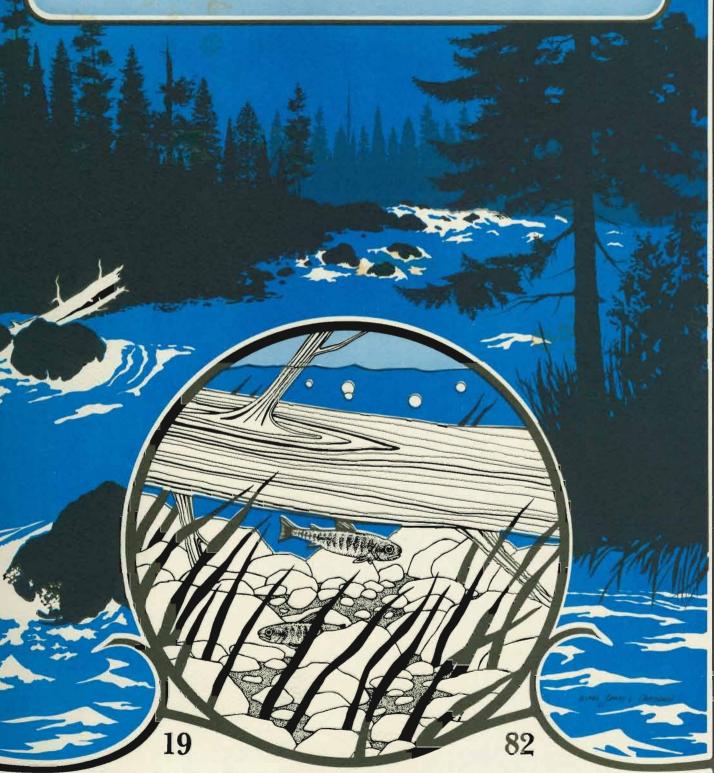
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FLATHEAL



FISH AND HABITAT INVENTORY OF STREAMS IN THE MIDDLE FORK OF THE FLATHEAD RIVER
Research Conducted by: MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS

Sponsored by: ENVIRONMENTAL PROTECTION AGENCY

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

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Sponsored By

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TABLE OF CONTENTS

																			Page
ACKNOWLEDGEMENTS			*	•			•		•	•	•	•	•			•		•	ii
LIST OF TABLES			•		•	•	•	•	•	•	•	•	•	•	•	٠	•	•	ix
LIST OF FIGURES		•	•		•					•	•	•	•	*:	•	•			xv
INTRODUCTION				•						•	•					•	•		1
McDONALD CREEK DRAINAGE			•		•		•	•	•	•	•	•	•	•			•	•	11
McDONALD CREEK REACH 1	, .			•						•		•	•	*			•	•	11
LINCOLN CREEK DRAINAGE			•								•	•	•	۰	*				15
LINCOLN CREEK REACH 1	•			•	•	•				•	•	•	•					ų	15
LINCOLN CREEK REACH 2				•	•		•		•	•	•	•	•	•		•	·		15
Walton Creek Reach 1 .	•				•	•		•	•		•		•	•	•		•		16
Walton Creek Reach 2 .			•	•	•			•		•		•	•						16
DEERLICK CREEK DRAINAGE	•		•			•										٠			24
DEERLICK CREEK REACH 1	•					•								•			•	•	24
HARRISON CREEK DRAINAGE	•				•													•	28
HARRISON CREEK REACH 1	•				•						•					•			28
NYACK CREEK DRAINAGE	• .																		32
NYACK CREEK REACH 1	•		•																32
NYACK CREEK REACH 2									•								•		32
COAL CREEK DRAINAGE	•						•				•		•	•				•	38
COAL CREEK REACH 1	•																		38
COAL CREEK REACH 2	•															•			38
COAL CREEK REACH 3																•			39
Pinchot Creek Reach 1.	•			•	•							•	•						39
Pinchot Creek Reach 2.	•										•	•		•		•			40
STANTON CREEK DRAINAGE																			48

																										Page
	STANTON CR	EEK RE	ACH	1			٠	*	*			*	.*	*			•		*		•		•	*	•	48
TUNN	EL CREEK DR	A INAGE			•	ě		¥			¥		ų,			•		•			•	•				52
	TUNNEL CRE	EK REA	CH	1				•	ě			•			9			٠	٠		·					52
	TUNNEL CRE	EK REA	CH	2		•:														•						52
MUIR	CREEK DRAI	NAGE .				•	*						*		•					٠						58
	MUIR CREEK	REACH	1	•	*	•		•							•					•	٠	è				58
	MUIR CREEK	REACH	2					*	*										é		•					58
	MUIR CREEK	REACH	1 3										*											٠		59
PAOL	A CREEK DRA	INAGE.	200	٠					*	•					•	•	•	•	•		•	*				65
	PAOLA CREE	K REAC	H 1										•				•		•		•	÷	ě			65
PARK	CREEK DRAI	NAGE .		(*)	•		•	•	•				-00						*	(e)	æ					69
	PARK CREEK	REACH	1			*		×			,					•	•			•					,	69
	PARK CREEK	REACH	1 2		•		•									•										69
	PARK CREEK	REACH	3			•			•						•											70
	PARK CREEK	REACH	4				¥	*		*	•				٠	٠.			٠	•		٠			٠	70
DICK	EY CREEK DR	AINAGE		•	•	•								٠		•	٠	•	٠			•				78
	DICKEY CRE	EK REA	CH	1	*:				.*				2						•							78
OLE (CREEK DRAIN	AGE.	((*)			•	÷					*								•					٠	82
	OLE CREEK	REACH	1.	•					•	•				•			•			•						82
	OLE CREEK	REACH	2.	•			*		•			*	*							•:		*				82
	OLE CREEK	REACH	3.		×		¥		٠			i i										×	¥			83
ESSE	X CREEK DRA	INAGE.	•	•	ě	*			•	•			•	•		•		•	•							89
	ESSEX CREE	K REAC	H 1				*		•					•				•	•	•						89
	ESSEX CREE	K REAC	H 2	2.	•	•	*		٠					•				(4)		4						89
RFΔR	CREEK DRAT	NACE		- 41	91							72		-	-						27	2	22			95

	Page
BEAR CREEK REACH 1	95
BEAR CREEK REACH 2	95
BEAR CREEK REACH 3	96
Giefer Creek Reach l	96
Skyland Creek Reach 1	97
CHARLIE CREEK DRAINAGE	109
CHARLIE CREEK REACH 1	109
CHARLIE CREEK REACH 2	109
CHARLIE CREEK REACH 3	110
LONG CREEK DRAINAGE	111
LONG CREEK REACH 1	111
LONG CREEK REACH 2	111
LONG CREEK REACH 3	112
Bergsicker Creek Reach 1	112
Bergsicker Creek Reach 2	113
TWENTY-FIVE MILE CREEK DRAINAGE	124
TWENTY-FIVE MILE CREEK REACH 1	124
TWENTY-FIVE MILE CREEK REACH 2	124
TWENTY-FIVE MILE CREEK REACH 3	125
GRANITE CREEK DRAINAGE	131
GRANITE CREEK REACH 1	131
GRANITE CREEK REACH 2	131
Challenge Creek Reach 1	132
Dodge Creek Reach 1	132
LAKE CREEK DRAINAGE	140

Page
140
140
141
141
149
149
149
150
150
151
152
152
163
163
163
164
164
165
165
166
166
178
178
179
179

		Page
	COX CREEK REACH 2	179
CLACI	K CREEK DRAINAGE	186
	CLACK CREEK REACH 1	186
	CLACK CREEK REACH 2	186
	CLACK CREEK REACH 3	187
BOWL	CREEK DRAINAGE	193
	BOWL CREEK REACH 1	193
	BOWL CREEK REACH 2	193
	BOWL CREEK REACH 3	194
	BOWL CREEK REACH 4	194
	BOWL CREEK REACH 5	195
	Basin Creek Reach 1	195
	Basin Creek Reach 2	196
	Basin Creek Reach 3	196
STRAI	WBERRY CREEK DRAINAGE	208
	STRAWBERRY CREEK REACH 1	208
	STRAWBERRY CREEK REACH 2	208
	STRAWBERRY CREEK REACH 3	209
	STRAWBERRY CREEK REACH 4	209
	Trail Creek Reach 1	210
	Trail Creek Reach 2	211
	South Fork Trail Creek Reach 1	211
	Gateway Creek Reach 1	212
	Gateway Creek Reach 2	212
	Gateway Creek Reach 3	213

	Page
Gateway Creek Reach 4	213
East Fork Strawberry Creek Reach 1	214
LITERATURE CITED	229
APPENDIX A	A1
APPENDIX B	B1

LIST OF TABLES

le	Page
Reach information and river km location for Middle Fork tributaries surveyed in 1979, 1980 and 1981	3
Stream habitat and fish population data for McDonald Creek, Reach 1	14
Stream habitat and fish population data for Lincoln Creek, Reach 1	20
Stream habitat and fish population data for Lincoln Creek, Reach 2.	21
Stream habitat and fish population data for Walton Creek, Reach 1	22
Stream habitat and fish population data for Walton Creek, Reach 2	23
Stream habitat and fish population data for Deerlick Creek, Reach 1	27
Stream habitat and fish population data for Harrison Creek, Reach 1	31
Stream habitat and fish population data for Nyack Creek, Reach 1	36
Stream habitat and fish population data for Nyack Creek, Reach 2	37
Stream habitat and fish population data for Coal Creek, Reach	43
Stream habitat and fish population data for Coal Creek, Reach 2	44
Stream habitat and fish population data for Coal Creek, Reach 3	4 5
Stream habitat and fish population data for Pinchot Creek, Reach 1	46
Stream habitat and fish population data for Pinchot Creek, Reach 2	47
Stream habitat and fish population data for Stanton Creek, Reach 1	51
	Reach information and river km location for Middle Fork tributaries surveyed in 1979, 1980 and 1981 Stream habitat and fish population data for McDonald Creek, Reach 1. Stream habitat and fish population data for Lincoln Creek, Reach 1. Stream habitat and fish population data for Lincoln Creek, Reach 2. Stream habitat and fish population data for Walton Creek, Reach 1. Stream habitat and fish population data for Walton Creek, Reach 2. Stream habitat and fish population data for Deerlick Creek, Reach 1. Stream habitat and fish population data for Deerlick Creek, Reach 1. Stream habitat and fish population data for Nyack Creek, Reach 1. Stream habitat and fish population data for Nyack Creek, Reach 2. Stream habitat and fish population data for Coal Creek, Reach 1. Stream habitat and fish population data for Coal Creek, Reach 2. Stream habitat and fish population data for Coal Creek, Reach 3. Stream habitat and fish population data for Pinchot Creek, Reach 1. Stream habitat and fish population data for Pinchot Creek, Reach 1. Stream habitat and fish population data for Pinchot Creek, Reach 2. Stream habitat and fish population data for Pinchot Creek, Reach 2.

Table		Page
17	Stream habitat and fish population data for Tunnel Creek, Reach 1	56
18	Stream habitat and fish population data for Tunnel Creek, Reach 2	57
19	Stream habitat and fish population data for Muir Creek, Reach 1	62
20	Stream habitat and fish population data for Muir Creek, Reach 2	63
21	Stream habitat and fish population data for Muir Creek, Reach 3	64
22	Stream habitat and fish population data for Paola Creek, Reach 1	68
23	Stream habitat and fish population data for Park Creek, Reach 1	74
24	Stream habitat and fish population data for Park Creek, Reach 2	7 5
2 5	Stream habitat and fish population data for Park Creek, Reach 3	76
26	Stream habitat and fish population data for Park Creek, Reach 4	77
27	Stream habitat and fish population data for Dickey Creek, Reach 1	81
28	Stream habitat and fish population data for Ole Creek, Reach 1	86
29	Stream habitat and fish population data for Ole Creek, Reach 2	87
30	Stream habitat and fish population data for Ole Creek, Reach 3	88
31	Stream habitat and fish population data for Essex Creek, Reach 1	93
32	Stream habitat and fish population data for Essex Creek, Reach 2	94

Table				Page
33			data for Bear Creek, Reach	104
34			data for Bear Creek, Reach	105
35			data for Bear Creek, Reach	106
36			data for Giefer Creek,	107
37			data for Skyland Creek,	108
38			data for Charlie Creek,	116
39			data for Charlie Creek,	117
40			data for Charlie Creek,	118
41		* *	data for Long Creek, Reach	119
42	and the second second second		data for Long Creek, Reach	120
43			data for Long Creek, Reach	121
44			data for Bergsicker Creek	122
45			data for Bergsicker Creek,	123
46			data for Twenty-five Mile	128
4 7			data for Twenty-five Mile	129
48			data for Twenty-five Mile	130

Table		Page
49	Stream habitat and fish population data for Granite Creek, Reach 1	136
50	Stream habitat and fish population data for Granite Creek, Reach 2	137
51	Stream habitat and fish population data for Challenge Creek, Reach 1	138
52	Stream habitat and fish population data for Dodge Creek, Reach 1	139
53	Stream habitat and fish population data for Lake Creek, Reach 1	145
54	Stream habitat and fish population data for Lake Creek, Reach 2	146
55	Stream habitat and fish population data for Miner Creek, Reach	147
56	Stream habitat and fish population data for Miner Creek, Reach 2	148
57	Stream habitat and fish population data for Morrison Creek, Reach 1	156
58	Stream habitat and fish population data for Morrison Creek, Reach 2	157
59	Stream habitat and fish population data for Morrison Creek, Reach 3	158
60	Stream habitat and fish population data for Morrison Creek, Reach 4	159
61	Stream habitat and fish population data for Lodgepole Creek, Reach l	160
62	Stream habitat and fish population data for Lodgepole Creek, Reach 2	161
63	Stream habitat and fish population data for Whistler Creek, Reach 1	162
64	Stream habitat and fish population data for Schafer Creek, Reach 1	170

Table				Page
6 5			data for Schafer Creek,	17]
66	Stream habitat and fi		data for Schafer Creek,	172
67			data for Schafer Creek,	173
68			data for Dolly Varden Creek,	174
69			data for Argosy Creek,	175
70			data for Argosy Creek,	176
71			data for West Fork Schafer	177
72			data for Calbick Creek,	183
73	_		data for Cox Creek, Reach .	184
74			data for Cox Creek, Reach .	185
75			data for Clack Creek, Reach	190
76			data for Clack Creek, Reach	191
77		fish population	data for Clack Creek, Reach	192
78	Stream habitat and		data for Bowl Creek, Reach	200
79	Stream habitat and	fish population	data for Bowl Creek, Reach	201
80			data for Bowl Creek, Reach	202

Table				Page
81			data for Bowl Creek, Reach	203
82			data for Bowl Creek, Reach	204
83			data for Basin Creek, Reach	205
84			data for Basin Creek, Reach	206
85			data for Basin Creek, Reach	207
86			data for Strawberry Creek,	217
87			data for Strawberry Creek,	218
88		- +	data for Strawberry Creek,	219
89		~ +	data for Strawberry Creek,	220
90			data for Trail Creek, Reach	221
91		The control of the second second second	data for Trail Creek, Reach	222
92			data for South Fork Trail	223
93			data for Gateway Creek,	224
94			data for Gateway Creek,	22 5
9 5			data for Gateway Creek,	226
96 97	Reach 4		data for Gateway Creek, data for East Fork Straw-	227
				228

LIST OF FIGURES

F,	igure	e	Page
	1	Drainage map of the Middle Fork Flathead River showing major tributaries	2
	2	Legend for physical habitat maps	8
	3	Legend for fish population maps	9
	4	Physical habitat information for McDonald Creek	12
	5	Fish population information for McDonald Creek	1.3
	б	Physical habitat information for the Lincoln Creek drainage	18
	7	Fish population information for the Lincoln Creek drainage	19
	8	Physical habitat information for Deerlick Creek	25
	9	Fish population information for Deerlick Creek	26
	10	Physical habitat information for Harrison Creek	29
	11	Fish population information for Harrison Creek	30
	12	Physical habitat information for Nyack Creek	34
	13	Fish population information for Nyack Creek	35
	14	Physical habitat information for the Coal Creek drainage	41
	15	Fish population information for the Coal Creek drainage	42
	16	Physical habitat information for Stanton Creek	49
	17	Fish population information for Stanton Creek	50
	18	Physical habitat information for Tunnel Creek	54
	19	Fish population information for Tunnel Creek	55
	20	Physical habitat information for Muir Creek	60
	21	Fish population information for Muir Creek	61
	22	Physical habitat information for Paola Creek	66
	23	Fish population information for Paola Creek	67
	24	Physical habitat information for Park Creek	72

LIST OF FIGURES (CONT.)

Figur	ce ce	Page
25	Fish population information for Park Creek	73
26	Physical habitat information for Dickey Creek	79
27	Fish population information for Dickey Creek	80
28	Physical habitat information for Ole Creek	84
29	Fish population information for Ole Creek	85
30	Physical habitat information for Essex Creek	91
31	Fish population information for Essex Creek	92
32	Physical habitat information for Bear Creek	98
33	Fish population information for Bear Creek	99
34	Physical habitat information for Giefer Creek	100
35	Fish population information for Giefer Creek	10 l
36	Physical habitat information for Skyland Creek	102
37	Fish population information for Skyland Creek	103
38	Physical habitat information for Charlie and Long Creek drainages	114
39	Fish population information for Charlie and Long Creek drainages.	115
40	Physical habitat information for Twenty-five Mile Creek	126
41	Fish population information for Twenty-five Mile Creek	127
42	Physical habitat information for the Granite Creek drainage	134
43	Fish population information for the Granite Creek drainage	135
44	Physical habitat information for the Lake Creek drainage	143
45	Fish population information for the Lake Creek drainage	144
46	Physical habitat information for the Morrison Creek drainage .	154
47	Fish population information for the Morrison Creek drainage	155
48	Physical habitat information for the Schafer Creek drainage	168

LIST OF FIGURES (CONT.)

Figui	ce	Page
49	Fish population information for the Schafer Creek drainage	169
50	Physical habitat information for Calbick and Cox Creek drainages	181
51	Fish population information for Calbick and Cox Creek drainages	182
52	Physical habitat information for Clack Creek	188
53	Fish population information for Clack Creek	189
54	Physical habitat information for the Bowl Creek drainage	198
55	Fish population information for the Bowl Creek drainage	199
56	Physical habitat information for the Strawberry Creek drainage	215
57	Fish population information for the Strawberry Creek drainage.	216

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INTRODUCTION

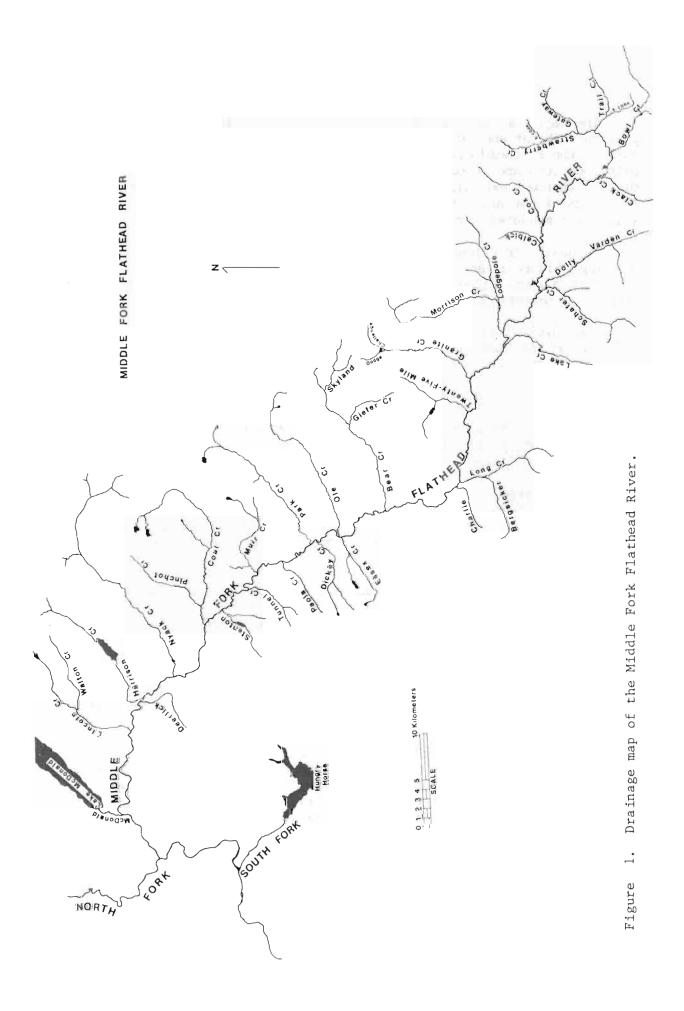
The maps, narratives and tables presented in this report summarize physical habitat and fish species information for tributaries to the Middle Fork of the Flathead River. Maps provide physical and biological sample site locations and stream reach information. The narratives briefly discuss channel and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

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

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

- fluvial systems are dynamic and stream channels can change over a period of time altering their physical character as well as orientation,
- 2) fish populations in the upper Flathead drainage are migratory and while areas identified by our surveys were assuredly important, it was probable that stream reaches not identified as important during our "point-in-time" survey could have been important during another time of year,
- 3) fish habitat in stream reaches inventoried may have been previously degraded by land use activities and were not capable of supporting fish at their natural potential, and
- 4) juvenile fish populations may have been below carrying capacity in some reaches due to inadequate adult spawning escapements resulting from migration barriers in the stream channel, exploitation by anglers, natural phenomena such as catastrophic events, or other causes.

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



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

Drainage	Distance above NF confluence (km)	Reach no.	Drainage area (km³)	Length (km)	Gradient (%)	Late summer flow (cfs)
McDonald Creek	7.4		440.1	!!	1	150.0
		П		3.3	0.2	1
Lincoln Creek	18.7		93.5	1	!	23.9
		П	1 1	8.0	2.0	
		2	! !	8.0	3.0	!
Walton	!!!!		24.4	F E I	1	i ! !
		1	 	3.7	4.8	!!!
		2		3.2	2.5	
Deerlick Creek	21.9		39.4		1	28.6
		1		5.1	0.2	!!
Harrison Creek	22.5		8.69	1	1	47.5
		1	1	5.3	1.9	
Nyack Creek	. 28.5		214.9	1	!!!	65.1
		1	!	11.4	0.2	-
		2	1	1.9	2.5	1
Coal Creek	37.6		144.1		[42.4
		П	!	5.6	2.4	}
		2		12.5	0.7	1
		3		7.6	2.7	!!!
Pinchot	!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!		6.64	1	!!!	
		П	!	1.8	4.5	;
		2	!	3.7	2.6	1
Stanton Creek	40.4		33.5	1	1	15.8
		-	!	2.4	3.5	1 1
Tunnel Creek	45.2		21.9		-	12.3
		1	<u> </u>	1.4	4.2	1
		2	!	4.3	0.9	!!
Muir Creek	49.2		34.8	-	1	7.4
		\vdash	1	1.9	5.0	1
		2	l I	2.4	3.8	!!;
		т	!	2.9	7.7	! ! !

Table 1. (Continued).

	Distance above					Late Summer
		Reach	Drainage	Length	Gradient	flow
Drainage	(km)	no.	$area(km^2)$	(km)	(%)	(cfs)
Dools Crost	52.9		16.9		! !	5.2
ו מסום	•	-	1 1	1.2	9.6	1
Park Creek	58.4		101.6	!	!!	22.2
		-		3.5	1.7	1
		2	-	8.4	6.0	1 1
		c	1 1	7.6	2.2	-
		4	-	3.2	4.5	
Dickey Creek	59.4		23.3	!	!	3.3
,		1	1	4.4	4.1	-
Ole Creek	63.2		119.5	1	1	33.6
		1	!!!	7.4	1.6	1
		2	!	4.0	1.1	!!!
		m	1	15.6	2.0	
Essex Creek	63.6		26.6	1	1	$\sqrt{-0}$
		1		1.9	2.2	!
		2		1.6	8.3	!
Bear Creek	71.4		145.4	i i	!	19.2
		1	-	5.9	1.8	1
		2	!	7.7	0.7	!
		c		10.1	2.6	1
Giefer	[15.7	i	!!	0.8
		1	1	3.7	2.5	i i
Skyland	111111		21.4		[] 1	7.4
		1		3.4	3.1	!
Charlie Creek	82.0		27.2	1		0.7
		1	!	9.0	2.2	!!!
		2	!	5.9	3.7	!
		М		2.9	11.2	1 1
Long Creek	83.2		57.0	1	! ! 1	7.8
		-1	!	2.7	. ·	1
		2	!	1.3	1.8	!
		3		4.6	5,5	1

Table 1. (Continued).

	Distance above					Late summer
	onflu	Reach	Drainage	Length	Gradient	flow
Drainage) [no.	area(km²)	(km)	(%)	(cfs)
Bergsicker	 		22.8	1	! !	1.1
		1		4.3	1.7	!
		2	1 1	1.8	2.5	
Twenty-five Mile Creek	92.4		53.6	1	-	6.1
		П	1	1.0	9.9	!
		2		3.9	2.3	! ! !
		m	1	6.4	6.7	1 1 1
Granite Creek	97.8		74.6	ļ	1	13.7
		1	1 1	7.9	1.7	1 1
		2	!	5.5	1.0	5.4
Challenge			18.9	1 1		1.1
		П	1	4.5	3,3	1 1 1
Dodge	!!!!!		11.1	1	!!	/ _ 0
		П	1	3.7	3,4	! ! !
Lake Creek	103.0		19.4	1	1 1	21.4
		1	!	2.5	2.5	1
		2	1	6.4	0.7	1
Miner			19.5	1	1	!
		. 1	i i I	2.5	1.3	!
		2	!	1.9	3,3	!
Morrison Creek	106.0		133.1		1	28.5
		1	!	7.5	1.1	1
		2		3.8	2.3	1
		М		8.8	1.7	
		7		2.3	5.2	1
Lodgepole	-		49.2		! !	8.4
			!	6.5	1.1	!
		2	1	4.1	2.8	1
Whistler	! ! ! !		10.1		1	2.6
		П		3.1	1.6	1 1 1

Table 1. (Continued).

	Distance above					Late summer
	NF confluence	Reach	Drainage	Length	Gradient	flow
Drainage	(km)	no.	area(km²)	(km)	(%)	(cfs)
; ;			, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			° 00
Schaier Creek	114.6		1.20.4	 		0.04
		П		7.6	0.7	1
		2	!	1.1	1.3	!!!
		3		4.8	1.0	-
		7		3.7	5.5	
Dolly Varden	1 1		68.4		!!	14.7
		1	1	13.1	1.0	1
Argosy			15.4	-		3.8
		П	1 1	1.5	5.8	1
		2	1	3.7	2.7	1 1
W.F. Schafer			15.6	1	!	-
		1	-	3.3	3.8	-
Calbick Creek	122.4		21.7	-	Í I 1	2.5
		1	1	4.3	2.3	1 1
Cox Creek	125.2		51.			1.4
		1	!	3.3	9.0	
		2	1	6.1	1.6	!
Clack Creek	137.7		36.57	1	!!	6.6
		1	1	2.8	1.0	!
		2	 	2.7	1.0	!
		c	ſ I	5.1	7.0	!
Bowl Creek	140.5		76.80	1	1	18.3
		1	-	2.6	1.0	!
		2	!	4.2	2.5	
		Э	1	1.6	1.0	!
		7	! !	6. 4	3.4	!
		5	-	2.4	3.8	-
Basin			25.25	1	!	4.1
		1	I I I	2.1	1.1	
		2	!	9.9	1.1	1
		3	-	1.8	2.2	

Table 1. (Continued).

	Distance above					Late summer
	NF confluence	Reach	Drainage	Length	Gradient	flow
Drainage	(km)	no.	area(km²)	(km)	(%)	(cfs)
Strawberry Creek	140 5		71.04	ļ	!	15.2
		1	1	4.9	0.7	!
		2	1	7.5	1.1	
		3	-	5.1	1.9	!
		7	-	2.3	1.0	!!!
Trail	1		49.91	1	1	9.6
		1	!	7.7	1.6	1
		2	!	4.0	2.7	1
S.F. Trail	1 1		15.7	1	1	1 !
		1	1 1	4.8	3.8	!
Gateway	;		19.63	į	1	4.0
		1	1	2.5	2.9	1 1
		2		2.2	0.4	!
		n	1	1.8	4.8	! !
		7	!	1.0	1.2	-
E.F. Strawberry	!		9.1	!	-	1
		1		3.0	5.2	-

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

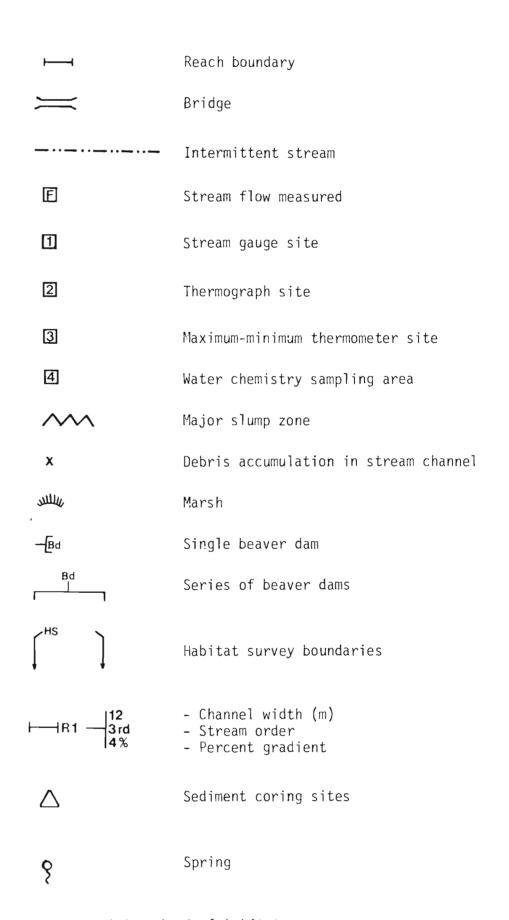


Figure 2. Legend for physical habitat map.

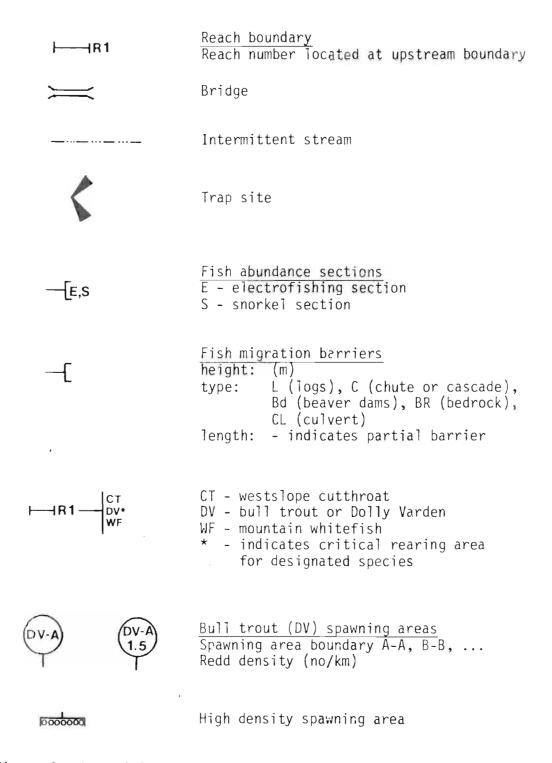


Figure 3. Legend for fish population map.

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

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

<u>Pattern</u>

- S Straight very little curvature within the reach
- N Sinuous slight curvature within a belt of less than approximately two channel widths
- P Irregular no repeatable pattern
- C Irregular meander a repeated pattern in vaguely present in the channel and the general valley trend is less than 90°
- 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 streambank is in continuous contact (coincident with) valley walls
- C Confined in continuous or repeated contact at the outside of major meander bends
- F Frequently confined by the valley wall
- X Occasionally confined by the valley wall
- U Unconfined not touching the valley wall
- N Not applicable (e.g., where no valley wall exists)

MCDONALD CREEK DRAINAGE

MCDONALD CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-19-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-19-81

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

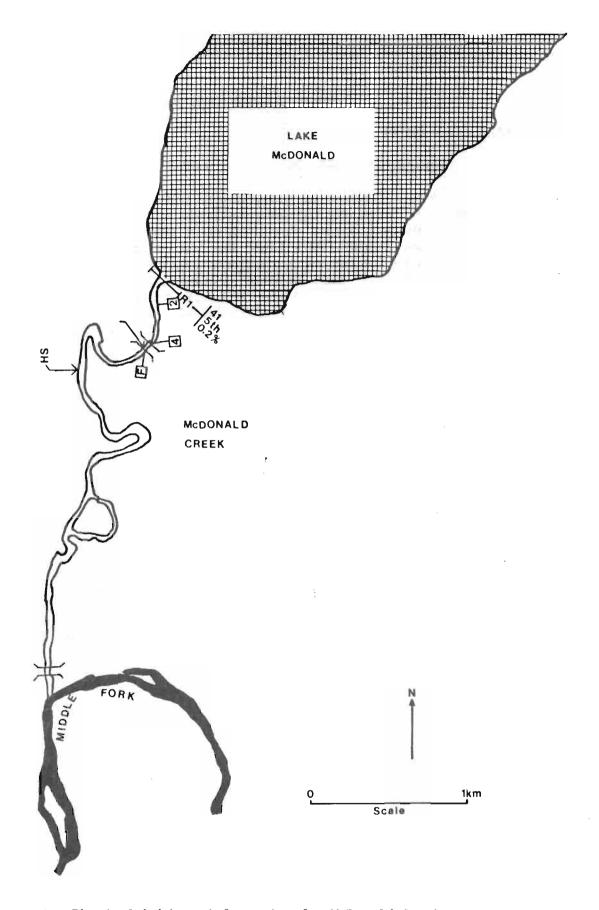


Figure 4. Physical habitat information for McDonald Creek.

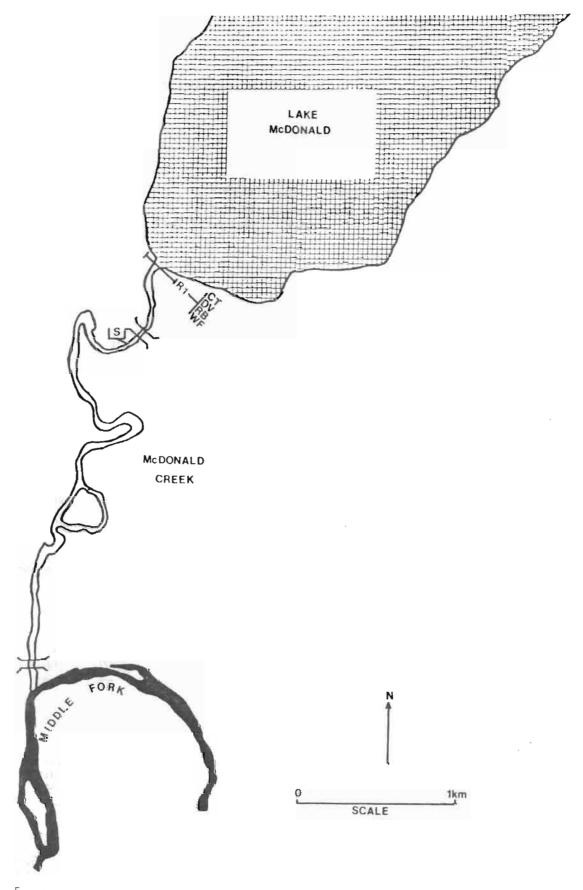


Figure 5. Fish population information for McDonald Creek.

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

Stream Name	Reach number		leach ength	Tributary <u>of</u>	Upper reach boundar	у	Upper elev.(m	Lower reach boundar	-у	Lower elev.(m)
lcDonald	001	C 7N	3.2	Middle Fork	Outle McDon	t of ald Lake	960.6		ion w/ Le Fork	954.6
Stream	Drainage area(km²) 440.1	Ave. wetted width(m) 29.8	Ave depth reac	for ch h(m) w	Ave. nannel idth(m) 41	Valley width(m) 1700	Valley- channel ratio 30		Flov character Plac	istics
Confine- ment	Pattern	Side channe occurence	1	verage low flow	Flow dur survey (m³/sec	, peal	erage k water np(C)	Turbidity	Maximu pool depth(
U	īJ	Low	-	4.2		_	_	Low	3.0	
⊊ pool	% run	% riffle		ocket- ater	⊊ class I pools	≈ class II poo			% class IV pools	% class V pools
10	90	0	•	0	100	0	0		0	0
		% bed mate				D-90	1	Stability	y	Bank
% fines	%grave1	% rubble	% b	oulder	%bedrock	<u>(cm)</u>	gradient	rating	-	form
15	65	19		I	0	21	0.2	70	R	epose
Bank Process	Ba gene mater		Flood plain debri		Channel debris	% stal channe debr	el % cove		over s	cover- norkel ection
Failing	Fluv	ial	Low		Low	80	1		1	12
Water chem	istry data									
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/1)		Total phos. ng/1)	No ₃ ⁻ (mg/l)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/1	K [†]) (<u>mg/l</u>	SO. (mg/1
105	51									
Spawning d	ata									
Number of bull trout redds in reach	Redo densit (no/km	:y	bull redd	er of trout s in ach	Redd density (no/km)	Year 	Number of bull trout redds in reach	Redd density (no/km)	Year 	
Fish popul	ation data									
Density (n	o/100 m² su	ırface area)						Other s untain	Eastern
DC.1.5.1.0										
	Cutthroat ge 1 Age	: II Age	111+	Age 0	Bull tr Age 1	out Age II	Age III+	Wh	itefish	8rk tro

LINCOLN CREEK DRAINAGE

LINCOLN CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-7-81

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

Valley Characteristics:

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

Fish Populations:

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

LINCOLN CREEK REACH 2

<u>Channel Characteristics</u>: Date Surveyed: 8-6-81

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

<u>Valley Characteristics:</u>

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

Fish Populations:

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

Walton Creek Reach 1

Channel Characteristics: Date Surveyed: 8-5-81

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

Valley Characteristics:

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

Fish Populations:

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

Walton Creek Reach 2

Channel Characteristics: Date Surveyed: 8-4-81

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat, eastern brook trout and a mature bull trout were observed. Density estimates of westslope cutthroat trout indicated an important rearing area with 12.0 age I or older fish per 100 m² surface area. High percentages of gravel in the bed material provided good spawning conditions. Bull trout spawning may occur in this reach; however, no conformation is available.

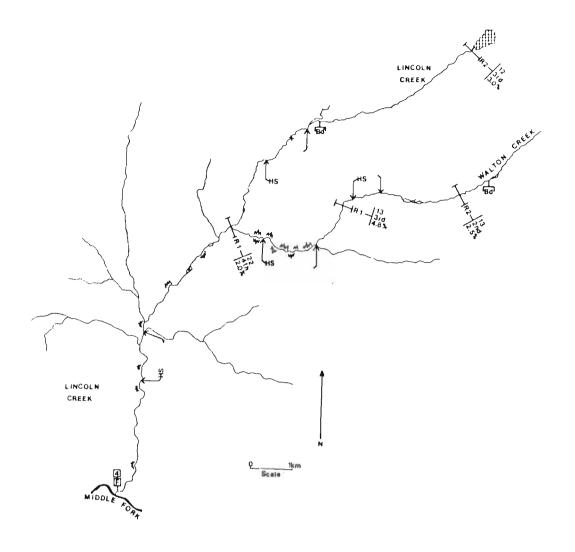


Figure 6. Physical habitat information for the Lincoln Creek drainage.

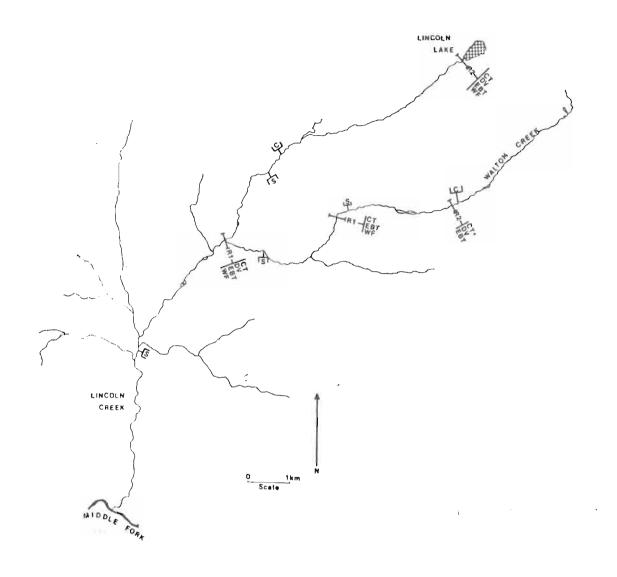


Figure 7. Fish population information for the Lincoln Creek drainage.

