19% pocketwater and 2% pool. Channel debris was low with 20% being stable. Overhanging vegetation provided very low cover, while instream cover was high. Stream gradient was 7.9% and the D-90 was 65 cm. Log jams and small cascade areas were common in the upstream portion.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 3:1. The average valley width was 24 m. Dead Horse Creek was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Westslope cutthroat were observed in this reach. A moderate population of small, resident cutthroat was present.

South Fork Coal Creek Reach I

Channel Characteristics: Date surveyed: 9-11-79 (Figure 14)

South Fork Coal Creek Reach I is a third order tributary in the Coal Creek drainage. Average wetted width was 6 m, and the average depth was 22 cm. This reach was composed of 50% riffle, 40% run, 7% pocketwater and 3% pool. Channel debris was moderate to low with 20% being stable. Overhanging vegetation and instream cover were moderate. Stream gradient was 3.0% and the D-90 was 38 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 4:1. The average valley width was 58 m. The South Fork was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 15)

Westslope cutthroat and bull trout were observed in Reach I. Spawning by migratory bull trout was documented with an average of 10 redds enumerated annually during four years of survey. Density estimates of 1.5 age I or older bull trout indicated an important rearing area. Migratory cutthroat may be present and a resident population also existed.

South Fork Coal Creek Reach II

Channel Characteristics: Date surveyed: 9-1-79 (Figure 14)

The South Fork of Coal Creek Reach II is a second order tributary in the Coal Creek drainage. Average wetted width was 3.5 m with an average depth of 12 cm. Reach II consisted of 50% riffle, 30% run, 12% pocketwater and 8% pool. Channel debris was low with 30% stable material. Instream cover and bank cover were both low. Stream gradient was 11.1% and the D-90 was 50 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 3:1. The average valley width was 50 m. Reach II was occasionally confined and had an irregular pattern. Flood plain debris was moderate to high.

Fish Populations: (Figure 15)

Bull and westslope cutthroat trout were found in Reach II. Resident cutthroat were present. Migration is blocked by a 20 m high and 25 m long cascade at the lower end of the reach; however, bull trout spawning was observed below this barrier.

Mathias Creek Reach I

Channel Characteristics: Date surveyed: 9-11-79 (Figure 14)

Mathias Creek Reach I is a second order tributary in the Coal Creek drainage. Average wetted width was 4.5 m and the average depth was 19 cm. Reach I was composed of 40% run, 30% riffle, 21% pocketwater and 9% pool. Channel debris was high with 25% being stable. Overhanging vegetation was abundant and instream cover was high. Stream gradient was 2.4% and the D-90 was 30 cm. Many side channels and a series of beaver dams were found.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 22:1. The average valley width was was 200 m. Reach I was unconfined and had an irregular pattern.

Fish Populations: (Figure 15)

Westslope cutthroat and bull trout were observed in Reach I. Spawning by migratory bull trout was documented with an average of 10 redds enumerated annually during four years of survey. Density estimates of 1.9 age I or older bull trout indicated an important rearing area.

Mathias Creek Reach II

Channel Characteristics: Date surveyed: 9-11-79 (Figure 14)

Mathias Creek Reach II is a second order tributary in the Coal Creek drainage. Average wetted width was 3.5 m and the average depth was 22 cm. Reach II was composed of 40% run, 40% pocketwater, 10% riffle and 10% pool. Channel debris was moderate and 20% was stable. Bank cover was moderate and instream cover was low. Stream gradient was 8% and the D-90 was 100 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 9:1. The average valley width was 65 m. Reach II was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 15)

Mathias Creek Reach II has been shocked and snorkeled during the 1979 and 1980 field season. No fish were observed or captured during these times. A series of beaver dams at the upper end of Reach I may impede movement of trout into Reach II.

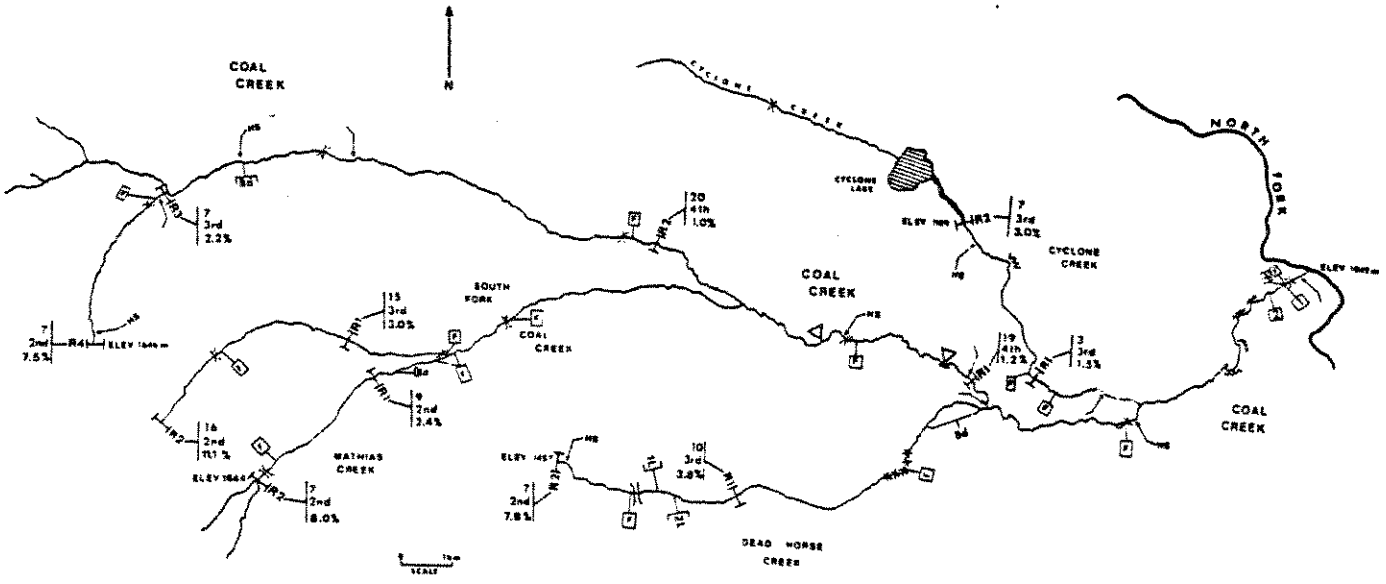

Figure 14. Location of physical habitat parameters by reach for the Coal Creek drainage.

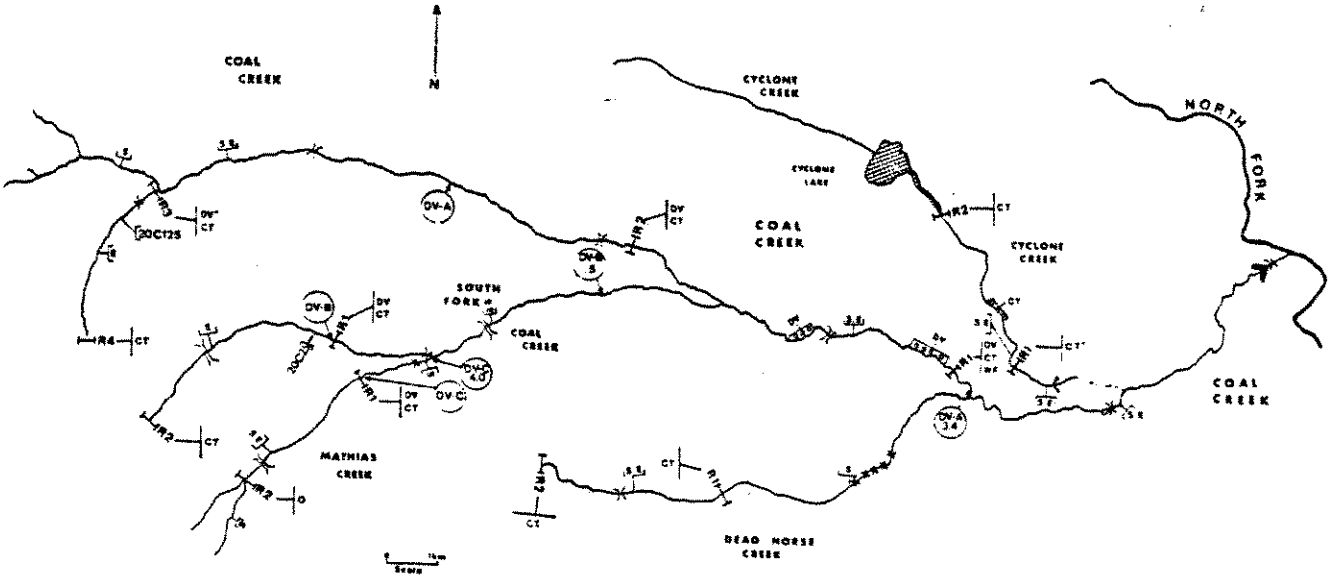

Figure 15. Fish population information by reach for the Coal Creek drainage.

Table 27. 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 Creek	001	DAM	10.1	North Fork	.6 km above Dead Horse	1146.0	mouth	1026.0

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	211.5	15.0	.29	7	20	21	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	low	--	--	--	low	0.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
4	50	40	6	23	9	7	50	11

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
0	0	0	0	0	40	1.2	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	3	1	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)
82	73	0.65	.007	0.02	20.5	.068	1.2	--	1.1

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
1	1.6	80	0	0.0	79	0	0.0	81

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0.9	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	11	0	0	0	0	0

Table 28. 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 Creek	002	DAL	8.4	North Fork	2.2 km above south fork Coal	1224.0	.6 km above Dead Horse	1146.0

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	--	11.5	.31	19	400	10	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)
C	P	moderate	--	--	16	low	2.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	60	20	10	25	10	3	62	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	10	30	20	20	46	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	20	2	2	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
47	6.2	80	40	5.3	79	29	3.9	81

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 29. 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 Creek	003	DAK	10.5	North Fork	junction with north head-waters	1620.0	2.2 km above south fork Coal	1224.0

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	--	4.0	.18	7	100	13	swirling

Confine-ment	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	low	--	--	--	low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	60	30	7	3	5	20	34	38

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	35	25	19	1	40	2.2	98	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	2	10	26

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	4	0.4	79	1	0.1	81

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.7	1.2	2.4	3.4	0.0	1.2	0.4	0.0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	8	29	106	0	11	9	0

Table 30. Stream habitat and fish population data for Coal 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)
Coal Creek	004	DAJ	2.2	North Fork	headwaters	1646	junction with north headwater	1478

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	.08	20	200	3	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	P	nil	--	0.3	--	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
13	60	20	7	0	7	17	26	43

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
40	40	10	8	2	33	7.5	89	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	moderate	low	30	2	10	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 31. Stream habitat and fish population data for Cyclone 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)
Cyclone Creek	001	DAU	2.5	North Fork	north end Cyclone Park	1164.0	junction with Coal Creek	1092.0

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	34.9	1.2	.10	3	500	99	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	N	low	--	0.05	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	60	30	7	0	0	22	78	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	60	10	9	1	20	1.5	81	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	low	low	10	2	20	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
34.9	2.9	5.1	4.9	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
38	20	62	153	0	0	0	0

Table 32. Stream habitat and fish population data for Cyclone 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)
Cyclone Creek	002	DAT	4.0	North Fork	Cyclone Lake	1296.0	north end Cyclone Park	1164.0

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	--	3.0	.20	7	40	6	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)
F	N	low	--	0.04	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	60	30	7	0	1	25	74	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	60	15	14	1	35	3.0	89	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
W	bedrock	low	low	10	2	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 33. Stream habitat and fish population data for Dead Horse 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)
Dead Horse Creek	001	DA0	6.1	North Fork	bridge across Dead Horse	1374.0	junction with Coal Creek	1146.0

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	25.2	3.5	.17	10	32	3	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	--	0.19	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	30	60	7	1	1	20	78	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	50	20	10	10	37	3.8	102	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	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
1.7	0	0.6	0.3	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2	0	7	9	0	0	0	0

Table 34. Stream habitat and fish population data for Dead Horse 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)
Dead Horse Creek	002	DAN	1.2	North Fork	headwaters	1464.0	bridge across Dead Horse	1374.0

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	--	2.0	.13	7	24	3	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	--	0.09	--	low	8.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	40	40	18	0	0	5	95	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	30	30	20	10	65	7.9	77	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	20	2	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)
--	--	--	--	--	--	--	--	--	--

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	0.6	0	1.2	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	4	0	37	0	0	0	0

Table 35. Stream habitat and fish population data for South Fork 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)
South Fork Coal Creek	001	DAS	9.0	North Fork	2nd bridge up South Fork Coal Creek	1472	junction with Coal Creek	1201

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	34.4	6.0	.22	15	58	4	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	--	0.12	--	low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	40	50	7	1	8	22	39	30

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	30	20	20	10	38	3.0	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	20	10	20	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
2	0.2	80	4	0.5	79	24	3.0	81

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	0.2	0.2	0.2	0.3	0.2	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	2	6	1	1	6	9

Table 36. Stream habitat and fish population data for South Fork 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)
South Fork Coal Creek	002	DAR	2.0	North Fork	headwaters	1695	2nd bridge up South Fork Coal Creek	1472

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	--	3.5	.12	16	50	3	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	--	0.05	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	30	50	12	1	4	36	23	36

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	20	10	10	30	50	11.1	88	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	moderate	low	30	2	10	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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 37. Stream habitat and fish population data for Mathias 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)
Mathias	001	DAQ	1.5	North Fork Cr. south fork	culvert 1.5 km from Coal	1398.0	junction with south fork Coal Cr.	1356.0

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	13.2	4.5	.19	9	200	22	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)
U	P	low	--	0.08	--	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	40	30	20	3	4	22	71	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	30	20	19	1	30	2.4	91	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	moderate	high	25	2	40	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
10	6.6	80	2	1.3	79	10	6.7	81

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	1.5	0	0	0	0.5	0.2	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	18	0	0	0	11	9

Table 38. Stream habitat and fish population data for Mathias 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)
Mathias	002	DAP	2.8	North Fork	headwaters	1644.0	culvert 1.5 km from Coal Cr. south fork	1398.0

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	--	3.5	.22	7	65	9	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	--	0.05	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	40	10	40	0	1	10	89	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	30	20	10	20	100	8.0	52	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	moderate	moderate	20	10	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 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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

QUARTZ CREEK DRAINAGE

QUARTZ CREEK REACH I

Channel Characteristics: Date surveyed: 8-22-80 (Figure 16)

Reach I of Quartz Creek is a fourth order tributary to the North Fork. Average wetted width was 13.8 m and the average depth was 40.2 cm. This reach contained 57% run and 43% riffle. Low amounts of debris were present with 60% stability. Bank cover was low and instream cover was moderate. The channel gradient was 2.0% and the D-90 was 40 cm. The creek originated at Quartz Lake, 12.7 km above the mouth.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 4:1. The average valley width was 150 m. The channel was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 17)

Cutthroat trout, mountain whitefish and suckers were present. Juvenile and adult fish of each species were observed. All age classes of cutthroat were observed with a total density of 4.5 cutthroat per 100 m^2. Suckers apparently used this stream for spawning.

Cummings Creek Reach I

Channel Characteristics: Date surveyed: 8-24-80 (Figure 16)

This is a second order tributary to Quartz Creek. Average wetted width was 5.2 m with an average depth of 18.8 cm. This reach contained 54% run, 42% riffle and 4% pocketwater. There was a low to moderate amount of debris and low amounts of bank cover. Instream cover was low. The channel gradient was 6.6% and the D-90 was 60.6 cm. The headwater area was flat and swampy.

Valley Characteristics:

The upper bank slope gradient was 40-60%. The reach had a valley to channel ratio of 4:1 with an average valley width of 40 m.

Fish Populations: (Figure 17)

Cutthroat trout and sculpins were present in this reach. Mature resident cutthroat trout were observed while snorkeling.

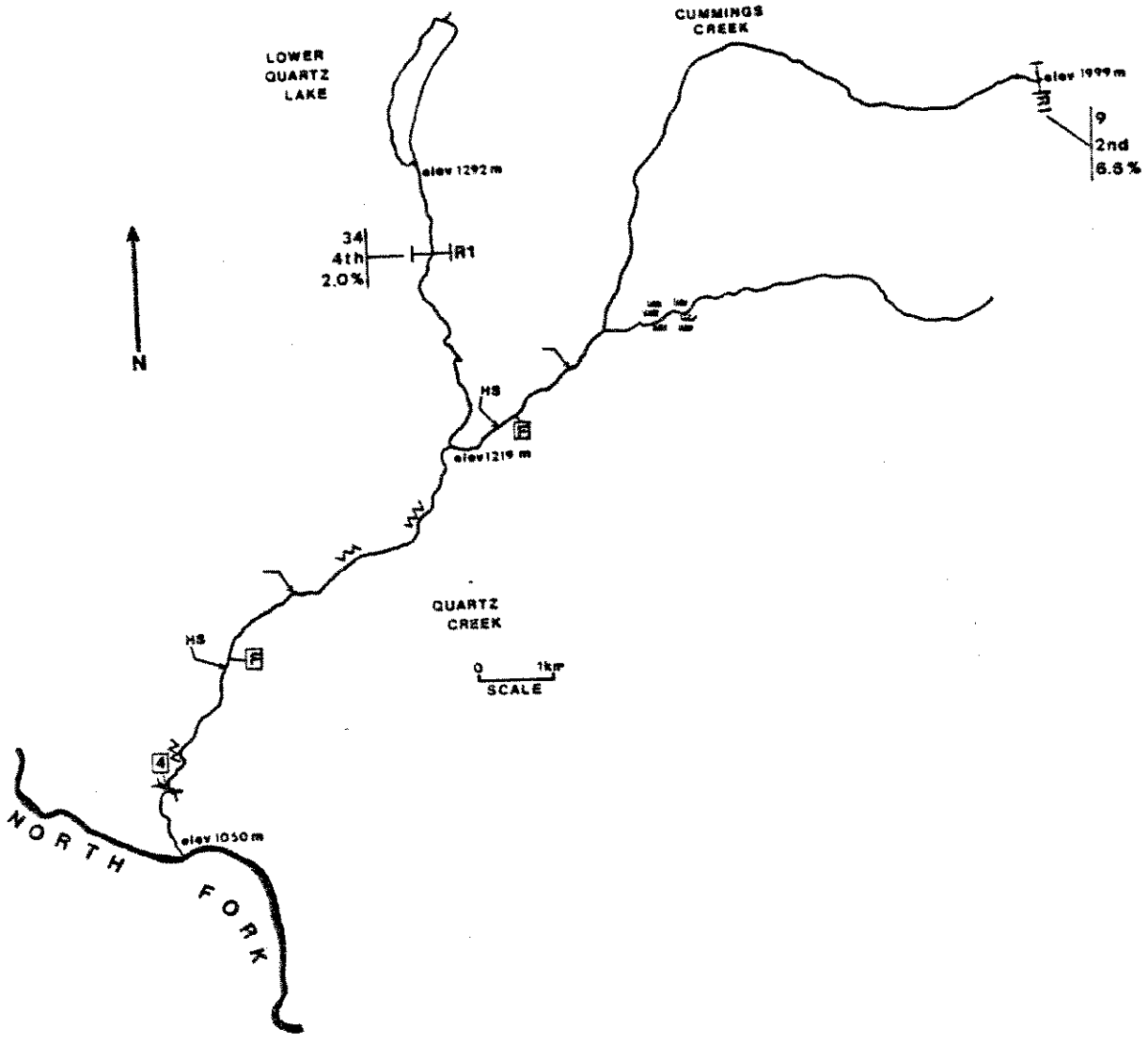

Figure 16. Location of physical habitat parameters for Quartz Creek and Cummings Creek.