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

Stream Name Lincoln Cr.	Reach <u>number</u> 001	number <u>L</u>	each Tribut ength of .0 Midd Fork	<u>boundar</u> Le Junct	ion w/	Upper elev.(m 1155.2		•
Physical H Stream order 04	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m) 22	Valley width(m)	Valley- channel ratio	-	Flow haracteristics Ling, broken
Confine- ment X	Pattern P	Side channel occurence	Average l low flow	Flow du surve (m³/se	ring Av	erage k water	Turbidity Low	Maximum pool depth(m) 0.7
2 pool	* run 78	# riffle	pocket- water	% class 1 pools	% clas II poo O		ass % c	lass % class pools V pools
fines 15	%gravel	% bed mater % rubble 35	tial <u>a boulder</u>	%bedrock	D-90 (cm) 48	gradient 2.0	$\frac{\text{Stability}}{\text{rating}}$	Bank <u>form</u> Flat
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% stal channe debr	el % cove is canop	y overha	ng section
Failing	-	ial	Low	Low	50	1	1	20
Cond. (umohs/ cm)	Alk. (mg/1)	Total carbon (mg/l)	Total phos. (mg/1)	No₃ - (mg/l) 	Ca ⁺⁺ (mg/1)	Mg ^{.++} (mg/1)	Na ⁺ (mg/l <u>)</u> 	K ⁺ SO ₄ (mg/1) ————————————————————————————————————
Spawning o	fa ta							
Number of bull trout redds in reach	Redc densit (no/km	У	Number of bull trout redds in reach	Redd density (no/km) 	Year ——	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>
Density (r	Cutthroat	urface area)	111+ Age 0	Bull t	rout Age II	Age III+	Mounta White	

0

0.1

0

0

0.1

0.7

0

P

P

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

Stream <u>Name</u> Lincoln	Reach number 002	<u>number</u> <u>l</u>	Reach Tribut Length of 5.0 Middl Fork	<u>boundar</u> e Outle		Upper elev.(m 1395.		
Physical	Habitat dat	<u>a</u>				W 22		
Stream	Drainage	Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel	_	Flow
order 03	area(km²)	width(m) 8.2		width(m) 12	width(m) 60	<u>ratio</u> 	_	haracteristics oken, tumbling
7.		Side	Average	Flow dur	cina A	verage	DI	Maximum
Confine- ment	Pattern	channe	1 low	survey	, J pea	ak wäter	Turbidity	pool
X	P	occurenc Modera	_	(m³/sec	-)		Ni1	depth(m) 1.2
<u>\$ pool</u>	% run 75	% riffle 7	% pocket- water 18	% class I pools 7	% clas II pod 7		ools IV	lass % class pools V pools
		% bed mate	The second secon		D-90	% %	Stability	Bank
% fines 25	#gravel 30	* rubble 20	½ boulder 24	% <u>bedrock</u> 1	(cm) 42	gradient 3.0	rating 84	form Elet
23	30	20	24	1	42	5.0	04	Flat
Bank		ank etic	Flood plain	Channel	% sta chann		er- % cover	% cover- snorkel
Process	mate		debris	debris	debr			
Failing	F1u	vial	Moderate	Moderate	35	16	23	27
Water cher	mistry data						=	
Cond.		Total	Total	•		4.1		_
(umohs/ cm)	Alk. (mg/l)	carbon (mg/l)	phos. (mg/l)	No ₃	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/l)	Na ⁺ (mg/l)	K [†] SO ₄ (mg/l)
	-			<u></u>		<u></u>	11197 1 2	
Spawning	data							
Number of bull trou redds in	t Redo densit		Number of bull trout redds in	Redd density		Number of bull trout redds in	Redd density	
reach	(no/kr		reach	(no/km)	<u>Year</u>	reach	(no/km)	Year
Fish popu	lation data							

Density	(no/100	m ² surface	areal					Other:	species
<u>Demare</u>	Cutth		<u>, ureu</u> /		Bull t	rout		Mountain Whitefish	Eastern Brk trout
Age 0	Age I	Age II	Age 111+	Age 0	Age 1	Age II	Age III+		
0	0.3	0.5	2.2	0	0	0.1	0.1	P	P

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

Stream Name Walton Cr.	Reach number 001	number L	each Tribute ength of Lincol Creek	houndar In 1st t	trib on n at km.	Upper <u>elev.(π</u> 1331	.5 Junct		Lower elev.(m) 1155.2
Physical	Habitat data	<u>a</u> Ave.	Ave.	Ave.		Valley-			
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel width(m)	Valley width(m)	channel ratio		Flow characterist	tics
03	24.4	6.8	.23	13	75	06	В	roken, tu	mbling
Confine- ment	Pattern	Side channe occurence		Flow du surve (m³/se	y pea	verage ik water emp(C)	Turbidity	Maximum pool depth(m)	
F	P	Moderat		 % class	« olar		Low	0.8	2)266
% pool	% run	% riffle	% pocket- water	I pools	% clas				class pools
0	45	15	40	0	4	1	6	80	0
% fines	%gravel	% bed mater % rubble	% boulder	%bedrock	D-90 (cm)	gradient	Stability rating	Ban for	
10	20	35	35	0	55	4.8	98		ose
Bank Process Aggradin	gene mater	ial	Flood plain debris Low	Channel debris Low	% sta chann debr	nel % coveris canon	100.00	ver snor	ion
Water che	mistry data								
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ^{††} (mg/1)	Na ⁺ (mg/1)	κ ⁺ (<u>mg/l</u>)	SO. (mg/l)
Spawning	data								
Number of bull trou redds in reach	densit (no/km	y	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	
							Mar Mic		
Density (no/100 m ² su Cutthroat			Bull to	rout Age II	Age III+			ies Eastern Brk trout

0

Age I Age II

0

Age III+

P

P

0

Cutthroat Age I Age II

0.8

0.1

Age 0

Age 111+

2.4

Age 0

0

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

Stream Name Walton Cr.	Reach number 002	number <u>L</u>	each Tributa ength of 3.2 Linco Cr.	boundar 1n Mout	h of on at	Upper elev.(m) 1410.6		
Physical	Habitat dat			_				
Stream order 02	Drainage area(km²)	Ave. wetted width(m) 5.5	Ave. depth for reach(m) .16	Ave. channel width(m)	Valley width(m) 250	Valley- channel <u>ratio</u> 19		Flow acteristics ng, swirling
Confine- ment X	<u>Pattern</u> P	Side channe occurence Moderat	<u>flow</u>	Flow du surve (m³/se	y pea	verage uk water emp(C) 1		laximum pool epth(m) 1.1
1 pool	% run	% riffle	å pocket- water	% class I pools				
5	90	5	0	43	43	14		0
% fines	%gravel	% bed mater % rubble	sial % boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
25	45	25	5	0	13	2.5	113	Flat
Bank <u>Process</u> Failing	gene mater	ank etic rial vial	Flood plain debris Low	Channel debris Low	% sta chann debr 40	el % cover		% cover- snorkel section 23
		v <u>ra</u> r	LOW	LOW	40	10	25	23
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/l)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na ⁺ (mg/1) 	κ ⁺ S0. (<u>mg/1)</u> (<u>mg/1)</u>
Spawning	data							
Number of bull trou redds in reach	t. Redo densit (no/kr	ty	Number of bull trout redds in reach	Redd density (no/km)	Year 	Number of bull trout redds in reach	Redd density (no/km) Ye.	<u>ar</u> -
	lation data no/100 m² si	infana ama-1					0t	her species
	Cutthroat			Bull to	rout		Mountain Whitefis	Eastern
	Age I Age 3.1 4.		7	Age I ——	Age 11 	Age 111+ 	A	P

DEERLICK CREEK DRAINAGE

DEERLICK CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-20-81

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

Valley Characteristics:

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

Fish Populations:

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

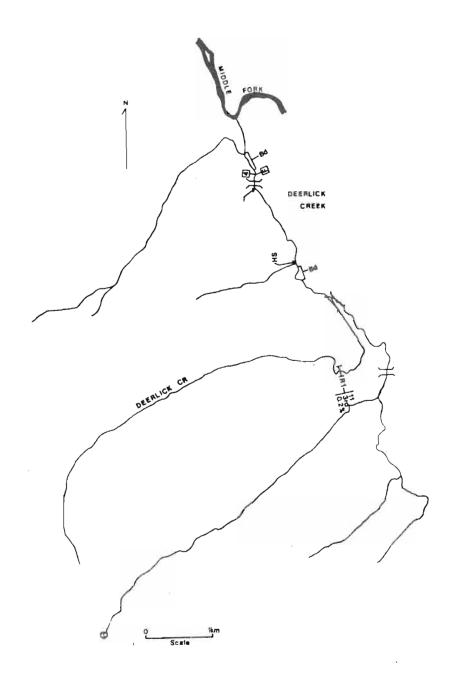


Figure 8. Physical habitat information for Deerlick Creek.

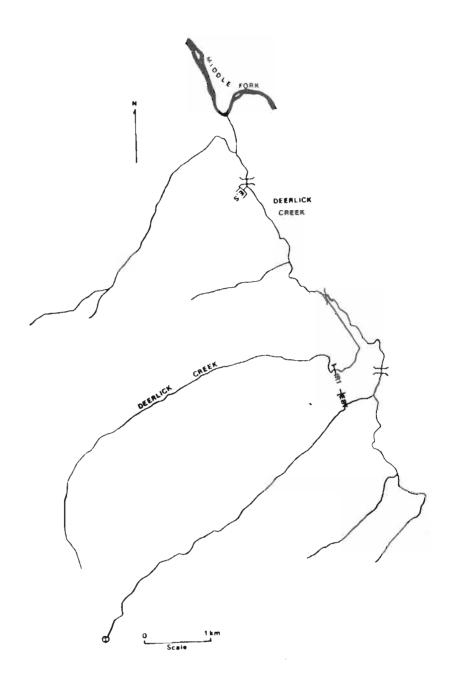


Figure 9. Fish population information for Deerlick Creek.

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

Stream <u>Name</u> Deer Lick Cr.	Reach number 001	number L	each Tributa ength of .4 Midd Fork	boundar le 1.6	ry km above crossin				Lower elev.(m) 1009.3
Physical H	Habitat dat								
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for <u>reach(m)</u>	Ave. channel <u>width(m</u>)	Valley width(m)	Valley- channel ratio	<u>(</u>	Flow · characteris	tics
03	39.4	10.6	.36	11	500	45	P1	acid, s	virling
Confine- ment	Pattern	Side channel occurence	flow	Flow du surve (m³/se	y pea	rerage k water emp(C)	Turbidity	Maximum pool depth(m)	
X	P	Low	.81 % pocket-	−− % class	% clas	 s % c1	Low	2.0	% class
% pool	% run	% riffle	water	I pools					V pools
8	84	8	. 0	50	50	0		0	0
1 fines	%gravel	% bed mater % rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Ba fo	
40	40	20	0	0	18	0.2	71	Unde	ercut
Bank Process		ank etic rial	Flood plain debris	Channel debris	% sta chann debr	el % cove		er sno	over- rkel tion
Failing	Flux	/ial	Low	Low	50	. 16	16	28	3
Water chem	istry data								
Cond. (umohs/ cm)	Alk. (mg/1) 118	Total carbon (mg/l)	Total phos. (mg/1)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/3)	Na [†] (mg/l) 	K ⁺ (<u>mg/l)</u>	50. (mg/1)
Spawning d	la ta								
Number of bull trout redds in reach	Red dens i (no/ki	ty	Number of bull trout redds in 	Redd density (no/km)	Year 	Number of bull trout redds in 	Redd density (no/km)	<u>Year</u>	
F:-L 1	ation data								
	o/100 m² s Cutthroat	urface area) e II Age	III+ Age 0	Bull to	rout Age Il	Age III+	Mount White		cies Eastern Brk trout

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HARRISON CREEK DRAINAGE

HARRISON CREEK REACH 1

<u>Channel Characteristics</u>: Date Surveyed: 9-10-81

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

Valley Characteristics:

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

Fish Populations:

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

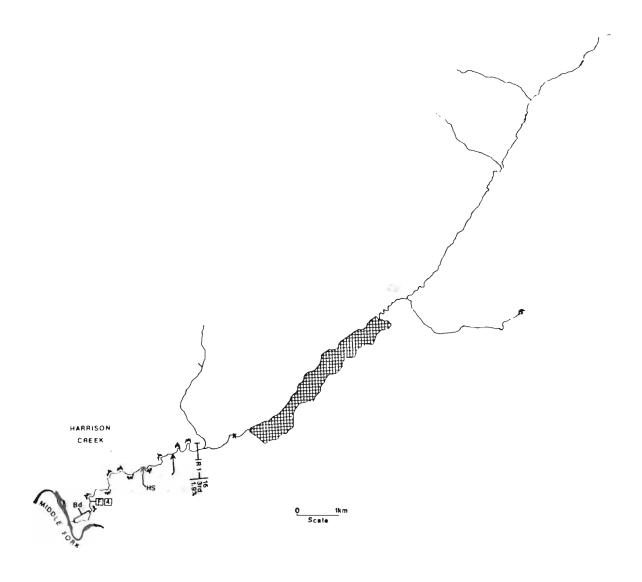


Figure 10. Physical habitat information for Harrison Creek.

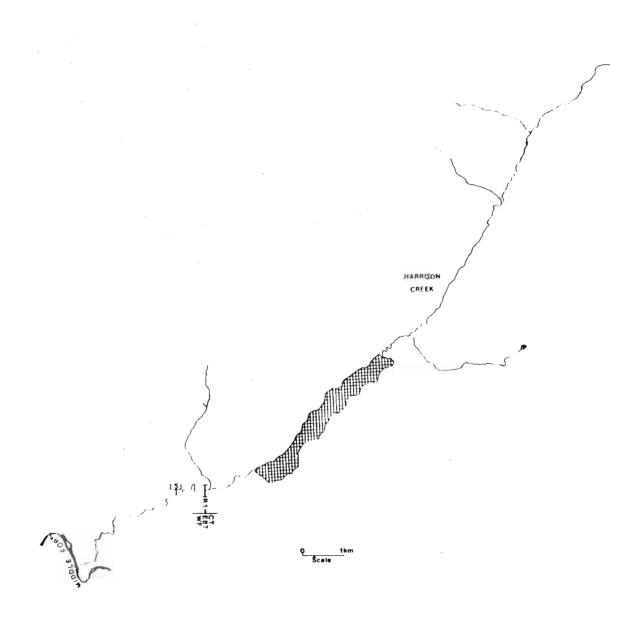


Figure 11. Fish population information for Harrison Creek.

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

Stream Name	Reach number		each Tributa ength of	Upper ary reach bounda	ry	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Harrison Cr.	001	C7T 5	.3 Middl Fork	e 5.3 l moutl	km above n	1106.6	Junction w Middle For	1003.2
Physical F	Habitat dat. Drainage	a — Ave. wetted	Ave. depth for	Ave. channe l	Valley	Valley- channel		Flow ·
order 03	area(km²) 69.8	width(m) 11.3		width(m)	width(m)	ratio 03	chara	cteristics ing, rolling
Confine- ment	Pattern	Side channe occurence	Average low	Flow du surve (m³/se	uring Av ey pea	erage k water	Ma	ximum pool pth(m)
F	P	Low	1.3 % pocket-	−− % class		.6 s % c1a		l.l % class
<u>~ pool</u>	% run	% riffle	water	I pools	II poo	<u> </u>	ols IV pool	s V pools
0	50	18 % bed mater	32	0	O D-90	O %	100 Stability	O Bank
fines 10	%gravel 25	% rubble 32	% boulder 33	% <u>bedrock</u> O		gradient 1.9	rating 94	form Steep
Bank Process	Ba gene <u>mate</u>		Flood plain debris	Channel debris	% stal channe debr	el % cover		% cover- snorkel section
Failing	Flu	vial	Low	Low	60	1	1	28
Water chem	nistry data							
Cond. (umohs/ cm) 105	Alk. (mg/1) 46	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na ⁺ (mg/1)	K ⁺ SO. (mg/l)
Spawning o	iata							
Number of bull trout redds in reach	Redo densii (no/kr	ty	Number of bull trout redds in reach	Redd density (no/km) 			Redd density (no/km) Yea	<u>r</u> -
Density (n	Cutthroat	urface area	III+ Age 0	Bull t Age J	rout Age ll	Age]]]+	Oth Mountain Whitefish	er species Eastern 8rk trout
-						^	_	

0

0

0

0

0.1

0

0.5

P

P

NYACK CREEK DRAINAGE

NYACK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-18-81

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

Valley Characteristics:

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

Fish Populations:

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

NYACK CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-17-81

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

Valley Characteristics:

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

Fish Populations:

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

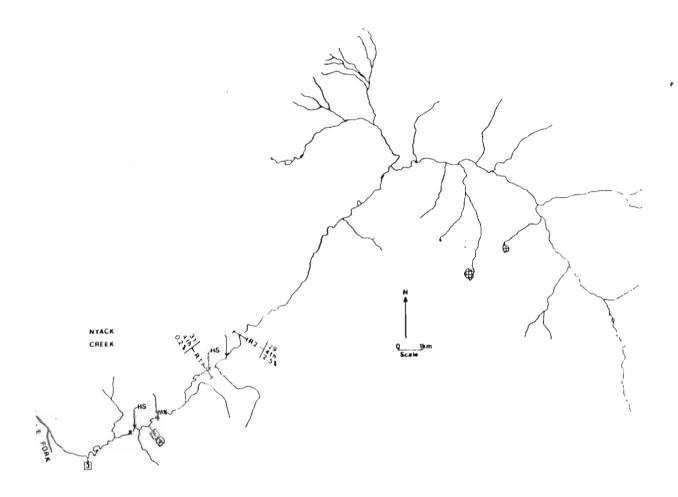


Figure 12. Physical habitat information for Nyack Creek.

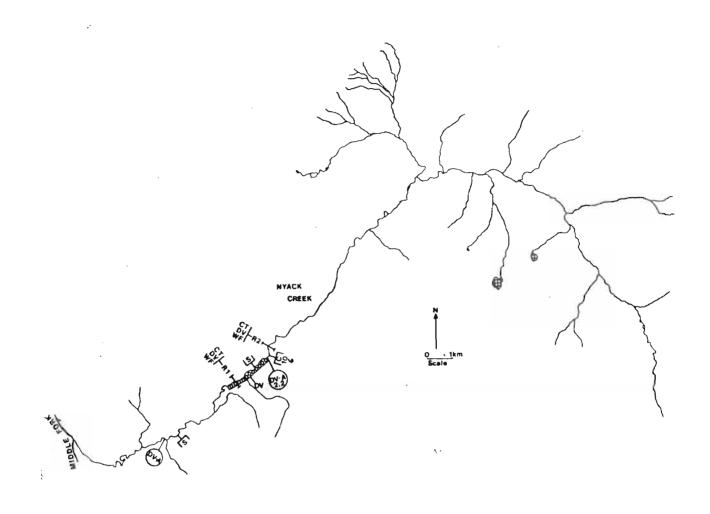


Figure 13. Fish population information for Nyack Creek.

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

Stream Name	Reach number		each Tributa ength of	Upper ry reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Nyack	001	C7U l	l.4 Midd1		km above	1045.8	Junctio	
Cr.			Fork	mouth	1		Midd1e	Fork
Physical	Habitat dat	Ave.	Ave.	Ave.		Valley-		
Stream	Drainage	wetted	depth for	channel	Valley	channel		Flow :
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	ratio	_	haracteristics
04	214.9	17.9	. 54	31	400	13	Rol	ling, Placid
Confine-		Shide Channell	Average low	Flow dur surve		erage water		Maximum pool
ment	Pattern	ocem ence		(m³/sec			urbidity	depth(m)
U	С	Low	1.8		_	_	Low	3.0
	2 run	% riftle	2. pocket- water	2 class	% class			lass % class
≈ pao1 7	2_ run 93	0	()	I pools	11 poo1 20	5 111 pc	1015	0 0 0
43	73	⊕ bed mater		00	D-90		Stability	Bank
% fines	2gravel	2 rubble	7 boulder	Zbedrock		gradient	rating	form
30	55	J '>	()	0	20	0.2	99	Flat
	R.	ank	Flood		% stab	ile		% cover-
Bank	gen	etic	plain	Channel	channe	1 % cover		snorkel
racess	ma te		debris	debris	debri			
Failing	g Fluv	71AL	Low M	oderate	20	4	6	12
Water che	mistry data							
Cond.	0.11	Total	Total	No	Ca ⁺⁺	Mq ⁺⁺	Na ⁺	K ⁺ SO ₄
(umohs/	Alk.	(may/)	(mm//1)	No ₃ (mg/1)	(mg/1)	(mg/1)	(mg/l <u>)</u>	(mg/1) $(mg/1)$
220	111	The Name						
Spawning	data							
Number of			Number of			Number of		
bull trou redds in	t Red densi		bull trout redds in	Redd density		bull trout redds in	Redd density	
reach	(no/k		reach	(no/km)	Year	reach	(no/km)	Year
5	G.	4 80	7	0.6	8]	0	0	82
Fish papu	lation data							
Density (no/1041 m ² s	urface area)					112.24	Other species
	Cutthroat			Bull tr	rout		Mounta White	
	Age I Au	e III Jose	III+ Age 0	Age I		Age [1]+		
0	0	0 0	0	0.1	0	0	A	Α

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

Stream Name	Reach number	Seri al number		Upper utary reach of boundar	·y	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Nyack	002	C7V	1.9 Midd		at km	1094.4	11.4 km a	bove 1045.8
Cr.			Fork	13.3			mouth	
D) - ' 1	11.6.54.4.4.4.4	_						
	Habitat dat	Ave.	Ave.	Ave.	V- 33	Valley-		El acce
Stream order	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel <u>width(m</u>)	Valley width(m)	channel _ratio_	c ha	Flow racteristics
04		18.0	.66	29	30	01	F	Rolling
<i>C(:</i>		Sid			3	verage	,	Maximum
Confine- ment	Pattern	chann occuren		surve (m³/se	y pea <u>c)</u> te	ik water emp(C)	[urbidity o	pool depth(m)
F	P	Nil			-		Low	2.8
% pool	% run	% riffle	% pocket water	- % class I pools				
0	86	14	0	67	. 0	0	33	0
« finos	*anauol	% bed mat % rubbl		r %bedrock	D-90	% gradient	Stability	Bank form
% fines 15	%gravel 35	40	5	5	<u>(cm)</u> 86	2.5	rating_ 88	Repose
								-
Bank		ank etic	Flood plain	Channel	% sta chann		- % cover	% cover- snorkel
Process	mate		<u>debris</u>	<u>debris</u>	debr			section
Failin	g Fluv	ıaı	Low	Low	5	1	1	18
Water che	mistry data							
Cond.	***	Total	Total	·	++	++	+	K ⁺ 504
(umohs/ cm)	Alk. (mg/l)	carbo (mg/l		No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/l)	K 504 (mg/1) (mg/1)
Spawning	data							
Number of			Number of			Number of		
bull trou redds in	t Redo densi		bull trou redds in	t Redd density		bull trout redds in	Redd den sity	
reach	(no/kr	n <u>)</u> Year	<u>reach</u>	(no/km)	Year	reach	(no/km) Ye	ear
9	04.7	80	7	03.6	81	23	12.1	32
Fish popu	lation data							
Density (no/100 m² si	urface are	<u>a</u>)				Ot Mountair	her species Eastern
Age 0	Cutthroat Age I Age	e II Ao	e III+ Age	Bull to	rout Age II	Age III+	Whitefis	
<u> </u>	Age 1 Age		e III+ Age	0 <u>Age 1</u>	Aue 11	0 1	**	

0

0.1

0.1

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A

0.1

0

0

COAL CREEK DRAINAGE

COAL CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-13-81

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

Valley Characteristics:

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

Fish Populations:

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

COAL CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-12-81

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

Valley Characteristics:

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

in the upstream portion.

Fish Populations:

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

COAL CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-11-81

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

Valley Characteristics:

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

Fish Populations:

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

Pinchot Creek Reach 1

Channel Characteristics: Date Surveyed: 8-13-81

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

the bed material and bedrock was also present.

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat, juvenile bull trout, eastern brook trout and mountain whitefish were observed. Density estimates showed this reach to be an important rearing area for juvenile bull trout with 2.6 age I or older fish per 100 m² surface area. A bedrock cascade formed a partial barrier to upstream migration near the mouth. The Coal Creek drainage was closed to fishing in 1972.

Pinchot Creek Reach 2

Channel Characteristics: Date Surveyed: 8-14-82

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

Valley Characteristics:

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

Fish Populations:

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

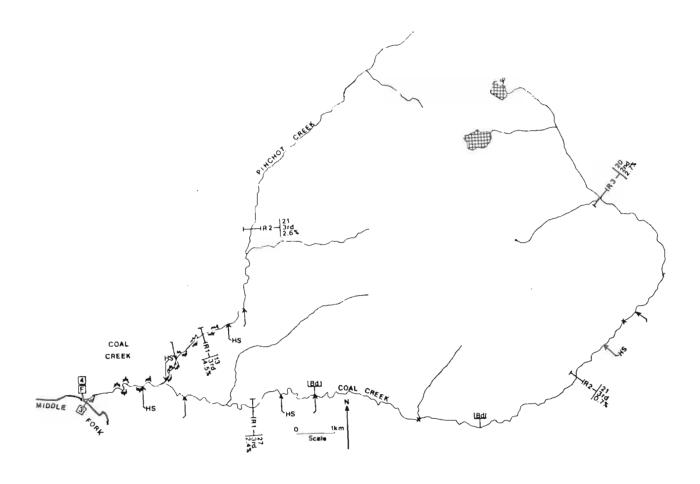


Figure 14. Physical habitat information for the Coal Creek drainage.

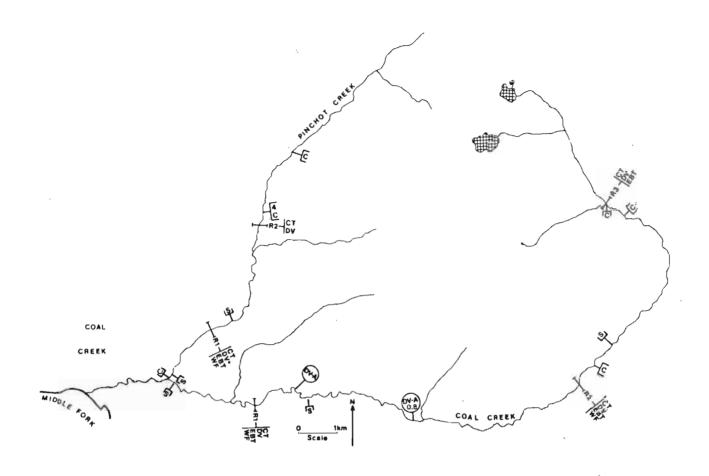


Figure 15. Fish population information for the Coal Creek drainage.

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

Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ry reach boundar	ry	Upper elev.			Lower elev.(m)
Coal Cr.	001	C7W	5.6	Midd1 Fork		above at km	1167.		tion w/ le Fork	1033.6
Physical	Habitat dat	<u>a</u> Ave.	Av		Ave.		Vallev-			
Stream order	Drainage area(km²)	wetted width(m)	dept _rea	n for ch(m)	<pre>channel width(m)</pre>	Valley width(m)	channel ratio		charact	low [.] teristics
04	144.1	10.1	. 3	9	27	100	01		Broken	, tumbling
Confine- ment	Pattern	Sid chann occuren	el	lverage low flow	Flow du surve (m³/se	y pea	verage ak water emp(C)	Turbidit		imum ool .h(m)
F	P	Low		1.2		-:	19	Low	1.5	5
% pool	% run	% riffle		ocket- vater	% class I pools	II pod	ols III	class pools	% class IV pools	% class V pools
2	59	9	. ,	30	0	4		17	79	0
% fines	%gravel	% bed mat % rubbl		oulder	%bedrock	D-90 (cm)	% gradient	Stabili ratir		Bank form
7	15	28	-	36	14	84	2.4	101		Steep
Bank Process	Ba gene mater	ri -	Flood plair debr	1	Channel debris	% sta chanr debr	nel % co		cover erhang	% cover- snorkel section
Failing	g Fluv	rial	Lo	w	Low	20		1	1	24
Water che	mistry data									
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbo (mg/l		Total phos. mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (mg/1	Na [†]) <u>(mg/</u>	K <u>1</u>) (<u>mg</u>	
125	53								-	
Spawning	data									
Number of bull trou redds in reach		t y	bull re d o	er of trout ds in ach	Redd density (no/km)	<u>Year</u>	Number of bull trou redds in reach_			
			-	-						
Fish popu	lation data									
	no/100 m² su Cutthroat				Bull t				Other lountain lhitefish	species Eastern Brk trout
Age 0	Age I Age	II Ag	e 111+	Age 0	Age 1	Age II	Age 111+		_	_

0.1

0.1

0

P

P

0

0.4

0.8

0

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

Stream Name	Reach number		each Tributa ength of	•	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Coal Cr.	002	C7X 12	2.5 Middl Fork		below at km	1228.2	1 km above trib at km 4.8	1143.0
Physical	Habitat data	1						
Stream order 03	Drainage area(km²)	Ave. wetted width(m) 12.5	Ave. depth for reach(m) .46	Ave. channel width(m) 21	Valley width(m) 100	Valley- channel <u>ratio</u> 05	charac	low teristics
Confine-	Pattern	Side channel	Average low	Flow dur survey (m³/sec	ring Ave y peal	erage Kwater	Max p	ng, placid imum ool ith(m)
X	С	Moderat				······································		.5
2 pool	% run	% riffle	<pre>pocket- water</pre>	% class I pools	% class II poo		ss % class	% class
43	57	0	0	43	38	19	0	0
% fines	%gravel	% bed mater % rubble	ial % boulder	%bedrock	D-90 (cm)	gradient	Stability rating	Bank form
55	42	3	0	0	16	0.7	108	Repose
Bank Process Failing	gene mater	<u>ia</u> l	Flood plain debris oderate	Channel <u>debris</u> Moderate	% stat channe debri	el % cover		<pre># cover- snorkel section 28</pre>
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l) 	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ - (mg/l)	Ca ⁺⁺ (mg/1) 	Mq ⁺⁺ (mg/1) 		K ⁺ SO ₄ g/1) (mg/1)
Spawning	data							
Number of bull trou redds in reach		y 1) Year	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>		Redd density (<u>no/km) Year</u>	
Fish popu	lation data							
Density (no/100 m² su Cutthroat	rface area)		Bull tr	cout		Othe Mountain Whitefish	r species Eastern Brk trout
0.2	Age 1 Age 0.5 1.					Age III+ 0.2	P	P

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

Stream Name	Reach number	Serial number	Reach Length	Tributar of	Upper y reach boundar	у	Upper elev.(m	Lower reach) boundary	,	Lower elev.(m)
Coal Cr.	003	C7Y	7.6	Middle Fork	e Trib at km	from W. 25.7	1434.9	l km l falls km 18.	at	1228.2
Physical	Habitat <u>d</u> ata									
Stream order	Drainage area(km²)	Ave. wetted width(m		h for	Ave. channel width(m)	Valley width(m)	Valley- channel <u>ratio</u>		Flow character	
03		10.6	. 3	7	20	50	02	Ro	olling,	broken
Confine- ment	Pattern	Si chan occure	nel	Average low flow	Flow dur survey (m³/sec	/ pea	verage ik water emp(C)	Turbidity	Maximu pool depth(
F	P	Lo	V			-		Low	1.5	
* pool	% run	I riffl	e _ 1	pocket- water	% class I pools	% clas	ols III p		class / pools	% class V pools
5	44	17		34	9	18	0		73	0
% fines	%grave1	% bed ma % rubb		boulder	%bedrock	D-90 (cm)	gradient	Stability rating		Bank form
15	25	32		23	5	81	2.7	87		epose
Bank Process	gene mater	rial	Floor plain debr	n <u>i s</u>	Channel debris	1 sta chann <u>debr</u> 40	el % cove	over)	ver s	cover- norkel ection
Failing		lal	Moder	ale Mo	oderate	40	/	6		17
Cond. (umohs/ cm)	Alk. (mg/l)	Tota carbo (mg/	on	Total phos (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/l)	K [†] (mg/1	SO.) <u>(mg/1)</u> ——
Spawning	data									
Number of bull trou redds in reach	t Redo densit (no/kn	ty	bul red	ber of 1 trout ds in each —	Redd density (no/km)	Year ——	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u> 	
Fish popu	lation data									
Density (no/100 m² su Cutthroat	urface are	<u>ea</u>)		Bull tr	out			Other s ntain cefish	pecies Eastern Brk trou
	Age I Age		0.6	Age 0	Age I O	Age 11 0.1	Age 111+ 0.7	- 1		A

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

Stream Name	Reach number		each Tribut ength of	-	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Pinchot Cr.	001	C7Z	1.8 Coal Cr.	1.8 km mouth	n above	1167.4	Junction Coal Cr	•
	Habitat <u>d</u> ata	<u>a</u> Ave.	Ave.	Ave.		Valley-	GOAT GI	
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channe1	Valley width(m)	channel ratio	c ha	Flow racteristics
03	49.9	6.5	.40	13	25	02		ing, tumbling
Confine- ment X	Pattern P	Side channe occurence Low	flow 	Flow dur survey (m³/sec	, pea		urbidi t y Nil	Maximum pool depth(m) 1.0
% pool	% run	% riffle	<pre>pocket- water</pre>	% class I pools	% clas II poo			
0	0	60	40	0	. 0	9	91	0
% fines	%gravel	% bed mater % rubble	ial % boulder	%bedrock	D-90 (cm)	gradient	Stability rating_	Bank form
5	20	25	40	10	101	4.5	92	Repose
Bank Process Failing	Ba gene <u>mater</u> Fluv	<u>ia</u> l	Flood plain debris High	Channel debris Moderate	% sta chann debr 25	el % cover- is canopy	2 cover overhang 9	% cover- snorkel section 21
Water cher	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/l)	Na ⁺ (mg/1) 	K ⁺ SO., (mg/1) (mg/1)
Spawning o	data							
Number of bull trout redds in reach	Redd densit (no/km	y	Number of bull trout redds in reach	Redd density (no/km)	Year 		Redd density (no/km) <u>Ye</u> 	<u>ear</u>
Fish popul	ation data							
	no/100 m² su Cutthroat Age I Age		111+ Age 0	Bull tr		Ann 111+	Ot Mountair Whitefis	
_			.7 0	0.4	2.0	Age 111+ 0.2	P	A

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

Stream Name	Reach number		Reach Tribut ength of		-y	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Pinchot	002	C71	3.9 Coal Cr.	3 km Falls	below	1265.0	1,8 km a mouth	
Stream	labitat dat. Drainage area(km²)	<u>a</u> Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	ch	Flow · aracteristics
03	<u></u>	7.2	•27	21	50	2		eid, rolling
Confine- ment X	Pattern C	Side channe occurence Moderat	Average l low e <u>flow</u>	Flow du surve (m³/se	ring Av y pea	erage k water	urbidity Nil	Maximum pool . depth(m)
<u>\$ pool</u>	% run 86	% riffle	% pocket- water O	% class I pools O				ools V pools
O	00	% bed mate	J	0	D-90	V	Stability	Bank
% fines	%gravel	% rubble	% boulder	%bedrock		gradient	rating	form
12	38	38	12	0	31	2.6	91	Repose
Bank <u>Process</u> Failing	Ba gene <u>mate</u> r Fluv	<u>ria</u> l	Flood plain <u>debris</u> foderate	Channel <u>debris</u> Moderate	% sta chann debr	el % cover		% cover- snorkel section 16
Water chem	istry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/l <u>)</u>	K ⁺ SO ₄ (<u>mg/1)</u>
								·
Spawning d	<u>a ta</u>							
Number of bull trout redds in 	Redo densii (no/kn	ty	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>			/ear
						·	-	
Fish popul	ation data							
Density (n	Cutthroat	urface area		Bull ti			C Mountai Whitefi	
Age 0 A	ge I <u>Ag</u> e	II Age	III+ Age C	Age I	Age II	Age III+		

0.2

0

A

Α

0

2.6

1.9

0

1.3

STANTON CREEK DRAINAGE

STANTON CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-16-81

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

Valley Characteristics:

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

Fish Populations:

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

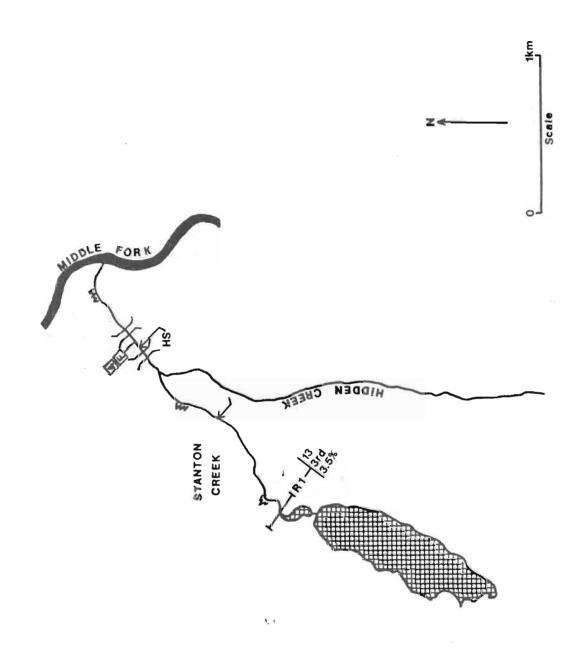


Figure 16. Physical habitat information for Stanton Creek.

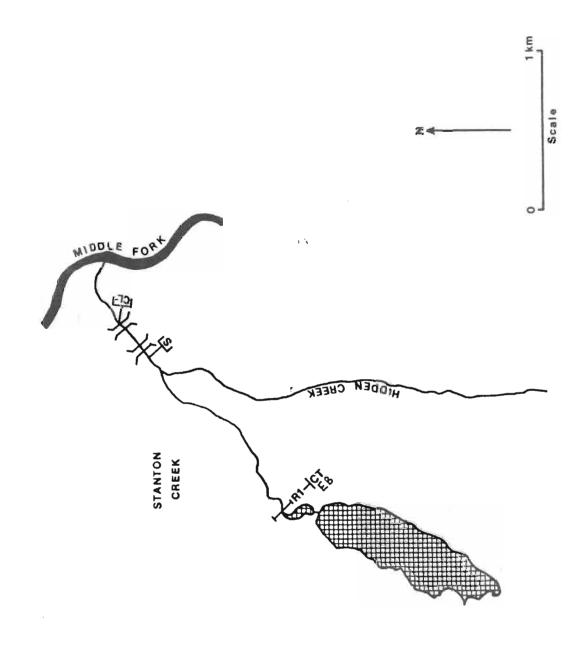


Figure 17. Fish population information for Stanton Creek.

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

Stream Name	Reach number		each Tributa ength of	Upper iry reach boundar	-y	Upper elev.(m	Lower reach boundary		Lower elev.(m)
Stanton	001	C72 2	2.4 Midd	le Stant	ton Lake	1143.0	Juncti	ion w/	1057.9
Cr.			Fork	out	let		Middle	Fork	•
Physical	Habitat dat	.							
ringsical	nabitat data	Ave.	Ave.	Ave.		Valley-			
Stream	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	<pre>channel width(m)</pre>	Valley width(m)	channel ratio		Flow character	
03	33.6	10.2	.41	13	30	02		coken, t	
Confine- ment	Pattern	Side channe occurenc		Flow du surve (m³/se	y pea	rerage k water emp(C)	Turbidity	Maximum pool depth(m	
F	P	Low	. 44				Low	1.3	
2 pool	% run	% riffle	% pocket- water_	% class I pools	% clas			class pools	% class V pools
5	27	50	18	6	0	6)	88	0
		% bed mate	rial		D-90	¥	Stability	8	ank
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating		orm
10	25	25	39	1	92	3.5	89	Re	epose
Bank <u>Process</u> Fa i ling	Ba gena <u>mater</u> Fluv	<u>ria</u> l	Flood plain debris Low	Channel debris Low	% sta chann debr 75	el % cove is canop		er sn	cover- orkel ction 24
<u>Water</u> chem	nistry data								
Cond.		Total	Total						
(umohs/	Alk. (mg/l)	carbon (mg/l)	phos. (mg/l)	No ₃ (mg/l)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (mg/1)	Na [†] (mg/l)	κ ⁺ (<u>mg/l)</u>	SO. (mg/l)
185	92								
Spawning o	data								
Number of bull trout redds in	densit	ty	Number of bull trout redds in reach	Redd density (no/km)	Ypar	Number of bull trout redds in reach	Redd density (no/km)	Year	
reach	(no/kn	n) <u>Year</u>	reach	(no/ kiii)	Year	Teach	THO KILL	1641	
Fish popul	lation data				****				asias
Density (r	no/100 m² su Cutthroat			Bull t	rout	Age III+	Moun Whit	Other sp tain efish	ecies Eastern Brk troi

Age II

0

Age 1

0

Age III+

0

Α

Р

Age 0

Age I Age II

0.6

Age 111+

0.2

Age 0

0

TUNNEL CREEK DRAINAGE

TUNNEL CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-17-81

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

Valley Characteristics:

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

Fish Populations:

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

TUNNEL CREEK REACH 2

<u>Channel Characteristics</u>: Date Surveyed: 7-29-82

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

Valley Characteristics:

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

Fish Populations:

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

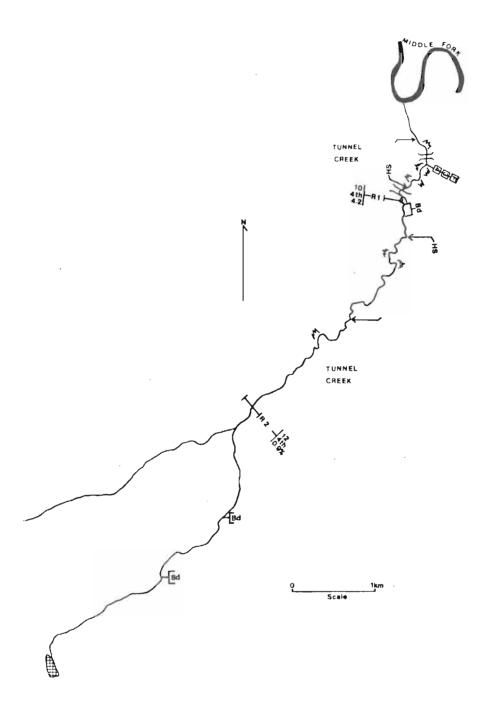


Figure 18. Physical habitat information for Tunnel Creek.

54

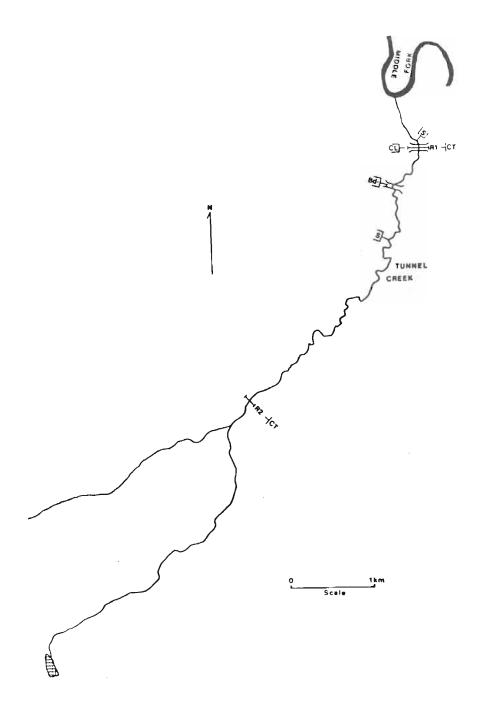


Figure 19. Fish population information for Tunnel Creek.

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

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundar	<i>t</i>	Upper elev.(m	Lower reach boundary	Lower elev.(m)
Tunnel	001	C73	1.4	Middle	-	y Road	1130.		
Cr.				Fork	Cross	ing		Middle	Fork
Physical	Habitat dat	a							
Stream order 04	Drainage area(km²)	Ave. wetted width(m) 7.9	read	h for c	Ave. hannel idth(m)	Valley width(m) 75	Valley- channel <u>ratio</u> 07		Flow ·
04	21.9							Broi	ken, tumbling
Confine- ment	Pattern	Sic chann occuren	e1 <u>ce</u>	Average low flow	Flow dur survey (m³/sec	pea		Turbidity	Maximum pool depth(m)
F	P	Ni1		. 34 bocket-	 ۶ class	% clas	14 ss %c1	Low ass %cl	1.0 ass % class
2 pool	% run	% riffle		vater	I pools	II pod			ools V pools
1	49	5		45	15	0	23		
% fines I5	%gravel 10	bed mat rubbl		oulder 15	%bedrock 50	D-90 <u>(cm)</u> 44	gradient 4.2	Stability rating 92	Bank <u>form</u> Steep
Bank Process		ank etic rial	Flood plair debri	1	Channel debris	% sta chanr debr	nel 🦇 cove		
Aggrading	Fluv:	ial	Low	Mo	oderate	60) 3	3	34
Water chem	mistry data								
Cond. (umohs/ cm)	Alk. (mg/1) 89	Total carbo (mg/l		Total phos. mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/l) 	Mq ⁺⁺ (Mq/1) 	Na [†] (mg/1) ——	K ⁺ SO. (mg/1) (mg/1)
Spawning o	da ta								
Number of bull trout redds in reach	t Redd dens i 1 (no/kr ——	ty	bull redo	er of trout ds in each	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in 	Redd density (no/km)	<u>Year</u>
Fish popu	lation data								Other specie
	no/100 m² si Cutthroat Age I Age		a) e]]]+	Age 0	Bull tr Age I	out Age II	Age III+	Mounta Whitef	
0			0.1	0	0	0	0	A	A

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

Stream Name	Reach number		ach Tributa	Upper ry reach boundar	у	υρμετ elev.(m)	Lower reach boundary	Lower elev.(m)
Tunnel	002	C74 4.	3 Middle	e = 0.4 kg	m below	1173.4	Quarry Roa	d 1130.8
			Fork	fork			Crossing	
Physical	Habitat data	a						
		Ave.	Ave.	Ave.		Valley-	61	OM .
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel width(m)	Valley width(m)	channel ratio		eristics
04		10.8	.50	12	250	20		ng, Placid
04		10.0	. 50			20		
Cartina		Side	Average low	Flow du			Maxi	mum
Confine- ment	Pattern	channel occurence	flow	survey (m³/sec	peak temp		urbidity dept	
U	C	Nil			1		Low 2.	
			% pocket-	% class	% class	% clas		% class
2 pool	% run	% riffle	water	I pools	II pools			V pools
8	90	2	0	27	27	46	0	0
		% bed mater	ial		D-90		Stability	Bank
% fines	2gravel	% rubble	% boulder	%bedrock		radient	rating	form
80	20	0	0	0	9	0.9	78	Flat
	n.		51aad		9 - + - h l	_		96
Bank		ank etic	Flood plain	Channel	% stable channel	e % cover-	- % cover	% cover- snorkel
Process	mater		debris	debris	_debris	canopy	overhang	section
Stable	Fluv	ial	Nil	Moderate	75	1	3	16
Water che	mistry data							
Cond.		Total	Total	•				
(umohs/	Alk.	carbon	phos.	No 3	Ca ⁺⁺	Mg++	Na ⁺ K	
cm)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	/1) (mg/1)
		21 122						
Spawning	data							
Number of			Number of		N	umber of		
bull trou			bull trout	Redd		ull trout	Redd	
redds in reach	densit (no/kr		redds in reach	density (no/km)	Year		density (no/km) Year	
		100-0	1.1-4/1	T 15-				
Fish popu	lation data							
Density (no/100 m ² su	urface area)						species
112	Cutthroat			Bull tr	cout		Mountain Whitefish	Eastern Brk trout
Age 0		11 Age	111+ Age 0	Age I		ge III+	#III CE 1 13 II	Dik trout
0	0 0	.1 (0	0	0	C	A	A

MUIR CREEK DRAINAGE

MUIR CREEK RÉACH 1

Channel Characteristics: Date Surveyed: 7-30-81

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat trout were observed in good numbers. A density estimate of 11.6 age I or older cutthroat per 100 m² surface area indicated an important rearing area. Several fish approaching the 300 mm size were observed. A single adfluvial bull trout was observed; however, no juvenile bull trout were observed. Muir Creek was closed to fishing by Glacier National Park regulations in 1972.

MUIR CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-30-81

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat trout were observed in moderate densities, with 5.3 age II or older fish per 100 m² surface area. No other fish species was observed.

MUIR CREEK REACH 3

Channel Characteristics: Date Surveyed 7-29-81

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

Valley Characteristics:

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

Fish Populations:

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

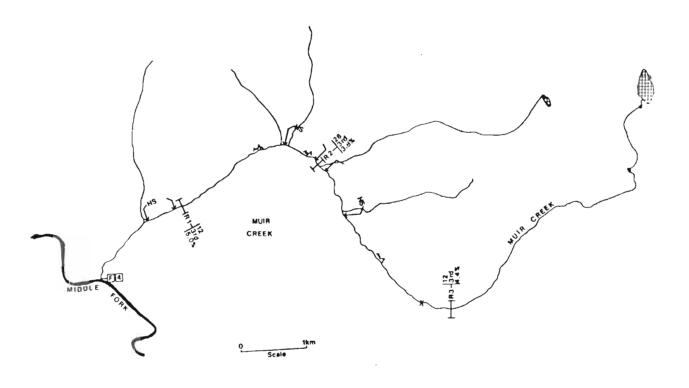


Figure 20. Physical habitat information for Muir Creek.

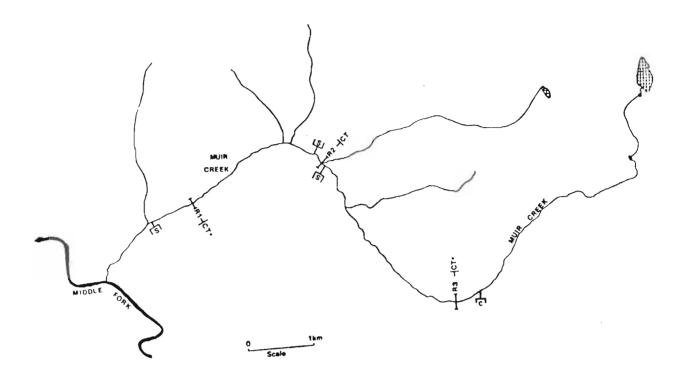


Figure 21. Fish population information for Muir Creek.

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

Stream Name_	Reach number	Serial number	Reach Tribu Length o	f boundar	r <u>y</u>	Upper elev.(m			Lower elev.(m
Muir Cr.	001	C75	1.9 Midd Fork		e 1st from So.	1179.5	Juncti Middle		1082.
Physical H	labitat data			Aa		V-11			
	Drainage area(km²)	Ave. wetted width(m)		Ave. channel width(m)	Valley width(m)	Valley- channel ratio		Flow characteri	stics
03	34.8	5.4	.22	12	20	2	Tu	mbling,	broke
Confine- ment	Pattern	Sic chanr occuren	iel low ice flow	Flow du surve (m³/se	y pea	erage k water mp(C)	Turbidity	Maximum pool depth(m	
C	P	Low			a: 3		Low	1.0	~ 1
<u>% pool</u>	% run 29	* riffle	% pocket- water 52	F class I pools			ools IV	pools 70	% class V pools
3	2)	% bed mat		,	D-90	ar in	Stability		ank
fines 10	*grave1	% rubbl 30		%bedrock 15		gradient 5.0	rating 87	<u>f</u>	orm eep
Bank		ank etic	Flood plain debris	Channel debris	% sta chann debr	el % cove		er sn	cover- orkel ction
Process Failing	Fluv	-	Low	Low	10	10	<u>5</u> 5	ang se	25
1922200									
Water chem	istry data								
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbo (mg/l	n phos.	No ₃ - (mg/l)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/l)	K ⁺ (mg/l)	SO↓ (mg/
150	71								
Spawning d	lata								
Number of bull trout			Number of bull trout			Number of bull trout redds in	Redd density		
redds in reach	densit (no/kn	•	redds inreach_	density (no/km)		reach	(no/km)	<u>Year</u>	
Fish popul	ation data								
Density (n	o/100 m² su	urface are	<u>a</u>)	Bull t	rout		Moun Whit	Other sp tain efish	ecies Easter Brk tr

Age 1 Age 11 0 0

0.1

A

Α

Age 111+ 9.9 Age 0

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

Stream <u>Name</u> Muir Cr.	Reach number 002	<u>number</u> <u>L</u>	each Tributa ength of 2.4 Middl Fork	boundar Le 4th,	lst orde on No.	Upper elev.(m er 1270.	7 Above	Lower elev.(m) 1st 1179.5 rom S.
Physical Stream order 03	Habitat dat Drainage area(km²)	Ave. wetted width(m) 5.9	Ave. depth for reach(m) .17	Ave. channel width(m) 28	Valley width(m) 50	Valley- channel ratio 02		Flow haracteristics ling, broken
Confinement X pool 5	Pattern P ** run 43	Side channe occurence Moderat	flow	Flow du surve (m³/se % class 1 pools	y pea c) te % clas	 s % cl	001s <u>1V</u>	Maximum pool depth(m) 0.6 lass % class pools V pools 66 0
fines 10	*gravel 20	% bed mater % rubble 40	boulder 30	%bedrock	D-90 (cm) 68	gradient 3.8	Stability rating 98	Bank <u>form</u> Repose
Bank Process Failing			flood plain debris Low	Channel debris Low	% sta chann <u>debr</u> 50	el % cove		
Water che Cond. (umohs/ cm)	mistry data Alk. (mg/l) 	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Ma ⁺⁺ (mg/1) ——	Na [†] (mg/1)	K ⁺ SO₄ (<u>mg/1)</u> (<u>mg/1)</u>
Number of bull trou redds in reach		ty	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 popu	lation data no/100 m² su Cutthroat	 urface area)		Bull t			Mounta Whitef	Other species
Age 0	0 1.		.5 Age 0	Age 1 O	<u>Age 11</u> O	Age 111+ 0	A	A

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

Stream Name	Reach number	Serial number	Reach Length	Tributary	Upper reach boundary	,	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Muir	003	C77	2.9	Middle	.4 km	above	1398.4	4 4th fir	st 1270.7
Cr.				Fork	falls	at 6.7		order t	rib
					km			on No.	
Physical h	Habitat data		Av	_	A		V-11		
Stream	Drainage	Ave. wetted	dept	h for c	Ave.	Valley	Valley- channel		Flow ·
order 03	area(km²)	width(m) 4.6		ch(m) w	idth(m)	width(m) 28	natio 02	_	aracteristics ken, tumbling
		Sid		Average	Flow dur	ina Av	erage		Maximum
Confine- ment	Pattern	chann	e1	low flow	survey (m³/sec	pea	k water	Turbidity	pool depth(m)
X	N	Low						Nil	0.6
£ pool	% run	riff)e		pocket- water	% class I pools	% clas Il poo			
0	25	45	1	30	0	0	0	10	
		* bed mat				D-90		Stability	Bank
% fines	Igravel	% rubbl	e %	ooulder	%bedrock	(cm)	gradient	rating	form
15	27	35		18	5	48	4.4	93	Repose
Bank Process	Ba gene mater		Floor plain debr	n	Channel debris	% sta chann debr	el % cover		
ailing	Fluv		Low		Low	25	12	8	23
Water chem	nistry data								
Cond. (umphs/ cm)	Alk. (mg/1)	Total carbo (mg/l		Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/l)	K ⁺ 50. (mg/1) (mg/1)
Spawning d	da ta		•						
Number of bull trout redds in reach	Redo densit (no/km	У	bul red	per of I trout ds in each	Redd density (no/km)	Year	Number of bull trout redds in reach		Year
Fish popul	ation data								
Density (n	no/100 m³ su	rface are	a)					Mounta	Other species in Eastern
	Cutthroat				Bull tr	out		Whitef	
Age O A	age I Age	11 Aq	e 111+	Age 0	Age I	Age 11	Age III+		210.00

PAOLA CREEK DRAINAGE

PAOLA CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-17-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 7-21-81

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

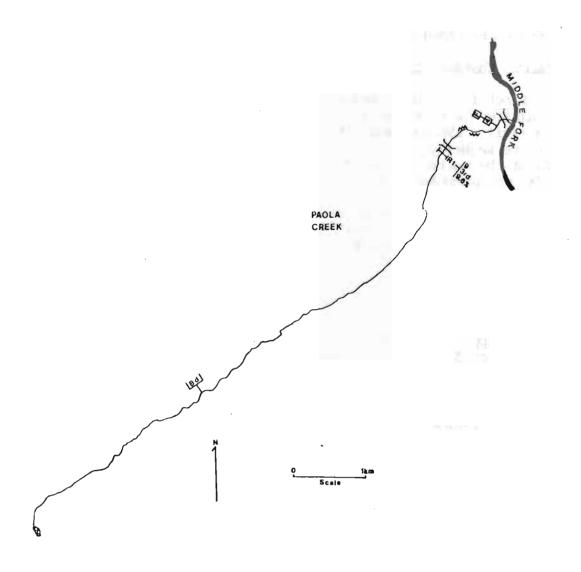


Figure 22. Physical habitat information for Paola Creek.

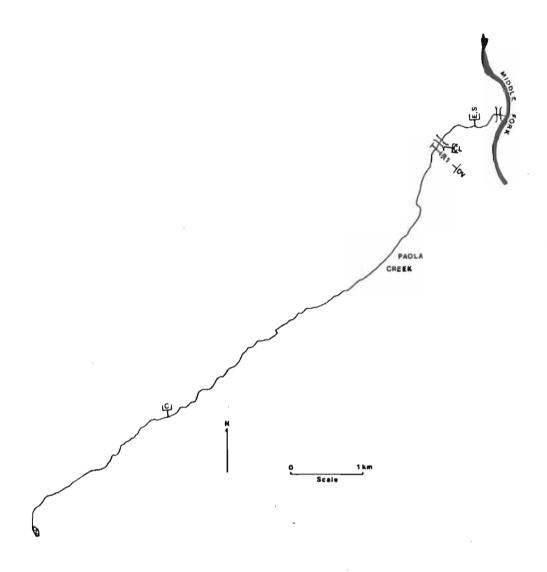


Figure 23. Fish population information for Paola Creek.

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

Physical Habitat data Stream Drainage wetted depth for channel profession order area(m') width(m) reation 3 16.9 7.1 .34 9 50 05 Tumbling Confine- Channel low survey peak water pool pool pool pool pool pool pool poo	Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ar y re a ch boundar	·y	Upper elev.(m	Lower reach boundary		Lower elev.(m)
Stream Drainage wetted depth for reach(m) width(m) width(m) ratio channel order area(km²) width(m) reach(m) width(m) width(m) ratio channel channel channel low width(m) width(m) ratio channel channel channel low survey peak water pool temp(c) Turbidity depth(m) F P Low . 15 Low 1.3 2 pocket . 2 class . 3 cl		001	C78	1.2				1203.		-	1088.3
103 16.9 7.1 .34 9 50 05 Tumbling	Stream	Drainage	Ave. wetted	dept	th for	channel		channel		_	
Confine- ment Pattern occurrence flow survey peak water pool pool ment Pattern occurrence flow (m*/yec) temp(C) Iurbidity depth(m) F P Low .15 Low 1.3 2 pool 1 run 2 riffle water 1 pools 11 pools 111 pools 1V pools V pools 18 0 67 15 9 27 18 46 0 0 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 20 20 20 20 20 20 20 20 20											
2 pool 2 run 2 riffle water 1 pools 11 pools 111 pools 1V pools V pools 18 0 67 15 9 27 18 46 (2 bed material 2 bed material 3 boulder 2 bedrock (cm) gradient rating form 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 20 20 20 20 20 20 20 20 20	Confine- ment	Pattern	Si chan occure	de nel nce	Average low flow	surve	ring Av y pea	verage ik water		Maximum pool depth(m	
## bed material D-90 Stability Bank Fines Stability Stability Stability Bank Fines Stability	2 pool	% run	2 riff]	9	pocket- water	1 pools	<u> 11 poo</u>	ols III	lass %	class pools	% class V pools
Effines Igravel Trubble Toulder The Species (cm) gradient rating form 10 20 20 50 0 88 9.6 94 Repose 10 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 50 0 88 9.6 94 Repose 10 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 50 0 88 9.6 94 Repose 10 20 20 20 20 20 20 20 20 20 20 20 20 20	10	U		torial	1.5	9			-		_
Bank genetic plain Channel town atterial debris debris debris canopy overhang section table Fluvial Low Low 80 37 18 27 Nater chemistry data Siond. Total Total phos. No. Ca++ Mg++ Na+ K+ Carbon phos. No. Ca++ Mg++ Na+ K+ Cambon (mg/l) (mg	fines	*gravel			boulder	%bedrock					
Bank genetic plain Channel channel % cover % cover snorkel % cocess material debris debris debris canopy overhang section table Fluvial Low Low 80 37 18 27 Nater chemistry data Cond. Total Total phos. No. Cather Mgth Nath Kthem (mg/l) (mg	10	20	20		50	0	88	9.6	. 94	Re	pose
Water chemistry data Cond. Total Total (umohs/ ATK, carbon phos. No. Ca++ Mg++ Na+ K+ (mg/1)	Process	gene matem	etic rial	plai debr	n is	debris	chann debr	el % coveris canon	overh	er sn nang se	orkel ction
Total Total (umohs/ Alk. carbon phos. No, Ca ⁺⁺ Mg ⁺⁺ Na ⁺ K ⁺ cm) (mg/l) (Labie	. Tuv	101	В	•	10 W	00	3,	(,	21
umohs/ Alk. carbon phos. No, Ca ⁺⁺ Mg ⁺⁺ Na ⁺ K ⁺ (cm) (mg/l)	later chei	mistry data									
Number of Number of Number of Number of bull trout Redd bull trout Redd bull trout Redd bull trout Redd redds in density redds in density reach (no/km) Year reach (no/km) Year reach (no/km) Year Other species	(umohs/ cm)	(mg/1)	carbo	on	phos.						SO. (mg/1
Number of Number of Number of bull trout Redd redds in density redds in density reach (no/km) Year reach	170	91		•							
bull trout Redd bull trout Redd bull trout Redd redds in density redds in density reach (no/km) Year reach (Spawning (data									
Other species	bull trou redds in	densi	ty	bul red	1 trout ds in	density	Year	bull trout redds in	density	<u>Year</u>	
Other species											
	ish popu	lation data									
	Density (_		Bull t	rout			tain	ecies Eastern Brk_tro

0.2

0.2

0.4

Α

0 0 0

0

0

PARK CREEK DRAINAGE

PARK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-7-81

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

Valley Characteristics:

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

Fish Populations:

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

PARK CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-4-81

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

Valley Characteristics:

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

followed the south bank.

Fish Populations:

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

PARK CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-4-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-6-81

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

PARK CREEK REACH 4

Channel Characteristics: Date Surveyed: 8-5-81

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

Valley Characteristics:

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

Fish Populations:

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

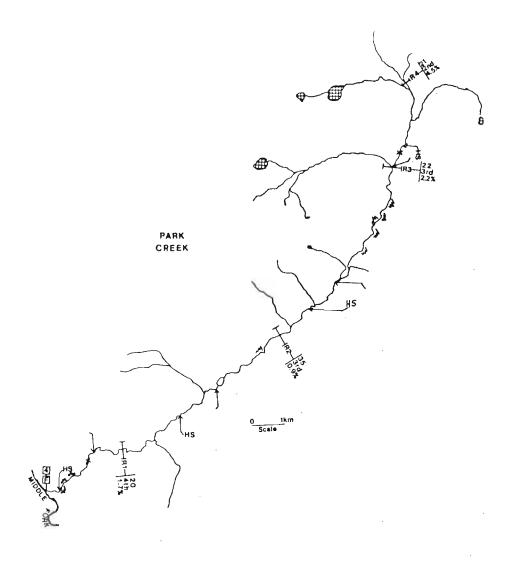


Figure 24. Physical habitat information for Park Creek.

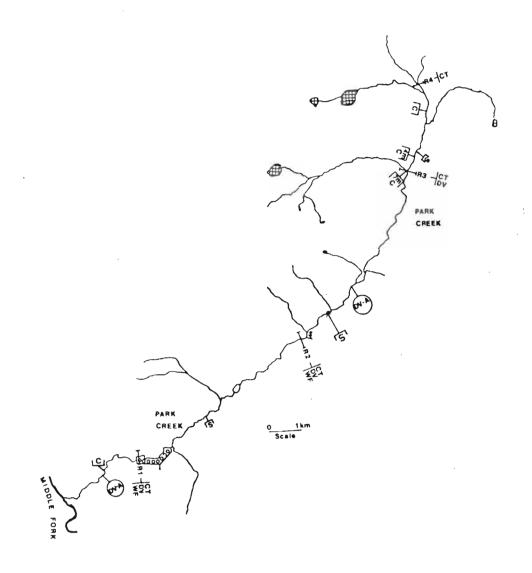


Figure 25. Fish population information for Park Creek.

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

Stream Name	Reach number			utary of	Upper reach boundary	·	Upper elev.(m)	Lower reach boundary		Lower elev.(m)
Park Cr.	001	C79	3.5 Mid For	dle k	3.5 kmouth	m above	1179.5	Juncti Middle		1118.7
Physical	Habitat data		Ave.		A		V-7.2			
Stream order 04	Drainage area(km²) 101.6	Ave. wetted width(m) 9.9	depth for reach(m)	ch	Ave. annel dth(m)	Valley width(m) 30	Valley- channel ratio 02	s -	Flow characteris Broken	
0-4	101.0									
Confine- ment	Pattern	Side channe occurence		e	Flow dur survey (m³/sec	pea	erage k water mp(C)	urbidity	Maximum pool depth(m)	<u>.</u>
E	P	Nil	• 62				16	Low	2.4	
% pool	% run	‡ riffle	; pocket water	-	% class I pools	% clas Il poo	1 <u>s</u> 111 pc	ols IV	pools	% class V pools
18	42	3	37		22	16	9		53	0
% fines	%gravel	% bed mate % rubble	rial 1 boulde	r	bedrock	D-90 (cm)	gradient	Stability rating		ınk orm
7	12	13	38	-1	30	$\frac{\langle c_{iii} \rangle}{110}$	1.7	74		eep
Bank Process	Ba gene mater		Flood plain debris		hannel deb <u>ris</u>	% sta chann _debr	el % cover		er sno	cover- orkel ction
Stable	Fluv	ial	Low		Low	20	13	9	2	9
Water chem	nistry data									
Cond. (umohs/ cm)	Alk. (mg/1)	Total carbon (mg/l)	Total phos. (mg/l)		No ₃	Ca ⁺⁺	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/])	K ⁺ (mq/l)	50. (mg/1)
150	67	(119,77)		<u> </u>	mg/l) 	(mg/1) 	<u>(1197 1 /</u>	<u>/////////////////////////////////////</u>		1119717
Spawning (data									
Number of bull trou- redds in reach	t Redd densit (no/kn	ty	Number of bull trou redds in reach		Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	
3	0.8	81	0		0	82				
Fish popu	lation data								0.1	
Density (no/100 m ² su	urface anea)					Mount	Other spe	Eastern
Fan r	Cutthroat	il kae	III+ Age	0	Bull tre	Age II	Age 111+	White		Brk trout
Age D l	ige L Age	11 9000	14 IT AGE	U	Age 1	nge 11	Mac 111			

0.1

0

0.1

P

A

0

0.7

0.4

0.2

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

Stream Name Park Cr.	Reach number 002	Serial number C8A	Reach Length 8.4	Tributary of Middle Fork	boundar; 4.3 ki	m above ing Tr.	Upper <u>elev.(m)</u> 1252.5	Lower reach boundary 3.5 km mouth	above	Lower elev.(m) 1179.5
Physical Stream	Habitat dat	<u>a</u> Ave. wetted	Av dent	-	Ave. nannel	Valley	Valley- channel		Flow	
order	area(km²)	width(m) rea	ch(m) w	idth(m)	width(m)	<u>ratio</u>		haracteri	<u>stics</u>
03		10.4	•	33	35	405	12	Pla	cid, R	olling
Confine- ment	Pattern	Sid chani occurer	ne l nce	Average low flow	Flow dur survey (m³/sec	, pea	erage k water mp(C)	urbidity	Maximum pool depth(m	
U	N	Modera				g' - 1	% -1-	Lov	1.1	g: -1
s pool	run 😩	% riffle		pocket- water	% class I pools	% clas 11 poo			lass pools	% class V pools
15	60	25		0	24	38	38			0
% fines	%gravel	% bed mat % rubbl		boulder	%bedrock	D-90 (cm)	% gradient	Stability rating		ınk orm
27	52	20		1	0	25	0.9	106	F_{1}	at
Bank Process Aggradin	gene mater		Floo plai debr Moder	n (Channel debris oderate	% sta chann debr 20	el % cover		ng sec	over- orkel tion
Water che	mistry data									
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbo (mg/l	n	Total phos. (mg/1)	No ₃ - (mg/1) 	Ca ^{††} (mg/l) ——	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/l) 	K ⁺ (mg/1)	SO ₄ (mg/1)
Spawning	data									
Number of bull trou redds in reach		ty	bul red	per of I trout ds in each	Redd density (no/km)	Year		Redd density (no/km)	Year	
7	00.8	81		0	0	82				
Fish popu	lation data									
Density (no/100 m² su	ırface are	a)					Mounta	Other spe	cies Eastern
Age 0	Cutthroat Age I Age	II Ac	e 111+	Age 0	Bull tr	out Age 11	Age III+	Whitef		Brk trout
-			0.6	0	Age I	0.2	0.2	Р		A

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

Stream Name Park Cr.	Reach number 003	number <u>Le</u>	each Tributa ength of 7.6 Middl Fork	boundar	forks	Upper elev.(m 1422.7		ig Tr.
Physical Stream order 03	Drainage area(km²)	Ave. wetted width(m) 9.9	Ave. depth for reach(m)	Ave. channel width(m) 22	Valley width(m) 70	Valley- channel ratio 03	-	Flow haracteristics acid, Rolling
Confinement X pool 2	Pattern N ½ run 47	Side channel occurence Moderat Friffle 31		Flow dur survey (m³/sec % class I pools	/ pea	 ss % cl	<u>ools</u> <u>IV</u>	Maximum pool depth(m) 0.9 lass % class pools V pools 5 0
½ fines 7	*gravel 25	% bed mater % rubble 42	% boulder 25	%bedrock 1	D-90 (cm) 65	gradient 2.2	Stability rating 98	Bank <u>form</u> Repose
Bank <u>Process</u> Aggradin	gene mater ig Fluv	rial	Flood plain debris Moderate	Channel debris Low	% sta chann debi	nel % cove ris canop		
Water che Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) ——	Mq ⁺⁺ (ng/1)	Na ⁺ (mg/1) ——	K ⁺ SO ₄ (<u>mg/1) (mg/1)</u>
Spawning Number of		4	Number of bull trout	Redd		Number of	Redd	
bull trou redds in reach	dens it (no/kr	. y	redds in reach	density (no/km)	Year 	redds in reach	density (no/km)	<u>Year</u>
Density (no/100 m ² so Cutthroat Age 1 Age	urf <u>ace area</u>) - Il Age	111+ Age 0	Bull tr Age I	out Age II	Age III+	Mount White	
Age 0 O		.3 0.4		0.2	0	0	A	A

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

Stream Name	Reach number		each Tributi ength of	Upper ary reach boundary	,	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Park Cr.	004	C8C	3.2 Midd1 Fork		n above forks	1568.6	Upper fork	
CI.			TOTK	аррег	TOTKS		ac 17.5 Ki	.4
Physical	Habitat dat		Ave.	Ave.		Valley-		
Stream	Drainage	Ave. wetted	depth for	channel	Valley	channel		Flow ·
02	area(km²)	$\frac{\text{width(m)}}{7.2}$.33	width(m) 21	width(m) 30	ratio 02		cteristics ng, tumbling
		Side	Average	Flow dur		erage		x imum
Confine- ment	Pattern	channel occurence	low	survey (m³/sec	peak	(water np(C) <u>T</u>		pool pth(m)
C	N	Low						.0
* pool	1 run	% riffle	<pre>pocket- water</pre>	% class I pools	il pool			
43	19	5	33	25	25	0	50	0
% fines	gravel	% bed mater % rubble	ial % boulder	Shedrock	D-90 (cm)	gradient	Stability rating	Bank form
5	1.3	20	57	5	89	4.5	81	Repose
	Ва	ank	Flood		% stab	le		% cover-
Bank Process	gene mater	etic rial	plain debris	Channel _debris	channe _debri			snorkel <u>section</u>
Stable	F1uv	vial	High	Moderate	20	1	7	25
Water che	mistry data							
Cond.								
		Total	Total		++	++	+	+
(umohs/	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1)	Na [†] (mg/l <u>)</u> (<u>m</u>	κ ⁺ SO ₄ πg/l) (mg/l)
(umohs/	4	carbon	phos.					- 1
(umohs/	(mg/1)	carbon	phos.					- 1
(umohs/	(mg/1)	carbon	phos.					- 1
(umohs/cm) Spawning	(mg/1) data	carbon (mg/1)	phos. (mg/l) Number of	(mg/1) 	(mg/1) 	(nig/1) Number of	<u>(mg/1)</u> (<u>n</u>	- 1
(umohs/ cm) Spawning Number of bull trou redds in	(mg/1) data t Regulation	carbon (mg/1)	Number of bull trout redds in	(mg/1) Redd density	(mg/1) 	(mg/l) Number of bull trout redds in	(mg/1) (mg/1) (mg/1) Redd density	<u>mg/1) (mg/1)</u>
(umohs/ cm) Spawning	(mg/1) data t Rego	Carbon (mg/1)	phos. (mg/l) Number of bull trout	(mg/1) Redd	(mg/1) 	(mg/l) Number of bull trout redds in	(mg/1) (<u>mg/1)</u>	<u>mg/1) (mg/1)</u>
(umohs/ cm) Spawning Number of bull trou redds in reach	(mg/l) data t Reor densii (no/kr	carbon (mg/1)	Number of bull trout redds in reach	(mg/1) Redd density (no/km)	(mg/1) 	(mg/l) Number of bull trout redds in	(mg/1) (mg/1) (mg/1) Redd density	<u>mg/1) (mg/1)</u>
Spawning Spawning Number of bull trou redds in reach Fish popu	(mg/l) data t Reordensi: (no/kr	carbon (mg/1)	Number of bull trout redds in reach	(mg/1) Redd density (no/km)	(mg/1) 	(mg/l) Number of bull trout redds in	Redd density (no/km) Year	mg/l) (mg/l)
Spawning Number of bull trou redds in reach Fish popu Density (data t Rediction data lation data no/100 m² su Cutthroat	d ty Year	Number of bull trout redds in reach	Redd density (no/km)	<u>√wg/1)</u> <u>∀e≀ar</u>	(mg/l) Number of bull trout redds in reach	(mg/1) (ng/1) (n	<u>mg/1) (mg/1)</u>
Spawning Number of bull trou redds in reach Fish popu Density (data t Reordensing (no/km lation data no/100 m² su Cutthroat	carbon (mg/1)	Number of bull trout redds in reach	Redd density (no/km)	<u>₩g/1)</u> <u>₩eas</u>	(mg/l) Number of bull trout redds in	Redd density (mo/km) Year Othe	er species Eastern

DICKEY CREEK DRAINAGE

DICKEY CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-16-81

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

<u>Valley Characteristics:</u>

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

Fish Populations:

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

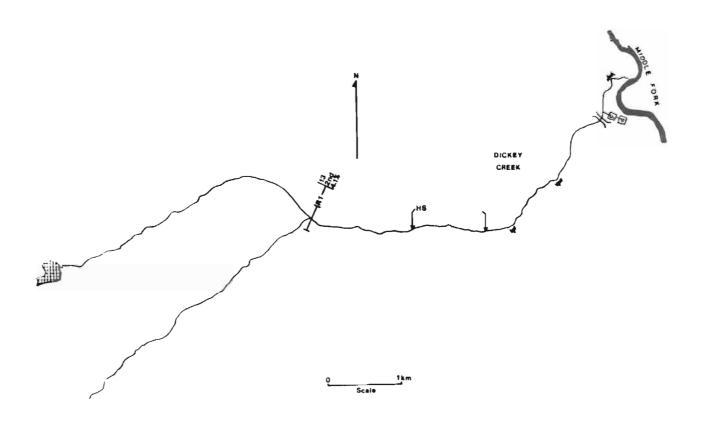


Figure 26. Physical habitat information for Dickey Creek.

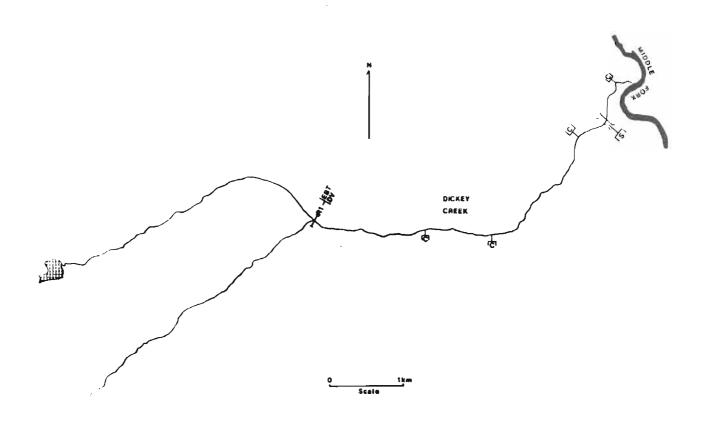


Figure 27. Fish population information for Dickey Creek.

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

Stream Name	Reach number		Reach Length	Tributa of	Upper ry reach bounda	ary	Uppe elev		ary	Lower elev.(m)
Dickey	001	C8D	4.4	Middle	e lst	inter-	130	1.1 Jun	ction w/	1118.7
Cr.				Fork	mitt	ent trib			dle Fork	
					on S	ο.				
Physical	Habitat dat									
Stream	Drainage	Ave. wetted	Av	e. h for	Ave. channel	Valley	Valley- channel		Flox	
order	area(km²)	width(m)		ch(m)	width(m)	width(m)	ratio		characte	
02	23.3	5.8	. 2		13	50	04	3 (4		tumbling
0.2	20.5								~	-
Confine		Side channe		Average low	Flow d		Average		Maximu	
Confine- ment	Pattern	occurenc		flow	S urv (m³/s		eak water temp(C)	Turbidit	pool y depth(
F	P	Low	-	.09				Nil	1.2	<u> </u>
Г	1	LOW		pocket-	% clas	s %cla	155 %	class	% class	% class
2 pool	∜ run	: riffle		water	l pool			I pools	1V pools	V pools
11	37	19		33	0	18	}	19	63	0
		% bed mate	rial			D-90	%	Stabili	tv	Bank
% fines	%gravel	% rubble	k	boulder	%bedroc	k (cm)	gradient			form
10	10	8		7	65	68	4.1	58		Steep
Bank Process	Bank genetic material		Floo plai debr	n	% st. Channel chan debris deb		inel % c		cover s	% cover- snorkel section
Stable	Fluvial			Low		Low 75			10	
Jeanie		VIGE	ЦС	••	20.	·		•		
Water cher	mistry data									
Cond.	A 3 to	Total		Total	a)	Ca ⁺⁺	M- +-	+ Na ⁺	κ*	50
(umohs/ cm)	Alk. (mg/l)	carbon (mg/l)		phos. (mg/l)	No ₃ (mg/1)	(mg/l)	Mgʻ (mg/			50. (mg/l)
200	116	-								
Spawning	data									
Number of bull trou redds in	t Redo dens i		bul	ber of 1 trout ds in	Redd densit		Number o bull tro redds in	ut Redd		
reach	(no/kr	3		each	(no/km		reach	(no/km)	Year	
Fish popu	lation data								Other	pasias
Density (no/100 m² si	ırface area)					M	Other s ountain	Eastern
	Cutthroat				Bull	trout			hitefish	8rk trout

Age II

A

Α

OLE CREEK DRAINAGE

OLE CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-14-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-13-81

Westslope cutthroat, juvenile and adult bull trout eastern brook trout and mountain whitefish were observed. Densities of juvenile bull trout indicated an important rearing area with 4.1 age I or older bulls per 100 m² surface area. Stream trapping data showed adult bull trout use Reach 1 as a migration corridor to spawning areas in the upper reaches. An outmigration of juvenile bull trout and cutthroat was also observed. Glacier National Park regulations closed Ole Creek to fishing in 1972.

OLE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-11-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-9-81

Westslope cutthroat, juvenile bull trout and mountain whitefish were observed. Densities of juvenile bull trout showed an important rearing area with 1.7 age I or older bulls per 100 m² surface area. Spawning by adfluvial bull trout has been documented with an average of 30 redds enumerated annually during three years of survey. Bull trout redd density in the high use portion of this reach was 9.5 redds per km during the 1981 redd survey. Westslope cutthroat were present in moderate densities and spawning by migratory fish is suspected in high water channels and tributary drainages. Glacier National Park regulations closed Ole Creek to fishing in 1972.

OLE CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-11-81

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. A density estimate indicated an important bull trout rearing area, with 3.2 age I or older bulls per 100 m² surface area. Spawning by adfluvial bull trout has been documented. Cutthroat were present in moderate densities. Ole Creek was closed to fishing by Glacier National Park regulations in 1972.

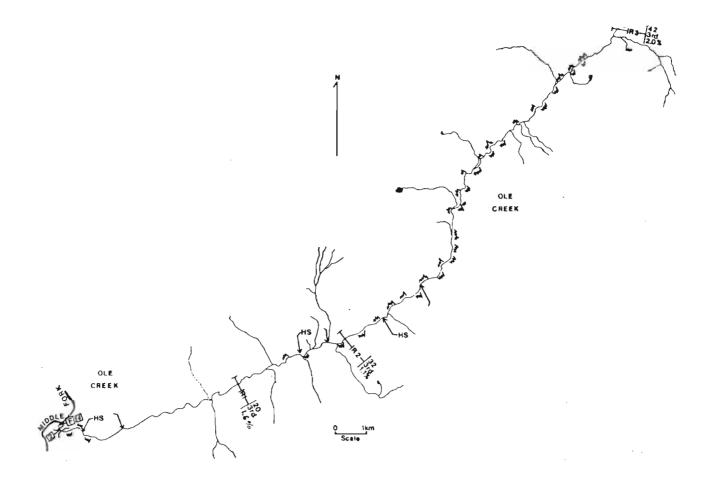


Figure 28. Physical habitat information for Ole Creek.

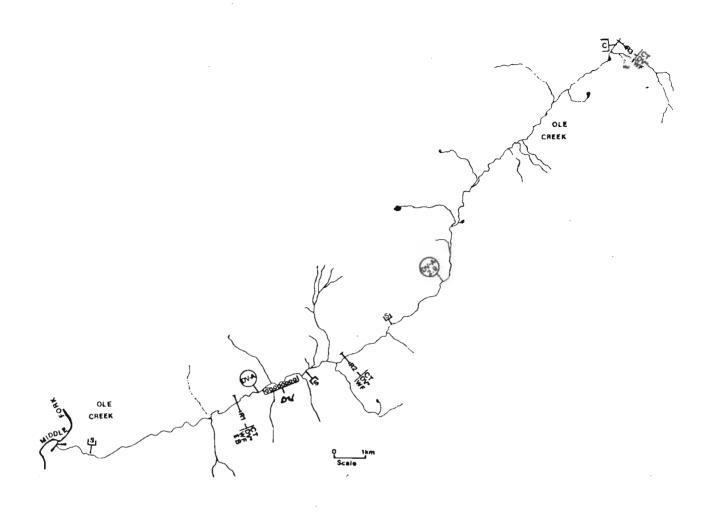


Figure 29. Fish population information for Ole Creek.

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

Stream Name Ole Cr.	Reach number 001	number L	each Iributa ength of 7.4 Middle Fork	boundary e End of	canyon above	Upper elev.(m) 1256.6	Lower reach boundary Junction Middle Fo	•
Physical	Habitat data	<u>a</u> Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel	Valley width(m)	channel ratio	char	Flow : acteristics
03	119.5	10.2	.44	20	50	03		ling, broken
Confine- ment C	Pattern P	Side channel occurence Nil	Average low	Flow dur survey (m³/sec	ing Ave peak) tem	rage water	m urbidity d	aximum pool epth(m)
C	Г	NII	.93 % pocket-	% class	% class			2.0 % class
= pool	° run	% riffle	water	I pools	II pool		ols IV poo	ls V pools
3	45	7	45	50	0	0	50	0
% fines	2grave1	% bed mater % rubble	boulder	%bedrock	D-90 (cm)	gradient S	Stability rating	Bank
20	15	25	30	10	151	1.6	107	Repose
Bank <u>Process</u> Failing	gene mater	ank etic ial vial	Flood plain debris Low	Channel debris Low	% stab channe debri	1 % cover-	% cover overhang 5	% cover- snorkel section 22
Water chem	nistry data							
Cond. (umohs/ cm) 170	Alk. (mg/1) 76	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/l)	Na ⁺ (mg/1) 	K ⁺ SO ₄ (mg/1) (mg/1)
Spawning (data							
Number of bull trout redds in reach	t Redo densit (no/kr	У	Number of bull trout redds in reach	Redd density (no/km)			Redd density (no/km) Yea	<u>ar</u> -
	lation data							
40 - 40 - 7	no/100 m ² si	urface area)						her species
	Cutthroat		111+ Age 0	Bull tr	out Age II	Age III+	Mountain Whitefis	

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

Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ry reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
01e	002	C8F	4.0	Middle		above	1301.1	End of	canyon 1258.6
Cr.				Fork	Field	ing Tr.		7.4 km	above
					Cross	ing		mouth	
Physical	Habitat data Drainage	<u>a</u> Ave. wetted	Av dept	e. h for	Ave. channel	Valley	Valley- channel		Flow
order	area(km²)	width(m)		Service Company		width(m)	ratio	<u>c</u>	naracteris <u>tics</u>
03		9.6	. 2	0	32	200	06	Bro	ken, swirling
Confine-		Sic chann		Average low	Flow dur survey		erage k water		Maximum pool
ment	Pattern	occurer		flow	(m³/sec			urbidity	depth(m)
U	P	Modera				-		Low	1.1
2 pool	% run	% riffle		pocket- water	% class I pools	% clas II poo			ass % class ools V pools
5	62	30		3	12	25	50	1	3 0
% fines	%gravel	% bed mat % rubbl		boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
15	35	30		20	0	31	1.1	107	Repose
Bank Process	gene mater		Floo plai debr	n is	Channel debris Low	% sta chann <u>debr</u> 30	el % cover is canopy		
Failing	riuv	Lai	Low		LOW	5(, ,	,	15
Water chem	nistry data								
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbo (mg/l	n	Total phos. (mg/1)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/l) 	Na [†] (mg/l) 	(mg/1) (mg/1)
Spawning o	data								
Number of bull trout redds in reach	Redd dens 11 (no/kr 4.7	ty n) Year	bul red r	ber of 1 trout ds in each 9	Redd density (no/km) 04.7	Year 81			Year 82
Fish popul	ation data								
Density (r	10/100 m² su	irface are	<u>a</u>)					Mounta	Other species
Age O A	Cutthroat age 1 Age	11 Ag	e III+	Age 0	Bull tr Age I	out Age Il	Age III+	Whitef	
			2.9	0	0.3	0.7	0.7	P	\mathbf{A}_{\perp}

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

Stream Name	Reach number		Reach Tribut Length of		ry	Upper elev.(m)	Lower reach boundary		Lower elev.(m)
Ole	003	C8G	5.6 Midd	le Falls	above	1617.3	.2 km	above	1301.1
Cr.			Fork	Debr	is Cr.		Fieldi: Crossi:	9	
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 characteris	tics
03		9.3	.29	42	150	04	Bro	oken, sw	rling
Confine-	Dattom	Side channe	l low	surve	y pea	verage ik water	Toubidies	Maximum pool	
ment X	Pattern	occurenc	-	(m³/se	<u>c)</u> e	emp(C)	Turbidity	$\frac{\text{depth}(m)}{0.7}$	
Λ	1	11161	% pocket-	2 class	% clas	s % cla	Low ass % o		% class
© pool 0	5 run 65	25 riffle	water 10	I pools	11 poo	01s	ools IV	poo1s 00	V pools O
		% bed mate			D-90	%	Stability		n k
% fines	#gravel	% rubble		%bedrock		gradient	rating		rm
15	24	40	20	I	45	2.0	106	Rep	ose
		ank	Flood		% sta				over-
Bank Process	gene mater		plain debris	Channel debris	chann debr				rkel tion
Failing	-		loderate	Low	25	1	1		.4
	mistry data								
Cond.		Total	Total	•					
(umohs/	Alk.	carbon		No 3	Ca ⁺⁺	Mq ++	Na +	K ⁺	SO ₄
cm)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(<u>mg/1)</u>	(mg/1)
Spawning	data								
Number of bull trou redds in	t Redo densit		Number of bull trout redds in	Redd density		Number of bull trout redds in	Redd density		
reach	(no/ki		reach	(no/km)	Year	reach	(no/km)	Year	
4	00.3	81							

c	`	(ን
7	٦	7	٦

Bull trout

1.6

Age I

0.8

0

Age III+

0.8

Other species

Eastern

A

3rk trout

Mountain

Whitefish

P

Fish population data

Age C

0

Density (no/100 m² surface area)

Age 11

2.6

Age III+

1.5

Cutthroat Age I Age

0.6

ESSEX CREEK DRAINAGE

ESSEX CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-24-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-4-81

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

ESSEX CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-28-81

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

Valley Characteristics:

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

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

Fish Populations:

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

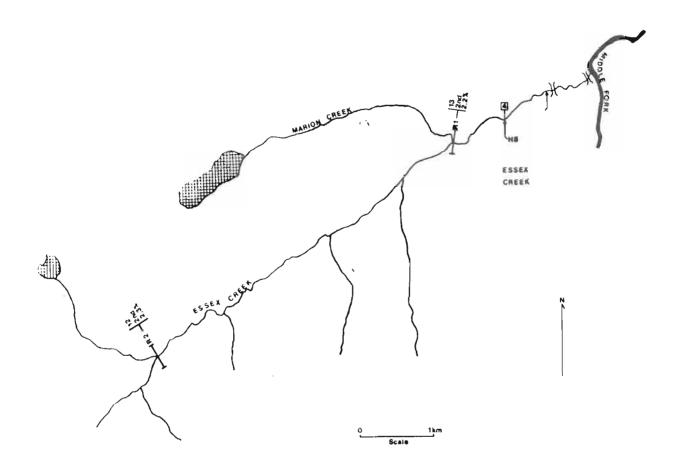


Figure 30. Physical habitat information for Essex Creek.