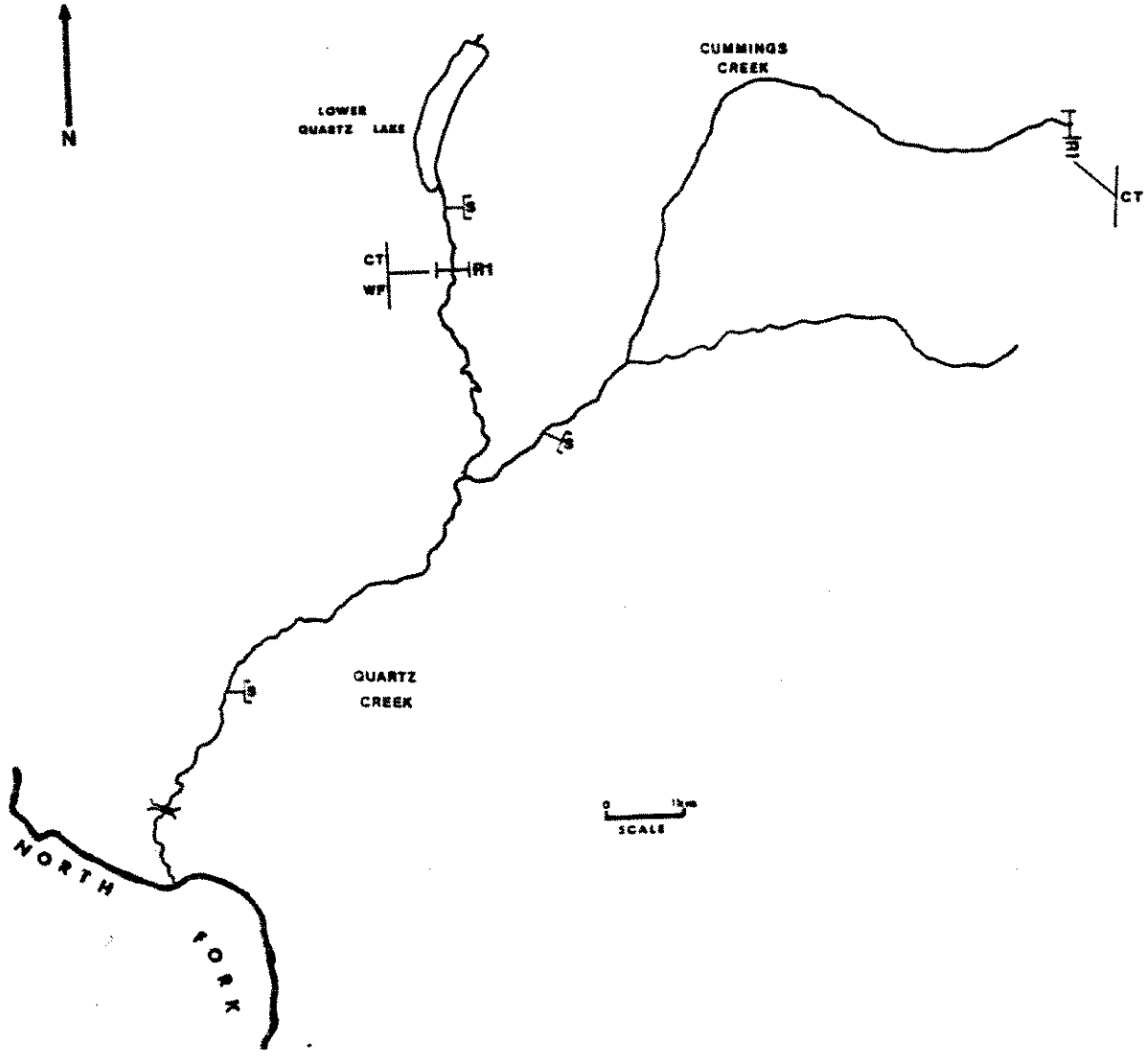

Figure 17. Fish population information by reach for Quartz Creek and Cummings Creek.

Table 39. Stream habitat and fish population data for Quartz 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)
Quartz Creek	001	DB6	10.1	North Fork	lower Quartz Lake	1257.0	mouth	1050

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	135.9	13.8	.40	34	150	4	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	P	moderate	--	2.27	--	moderate	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	55	43	1	25	25	0	50	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	40	2.0	92	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	60	10	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)
--	--	1.66	.006	0.01	8.9	.025	--	--	2.0

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	1.9	1.1	1.5	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	13	13	47	0	0	0	0

Table 40. Stream habitat and fish population data for Cummings 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)
Cummings Creek	001	DBX	11.8	North Fork	headwaters	1999	mouth	1219

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	--	5.2	.19	9	40	4	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	--	0.15	--	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	56	39	2	0	12	25	63	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	30	30	10	0	61	6.6	91	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	moderate	30	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 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.5	0.7	1.5	3.7	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	5	18	115	0	0	0	0

HAY CREEK DRAINAGE

HAY CREEK REACH I

Channel Characteristics: Date surveyed: 8-11-80 (Figure 18)

Hay Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 8.5 m and the average depth was 33 cm. Reach I consisted of 42% run, 40% riffle, 16% pocketwater and 2% pool. Channel debris was low with 40% being stable. Debris accumulation occurred near the upper end of this reach. Bank cover was moderate and instream cover was high. Stream gradient was 1.5% and the D-90 was 66 cm. Beaver activity and cattle grazing occurred on the lower bank. A major slump zone was present two kilometers below the upper reach break.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 4:1. The average valley width was 90 m. Hay Creek was frequently confined and had a sinuous stream pattern.

Fish Populations: (Figure 19)

Bull trout, westslope cutthroat trout and sculpins were observed in this reach. A resident bull trout population may exist and the presence of a migratory cutthroat population was not determined.

HAY CREEK REACH II

Channel Characteristics: Date surveyed: 8-11-80 (Figure 18)

Hay Creek Reach II is a third order tributary in the North Fork drainage. Average wetted width was 9 m and the average depth was 33 cm. Reach II was comprised of 46% run, 30% riffle, 19% pool and 5% pocketwater. Channel debris was low to moderate and 40% was stable. Bank and instream cover were both moderate. Stream gradient was 1.5% and the D-90 was 24 cm. Some beaver activity was noted in the middle of this reach.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 10:1. The average valley width was 150 m. Reach II was unconfined and had an irregular stream pattern.

Fish Populations: (Figure 19)

Bull trout, westslope cutthroat trout, sculpins and yellowstone cutthroat

trout were observed in this reach. This reach may also contain a resident population of bull trout. Migratory cutthroat use of this reach was not confirmed. Cutthroat were present in higher densities than bull trout.

HAY CREEK REACH III

Channel Characteristics: Date surveyed: 8-11-80 (Figure 18)

Hay Creek Reach III is a third order tributary in the North Fork drainage. Average wetted width was 7.2 m and the average depth was 33 cm. Reach III was composed of 50% run, 35% riffle, 12.5% pool and 2.5% pocket-water. Channel debris was moderate with 60% stability. Vegetation provided only slight bank cover while instream cover was low-moderate. Stream gradient was moderate (3.4%) and the D-90 was 30 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 17:1. The average valley width was 200 m. Reach III was unconfined and had an irregular pattern.

Fish Populations: (Figure 19)

Bull trout and westslope cutthroat were observed in this reach. Both species are suspected to maintain resident populations. Use by migratory cutthroat was unknown.

HAY CREEK REACH IV

Channel Characteristics: Date surveyed: 8-11-80 (Figure 18)

Hay Creek Reach IV is a second order tributary in the North Fork drainage. Average wetted width was 3.7 m and the average depth was 16 cm. Reach IV consisted of 51% riffle, 34% pocketwater, 10% run and 5% pool. Five percent of the total 34% pocketwater consisted of cascades. Channel debris was moderate and 30% was stable. Bank and instream cover were both moderate. Stream gradient was 10% and the D-90 was 62 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 26:1. The average valley width was 200 m. Reach IV was unconfined and had an irregular stream pattern.

Fish Populations: (Figure 19)

Westslope cutthroat trout were observed in this reach. Cascades at

least 2 m high created a partial fish migration barrier in the middle of the reach.

Moran Creek Reach I

Channel Characteristics: Date surveyed: 7-25-80 (Figure 18)

Moran Creek Reach I is a third order tributary in the Hay Creek drainage. Average wetted width was 4.4 m and the average depth was 20 cm. Reach I consisted of 60% riffle, 38% run and 2% pool. Channel debris was low with 20% stability. Vegetation provided high bank cover and instream cover was low-moderate. Stream gradient was 3.9% and the D-90 was 24.5 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 7:1. The average valley width was 70 m. Reach I was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 19)

Bull trout, westslope cutthroat trout, mountain whitefish and sculpins were observed in this reach. The presence of juvenile bulls suggested that bull trout may use the area for spawning. This was an important reach for cutthroat trout rearing with a density of 20 trout per 100 m^2 surface area.

Moran Creek Reach II

Channel Characteristics: Date surveyed: 7-25-80 (Figure 18)

Moran Creek Reach II is a third order tributary in the Hay Creek drainage. Average wetted width was 4.9 m and the average depth was 23 cm. Reach II was comprised of 60% riffle, 20% run, 15% pocketwater and 5% pool. Ten percent of the total 15% pocketwater was made up of cascades. Channel debris was moderate with 60% being stable. Vegetation provided high bank cover and instream cover was moderate. Stream gradient was 7.6% and the D-90 was 32 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 2:1. The average valley width was 20 m. Reach II was frequently confined and had an irregular pattern.

Fish Populations: (Figure 19)

Westslope cutthroat were observed in this reach. A partial fish migration barrier, consisting of a 2 m high log jam, was located near the upper end of this reach when the survey was conducted.

Moran Creek Reach III

Channel Characteristics: Date surveyed: 7-25-80 (Figure 18)

Moran Creek Reach III is a third order tributary in the Hay Creek drainage. Average wetted width was 4.5 m and the average depth was 20 cm. Reach III was composed of 60% run, 27% riffle, 7% pool and 6% pocketwater. Channel debris was moderate and 60% was stable. Vegetation provided abundant bank cover and instream cover was moderate. Stream gradient was 5.5% and the D-90 was 26 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 10:1. The average valley width was 100 m. Reach III was unconfined to occasionally confined and had an irregular pattern.

Fish Populations: (Figure 19)

Westslope cutthroat were observed in this reach and were probably resident fish.

Moran Creek Reach IV

Channel Characteristics: Date surveyed: 7-25-80 (Figure 18)

Moran Creek Reach IV is a second order tributary in the Hay Creek drainage. Average wetted width was 4.2 m and the average depth was 13 cm. Reach IV was composed of 68% riffle, 17% pocketwater and 5% pool. Channel debris was low and 70% was stable. Both bank and channel cover were low. Stream gradient was 8.5 and the D-90 was 40 cm.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was 10:1. The average valley width was 70 m. Moran Creek was frequently confined and had an irregular stream pattern.

Fish Populations: (Figure 19)

Very little spawning habitat was available in Reach IV. Resident westslope cutthroat trout were observed during the survey.

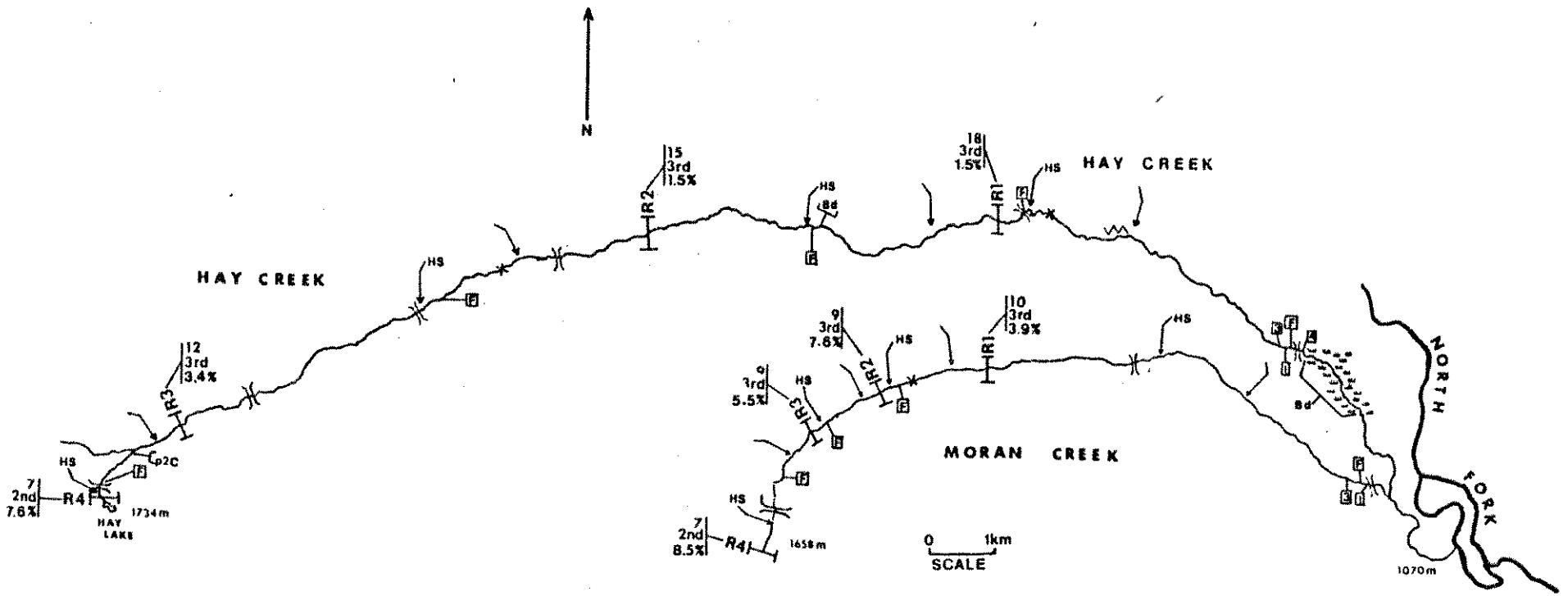

Figure 18. Location of physical habitat parameters by reach for Hay Creek and Moran Creek.

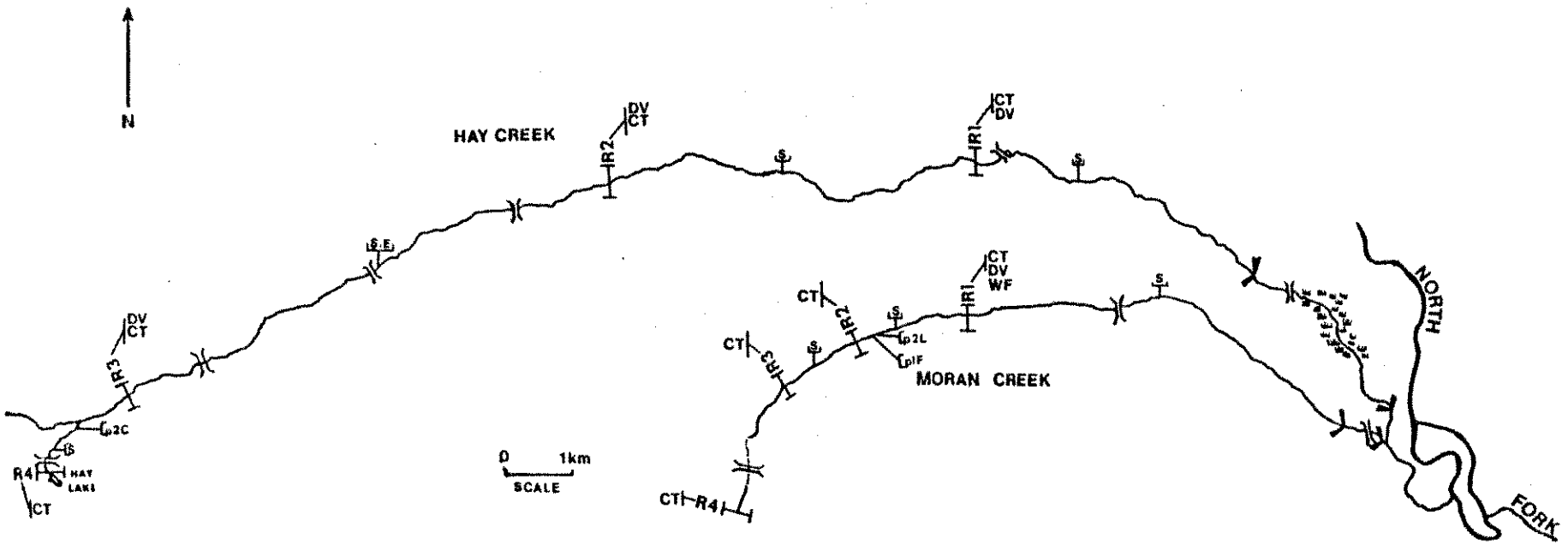

Figure 19. Fish population information by reach for Hay Creek and Moran Creek.