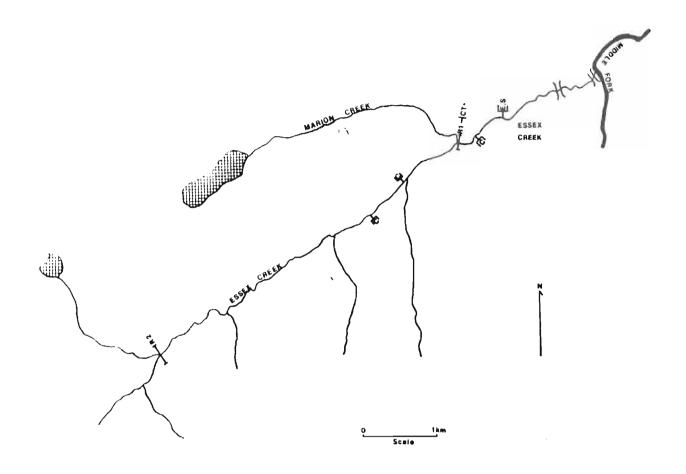


Figure 31. Fish population information for Essex Creek.

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

Stream Name	Reach number	<u>number</u> <u>L</u>	each Tributa	boundary		Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Essex	001	С8Н .	19 Middl Fork	le Junct Mario	ion w/ n Cr.	1216.0	RxR Crossing	1173.4
			10210	1141 10	02.		010331116	
Physical	Habitat data	a						
Stream	Drainage	- Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow ·
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	ratio		cteristics
02	26.6	6.3	.21	13	250	19	Swirli	ing, rolling
Confine-		Side channel	Average I low	Flow dur survey		erage k water		ximum pool
ment	Pattern	occurence		(m³/sec			urbidity de	pth(m)
U	P	Low				14	Nil 1.	
nool	1 run	: riffle	% pocket- water	% class 1 pools	% clas II poo			
8	42	33	17	23	23	15	29	0
		% bed mater	rial		D-90	9'	Stability	Bank
10	*grave1	1 rubble 42	\$ boulder 19	% <u>bedrock</u>	(cm) 36	gradient 2.2	rating 84	<u>form</u> Repose
10	20	42	17	1	50	Z • Z	84	керозе
					2001			
0 1		ank - * : -	Flood	Channal	% sta		9	% cover-
Bank Process		etic	Flood plain debris	Channel debris	t sta chann debr	el % cover		% cover- snorkel <u>section</u>
	gene	etic rial	plain		chann	el % cover		snorkel
Process Stable	gene mater Fluv	etic rial	plain debris	debris	chann debr	el % cover is canopy	overhang	snorkel section
Process Stable Water che	gene mater	etic rial vial M	plain debris doderate	debris	chann debr	el % cover is canopy	overhang	snorkel section
Stable Water che	gene mater Fluv emistry data Alk.	etic rial rial M Total carbon	plain debris loderate Total phos.	Low No ₃	chann debr 60	el % cover is canopy 12	overhang 16	snorkel section 30
Process Stable Water che	gene mater Fluv emistry data	etic rial vial M Total	plain debris loderate Total	debris Low	chann- debr 60	el % cover is <u>canopy</u> 12	overhang 16	snorkel section 30
Stable Water che	gene mater Fluv emistry data Alk.	etic rial rial M Total carbon	plain debris loderate Total phos.	Low No ₃	chann debr 60	el % cover is canopy 12	overhang 16	snorkel section 30
Stable Water che Cond. (umohs/ cm)	gene mater Fluv emistry data Alk. (mg/l)	etic rial rial M Total carbon	plain debris loderate Total phos.	Low No ₃	chann debr 60	el % cover is canopy 12	overhang 16	snorkel section 30
Stable Water che	gene mater Fluv emistry data Alk. (mg/l)	etic rial rial M Total carbon	plain debris loderate Total phos.	Low No ₃	chann debr 60	el % cover is canopy 12	overhang 16	snorkel section 30
Process Stable Water che Cond. (umohs/ cm) Spawning	gene mater Fluv emistry data Alk. (mg/l) —— data	etic rial rial M Total carbon (mg/1)	plain debris Ioderate Total phos. (mg/l)	Low No ₃ - (mg/1)	chann debr 60	el % cover iscanopy	overhang 16 Na ⁺ (mg/1)	snorkel section 30
Process Stable Water che Cond. (umohs/ cm)	gene mater Fluv emistry data Alk. (mg/l) data f Reddidensi	rial M Total carbon (mg/1)	plain debris Moderate Total phos. (mg/l)	No 3 (mg/1)	chann debr 60	el % cover is	Na ⁺ (mg/1) (A	snorkel section 30
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in reach	generates Fluv emistry data Alk. (mg/l) data f	rial M Total carbon (mg/1)	Plain debris Ioderate Total phos. (mg/l) Number of bull trout redds in reach	No ₃ (mg/1)	chann debr 60	el % cover is	Na ⁺ (mg/1) (no/km) Year	snorkel <u>section</u> 30 K [†] SO. mg/1) (mg/1)
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in:	gene mater Fluv emistry data Alk. (mg/l) data f Reddidensi	rial M Total carbon (mg/1)	plain debris Ioderate Total phos. (mg/l) Number of bull trout redds in	No 3 (mg/1)	chann-debr 60 Ca ⁺⁺ (mg/1)	el % cover is	Na ⁺ (mg/1) (A	snorkel <u>section</u> 30 K [†] SO. mg/1) (mg/1)
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in reach	gene mater Fluv emistry data Alk. (mg/l) data f Reddidensi	rial M Total carbon (mg/1)	Plain debris Ioderate Total phos. (mg/l) Number of bull trout redds in reach	No 3 (mg/1)	chann-debr 60 Ca ⁺⁺ (mg/1)	el % cover is	Na ⁺ (mg/1) (no/km) Year	snorkel <u>section</u> 30 K [†] SO. mg/1) (mg/1)
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in reach Fish popu	genemater Fluv emistry data Alk. (mg/l) data fut Redd densi (no/ki	Total Carbon (mg/1) d ty m) Year	plain debris Ioderate Total phos. (mg/l) Number of bull trout redds in reach	No 3 (mg/1)	chann-debr 60 Ca ⁺⁺ (mg/1)	el % cover is	Na ⁺ (mg/1) (no/km) Year	snorkel section 30 K [†] SO, mg/l) (mg/l)
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in reach Fish popu	genemater Fluv emistry data Alk. (mg/l) data fut Red densi (no/kr	Total Carbon (mg/1) d ty m) Year	Plain debris Ioderate Total phos. (mg/l) Number of bull trout redds in reach	No3 (mg/1) Redd density (no/km)	channedebr 60 Ca ⁺⁺ (mg/1) Year	el % cover is canopy 12 Mq++ (mg/l) Number of bull trout redds in reach	Na ⁺ (mg/1) Redd density (no/km) Othe	snorkel section 30 K [†] \$0, mg/1) (mg/1)
Process Stable Water che Cond. (umohs/ cm) Spawning Number of bull trou redds in reach Fish popu	genemates Fluv emistry data Alk. (mg/l) data fut Red densi (no/ku	Total M Total Carbon (mg/1) d ty m) Year urface area)	plain debris loderate Total phos. (mg/l) Number of bull trout redds in reach	No3 (mg/1) Redd density (no/km)	channedebr 60 Ca++ (mg/1) Year	el % cover is	Na ⁺ (mg/1) Redd density (no/km) Year Othe	snorkel section 30 K [†] \$0, mg/1) (mg/1)

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

Stream Name	Reach number		Reach Tribut Length of	Upper ar y reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Essex Cr.	002	C81	1.6 Middl Fork	e 4.1 kr mouth	n above	1353.3	Junction Marion Cr	•
Physical	Habitat data							
Stream <u>order</u>	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel _ratio	cha	Flow : racteristics
02		8.4	. 20	12	100	08	Т	umbling
Confine- ment	Pattern	Side channe occurenc	l low	Flow dui survey (m³/sec	y pea	verage ak water emp(C)		daximum pool depth(m)
F	P	Nil						2.0
° pool	% run	% riffle	% pocket- water	% class I pools	% clas	ols <u>III po</u>	ools IV poo	
18	43	26	13	8	15	40		0
% fines	%grave1	<pre># bed mate # rubble</pre>		%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
1	5	8	12	74	40	8.2	54	Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann _debr	iel 🧏 cover		% cover- snorkel section
Stable	F1uv	/ial	Moderate :	Moderate	30	5	1	
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)		No ₃ - (mg/l)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/1)	Na [†] (mg/l)	K ⁺ SO ₄ (mg/1)
Spawning	da ta							
Number of bull trou redds in reach		ty	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km) Ye	ear_
-+								
Fish popu	lation data							
Density (no/100 m² su	urface area)				Mountain	her species Eastern
Ann 0	Cutthroat	11 6	1111	Bull tr			Whitefis	
Age 0	Age I Age	II Age	111+ Age 0	Age I	Age II	Age III+		

Α

BEAR CREEK DRAINAGE

BEAR CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-31-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-5-81

Westslope cutthroat, juvenile and adult bull trout, eastern brook trout and mountain whitefish were observed. A density estimate indicated an important rearing area for juvenile bull trout (2.8 age I or older fish per 100 m² surface area). Trapping results showed the area to be a migration corridor for adfluvial bull trout and migratory westslope cutthroat trout.

BEAR CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-27-81

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

Valley Characteristics

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

Fish Populations: Date Surveyed: 7-31-81

Westslope cutthroat, juvenile and adult bull trout, eastern brook trout, mountain whitefish and sculpins were observed. Adfluvial bull trout spawning was documented with an average of 15 redds enumerated annually during three years of survey. Redd density in the 1981 high use area was 6.0 bull trout redds per km. This reach also contained the highest eastern brook trout density observed (6.4 per 100 m²) with several fish approaching 300 mm in length.

BEAR CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-29-81

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 7-31-81

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

Giefer Creek Reach 1

<u>Channel Characteristics</u>: Date Surveyed: 7-25-81

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

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 7-26-81

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

Skyland Creek Reach 1

Channel Characteristics: Date Surveyed: 7-25-81

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

Valley Characteristics:

The upper bank slope was 40 to 60% and the valley to channel ratio varied from 0 to 21. The average valley width was 30 m. Reach 1 had an irregular pattern and was generally entrenched.

Fish Populations: Date Surveyed 7-26-81

Westslope cutthroat and juvenile bull trout were observed. A density estimate of 3.4 age I or older bull trout per 100 m² surface area indicated an important rearing area, although no bull trout spawning has been observed here.

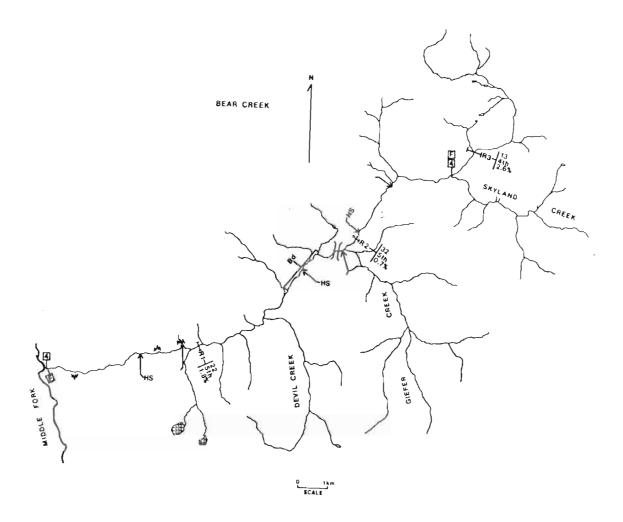


Figure 32. Physical habitat information for Bear Creek.

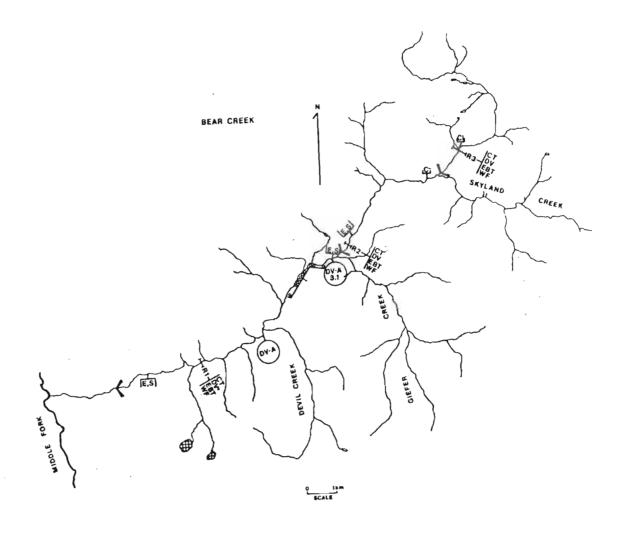


Figure 33. Fish population information for Bear Creek.

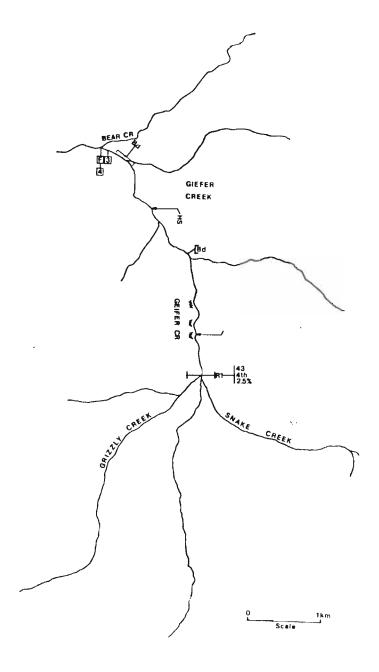


Figure 34. Physical habitat information for Giefer Creek.

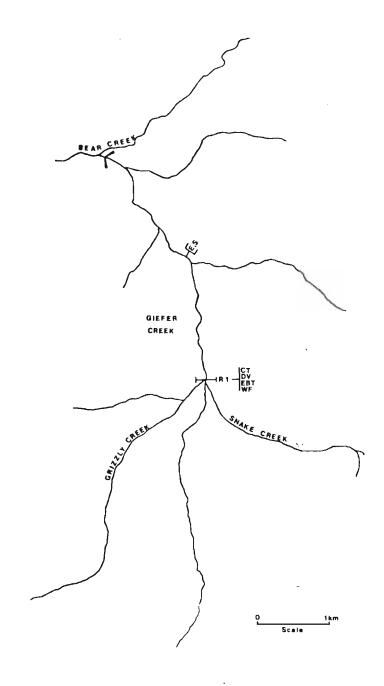


Figure 35. Fish population information for Giefer Creek.

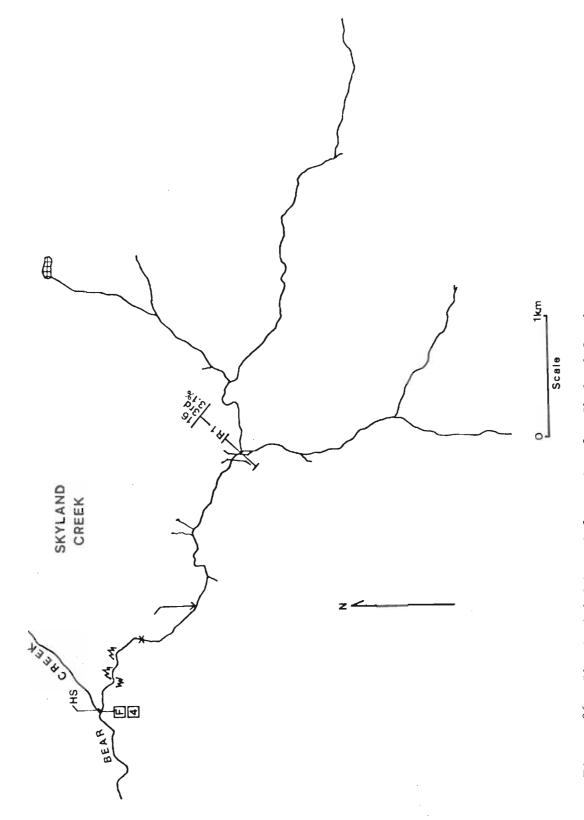


Figure 36. Physical habitat information for Skyland Creek.

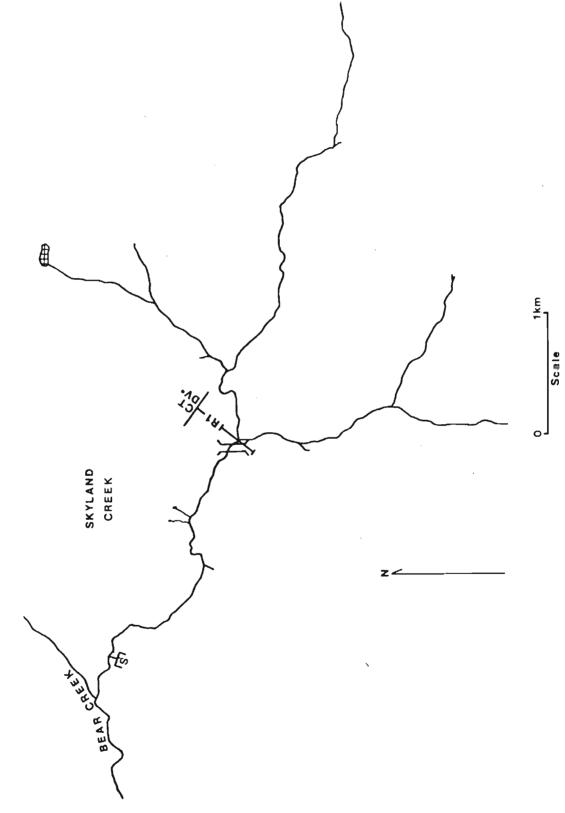


Figure 37. Fish population information for Skyland Creek.

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

Stream <u>Name</u> Bear Cr.	Reach number 001		each Tributa ength of 5.9 Midd Fork	boundar	km above	Upper elev.(m 1285.9		,
Physical I	Habitat dat	a						
Stream order 05	Drainage area(km²) 145.4	Ave. wetted width(m) 10.3	Ave. depth for reach(m) .47	Ave. channel width(m) 22	Valley width(m) 200	Valley- channel <u>ratio</u> 03		Flow characteristics id, rolling
Confine- ment X	Pattern P	Side channel occurence Low	Average low flow .54	Flow du surve (m³/se 	y pea		Turbidity Moderate	$\begin{array}{c} \text{Maximum} \\ \text{pool} \\ \underline{\text{depth(m)}} \\ \hline 1.3 \end{array}$
* pool 0	% run 48	<u>≈ riffle</u> 23	% pocket- water 29	% class 1 pools 0			<u>ools</u> <u>1V</u>	class % class pools V pools O
% fines 10	%gravel 15	% bed mater % rubble 32	% boulder 41	%bedrock 2	D-90 (cm) 67	gradient 1.8	Stability rating 92	Bank <u>form</u> Flat
Bank Process Stable			Flood plain debris Low	Channel debris Low	% sta chann <u>debr</u> O	el % cove		
Water chem	nistry data							
Cond. (umohs/ cm) 240	Alk. (mg/1) 131	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (mg/1) 	Na [†] (mg/l) ——	K ⁺ SO ₄ (mg/1) ——
Spawning o	ia ta							
Number of bull troud redds in reach	Red dens i (no/k)	ty	Number of bull trout redds in reach	Redd density (no/km) 	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km) 	<u>Year</u>
	ation data							Other species
	Cutthroat Age I Ag	e II Age 0 0.3		Bull t Age I O	rout Age II 0.1	Age 111+ 2.7	Mount White P	ain Eastern

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

Stream Name	Reach number		Reach Tribut Length of	•	r <u>y</u>	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bear Cr.	002	C8K	7.7 Midd Fork		m above er Cr.	1352.8	5.9 km abo	ove 1285.9
<u>Physical</u>	Habitat dat	<u>a</u> Ave .	Ave.	Ave.		Valley-		
Stream <u>order</u>	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel width(m)	Valley width(m)	channel <u>ratio</u>	char	Flow racteristics
05		9.0	.28	32	480	>10	Brok	en, rolling
Confine- ment U	Pattern N	Side channe occurend Moderat	el low ee flow e	Flow du surve (m³/se	y pea c) te	18	urbidity c	daximum pool depth(m) 1.5
2 pool 10	<u>% run</u> 54	% riffle	% pocket- <u>water</u> O	% class 1 pools 70			ools IV poo	
z fines 48	%gravel 32	% bed mate % rubble 15		%bedrock O	D-90 (cm) 23	gradient 0.9	Stability rating 104	Bank <u>form</u> Flat
Bank <u>Process</u> Failing			Flood plain debris Low	Channel debris	% sta chann debr 20	el % cover is canopy		% cover- snorkel section 16
Water che	mistry data							
Cond. (umohs/ 	Alk. (<u>mg/l)</u> ——	Total carbor (mg/l) 		No ₃ - (mg/1) 	Ca ⁺⁺ (mg/1) ——	Mg ⁺⁺ (mg/1) ——	Na ⁺ (mg/1)	K ⁺ SO ₄ (mg/1)
Spawning	data							
Number of bull trou redds in reach 9		ty m) Year	Number of bull trout redds in reach	Redd density (no/km) 1.6	Year 81	Number of bull trout redds in reach 23		ar 32
Fish popu	lation data							
Density (no/100 m² su Cutthroat	urface area)	Bull t	rout		Mountain	
Age 0			111+ Age (Age II 0.1	Age 111+ 0.2	<u>Whitefis</u> P	h Brk trout P

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

Stream Name	Reach number		each Tributa ength of	Upper reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Bear Cr.	003	C8L 10).l Middle Fork		xR xing summit	1617.3	3 .8 km abo	
Physical	Habitat dat	<u>a</u> Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel width(m)	Valley width(m)	channel ratio		Flow - cteristics
04		7.5	.22	13	75	06	Rollin	g, swirling
Confine- ment F	<u>Pattern</u> P	Side channel occurence Nil	Average low <u>flow</u>	Flow dum survey (m³/sec	, pea	erage k water mp(C)	Turbidity de	ximum pool pth(m)
1	ı	1411	% pocket-	% class	% clas	 s % cla		.6 % class
5 pool	½ run	% riffle	water	<u>I_pools</u>	11 poo	ls III po	ools <u>IV pool</u>	
5	53	32	10	0	55	0	45	0
% fines	%gravel	<pre>% bed mater % rubble</pre>	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
15	20	36	26	3	38	2.6	75	Repose
Bank Process Failing	Ba gene mater Flux	rial	Flood plain debris Low	Channel debris	% sta chann debr 25	el % cover is canopy		% cover- snorkel section
Water cher	mistry data							
Cond. (umohs/ cm) 255	Alk. (mg/1) 114	Total carbon (mg/l)	Total phos. (mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/l) 	Mg ⁺⁺ (mg/1)	Na ⁺ (<u>mg/1</u>) (<u>r</u> 	κ [†] 50. ng/l) (mg/l)
Spawning	data							
Number of bull trou- redds in reach	t Redo densii (no/kr ——	ty	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km) Yea	<u>.</u>
Fish popu	lation data						0.1	
Density (urface ar <u>ea</u>)					Mountain	er species Eastern
Age 0	Cutthroat Age I Age	Age	III+ Age 0	Bull tr Age I	Age II	Age III+	Whitefish	8rk trout
0	0 0.	. 3 0	.3 0	0.1	0.3	0.7	P	P

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

Stream Name Giefer Cr.	Reach <u>number</u> 001	number L	each Tributa ength of Bear Cr.	boundar	ion w/	Upper elev.(m) 1434.9	Lower reach boundary Junction Bear Co	
Physical Stream	Habitat data Drainage	Ave. wetted	Ave. depth for	Ave.	Valley	Valley- channel		Flow ·
<u>order</u> 04	29.1	width(m) 4.8	reach(m)	width(m) 43	width(m) 150	<u>ratio</u> 03		ling, swirling
Confine- ment U	Pattern P	Side channel occurence Low	Average low flow .022	Flow du surve (m³/se	ring Av y pea c) te	erage k water mp(C)	Turbidity Low	Maximum pool depth(m)
% pool	<u>5 run</u> 40	% riffle	% pocket- water	% class I pools	II poo	ls III po	ools IV p	oools V pools
2 fines 16	%grave1 28	% bed mater % rubble 43	12 ial boulder 13	8bedrock 0	D-90 (cm) 26	gradient 2.5	Stability rating 89	Bank form Repose
Bank Process	gene mater	<u>ia</u> l	Flood plain debris	Channel debris	% sta chann debr	el % cover is canopy	y overhan	g section
Failing	Fluv	/1a1	Low	Low	10	6	4	27
Cond (umohs/cm)	Alk. (mg/1) 133	Total carbon (mg/l)	Total phos. (mg/1) ——	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (nig/1)	Na ⁺ (mg/1) 	K ⁺ SO ₊ (mg/1)
Spawning (da ta							V
Number of bull trout redds in reach	t Redc densit (no/km	y n) Year	Number of bull trout redds in reach	Redd density (no/km)	Year 	Number of bull trout redds in reach	Redd density (no/km) 	<u>Year</u>
	lation data							Other species
Age D /		II Age		Bull tr Age I	out Age II	Age III+	Mounta Whitef	in Eastern
0	0.2 1.	6 2.	3 0	0	0	0.4	Α	P

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

Stream Name	Reach number	number L	each Tributa ength of	Upper ry reach boundar	ry	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Skyland Cr.	001	C8N 3	.4 Bear Creek		tion w/ Skyland	1562.6	Junction Bear Cr.	
Physical	Habitat dat							
Stream order 04	Drainage area(km²) 21.6	Ave. wetted width(m) 6.1	Ave. depth for _reach(m) _28	Ave. channel width(m) 16	Valley width(m)	Valley- channel <u>ratio</u> 02	_	Flow bracteristics oling, broken
Confine- ment E	Pattern P	Side channe occurence Low		Flow du surve (m³/se 	y pea	erage k water mp(C)	Turbidity Low	Maximum pool depth(m)
10 pool	<u>* run</u> 49	% riffle	% pocket- water 40	% class I pools O	11 poo 11	1s III po 19	70 70	% class v pools
% fines 12	*gravel 22	<pre># bed mate # rubble 30</pre>	boulder 35	%bedrock	D-90 (cm) 53	gradient 3.1	Stability rating 98	Bank form Steep
Bank Process Failing			Flood plain <u>debris</u> (oderate M	Channel debris oderate	% sta chann debr 50	el % cover		% cover- snorkel section 25
	nistry data							
Cond. (umohs/ cm) 305	Alk. (mg/1) 98	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ (mg/l)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (ng/1)	Na ⁺ (mg/1) 	K ⁺ SO. (mg/1)
Spawning o	da ta							
Number of bull trout redds in reach	Redi densi (no/ki	ty	Number of bull trout redds in 	Redd density (no/km)	Year 	Number of bull trout redds in reach	Redd density (no/km) Y	ear
	lation data						0	ther species
	Cutthroat	urface area]]]+ Age 0	Bull t Age 1	rout Age II	Age 111+	Mountai Whitefi	n Eastern
_		0.3		0.8	1.5	1.1	A	A

CHARLIE CREEK DRAINAGE

CHARLIE CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-20-79

Reach 1 is a second order tributary to the Middle Fork. Average wetted width was 7.0 m and the mean depth was 0.25 m. This reach was composed of 50% riffle, 40% run, 5% pocketwater and 5% pool areas. Channel debris was low with 30% stable. Bank cover was low to moderate, with 10% of the wetted surface area influenced by overhang. Moderate instream cover (20%) was provided by substrate, turbulence and depth. Stream gradient was 2.2% and the D-90 was 20 cm. Some mass wasting was observed and several debris jams were noted. A 0.2 km bedrock area was present just above a closely spaced pair of waterfalls at stream km 0.4. The Long Creek Trail crossed just above the mouth.

Valley Characteristics:

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

Fish Populations: Date Surveyed: 7-21-79

Westslope cutthroat and bull trout were observed. A density estimate indicated an extremely important rearing area for juvenile bull trout with 6.3 age I or older fish per 100 m² surface area. Adfluvial bull trout migrate through this reach to spawning areas in the upper reaches of Charlie Creek.

CHARLIE CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-19-79

Reach 2 is a second order tributary in the Middle Fork drainage. Average wetted width was 4.0 m and the mean depth was 0.25 m. This reach was composed of 50% riffle, 30% run, 16% pool areas and 4% pocketwater areas. Channel debris was moderate, with 10% stable. Bank cover was moderate, with 20% of the wetted surface area influence by overhang. Moderate to high instream cover (25%) was provided by substrate, turbulence, depth and debris. Stream gradient was 3.7% and the D-90 was 10 cm. The low banks were generally steep, but stabilized by heavy vegetation and occasional braiding was noted. A bedrock cascade area was located at stream km 3.9.

<u>Valley Characteristics:</u>

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

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

Fish Populations: Date Surveyed: 7-21-79

Westslope cutthroat and bull trout were observed. Density estimates indicated an extremely important rearing area for juvenile bull trout, with 8.7 age I or older fish per 100 m² surface area. Spawning by adfluvial bull trout has also been documented here.

CHARLIE CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-19-79

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

Valley Characteristics:

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

Fish Populations:

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

LONG CREEK DRAINAGE

LONG CREEK REACH 1

<u>Channel Characteristics</u>: Date Surveyed: 9-3-80

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 9-6-80

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

LONG CREEK REACH 2

<u>Channel Characteristics</u>: Date Surveyed: 9-3-80

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

<u>Valley Characteristics:</u>

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

Fish Populations: Date Surveyed: 9-6-80

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

LONG CREEK REACH 3

Channel Characteristics: Date Surveyed: 9-5-80

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat and bull trout were observed. Density estimates indicated an important rearing area for juvenile bull trout, with 1.9 age I or older fish per 100 m2 surface area. Spawning by adult bull trout has also been documented. Long Creek was closed to fishing by state regulations in 1962. Bergsicker Creek Reach 1

Channel Characteristics: Date Surveyed: 8-1-79

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

<u>Valley Characteristics:</u>

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

Fish Populations: Date Surveyed: 8-2-79

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

Bergsicker Creek Reach 2

Channel Characteristics: Date Surveyed: 8-2-79

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

<u>Valley Characteristics:</u>

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

Fish Populations: 8-1-79

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

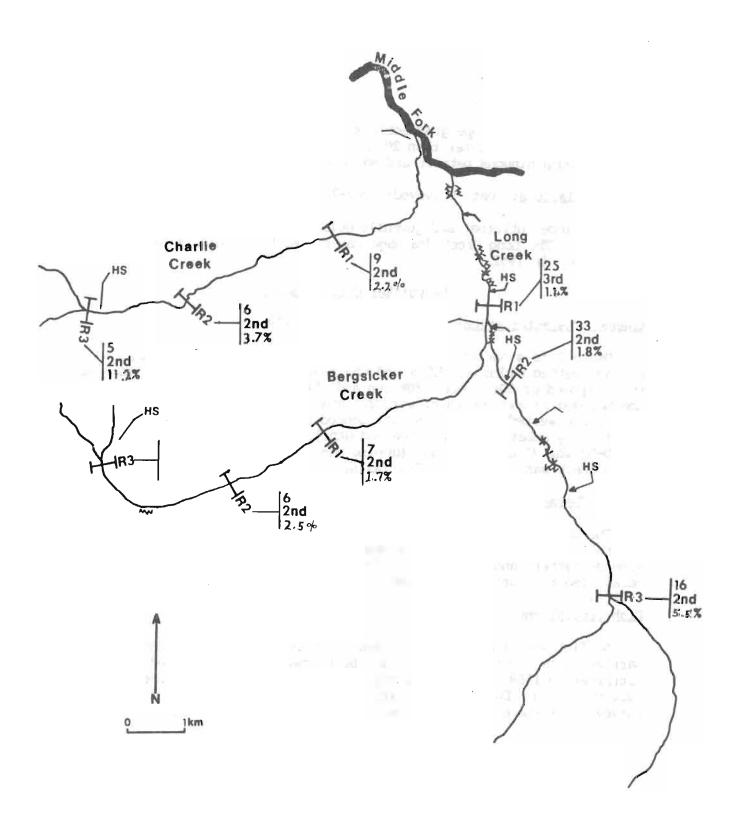


Figure 38. Physical habitat information for Charlie and Long Creek drainages.

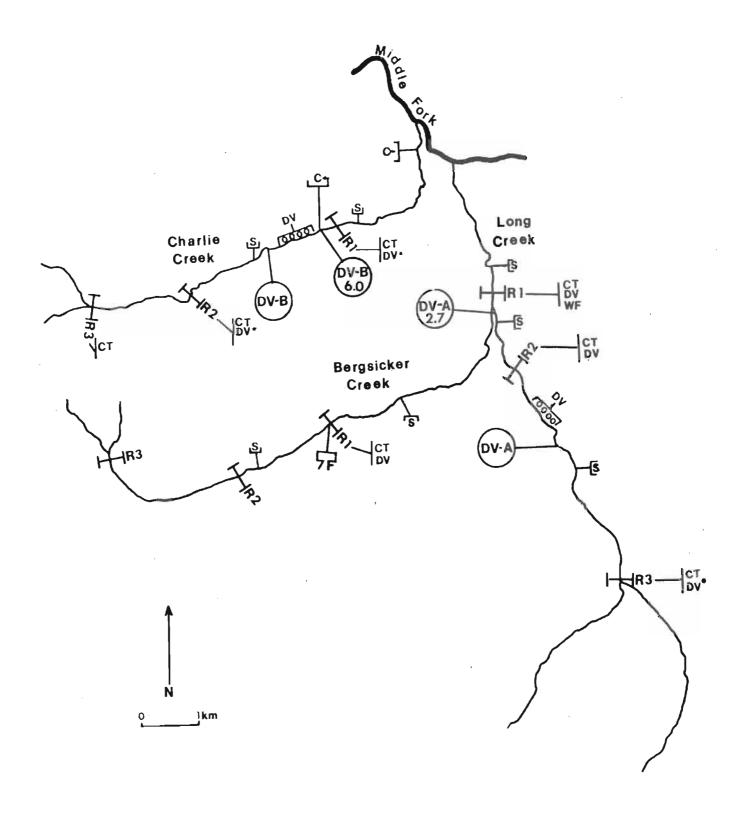


Figure 39. Fish population information for Charlie and Long Creek drainages.