Table 41. Stream habitat and fish population data for Hay 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)
Hay Creek	001	DAX	10.7	North Fork	7 miles from mouth	1228	mouth	1064

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	111.6	8.5	.33	18	80	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)
F	N	moderate	--	0.60	15	moderate	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	42	40	16	4	10	22	64	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
30	40	20	10	0	66	1.5	100	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	40	20	20	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)
148	100	0.10	.004	--	26.6	.095	1.1	--	1.0

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1.2	0	0.5	2.9	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	0	6	90	0	0	0	0

Table 42. Stream habitat and fish population data for Hay 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)
Hay Creek	002	DAY	7.2	North Fork	11.5 miles from mouth	1338	7 miles from mouth	1228

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	--	9.1	.33	15	150	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)
U	P	low	--	0.40	--	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
19	46	30	5	14	18	39	29	0

% bed material					D-90 (cm)	% gradient	Stability rating	Bank form
% fines	%gravel	% rubble	% boulder	%bedrock				
40	40	18	2	0	24	1.5	86	flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
aggrading	fluvial	low	low	40	20	20	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
0.7	0.2	0.4	7.0	0	0	0	0.1	present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	1	5	218	0	0	0	5

Table 43. Stream habitat and fish population data for Hay 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)
Hay Creek	003	DAV	7.5	North Fork	bridge 2 km below Hay Lake	1591	11.5 miles from mouth	1338

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	--	7.2	.33	12	200	16	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	--	0.24	--	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
13	35	50	2	13	16	50	21	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	50	20	20	0	30	3.4	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	60	10	10	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
--	--	--	--	--	--	--	--	--

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	0.2	0.6	3.5	0	0	0	0.3	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	1	7	109	0	0	0	14

Table 44. Stream habitat and fish population data for Hay 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)
Hay Creek	004	DAW	1.9	North Fork	Hay Lake	1734	bridge 2 km below Hay Lake	1591

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	--	3.7	.16	7	200	30	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)
U	P	low	--	0.03	--	low	9.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	10	56	29	0	14	86	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
15	30	15	20	20	62	7.6	77	steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	moderate	moderate	30	5	20	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
1.7	0.6	1.1	2.3	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2	4	13	72	0	0	0	0

Table 45. Stream habitat and fish population data for Moran 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)
Moran Creek	001	DAZ	7.1	North Fork	7.1 km above junction with Hay	1353	junction with Hay Creek	1070

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	23.6	4.3	.10	10	70	7	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	P	low	.14	0.19	15	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	38	60	0	10	37	53	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
13	50	19	18	0	24	3.9	106	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	34	32	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 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
0.6	4.2	9.8	6.9	0.2	0	0.2	0.6	present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
7	28	119	215	1	0	4	28

Table 46. Stream habitat and fish population data for Moran 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)
Moran Creek	002	DA1	1.4	North Fork	8 km above junction with Hay Creek	1463	7.1 km above junction with Hay Creek	1353

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	--	4.9	.23	9	20	2	tumbling/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)
C	P	low	--	0.08	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	19	66	10	0	0	100	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
35	40	12	12	1	32	7.6	74	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	60	33	27	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	0.5	3.6	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	6	112	0	0	0	0

Table 47. Stream habitat and fish population data for Moran 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)
Moran Creek	003	DA2	1.8	North Fork	dry area below cascade	1561	8 km above junction with Hay Creek	1463

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	.22	9	100	11	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	P	low	--	0.05	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	60	27	6	0	8	26	66	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
27	43	20	10	0	26	5.5	97	undercut

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	moderate	60	17	27	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	0.2	0.2	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	2	6	0	0	0	0

Table 48. Stream habitat and fish population data for Moran 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)
Moran Creek	004	DA3	1.0	North Fork	upper falls	1658	dry area below upper cascade	1561

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	--	4.2	.13	7	70	9	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	--	0.09	--	low	0.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	0	68	27	0	0	100	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	30	30	30	0	40	8.5	63	steep

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
R	fluvial	low	low	70	10	0	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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

BOWMAN CREEK DRAINAGE

BOWMAN CREEK REACH I

Channel Characteristics: Date surveyed: 8-12-80 (Figure 20)

This reach is a third order tributary to the North Fork. Average wetted width was 13.9 m and the average depth was 39.3 cm. The reach contained 50% run and 50% riffle. There was a low to moderate amount of debris with 40% stability and very little bank cover. Instream cover was moderate. The channel gradient was 1.7% and the D-90 was 49 cm. The creek originated from Bowman Lake 9.7 km above the mouth.

Valley Characteristics:

The upper bank slope gradient was 30-40% with a valley to channel ratio of 3:1. The average valley width was 75 m. The channel was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 21)

Cutthroat trout and mountain whitefish were present in this reach. Juvenile and adult fish of both species were observed. A density of 11.2 cutthroat per 100 m^2 indicated an important rearing area.

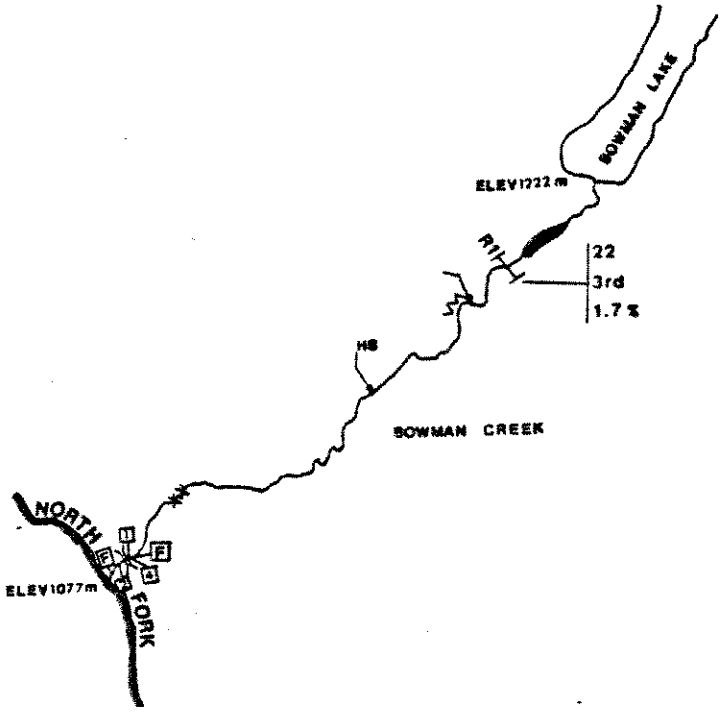

Figure 20. Location of physical habitat parameters by reach for Bowman Creek.

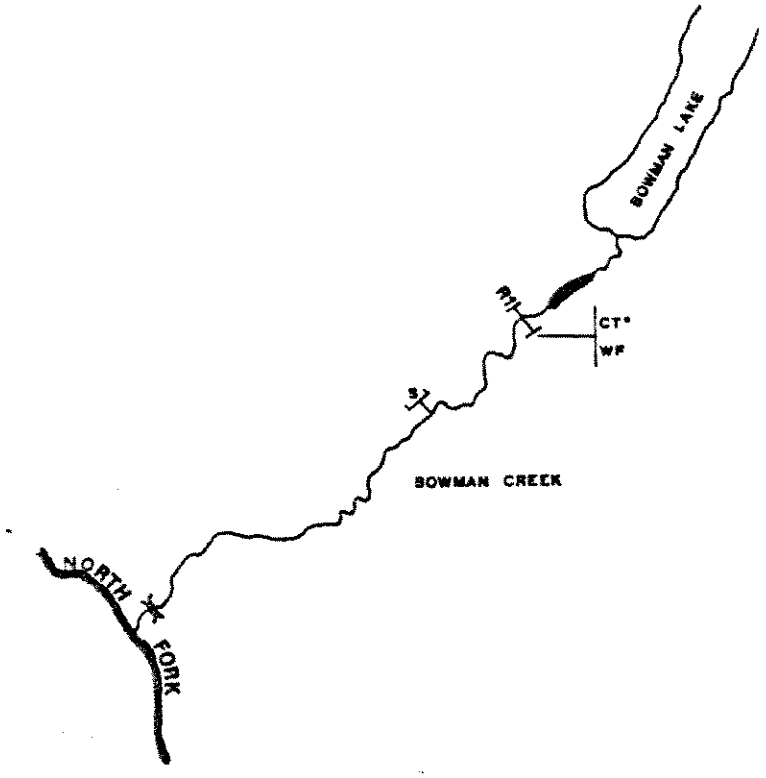

Figure 21. Fish population information by reach for Bowman Creek.

Table 49. Stream habitat and fish population data for Bowman 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)
Bowman Creek	001	DB3	8.2	North Fork	Bowman Lake	1222	mouth	1077

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	177.9	13.0	.39	22	75	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	1.26	1.89	21	low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	57	43	0	0	0	0	0	100

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	30	30	20	0	49	1.7	96	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	40	3	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)
122	68	0.89	.004	0.02	21.0	.057	0.8	--	0.8

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0.1	0.1	11.0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	1	1	343	0	0	0	0

AKOKALA CREEK DRAINAGE

AKOKALA CREEK REACH I

Channel Characteristics: Date surveyed: 8-19-80 (Figure 22)

Akokala Creek Reach I is a fourth order tributary in the North Fork drainage. Average wetted width was 10.5 m and the average depth was 33 cm. Reach I consisted of 70% run, 25% riffle, 3% pocketwater and 2% pool. Channel debris was low and 40% was stable. Vegetation provided only slight bank cover while instream cover was moderate. Stream gradient was 1.4% and the D-90 was 25 cm. A marsh area partially created by beaver dams occurred 1 km below the upper end of this reach and extended 2 km downstream. The creek divided into two separate channels in this area. A major slump zone was present in the middle of this reach.

Valley Characteristics:

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

Fish Populations: (Figure 23)

Westslope cutthroat, mountain whitefish and sculpins were observed in this reach. Migratory and resident westslope cutthroat trout were present. The presence of whitefish fry indicated this area was used for spawning.

AKOKALA CREEK REACH II

Channel Characteristics: Date surveyed: 8-19-80 (Figure 22)

Akokala Creek Reach II is a second order tributary in the North Fork drainage. Average wetted width was 10 m and the average depth was 33 cm. Reach II consisted of 56% run, 43% riffle and 1% pocketwater. Channel debris was low and 20% was stable. Bank cover was low and instream cover was moderate. Stream gradient was 2.9% and the D-90 was 35 cm. A major slump zone was present 1 km above the lower end of this reach.

Valley Characteristics:

The upper bank slope was less than 30% and the valley to channel ratio was 6:1. The average valley width was 100 m. Reach II was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 23)

Westslope cutthroat trout, mountain whitefish and sculpins were observed in Reach II. Migratory and resident westslope cutthroat trout were present.

Parke Creek Reach I

Channel Characteristics: Date surveyed: 8-20-80 (Figure 22)

Parke Creek Reach I is a third order tributary in the Akokala Creek drainage. Average wetted width was 5.7 m, and the average depth was 14 cm. Reach I was comprised of 52% riffle, 33% run, 15% pocketwater, and a trace of pools. Channel debris was moderate with 40% stable material. Vegetation provided only slight bank cover while instream cover was moderate. Stream gradient was 4.9% and the D-90 was 57 cm. A major slump zone was present one kilometer below the head of this reach and two areas of debris accumulation appeared just below the slump zone.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio was 6:1. The average valley width was 80 m. Reach I was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 23)

Westslope cutthroat trout and sculpins were observed in this reach.

Parke Creek Reach II

Channel Characteristics: Date surveyed: 8-20-80 (Figure 22)

Parke Creek Reach II is a third order tributary in the Akokala Creek drainage. Average wetted width was 5.6 m and the average depth was 31 cm. Reach II was composed of 50% riffle, 40% run, and 10% pocketwater. Channel debris was moderate and 30% was stable. Bank cover was high and instream cover was moderate. Stream gradient was 4.9% and the D-90 was 12 cm. The lower 1-2 km of Reach II was a marsh area.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio was 12:1. The average valley width was 120 m. Reach II was occasionally confined and had an irregular meandering pattern.

Fish Populations: (Figure 23)

Westslope cutthroat trout and sculpins were observed in this reach.

Longbow Creek Reach I

Channel Characteristics: Date surveyed: 8-20-80 (Figure 22)

Reach I of Longbow Creek is a second order tributary in the Akokala Creek

drainage with an average wetted width of 5.1 m and an average depth of 23.5 cm. This reach contained 44% run, 50% riffle, 6% pocketwater and no pools. There was a low to moderate amount of debris with 30% being stable. Low amounts of instream cover and moderate amounts of bank cover were present. The channel gradient was steep (12.3%) and the D-90 was 70.5 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 15:1. The average valley width was 100 m.

Fish Populations: (Figure 23)

Adult and juvenile cutthroat trout were observed in this reach in moderate densities.

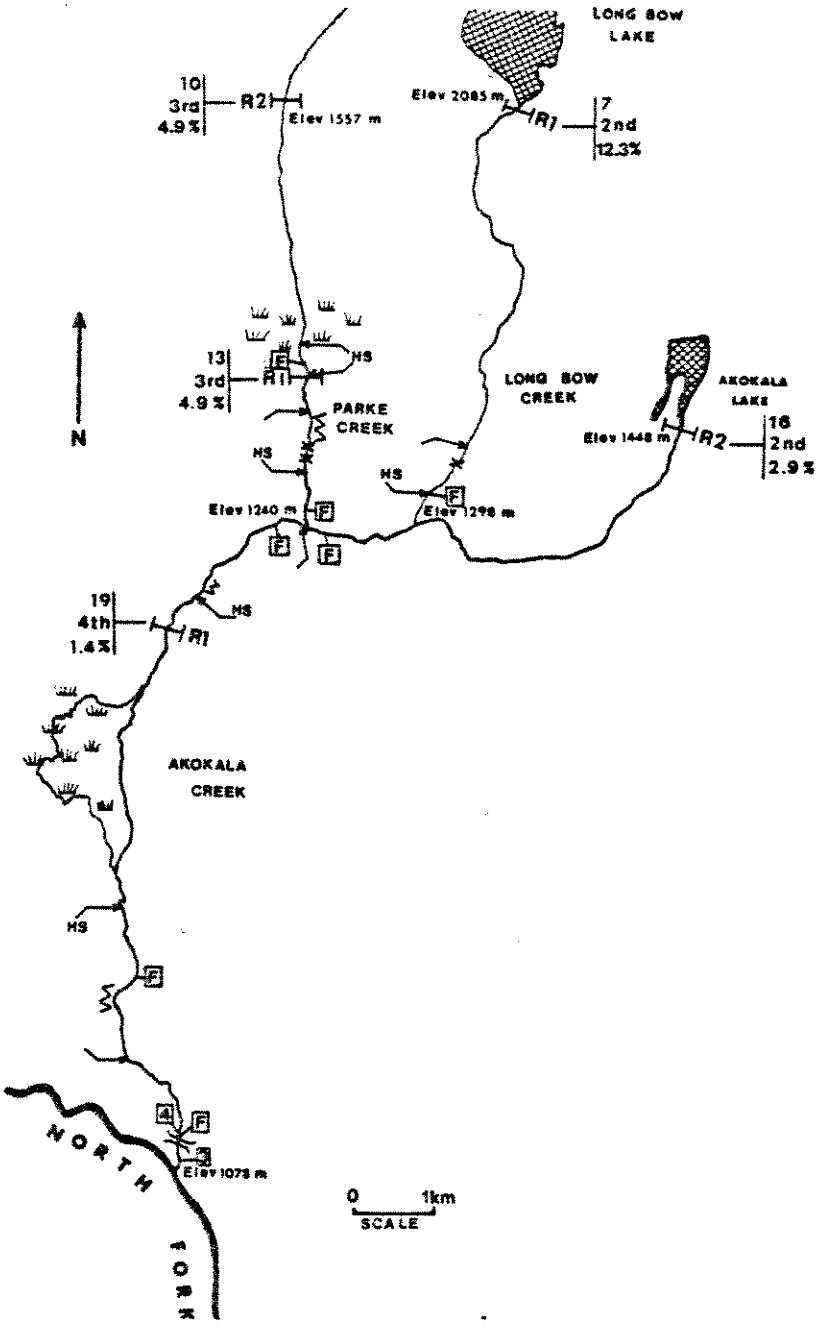

Figure 22. Location of physical habitat parameters by reach for the Akokala Creek drainage.

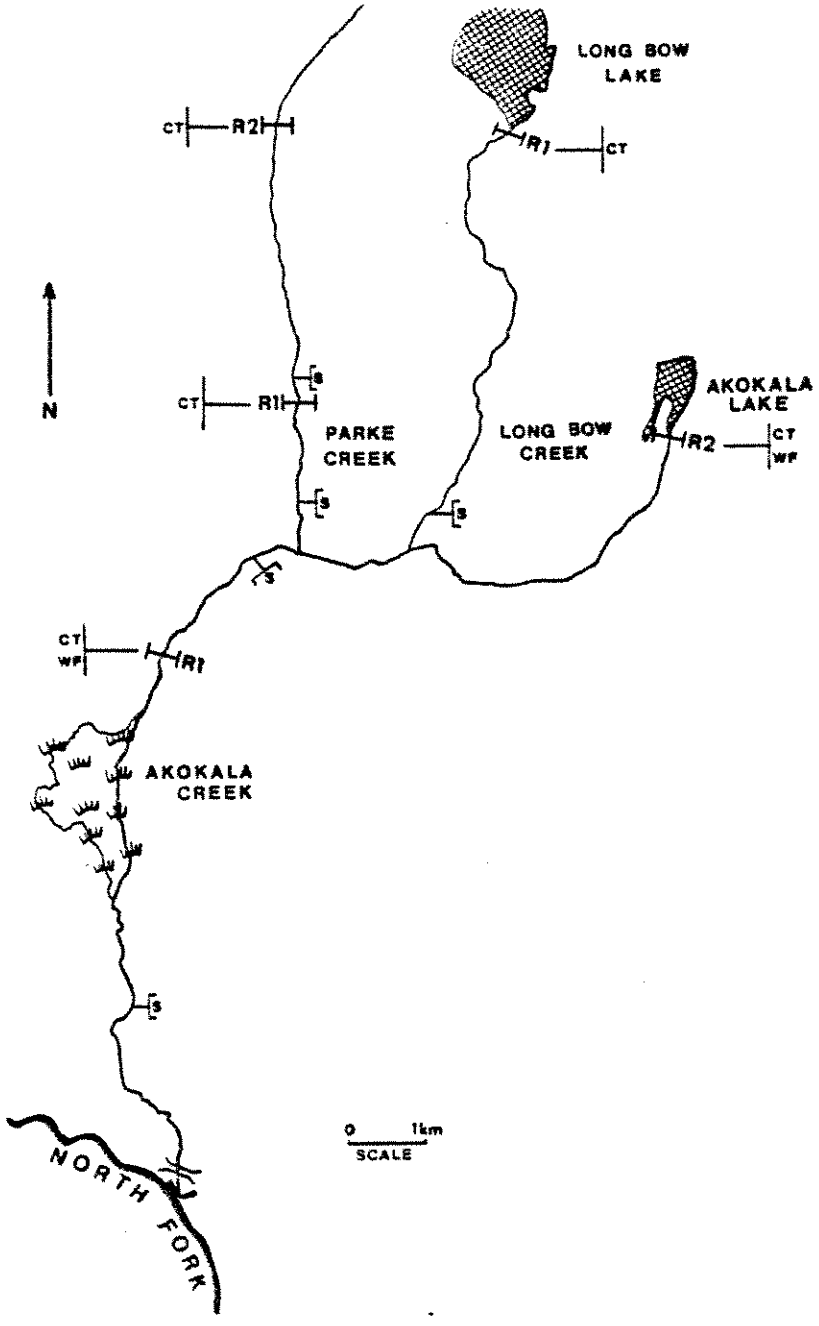

Figure 23. Fish population information by reach for the Akokala Creek drainage.