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

Stream Name Charlie Cr.	number ni	umber	Length	Upper reach boundary 2.8 km above mouth	Upper <u>elev.(m)</u> 1284.0	Lower reach boundary Mouth	Lower elev.(m) 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		tics
2	27.2	7.0	. 25	9	50	1	Bro	oken, rol	lling
Confine- ment F	Pattern N	Side channel occurence Low	Average low flow .02	Flow dur survey (m³/sec	, j pea	verage ak water emp(C)	Turbidity Nil	Maximum pool depth(m)	
<u>\$ pool</u> 5	% run 40	% riffle	% pocket- water 5	% class 1 pools 70	% clas 11 poo		pools IV		6 class 4 pools 10
-		% bed mater		. 0	D-90	ay.	Stability Bank		
% fines	%gravel	% rubble	% boulder	%bedrock	(cm)	gradient	rating	for	
30	20	33	16	1	20	2.2	102	Ste	еер
Bank Process	Bank genetic <u>materia</u> l		Flood plain debris	Channel chan debris debi		el % cover- % cove		er snor	
Failing	Fluvial		Low	Low	30	10	10	20)
Water chemistry data									
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/l) 	Mg ⁺⁺ (mg/l)	Na ⁺ (mg/1)	(<u>mg/1)</u>	SO. (mg/1)
Spawning	data								
Number of bull trou redds in reach	t Redo densit (no/kn	ty	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	
3	1.1	. 80							

Fish population data

Density (no/100 m² surface area)								Other species		
bensity			area)					Mountain	Eastern	
Cutthroat				Bull trout				Whitefish	3rk trout	
Age O	Age I	Age II	Age 111+	Age 0	Age 1	Age II	Age III+			
0.5	1.0	2.0	1.0	1.5	5.6	0.7	0	A	A	

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

Stream Name	Reach number		each Tribu	Upper utary reach of boundar	·y	Upper elev.(m)	Lower reach boundary	Lower elev.(m)	
Charlie Cr.	002	DCN 2	2.8 Midd		m above	1396.0	2.8 km	above 1290.0	
	Habitat dat	à	Fork	. mouth			mouth		
Stream	Drainage	Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow	
<u>order</u> 2	area(km²) ——	width(m) 4.0		<u>width(m</u>) 6	width(m) 60	<u>ratio</u> 10	_	characteristics oken, rolling	
Confine- ment U	Pattern N	Side channe occurenc Low	l low e flow	surve (m³/se	y peak		urbidity Nil	Maximum pool depth(m) 0.9	
≈ pool 16	<u>% run</u> 30	% riffle 50	% pocket wate <u>r</u> 4	- % class I pools 40	% class 11 pool 20		ols IV	class % class pools V pools 10	
% fines 30	%gravel	% bed mate % rubble 26	•		D-90		Stability rating 97	Bank form Repose	
Bank <u>Process</u> Stable			Flood plain debris Low	Channel debris Moderate	% stab channe debri 10	el % cover			
	mistry data	- L- L-	Low	noderate	10	10	20	23	
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/l) 	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na ⁺ (mg/l <u>)</u> 	K ⁺ SO ₄ (mg/1)	
Spawning data									
Number of bull trou- redds in 		ty	Number of bull trou redds in each	t Redd density (no/km)			Redd density (no/km)	<u>Year</u>	
Density (Cutthroat	e II Age	III+ Age	Bull to 0 Age I 4.5		Age 111+ 2.5	Mount White	efish 8rk trout	

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

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

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 characteris	tics
2		4.0	.43	5	15	3	Brol	ken, tum	bling
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	pea	verage ak water emp(C)	Turbidity	Maximum pool depth(m)	
F	N	Low					Nil	1.2	
% pool 40	1 run	% riffle 59	% pocket- water 0	% class I pools 20	% clas II pod 20		pools IV		% class V pools 20
		% bed mater		or I I	D-90	2	Stability	Bar	
½ fines 40	*gravel 20	<pre>% rubble</pre>	% boulder 5	%bedrock 30	(cm) 20	gradient 11.2	rating 107	<u>for</u> Rei	ose
Bank Process		ank etic rial	Flood plain debris	Channel debris	% sta chanr debr	nel % cov		er snoi	over- rkel tion
Stable	Flux	vial	Low	Moderate	20) 1	20	0	
Water chem	nistry data								
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mq/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mq/1)	Na ⁺ (mq/1)	K ⁺ (mq/l)	SO ₄
		2-			<u></u>				
Spawning c	data								
Number of bull trout redds in reach_	t Redo densii (no/kr	ty	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	bull trout redds in reach_	Redd density (no/km)	Year	bull trout redds in reach	Redd density (no/km)	Year

Fish population data

0	. (20/100	m² surface	1 2002					Other	species
vensity			area		0.11			Mountain	Eastern
	Cutth	roat			Bull t	rout		Whitefish	Brk trout
Age D	Age 1	Age II	Age 111+	Age 0	Age I	Age II	Age III+		
								A	A

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

Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ry reach boundary	,		pper lev.(m)	Lower reach boundar	у	Lower elev	
Long	001	DD6	2.7	Midd1	e .1 km	above	1.	304.0	Mout	h	12 7 4	†. (
Cr.				Fork	Trail	Ford						
Physical	Habitat dat	<u>a</u> Ave.	Av	•	Ave.		Val'	lov				
Stream	Drainage	wetted width(m)	dept	h for ch(m)	channe1	Valley width(m)	char				ow · eristics	
order 3	<u>area(km²)</u> 57.0	8.7	. 2		25	100	4	10			ken	
		Sic	e	Average	Flow dur	ing A	verage			Maxi	mum	
Confine- ment	Pattern	chanr occuren		low flow	survey (m³/sec		ak wate emp(C)		[urbidity		ool .h(m)	-
С	N	Low		.22					Low	1.		
pool .	ະ run	% riffle		pocket- water	% class I pools	% cla II po		% cla		class V pools	% cla V poo	
5	86	7		2	20	20)	40		10	10	1
fines	*avavol	% bed mat % rubbl		boulder	%bedrock	D-90 (cm)	% gradi	iont	Stability rating		Bank form	
30	%gravel 32	16	e w	21	1	103	1.		108	-	Steep	
	p	ank	Floo	d		% st		-	- • -		% cover-	
Bank Process		etic	plai: debr	n	Channel debris	chan deb	nel	% cover		ver hang	snorkel section	
ailing	Fluv		Lo	_	Low	10		1	2		17	
Water cher	nistry data											
Cond.	A11.	Total		Total	- -	Ca ⁺⁺		Ma ⁺⁺	Na ⁺	K	+ 5.	
(umohs/ cm)	Alk. (mg/l)	carbo (mg/l		phos. (mg/l)	No ₃ (mg/1)	(mg/1)		mg nig/1)	(mg/1)			0. ig/
Spawning	da ta						•	<u></u>		-	- 8	
Number of bull trou redds in reach	t Red densi: (no/ki	ty	bul red	ber of 1 trout ds in each	Redd density (no/km)	Year	Numbe bull redds rea	trout in	Redd density (no/km)	Year		
ish popu	lation data											
Density (no/100 m ² Si	urface are	a)						Mo	Other ntai n	species East	0.5
	Cutthroat				Bull tr	out.				tefish	Brk '	

Age III+

A

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

Stream Name Long Cr.	Reach number 002	<u>number</u> <u>Le</u>	rach Tribut of of Midd Fork	boundar le Mouth canyo		Upper elev.(m) 13 29. 0		
Stream order	Habitat data Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel <u>width(m</u>)	Valley width(m)	Valley- channel _ratio	char	Flow · racteristics
2		4.4	.16	33	500	15	Rollin	g, broken
Confine- ment U	Pattern C	Side channel occurence	Average low <u>flow</u>	Flow dur survey (m³/sec	y pea	erage k water mp(C)	Turbidity c	Maximum pool depth(m) 1.1
U	C	High	% pocket-	 % class	 % clas:	– s%cla	Low ass %clas	
5 pool	% run	% riffle	water	I pools	11 poo		ools IV poo	ols V pools
9	82	9 % bed mater	0 ial	13	27 D-90	40 %	10 Stability	10 Bank
% fines	%gravel	% rubble	% boulder	%bedrock	<u>(cm)</u>	gradient	rating	form
30	46	23	1	0	33	1.8	104	Repose
Bank Process	gene mater	<u>ia</u> l	Flood plain debris	Channel debris Moderate	% stal channe debr 10	el % cover		% cover- snorkel section 12
Aggradin	ig Fluv	Tal Mo	derate	moderate	10	10	14	12
Water cher	mistry data							
Cond. (umohs/ cm)	Alk. (mg/1)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/1) 	Na ⁺ (mg/!) ——	K ⁺ SO ₄ (mg/1) ————————————————————————————————————
Spawning (data							
Number of bull trou- redds in reach 	t Redd densit (no/km 1.5	y <u>Year</u>	Number of bull trout redds in reach	Redd density (no/km) 11.5	Year 79	Number of bull trout redds in reach	Redd density (no/km) Ye	ar -
Fish popu	lation data							
Density (r	no/100 m² su	rface area)					Ot Mountain	her species Eastern
Age O	Cutthroat Age I Age	11 Age	III+ Age 0	Bull tr Age I	Age II	Age III+	Whitefis	h <u>Brk trout</u>
0.2	0 0.	2 0.	5 0	0.2	0.7	0.3	A	A

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

Upper

Lower

Stream Name	Rea ch number		ach Tributa	ry reach boundary	,	Uppe r elev.(m)	reach boundary	Lower elev.(m)
Long Cr.	003	DD8 4	.6 Midd Fork	le Headw	aters	1585.0	Mouth ca above Bersicke	nnyon 1329.0
Physical Stream order	Habitat dat Drainage area(km²)	<u>a</u> Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	cha	Flow · racteristics
2		6.1	.16	16	100	6	Roll:	ing, broken
Confine- ment F	Pattern P	Side channel occurence Nil	Average low flow	Flow dur survey (m³/sec	peal	erage water mp(C) T		Maximum pool depth(m) 0.7
‰ pool	% run	% riffle	% pocket- water	% class I pools	% class 11 poo		ss % cla	
7	81	12	0	0	0	100	0	0
		% bed mater	ial		D-90	No.	Stability	Bank
% fines	2gravel	% rubble	1 boulder	%bedrock	(cm)	gradient	rating	<u>form</u>
32	48	18	2	0	52	5.5	95	Repose
Bank Process		ank etic rial	Flood plain debris	Channel debris	2 stat channe debri	el % cover	- % cover overhang	% cover- snorkel section
Aggrading	g Flux	vial	Low	Low	0	3	2	13
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mq ⁺⁺ (mg/1)	Na [†] (mg/1) 	K ⁺ SO ₄ (mg/1) ————————————————————————————————————
Spawning	data							
Number of bull trou redds in reach		ty	Number of bull trout redds in reach	Redd density (no/km) 1.1	Year 80		Redd density (no/km) Y	<u>ear</u>
Fish popu	lation data							
	Cutthroat	urface area)		Bull tr			0 Mountai Whitefi	
		0.5 O.		Age 1 0.6	0.4	0.9	A	A

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

Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ry reach bounda	ry	Uppe elev	r re	wer ach undary		Lower elev.(m)
Bersicker	001	DCQ	4.2	Long	4.2	km abov	e 136	8.0 J	unction	w/ "	1296.0
Cr.				Creek		g Creek			ong Cre		
Physical !	Habitat data	Ave.	Avo		Ave.		Valle y -				
Stream order	Drainage area(km²)	wetted width(m)	dept rea	h for ch(m)	<pre>channel width(m)</pre>	Valley width(m)	channel ratio		<u>c ha r</u>	Flow acteris	tics
2	22.8	4.0	. 1	2	7	70	10		Placi	d, rol	ll i ng
Confine- ment X	Pattern N	Sic chann occurer Modera	el ce ate	Average low flow	Flow d surv (m³/s	ey pe	verage ak water emp(C)			daximum pool depth(m)	•
% pool	% run	% riffle		vater_	% clas	s II po		class I pools	% clas		class pools
24	30	40		6	40	20		20	10		10
% fines	%grave1	% bed mat % rubbl		oulder	%bedroc	D-90 (cm)	gradient		oility iting	Bar	
20	40	28		11	1	25	1.7	8	-	_	ose
Bank Process Stable	Ba gene mater Fluv	ial	Flood plair debr	1 i <u>s</u>	Channel debris	chan deb	ris ca	over- nopy	% cover overhang	snor sect	tion
Stable	riuv	lai I	lodera	te M	oderate	2		L	10	J	.6
Water chem	nistry data										
Cond. (umohs/ cm)	Alk. (mg/1)	Total carbo (mg/l	n	Total phos. mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg [†] (mg/	+ 1) (Na ⁺ mg/1)	K [†] (<u>mg/1)</u> 	SO. (mg/1)
Spawning o	lata										
Number of bull trout redds in reach	Redo densit (no/km 	.y	bul' re d o	per of trout ds in each	Redd density (no/km		Number of bull tro redds in reach	ut Re		ar 	
Fish popul	ation data										
Density (r	0/100 m ² su	irface are	<u>a</u>)		Bull 1	rout			Ot Mountain Whitefis		ies Eastern Brk trou
Age O A	ige I Age		e 111+).6	Age 0	Age I	Age 11 0.4	Age III+		A	_	A

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

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach bounda	r y		per ev.(m)	Lower reach boundary		Lower elev.(m)
Bergsicke Cr.	r 002	DCP	1.9	Long Creek		km abov Creek	e 14	16.0	4.2 l above	cm Long	1368.0
									Creek	τ	
Physical H	abitat dat	Ave.	Ave		Ave.		Valle	21/			
	Drainage area(km²)	wetted width(m)	depth reac	for c	hannel vidth(m)	Valley width(m)	chan	ne 1		Flow characteri	
2		4.5	.1	5	6	70	10)		Roll	ing
Confine- ment	Pattern	Side channe occuren	21	verage low flow	Flow du surve (m³/se	y pe	Average eak waten temp(C)		urbidity	Maximum pool depth(m	
X	N	Moderat		har c	A - C HA	H- +		b	Nil	1.0	
% pool	% run	% riffle		ocket- ater	% class			III pod		pools	% class V pools
15	30	50		5	20	20		30		20	10
% fines	%grave1	% bed mate % rubble		oulder	%bedrock	D-90 (cm)	gradie		Stability rating		ank orm
20	50	20		9	1	25	2.	5	86	Re	pose
Bank Process	gene mate		Flood plain debri	<u>s</u>	Channel debris	char deb	oris	cover- canopy	2 coverna overna 30	er sn	cover- orkel ction
Stable	FIU	vial	Low	PLO	oderate	2	20	10	30		U
Water chem	istry data										
Cond. (umohs/ cm)	Alk. (mg/l) ——	Total carbor (mg/l) 	1	Total phos. ng/l) ——	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)		g ⁺⁺ g/1)	Na ⁺ (mg/1)	K ⁺ (mg/1)	SO. (mg/1)
<u>Spawning</u> d	a ț <u>a</u>										
Number of bull trout redds in reach	Redi densi <u>(</u> no/ki	ty	bull redd	er of trout s in ach	Redd density (no/km)		Number bull t redds reac	trout in c	Redd density no/km)	<u>Year</u>	
	- 1 - 5	I	194 / 1	7712			- 				
Fish popul	ation data										
Density (no		urface area)						Mount		Eastern
	-	* 11 Aqu	0	Age 0	Bull t Age I O	Age 11 O	Age 11]+	White		Brk trout
U	U	U	U	U	U	U	. 0		A	A	A

TWENTY-FIVE MILE CREEK DRAINAGE

TWENTY-FIVE MILE CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-21-79

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

Valley Characteristics:

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

Fish Populations:

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

TWENTY-FIVE MILE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-21-79

Reach 2 is a third order tributary in the Middle Fork drainage.

Average wetted width was 7.0 m and the mean depth was 0.15 m. This reach was composed of 70% run, 20% riffle, 5% pool and 5% pocketwater areas.

Channel debris was nil to low. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Instream cover was provided by substrate, turbulence and occasionally by depth. Stream gradient was 2.3% and the D-90 was 22 cm. Braiding occurred and the channel became intermittent at several locations. The Giefer-Twenty-five Mile Creek trail crossed at stream km 1.8 and again at km 5.4.

Valley Characteristics:

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

Fish Populations:

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

TWENTY-FIVE MILE CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-20-79

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 2.5 m and the mean depth was 0.11 m. This reach was composed of 60% riffle, 30% run, 8% pocketwater and 2% pool areas. Channel debris was moderate, with 40% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Moderate instream cover (18%) was provided by substrate, turbulence and occasionally by debris or depth. Stream gradient was 4.% and the D-90 was 46 cm. Clay was present in the bed material at several locations and a dry section was observed near the junction of Ear Creek. A barrier falls was present above Ear Creek and the trail crossed at stream km 7.7.

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-21-79

Westslope cutthroat were the only fish species observed. A density estimate indicated an important rearing area for juvenile cutthroat with 13.7 age I or older fish per 100 m² surface area.

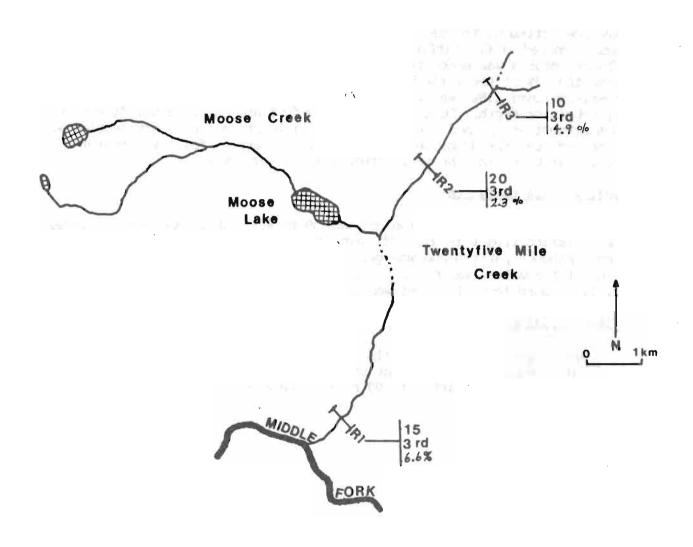


Figure 40. Physical habitat information for Twenty-five Mile Creek.

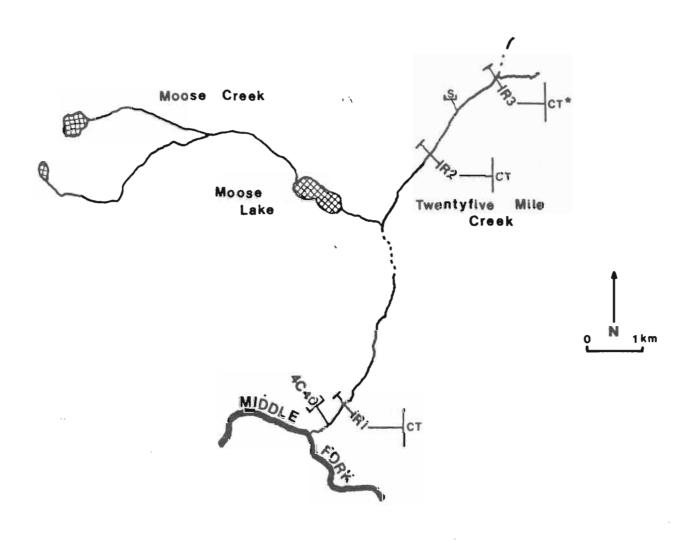


Figure 41. Fish population information for Twenty-five Mile Creek.

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

Stream Name	Reach number		Reach Tribut Length of	•	у	Upper elev.(m	Lower reach) boundary	Lower elev.(
enty-fiv Cr.	e 001	DCU	1.0 Middl Fork	e 1 km mouth	above 1	1362.0	Mouth	1296.
Physical H	Habitat dat		Aa	A		Mallan		
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel _ratio_	<u>.</u>	Flow characteristics
3	53.6	10.0	. 25	15	20	1	Τυ	mbling, brok
Confine- ment	Pattern	Side channe occurenc	1 low	Flow dur survey (m³/sec	, pea	verage ak water amp(C)	Turbidity	<pre>Maximum pool depth(m)</pre>
С	S	Nil	0.17				Nil	1.0
2 pool	: run	* riffle	pocket- water	% class I pools	% clas	ols III p	ools IV	class % class pools V pools
1	10	29	60	0	0	0		50 50
% fines	%grave1	<pre># bed mate # rubble</pre>		%bedrock	D-90 (cm)	gradient	Stability rating	Bank form
10	20	40	20	10	60	6.6	104	Steep
Bank Process		ank etic rial	Flood plain debris	Channel debris	% sta chanr debr	nel % cove		
Failing		rock	Nil	Low	40		3	0
Water chem	nistry data							
Cond.		Total	Total					
(umohs/	A)k. (mg/1)	carbon (mg/l)	phos. (mg/1)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (ng/1)	Na ⁺ (mg/])	K ⁺ SO. (mg/
	70.04	====						
Spawning o	la ta							
Number of bull trout redds in reach	. Red densi (no/ki	ty	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year
						71 <u>20-24</u>		
Fish popul	ation data							
		urface area)				Mount	Other species tain Easter
Amp. 0 A	Cutthroat	e II 400	111+ Age 0	Bull tr		Ame 113+	White	

A

Α

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

Stream Name	Reach number		Reach Tribut Length of		у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
[wenty-five	002	DCT	5.4 Midd		above	1487.0	l km a	bove 13 62. 0
Cr.			Fork	Moos	se Cr.		mouth	
	abitat dat Drainage area(km²) ——	a Ave. wetted width(m) 7.0	Ave. depth for <u>reach(m)</u> .15	Ave. channel width(m) 20	Valley width(m) 80	Valley- channel ratio	_	Flow · naracteristics ten, rolling
		Side	e Average	Flow du	rina Av	erage		Maximum
Confine- ment	Pattern	chann	l low	surve (m³/sec	y pea	k wäter	Turbidity	pool , depth(m)
X	N	Moder		(111.) 264	<u>.</u>		Nil	1.0
5 pool	% run	% riffle	% pocket- water	% class I pools	% clas II poo		ass % cl	
5	70	20	5	27	27	46	0	0
% fines	%gravel	% bed mate % rubble		%bedrock	D-90 (cm)	gradient	Stability rating	Bank form
20	40	28	12	0	22	2.3	90	Repose
Bank Process Aggrading			Flood plain <u>debris</u> Low	Channel debris Nil	% sta chann debr	el % cover is canopy		
Water chem	istry data							
Cond. (umohs/ cm)	Alk. (<u>mg/l)</u>	Total carbor (mg/l		No ₃ - (mg/1)	Ca ⁺⁺ (<u>mg/1)</u>	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/l) 	K ⁺ SO ₄ (mg/1) ————————————————————————————————————
Spawning da	<u>ita</u>							
Number of bull trout redds in reach	Red densi (no/ki	ty	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km)	Year
			-			4-		-
Fish popula	ation data							
Density (no	Cutthroat])	Bull tr	out Age II	Age III+	Mounta Whitef	

Α

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

Stream Name	Reach number		each Tribut ength of	•	,	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
enty-fiv	e 003	DCS	2.0 Midd		Creek	1585.0	1 km above	1487.0
Creek			Fork				Moose Cr.	
Physical	labitat data							
		Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel width(m)	Valley width(m)	channel ratio		low teristics
3		2.5	.11	10	16	2		ing, rolli
		Side	Average	Flow dur		erage		imum
Confine-	0	channe	l low	survey	pea	k water	p	0001
C	Pattern	Low	flow	(m³/sec .04) te	mp(C) T		th(m) L.O
C	14	LOW	pocket-	2 class	% clas	s % cla		2 class
5 pool	% run	% riffle	water	1 pools	11 poo			
2	30	60	. 8	2	3	25	50	20
% fines	%grave1	% bed mater % rubble	rial & boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
30	30	28	11	1	46	4.9	90	Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	el % cover- is canopy	overhang	% cover- snorkel section
Failing	Fluv	rial Mo	oderate	Moderate	40	3	3	18
Water chem	istry data							
Cond.		Total	Total					
(umohs/	Alk.	carbon	phos.	No ₃	Ca ⁺⁺	Mg++		K ⁺ SO ₄
<u>cm)</u>	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1) (m	ig/1) (mg/1
Spawning d	lata							
Number of bull trout			Number of bull trout	Redd		Number of bull trout	Redd	
redds in reach	densit (no/km		redds in reach	density (no/km)	Year		density (no/km) Year	
								-
Fish popul	ation data							
							Othe	r species
Density (n		irface area)	B.:13 +	out		Mountain Whitefish	Eastern Brk troi
Age O A	Cutthroat ue I Age	11 Age	III+ Age C	Bull tro	Age 11	Age 111+	wniterish	ark tro

0

0

Α

Α

3.0

0

5.7

5.0

0

GRANITE CREEK DRAINAGE

GRANITE CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-5-80

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

Valley Characteristics:

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

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Adfluvial bull trout spawning and migration has been documented here. A density estimate of 2.1 age I or older bull trout per 100 m² surface area indicated an important rearing area. Migratory cutthroat presence has also been noted. Granite Creek was closed to fishing by state regulations in 1962.

GRANITE CREEK REACH II

Channel Characteristics: Date Surveyed: 9-4-80

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

Valley Characteristics:

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

Fish Populations:

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

Challenge Creek Reach 1

Channel Characteristics: Date Surveyed: 8-18-79

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 9-23-80

Westslope cutthroat, juvenile bull trout and mountain whitefish were observed. Migratory and resident cutthroat were present in high densities (13.9 age I or older fish per 100 m² surface area), indicating an important rearing area. Electrofishing estimates in 1981 and 1982 enumerated 61 and 78 age II or older cutthroat per 100 m of stream length, respectively. A substantial amount of spawning by migratory and resident cutthroat has been documented here. The Granite Creek drainage was closed to fishing by state regulations in 1962.

Dodge Creek Reach 1

Channel Characteristics: Date Surveyed: 8-15-79

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

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

Valley Characteristics:

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

Fish Populations:

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

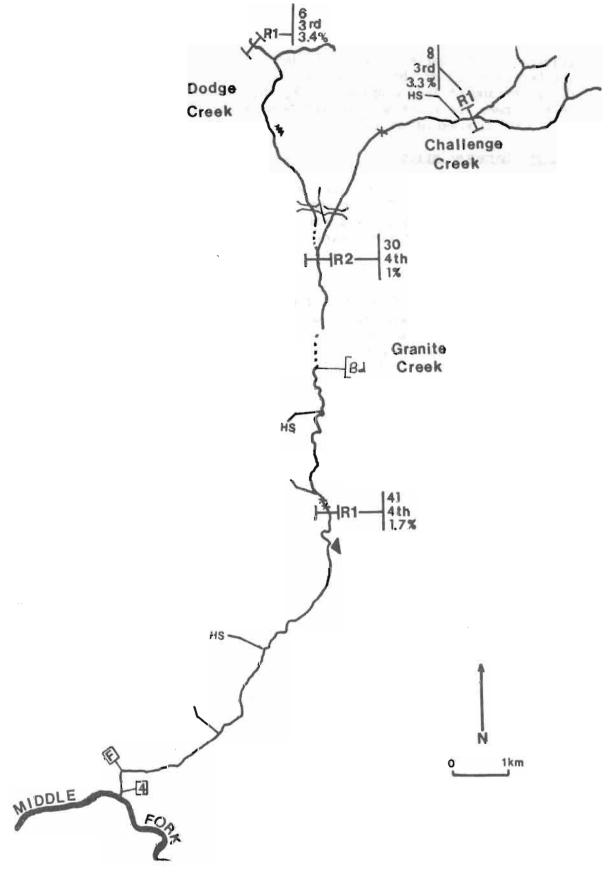


Figure 42. Physical habitat information for the Granite Creek drainage.

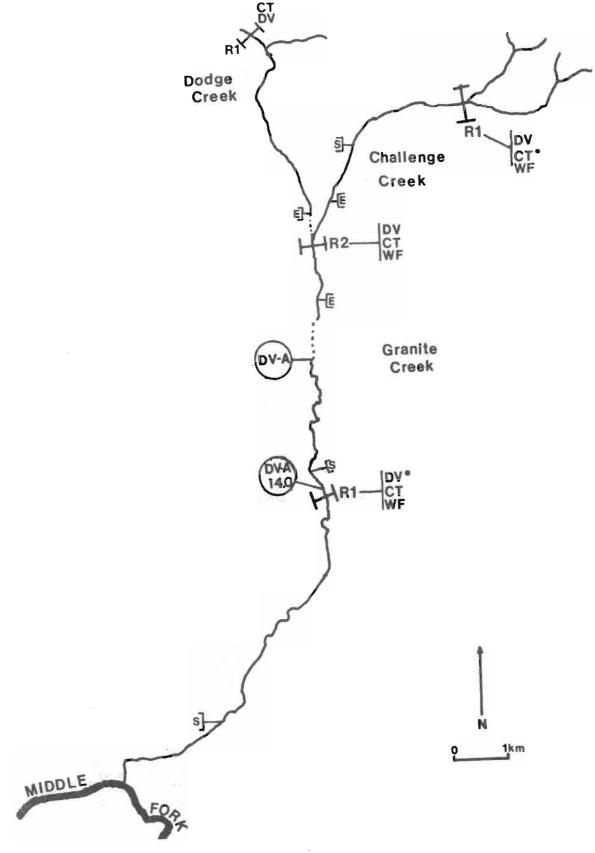


Figure 43. Fish population information for the Granite Creek drainage.

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

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

Physical	Habitat dat	<u>a</u> Ave.	Ave.	Ave.		V-110			
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel	Valley width(m)	Valley- channel _ratio		Flow characteri	
4	74.6	8.6	.31	41	180	5		Rolli	ng
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	, pe	verage ak water emp(C)	Turbidity	Maximum pool depth(m)	
F	C	Low	0.39				Nil	1.0	
% pool	% run	% riffle	% pocket- water	7 class I pools	% cla II po			class pools	% class V pools
4	24	46	26	0	29		6 6	55	0
α · f :	6/ p	% bed mater		Who diesel	D-90	% aradiant	Stability		ink
% fines	%gravel	% rubble	% boulder	%bedrock	(cm) 62	gradient	rating	_	orm
10	20	50	20	0	62	1.7	102	ке	pose
Bank Process		ank etic rial	Flood plain debris	Channel debris	% sta chan _debi	nel % cov		er sno	cover- orkel ction
Failing	g Flux	vial M	oderate	Low	20) 1	1		20
Water che	mistry data								
Cond. (umohs/ cm) 160	Alk. (mg/1) 118	Total carbon (mg/1) 0.65	Total phos. (mg/1) .003	No 3 (mg/1)	$\begin{array}{c} \text{Ca}^{++} \\ \text{(mg/1)} \\ 33 \cdot 1 \end{array}$	Mg ⁺⁺ (mg/1) .108	Na ⁺ (mg/l) 1.1	K [†] (<u>mg/l)</u> 	50. (mg/1) 1.3
Spawning	data								
Number of bull trou redds in reach		ty	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	
O Fish popu	O plation data	80				74			
		Salacio de Lettre CA						Other spe	cies
Density (urface area)		D 11				tain	Eastern
Age 0	Cutthroat Age 1 Ag	e II Age I	111+ Age 0	Bull tr Age 1	Age II	Age III+	Whit	efish	8rk trout
0	0 (0	0.7	1.4]	P	A

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

Stream Name Granite Cr.	Reach number 002	number <u>Le</u>	each Tributar ength of .5 Middl Fork	boundar e Junct Dodge	ion of	Upper elev.(m) 1500.0		above 1440.0
Physical	Habitat data							
Stream	Drainage	Ave. wetted		Ave. channel	Valley	Valley- channel		Flow -
order 4	area(km²)	width(m) 6.4	reach(m)	width(m)	width(m) 200	racio	_	tharacteristics ling, placid
Confine- ment	Pattern	Side channel occurence	Average low	Flow dun survey (m³/sec	ring Ave	erage k water	Turbidity	Maximum pool depth(m)
X	С	Low	% pocket-	ـــ ۶ class	- ‰ class	 s % cla	Nil ass % c	1.7
2 pool	<u>%</u> r <u>un</u>	<u>Eriffle</u>	water	I pools	II poo			pools V pools
15	41	44 % bed mater	0	22	45	33		0 0
% fines	%grave1	# rubble	% boulder	%bedrock	D-90 (cm)	gradient	Stability <u>rating</u>	Bank form
20	50	29	1	0	27	1.0	95	Repose
Bank Process Failing			Flood plain debris derate M	Channel debris oderate	% stab channe debri	el % cover		
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/1)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/1)	κ ⁺ SO ₊ (mg/1) ————————————————————————————————————
Spawning	da ta							
Number of bull trou redds in reach	t Redo densit (no/kr	ty n) <u>Year</u>	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km)	Year
34	6.2	80	14	2.5	81	34	6.2	82
Fish popu	lation data							
	Cutthroat	urface area)	III+ Age O	Bull tr		Age III+	Mount White	
and the second second	0.2			Age 1	0.2	0	P	A

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

Stream Name	Reach number	Serial number	Reach Length	Tributar y of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Challenge Cr.	001	DCR	4.5	Granite Creek	Headwaters	1 670. 0	Junction w/ Dodge Cr.	1524.0

Physical 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	18.9	4.0	.15	8	35	4	Tum	bling, rolling
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow du surve (m³/se	y pea	verage ak water emp(C)	Turbidity	Maximum pool depth(m)
X	N	Low	.03				Nil	1.0
s pool	% run	% riffle	% pocket- water	% class I pools	% clas			class % class pools V pools
10	50	40	0	5	5	20)	70 0
		# bed mater			D-90	2	Stability	Bank
% fines	%grave1	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
40	30	20	10	0	27	3.3	93	Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	el % cov		
Stable	Flu	vial Mo	derate	Moderate	30	~ -1	20	25
Water che	mistry data							
Cond. (umohs/ cm)	A1k. (mg/1)	Total carbon (mg/1)	Total phos. (mg/1)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/1)	K ⁺ SO ₄ (mg/1)

Spawning data

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

Fish population data

Density	(no/100	m² surface	area)						species
Denis rej	Cutth				Bull t	rout		Mountain Whitefish	Eastern Brk trout
Age C	Age 1	Age 11	Age III+	Age O	Age I	Age 11	Age iii+		
1.3	3.8	4.5	5.1	0	0	0	0.3	P	Α

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

Stream Name	Reach number		Reach Tribu _engtho	•	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Dodge	001		3.7 Gran	nite 3.7	km above	1647.7	Mouth	1518.5
Cr.			Cre	eek mout	h			
Physical	wakina daa							
Physical	Habitat dat	Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel	Valley	channel ratio	chan	Flow - acteristics
3	11.1	2.0	.10	width(m) 6	width(m) 25	04		swirling
J	11.1	2.0	•10	U	23	04	r raciu,	SWILLING
Confine-		Side channe	-	e Flow du surve	_	rage :water	Ma	eximum pool
_ment	Pattern	occurenc		(m³/se			urbidity de	epth(m)
X	N	Nil			-		Low .	40
			% pocket-		% class		ss % class	s % class
z pool	½ run	å <u>r</u> iffle	water	I pools	Il pool	s III po	ols <u>IV pool</u>	<u>V pools</u>
10	30	40	0	0	0	0	70	30
% fines	%gravel	<pre>\$ bed mate % rubble</pre>		%bedrock	D-90 (cm)	gradient	Stability rating	Bank form
40	40	15	5	0	13	3.4	91	Repose
40	40	15	J	U	13	J•4	71	Repose
Bank Process		ank etic rial	Flood plain debris	Channel debris	% stab channe debri	1 % cover		% cover- snorkel section
Stable		 /ial	Nil	Moderate	20	10	10	
	nistry data							
Cond. (umohs/ cm)	Alk. (<u>mg/l)</u> ——	Total carbon (mg/l)	Total phos. (mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/1) 	Mq ⁺⁺ (mg/1) 	Na ⁺ (mg/1 <u>)</u> (K [†] SO ₄ mg/1) (mg/1)
Spawning o	data							
Number of bull trout redds in reach	Redo dens i (no/kr	ty	Number of bull trout redds in reach	Redd density (no/km)			Redd density (no/km) Yea	<u>r</u>
Fish popul	lation data							
Density (r	no/100 m² su	urface area)					er species
	Cutthroat			Bull tr	out		Mountain Whitefish	Eastern Brk trout
Age O A	ge I Age		III+ Age			Age III+		

Age 1

Age II

Age 0

LAKE CREEK DRAINAGE

LAKE CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-7-80

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

Valley Characteristics:

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

Fish Populations:

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

LAKE CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-26-80

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

Valley Characteristics:

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

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

Fish Populations:

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

Miner Creek Reach 1

Channel Characteristics: Date Surveyed: 8-25-80

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

Valley Characteristics:

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

Fish Populations:

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

Miner Creek Reach 2

Channel Characteristics: Date Surveyed: 8-25-80

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

Valley Characteristics:

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

Fish Populations:

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



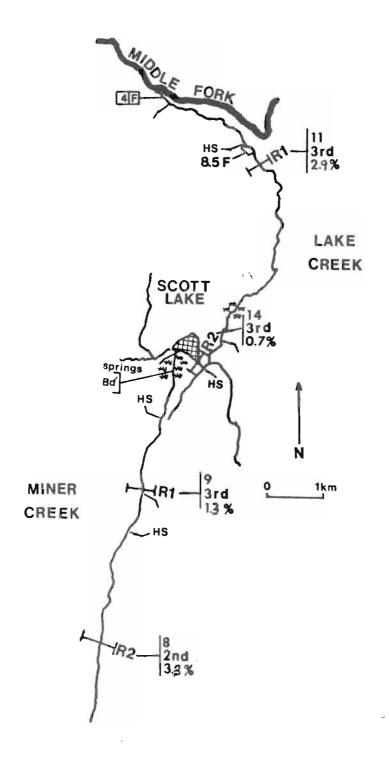


Figure 44. Physical habitat information for the Lake Creek drainage.

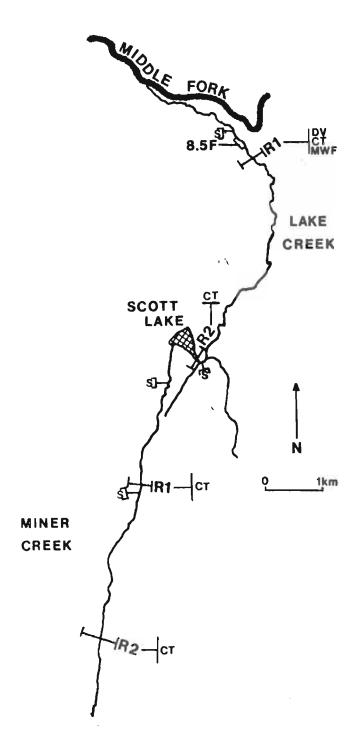


Figure 45. Fish population information for the Lake Creek drainage.

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

				700				
Stream Name	Reach number		Reach Tribut Length of		y	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Lake	001	DDH	2.5 Midd:	le 2.5 l	km above	e 14 40. 0	Moutl	
Cr.			Fork			•		
Physical	Habitat_dat	a						
Ctucam	Drainago	Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow ·
Stream orde r	Drainage area(km²)	welled width(m)	reach(m)		width(m)	ratio		characteristics
3	19.4	6.8	.45	11	70	6		ng, tumbling
		Side	- J	Flow dur		verage		Maximum
Confine- ment	Pattern	channe occurenc		survey (m³/sec		k water emp(C)	Turbidity	pool depth(m)
E	P	Low	0.61		7		Low	3.0
			pocket-	% class	% clas			class % class
5 pool	% run	" riffle	water	I pools	Il poo			pools V pools
10	20	5	65	25	0	25		
% fines	%grave)	% bed mate % rubble		%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
10	10	40	39	1	121	2.9	70	Steep
	n	1:	F1-04		Ø			9/ 00/10/1
Bank		ank etic	Flood plain	Channel	% sta chann		r- % cove	% cover- er snorkel
Process	mate		debris	debris	debr			
Failing	g Fluv	vial M	oderate	Moderate	20	10	10	30
Water che	emistry data							
Cond.		Total	Total					,
(umohs/	Alk.	carbor		No ₃	Ca ⁺⁺	Mq ++	Na ⁺	K ⁺ SO.,
cm)	(mg/1)	(mcl/3)	(mg/1)	(mg/l)	(mg/1)	(mg/1)	<u>(mg/l)</u>	(mg/1) $(mg/1)$
48	34				- -			
Spawning	da ta							
Number of			Number of			Number of	D 11	
bull trou	ıt Red densi		bull trout redds in	Redd density		bull trout redds in	Redd density	
redds in reach	(no/k		reach	(no/km)	Year	reach	(no/km)	Year
1	0.3	3 80						
Fish popu	ulation data							
Density	(no/100 m² s	urface area)				Mount	Other species tain Eastern
-	Cutthroat			Bull tr			White	
Non D	1.00 1.00	p 11 Lor	1114 Ann 1		Age 11	Age III+		

Age I

0

Age 11

0

A

A

Age D

0

Age]]]+

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

Stream Name Lake Cr.	Reach number 002	<u>number</u> <u>L</u>	each Tributa ength of .9 Midd Fork	boundar	y tt Lake	Upper <u>elev.(m</u> 1478.0	Lower reach boundary 2.5 km mouth	Lower elev.(m) above 14 40. 0
Physical	Habitat data	3						
Stream <u>order</u>	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel _ratio_	<u>c</u>	Flow haracteristics
3		8.6	.17	14	80	6		Roll i ng
Confine- ment X	Pattern P	Side channel occurence Low	<u>flow</u> 	Flow dur survey (m³/sec	pea c) te	h	Turbidity Moderate	Maximum pool depth(m) 1.0
% pool	% run	% riffle	% pocket- water	% class I pools	% clas			lass % class pools V pools
14	66	14	6	0	60	3.5	5	5 0
N 6		% bed mater			D-90	%	Stability	Bank
% fines 10	*gravel	% rubble 29	\$ boulder	%bedrock O	(cm)	gradient	rating	<u>form</u>
10	00	29	1	U	31	0.7	72	Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	iel % cove		
Stable	F1t	ıvial M	oderate	Low	30	7	8	23
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/1) 	Total carbon (mg/l)	Total phos. (mg/1)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1) 	Na ⁺ (mg/1)	K ⁺ SO ₄ (<u>mg/1)</u> —— ——
Spawning	data							
Number of bull trou redds in reach O		.y	Number of bull trout redds in reach_	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in reach_	Redd density (no/km)	Year
U	U	80						
Fish popu	lation data							
	Cutthroat Age I Age	irface area)	111+ Age 0	Bull tr Age I	out Age II	Age III+	Mounta White	

0

0

0

Α

Α

0 0

0.5

0

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

Stream Name	Reach number		each Tributa ength of	Upper ir y reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Miner	001	DDF	2.5 Lake	Fork	2.5 km	1510.0	Scott	Lake 1478.0
Cr.			Cr.	above	Scott			
				Lake				
Physical	Habitat dat							
Stream	Drainage	Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow -
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	ratio	<u> </u>	characteristics
3	19.5	3.3	.18	9	250	29	Placio	d, swirling
		Side	Average	Flow dur	rina Av	erage		Maximum
Confine-		channe]	low	survey	, pea	k water		pool ,
ment	Pattern	occurence	flow	(m³/sec	te te	mp(C) T	urbidity	depth(m)
U	P	Low					Low	1.2
2 pool	% run	% riffle	% pocket- water	% class l pools	% clas II poo			class % class pools V pools
30	70	0	0	28	43	29	0	
30	70	# bed mater	-	20	D-90		Stability	O Bank
% fines	%grave1	% rubble	% boulder	%bedrock	(cm)	gradient	rating	form
60	39	1	0	0	14	1.3	84	Repose
								-
	Ba	ank	Flood		% sta	h 1 A		9
Rank	nene			Channel			- % cove	% cover- or snorkel
Bank Process	gene mater	etic	plain debris	Channel debris	chann debr	el % cover		er snorkel
	mater	etic rial	plain		chann	el % cover		er snorkel
Process Failing	mater Fluv	etic rial	plain debris	debris	chann _debr	el % cover is canopy	overha	er snorkel ing section
Process Failing	mater	etic rial	plain debris	debris	chann _debr	el % cover is canopy	overha	er snorkel ing section
Process Failing Water chem Cond.	mater Fluv mistry data	etic rial ial Total	plain debris Low Total	debris Low	chann debr 40	el % cover is canopy 0	<u>overha</u> 6	er snorkel ing <u>section</u> 21
Process Failing Water chem Cond. (umohs/	mater Fluv mistry data Alk.	etic rial ial Total carbon	plain debris Low Total phos.	Low No3	chann debr 40	el % cover is canopy O	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Process Failing Water chem Cond.	mater Fluv mistry data	etic rial ial Total	plain debris Low Total	debris Low	chann debr 40	el % cover is canopy 0	<u>overha</u> 6	er snorkel ing <u>section</u> 21
Process Failing Water chem Cond. (umohs/	mater Fluv mistry data Alk.	etic rial ial Total carbon	plain debris Low Total phos.	Low No3	chann debr 40	el % cover is canopy O	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Failing Water chem Cond. (umohs/ cm)	Fluv mistry data Alk. (mg/l)	etic rial ial Total carbon	plain debris Low Total phos.	Low No3	chann debr 40	el % cover is canopy O	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Process Failing Water chem Cond. (umohs/	Fluv mistry data Alk. (mg/l)	etic rial ial Total carbon	plain debris Low Total phos.	Low No3	chann debr 40	el % cover is canopy O	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Process Failing Water chem Cond. (umohs/ cm)	Fluv mistry data Alk. (mg/l)	etic rial ial Total carbon	Total phos.	Low No3	chann debr 40	el % cover is canopy O Mq ⁺⁺ (mg/1)	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Failing Water chem Cond. (umohs/ cm)	mater Fluv mistry data Alk. (mg/l)	Total carbon (mg/1)	plain debris Low Total phos.	Low No3	chann debr 40	el % cover is canopy O	<u>overha</u> 6 Na ⁺	er snorkel section 21 K ⁺ SO ₄
Process Failing Water chem Cond. (umohs/cm) Spawning of bull trout redds in	mater Fluv mistry data Alk. (mg/l) data t Redo	Total carbon (mg/1)	Plain debris Low Total phos. (mg/l) Number of bull trout redds in	No 3 (mg/1)	chann debr 40 Ca++ (mg/1)	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	overha 6 Na ⁺ (mg/1) —— Redd density	r snorkel
Process Failing Water chem Cond. (umohs/ cm) Spawning of bull trout redds in reach	mater Fluv mistry data Alk. (mg/l) data t Redo densit (no/kr	Total carbon (mg/1) d ty n) Year	Dain debris Low Total phos. (mg/l) Number of bull trout	debris Low No 3 (mg/1)	chann debr 40	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	overha 6 Na (mg/1)	er snorkel section 21 K ⁺ SO ₄
Process Failing Water chem Cond. (umohs/cm) Spawning of bull trout redds in	mater Fluv mistry data Alk. (mg/l) data t Redo	Total carbon (mg/1)	Plain debris Low Total phos. (mg/l) Number of bull trout redds in	No 3 (mg/1)	chann debr 40 Ca++ (mg/1)	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	overha 6 Na ⁺ (mg/1) —— Redd density	r snorkel
Process Failing Water chem Cond. (umohs/ cm) Spawning of bull trout redds in reach 0	mater Fluv mistry data Alk. (mg/l) data t Redo densit (no/kr	Total carbon (mg/1) d ty n) Year	Plain debris Low Total phos. (mg/l) Number of bull trout redds in	No 3 (mg/1)	chann debr 40 Ca++ (mg/1)	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	overha 6 Na ⁺ (mg/1) —— Redd density	r snorkel
Process Failing Water chem Cond. (umohs/cm) Spawning of bull trout redds in reach O Fish popul	mater Fluv mistry data Alk. (mg/l) — data t Reddidensit (no/kr 0	Total carbon (mg/1)	Dain debris Low Total phos. (mg/l) Number of bull trout redds in reach	No 3 (mg/1)	chann debr 40 Ca++ (mg/1)	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	Na ⁺ (mg/1) Redd density (no/km)	x snorkel section 21 x SO. (mg/1) (mg/1) Year
Process Failing Water chem Cond. (umohs/cm) Spawning of bull trout redds in reach O Fish popul	mater Fluv mistry data Alk. (mg/l) — data t Redd densit (no/kr 0 lation data	Total carbon (mg/1) d ty n) Year	Dain debris Low Total phos. (mg/l) Number of bull trout redds in reach	No3- (mg/1) Redd density (no/km)	Ca ⁺⁺ (mg/1) Year	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	Na ⁺ (mg/1) Redd density (no/km)	r snorkel ring section 21 K ⁺ SO ₄ (mg/1) (mg/1) Year Other species tain Eastern
Process Failing Water chem Cond. (umohs/cm) Spawning of bull trout redds in reach O Fish popul Density (red)	mater Fluv mistry data Alk. (mg/l) — data t Redd densit (no/kr 0 lation data no/100 m² st	Total carbon (mg/1) d ty n) Year 80	Dain debris Low Total phos. (mg/l) Number of bull trout redds in reach	No 3 (mg/1)	Ca ⁺⁺ (mg/1) Year	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of bull trout redds in	Na ⁺ (mg/1) Redd density (no/km)	er snorkel Ing section 21 K SO. (mg/1) (mg/1) Year Other species Jain Eastern
Process Failing Water chem Cond. (umohs/cm) Spawning of Number of bull trout redds in reach O Fish popul Density (reds)	mater Fluv mistry data Alk. (mg/l) — data t Redd densii (no/kr 0 lation data no/100 m² si Cutthroat Age I Age	Total carbon (mg/1) d ty n) Year 80	Plain debris Low Total phos. (mg/l) Number of bull trout redds in reach	Moga (mg/l) Redd density (no/km)	Chann debr 40 Ca++ (mg/1) Year	el % cover is canopy O Mq ⁺⁺ (nig/1) Number of buil trout redds in reach	Na ⁺ (mg/1) Redd density (no/km)	r snorkel ring section 21 K ⁺ SO ₄ (mg/1) (mg/1) Year Other species tain Eastern

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

Stream Name	Reach number		each Tributi		у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Miner Cr.	002	DDE 3	3.0 Lake Creek		waters	1608.0	Fork 2.5 above Sc Lake	km 1510.0 ott
Physical	Habitat dat	<u>a</u> Ave.	Ave.	Ave.		Vallev-		
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel width(m)	Valley width(m)	channel ratio	char	Flow acteristics
2		3.6	.14	8	100	13	Broken,	rolling
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow du surve (m³/se	y pea	verage ik water emp(C) T		aximum pool epth(m)
C	P	Low	1114	n . Tr us	11.0	35		1.0
pool د	% run	% riffle	% pocket- water	% class I pools	% clas			
5	55	0	40	30	34	20		0
% fines	%gravel	<pre>% bed mater % rubble</pre>	% boulder	%bedrock	D-90 (cm)	1 gradient	Stability rating	Bank <u>form</u>
10	30	20	20	20	61	3.3	68	Steep
Bank Process Failing	geno <u>ma t</u> er		Flood plain debris derate	Channel debris Low	% sta chann debr 1	iel % cover		% cover- snorkel section 39
				2011	_			9.1.
Cond. (umohs/ cm)	Mistry data Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/1)	No ₃ (mg/l)	Ca ⁺⁺ (mg/1) ——	Mg ⁺⁺ (mg/1)	Na [†] (mg/1)	K ⁺ SO ₊ (mg/1)
Spawning	data							
Number of bull trou redds in reach O		ty	Number of bull trout redds in reach	Redd density (no/km)	Year 		Redd density (no/km) Yea	<u>ır</u> _
Fish popu	lation data							
Density (urface area)					Mountain	<u>er species</u> Eastern
	7.2	<u>11 Age</u>		Bull tr Age I	Age II	Age III+	Whitefish	Brk trout
0	0	0 2.	8 0	0	0	0	A	A

MORRISON CREEK DRAINAGE

MORRISON CREEK REACH 1

Channel Characteristics: Date Surveyed: 9-6-80

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

Valley Characteristics:

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

Fish Populations:

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

MORRISON CREEK REACH 2

Channel Characteristics: Date Surveyed: 9-7-80

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

Valley Characteristics:

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

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

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. Spawning by adfluvial bull trout has been documented and the area served as a migration corridor to high use spawning areas upstream. A density estimate of 4.0 age I or older bull trout per 100 m² surface area indicated an important rearing area. Low densities of age III+ cutthroat were observed.