Table 50. Stream habitat and fish population data for Akokala 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)
Akokala Creek	001	DBG	8.0	North Fork	2.6 km below mouth Parke Creek	1193	mouth	1078

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	120.1	10.4	.33	19	100	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)
X	C	moderate	0.28	1.30	19	moderate	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	70	25	3	20	20	0	60	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	30	30	10	0	25	1.4	97	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	40	10	10	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)
65	47	1.02	.010	--	13.8	.037	1.2	--	0.7

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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.6	0.4	0.1	1.3	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	3	1	40	0	0	0	0

Table 51. Stream habitat and fish population data for Akokala 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)
Akokala Creek	002	DBH	8.8	North Fork	Akokala Lake	1448	2.6 km below mouth Parke Creek	1193

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	--	9.8	.33	16	100	7	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	high	--	1.06	--	low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	56	43	1	7	36	50	7	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	35	2.9	90	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	low	20	3	3	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0.7	1.3	4.8	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	5	16	149	0	0	0	0

Table 52. Stream habitat and fish population data for Parke 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)
Parke Creek	001	DBJ	1.8	North Fork	2 km up from mouth	1329	mouth	1240

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	.14	13	80	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)
X	N	low	--	0.21	--	low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
1	33	51	15	0	11	33	56	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	57	4.9	98	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	10	10	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
--	--	--	--	--	--	--	--	--

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	1.9	2.2	3.2	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	13	26	100	0	0	0	0

Table 53. Stream habitat and fish population data for Parke 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)
Parke Creek	002	DBY	4.6	North Fork	7 km up from mouth	1557	2 km up from mouth	1329

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	--	5.6	.31	10	120	12	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	low	--	0.29	--	low	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	40	50	10	0	0	0	100	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
40	40	19	1	0	12	4.9	82	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	30	20	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
--	--	--	--	--	--	--	--	--

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+		
2.1	1.2	2.1	1.7	0	0	0	0	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2	8	25	53	0	0	0	0

Table 54. Stream habitat and fish population data for Long Bow 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 Bow Creek	001	DBI	6.4	North Fork	Long Bow Lake	2085	mouth	1298

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	.24	7	100	15	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	N	low	--	0.21	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	48	48	4	6	6	13	75	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	71	12.3	105	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	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 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	2.6	3.8	0	0	0	0	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	2	31	118	0	0	0	0

RED MEADOW CREEK DRAINAGE

RED MEADOW CREEK REACH I

Channel Characteristics: Date surveyed: 8-8-79 (Figure 24)

Red Meadow Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 7.5 m and the average depth was 29 cm. Reach I was composed of 60% riffle, 30% run, 8% pocketwater and 2% pool. Channel debris was moderate and 43% was stable. Vegetation provided abundant bank cover and instream cover was moderate. Stream gradient was 2.2% and the D-90 was 47 cm. Two major slump zones occurred below the mouth of the south fork of Red Meadow Creek.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 10:1. The average valley width was 100 m. Reach I was occasionally confined and had an irregular to sinuous pattern.

Fish Populations: (Figure 25)

A great variety of game fish species were present in Reach I including westslope cutthroat, yellowstone cutthroat, bull trout, arctic grayling, mountain whitefish and sculpins. Density estimates of 11.2 age I or older westslope cutthroat per 100 m^2 surface area indicated an important rearing area. Juvenile bull trout also utilized the area for rearing and migratory adults of both species annually migrate through to upstream spawning areas.

RED MEADOW CREEK REACH II

Channel Characteristics: Date surveyed: 8-8-79 (Figure 24)

Red Meadow Creek Reach II is a third order tributary in the North Fork drainage. Average wetted width was 6 m and the average depth was 22 cm. Reach II consisted of 60% run, 20% riffle, 12% pocketwater and 8% pool. Channel debris was moderate with 20% stability. Bank cover and instream cover were both moderate. Stream gradient was 0.9% and the D-90 was 41 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 8:1. The average valley width was 75 m. Reach II was occasionally to frequently confined and its pattern was irregular.

Fish Populations: (Figure 25)

Species observed included bull trout, westslope cutthroat, yellowstone cutthroat, arctic grayling, mountain whitefish and sculpins. Density estimates indicated an important rearing area for both migratory and resident westslope cutthroat and bull trout with 14.8 and 6.1 age I or older fish per 100 m^2 surface area, respectively. Spawning by migratory bull trout was documented with an average of nine redds enumerated annually during three years of survey.

RED MEADOW CREEK REACH III

Channel Characteristics: Date surveyed: 8-8-79 (Figure 24)

Red Meadow Creek Reach III is a second order tributary in the North Fork drainage. Average wetted width was 3.5 m and the average depth was 16 cm. Reach III was comprised of 50% pocketwater, 20% run, 15% riffle and 15% pool. Channel debris was low and 20% was stable. Bank and instream cover were both moderate. Stream gradient was 7.6% and the D-90 was 50 cm. Areas of chutes and cascades were observed.

Valley Characteristics:

The upper bank slope gradient was 30-50% and the valley to channel ratio was 2:1. The average valley width was 15 m. Reach III was frequently confined and had an irregular pattern.

Fish Populations: (Figure 25)

A variety of game fish species were present in Reach III including bull trout, westslope cutthroat trout, yellowstone cutthroat trout, arctic grayling and mountain whitefish. The arctic grayling and yellowstone cutthroat trout observed resulted from downstream movement out of Red Meadow Lake. The lower third was an important rearing area for bull trout, with densities of 4.2 age I or older fish per 100 m^2 surface area. Cascades 15 m high and 10 m long created a partial fish migration barrier just above the mid-point of this reach.

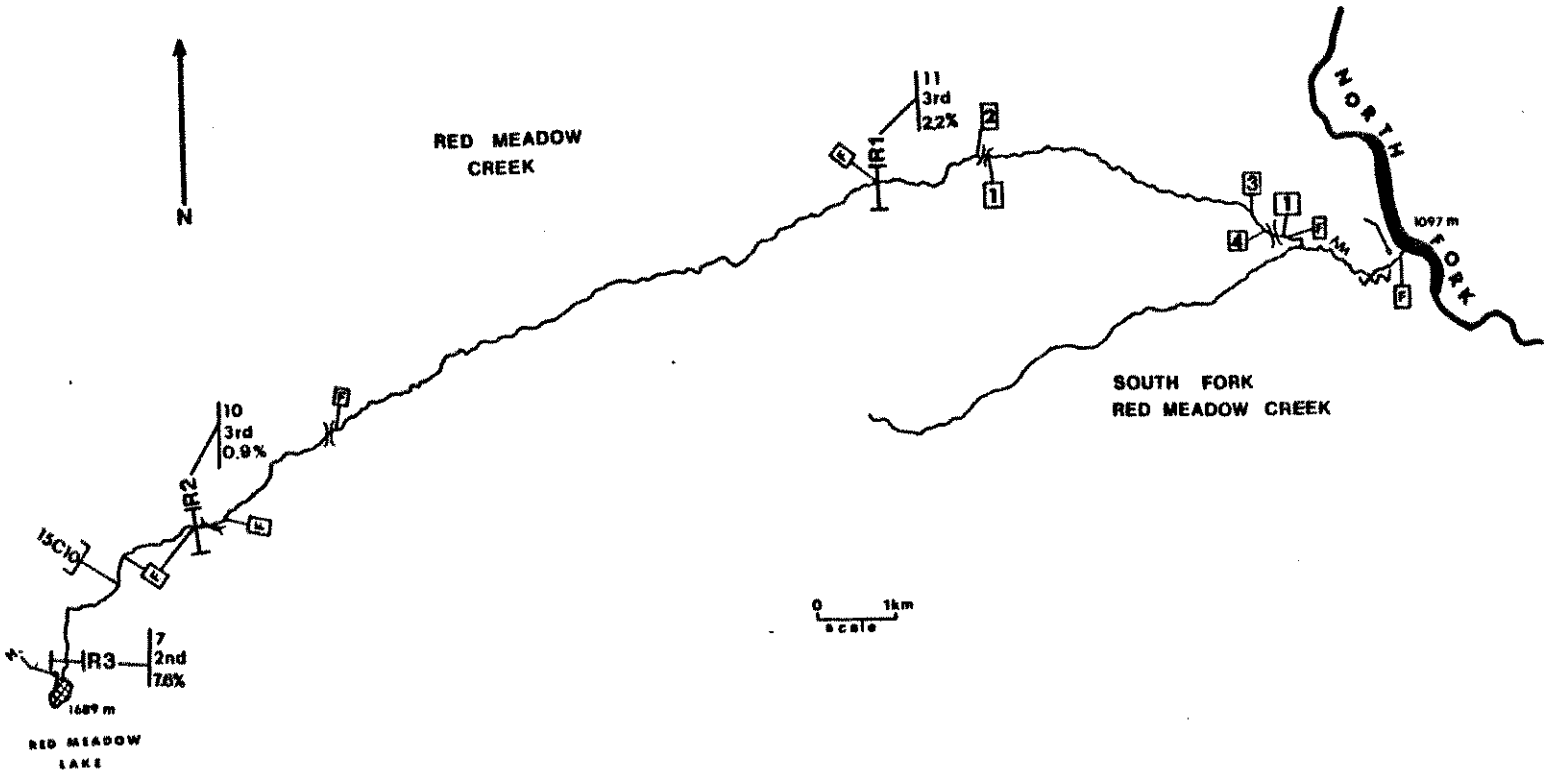

Figure 24. Location of physical habitat parameters by reach for Red Meadow Creek.

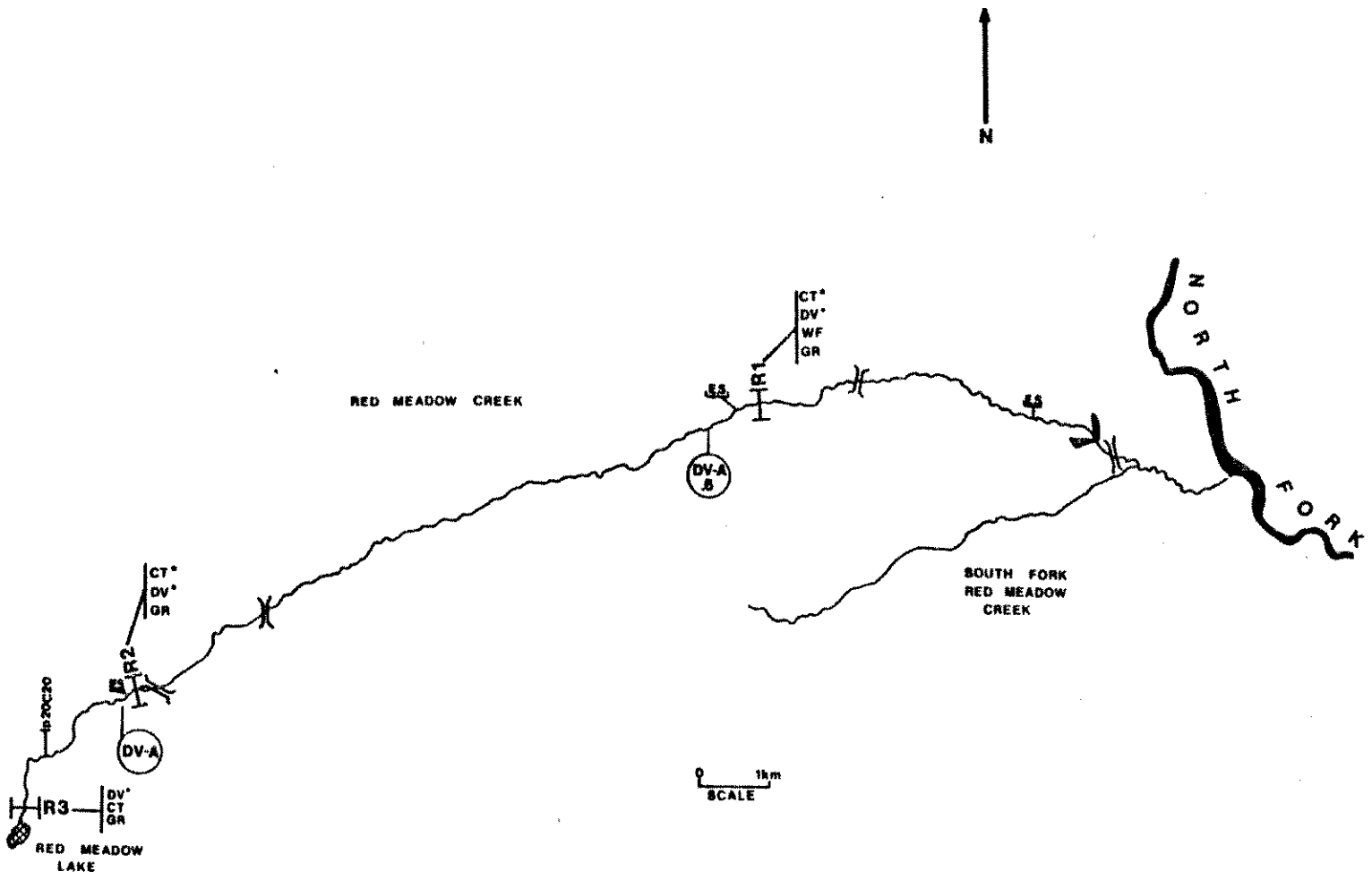

Figure 25. Fish population information by reach for Red Meadow Creek.

Table 55. Stream habitat and fish population data for Red Meadow 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)
Red Meadow Creek	001	DCJ	7.7	North Fork	1 km above 2nd bridge across RMC	1268	mouth	1097

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	76.8	7.5	.29	11	108	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)
X	P	low	.47	0.47	15	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	30	60	0	1	5	14	80	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	25	25	0	47	2.2	85	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	43	20	30	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)
132	79	0.98	.005	0.01	23.5	.061	0.9	--	0.9

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	0	0	78			

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
4.5	7.9	2.8	0.5	0	0	0.4	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
5	54	34	16	0	0	9	0

Table 56. Stream habitat and fish population data for Red Meadow 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)
Red Meadow Creek	002	DCL	19.0	North Fork	.6 km below Link Lake fork	1450.8	1 km above 2nd bridge across RMC	1268

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	--	6.0	.22	10	73	7	placid/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	1.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	60	20	10	4	10	23	63	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	40	15	14	1	41	0.9	92	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	20	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
6	0.5	80	2	0.2	79	19	1.7	81

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	1.1	3.8	9.7	0	1.1	4.4	1.6

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	7	4	302	0	10	96	74

Table 57. Stream habitat and fish population data for Red Meadow 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)
Red Meadow Creek	003	DCI	3.2	North Fork	Red Meadow Lake	1689	.6 km below Link Lake fork	1450.8

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	---	3.5	.16	7	15	2	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	P	low	--	0.26	--	low	1.3

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	20	20	50	0	0	10	90	0

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
10	20	20	20	30	50	7.6	74	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	nil	low	20	30	20	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
--	--	--	--	--	--	--	--	--

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	1.2	3.4	0	0	3.4	0.8	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	14	106	0	0	74	37

MOOSE CREEK DRAINAGE

MOOSE CREEK REACH I

Channel Characteristics: Date surveyed: 7-26-80 (Figure 26)

Moose Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 4.8 m and the average depth was 24 cm. Reach I consisted of 50% run, 43% riffle, 5% pool and 2% pocketwater. Channel debris was low with 30% being stable. Vegetation provided high bank cover and instream cover was moderate. Stream gradient was 2.7%. and the D-90 was 32 cm. A major slump zone occurred in the middle of the reach and beaver activity was observed near the lower end.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 7:1. The average valley width was 75 cm. Reach I was occasionally confined and had an irregular meandering pattern.

Fish Populations: (Figure 27)

Bull trout, westslope cutthroat trout and sculpins were observed. Juvenile bull trout were present although no bull trout spawning has been documented here. Beaver dams near the mouth may impede bull trout migration during low summer flows. Migratory and resident populations of cutthroat were present and densities of 10.8 Age I or older fish per 100 m^2 surface area indicated an important rearing area.

MOOSE CREEK REACH II

Channel Characteristics: Date surveyed: 7-26-80 (Figure 26)

Moose Creek Reach II is a second order tributary in the North Fork drainage. Averaged wetted width was 5.8 m and the average depth was 27 cm. Reach II was comprised of 60% riffle, 37% run and 3% pool. Channel debris was low with 70% being stable. Bank cover and instream cover were both moderate. Stream gradient was 3.5 % and the D-90 was 26 cm. A major slump zone occurred in the middle of this reach.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 40:1. The average valley width was 400 m. Reach II was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 27)

Westslope cutthroat trout were observed in this reach. This area provided important cutthroat trout rearing habitat with densities of 27.4 age I or older fish per 100 m^2 surface area.

MOOSE CREEK REACH III

Channel Characteristics: Date surveyed: 7-27-80 (Figure 26)

Moose Creek Reach III is a second order tributary in the North Fork drainage. Average wetted width was 1.7 m and the average depth was 27 cm. Reach III consisted of 64% run, 24% riffle and 12% pool. Channel debris was low with 40% being stable. Bank cover and instream cover were moderate. Stream gradient was 2.8% and the D-90 was 25 cm. Some beaver activity was noted in the middle of this reach.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 25:1. The average valley width was 400 m. Reach III was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 27)

Westslope cutthroat were observed in this reach. Density estimates showed this to be a very important rearing area with 62.0 age I or older cutthroat per 100 m^2 surface area.

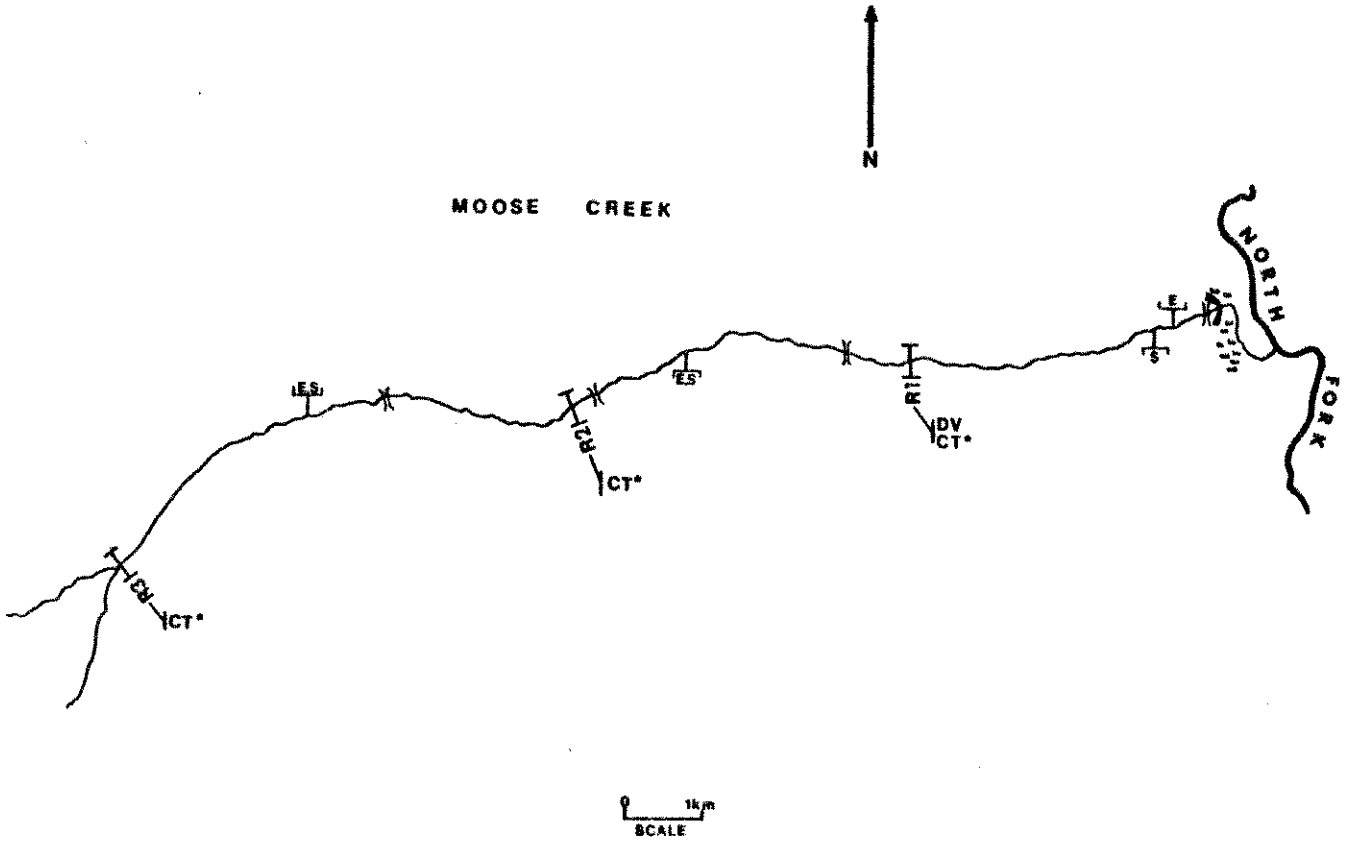

Figure 27. Fish population information by reach for Moose Creek.

Table 58. Stream habitat and fish population data for Moose 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)
Moose Creek	001	DD9	5.2	North Fork	1 km below Whale Buttes bridge	1253	mouth	1109

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	48.0	4.8	.24	11	75	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	C	low	0.17	0.31	15	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	50	43	2	5	14	19	59	3

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
27	30	33	10	0	32	2.6	105	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	22	26	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)
90	78	1.02	.004	--	20.6	0.84	1.0	--	1.0

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3.4	2.4	5.3	3.1	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
4	16	64	97	0	0	0	0

Table 59. Stream habitat and fish population data for Moose 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)
Moose Creek	002	DEA	4.9	North Fork	bridge 2 km above Whale Buttes Bridge	1426	1 km below Whales Buttes Bridge	1253

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	--	5.8	.21	10	400	10	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	--	0.26	--	--	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	37	60	0	19	37	44	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	50	30	10	0	26	3.5	95	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	70	15	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
--	--	--	--	--	--	--	--	--

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
0.4	9.4	12.4	5.6	0	0	0	0	absent	

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	64	150	175	0	0	0	0

Table 60. Stream habitat and fish population data for Moose 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)
Moose Creek	003	DEB	11.4	North Fork	3 km above rock quarry	1743	bridge 2 km above Whale Butte bridge	1426

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	--	4.7	.24	39	150	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	P	low	--	0.19	--	--	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
6	64	24	6	4	17	25	54	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	40	10	0	20	2.8	93	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	40	10	20	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
--	--	--	--	--	--	--	--	--

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	5.9	10.1	46.0	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	40	122	1435	0	0	0	0

WHALE CREEK DRAINAGE

WHALE CREEK REACH I

Channel Characteristics: Date Surveyed: 8-28-79 (Figure 28)

Whale Creek Reach I is a fourth order tributary in the North Fork drainage. Average wetted width was 13 m, and the average depth was 34 cm. Reach I consisted of 50% run, 40% riffle, 7% pocketwater, and 3% pool. Channel debris was moderate with 20% being stable. Vegetation provided only slight bank cover while instream cover was moderate. Stream gradient was 1.1% and the D-90 was 48 cm. Three different areas of debris accumulation and a major slump zone occurred within a 5 km section of this reach.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 12:1. The average valley width was 220 m. Reach I was occasionally confined and has an irregular pattern.

Fish Populations: (Figure 29)

Westlope cutthroat, bull trout, mountain whitefish and sculpins were observed here. Spawning by adfluvial bull trout has been documented with an average of 23 redds enumerated annually during four years of survey. In 1982 a 4 km high use spawning area was noted near the upper reach break with redd densities of 13 per km. Migratory cutthroat were also observed here.

WHALE CREEK REACH II

Channel Characteristics: Date Surveyed: 8-28-79 (Figure 28)

Whale Creek Reach II is a fourth order tributary in the North Fork drainage. Average wetted width was 13 m, and the average depth was 34 cm. Reach II contained 50% run, 20% riffle, 19% pool, and 11% pocketwater. Channel debris was moderate to high and 25% was stable. Bank and instream cover were both low. Stream gradient was 0.7% and the D-90 was 27 cm. Three instream debris accumulations were noted and a major slump zone was present 2.5 km above the lower reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 10:1. The average valley width was 175 m. Reach II was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 29)

Westslope cutthroat, bull trout, mountain whitefish and sculpins were observed. Adfluvial bull trout spawning occurred with an average of 76 redds enumerated annually during four years of survey. Density estimates of 1.6 age I or older bull trout per 100 m^2 surface area indicated an important rearing area.

Shorty Creek Reach I

Channel Characteristics: Date Surveyed: 8-18-79 (Figure 28)

Reach I of Shorty Creek is a fourth order tributary. It had a wetted width of 9 m and an average depth of 20 cm. This reach contained 20% run, 30% riffle and 50% pool. Channel debris was high with 30% being stable. A trace of bank cover was present. Instream cover varied by feature with deep pools providing the only instream cover observed. The channel gradient was 2% and the D-90 was 25 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 5:1. The average valley width was 70 m. The channel was frequently confined and had an irregular pattern.

Fish Populations: (Figure 29)

Westslope cutthroat and bull trout were observed here. Spawning by adfluvial bull trout was documented with an average of 28 redds enumerated during four years of survey. Densities of 1.6 age I or older bull trout per 100 m^2 surface area indicated an important rearing area.

Shorty Creek Reach II

Channel Characteristics: Date Surveyed: 8-18-79 (Figure 28)

Reach II of Shorty Creek is a third order tributary. The wetted width was 5 m with an average depth of 20 cm. Reach II contained 30% runs, 50% riffle and 20% pool. Channel debris was moderate with 20% being stable. Bank cover and instream cover were very low. Channel gradient was 5% and the D-90 was 43 cm. Waterfalls and cascades created by large boulders created a barrier to upstream migration in the lower reach.

Valley Characteristics:

The upper bank slope gradient was 30-40%. There was a valley to channel

ratio of 8:1 and a valley width of 70 m. The channel was frequently confined with an irregular pattern.

Fish Populations: (Figure 29)

No fish were observed while surveying or snorkeling in this reach, probably due to the barriers mentioned above.

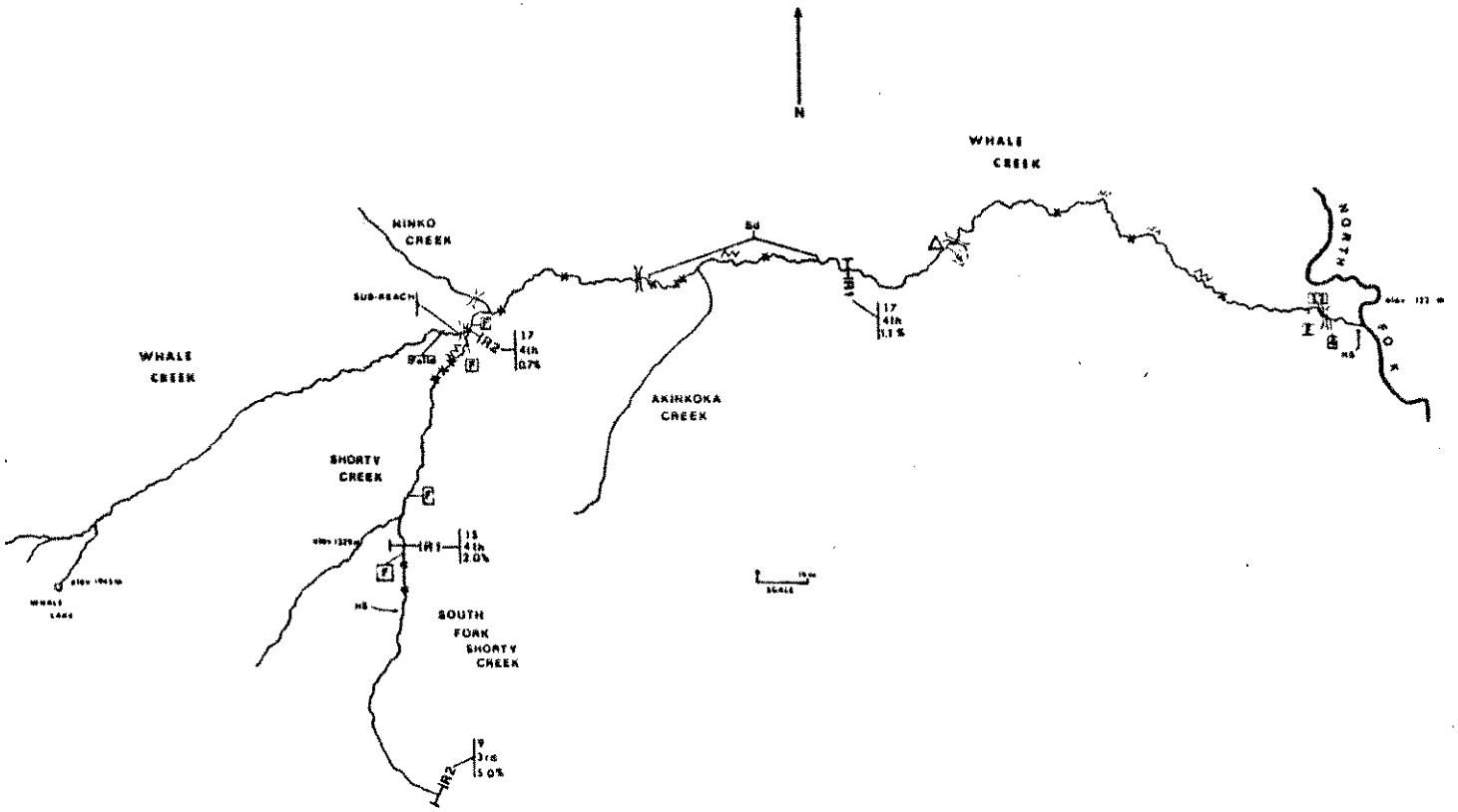

Figure 28. Location of physical habitat parameters by reach for the Whale Creek drainage.

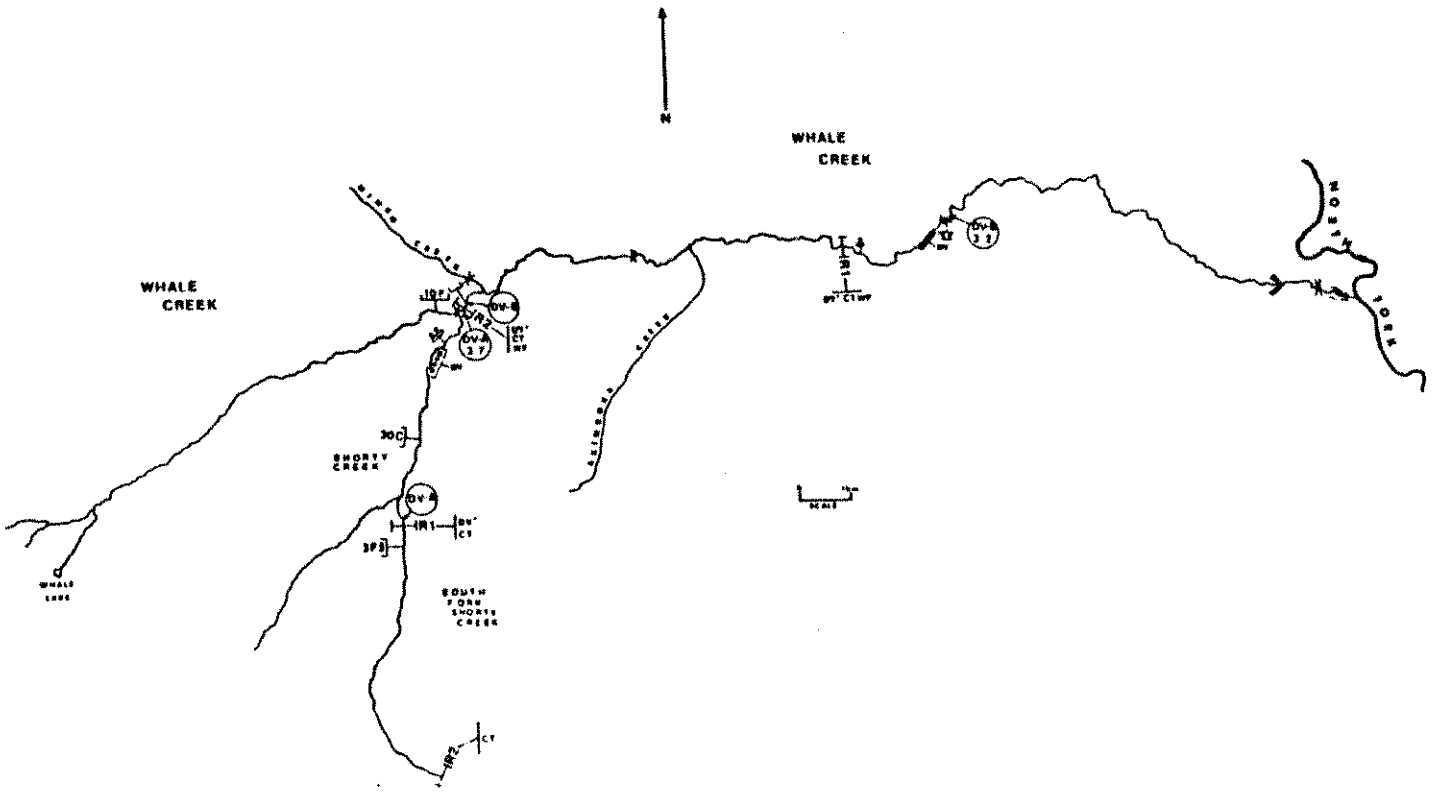

Figure 29. Fish population information by reach for the Whale Creek drainage.

Table 61. Stream habitat and fish population data for Whale 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)
Whale Creek	001	DA6	13.9	North Fork	2 km above Whale Buttes Bridge	1280	mouth	1122

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	165.5	13.0	.34	17	220	13	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)
X	P	moderate	1.57	1.64	15	low	1.8

% 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	10	15	35	35

% bed material					D-90	%	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
20	40	20	19	1	48	1.1	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	20	5	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)
--	--	0.84	.003	0.14	35.5	.102	--	--	30.4

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
12	1.5	80	10	1.3	79	22	2.8	81

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	0.3	0	0.1	0.3	present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	1	0	1	9

Table 62. Stream habitat and fish population data for Whale 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)
Whale Creek	002	DA5	11.5	North Fork	Whale Creek Falls	1365	2 km above Whale Buttes Bridge	1280

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	--	13.0	.34	17	175	22	swirling/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	high	--	0.73	--	low	2.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
30	50	20	0	17	20	27	36	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
40	40	10	9	1	27	0.7	87	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	low	20	5	10	4

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
35	3.5	80	24	2.4	79	79	7.9	81

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	0.1	0.2	0.1	1.3	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	19	1	2	2	60

Table 63. Stream habitat and fish population data for Shorty 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)
Shorty Creek	001	DA4	4.5	North Fork	Falls (1 km above north fork Shorty)	1405	junction with Whale Creek	1365

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	48.0	9.0	.20	15	70	5	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	C	moderate	--	1.49	--	low	1.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
30	20	30	20	13	17	31	32	7

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	60	15	15	0	25	0.9	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	high	30	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
4	0.8	80	33	6.6	79	17	3.4	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	0.3	0.4	0.4	0.7	0.4	0.7	0.5	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	2	5	12	1	4	15	23

Table 64. Stream habitat and fish population data for Shorty 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)
Shorty Creek	002	DCK	4.6	North Fork	headwaters	1640	falls 1 km above north fork Shorty	1405

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	--	5.0	.34	9	70	8	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)
C	P	low	--	0.22	--	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
6	30	50	14	1	8	20	50	21

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
10	20	5	5	60	43	5.0	76	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	bedrock	low	moderate	20	1	10	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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

FORD CREEK DRAINAGE

FORD CREEK REACH I

Channel Characteristics: Date surveyed: 8-20-80 (Figure 30)

Ford Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 4 m and the average depth was 18 cm. Reach I was comprised of 47% riffle, 40% run, 7% pool and 6% pocketwater. Channel debris was moderate with 40% being stable. Stream gradient was 3.4% and the D-90 was 25 cm. A major slump area occurred 1 km above the lower reach break and sediment from this slump solidly imbedded substrate immediately downstream.

Valley Characteristics:

The upper bank slope gradient was <30% and the valley to channel ratio was 17:1. The average valley width was 100 m. Reach I was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 31)

Westslope cutthroat and sculpins were observed in this reach. The westslope cutthroat were believed to be resident fish.

FORD CREEK REACH II

Channel Characteristics: Date surveyed: 8-23-80 (Figure 30)

Ford Creek Reach II is a third order tributary in the North Fork drainage. Average wetted width was 3 m and the average depth was 13 cm. Reach II consisted of 56% run, 37% riffle and 7% pocketwater. Channel debris was moderate to low with 20% being stable. Vegetation provided high bank cover while instream cover was moderate. Stream gradient was 2.9% and the D-90 was 9 cm. The lower kilometer of this reach was a marsh area.

Valley Characteristics:

The upper bank slope was less than 30% and the valley to channel ratio was 25:1. The average valley width was 100 m. Reach II was unconfined and had an irregular meandering pattern.

Fish Populations: (Figure 31)

Westslope cutthroat trout and sculpins were observed in this reach. The westslope cutthroat were thought to be resident fish.

FORD CREEK REACH III

Channel Characteristics: (Figure 30)

Ford Creek Reach III is a third order tributary in the North Fork drainage. Average wetted width was 3 m and the average depth was 11 cm. Reach III was comprised of 43% run, 43% riffle, 7% pool and 7% pocketwater. Channel debris was low with 20% being stable. Vegetation provided high bank cover while instream cover was moderate. Stream gradient was 15% and the D-90 was 32 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 17:1. The average valley width was 70 m. Reach III was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 31)

Westslope cutthroat trout and sculpins were observed in this reach. The westslope cutthroat were probably resident fish.