MORRISON CREEK REACH 3

Channel Characteristics: Date Surveyed: 9-9-80

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

Valley Characteristics

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

Fish Populations:

Westslope cutthroat and bull trout were observed. Spawning by adfluvial bull trout was documented with an average of 25 redds enumerated annually during four years of survey. A high use spawning area contained 7.5 redds per km during the 1980 survey. Densities of 7.8 age I or older bull trout per 100 m² surface area indicated an important rearing area. Moderate densities of cutthroat were observed and several fish 300-350 mm were present.

MORRISON CREEK REACH 4

Channel Characteristics: Date Surveyed: 9-10-80

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

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

Valley Characteristics:

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

Fish Populations:

Bull trout were the only species observed. A density estimate of 1.3 age I or older bull trout per 100 m² surface area indicated an important rearing area. Electrofishing estimates enumerated an average of 91 age I or older bull trout per 100 m of stream length over three years of survey. Limited spawning by adfluvial bull trout was documented here. The Puzzle Creek drainage was also a rearing area for cutthroat and bull trout.

Lodgepole Creek Reach 1

Channel Characteristics: Date Surveyed: 8-22-80

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

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-23-80

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

Lodgepole Creek Reach 2

Channel Characteristics. Date Surveyed 8-20-80

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

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 2 to 5.1. The average valley width was 70 m. Reach 2 had a sinuous pattern and was occasionally confined. The Lodgepole Creek trail ran along the northwest bank, then followed Drumming Creek through the headwaters.

Fish Populations: Date Surveyed 8-22-80

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

Whistler Creek Reach 1

Channel Characteristics: Date Surveyed: 8-20-80

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

Valley Characteristics.

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

Fish Populations: Date Surveyed: 8-21-80

Westslope cutthroat trout and juvenile bull trout were observed. Densities of juvenile bull trout indicated an important rearing area, with 7.2 age I or older bull trout per 100 m² surface area. Mature bull trout were also observed, but spawning here has not been documented. Morrison Creek drainage was closed to fishing in 1962.

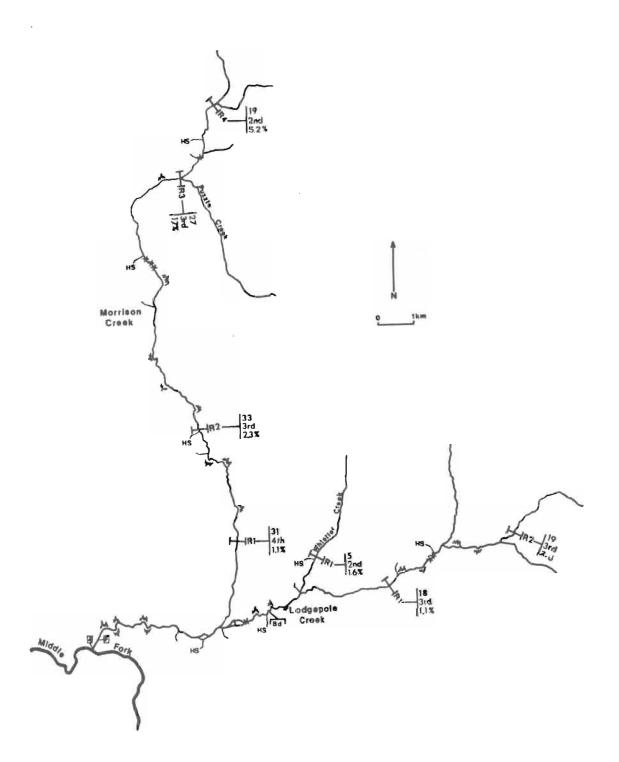


Figure 46. Physical habitat information for the Morrison Creek drainage.

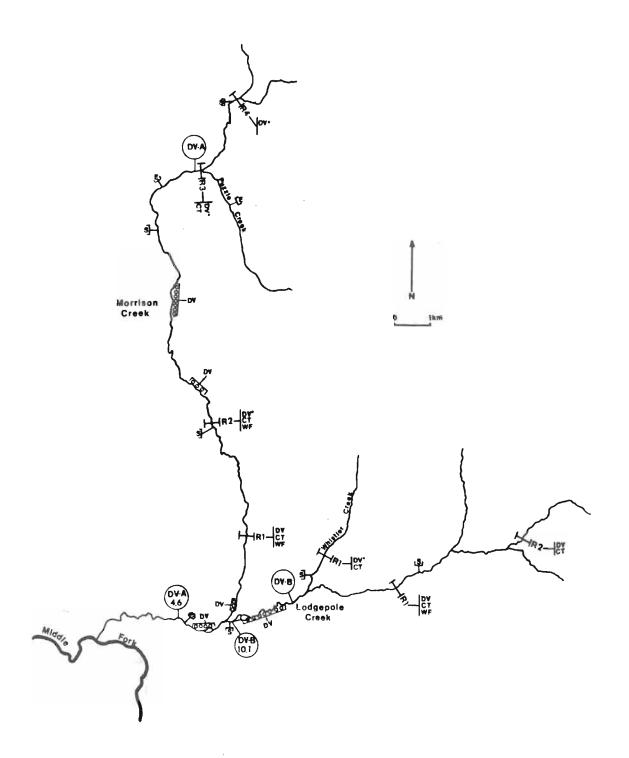


Figure 47. Fish population information for the Morrison Creek drainage.

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

Stream Name	Reach number		each Tributa ength of	Upper ary reach boundar	у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Morrison	001	DC7 7	.5 Middl		km below	1452.0	Mouth	1368.0
Cr.			Fork	Star	Creek			•
Physical I	Habitat dat	<u>a</u> Ave.	Ave.	Ave.		Valley-		
Stream	Drainage	wetted	depth for	channel	Valley	channel	,	Flow
<u>order</u> 4	$\frac{\text{area}(\text{km}^2)}{133.1}$	width(m) 10.5	<u>reach(m)</u> .29	width(m) 31	width(m) 200	<u>ratio</u> 7		arac <u>teris</u> tics
4	122.1					•	KOTTIN	g, swirling
Confine-		Side channe	Average I low	Flow dur survey		erage k water		Maximum pool
ment	Pattern	occurence		(m³/sec			urbidity	depth(m)
X	P	Moderat					Low	1.9
2 pool	% run	% riffle	% pocket- water	% class 1 pools	% clas Il poo			
25	60	14	1	12	50	38		
		% bed mater			D-90		Stability	Bank
# fines	1gravel	% rubble 20	% boulder	%bedrock	(cm)	gradient	rating	<u>form</u>
30	40	20	9	1	39	1.1	93	Steep
D I		ank	Flood	Channel	% stal		W	% cover-
Bank Process	gene mater		plain debris	debris	channe			snorkel g <u>section</u>
Failing	Fluv	ial Mo	derate	Low	20	9	1	10
Water chem								
MOLE! CHEM								
	nistry data		7-4-1					
Cond. (umohs/	Alk.	Total carbon	Total phos.	No 3 -	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺ 50₊
(umohs/	Alk. (mg/l)	Total carbon (mg/l)	phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/1)	(mg/1) (mg/1)
(umohs/	Alk.	Total carbon	phos.		Ca ⁺⁺ (mg/1) 50.1	Mg++	Na ⁺ (mg/1) 1.5	
(umohs/ cm) 220	Alk. (mg/1) 138	Total carbon (mg/l)	phos. (mg/l)		(mg/l)	Mg ⁺⁺ (mg/1)	<u>(mg/1)</u>	(mg/1) (mg/1)
(umohs/	Alk. (mg/1) 138	Total carbon (mg/l)	phos. (mg/l)		(mg/l)	Mg ⁺⁺ (mg/1)	<u>(mg/1)</u>	(mg/1) (mg/1)
(umohs/cm) 220	Alk. (mg/1) 138	Total carbon (mg/l)	phos. (mg/l)		(mg/l)	Mg ⁺⁺ (mg/1)	<u>(mg/1)</u>	(mg/1) (mg/1)
(umohs/cm) 220 Spawming d Number of bull trout	Alk. (mg/1) I38	Total carbon (mg/1) 0.82	phos. (mg/1) .006 Number of bull trout	(mg/1) Redd	(mg/l)	Mg ⁺⁺ (mg/l) .113 Number of bull trout	(mg/1) 1.5	(mg/1) (mg/1)
(umohs/cm) 220 Spawming d	Alk. (mg/1) I38	Total carbon (mg/1) 0.82	phos. (mg/1) .006	(mg/1) 	(mg/l)	Mg ⁺⁺ (mg/1) .113 Number of bull trout redds in	(mg/l) 1.5 Redd density	(mg/1) (mg/1)
(umohs/cm) 220 Spawming d Number of bull trout redds in	Alk. (mg/1) I38	Total carbon (mg/1) 0.82	nhos. (mg/1) .006 Number of bull trout redds in	(mg/1) Redd density	(mg/1) 50.1	Mg ⁺⁺ (mg/1) .113 Number of bull trout redds in	(mg/l) 1.5 Redd density	(<u>mg/1)</u> (<u>mg/1)</u> 10.4
(umohs/cm) 220 Spawming d Number of bull trout redds in reach 32	Alk. (mg/1) 138 Redd densit (no/kr	Total carbon (mg/1) 0.82	Number of bull trout redds in reach	Redd density (no/km)	(mg/1) 50.1 Year	Mg ⁺⁺ (mg/l) .113 Number of bull trout redds in reach	(mg/l) 1.5 Redd density (no/km)	(<u>mg/1)</u> (<u>mg/1)</u> 10.4
(umohs/cm) 220 Spawming of humber of bull trout redds in reach 32 Fish popul	Alk. (mg/1) 138 Redding density (no/kr 4.3	Total carbon (mg/1) 0.82	Number of bull trout redds in reach	Redd density (no/km)	(mg/1) 50.1 Year	Mg ⁺⁺ (mg/l) .113 Number of bull trout redds in reach	(mg/1) 1.5 Redd density (no/km)	(mg/1) (mg/1) 10.4 Year 82 Other species
(umohs/cm) 220 Spawming of humber of bull trout redds in reach 32 Fish popul	Alk. (mg/1) 138 Redding density (no/kr 4.3	Total carbon (mg/1) 0.82	Number of bull trout redds in reach	Redd density (no/km) 3.2	(mg/1) 50.1 Year 81	Mg ⁺⁺ (mg/l) .113 Number of bull trout redds in reach	Redd density (no/km)	(mg/1) (mg/1) 10.4 Year 82 Other species in Eastern
(umohs/cm) 220 Spawming d Number of bull trout redds in reach 32 Fish popul Density (n	Redding/1) I38 Redding/1 (no/kr 4.3 ation data 0/100 m² su	Total carbon (mg/1) 0.82	Number of bull trout redds in reach 24	Redd density (no/km) 3.2	(mg/1) 50.1 Year 81	Mg ⁺⁺ (mg/l) .113 Number of bull trout redds in reach	Redd density (no/km) 4.9	(mg/1) (mg/1) 10.4 Year 82 Other species in Eastern

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

Stream Name Morrison Creek	Reach number 002	number L	each Tributa ength of 3.8 Middle Fork	boundar	below	Upper <u>elev.(m)</u> 1536.0	Lower reach boundary 1.1 km b Star Cre	
Stream order 3	Habitat dat Drainage area(km²) ——	Ave. wetted width(m) 10.0 Side channe		33 Flow dur	pea	Valley- channel ratio 3 erage k water	Broken,	Flow aracteristics rolling Maximum pool
ment C	Pattern C	Occurence		(m³/sec	<u>te</u>	mp(C) T	urbidity T	depth(m)
£ pool	5 run	Moderate ** riffle	pocket- water	2 class I pools	‰ clas II poo			
20	50	10	20	0	40	55	5	0
% fines	2gravel	% bed mater % rubble	% boulder	%bedrock	D-90 (cm)	% gradient	Stability rating_	Bank form
10	50	30	9	1	54	2.3	93	Steep
Bank Process Failing			Flood plain debris High	Channel debris MOderate	% sta chann debr 20	el % cover		% cover- snorkel section 24
Water cher	mistry data							
Cond. (umohs/	Alk.	Total	Total	-	. ++			
<u></u>	(mg/1)	(mg/1)	phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/l) 	Na [†] (mg/l) 	K ⁺ S0. (<u>mg/1)</u> (<u>mg/1)</u>
		A 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				4		
	data	(mg/1) d ty n) Year				(mg/l) Number of bull trout redds in	(mg/l) Redd density	
Number of bull troureds in reach	data t Redi densi (no/kr	(mg/1) d ty n) Year	Number of bull trout redds in reach	Redd density (no/km)	(mg/1) 	Number of bull trout redds in reach	(mg/l) Redd density (no/km) Y	(mg/1) (mg/1)
Number of bull trouredds in reach	t Redd densi (no/kr 1.	(mg/1) d ty n) Year	Number of bull trout redds in reach	Redd density (no/km)	(mg/1) 	Number of bull trout redds in reach	Redd density (no/km) Y	(mg/1) (mg/1) ear 82 ther species
Number of bull trouredds in reach 4 Fish popul	data t Redidensii (no/kr 1. lation data no/100 m² su Cutthroat	(mg/1) d ty m) Year 1 80	Number of bull trout redds in reach 0	Redd density (no/km)	(mg/1) Year 81	Number of bull trout redds in reach	Redd density (no/km)	ear 82 ther species Rastern

Table 59. Stream habitat and fish population data for Morrison Creek, Reach 3.

Stream Name	Reach number		Reach Length	Tributary	Upper reach boundar	у	Upper elev.(m)	Lower reach boundary		Lower elev.(m)
Morrison Creek	003	DC5	8.8	Middle Fork	Mouth Creek	Puzzle	1680.0	.1 km b Crescer		1536.0
Physical	Habitat data	<u>a</u> Ave.	Av		Ave.		Valley-			
Stream order 3	Drainage area(km²) ——	wetted width(m)	dept rea	h for ch	nannel idth(m) 27	Valley width(m) 75	channel ratio	_	Flow character ing, r	
Confine- ment	Pattern	Side channe occurenc	1	Average low flow	Flow dur survey (m³/sec	pea	erage k water mp(C)	urbidity	Maximum pool depth(m	n .
X	P	High	%	 oocket-	 % class	% clas			0.9	% class
<u>5 pool</u> 8	<u>% run</u> 51	% riffle	-	water LO	I pools	11 poo 40	<u>111 po</u> 55		pools 5	V pools O
fines 20	*gravel	% bed mate % rubble 30	the second second second	ooulder 9	%bedrock 1	D-90 (cm) 43	gradient 1.7	Stability rating 100	<u>1</u>	Bank Form pose
Bank Process	Ba gene mater		Floor plair debr	1 0	hannel debris	% stal chann debr	el % cover		r sr	cover- norkel ection
Failing	Fluv	vial	High	n Mod	erate	40	13	8		18
Water cher Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)		Total phos.	N _{O 3} (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na [†] (<u>mg/1</u>) ——	κ [†] (<u>mg/l)</u> ——	SO. (mg/1)
Spawning	da ta									
Number of bull trou redds in reach	t Redd densit (no/km 4.4	y Year	bul redo	per of I trout ds in each	Redd density (no/km)	Year 81	Number of bull trout redds in reach	Redd density (no/km) 3.9	Year 82	
	lation data								0+bc=	ocias
	no/100 m² su Cutthroat Age I Age)	Age 0	Bull tr	out Age II	Age III+	Mount White		Eastern Brk trout
0	0 0.			0	0	2.7	5.1	A		A

Stream habitat and fish population data for Morrison Creek, Table 60. Reach 4.

Stream <u>Name</u>	Reach number		Reach Tribut Length of		у	Upper elev.(m	Lower reach boundary		Lower elev.(m)
Morrison	004	DC4	2.3 Midd	le Head	waters	1800.0	Mouth	1	680.0
Cr.			Fork				Puzzl	e Cr.	•
Physical	Habitat data	Ave.	Ave.	Ave.		Valley-			
Stream	Drainage	wetted	depth for	channel	Valley	channel		Flow	
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	<u>ratio</u>		characteri:	stics
3		4.3	.18	19	40	3	Rol	ling,tum	nbling
		Side	Average	Flow dur	ing Av	verage		Maximum	
Confine- ment	Pattern	channe occurenc		survey (m³/sec		k water emp(C)	Turbidity	pool depth(m)	
				(111 / 250		mp(L)			<u>-</u>
F	N	Modera	te % pocket-	 ⊊ class	% clas	 ss %cl	Low	0 .9	% class
ړ pool	% run	% riffle	water	l pools	II_pod			pools	V pools
1	54	25	20	0	20	7	0	10	0
	62.414	% bed mate			D-90	2	Stability	Ва	ink
% fines	%gravel	% rubble		%bedrock	(cm)	gradient	<u>rating</u>	fo	חדונ
20	30	30	19	1	52	5.2	91	Ste	eep
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	el % cove		er sno	over- rkel tion
Failing	Fluvia	_	70.5	Moderate	25	18	9		.3
rarring	TIUVIO		IIIgii	nouerate	2.5	10	9	1	. 3
Water cher	mistry data								
Cond.		Total	Total						
(umohs/	Alk.	carbon	phos.	No 3	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺	50.
<u>cm)</u>	(mg/1)	(mg/1)	$\frac{(mg/1)}{}$	(mg/1)	(mg/1)	(mg/l)	<u>(mg/l)</u>	(<u>mg/l)</u>	(mg/1)
		,,							
Spawning	data								
Number of bull trout	t Redd		Number of bull trout	Redd		Number of bull trout	Redd		
redds in	densit	y	redds in	density		redds in	density		
_ reach_	(no/km		<u>reach</u>	<u>(no/km)</u>	<u>Year</u>	reach_	(no/km)	<u>Year</u>	
0	0	80	0	0	18	2	.87	82	
Fish popul	lation data								
	no/100 m² su	rfaco area	1					Other spe	cies
bensity (r	Cutthroat	riace area		011	0.41		Mount	ain	Eastern
Age O A	age I Age	II Age	111+ Age 0	Bull tr Age 1	Age 11	Age 111+	White	11511	Brk trout
^	0			PH.		and .			

0.5

0.5

Α

Α

0.3

0

0.4

0

Table 61. Stream habitat and fish population data for Lodgepole Creek, Reach 1.

Reach number				ry	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
e 001	DDD	6.5 Morri Cr.			1500.0	Junction Morrison	w/ 1428.0
Habitat dati Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	cha	Flow racteristics
49.2	6.2	.29	18	500	28	Swirli	ng, placid
Pattern	channe	e flow	surve	y peal	water		Maximum pool depth(m)
С	Low	. 24					1.8
% run	% riffle	% pocket- water_					
57	20	1	21	48	31	0	0
agravel			%bedrock	D-90 (cm)		and the state of t	Bank form
35	16	4	0	21	1.1	92	Repose
gene mater	etic <u>ia</u> l	Flood plain debris	Channel debris	channe debri	s canopy	overhang	% cover- snorkel section
		птдп	Moderate	30	13	11	22
istry data	i.						
Alk. (mg/1) 134	Total carbon (mg/l)	Total phos. (mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na ⁺ (mg/1) 	K ⁺ SO. (mg/1)
lata							
densit	.y	Number of bull trout redds in <u>reach</u>	Redd density (no/km) 2.8	Year 81	bull trout redds in c	no/km) Ye	ear 32
ation data							
	rface area	ı				Mountain	
Cutthroat ge 1 Age	II Age	111+ Age 0			Age 111+	Whitefis	<u>ah</u> <u>Brk trout</u>
			0.3	0.1	0	P	A
	number e 001 Habitat dat Drainage area(km²) 49.2 Pattern C 2 run 57 2gravel 35 Bagene mater Fluv: histry data Alk. (mg/l) 134 data Redd densit (no/km 2.2 ation data no/100 m² su Cutthroat toe 1 Age	number number Le O01 DDD Habitat data Drainage area(km²) wetted width(m) 49.2 6.2 Side channe occurence C Low run riffle 57 20 bed material 7 rubble 35 16 Bank genetic material Fluvial histry data Alk. (mg/l) 134 Total carbon (mg/l) 134 Total carbon (mg/l) 134 data Redd density (mo/km) 2.2 80 ation data mo/100 m² surface area) Cutthroat for 1 Age 11 Age	number number length of e OO1 DDD 6.5 Morrical Cr. Habitat data Drainage wetted depth for reach(m) 49.2 6.2 .29 Side channel low occurence flow .24 run riffle water spocketwater 57 20 1 bed material water 57 20 1 bed material shoulder 35 16 4 Bank Flood plain debris Fluvial High histry data . Alk. carbon phos. (mg/l) (mg/l) 134 Alk. carbon phos. (mg/l) (mg/l) 134 Redd density (mg/l) (mg/l) (mg/l) 134 Altata Redd bull trout redds in reach 2.2 80 18 ation data cutthroat carbon phos 18 ation data cutthroat surface area 18 Cutthroat carbon phos 19 Cutthroat carbon phos 18	Reach number Redd density (no/km) Redd density (no/km) Reach number Redd density (no/km) Redd number Redd number Redd density (no/km) Redd number R	Reach number number length of boundary e O01 DDD 6.5 Morrison 6.5 km above Cr. Morrison Cr. Habitat data Drainage area(km²) width(m) reach(m) width(m) width(m) width(m) width(m) reach(m) width(m) width(m) width(m) width(m) width(m) reach(m) width(m) width(m) width(m) width(m) width(m) reach(m) width(m) wid	Reach number number length of boundary reach of boundary elev.(m) and the length of boundary elev.(m) are number number length of boundary elev.(m) are number of built rout density (no/km) year reach (no/km) year length of the politic length of built rout density (no/km) year reach (no/km) year year year year year year year year	Reach Serial Reach Of Doundary Elev.(m) boundary Elev.(m) E

Table 62. Stream habitat and fish population data for Lodgepole Creek, Reach 2.

Stream Name	Reach number		each Tribut ength of	•	ry	Upper elev.(m)	Lower reach boundary		Lower elev.(m)
Lodgepol	e 002	DDC	4.1 Morris	on 1.4	km above	_		above	1530.0
Creek			Cr.		mming Cr	•		on Cr.	
Obusical	Habitat dat								
		Ave.	Ave.	Ave.		Valley-			
Stream order	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel width(m)	Valley width(m)	channel ratio	c	Flow haracteri	
3	<u></u>	4.2	.28	19	70	4	_	ng, sw	
		Side	Average	Flow du	rino Av	erage		Maximum	· ·
Confine-	0.**	channel	low	surve	y pea	k water	rmb.intik	pool	
mentX	<u>Pattern</u> N	occurence High	flow	(m³/se	<u>c)</u> _te	mp(C)	<u>furbidity</u>	depth(m	<u>/</u>
11	11	nign	% pocket-	 ⊊ class	- ‰ clas:	 s %cla	Low ss %c	0.8 lass	% class
5 pool	<u>⊱̃ run</u>	<u>% riffle</u>	water	1 pools				pools	<u>V pools</u>
20	50	10	20	0	50	4(10	0
fines	%gravel	1 bed mater % rubble	1 boulder	%bedrock	D-90 (cm)	gradient	Stability rating		ank orm
30	40	20	10	0	35	2.8	97	Ste	eep
	Ra	an k	Flood		% stal	nle.		•	cover-
Bank	gene	etic	plain	Channel	channe	el % cover		r sni	orkel
<u>Process</u> Failing	mater Flu	v i al	debris High	<u>debris</u> High	debri 35			ng <u>se</u>	ction
1 4111116		VIAI	III GII	птви	. 33	7	28		31
Water cher	mistry data	2							
Cond.	531	Total	Total		_ ++	. ++	+	u+	
(umohs/	Alk. (mg/l)	carbon (mg/l)	phos. (mg/l)	No ₃ ⁻ (mg/l)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (n:q/1)	Na [†] (mg/l)	K [†] (mg/l)	50. (mg/l)
-									
Snawning o	da ta								
P. 1									
Number of bull trout	Redd	I	Number of bull trout	Redd		Number of bull trout	Redd		
redds in reach	densit (no/km	Ψ.	redds in reach	density (no/km)	Year		density (no/km)	Year	
0	0	80							
Fich norm	ation data								
								Other spe	cies
vensity (n	io/100 m² su Cutthroat	riace area)		Bull tr	2014		Mounta	in	Eastern
	ae l Age		11+ Age 0	Age 1		Age 111+	<u>Whitef</u>	1511	Brk trout
0.2	0.8 2.	.3 1.	2 0	0.2	0	0.2	A		Α

A

Table 63. Stream habitat and fish population data for Whistler Creek, Reach 1.

Stream Name Whistler Creek	Reach number 001	<u>number</u> <u>L</u>	each Tribut ength of .1 Lodger Creek	•		Upper elev.(m) 1500.0	Lower reach boundary Junction Lodgepol	
Physical	Habit at data	a Ave.	Ave.	Ave.		Valley-		
Stream <u>order</u>	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel width(m)	Valley width(m)	channel ratio	char	Flow racteristics
2	12.0	3.0	.16	5	200	33	Broken,	rolling
Confine- ment U	Pattern N	Side channel occurence Low	Average low flow •07	Flow du surve (m³/sed	y pead			daximum pool depth(m) 0.9
2 pool	% run	% riffle	% pocket- water	⊊ class I pools	% class	7		
20	60	15	5	8	31	56	5	0
fines	%grave1	<pre>\$ bed mater % rubble</pre>	ial % boulder	2bedrock	D-90 (cm)	gradient S	tability rating	Bank form
15	55	20	10	0	25	1.6	83	Undercut
Bank Process Stable	Ba gene mater Fluvi	tic ial	Flood plain <u>debris</u> derate M	Channel debris loderate	% stat channe debri	el % cover- canopy	% cover overhang 22	cover- snorkel section
Water chem	istry data	2						
Cond. (umphs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/l)	Ca ⁺⁺ (mg/l) 	Mq ⁺⁺ (mg/1) 	Na [†] (mg/l)	K ⁺ SO ₊ (mg/1) ————————————————————————————————————
Snawning d	ata							
Number of bull trout redds in reach	Redd density (no/km 		Number of bull trout redds in reach	Redd density (no/km)			Redd ensity no/km) Yea 	a <u>r</u> -
	o/100 m² sur	face area)					Mountain	ner species Eastern
	Cutthroat De 1 Age 0 0.		1)+ Age 0 0	Bull tr Age 1 0.5		Age 1]]+ 1.2	<u>Whitefish</u> A	Brk trout A

SCHAFER CREEK DRAINAGE

SCHAFER CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-13-80

Reach 1 is a fourth order tributary from the Middle Fork upstream to the junction of Dolly Varden Creek, where it becomes third order. Average wetted width was 7.5 m and the mean depth was 0.36 m. This reach was composed of 44% run, 42% riffle, 9% pool and 5% pocketwater areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 5% of the wetted surface area influenced by overhang. Low instream cover (<10%) was provided by substrate, turbulence and depth. Stream gradient was 0.7% and the D-90 was 13 cm. Several slumping areas were present and many high water channels and springs were observed. Beaver activity was observed from stream km 4.0 to 5.0 and a portion was intermittent during low flows. A 1 m bedrock falls was located 0.4 km above Dolly Varden Creek. The Schafer Creek trail crossed at stream km 4.3.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 1 had an irregular meandering pattern and was occasionally confined. Several outfitter camps were located on the west bank.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat, bull trout and mountain whitefish were observed. Whitefish were the most numerous species present during the density survey. Spawning by adfluvial bull trout has been documented and the high use portion contained 5.3 bull trout redds per km during the 1980 redd survey.

SCHAFER CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-12-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 7.1 m and the mean depth was 0.32 m. This reach was composed of 56% pocketwater, 32% run and 12% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with 6% of the wetted surface area shielded. Moderate instream cover (11%) was provided by substrate, turbulence and aquatic vegetation. Stream gradient was 1.3% and the D-90 was 38 cm. Several slumping areas were observed and the Schafer Creek trail crossed twice.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 150 m. Reach 2 had a sinuous pattern and was frequently confined by canyon walls.

Fish Populations:

Westslope cutthroat trout and mountain whitefish were observed in low densities. Beaver activity and an intermittent section during late summer flows probably prevented adult bull trout from moving into this reach.

SCHAFER CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-11-80

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 6.2 m and the mean depth was 0.25 m. This reach was composed of 65% run, 20% pool and 15% riffle areas. Channel debris was low, with 30% stable. Bank cover was low, with 10% of the wetted surface area influenced by overhang. Moderate instream cover (20%) was provided by substrate, undercut banks and debris. Stream gradient was 1.0% and the D-90 was 24 cm. Some areas of mass wasting were observed and many log jams were present in the floodplain. Slight beaver activity was also noted just below the mouth of Capitol Creek and a 0.5 km section above Rambler Creek was intermittent during fall of 1980.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was greater than 30:1. The average valley width was 500 m. Reach 3 had an irregular meandering pattern and was generally unconfined. The Schafer Creek Trail ran along the east bank and the Capitol Mountain Trail joined the Schafer Creek Trail near stream km 7.2.

Fish Populations: Date Surveyed: 7-13-80

Westslope cutthroat trout were observed in moderate densities.

SCHAFER CREEK REACH 4

Channel Characteristics: Date Surveyed: 7-13-80

Reach 4 is a third order tributary from the reach break up to the West Fork of Schafer Creek, where it becomes second order. Average wetted width was 4.0 m and the mean depth was 0.13 m. This reach was composed of 45% run, 25% riffle, 20% pocketwater and 10% pool areas. Channel debris was low, with 80% stable. Bank cover was moderate to high, with 25% of the wetted surface area influenced by overhang. Moderate instream cover (17%) was provided by substrate, turbulence and aquatic vegetation. Stream gradient was \$.5% and the D-90 was 41 cm. Several bedrock cascades were present and formed barriers 0.4 km above the West Fork of Schafer Creek.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was approximately 15:1. The average valley width was 100 m. Reach 4 had an irregular pattern and was occasionally confined.

Fish Populations:

Westslope cutthroat trout were observed in moderate densities. No fish population data were collected above the falls at stream km 13.2.

Dolly Varden Creek Reach 1

Channel Characteristics: Date Surveyed: 7-13-80

Reach 1 is a third order tributary to Schafer Creek. Average wetted width was 10.0 m and the mean depth was 0.37 m. This reach was composed of 55% run, 25% riffle, 17% pool and 3% pocketwater areas. Channel debris was moderate, with 17% stable. Bank cover was low, with 7% of the wetted surface area influenced by overhang. Moderate instream cover (13%) was provided by substrate, debris and undercut banks. Stream gradient was 1.0% and the D-90 was 20 cm. Several slumping areas were observed and some channel braiding occurred in lower gradient, meadow-like sections. Beaver activity also backed up several small areas and caused braiding. A barrier falls was located at the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 175 m. Reach 1 had an irregular meandering pattern and was generally unconfined with an occasional steep bank on one side. The Dolly Varden Creek Trail followed the west bank and the Chair Mountain Trail junction was located near stream km 3.7. A large, off-channel beaver dam area formed a swampy meadow with several ponds near stream km 7.1.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat, bull trout, mountain whitefish and sculpins were observed. During July, surveys showed mountain whitefish to be the most numerous fish species present, with cutthroat and juvenile bull trout observed in extremely low densities. However, in a September survey, juvenile bull trout were observed in very high densities. This suggests that Dolly Varden Creek may be seasonally important for juvenile bull trout. Spawning by adfluvial bull trout has also been documented with an average of 27 redds enumerated annually during four years of survey.

Argosy Creek Reach 1

Channel Characteristics: Date Surveyed: 7-11-80

Reach 1 is a second order tributary to Dolly Varden Creek. Average wetted width was 5.4 m and the mean depth was 0.22 m. This reach was composed of 45% run, 39% riffle, 10% pocketwater and 6% pool areas. Channel debris was moderate, with 20% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Moderate instream cover (19%) was provided by substrate and turbulence. Stream gradient was 5.8% and the D-90 was 65 cm. Several low wasting banks were observed and scattered log jams caused channel braiding to occur. A bedrock cascade

area was present near the upper break where the stream turned approximately 45 degrees to the northeast.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 2:1. The average valley width was 50 m. Reach 1 had an irregular pattern and was confined to entrenched. The Argosy Creek Trail followed the north bank.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat and juvenile bull trout were observed in low to moderate densities. A large, new log jam just above the mouth may prevent adult bull trout from moving into Argosy Creek.

Argosy Creek Reach 2

Channel Characteristics: Date Surveyed: 7-11-80

Reach 2 is a second order tributary in the Dolly Varden Creek drainage. Average wetted width was 3.8 m and the mean depth was 0.10 m. This reach was composed of 49% run, 44% riffle and 7% pool areas. Channel debris was low, with 20% stable. Bank cover was low, with 10% of the wetted surface area shielded. Moderate instream cover (18%) was provided by substrate, turbulence, debris and depth. Stream gradient was 2.7% and the D-90 was 25 cm. A large log jam was located 0.5 km above the lower reach break and the majority of substrate was suitable for spawning (60% fines and gravels).

Valley Characteristics:

The upper bank slope gradient was approximately 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 100 m. Reach 2 had an irregular meandering pattern and was unconfined. The Argosy Creek trail followed the north bank and an outfitter's camp was located near stream km 3.2.

Fish Populations: Date Surveyed: 7-12-80

Westslope cutthroat and juvenile bull trout were observed. Density estimates showed an important rearing area for cutthroat, with 11.4 age I or older fish per 100 m² surface area. Cutthroat spawning may also occur in this reach. Spawning by adfluvial bull trout has not been documented although several adult fish have been observed and juvenile bull trout were present in moderate densities.

West Fork Schafer Creek

Channel Characteristics: Date Surveyed: 7-14-80

Reach 1 is a third order tributary up to the first major fork, where it becomes second order. Average wetted width was 5.8 m and the mean depth was 0.19 m. This reach was composed of 40% riffle, 30% run, 25% pool and

5% pocketwater areas. Channel debris was low, with 10% stable. Bank cover was low, with 5% of the wetted surface area influenced by substrate, turbulence and depth. Stream gradient was 3.6% and the D-90 was 38 cm. Some mass wasting was noted and bedrock banks entrenched a large section. A cascade section was present at stream km 2.0 and channel braiding occurred in several locations.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 75 m. Reach 1 had an irregular pattern and was generally entrenched. The Schafer Creek trail followed the north bank and crossed just above the cascade section.

Fish Populations:

Westslope cutthroat were the only fish species observed and were present in moderate densities.

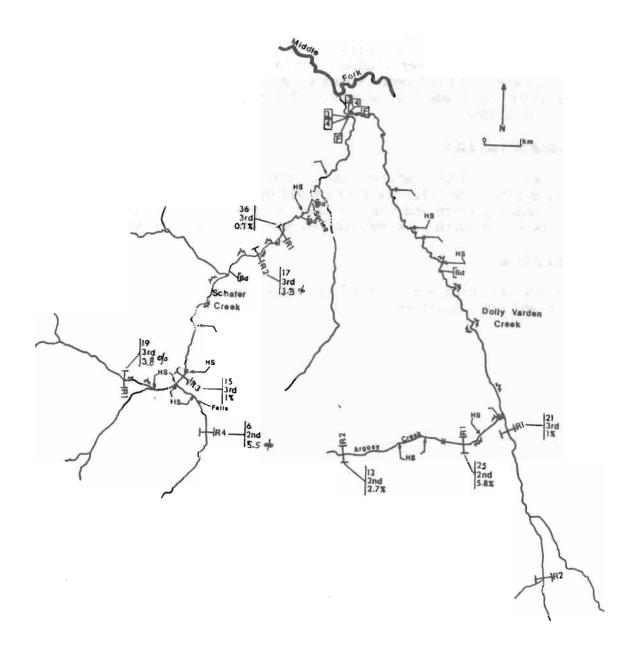


Figure 48. Physical habitat information for the Schafer Creek drainage.

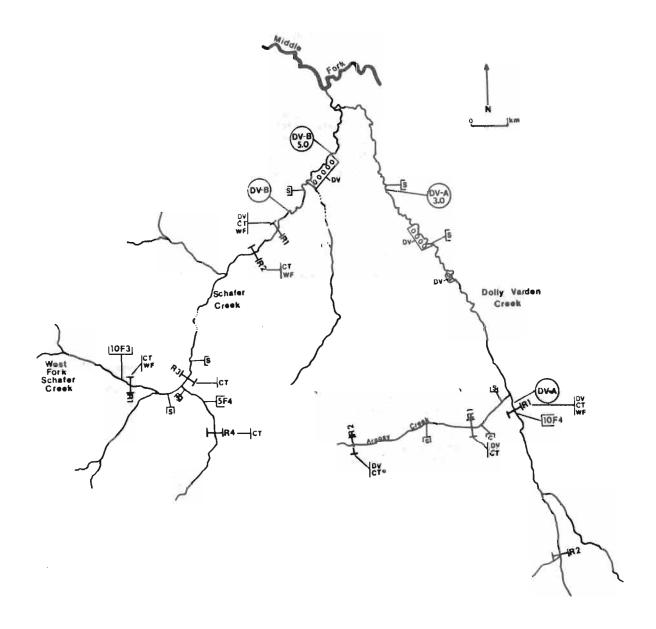


Figure 49. Fish population information for the Schafer Creek drainage.

Table 64. Stream habitat and fish population data for Schafer Creek, Reach 1.

Fish population data

Aug 0 0

Density (no/100 m² surface area)

Cutthroat

Age 1 Age 11 0 0

Age 111+

Ace D

0.1

Other species

Eastern

Α

Brk trout

Mountain

Whitefish

P

Stream Name	Reach number		Reach Tr Length	ibutary of	Upper reach boundar	у	Upper alav.				Lower elev.(m)
Schafer	001	DDN	4.6 M	iddle	.15 k	m below	14 98 ,	0 Mo	uth	1	464.0
Creek			F	ork	Rouge	Cr.					
Physical	Habitat dat	à									
		Ave.	Ave.		Ave.		Valley-				
Stream order	Drainage area(km²)	wetted width(m)	depth f reach(i		annel <u>dth(m</u>)	Valley width(m)	channel ratio		<u>c h</u>	Flow : aracteris	tics
4	126.4	7.5	.36	3	6	200	6	P	lacid	, rolli	ng
		Side		-age	Flow dur	_	erage			Maximum	
Confine- ment	Pattern	channe occurenc		<u>></u> . >₩	survey (m³/sec		k water mp(C)	Turbid	ity	pool depth(m)	•
X	C	Moderat	e .5	7		1	18	Low		1.5	
⊊ pool	° run	% riffle	% poci wate		% class I pools	% clas II poo		class pools	% cla IV po	ass %	class pools
9	44	42	5		4	40		40	10		0
		% bed male	rial			D- 90	2	Stabi`	_	Bar	k _
<u>fines</u>	2gravel	% rubble		der 2	<u>bedrock</u>	<u>(cm)</u>	gradient	rati	ing	for	m
35	35	24	5		1	13	0.7	10	1	Rep	ose
	Bā	3n k	Flood			% stal	ble			% cc	ver-
Bank Process	gene mater		plain debris		nannel Mebris	channe debri			cover verhanc	snor sect	
Failing	Fluv:		Low		Low	10	3			• —	
J	•		LOW	,	LOW	10	3		4	7	
Water chem	istry data	*									
Cond.	14.500	Total	Tot			++	++		+	+	
(umohs/ cm)	Alk. (mg/l)	carbon (mg/l)	pho (mg/		No ₃ ⁻ mg/l)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (nig/1)	Na (mg		K ⁺ (<u>mg/l)</u>	SO. (mg/l)
75	51	0.85	.00			16.6	.033	73	/ -	·	5.6
				,		10.0	•055				5.0
Spawning d	ata										
Number of			Number	of			Number of				
bull trout			bull tr		Redd		bull trout				
redds in reach	densit (no/km		redds i reach		density (no/km)	Year	redds in _reach_	densit (no/km	-	ear	
10	2.2	80	12	_ ,	2.6	81	17	3.7		82	

0

Age 1 Age 11

0

Age 111+

Table 65. Stream habitat and fish population data for Schafer Creek, Reach 2.

Upper

Lower

P

Α

Stream Name	Reach number		each Tributa		v	Upper elev.(m)	reach boundary	Lower elev.(m)
Schafer	002		1.1 Midd		above	1.512.0	.15 km	
Creek			Fork		Creek		Rouge C	
Objection	u.bia.a daa							
Physical	Habitat data	Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wet t ed width(m)	<pre>depth for reach(m)</pre>	<pre>channel width(m)</pre>	Valley width(m)	channel ratio	c ha	Flow racteristics
3	area (Kiii]	7.1	• 32	17	150	9		g, broken
Confine-		Side channel	Average low	Flow dur Survey	_	erage k water		Maximum pool
ment	Pattern	occurence	flow	(m³/sec) ter	mp(C) T		depth(m)
F	N	Low					Low	0.7
⊊ pool	% run	2 riffle	% pocket- water	% class 1 pools	% class Il pool			
12	32	0	56	0	8	33		0
		% bed mater			D-90		Stability	Bank
fines	agravel	% rubble	% boulder	*bedrock		gradient	rating	form
20	28	37	14	1	38	1.3	84	Steep
Bank Process	gene mater		Flood plain debris	Channel debris	% stab channe debri	al % cover		% cover- snorkel section
Failing	g Fluv	ial	Low	Low	. 10	3	6	11
Water chem	istry data	ž.						
Cond (umohs/ cm)	Alk. (mg/1)	Total carbon (mg/1) ——	Total phos. (mg/l)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na ⁺ (mq/1)	K ⁺ SO ₄ (mg/1) ————————————————————————————————————
Spawning d	ata							
Number of bull trout redds in reach	Redd density (no/km O	y'	Number of bull trout redds in reach	Redd density (no/km)	1			ar —
Fish popul	ation data							
Density (n	o/100 m² sur	face area)						her species
A O sex	Cutthroat ge 1 Age	II Ase I	11+ Age 0	Bull tro		40e 111+	Mountain Whitefis	

1.1

Table 66. Stream habitat and fish population data for Schafer Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	003	DD4	4.8	Middle Fork	.4 km below W.F. junction	1560.0	1 km above Rouge Cr.	1511.0

Physical	Habitat dat	_	_	_		1000		
Stream	Drainage	Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow
order	area (km²)	width(m)	reach(m)	width(m)	width(m)	ratio		characteristics
3		6.2	. 25	15	500	33		rling, rolling
Cartino		Side channel	Average low	Flow du surve		verage ik water		Maximum pool
Confine- ment	Pattern	occurence	flow	(m³/se		emp(C)	Turbidity	depth(m)
U	C	Low					Nil	1.2
			% pocket-	% class	‰ clas	.s % c	lass %	class & class
2 pool	<u>ت run</u>	2 riffle	water	I pools				pools V pools
20	65	15	0	35	30	2:	5	5 5
		<pre>bed mater</pre>		1	D-90	A.	Stability	Bank
* fines	2grave)	% rubble	& boulder	*bedrock	(cm)	gradient	rating	form
5	53	39	3	0	24	1.0	106	Undercut
	_	-						
0 1		ank atio	Flood	Channel	% sta chann		er- % cove	% cover- er snorkel
Bank Process	mater	etic rial	debris	debris	debr			
Failing			Low	Low	30		10	
rarring		, 141	HOW.	шом	. 50	10	10	20
Water cher	nistry data	2		_				
Cond.		Total	Total					
(umohs/	Alk.	carbon	phos.	No3	Ca ⁺⁺	Mg ⁺⁺	Na ⁺	K ⁺ 50.
cm)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(ng/1)	<u>(mg/1)</u>	(mg/1) $(mg/1)$
	42							
Snawning	da ta							
Number of			Number of			Number of		
bull trout			bull trout	Redd		bull trout	Redd	
redds in reach	densit (no/kπ		redds in reach	density (no/km)	Year	redds in reach	density (no/km)	Year
1	0.2	79	0			100011	(110) Killy	1601
1	0.2	79	U	0	80			
Fish popul	lation data							
		- 1						Other species
Density (r	no/100 m² su	riace area)					Mount	ain Eastern
7	Cutthroat	II Age I	1)+ Age 0	Bull tr Age 1	out Age II	Age 111+	White	fish Brk trout
Auc 0 F	0 0.		0	0	0	0	А	A
U	0 0	.0 3.1	U	0	J	U	A	A A

Table 67. Stream habitat and fish population data for Schafer Creek, Reach 4.

Stream _Name_	Reach number		Reach Tributa ength of	Upper reach bounda	ry	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Schafer Creek	004	DD5	3.7 Middl Fork	e Hea	dwaters	1768.0	.4 km belo	
<u>Physical</u>	Ha <u>bitat dat</u>	<u>a</u> Ave.	Ave.	Ave .		Valley-	J	
Stream order 2	Drainage area(km²) ——	wetted width(m) 4.0	depth for reach(m)	channel width(m) 6	Valley width(m) 100	channel <u>ratio</u> 15	chara	flow cteristics .ng, broken
Confine- ment X	<u>Pattern</u> P	Side channe occurence Nil	Average l low	Flow du surve (m³/se	uring Ave ey peak	erage c water	Ma urbidity de	ximum pool pth(m)
pool ــَ	½ run	<u> </u>	% pocket- water	% class I pools				% class V pools
10	45	25 % bed mater	20 -ial	0	5 D- 90	65	15 Stability	5 Bank
fines	agravel	% rubble	2 boulder	*bedrock	<u>(cm)</u>	gradient	rating	form
25	35	25	15	0	41	5.5	95	Undercut
Bank Process	gene mater	<u>ia</u> l	Flood plain debris	Channel debris	% stab channe debri	1 % cover- s canopy	% cover overhang	% cover- snorkel section
Stable	Fluv	ial	Nil	Low	. 80	25	25	17
<u>Water chem</u>	nistr <u>y data</u>	•		-				
Cond. (umohs/ cm) ——	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 		k ^⁴ 50. g/l) (mg/l)
<u>Spawning c</u>	ia ta							
Number of bull trout redds in reach	Redd densit (no/km O	y ′	Number of bull trout redds in reach	Redd density (no/km)	t		Redd ensity no/km) Year 	
Fish popul		-()					Othe	r species
	Cutthroat		1)14	Bull tr		122	Mountain Whitefish	Eastern Brk trout
	.3 1	.7 O.		<u>Age 1</u> 0	0 Age 11 A	0	A	A

Table 68. Stream habitat and fish population data for Dolly Varden Creek, Reach 1.

Stream Name	Reach number		each Tributa ength of	Upper ry reach boundar	у	Upper elev.(m	Lower reach boundary		Lower elev.(m)
lly Vard	en 001	DDA	13.1 Schafe		above	1560.0		ion w/	1452.0
Creek			Cr.	Argos	y Cr.		Schaf	er Cr.	,
Physical	Habitat dat		Ao	A=		11677			
Stream	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel	Valley	Valley- channel		Flow	
order 3	68.4	10.0	.37	width(m) 21	width(m) 175	ratio 8		character cid, ro	
3	00.7					_	1 14	-	J
Confine-	0-44	Side channel		Flow dur syrvey	pe	verage ak water	*	Maximum pool	
ment X	<u>Pattern</u> C	Moderate		(m³/sec	<u>)</u> _t	emp(C) 18	Nil	depth(i	<u>n)</u>
Λ	C	Hoderati	% pocket-	% class	% cla			class	‰ class
1 pool	1 run	2 riffle	water	1 pools	11 po	ols 111 pc		pools	V pools
17	55	25	3	28	28			8	0
fines	2grave)	<pre># bed mater # rubble</pre>	ial & boulder	*bedrock	D-90 (cm)	gradient	Stability rating		Bank form
27	55	17	1	0	20	1.0	103	Re	pose
Bank <u>Process</u> Failing	geni matei		Flood plain debris derate	Channel <u>debris</u> Moderate	% sta chanr debr	nel % cover ris canopy		er sr	cover- norkel ection
Water chem	istry data								
Cond.		Total	Total						
(umohs/	Alk.	carbon	phos.	No ₃	Ca ⁺⁺	Mg ++	Na ⁺	κ ⁺	SO.
^{cm)} 200	$\frac{(mg/1)}{151}$	(mg/1) 0.64	$\frac{(mg/1)}{.003}$	(mg/l) 	(mg/1) 43.5	$\frac{(nig/1)}{112}$	<u>(mg/l)</u>	(<u>mg/1)</u> 	(mg/1) 5.1
		0.04			. = • =				3.2
Spawning d	la La								
Number of bull trout redds in reach	Redo densit (no/km	Ly'	Number of bull trout redds in reach	Redd density (no/km)	Year		Redd density (no/km)	Year	
21	1.8	80	31	2.4	81	36	2.7	82	
Fish popul	ation data								
Density (n	o/100 m² su Cutthroat	urface area)		Bull tro			Mount White		ecies Eastern Brk trou
Aue O A	oe l Kae	11 Age	111+ Age 0	Age 1	Age 11	Age 111+			

0

Α

0.1

0.1

Table 69. Stream habitat and fish population data for Argosy Creek, Reach 1.

Stream Name Argosy Creek	Reach number 001	<u>number</u> <u>L</u>	each Tribut. ength of 1.5 Doll Varde Creek	boundaries 1.5 an Doll	km above y Varden	Upper <u>elev.(m)</u> 1650.0	Lower reach boundary Junction Dolly Var Creek	•			
Physical Habitat data											
Stream order	Drainage area(km²)	Ave. wetted width(m)	depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel _ratio_		Flow acteristics			
2	15.4	5.4	.22	25	50	2	Tumblin	g, broken			
Confine- ment	Pattern	Side channel occurence	4.2	Flow du surve (m²/se	y peak	erage k water np(C) Ti		eximum pool epth(m)			
С	P	Low	.11		-		Low	1.0			
<u>2 pool</u>	∑ run	1 riffle	% pocket- water	2 class 1 pools	11 pool	<u> </u>	ols IV pool	s V pools			
6	45	39	10	20	0	75	5	0			
fines	%grave)	% bed mater % rubble	% boulder	%bedrock	D-90 (cm)	gradient	Stability rating	Bank form			
20	30	20	20	10	65	5.8	84	Steep			
Bank Process Failing	gene mater	ial	Flood plain <u>debris</u> derate M	Channel debris oderate	% stab channe <u>debri</u> 20	al % cover-	% cover overhang 1	% cover- snorkel section			
Water cher	nistry data										
Cond. (umphs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ^{+†} {mg/1} 	Mg ⁺⁺ (mg/1)	Na [†] (mg/l) (K ⁺ SO ₄ mg/1) (mg/1)			
Spawning (da ta					-					
Number of bull trout redds in reach	Redd densit (no/km	y ′	Nember of bull trout redds in 	Redd density (no/km)	1		Redd ensity no/km) <u>Yea</u>	<u>-</u>			
Fish popul	ation data										
Density (no/100 m² surface area) Density (no/100 m² surface area) Bull trou! Mountain Eastern Whitefish Brk trou! Age U Age II Age III Age III											

Table 70. Stream habitat and fish population data for Argosy Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributa of	Upper ry reach bounda	ry	Upper elev.(m	Lower reach boundary		Lower elev.(m)
Argosy Creek	002	DC8	3.7	Dolly Varde Creek	n	dwaters	1750.0	1.5 km Dolly Creek	above Varden	1650.0
Physical	Habitat dat	<u>a</u> Ave.	Ave		Ave.		Valley-			
Stream order	Drainage area(km²)	wetted width(m)	depti	for h(m)	channel width(m)	Valley width(m)	channel ratio	_	Flow	
2		3.8	. 1	0	13	100	7	Plac	id, swi	rling
Confine- ment	Pattern	Side channe occurence	1	lverage low flow	Flow du surve (m³/se	y pe	verage ak water emp(C)	Turbidity	Maximum pool depth(m)	
П	С	Low	9			* -1-	 ss % cl	Nil	0.7	0 -1
2 pool 7	19 49	% riffle 44		ocket- vater 0	i class 1 pools 0			ools IV	pools	Sclass V pools O
		% bed mate		- 14	-	D-90	2	Stability	Ba	
fines 20	agravel 40	% rubble 29		oulder O	%bedrock	(cm) 25	gradient 2.7	rating 87	<u>fo</u> Rep	
Bank Process Failing	gene mater	<u>ia</u> l	Flood plain debri Modera	<u>s</u>	Channel debris Low	# sta chan debi	nel % cove ris canop		r sno	over- rkel tion 8
Water che	mistry data	?								
Cond. (জ্যাত্রhs/ লো)	Alk. (mg/l)	Total carbon (mg/l)		Total phos. mg/l)	No ₃ (mg/1)	(mg/1)	Mg ⁺⁺ (mg/1)	Na + (mg/1)	K ⁺ (mg/l) 	SO ₄ (mg/1)
Spawning	date									
buther of bull trou redds in reach 0	densit (no/km O	.y'	bull redd	er of trout s in ach	Redd density (no/km) 	Year 	Number of bull trout redds in 	Redd density (no/km)	<u>Year</u>	
	lation data	-V	`						Other spec	ies
	Cutthroat Loc 1 Age)	Age 0	Bull tr	Aor 11	ADP 111+	Mounta Whitef	in	Eastern Srk trout
0	2.2 7	1.9	.3	0	0.9	0.2	0	A		A

Stream habitat and fish population data for W.F. Schafer Creek, Reach 1. Table 71.

Stream Name	Reach number		Reach Tribut Length of	•	ry	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
F. Schafe Creek	er 001	DDL .	3.2 Schafe Cr.		km above Schafer	1 70 7.0	Junction wanter Cr.	
Physical I	Habitat dat	<u>a</u> Ave.	Ave.	Ave.		Valley-		
Stream <u>order</u>	Drainage area(km²)	wetted width(m)	<pre>depth for reach(m)</pre>	channel width(m)	Valley width(m)	channel _ratio_		low : teristics
3	10.0	5.8	.19	19	75	4	Rolling,	broken
Confine- ment E	Pattern P	Side channe occurenc Low	l low	Flow du surve (m³/se	ey peal	erage k water np(C)	production	imum ool <u>th(m)</u> .7
2 pool	% run	% riffle	₽ pocket- water	я class 1 pools				ઢ class V pools
25	30	40	5	15	30	25	15	15
		% bed mate		1	D- 90	2	Stability	Bank
fines	<u>%gravel</u>	% rubble	% boulder	%bedrock ∩		gradient	rating 87	<u>form</u>
10	50	39	1	U	38	3 .8	0/	Steep
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% stat channe _debri	s cover	overhang	% cover- snorkel section
Stable	Bedr	ock	Low	Low . 10		5	5	18
Water chem	istry data	.•						
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1) 	Na [†] K (mg/l) (mg —— —	.† 50. /1) (mg/1)
Snawning d	ala							
Number of bull trout redds in reach	Redd densit (no/km O	У	Number of bull trout redds in reach	Redd density (no/km) 			Redd density (no/km) Year 	
Fish popul	ation data							
Density (n	o/100 m² su	rface area)	Bull tr	cout		Other Mountain Whitefish	species Eastern Brk trout
	oc 1 Age		Ill+ Age D	Age 1		Age 111+	KID LET 180	SIK LTOU
0	0.7 2.	2 2.	6 0	0	0	0	Α	A

CALBICK CREEK DRAINAGE

CALBICK CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-22-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 3.9 and the mean depth was 0.15 m. This reach was composed of 60% run, 20% pool and 20% riffle areas. Channel debris was moderate, with half large and stable. Bank cover was high, with 29% of the wetted surface area influenced by overhang. Low instream cover (9%) was provided by undercut banks, debris and algae. Stream gradient was 2.3% and the D-90 was 29 cm. Several slumping areas were observed and many large log jams extended across the entire channel. The Big River Trail crossed 1.2 km above the mouth and the Calbick Creek Trail crossed at stream km 2.9, then continued up the western fork of Calbick Creek and into the Lodgepole Creek drainage.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 25:1. The average valley width was 250 m. Reach 1 had an irregular meandering pattern and was generally unconfined with occasional points of confinement.

Fish Populations: Date Surveyed: 8-26-80

Westslope cutthroat and juvenile bull trout were observed in moderate densities. Cutthroat spawning may occur, but documentation is not currently available. Low, late summer flows probably limit spawning by adfluvial bull trout.

COX CREEK DRAINAGE

COX CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-21-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 6.2 m and the mean depth was 0.20 m. This reach was composed of 55% run, 35% pool and 10% riffle areas. Channel debris was low, with half stable. Bank cover was moderate with 22% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by undercut banks, depth and debris. Stream gradient was 0.6% and the D-90 was 13 cm. Many log jams were observed and a beaver dam formed a migration barrier during low flows. Portions became intermittent during late summer and fall. The Big River trail crossed just below the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 50:1. The average valley width was approximately 1000 m in the lower portion and somewhat narrower in the upstream end. Reach 1 has an irregular meandering pattern and was unconfined. The valley wall on the south side was the south bank of the Middle Fork River.

Fish Populations: Date Surveyed: 8-25-80

Westslope cutthroat trout were the only fish species observed and were present in low densities.

COX CREEK REACH 2

Channel Characteristics: Date Surveyed: 8-22-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 5.5 m and the mean depth was 0.18 m. This reach was composed of 75% run, 18% riffle, 5% pool and 2% pocketwater areas. Channel debris was low, with none stable. Bank cover was low, with 5% of the wetted surface area shielded. Moderate instream cover (12%) was provided by substrate, turbulence, algae and undercut banks. Stream gradient was 1.6% and the D-90 was 45 cm. Several slumping banks were observed and some channel braiding occurred. The Cox Creek trail crossed 1.0 km below Wapiti Park, then continued up the west bank.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio was approximately 5:1. The average valley width was 250 m. Reach 2 had an irregular pattern and was occasionally confined.

Fish Populations: Date Surveyed: 8-25-80

Westslope cutthroat trout and sculpins were observed. A density estimate indicated an important rearing area for cutthroat, with 10.3 age I or older fish per $100~\text{m}^2$ surface area. Cutthroat spawning may also occur.



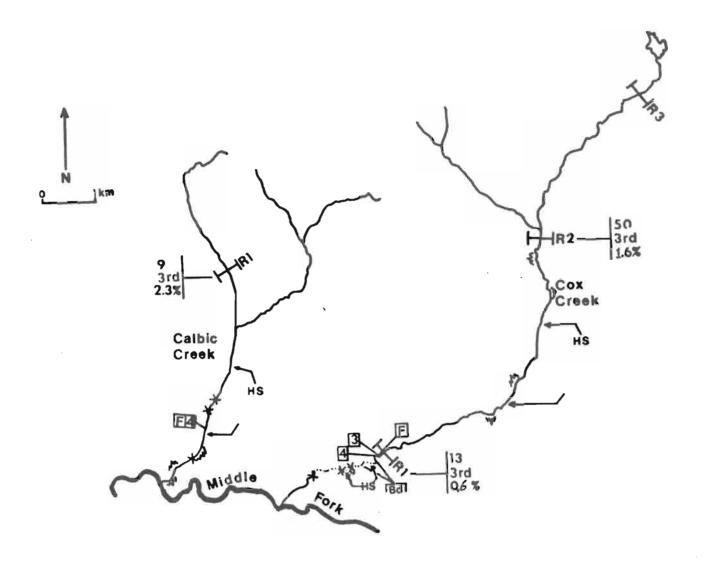


Figure 50. Physical habitat information for Calbick and Cox Creek drainages.

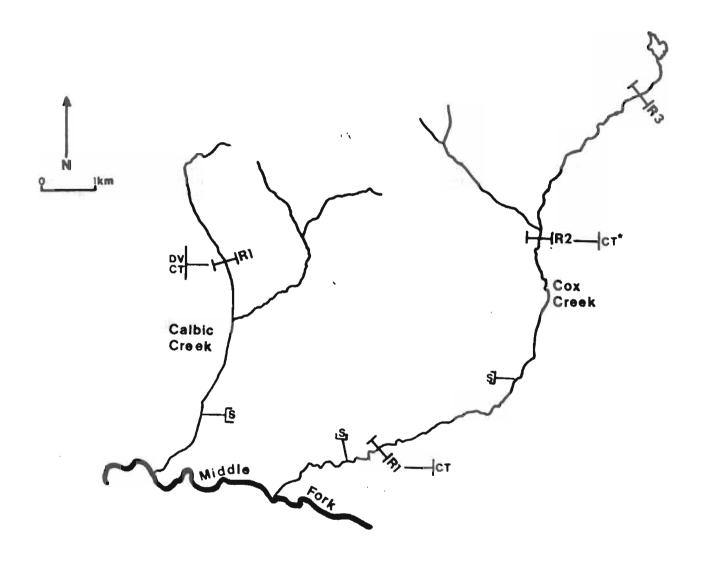


Figure 51. Fish population information for Calbick and Cox Creek drainages.

Table 72. Stream habitat and fish population data for Calbick Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Calbick	001	DD3	4.3	Middle	4.3 km above	1585.0	Mouth	1487.0
Creek				Fork	mouth			

Physical Stream order	Habitat dat Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio		Flow characteris	tics
3	21.7	3.9	.15	9	250	27	Bro	ken, rol	ling
Confine- ment U	Pattern C	Side channel occurence Low	Average low flow .07	Flow dur survey (m³/sec	pea	erage k water mp(C)	Turbidity Nil	Maximum pool depth(m) O.8	
2 pool 20	% run	* riffle	% pocket- water O	% class 1 pools 0	% class 11 poo 20		oools IV		class pools O
fines 69	igravel 20	* bed mater * rubble 10	½ boulder	<u>zbedrock</u>	D-90 (cm) 29	gradient 2.3	Stability rating 128	Bar <u>for</u> Ste	TN n
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% stat channe debri	el % cove		er snor	
Failing	g Fluv		Low	Moderate	. 50	31	29		9
Cond. (umohs/ cm)	Alk. (mg/1) 126	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/l)	Mg ^{††} (mg/1) ——	Na ⁺ (mq/l) 	K ⁺ (<u>mq/l)</u> 	\$0. (mg/1)
Snawning o	la ta								
Number of bull trout redds in reach	Redd densit (no/km	λ,	Number of bull trout redds in reach	Redd density (no/km)		Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	
Fish popul	ation data								

Age 1

0.6

Bull trout

Age 11

0

Age 111+

0

Density (no/100 m² surface area)

Age 11

4.1

Age]]]+

0.6

Age 0

0

Cutthroat
Age 1 Age
2.4 4

0

Other species

Eastern

Brk trout

A

Mountain

Whitefish

Α

Table 73. Stream habitat and fish population data for Cox Creek, Reach 1.

Upper

Lover

Mountain

Whitefish

A

Eastern

Α

Brk trout

Stream Name	Reach number		leach Tribut ength of		-y	Upper elev.(m)	reach boundary	Lower elev.(m)
Cox Cr.	001	DD1	3.3 Midd Fork		km above h	152 9. 0	Mouth	1509.0
Physical	Habitat data		Ava	A.v.a		W2220W		
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	<u>c</u> ha	Flow racteristics
3	51.7	6.2	.20	13	1000	75	Broker	n, rolling
Confine- ment U	Pattern C	Side channel occurence Low		Flow during survey (m²/sec	y peal	erage k water mp(C)		Maximum. pool depth(m) 1.8
1 pool	<u>S_ run</u>	% riffle	% pocket- water	% class 1 pools	% class	s % cla	ss % cla	ss % class
35	55	10	0	14	24	62	0	0
fines	2grave1	<pre>\$ bed mater \$ rubble</pre>	ial 2 boulder	%bedrock	D-90 (cm)	gradien t	Stability rating	Bank form
67	30	3	0	0	13	0.6	119	Steep
Bank <u>Process</u> Failing	Ba gene <u>mater</u> Fluvi	tic ial	Flood plain debris Low	Channel debris	% stab channe <u>debri</u> 50	s canopy		<pre>\$ cover- snorkel section 14</pre>
Water chem	nistry_data							
Cond. (uniohs/ cm) 145	$\frac{\text{Alk.}}{(\text{mg/l})}$	Total carbon (mg/l) 0.83	Total phos. (mg/l) .006	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 29.5	Mg ⁺⁺ (mg/1) .075	Na ⁺ (mg/1) O.7	K ⁺ SO. (mg/1) (mg/1) I5.8
Snawning o	fata							
Number of bull trout redds in reach	Redd density (no/km		Number of bull trout redds in reach	Redd density (no/km)			Redd density (no/km) Ye	ar
Fish popul	ation data							
Density (n	o/100 m² sur	face area)					Ot	her species

Bull trout

Age 11

0

Age 1

0

0

HOP 111+

0

Cutthroat

Age II

0.1

hae I

0

Age 111+

0.3

Table 74. Stream habitat and fish population data for Cox Creek, Reach 2.

Stream Name	Reach number		Reach Tribu Length <u>o</u>	•	ry	Upper elev.(m	Lower reach) boundary	Lower elev.(m)			
Cox	002	DD2	6.1 Mid	dle .2 kr	n below	1609.0	3.3 km	above 15 09. 0			
Cr.			For	k Burn	t Cr.		mouth				
Physical	Habitat data										
Stream	Drainage	Ave. wetted	Ave. dep t h fo r	Ave. channel	Valley	Valley- channel		Flow ·			
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	ratio	cl	haracte <u>ristics</u>			
3		5.5	.18	50	250	5	Ro11	ing, broken			
		Side			_	verage		Maximum			
Confine- ment	Pattern	channe occurenc		Survey (m³/sec		ak water emp(C)	Turbidity	pool . depth(m)			
X	P	Low		<u>(/ 3c.</u>		-		0.9			
11	1	HOW	% pocket-	& class	% clas	ss %c1	Low ass Icl				
2 pool	run	# riffle	water	1 pools	II poc			pools V pools			
5	75	18	2	0	25	75	0	0			
		* bed mate			D-90	D #	Stability	Bank			
1 fines	2gravel	% rubble			(cm)	gradient	<u>rating</u>	<u>form</u>			
50	31	15	4	0	45	1.6	89	Steep			
Bank Flood % stable % cover-											
Bank	gene		plain	Channel	chann	el % cove		snorkel			
Process	<u>mater</u>		<u>debris</u>	debris	debr O	ris canop 4	<u>y overhan</u> 5	<u> </u>			
Failing	g Fluv	lal	Low	Low	U	4)	12			
Water_chem	nistry data	2									
Cond.		Total	Total	•							
(umohs/	Alk.	carbon	phos.	No ₃	Ca ⁺⁺	Mq ⁺⁺	Na ⁺	K [†] SO.			
cm)	(mg/1)	(mg/l)	(mg/1)	(mg/1)	(mg/1)	(f\gin)	(mg/l)	(mg/l) (mg/l)			
Snawning o	iata										
Number of	0.44		Number of	0 - 44		Number of	D- 44				
bull trout	. Redd densit		buTT trout redds in	Redd density		bull trout redds in	Redd density				
reach	(no/km		reach	(no/km)	Year	reach_	(no/km)	Year			
		~~									
Fish popul	ation data										
Density (n	o/100 m² sui	rface area)				Mounta:	Other species in Eastern			
	Cutthroat			Bull tr	and the same of the same of		Whitef				
Line U A	ac 1 Age	II Age	111+ Age (Age 1	Age 11	Age 111+					

Age 1

Age 111+

A

A

0

Age 11 2.7 Age 111+

Age 0

CLACK CREEK DRAINAGE

CLACK CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-26-80

Reach 1 is a third order tributary to the Middle Fork. Average wetted width was 7.4 m and the mean depth was 0.22 m. This reach was composed of 56% run, 29% pool and 15% riffle areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 10% of the wetted surface area influenced by overhang. Low instream cover was provided by substrate, turbulence and debris. Stream gradient was 1.0% and the D-90 was 27 cm. A beaver dam area was present near the upper boundary and the Pentagon-Clack Creek Trail followed the bank along the upper half of Reach 1.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was generally greater than 15:1. The average valley width was 350 m. Reach 1 had a regular meandering pattern and was frequently confined at bends by steep banks.

Fish Populations:

Only mountain whitefish were observed during the density estimate; however, several cutthroat were noted during the habitat survey. Adfluvial bull trout utilized this reach for spawning and redd surveys enumerated an average of seven redds annually during four years of survey.

CLACK CREEK REACH 2

<u>Channel Characteristics</u>: Date Surveyed: 7-25-80

Reach 2 is a third order tributary in the Middle Fork drainage. Average wetted width was 21 m and the mean depth was 0.56 m. This reach was composed of 47% run, 36% pool and 17% riffle areas. Channel debris was low, with 85% in the form of stable beaver dams or lodges. Bank cover was low, with less than 3% of the stream surface area shielded. Low instream cover (5%) was provided by depth and beaver debris. Stream gradient was 1.0% and the D-90 was 8.5 cm. The entire reach was meadow-like and inundated by beaver dams. The majority of the bank and bed materials were gravel sized or smaller (100% of the bed and 99% of the bank). The Clack Creek trail crossed at stream km 5.5 and there was a dry section at this location during low flows.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio varied from 0 to 2:1. The average valley width was 500 m. Reach 2 had an irregular meandering pattern and was generally unconfined.

Fish Populations:

No fish were observed during the density estimate; however, westslope cutthroat and mountain whitefish were observed during the habitat survey.

CLACK CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-24-80

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 5.1 m and the mean depth was 0.17 m. This reach was composed of 73% run, 15% pocketwater, 7% pool and 5% riffle areas. Channel debris was low, with half stable. Bank cover was moderate, with 11% of the wetted surface area influenced by overhang. High instream cover (30%) was provided by substrate, turbulence, aquatic vegetation and debris. Stream gradient was 7.0% and the D-90 was 55 cm. Bedrock was present in the bank and streambed and several cascade areas were observed.

Fish Populations: Date Surveyed: 7-25-80

Westslope cutthroat were the only species observed during density estimates; however, juvenile bull trout and mountain whitefish were observed during the habitat survey.

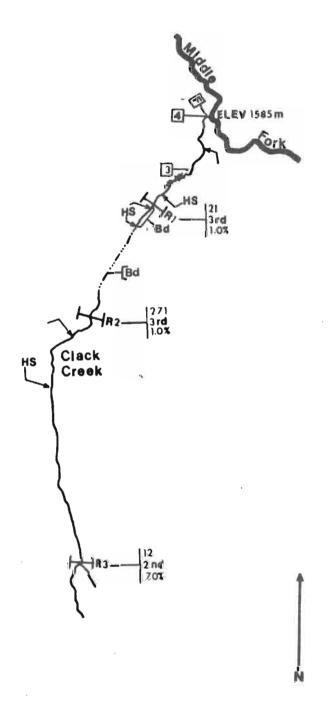


Figure 52. Physical habitat information for Clack Creek.

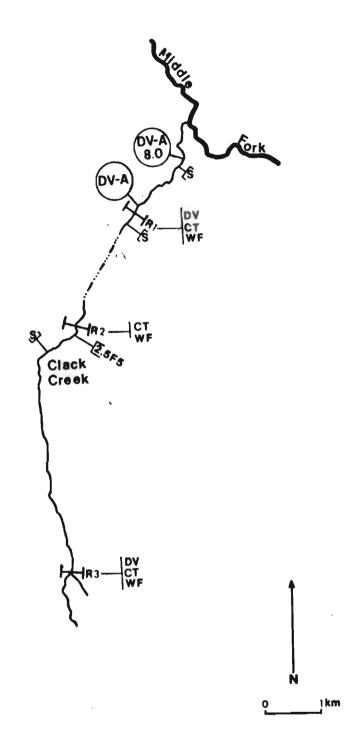


Figure 53. Fish population information for Clack Creek.

Stream habitat and fish population data for Clack Creek, Reach 1.

Tributary reach

Reach

Reach

Serial

Stream

Upper

Lower

reach

Lower

Upper

Stream Name	кеасћ number		each iribut ength of		y	Upper elev.(m)	reach boundary	Lower elev.(m)
Clack Cr.	001	DDX	2.8 Middl Fork	Le 2.8 l	km above	1621.5	Mouth	1585.0
Physical	Habitat dat	<u>a</u> Ave.	Ave.	A		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	Ave. channel width(m)	Valley width(m)	channel _ratio_	ch	Flow : aracteristics
3	36.6	7.4	.22	21	350	17	Brok	en, rolling
Confine- ment	<u>Pattern</u>	Side channel occurence		Flow dur survey (m³/sec	peak	rage water o(C) <u>Tu</u>	rbidity	Maximum pool depth(m)
F	R	Low	0.28			4	Nil	1.5
⊊ pool	% run	% riffle	<pre>pocket- water</pre>	⊊ class I pools	% class Il pools	% clas III poo		
29	56	15	0	34	26	37		1
**************************************		% bed mater		9h - d 1	D-90		tability	Bank
# fines 30	<u>%gravel</u> 40	% rubble 25	<pre>% boulder</pre>	%bedrock O	(cm) <u>c</u> 27	gradient 1.0	rating 121	<u>form</u> Undercut
Bank Process		ank etic <u>ria</u> l	Flood plain debris	Channel debris	% stabl channel debris	% cover-	% cover	% cover- snorkel section
Failing	Fluv:	ial	Low	Low	10	5	9	10
Water chem	nistry data	**		_				
Cond.	Alk.	Total carbon	Total phos.	No ₃ *	Ca ⁺⁺	Mq ++	Na ⁺	κ ⁺ 50,
(umohs/ cm)	(mg/1)	(mg/1)	(mg/l)	(mg/l)	(mg/1)	(mg/1)	(mq/l)	(mg/1) (mg/1)
200	140	0.77	.002		41.7	.101	1.7	1.9
Snawning c	ia ta							
Number of bull trout	: Redo		Number of bull trout	Redd	b	umber of ull trout	Redd	

1 1311 population data	Fish	popu'	lation	data
------------------------	------	-------	--------	------

density

(no/km)

3.6

Year

80

redds in

reach

10

Deneite	(00/300	m² surface	2021					Other	sp <u>ecies</u>
Density	(1107100	m Surrace	area)					Mountain	Eastern
	Cutth	roat			Bull t	rout		<u>Whitefish</u>	Brk trout
Aue 0	Age 1	Age 11	Age 111+	Age 0	Age 1	Age 11	Age 111+		
0	0	0	0	0	0	0	0	P	Α

density

(no/km)

2.5

Year

81

redds in

7

reach

density

(no/km)

2.5

Year

82

redds in

reach

7

Table 76. Stream habitat and fish population data for Clack Creek, Reach 2.

Upper

Lower

Mountain

Whitefish

Α

Eastern

Α

Brk_trout

Stream Name	Reach number		each Tributa ength <u>of</u>	ry reach	ry	Upper elev.(m	reach) boundary		Lower elev.(m)
Clack Cr.	002	DDY	2.7 Middle Fork		km above l Ford	1645.9	2.8 km mouth	above	1621.5
Physical	Habitat data	<u>a</u>							
Stream order 3	Drainage area(km²)	Ave. wetted width(m) 20.8	Ave. depth for reach(m) .56	Ave. channel width(m) 271	Valley width(m) 500	Valley- channel <u>ratio</u> 2	Pla	Flow characteri cid, swi	stics
Confine- ment	Pattern	Side channel occurence		Flow du surve (m³/se	y pea	verage k water mp(C)	Turbidity	Maximum pool depth(m	<u>,</u>
U	С	Low			w		Ni1	2.0	r -3
2 pool 36	<u>% run</u> 47	# riffle 17	% pocket- water O	2 class 1 pools 20	% clas 11 poc 10		ools IV	class pools O	% class V pools O
fines 64	%gravel 35	<pre># bed mater # rubble 1</pre>	k boulder 0	%bedrock	D-90 (cm) 8	gradient 1.0	Stability rating 99	fo	orm lercut
Bank Process	Ba gene mater	tic	Flood plain debris	Channel debris	% sta chann debr	el % cove		% c er sno	over- rkel tion
Failing	Fluvi	a1 .	Ni1	Low	. 85	1	2	<	:5
Water chem	nistry data	٠.							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Ma ⁺⁺ (mg/1)	Na ⁺ (mg/1)	κ [†] (<u>mg/l)</u>	SO. (mg/1)
Spawning c	da ta		,						
Number of bull trout redds in reach	Redd densit (no/km	y	Number of bull trout redds in reach	Redd density (no/km)	<u> Year</u>	Number of bull trout redds in reach	Redd density (no/km)	Year	
Fish popul	ation data								
Density (n	o/100 m² sur	rface area)					Mount	Other spec	ies Fastern

0

Age 1 Age 11

0

0

Age 111+

0

Cutthroat

Age 1 Age 11

0

0

Age 111+

0

Table 77. Stream habitat and fish population data for Clack Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Clack	003	DDZ	5.1	Middle	Headwaters	1987.0	1.9 km above	1645.0
Cr.				Fork			Trail Ford	

Physical	Habitat dat	a							
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio		Flow : characteristics	
2		5.1	.17	12	200	16	Bro	ken, rolling	
Confine- ment C	Pattern P	Side channel occurence Low	Average low flow	Flow dur survey (m³/sec) <u>16</u>	verage ak water emp(C)	Turbidity Ni1	Maximum: pool depth(m) 0.9	
2 pool	% run	% riffle	% pocket- water	⊊class Ipools	% clas Il pod			class % class pools V pools	
7	73	5	15	8	4	60		14 14	_
fines 18	igravel 48	<pre> bed mater rubble 22 </pre>	½ boulder 12	ã <u>bedrock</u> O	D- 90 (cm) 55	gradient 7.0	Stability rating 97	Bank <u>form</u> Flat	
Bank Process Stable	Ba gene mater Fluv	etic rial	Flood plain debris Low	Channel debris Low	% sta chann <u>debr</u> 5	el % covi	overh	ing <u>section</u>	
Mater char	nistry data	_							
-	iistry data	•		-					
Cond. (umohs/ cm)	Alk. (mg/l) 	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ (mg/l) ——	Ca ⁺⁺ (mg/1)	Mq ⁺⁺ (mg/1)	Na [†] (mg/l)	K [†] 50↓ (<u>mg/1) (mg/</u> —— —	
Spawning o	ia La								
Number of bull trout redds in reach	Redd densit (no/km	y'	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	Number of bull trout redds in 	Redd density (no/km) ——	<u>Year</u>	

Other species

Eastern

A

Brk trout

Mountain

Whitefish

Α

Age 0

Bull trout

Age 1 Age 11

0

Age 111+

Fish population data

Dansity (no/100 m² surface area)

Cutthroat

0

40c 1 Aoc 11

0

Age 111+

BOWL CREEK DRAINAGE

BOWL CREEK REACH 1

Channel Characteristics: Date Surveyed: 7-28-80

Reach 1 is a fourth order tributary which joins with Strawberry Creek to form the Middle Fork. Average wetted width was 9.8 m and the mean depth was 0.25 m. This reach was composed of 76% run and 24% riffle areas. Channel debris was low, with 20% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. High instream cover (33%) was provided by aquatic vegetation, debris and substrate. Stream gradient was 1.0% and the D-90 was 39 cm. Several slumping areas were observed and bedrock was occasionally present in the bed and bank material.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 1 had a sinuous pattern and was confined. The Bowl-Divide trail ran along the east bank.

Fish Populations:

Westslope cutthroat and mountain whitefish were observed. Both species were present in limited densities. Spawning by adfluvial bull trout has been documented here.

BOWL CREEK REACH 2

Channel Characteristics: Date Surveyed: 7-27-80

Reach 2 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 7.4 m and the mean depth was 0.24 m. This reach was composed of 74% run, 16% riffle, and 10% pool areas. Moderate to high channel debris was present, with 10% stable. Bank cover was moderate to high, with 25% of the wetted surface area influenced by overhang. Moderate instream cover (23%) was provided by substrate, undercut banks, debris and aquatic vegetation. Stream gradient was 2.5% and the D-90 was 35 cm. Many log jams were present and braiding was observed. Some slumping areas were noted and bedrock was occasionally present in the bed material.

<u>Valley Characteristics:</u>

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 175 m. Reach 2 had an irregular pattern and was generally confined by canyon walls. The Bowl-Divide trail runs along the north bank.

Fish Populations: Date Surveyed: 7-28-80

Westslope cutthroat and mountain whitefish were observed in low densities. Adfluvial bull trout utilized Reach 2 for spawning and redd counts enumerated an average of 14 redds annually, during four years of survey. Bull trout redd density in the 1980 high use area was 7.4 redds per The state of the s

BOWL CREEK REACH 3

Channel Characteristics: Date Surveyed: 7-29-80 TO ELECTIVE HER TO HAVE A LIE MA

Reach 3 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 7.9 m and the mean depth was 0.51 m. This reach was composed of 58% pool, 25% run, 11% riffle and 5% pocketwater areas. Channel debris was moderate, with 30% stable. Bank cover was moderate, with 15% of the wetted surface area shielded. Moderate instream cover (12%) was provided by undercut banks, depth and some debris. Stream gradient was 1.0% and the D-90 was 22 cm. Log jams and beaver activity caused substantial braiding to occur and backed up large areas forming the high percentage of pools. The upper reach break was located at the junction of Basin Creek.