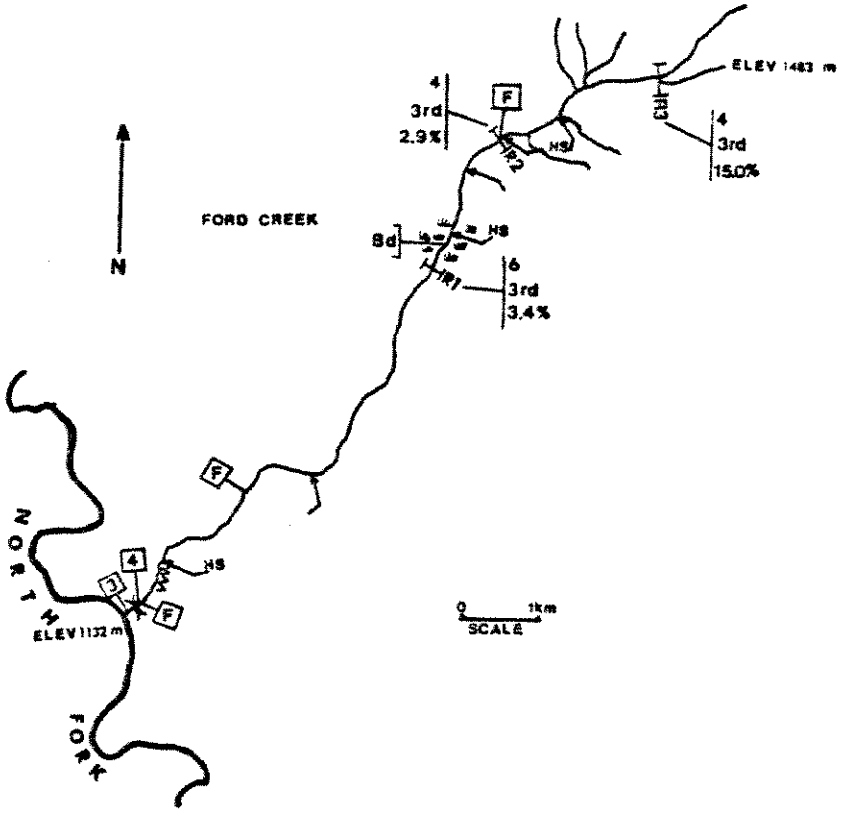

Figure 30. Location of physical habitat parameters by reach for Ford Creek.

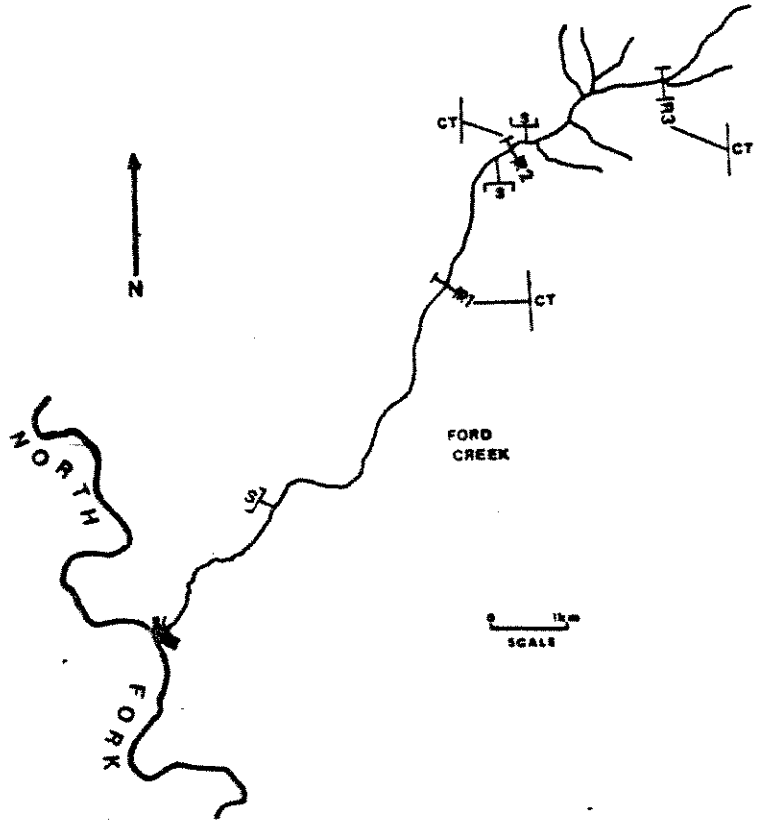

Figure 31. Fish population information by reach for Ford Creek.

Table 65. Stream habitat and fish population data for Ford 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)
Ford Creek	001	DBM	6.9	North Fork	7.2 km up from mouth	1364	mouth	1132

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	32.4	4.0	.18	6	100	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	moderate	0.06	.09	14	low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	40	47	6	0	40	30	30	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	40	20	10	0	25	3.4	82	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	40	40	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	85	1.67	.014	--	24.7	.055	2.0	--	0.4

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
--	--	--	--	--	--	--	--	--

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
5.0	3.9	5.0	0.9	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
55	26	60	28	0	0	0	0

Table 66. Stream habitat and fish population data for Ford 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)
Ford Creek	002	DBL	2.1	North Fork	9.5 km up from mouth	1426	7.2 km up from mouth	1364

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	--	3.0	.13	4	100	26	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	--	0.05	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	56	37	7	0	6	31	63	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
40	40	19	1	0	9	2.9	73	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	20	50	30	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	4.7	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	147	0	0	0	0

Table 67. Stream habitat and fish population data for Ford 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)
Ford Creek	003	DBK	3.8	North Fork	12.8 km up from mouth	2073	9.5 km up from mouth	1426

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	--	3.0	.11	4	70	17	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)
X	P	low	--	0.05	--	low	0.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
7	43	43	7	0	0	43	57	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	30	40	19	1	32	17.0	99	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	50	40	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0.3	0.7	2.7	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	2	8	84	0	0	0	0

KINTLA CREEK DRAINAGE

KINTLA CREEK REACH I

Channel Characteristics: Date Surveyed: 8-7-80 (Figure 32)

Reach I is the only reach surveyed in Kintla Creek. It extends from lower Kintla Lake to the North Fork River. It is a second order tributary with an average wetted width of 15.4 m and an average depth of 49 cm. Reach I contained 59% run, 40% riffle and 1% pocketwater. Channel debris was low with 50% being stable. Bank vegetation was low and instream cover was moderate. Stream gradient was 1.7% and the D-90 was 61 cm. Two major slump zones appeared along Kintla Creek and an area of debris accumulation was present 1 km below the lake outlet.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 2:1. The average valley width was 40 m. Kintla Creek was frequently confined and had an irregular pattern.

Fish Populations: (Figure 33)

Westslope cutthroat trout and mountain whitefish were observed in this creek. The westslope cutthroat were believed to be resident fish.

STARVATION CREEK DRAINAGE

STARVATION CREEK REACH I

Channel Characteristics: Date Surveyed 7-29-80 (Figure 32)

Starvation Creek Reach I is a third order tributary in the North Fork drainage. Average wetted width was 7 m and the average depth was 27.5 cm. Reach I contained 56% riffle, 40% run, 3% pool and 1% pocketwater. Channel debris was low and 50% was stable. Bank cover was low and instream cover was low-moderate. Stream gradient was 3.1% and the D-90 was 38 cm.

Valley Characteristics:

The upper bank slope was 40-60% and the valley to channel ratio was 7:1. The average valley width was 200 m. Reach I was frequently confined and had an irregular meandering pattern. Numerous slumping clay banks were found, firmly imbedding substrate downstream. The upper end of Starvation Creek lies in Canada and has been logged except near the creek banks.

Fish Populations: (Figure 33)

Bull trout, westslope cutthroat, mountain whitefish and sculpins were observed. Spawning by adult bull trout has been documented here.

STARVATION CREEK REACH II

Channel Characteristics: Date Surveyed: 8-5-80 (Figure 32)

Starvation Creek reach II is a second order tributary in the North Fork drainage. Average wetted width was 7.3 m and the average depth was 23 cm. Reach II consisted of 53% run, 40% riffle, 4% pocketwater and 3% pool. Channel debris was low and 70% was stable. Vegetation provided limited bank cover while instream cover was abundant. Stream gradient was 1.8% and the D-90 was 24 cm. An area of debris accumulation was present in the middle of this reach.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 4:1. The average valley width was 80 m. Reach II was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 33)

Bull trout, westslope cutthroat trout and sculpins were observed in this reach. Migratory as well as resident cutthroat were present and fish densities indicated an important rearing area for bull trout with 3.5 age I or older fish per 100 m^2 surface area. Bull trout were more abundant than cutthroat trout.

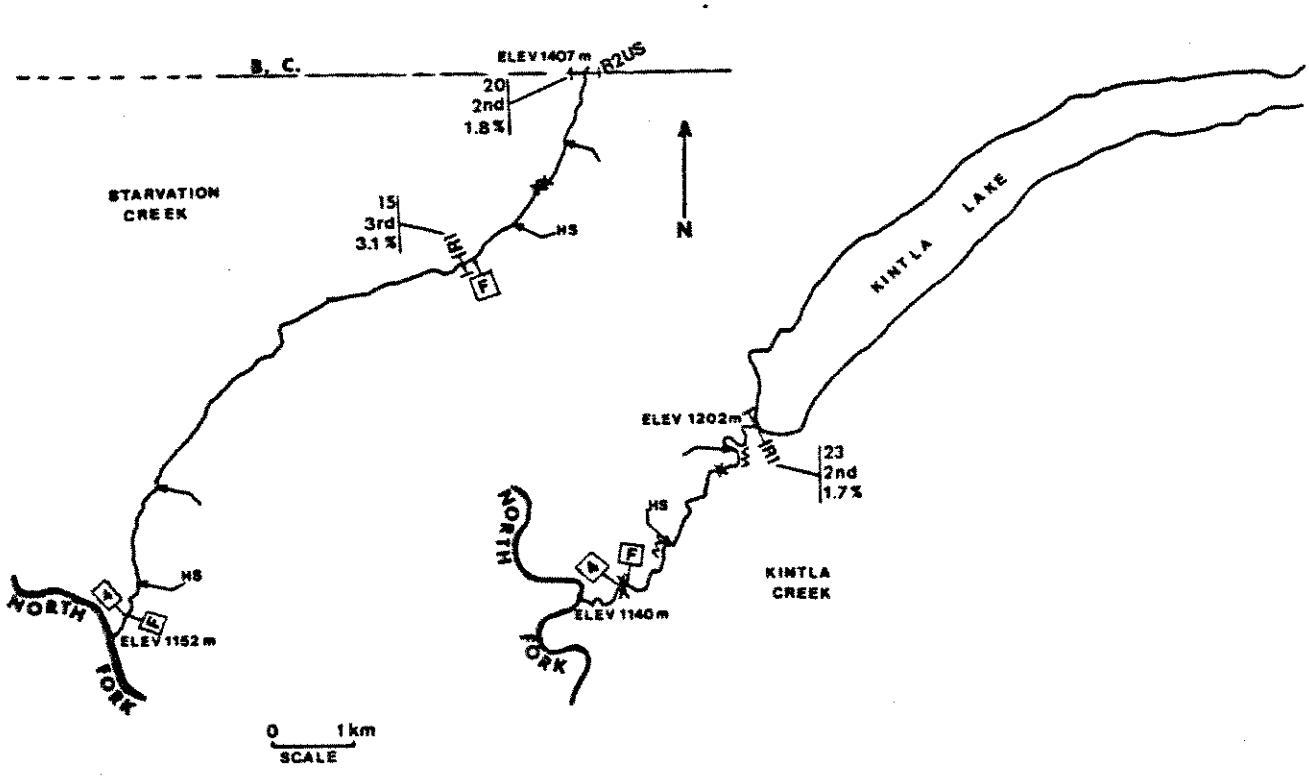

Figure 32. Location of physical habitat parameters by reach for Kintla Creek and Starvation Creek.

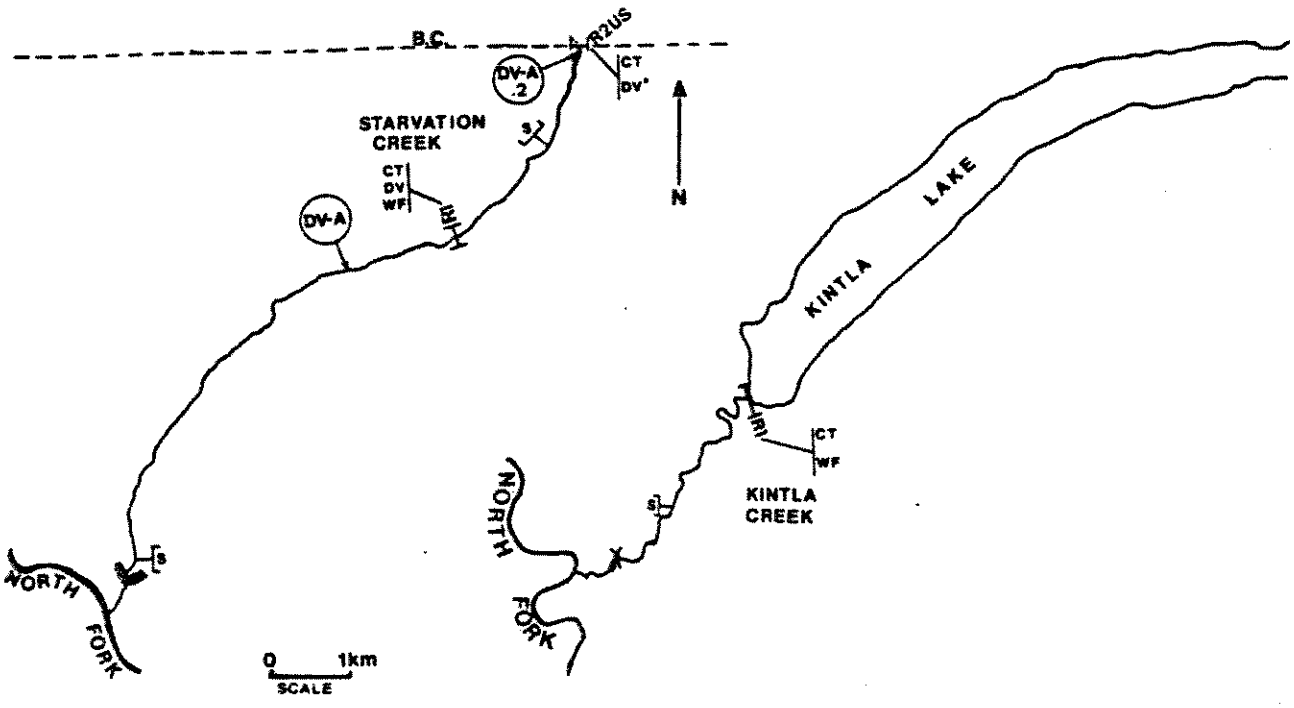

Figure 33. Fish population information by reach for Kintla Creek and Starvation Creek.

Table 68. Stream habitat and fish population data for Kintla 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)
Kintla Creek	001	DBN	3.5	North Fork	Kintla Lake	1202.4	mouth	1140.0

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	138.1	15.4	.49	23	40	2	rolling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
F	P	low	--	3.55	--	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	60	39	1	0	0	0	100	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	30	30	10	0	61	1.7	107	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	10	6	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)
--	--	0.76	.002	0.12	17.3	.043	--	--	2.5

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.1	0.2	1.0	0.7	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	1	12	22	0	0	0	0

Table 69. Stream habitat and fish population data for Starvation 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)
Starvation Creek	001	DBR	8.0	North Fork	8 km up from mouth	1392.0	mouth	1152.0

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	21.8	7.0	.28	15	100	7	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)
F	C	low	0.25	0.48	--	moderate	0.8

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	40	56	1	0	43	43	14	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
23	34	27	16	0	38	3.1	100	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	50	10	3	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)
100	83	0.54	.003	0.56	24.9	.065	1.3	--	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	0.0	80	--	--	--	1	0.1	81

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3.2	0	0.9	1.1	0	0	0.7	0.6

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3	0	11	34	0	0	15	28

Table 70. Stream habitat and fish population data for Starvation 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)
Starvation Creek	002	DBQ	3.2	North Fork	Canadian border	1446.0	8 km up from mouth	1392.0

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	--	7.3	.23	20	80	4	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	low	--	0.38	--	low	1.1

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
3	54	40	3	15	29	28	28	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	49	30	1	0	24	1.8	102	repose

Bank Process	Bank genetic material	Flocd plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	low	70	10	10	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
1	0.3	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	0.3	0.4	1.6	1.5	1.0	1.0	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	2	4	12	2	14	22	46

TRAIL/YAKINIKAK CREEK DRAINAGE

TRAIL CREEK REACH I

Channel Characteristics: Date Surveyed: 9-13-79 (Figure 34)

Trail Creek Reach I is a fifth order tributary in the North Fork drainage. Average wetted width was 15 m and the average depth was 30 cm. Reach I was composed of 60% run, 40% riffle and traces of pool and pocketwater. Channel debris was low with only a trace stable. Bank and instream cover were both low. Stream gradient was 2.0%, and the D-90 was 35 cm. The source of water for Reach I Trail Creek arises from springs which are fed by subterranian flows from Reach I of Yakinikak Creek. A 1 km long canyon was a feature at the upper end of Reach I. This canyon had 60% riffle, 40% run and traces of pool and pocketwater features. Two springs discharging an additional 27.2 cfs of water at 6.1°C were located immediately below the canyon, forming a 226 m long channel which enters Trial Creek from the north.

Valley Characteristics:

The upper bank slope was 40-60% and the valley to channel ratio was 6:1. The average valley width was 115 m. Reach I was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 35)

Westslope cutthroat, bull trout, mountain whitefish and sculpins were observed here. Migratory populations of cutthroat and bull trout were present. Spawning by adult bull trout was observed and four years of survey enumerated an average of 52 redds annually. Density estimates indicated an important rearing area for juvenile bull trout (1.7 age I + fish per 100 m^2 surface area).

Ketchikan Creek Reach I

Channel Characteristics: Date Surveyed: 8-23-80 (Figure 34)

Ketchikan Creek Reach I is a third order tributary in the Trail Creek drainage. Average wetted width was 2.7 m and the average depth was 13 cm. Reach I contained 70% run, 19% pool, and 11% riffle. Channel debris was moderate with 20% being sable. Overhanging vegetation provided abundant bank cover in this reach and instream cover was also high. Stream gradient was 0.5% and the D-90 was 14 cm.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio was 80:1. The average valley width was 400 m. Reach I was unconfined and had an irregular pattern. Most of this reach is located in private ownership.

Fish Populations: (Figure 35)

Westslope cutthroat were observed in this reach. It was a major rearing area for cutthroat trout supporting resident and migratory cutthroat populations at a density of 33.6 age I or older fish per 100 m^2 surface area.

Ketchikan Creek Reach II

Channel Characteristics: Date Surveyed: 8-23-80 (Figure 34)

Ketchikan Creek Reach II is a third order tributary in the Trail Creek drainage. Average wetted width was 3 m, and the average depth was 12.6 cm. Reach II contained 67% riffle, 29% run, and 4% pocketwater. Channel debris was low with 10% being stable. Overhanging vegetation provided high cover while instream cover was moderate. Stream gradient was 4.9% and the D-90 was 23 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 20:1. The average valley width was 50 m. Reach II was occasionally confined with an irregular pattern.

Fish Populations: (Figure 35)

Westslope cutthroat were observed in this reach. It was an important rearing area for cutthroat trout supporting resident and migratory cutthroat populations at a density of 17.1 age I or older fish per 100 m^2 surface area.

Ketchikan Creek Reach III

Channel Characteristics: Date Surveyed: 8-23-80 (Figure 34)

Ketchikan Creek Reach III is a third order tributary in the Trail Creek drainage. Average wetted width was 2.2 m, and the average depth was 12 cm. Reach III consisted of 50% run, 30% riffle, 10% pool, and 10% pocketwater. Channel debris was low with 10% being stable. Instream cover was low-moderate, while bank cover was low. Stream gradient was 3.1% and the D-90 was 8.5 cm. The lower 1-2 km of Reach III were a marsh area.

Valley Characteristics:

The upper bank slope gradient was 40-50% and the valley to channel ratio was 40:1. The average valley width was 100 m. Reach II was unconfined and had a regular meandering pattern.

Fish Populations: (Figure 35)

Westslope cutthroat were observed in this reach. This was a major rearing area for cutthroat trout supporting resident and migratory cutthroat populations at a density of 17.1 age I or older fish per 100 m^2 surface area.

YAKINIKAK CREEK REACH I

Channel Characteristics: Date Surveyed: 8-2-79 (Figure 34)

Reach I of Yakinikak Creek is a third order tributary to Trail Creek. Average wetted width was 6.0 m with an average depth of 27 cm. Reach I contained 56% run, 26.5% riffle and 17.5% pools. Channel debris was moderate with 55% being stable. Only small amounts of bank cover and instream cover were present. The channel gradient was 1.4% and the D-90 was 60 cm. Approximately 3 km of the lower reach flowed underground.

Valley Characteristics:

Reach I had a valley to channel ratio of 3:1 with a valley width of 50 m. The majority of the channel was entrenched with some being confined. The meandering pattern was irregular.

Fish Populations: (Figure 35)

The majority of the Reach I stream channel was dry most of the year. Fish were present in the upper .5 km of the reach; however, no fish population work was conducted in this area.

YAKINIKAK CREEK REACH II

Channel Characteristics: Date Surveyed: 8-11-79 (Figure 34)

Reach II of Yakinikak Creek is a fourth order tributary to Trail Creek. Average wetted width was 20 m with an average depth of 40 cm. This reach contained 40% run, 40% riffle and 20% pools. Channel debris was moderate and 30% stable. Only a trace of bank cover and instream cover were present. The channel gradient was 1.7% and the D-90 was 40 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60% and the valley to channel ratio was 15:1. The average valley width was 150 m. The channel was occasionally confined and had an irregular pattern.

Fish Populations: (Figure 35)

Westslope cutthroat trout were the most abundant species in this reach. A few bull trout and whitefish were also observed. The dry channel below this area precluded adult bull trout spawning.

YAKINIKAK CREEK REACH III

Channel Characteristics: Date Surveyed 8-15-79 (Figure 34)

Reach III of Yakinikak Creek is a third order tributary. Average wetted width was 7 m and the average depth of 30 cm. There was 50% run, 30% riffle and 20% pools in this reach. Moderate debris was present with 20% being stable. Instream cover was very low and bank cover was moderate. Channel gradient was 1.5% and the D-90 was 20 cm. A large beaver dam area was present in the middle of this reach.

Valley Characteristics:

The reach had a valley to channel ratio of 20:1 with an average valley width of 200 m. The channel was occasionally confined with an irregular pattern.

Fish Populations: (Figure 35)

Westslope cutthroat trout were observed in this reach.

YAKINIKAK CREEK REACH IV

Channel Characteristics: Date Surveyed: 8-15-79 (Figure 34)

Reach IV of Yakinikak Creek is a third order tributary. Average wetted width was 8 m and the average depth was 24 cm. This reach had 50% run, 20% riffle and 30% pools. Moderate amounts of channel were present with 20% being stable. A major debris pile consisting of large logs was located near the lower reach break. Instream cover was moderate and bank cover was abundant. The channel gradient was 1.0% and the D-90 was 57 cm.

Valley Characteristics:

The upper bank slope gradient was 40-60%. The valley to channel ratio was 4:1 and the valley width was 63 m. The channel was occasionally confined with an irregular meandering pattern.

Fish Populations: (Figure 35)

Westslope cutthroat trout were present in Reach IV in moderate densities.

YAKINIKAK CREEK REACH V

Channel Characteristics: Date Surveyed: 8-15-79 (Figure 34)

Reach V of Yakinikak is a third order tributary. Average wetted width was 3.4 m and the average depth was 15 cm. This reach contained 20% run, 50% riffle and 30% pools. Abundant channel debris was present with 20% being stable. A moderate amount of bank cover was present and instream cover was high. The channel gradient was 10.7% and the D-90 was 33 cm.

Valley Characteristics:

The upper bank slope gradient was 30% and the valley to channel ratio was 7:1. Average valley width was 40 m. The channel was frequently confined and had a sinuous pattern.

Fish Populations: (Figure 35)

Westslope cutthroat trout were present in Reach V in low densities.

Tuchuck Creek Reach I

Channel Characteristics: (Figure 34)

Tuchuck Creek Reach I is a fourth order tributary in the Trail Creek drainage. Average wetted width was 4 m and the average depth was 29 cm. Reach I contained 50% riffle, 40% run, and 10% pool. Channel debris was moderate and 30% was stable. Bank cover was abundant and instream cover was moderate. Stream gradient was 1.6% and the D-90 was 36 cm. Two different areas of debris accumulation appeared 1 km above the lower reach break.

Valley Characteristics:

The upper bank slope was 30-40% and the valley to channel ratio was 7:1. The average valley width was 60 m. Reach I was occasionally confined and had a sinuous pattern.

Fish Populations: (Figure 35)

Westslope cutthroat trout were observed in this reach. Density estimates of 19.0 age I or older cutthroat per 100 m^2 surface area indicated an important rearing area.

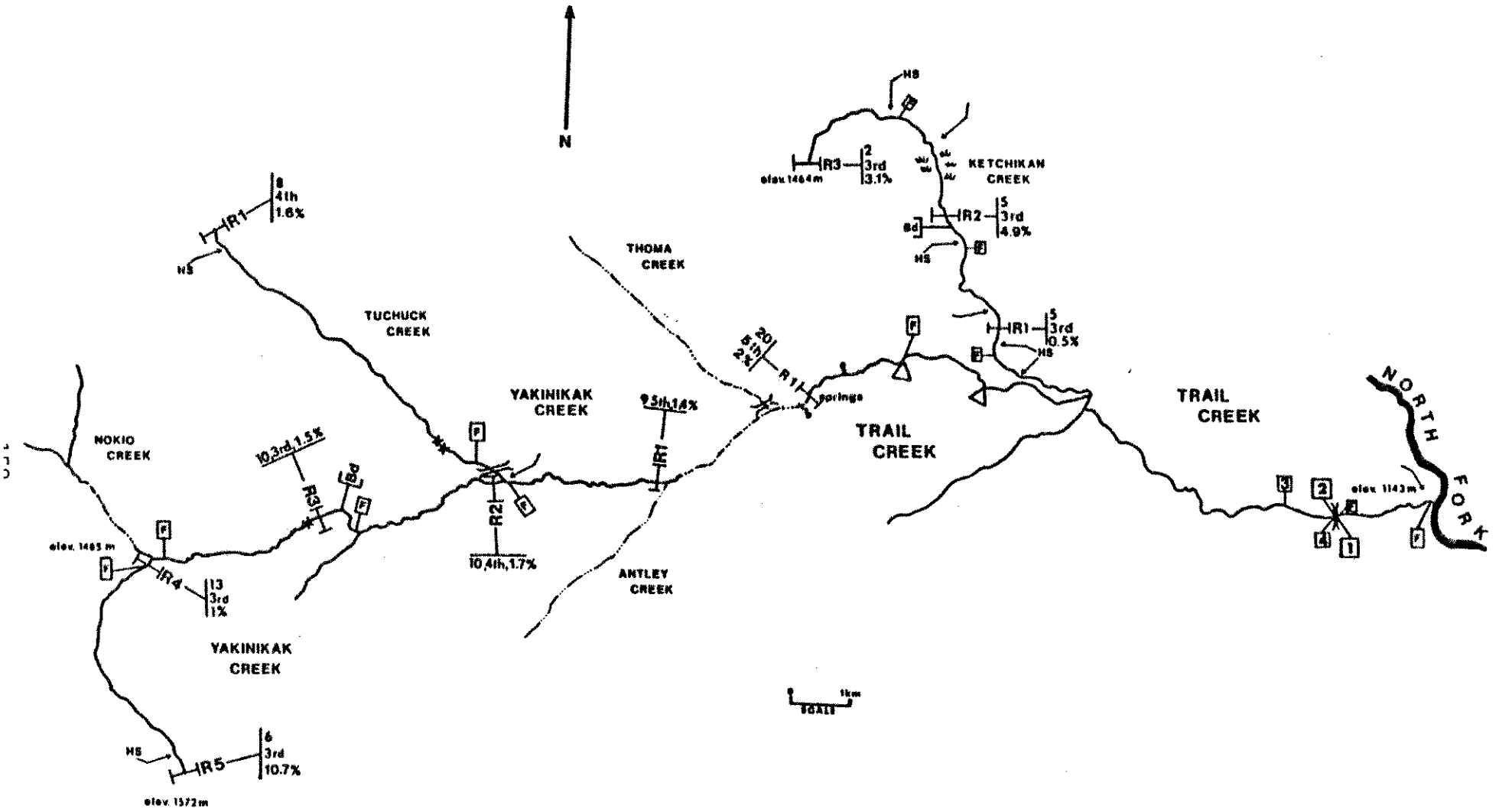

Figure 34. Location of physical habitat parameters by reach for the Trail Creek drainage.

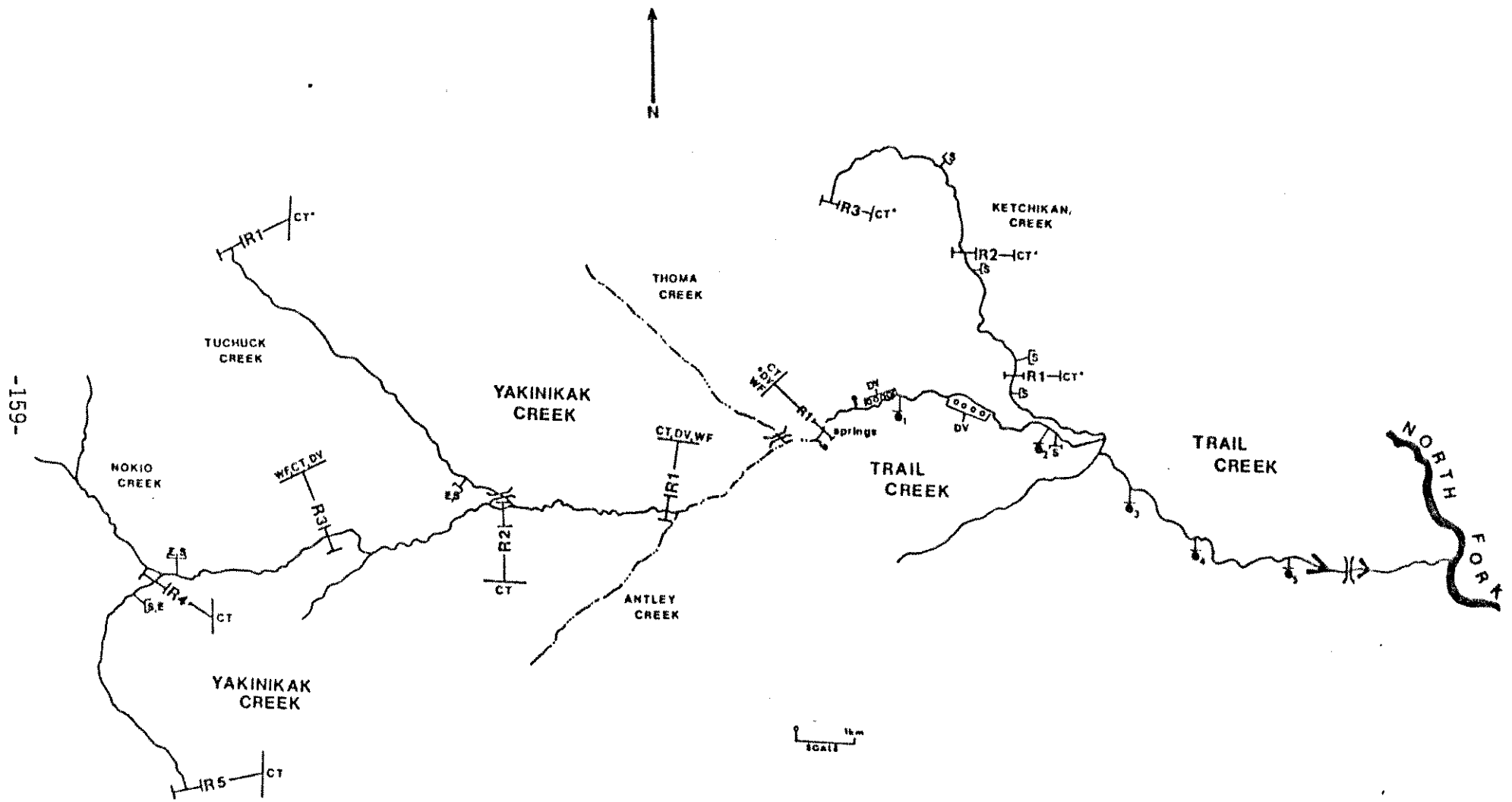

Figure 35. Fish population information by reach for the Trail Creek drainage.

Table 71. 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	DB7	11.4	North Fork	bottom dry area	1311	mouth Trail Creek	1170

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
5	186.1	15.0	.30	20	155	5	swirling/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	--	1.47	16	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	55	38	5	2	2	18	78	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	30	20	19	1	45	1.2	94	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	1	1	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)
--	--	0.76	.008	0.01	21.7	.062	--	--	13.2

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	3.6	80	35	4.1	79	82	9.7	81

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	1.6	0.1	0.9	0.7	present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	19	2	1	11	22

Table 72. Stream habitat and fish population data for Ketchikan 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)
Ketchikan Creek	001	DCA	3.0	North Fork	2 km above junction with trail	1284.0	junction with trail	1236.0

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	13.8	2.7	.13	5	700	80	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	P	low	--	0.03	--	low	0.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
19	70	11	0	0	0	100	0	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
40	50	10	0	0	14	0.5	107	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
aggrading	fluvial	low	moderate	20	80	80	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
29.8	4.8	11.5	17.3	0	0	0	0	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
33	33	139	540	0	0	0	0

Table 73. Stream habitat and fish population data for Ketchikan 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)
Ketchikan Creek	002	DCB	1.5	North Fork	.2 km below Johnson Creek	1356.0	2 km above junction with trail	1284.0

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	--	3.0	.13	5	50	10	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	low	--	0.04	--	low	0.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	29	67	4	0	0	8	92	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	23	4.9	66	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	30	60	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
--	--	--	--	--	--	--	--	--

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
1.7	3.8	4.7	8.6	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
2	26	57	268	0	0	0	0

Table 74. Stream habitat and fish population data for Ketchikan 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)
Ketchikan Creek	003	DB9	3.7	North Fork	headwaters	1483	.2 km below Johnson Creek	1368

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	--	2.2	.12	2	100	41	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	R	moderate	--	.02	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	50	30	10	0	10	40	50	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
30	40	29	1	0	9	3.1	90	flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	moderate	low	10	30	10	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
8.1	4.1	4.1	8.9	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
9	28	49	278	0	0	0	0

Table 75. Stream habitat and fish population data for Yakinikak 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)
Yakinikak Creek	001	DCG	3.0	North Fork	.1 km above Antley Creek	1353	junction with Thoma	1311

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
5	139.1	6.0	.27	9	50	3	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	--	0.95	--	low	1.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	44	39	9	6	8	25	61	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	20	20	20	30	48	1.4	64	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	55	10	10	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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 76. Stream habitat and fish population data for Yakinikak 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)
Yakinikak Creek	002	DCF	3.2	North Fork	.1 km above Seemo Creek	1408	1 km above Antley Creek	1353

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	--	10.0	.40	10	150	15	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)
X	P	low	--	0.67	--	low	1.2

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
12	40	40	8	5	25	25	45	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	30	25	24	1	4	1.7	79	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	30	1	1	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
0	0	0	0	0	0	0	0	absent	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 77. Stream habitat and fish population data for Yakinikak 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)
Yakinikak Creek	003	DCE	3.3	North Fork	top Big Beaver Dam	1457	.1 km above Seemo Creek	1408

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	1.30	10	200	20	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	low	--	0.42	--	low	1.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
8	50	30	12	5	5	30	60	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	60	5	5	0	20	1.5	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	20	10	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 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	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Table 78. Stream habitat and fish population data for Yakinikak 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)
Yakinikak Creek	004	DCD	3.6	North Fork	junction with Nokio Creek	1506	top Big Beaver Dams	1457

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	--	8.0	.24	13	63	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)
X	C	low	--	0.46	--	low	1.4

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
12	50	20	18	4	20	46	30	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	50	10	9	1	57	1.3	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	20	1	30	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0.4	5.7	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	5	178	0	0	0	0

Table 79. Stream habitat and fish population data for Yakinikak 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)
Yakinikak Creek	005	DCC	2.7	North Fork	headwaters	1801	junction with Nokio Creek	1506

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	--	3.4	.15	6	40	7	swirling/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	--	0.22	--	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
5	20	50	25	1	18	20	61	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
26	42	15	15	2	33	10.7	80	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
stable	fluvial	low	high	20	30	20	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
--	--	--	--	--	--	--	--	--

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	0.7	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	1	22	0	0	0	0

Table 80. Stream habitat and fish population data for Tuchuck 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)
Tuchuck Creek	001	DCH	6.5	North Fork	headwaters	1603	mouth Tuchuck campground	1496

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	27.2	4.0	.19	8	60	7	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	low	--	0.23	--	low	1.0

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
2	40	50	8	1	9	12	78	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
26	44	14	13	3	36	1.6	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	30	20	30	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
--	--	--	--	--	--	--	--	--

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
2.3	2.8	6.9	9.3	0	0	0	0	absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
3	19	83	290	0	0	0	0

KISHENEHN CREEK DRAINAGE

KISHENEHN CREEK REACH I

Channel Characteristics: Date Surveyed: 8-5-80 (Figure 36)

Kishenehn Creek Reach I is the only reach of this creek in the U.S. It flows from the U.S.-Canada border to the North Fork River and is a third order tributary. The average wetted width was 24 m and the average depth was 33.5 cm. Reach I contained 55% run and 45% pocketwater. Channel debris was low, with 70% being stable. Overhanging vegetation provided little bank cover and instream cover was moderate. Stream gradient was 1.5% and the D-90 was 35 cm. Three major slump areas were observed.

Valley Characteristics:

The upper bank slope gradient was 30-40% and the valley to channel ratio was 2:1. The average valley width was 150 m. Reach I was occasionally confined and had an irregular meandering stream pattern. The upper end of the Kishenehn drainage has been heavily logged although a 75 m buffer strip remains on each bank.

Fish Populations: (Figure 37)

Bull trout, westslope cutthroat trout, mountain whitefish and sculpins were observed in Reach I. Kishenehn Creek was used extensively by migratory westslope cutthroat and to a moderate extent by adfluvial bull trout. A barrier to adfluvial migration is located 2 km below the mouth of Beavertail Creek in Canada.

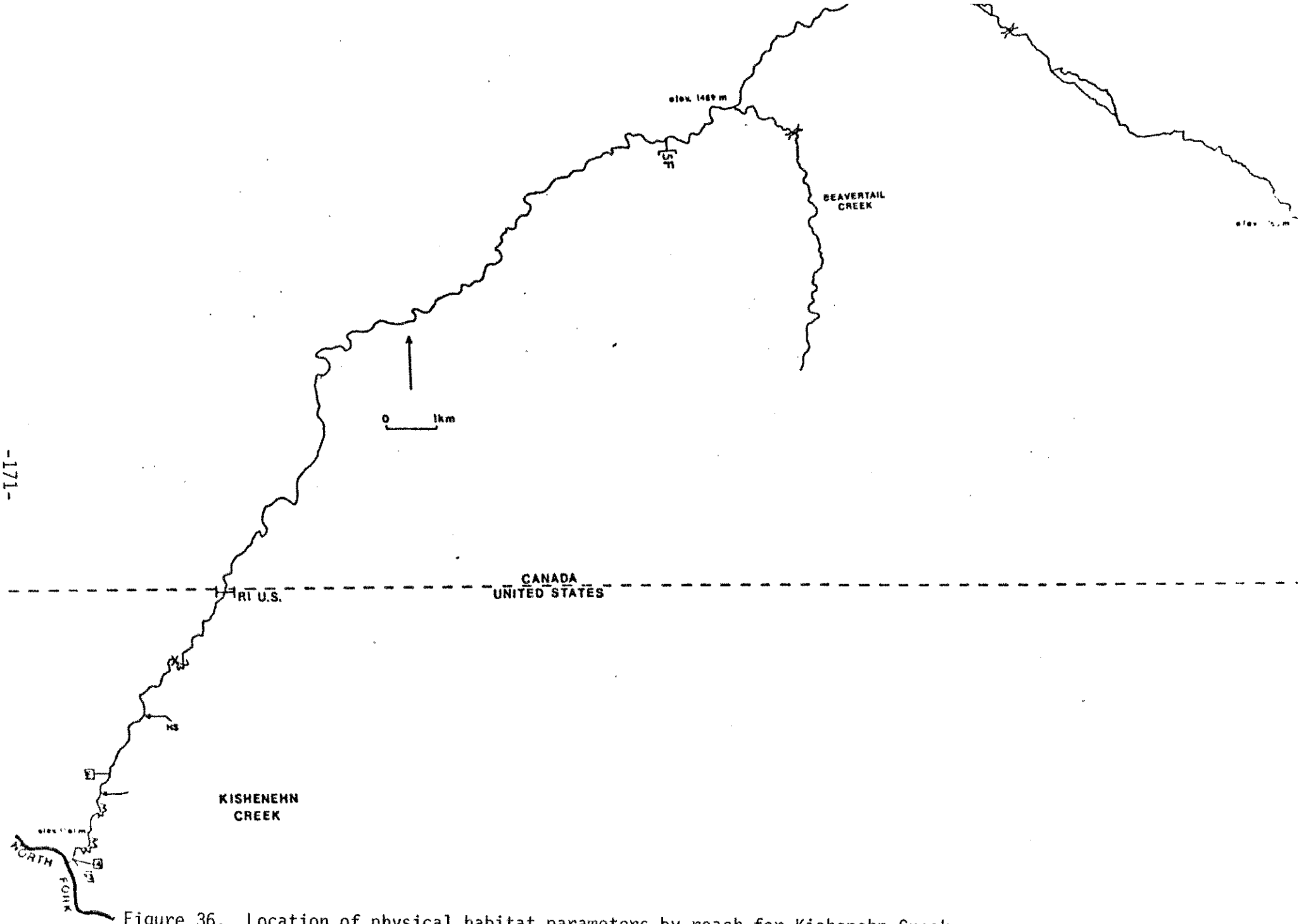

Figure 36. Location of physical habitat parameters by reach for Kishenehn Creek.

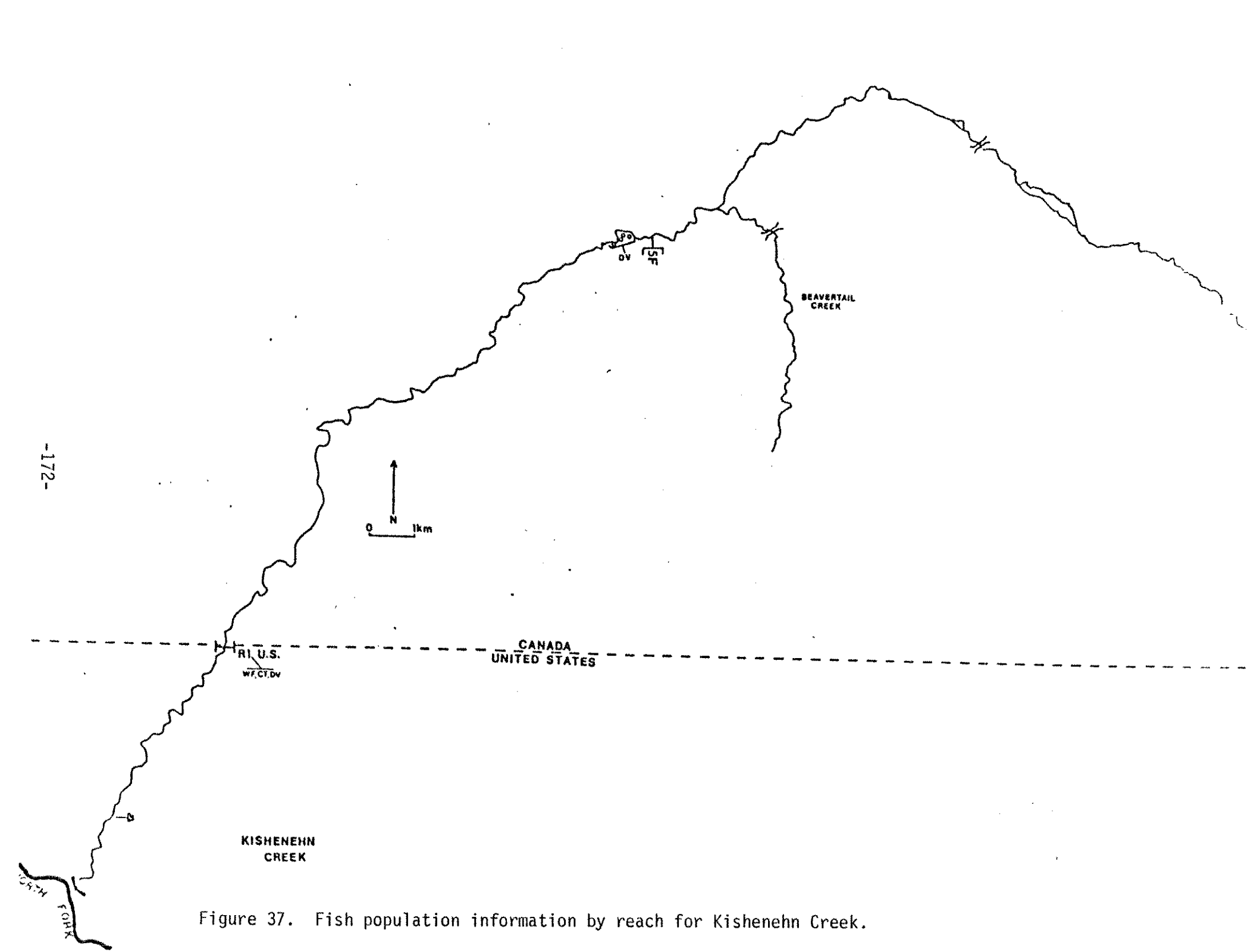

Figure 37. Fish population information by reach for Kishenehn Creek.

Table 81. Stream habitat and fish population data for Kishenehn 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)
Kishenehn Creek	001	DBO	8.7	North Fork	Canadian border	1307	mouth	1179

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	17.7	14.0	.34	76	150	2	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	high	1.39	1.90	1.7	low	1.5

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	55	45	0	0	50	50	0	0

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
23	37	33	7	0	35	1.5	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	low	70	10	10	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)
112	70	0.46	.005	0.01	24.9	.073	1.6	--	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	0	0	0	0	0	0

SPRUCE CREEK DRAINAGE

SPRUCE CREEK REACH I

Channel Characteristics: Date Surveyed: 7-28-80 (Figure 38)

Reach I of Spruce Creek is a third order tributary which originates in Canada. Average wetted width was 5.3 m and the average depth was 18.1 cm. This reach contained 20% run and 80% riffle with no pools or pocket water. Debris presence was variable throughout the reach and was 70% stable. There was a moderate amount of instream and bank cover present. The channel gradient was 1.8% with a D-90 of 19.3 cm. The lower end of Spruce Creek flowed through a cottonwood flat and became intermittent during time of low flow.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 99:1. The average valley width was 800 m. This reach had an unconfined channel.

Fish Populations: (Figure 39)

Cutthroat trout and sculpins were present in this reach.

SPRUCE CREEK REACH II

Channel Characteristics: Date Surveyed: 7-29-80 (Figure 38)

Reach II of Spruce Creek is a third order tributary which originates in Canada. Average wetted width was 5.8 m and the average depth was 21.4 cm. The reach had 25% run, 70% riffle and 5% pocketwater. Channel debris was low and 30% was stable. Bank cover was low and instream cover was generally moderate. The channel gradient was 2.6% and the D-90 was 38.3 cm.

Valley Characteristics:

The upper bank slope gradient was 30-40%. This reach had a valley to channel ratio of 7:1 with an average valley width of 100 m.

Fish Populations: (Figure 39)

Cutthroat trout were observed in this reach at a density of 9.8 trout per 100 m^2.

SAGE CREEK DRAINAGE

SAGE CREEK REACH I

Channel Characteristics: Date Surveyed: 7-28-80 (Figure 38)

Reach I is a fourth order tributary. Average wetted width was 16.4 m and the average depth was 29 cm. This reach had 66% run, 24% riffle and 10% pools. It contained a low amount of debris and 10% was stable. There was only a trace of bank cover and instream cover was moderate. The channel gradient was 0.2% and the D-90 was 21 cm.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was 3:1. The average valley width was 150 m with an unconfined channel.

Fish Populations: (Figure 39)

Cutthroat trout, mountain whitefish and sculpins were observed in Reach I. Cutthroat were the predominant species with a density of 11.1 cutthroat per 100 m^2. Juvenile bull trout were not observed in electrofishing or snorkeling transects although spawning by adfluvial bull trout has been documented.

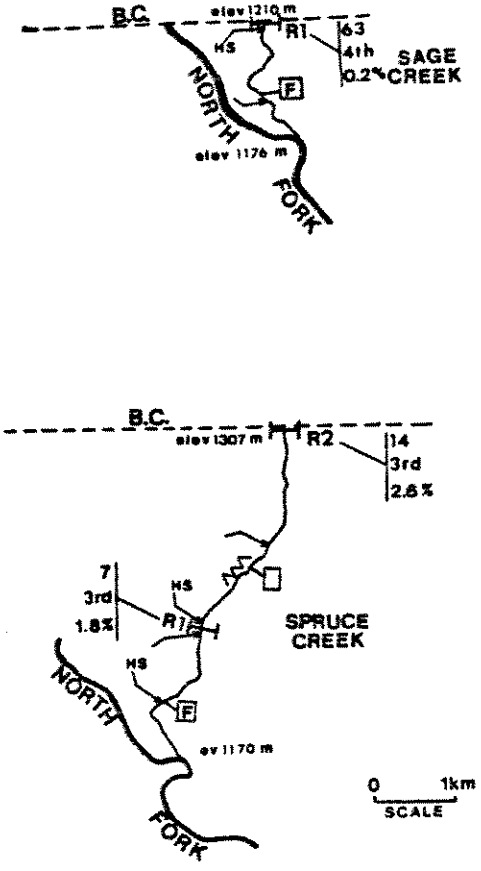

Figure 38. Location of physical habitat parameters by reach for Spruce Creek and Sage Creek.

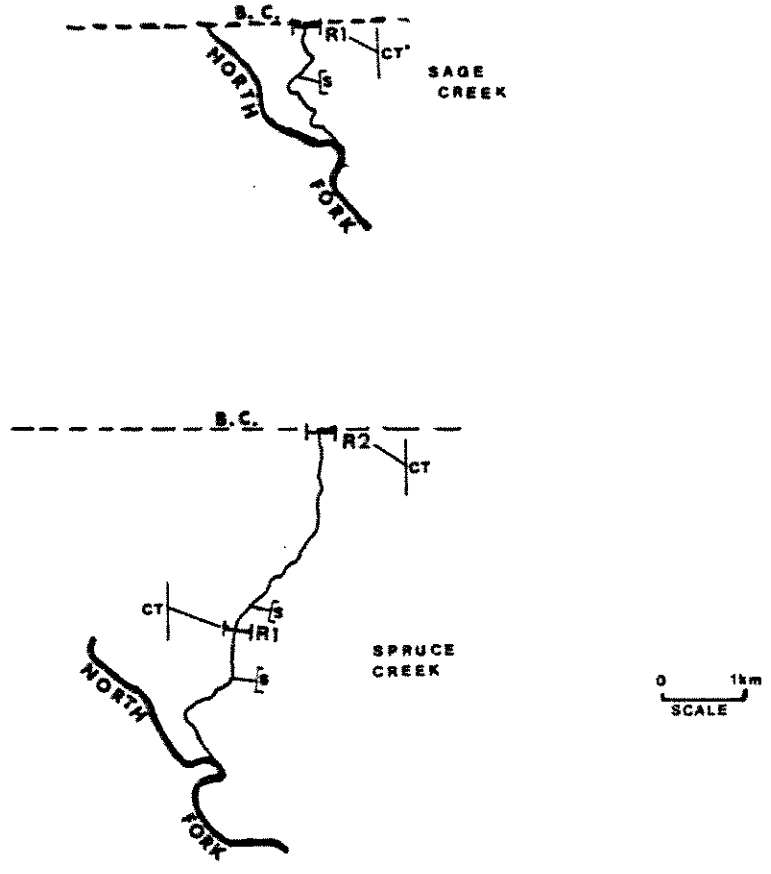

Figure 39. Fish population information by reach for Spruce Creek and Sage Creek.

Table 82. Stream habitat and fish population data for Spruce 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)
Spruce Creek	001	DBP	2.0	North Fork	2 km up from mouth	1216	mouth	1170.0

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	7.5	5.8	.18	7	800	99	swirling

Confinement	Pattern	Side channel occurence	Average low flow	Flow during survey (m³/sec)	Average peak water temp(C)	Turbidity	Maximum pool depth(m)
U	P	moderate	--	0.07	--	low	0.7

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	20	75	5	0	0	0	0	100

% bed material					D-90			
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	% gradient	Stability rating	Bank form
15	55	30	0	0	19	1.8	95	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	70	15	17	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	1.0	2.6	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
present	absent

Biomass (grams/100 m² surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	0	12	81	0	0	0	0

Table 83. Stream habitat and fish population data for Spruce 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)
Spruce Creek	002	DBS	3.4	North Fork	Canadian border	1307	1 km up from mouth	1216

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	--	5.1	.21	14	100	7	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	P	high	--	0.12	--	low	0.9

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
0	31	62	7	6	18	45	31	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	40	30	10	0	38	2.6	106	repose

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	low	low	30	3	3	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
--	--	--	--	--	--	--	--	--

Fish population data

Density (no/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	2.2	5.8	1.8	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0	15	70	56	0	0	0	0

Table 84. Stream habitat and fish population data for Sage 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)
Sage Creek	001	DBT	2.1	North Fork	Canadian border	1210	mouth	1195

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	6.2	16.4	.29	63	150	3	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	high	0.90	1.35	--	low	1.6

% pool	% run	% riffle	% pocket-water	% class I pools	% class II pools	% class III pools	% class IV pools	% class V pools
10	62	24	4	40	20	0	40	0

% bed material								
% fines	%gravel	% rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
25	50	25	0	0	21	0.2	101	flat

Bank Process	Bank genetic material	Flood plain debris	Channel debris	% stable channel debris	% cover-canopy	% cover overhang	% cover-snorkel section
failing	fluvial	moderate	low	10	3	3	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)
115	92	0.71	.006	0.01	29.4	.078	1.8	--	3.4

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			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
0.4	0.1	0	11.0	0	0	0	0

Other species	
Mountain Whitefish	Eastern Brk trout
absent	absent

Biomass (grams/100 m^2 surface area)

Cutthroat				Bull trout			
Age 0	Age I	Age II	Age III+	Age 0	Age I	Age II	Age III+
1	1	0	343	0	0	0	0

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STATE CODE NUMBERS BY CREEK

08-1160 Canyon Creek
08-4640 McGinnis
08-3820 Kimmerly
08-0680 Big Creek
08-3240 Hallowatt
08-6400 Skookoleel
08-7660 Werner
08-5020 Nicola
08-3840 Kletomus
08-4000 Langford
08-1110 Camas Creek
08-2390 Dutch
08-0210 Anaconda Creek
08-4270 Logging Creek
08-1620 Coal Creek
08-4580 Mathias
08-6620 South Fork Coal
08-1980 Dead Horse
08-1840 Cyclone
08-5650 Quartz Creek
08-1810 Cummings
08-4920 Moran Creek
08-3340 Hay Creek
08-0830 Bowman
08-0110 Akokala Creek
08-5370 Parke
08-4275 Long Bow
08-5760 Red Meadow
08-4900 Moose Creek
08-2810 Ford Creek
08-7700 Whale Creek
08-6320 Shorty
08-3830 Kintla Creek
08-7330 Trail Creek
08-3790 Ketchican
08-7940 Yakinikak
08-7400 Tuchuck
08-6990 Starvation Creek
08-3835 Kishenehn Creek
08-6845 Spruce Creek
08-6030 Sage Creek