Valley Characteristics:

The upper bank slope gradient was approximately 30% and the valley to channel ratio was greater than 20:1. The average valley width was 350 m. Reach 3 had a irregular pattern and was generally unconfined with occasional short sections being restricted by steep banks. The Bowl-Divide trail ran along the northeast bank and an outfitter's camp was located at Grizzly Park.

Fish Populations:

Westslope cutthroat, bull trout and mountain whitefish were observed. All species were present in moderate densities. Spawning by adfluvial bull trout has been documented here.

BOWL CREEK REACH 4

Channel Characteristics: Date Surveyed: 7-24-80

Reach 4 is a third order tributary in the Middle Fork drainage. Average wetted width was 4.6 m and the mean depth was 0.21 m. This reach was composed of 33% pocketwater, 30% pool, 30% run and 7% riffle areas. Channel debris was moderate, with 30% stable. Bank cover was high, with 41% of the wetted surface area influenced by overhang. Moderate instream cover (12%) was provided by debris, substrate and turbulence. Stream gradient was 3.4% and the D-90 was 36 cm. Several large log jams were observed and channel braiding occurred. Several bedrock cascades were also present.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 80 m. Reach 4 had an irregular pattern and was entrenched. The Bowl-Divide trail followed the north stream bank.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. Both species were present in low densities. Several bull trout redds were observed during 1980; however, large substrate limits the spawning habitat available.

BOWL CREEK REACH 5

Channel Characteristics: Date Surveyed: 7-25-80

Reach 5 is a second order tributary in the Middle Fork drainage. Average wetted width was 3.2 m and the mean depth was 0.24 m. This reach was composed of 50% pool, 25% run, 20% riffle and 5% pocketwater areas. Channel debris was moderate, with half stable. Bank cover was moderate, with approximately 20% of the wetted surface area shielded. Moderate instream cover (14%) was provided by debris, undercut banks, substrate and depth. Stream gradient was 3.8% and the D-90 was 15 cm. The Bowl-Divide trail followed the north bank to the uppermost fork where it crossed and climbed to Teton Pass on the Continental Divide. Substrate composition provided good spawning habitat during spring; however, low flows probably limit fall spawning.

Walley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was generally greater than 10:1. The average valley width was 150 m. Reach 5 had an irregular meandering pattern and was unconfined. This reach flowed through scattered meadow areas, where dry highwater overflow channels were observed.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed in low densities. Low water temperatures (44°F on 7-25-80), low summer flows and partial barriers probably limit fisheries potential.

Basin Creek Reach 1

Channel Characteristics: Date Surveyed: 7-29-80

Reach 1 is a third order tributary to Bowl Creek. Average wetted width was 5.8 m and the mean depth was 0.28 m. This reach was composed of 40% pool, 35% pocketwater, 15% run and 10% riffle areas. Channel debris was low to moderate, with half stable. Bank cover was moderate, with 13% of the wetted surface area shielded. Moderate instream cover (15%) was

provided by substrate, turbulence, and debris. Stream gradient was 1.1% and the D-90 was 34 cm. Log jams were present causing braided areas. Basin Creek Trail crossed at stream km 0.8.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was greater than 20:1. The average valley width was 250 m. Reach 1 had an irregular pattern and was occasionally confined.

Fish Populations: Date Surveyed: 7-28-80

Westslope cutthroat, juvenile bull trout, mountain whitefish and sculpins were observed. Density estimates indicated Reach 1 was an important rearing area, with 11.7 age I or older cutthroat per 100 m² surface area.

Basin Creek Reach 2

Channel Characteristics: Date Surveyed: 7-28-80

Reach 2 is a third order tributary in the Bowl Creek drainage. Average wetted width was 4.8 m and the mean depth 0.50 m. This reach was composed of 73% pool, 14% run and 13% riffle areas. Channel debris was low, with 20% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Low instream cover (11%) was provided by depth, or by debris and cut banks resulting from beaver activity. Stream gradient was 1.1% and the D-90 was 8.0 cm. This reach was located in a meadow with extensive marshy areas and beaver dams. Substrate was predominantly fines and gravels. The Basin Creek trail crossed several times near the upper reach break.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the reach had a valley to channel ratio which was greater than 25:1. The average valley width was 325 m. Reach 2 of Basin Creek had a tortuous meandering pattern and was unconfined throughout its length.

Fish Populations: Date Surveyed: 7-26-80

Westslope cutthroat, juvenile bull trout, mountain whitefish and sculpins were observed in this reach. Cutthroat were present in moderate densities (6.7 age I or older fish per 100 m² surface area). Several beaver dams over 1 m in height may have been migration barriers during low flows.

Basin Creek Reach 3

Channel Characteristics: Date Surveyed: 7-27-80

Reach 3 is a second order tributary in the Middle Fork drainage. Average wetted width was 3.3 m and the mean depth was 0.28 m. This reach was composed of 54% pool, 33% pocketwater and 13% riffle areas. Channel debris was moderate, with half stable. Bank cover was moderate, with 16% of the wetted surface area influenced by overhang. Moderate instream cover (17%) was provided by substrate, turbulence and depth. Stream gradient was 2.2% and the D-90 was 29 cm. The D-90 measurement may be low due to the presence of bedrock. Several bedrock cascades were present and a 4 m falls formed a migration barrier near the midway point. The unmaintained Basin Creek trail parallels the north bank along most of the reach, then swings due south crossing near the headwaters.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 50 m. Reach 3 had an irregular pattern and was generally confined by the valley walls.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. A density estimate indicated an important rearing area for cutthroat trout, with 13.5 age I or older fish per 100 m² of surface area. Tag return information showed the cutthroat present were mainly resident fish. A 4 m falls was present at stream km 9.3, above which no fish were observed.

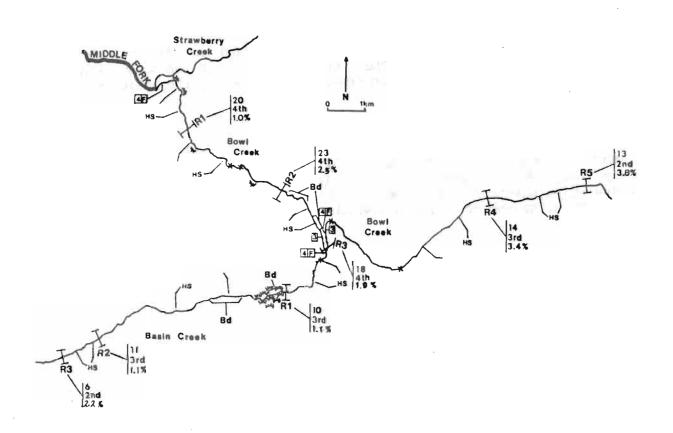


Figure 54. Physical habitat information for the Bowl Creek drainage.

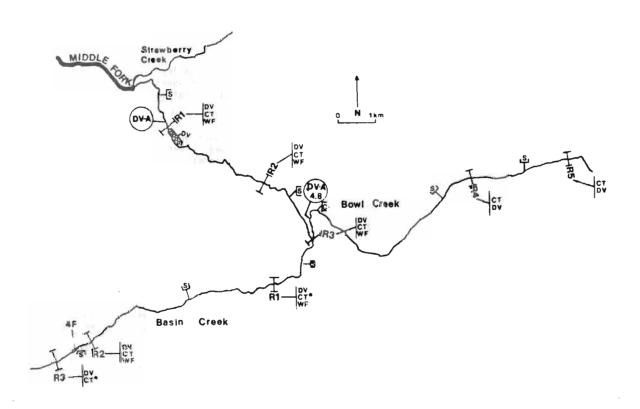


Figure 55. Fish population information for the Bowl Creek drainage.

Table 78. Stream habitat and fish population data for Bowl Creek, Reach 1.

Upper

Lover

Stream Name	Reach number		each Tributa ength of	ry reach boundar	.у	Upper elev.(m)	reach boundary	Lower elev.(m)
Bowl Cr.	001	DDQ 2	2.6 Middle Fork	e .6 km Scal _l	n below o Cr.	1620.0	Mouth at Strawberr Creek	1596 . 0 y
Physical 1	Habitat da t a					10.01		
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	char	Flow acteristics
4	46.8	9.8	.25	20	100	5	Broken	, rolling
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	, pea	erage k water mp(C) I		aximum pool epth(m)
C	N	Nil	0.52				Nil	1.5
2 pool	1 run	2 riffle	<pre>pocket- water</pre>	⊊ class I pools	% clas 11 poo			
0	76	24	0	67	0	33		0
		% bed mater		~	D-90		Stability	Bank
fines	*gravel	% rubble	& boulder	2bedrock	<u>(cm)</u>	gradient .	rating	form
25	20	43	12	0	39	1.0	86	Repose
Bank Process	Ba gene <u>mater</u>		Flood plain debris	Channel debris	% stal channe debr	el % cover		% cover- snorkel section
Failing	Colluv	ial	Low	Low	20	4	3	33
Water chem	istry data	3	-					
Cond. (umohs/ cm) 185	Alk. (mg/1) 134	Total carbon (mg/1) 0.80	Total phos. (mg/1) .003	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 38.5	$\frac{\text{Mg}^{++}}{(\text{mg}/1)}$ $\cdot 114$	$\frac{\text{Na}^{+}}{(\text{mg/l})}$ 1.6	κ ⁺ 50. mg/l) (mg/l) 3.9
Snawning o	lata							
Number of bull trout redds in reach	Redd densit (no/km O	У	Number of bull trout redds in reach	Redd density (no/km) 0.8	Year 81		Redd density (no/km) Yea 3.8 8	<u>r</u> 2
Fish popul	ation data							
Density (n	o/100 m² su Cutthroat	rface area)		Bull tr	n i t		Oth Mountain Whitefish	er species Eastern Brk trout
	0 .24		1]+ Ace 0 0	Age J O		0	A	A

Table 79. Stream habitat and fish population data for Bowl Creek, Reach 2.

Reach Tributary

Fish population data

Aur C

Density (no/100 m² surface area)

Cullhroat

0

LI soy I soy

0

Age 111+

0.3

Upper

Lower

Other species

Eastern

Α

Brk trout

Mountain

Whitefish

P

Stream Name	Reach number		each Tributa ength of	ry reach boundary		Upper elev.(m)	reach boundary	Lower elev.(m)
Bow1	002	DDR	4.2 Middle	e 2.9 k	m below	1728.0	.6 km	below 1 620 0
Cr.			Fork	Basin	Creek		Scalp	Creek
Physical	Habitat data	Ave.	Ave.	Ave.		Valley-		
Stream	Drainage	wetted	depth for	channel	Valley	channel		Flow
order 4	area(km²)	width(m) 7.4	reach(m)	width(m) v	vidth(m) 175	ratio 10		characteristics cid, rolling
4							114	,
Confine-		Side channel	Average low	Flow duri		rage water		Maximum pool
ment	Pattern	occurence	flow	(m³/sec)	tem	p(C) Tu	rbidity	depth(m)
С	P	High					Low	1.5
2 pool	‰ run	% riffle	% pocket- water	% class 1_pools	% class 11 pool			class % class pools
10	74	16	0	22	32	42		4 0
6 77		% bed mater			D-90		Stability	Bank
fines	1grave)	% rubble	2 boulder	åbedrock ○		gradient _	rating 125	<u>form</u>
30	36	20	14	0	35	2.5	123	Undercut
Bank Process Failing	Ba gene <u>mater</u> Fluvia	tic <u>ia</u> l	Flood plain <u>debris</u> loderate	Channel debris High	% stab channe debris	% cover-	% coverba	
Water chem	nistry data •							
Cond. (umohs/ cm)	Alk. (mg/l) 	Total carbon (mg/l)	Total phos. (mg/l) ——	No ₃ - (mg/1) 	Ca ⁺⁺ (mg/1) 	Mq ⁺⁺ (mg/1)	Na ⁺ (mq/1)	K [†] SO. (mg/l) (mg/l)
Snawnino d	ia ta							
Number of bull trout redds in reach	Redd density (no/km 4.5		Number of bull trout redds in <u>reach</u> 5	Redd density (no/km) 1.2	b		Redd ensity no/km)	Year 82

Age 0

0

Bull trout

0

Age I Age II

0

Age 111+

0

Table 80. Stream habitat and fish population data for Bowl Creek, Reach 3.

Stream Name Bowl Cr.	Reach number 003	number <u>L</u>	each Tribut ength of .6 Midd Fork	boundar le .1 km	above Creek	Upper <u>elev.(m)</u> 17 56. 0	Lower reach boundary 12.9 km belo Basin Creek	
Physical	Habitat data	a						
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio		low : teristics
4		7.9	.51	18	350	21	Rolling	, placid
Confine-	Pattern	Side channel occurence	flow	Flow dur survey (m³/sec	pea	verage k water emp(C) I	urbidity dept	imum pol th(m)
0	P	Moderat	e % pocket-	 & class	% clas	s % clas		.6 % class
2 pool	run	z riffle	water	I pools	II poo			V pools
58	26	11	5	21	54	21	4	0
fines	agravel	% bed mater % rubble	ial soulder	*bedrock	D-90 (cm)	gradient	stability rating	Bank form
12	40	43	5	0	22	1.0	-	 Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	el % cover-	% cover overhang	<pre>% cover- snorkel section</pre>
ailing	Fluvi	al M	oderate	Moderate	- 30	16	15	12
Water chem	mistry data	٠,						
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/1)	Na K (mg/l) (mg	
Spawning (da ta							
Number of bull trout redds in reach	Redd densit (no/km 4.4) [']	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u> 81		Redd ensity no/km) Year	
,	r • ¬	00	J	1.7	01	9	5.6 82	
ish popul	lation data							

0

Age]

0.4

0.2

Density (no/100 ma surface area)

Apr 1 Apr 11

1.0

1.2

0.1

Age III-

2.4

Other species

Eastern

A

Brk trou:

Mountain

Whitefish

P

ADE 1114

0.2

Table 81. Stream habitat and fish population data for Bowl Creek, Reach 4.

Tributary

___of

Reach

Length

Upper

boundary

reach

Lower

reach

boundary

Lower

elev.(m)

Upper

elev.(m)

Bowl Cr.	004	DDT	6.4 Middl Fork		cm above n Creek	1975.0	.l km ab Basin Cr	
Stream order	Habitat dat Drainage area(km²)	a Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio	<u>c ha</u>	Flow · aracteristics
3		4.6	.21	14	80	5		Roll i ng
Confine- ment	Pattern	Side channe occurence		Flow du surve (m²/se	y peak	rage water np(C)	Turbidity	Maximum pool depth(m)
E	P	Low	0.19			15	Nil	0.8
2 pool 30	<u>5 run</u> 30	2 riffle 7	% pocket- water 33	iclass I pools 2	% class 11 pool 50			ools V pools
		% bed mater			D-90	a.	Stability	Bank
fines 10	20 20	2 rubble 50	20 boulder	*bedrock O	<u>(cm)</u> 36	gradient 3.4	rating 80	<u>form</u> Steep
Bank Process	gene mater	<u>ria</u> l	Flood plain debris	Channel debris	% stab channe debri	1 % cover s canopy		% cover- snorkel section
Failing	Fluvi	al M	oderate	Moderate	. 30	8	41	12
Water chem	nistry data	٠.		-				
Cond. (umohs/ cm) 195	Alk. (mg/1) 145	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l) 	Mg ⁺⁺ (mg/l)	Na [†] (mg/l)	K ⁺ SO ₊ (mg/1) —— ——
Snawning o	la ta							

6.36		4141
risn	population	data

Redd

density

(no/km)

0.5

Year

80

humber of

bull trout

redds in

3

reach

Stream

Name

Reach

number

Serial

number

Density	· (no/100	m² surface	areal					Other	species
		roat	0.007		trout		Moun ta in Whitefish	Eastern Brk trout	
Aut 0	Age I	Age II	Age 111+	Age O	Age 1	AQE 11	Age 111+	<u></u>	<u> </u>
0	0.3	0	0.6	0	0	0.1	0.3	A	A

Redd

density

(no/km)

Number of

redds in

reach

Year

bull trout

Redd

Year

--

density

(no/km)

Number of

redds in

reach

bull trout

Table 82. Stream habitat and fish population data for Bowl Creek, Reach 5.

Tributary

Serial

Reach

Reach

Stream

reach

0

Fish population data

(no/km)

0

Density (no/100 m² surface area)

Cutthroat

0

Age I Age II

0.1

Year

80

Age 111+

0

Upper

reach

Lover

reach

Lower

Upper

reach

Age 1114

0.1

(no/km)

Year

Mountain

Whitefish

A

Other species

Eastern

Α

Brk trout

Stream Name	Reach number		Reach Tribu Length o		-y	Upper elev.(m	reach n) boundary	Lower elev.(m)
Bowl Cr.	005	DDU 2	2.4 Midd Fork		dwaters	2067.0	6.5 km al Basin Cre	
Physical	Habitat dat	a						
Stream	Drainage	— Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow
order	area(km²)	width(m)	reach(m)	width(m)	width(m)	ratio	char	racteristics
2		3.2	. 24	13	150	12	Rollin	ng, placid
		Side				erage	٣	łax imum:
Confine- ment	Pattern	channe occurenc		survey (m³/sec		k water mp(C)	Turbidity d	pool depth(m)
U	C	Low	-		<u> </u>		Low	0.6
			₽ pocket-	⊊ class	% clas			s & class
2 pool	⊊ run	2 riffle	water	<u>I</u> pools	<u>11 poo</u>		~	ols V pools
50	25	20	5	0	20	7		0
fines	Loravel	% bed mate % rubble		%bedrock	D-90 (cm)	gradient	Stability rating	Bank form
23	60	17	0	0	15	3.8	74	Repose
	n.		C) 4		e	. 1 -		r
Bank		ank etic	Flood plain	Channel	% stal channe		er- % cover	% cover- snorkel
Process	<u>ma te</u> i	<u>ria</u> l	debris	debris	debr		<u>overhang</u>	section
Failing	g Fluv	ial	Low	Moderate	. 50	22	19	14
Water chem	istry da <u>ta</u>	•4						
Cond.		Total	Total					
(umohs/	Alk.	carbon	phos.	No ₃ ~	Ca ⁺⁺	Ma ⁺⁺	Na ⁺	K ⁺ 504
Ctv.)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/l)	<u>(mg/l</u>)	(mg/1) $(mg/1)$
Spawning o	da va							
Avaber of bull trout redds in	Redo densit	Ly	Number of bull trout redds in	Redd density	Vana	Number of bull trout redds in	Redd density	

(no/km)

Bull trout

Age 1

0

Ao∈ 11

0

Year

<u>reac</u>h

__

Age 0

0

Table 83. Stream habitat and fish population data for Basin Creek, Reach 1.

Stream Name Basin Cr.	Reach number 001	<u>number l</u>	Reach Tribut Length of 2.1 Bowl Cree	boundar	ry km above Creek	Upper <u>elev.(m</u> 17 80. 0	Lower reach boundary Juncti Bowl C	on w/	Lower elev.(m) 1 756. 0
Physical Stream order 3	Habitat dat Drainage area(km²) 25.3	Ave. wetted width(m) 5.8	Ave. depth for reach(m) .28	Ave. channel width(m)	Valley width(m) 250	Valley- channel ratio 25		Flow characteri Rollii	<u>stics</u>
Confine- ment X	Pattern P	Side channe occurence Low		Flow du surve (m³/se	y pe a c) te		Turbidity Moderate	Maximum pool depth(m	
2 pool 40	<u>% run</u> 15	% riffle 10	% pocket- water 35	2 class 1 pools 17	% clas 11 poo 22		<u> 210c</u>	class pools 31	% class V pools O
fines 60	3gravel 20	% bed mater % rubble 10	½ boulder 10	%bedrock	D-90 (cm) 34	gradient 1.1	Stability rating 73	fo	ank o <u>rm</u> pose
Bank <u>Process</u> Failing	gene <u>mater</u> g Fluvi	<u>ia</u> l	Flood plain debris Low	Channel debris Low	% stal channedebr 50	el % cover is canopy		er sno ang sec	cover- orkel ction 15
Cond. (umohs/ cm)	Alk. (mg/1) 125	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 	Mg ⁺⁺ (mg/1) 	Na [†] (mg/l <u>)</u> ——	K [†] (<u>mg/1)</u> 	50. (mg/l)
Snawnieg c	iate								
Number of bull trout redds in reach	Redd densit (no/km O	.y'	Number of bull trout redds in reach	Redd density (no/km)	Year ——		Redd density (no/km)	Year ——	
141	ation data o/100 m² su Cutthroat ge 1 Age		11]+ Ace 0	Bull tr Age I		Age 111+	Mount White		ties Eastern Brk trout

Age 1 0.1 Age 11

0

Ace 0

Age 111+

0

P

Α

Age II

4.5

4.2

Age]

3.0

0.4

Table 84. Stream habitat and fish population data for Basin Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Basin Creek	002	DDJ	6.6	Bowl Creek	8.7 km above Bowl Creek	18 50. 0	2.1 km above Bowl Creek	1780.0

Stream order 3	Drainage area(km²)	Ave. wetted width(m) 4.8	Ave. depth for reach(m) .50	Ave. channel width(m) 11	Valley width(m) 325	Valley- channel <u>ratio</u> 30		flow characteristics Placid
Confine- ment U	<u>Pattern</u> T	Side channel occurence	Average low flow	Flow dur Survey (m³/sec	ing A	verage ak water emp(C) 20	Turbidity Nil	Maximum pool depth(m)
: pool 73	: <u>run</u> 14	iriffle 13	% pocket- water O	2 class 1 pools 8	% clas 11 poc 49		pools <u>IV</u>	class % class pools V pools 0
fines 42	sgrave) 57	* bed mater * rubble	\$ boulder 0	%bedrock 0	D-90 (cm) 8	gradient 1.1	Stability rating 87	Bank <u>form</u> Repose
Bank <u>Process</u> Failing	gene mater	<u>ia</u> l	Flood plain debris Low	Channel debris Low	% sta chann debr 20	el % cov		
Water chem Cond. (umbhs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (ng/1)	Na [†] (mg/1)	K ⁺ SO., (mg/l) (mg/l
Number of buil trout redds in reach		y '	Number of bull trout redds in reach	Redd density (no/km) ——	Year 	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>

206

Age 11 0.5 Age 111+ 0.1

Bull trout

Ace D

0

Age 111+ 2.0

Density (no/100 m2 surface area)

Age 1 1.3 3.4

Cutthroat

1.2

Other species

Eastern

Brk trout

Α

Mountain

Whitefish

P

Table 85. Stream habitat and fish population data for Basin Creek, Reach 3.

Stream Name	Reach number		each Tributa ength of	Upper iry reach boundary		Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Basin	003	DDI 1	.8 Bowl	11Cdd w	aters	1890.0	8.7 km	above 18 50. 0
Creek			Cree	k			Bowl Cr	eek
Physical	Habitat data	<u>a</u> Ave.	Ave.	Ave.		Valley-		
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel width(m)	Valley vidth(m)	ratio	<u>c</u>	Flow : haracteristics
2		3.3	. 28	6	50	8		Rolling
Confine- ment C	Pattern	Side channel occurence Low		Flow during survey (m³/sec)	pea	erage k water mp(C) T	urbidity Nil	Maximum pool depth(m)
7	, p. 1,-10	1	% pocket-	2 class	% clas	s % cla		lass % class
2 pool	1 run	2 riffle	water	I pools	11 poo			pools V pools
54	0	13	33	10	20	45	25	0
		% bed mater			D-90		Stability	Bank
fines	%gravel	% rubble	% boulder	*bedrock	(cm)	gradient	rating	form
10	15	35	20	20	29	2.2	63	Steep
Bank Process Stable	gene mater		Flood plain <u>debris</u> Moderate M	Channel debris Moderate	2 sta chann debr 50	el % cover		
Water che	emistry data							
Cond. (uniohs/ cm)	Alk. (mg/l)	Total corbon (mg/1)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1) 	Na [†] (mg/l) 	K ⁺ SO ₄ (mg/1)
Spawning	data							
Number of bull trou redds in	it Redo	d .	Number of bull trout redds in	Redd density			Redd density	
reach	densit (no/km O	n) Year 80	reach	(no/km)	Year 	reach_	(no/km) 	Year
neach_	(no/km O	n) Year 80	reach	(no/km)	Year 			Year
O Fish popu	(no/km O ulation data (no/100 m² su	n) Year 80	reach	(no/km) 			—— Mounta	Other species
Pish popu	(no/km O ulation data (no/100 m² su Cutthroat	n) Year 80	reach ——	(no/km) Bull tro				Other species

STRAWBERRY CREEK DRAINAGE

STRAWBERRY CREEK REACH 1

Channel Characteristics: Date Surveyed: 8-10-80

Reach 1 is a fourth order tributary which joins Bowl Creek to form the Middle Fork. Average wetted width was 13.4 m and the mean depth was 0.53 m. This reach was composed of 46% pool, 29% riffle, 15% run and 10% pocketwater areas. Channel debris was low, with 40% stable. Bank cover was low, with less than 3% of the wetted surface area shielded. Low instream cover (9%) was provided by substrate, turbulence and occasionally by depth. Stream gradient was 0.7% and the D-90 was 39 cm. Some mass wasting was observed and the Bowl-Divide trail crossed at stream km 0.9. A log jam was present at stream km 4.9 and the upper reach break was located at the junction of Trail Creek at km 5.3.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 5:1. The average valley width was 300 m. Reach 1 had an irregular meandering pattern and was occasionally confined at several bends. The Strawberry Creek trail followed the morth bank and an unmaintained trail crossed the upper end and lead up the Trail Creek drainage.

Fish Populations:

Westslope cutthroat, juvenile and adult bull trout, mountain whitefish and sculpins were observed. All species were present in low densities; however, good numbers of cutthroat were observed while conducting bull trout redd surveys in October. Adfluvial bull trout spawning has been documented, with an average of 11 redds enumerated annually during four years of survey.

STRAWBERRY CREEK REACH 2

Channel Characteristics: Date Surveyed: B-9-80

Reach 2 is a fourth order tributary in the Middle Fork drainage. Average wetted width was 10.2 m and the mean depth was 0.22 m. This reach was composed of 63% run, 18% riffle, 14% pool and 5% pocketwater areas. Moderate channel debris was present, with 25% stable. Bank cover was low, with approximately 3% of the wetted surface area influenced by overhang. Moderate instream cover (18%) was provided by substrate, debris, algae and depth. Stream gradient was 1.1% and the D-90 was 38 cm. Several log jams were observed and beaver activity caused channel braiding in two locations. Several slumping banks were present.

<u>Valley Characteristics:</u>

The upper bank slope gradient was 30 to 40% and the valley to channel ratio varied from 5 to 10:1. The average valley width was 200 m. Reach 2

had an irregular pattern and was occasionally confined by steep banks. The Strawberry Creek Trail crossed at stream km 8.2, just above the mouth of Gateway Creek, then followed the east bank up to the reach break at the East Fork of Strawberry Creek.

Fish Populations: Date Surveyed: 8-10-80

Westslope cutthroat, bull trout, sculpins and a sucker were observed. Cutthroat and juvenile bull trout were present in moderate densities. Spawning by adfluvial bull trout has been documented here.

STRAWBERRY CREEK REACH 3

Channel Characteristics: Date Surveyed: 8-24-80

Reach 3 is a third order tributary in the Middle Fork drainage. Average wetted width was 5.3 and the mean depth was 0.21 m. This reach was composed of 67% run, 20% riffle, and 13% pool areas. Channel debris was low, with only 2% stable. Bank cover was low, with 2% of the wetted surface area influenced by overhang. Moderate instream cover (13%) was provided by substrate, turbulence and depth. Stream gradient was 1.9% and the D-90 was 86 cm. Several slumping banks were observed and scattered bedrock areas were present in the streambed. Several old log jams were also noted, probably dating back to the 1964 flood. The Strawberry Creek trail crossed at stream km 17.8 and an outfitter's camp was located near this crossing.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 100 m. Reach 3 had a sinuous pattern and was generally confined by rock walls.

Fish Populations:

Westslope cutthroat and bull trout were observed in low densities during the survey; however, good numbers of cutthroat were observed while conducting bull trout redd surveys in October. Spawning by adfluvial bull trout has been documented here.

STRAWBERRY CREEK REACH 4

Channel Characteristics: Date Surveyed: 8-24-80

Reach 4 is a third order tributary in the Middle Fork drainage. Average wetted width was 4.3 m and the mean depth was 0.23 m. This reach was composed of 50% pool, 45% run and 5% riffle areas. Channel debris was low, with 70% large and stable. Bank cover was low, with 6% of the wetted surface area shielded. Low instream cover was provided by debris, depth and substrate. Stream gradient was 1.0% and the D-90 was 42 cm. Numerous log jams were present and several pools had large boulders. Substrate size and average depth provided excellent spawning habitat.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to channel ratio was greater than 50:1. The average valley width was 700 m. Reach 4 had an irregular meandering pattern and was occasionally confined at bends by the valley wall on one side. This reach was meadow-like in character with occasional stands of timber on the streambanks. The Strawberry Creek trail followed the west bank on its way to Badger Pass on the Continental Divide.

Fish Populations:

Westslope cutthroat and bull trout were observed. A density estimate indicated an important rearing area for juvenile bull trout, with 3.3 age I or older fish per 100 m² surface area. Spawning by adfluvial bull trout has been documented with an average of nine redds enumerated annually during three years of survey.

Trail Creek Reach 1

Channel Characteristics: Date Surveyed: 8-8-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 7.1 m and the mean depth was 0.36 m. This reach was composed of 44% pocketwater, 28% riffle, 18% pool and 10% run areas. Channel debris was moderate, with 40% stable. Bank cover was low, with 5% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by depth, debris, substrate and turbulence. Stream gradient was 1.6% and the D-90 was 41 cm. Several large log jams were observed and three bedrock cascade areas were present. The channel was braided and actively migrating through heavy debris from stream km 3.8 to 4.2 and a large spring entered from the north canyon wall at km 6.2. An unmaintained trail ran up the drainage and crossed at several points.

Valley Characteristics:

The upper bank slope gradient was 40 to 60% and the valley to channel ratio varied from 5 to 10:1; however, a portion was bounded by high canyon walls from km 5.6 to the upper reach break at km 7.4. The average valley width was 170 m in the lower reach and somewhat narrower in the canyon. Reach 1 had an irregular pattern and was occasionally confined through the lower portions and confined in the canyon area. An outfitter's camp was located at Grimsley Park near stream km 2.8.

Fish Populations:

Westslope cutthroat and juvenile and adult bull trout were observed. A density estimate indicated an important rearing area for juvenile bull trout, with 1.6 age I or older fish per 100 m² surface area. Spawning by adfluvial bull trout has been documented with an average of 29 redds enumerated annually during three years of survey. The 1980 high use portion contained approximately six bull trout redds per km.

Trail Creek Reach 2

Channel Characteristics: Date Surveyed: 8-6-80

Reach 2 is a third order tributary in the Strawberry Creek drainage. Average wetted width was 3.1 m and the mean depth was 0.20 m. This reach was composed of 40% run, 30% pool and 30% riffle areas. Channel debris was moderate, with 40% stable. Bank cover was moderate, with 21% of the wetted surface area influenced by overhang. Moderate instream cover (11%) was provided by substrate, debris and undercut banks. Stream gradient was 2.7% and the D-90 was 24 cm. Beaver activity was observed causing depositional areas (silt and sand) to be mixed in with the cobble-boulder substrate of higher gradient areas. Jeff Creek enters at stream km 7.6 and the uppermost fork was located at km 9.6. During 1980, a 1 km section was intermittent below the mouth of Jeff Creek.

Valley Characteristics:

The upper bank slope gradient was generally less than 30% and the valley to channel ratio was approximately 17:1. The average valley width was 150 m. Reach 2 had an irregular pattern and was occasionally confined. An unmaintained trail followed the stream channel up to a small flat near the upper forks.

Fish Populations: Date Surveyed: 8-7-80

Westslope cutthroat and bull trout were observed. Both species were present in low densities. A falls was observed at stream km 8.1 and formed a partial barrier. Low flow and low water temperature combine to limit fish populations here.

South Fork Trail Creek Reach 1

Channel Characteristics: Date Surveyed: 8-9-80

Reach 1 is a second order tributary to Trail Creek. Average wetted width was 2.1 m and the mean depth was 0.28 m. This reach was composed of 45% pool, 40% pocketwater and 15% riffle areas. Channel debris was high, with 60% stable. Bank cover was high, with 38% of the wetted surface area shielded. Moderate instream cover (12%) was provided by debris, substrate, turbulence and depth. Stream gradient was 3.8% and the D-90 was 30 cm. Numerous high water overflow channels were observed and some channel braiding occurred.

Valley Characteristics:

The upper bank slope gradient was 30 to 40% and the valley to channel ratio was approximately 12:1. The average valley width was 120 m. Reach 1 had an irregular pattern and was frequently confined. An unmaintained trail lead up the South Fork drainage, then swung west over Mount May and down into Bowl Creek at Grizzly Park.

Fish Populations:

Westslope cutthroat were the only species observed and were present in moderately high densities. Some cutthroat spawning may to take place in the overflow channels present.

Gateway Creek Reach 1

Channel Characteristics: Date Surveyed: 8-7-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 4.5 m and the mean depth was 0.19 m. This reach was composed of 57% run, 26% riffle, 10% pocketwater and 7% pool areas. Channel debris was high, with 20% stable. Bank cover was moderate, with 16% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by substrate, turbulence and debris. Stream gradient was 2.9% and the D-90 was 51 cm. High incidence of downed timber formed log jams, causing channel braiding to occur. In several locations, new channel migration was evident.

Valley Characteristics:

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

Fish Populations: Date Surveyed: 8-9-80

Westslope cutthroat and bull trout were observed. Juvenile bull trout were observed in moderate densities and adfluvial adults were noted; however, no bull trout spawning has been documented in Gateway Creek.

Gateway Creek Reach 2

Channel Characteristics: Date Surveyed: 8-7-80

Reach 2 is a third order tributary in the Strawberry Creek drainage. Average wetted width was 3.6 m and the mean depth was 0.19 m. This reach was composed of 36% pocketwater, 32% riffle, 23% run and 9% pool areas. Channel debris was low, with 10% stable. Bank cover was low, with less than 3% of the wetted surface shielded. Low instream cover (6%) was provided by substrate and turbulence. Stream gradient was 4.0% and the D-90 was 76 cm. Slumping areas were common through Gateway Gorge and some areas of bedrock were present. A 2 m falls was observed at stream km 3.7.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was approximately 2:1. The average valley width was 50 m. Reach 2 had an irregular pattern and was entrenched in a v-shaped canyon. Canyon walls were over 1,000 feet vertical at the highest point. The Big River Trail ran along the north side of the canyon.

Fish Populations: Date Surveyed: 8-8-80

Westslope cutthroat were the only species observed. The 2 m falls at km 3.7 may be a migration barrier to bull trout, as none were observed in Gateway Creek above this point.

Gateway Creek Reach 3

Channel Characteristics: Date Surveyed: 8-6-80

Reach 3 is a second order tributary down to the fork at Sabadoh Cabin, where it becomes third order. Average wetted width was 2.9 and the mean depth was 0.13 m. This reach was composed of 55% run, 30% pocketwater and 15% riffle. Channel debris was low, with only 5% stable. Bank cover was low, with less than 3% of the wetted surface area influenced by overhang. Low instream cover (9%) was provided by substrate, turbulence and algae. Stream gradient was 4.8% and the D-90 was 56 cm. Many slumping banks were present and two trail crossings were located just above the lower reach break (stream km 3.6 and km 3.7).

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio was approximately 7:1. The average valley width was 75 m. Reach 3 had a sinuous pattern and was generally confined by steep banks. Sabadoh Cabin was located at the upper end of Gateway Gorge, along the East Fork Strawberry Creek trail. The Big River trail was located on the South Bank.

Fish Populations: Date Surveyed: 8-8-80

Westslope cutthroat trout were the only fish species observed. A density estimate indicated an important rearing area, with 10.5 age I or older cutthroat per 100 m² surface area.

Gateway Creek Reach 4

Channel Characteristics: Date Surveyed: 8-6-80

Reach 4 is a second order tributary draining Big River Meadows. Average wetted width was 3.3 m and the mean depth was 0.23 m. This reach was composed of 65% run, 25% pool and 10% riffle areas. Channel debris was extremely low, with none stable. Bank cover was low, with 8% of the wetted surface area shielded. Extremely high instream cover (80%) was provided by a dense growth of algae and by undercut banks and exposed roots. Stream gradient was 1.2% and the D-90 was 16 cm. The majority of this reach had low, steep banks and silty bed. Banks were somewhat stabilized by a thick growth of grasses and low shrubs.

Valley Characteristics:

The upper bank slope gradient was less than 30% and the valley to

channel ratio was approximately 50:1. The average valley width was 200 m; however, the upper end was much wider (500 m). Reach 4 had an irregular meandering pattern and was unconfined. The Big River trail ran along the south bank through the meadow and on to Gateway Pass on the Continental Divide.

Fish Populations: 8-8-80

Westslope cutthroat were the only fish species observed. A density estimate indicated an extremely important rearing area with 27.2 age I or older fish per 100 m² surface area. This was the highest density found in any Middle Fork tributary reach. Most fish observed were relatively small in size (<180 mm). Westslope cutthroat spawning has been documented in riffle areas here.

East Fork Strawberry Creek Reach 1

Channel Characteristics: Date Surveyed: 8-10-80

Reach 1 is a third order tributary to Strawberry Creek. Average wetted width was 2.9 m and the mean depth was 0.13 m. This reach was composed of 49% run, 30% pocketwater, 20% pool, and a trace (1%) of riffle areas. Channel debris was moderate, with only 5% stable. Bank cover was low, with 7% of the wetted surface area influenced by overhang. Moderate instream cover (14%) was provided by substrate, turbulence and undercut bedrock ledges. Stream gradient was 5.2% and the D-90 was 63 cm. Bedrock was present in the bank and bed material and formed many cascading sections. The Strawberry Creek Trail crossed just above the mouth and the East Fork Trail crossed at stream km 1.4.

Valley Characteristics:

The upper bank slope gradient was greater than 60% and the valley to channel ratio varied from 2 to 5:1. The average valley width was 30 m. Reach 1 had an irregular pattern and was entrenched by rock walls.

Fish Populations:

Westslope cutthroat and juvenile bull trout were observed. A density estimate indicated an important rearing area for cutthroat, with 11.7 age I or older fish per 100 m² of surface area. Juvenile bull trout were also present in moderate to high densities below a 2 m cascading falls at stream km 0.6. No bull trout were observed above this falls.

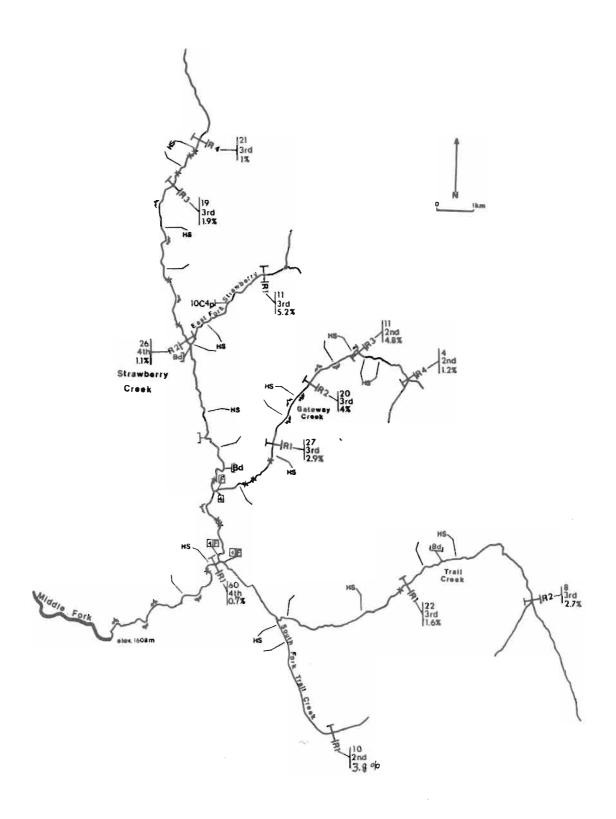


Figure 56. Physical habitat information for the Strawberry Creek drainage.

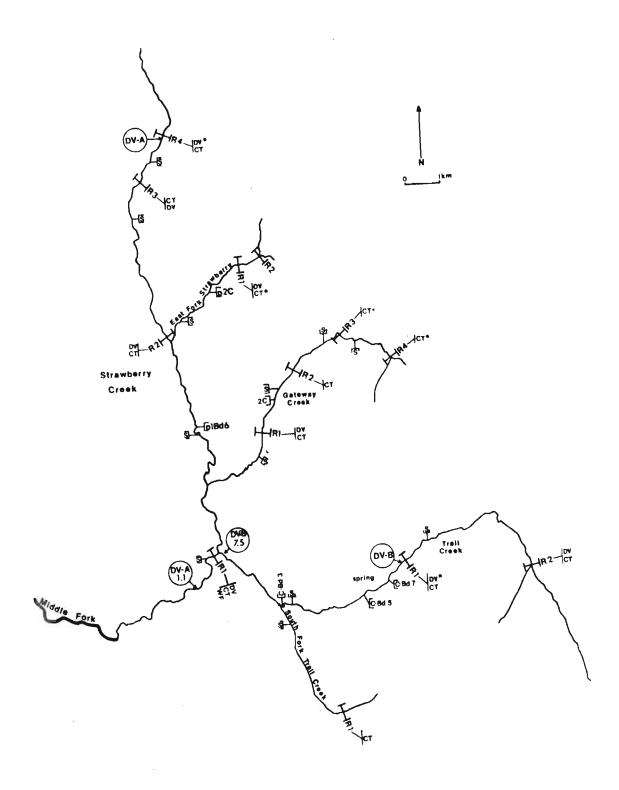


Figure 57. Fish population information for the Strawberry Creek drainage.

Table 86. Stream habitat and fish population data for Strawberry Creek, Reach 1.

Stream Name	Reach number	Serial	Reach Length	Tributary of	Upper reach boundary		Upper elev.(m)	Lower reach boundary		Lower elev.(m)
Strawberr	y 001	DCZ	4.9	Middle			1658.0	Junctio	on w/	1623.0
Creek				Fork	Trail	Creek		Bowl Cr	reek	
Discount - 1		_								
Physical	Habitat dat	Ave.	Ave	·.	Ave.		Valley-			
Stream order	Drainage area(km²)	wetted width(m)	depti _reac		hannel idth(m)	Valley width(m)	channel ratio	<u>c</u>	Flow haracteri	
4	71.0	13.4	. 5	3	60	300	5	Roll	ling, p	lacid
		Sid	e F	iverage	Flow dur	ing Av	erage		Maximum	
Confine- ment	Pattern	chann occuren		low flow	survey (m³/sec		k water mp(C) 1	urbidity	pool depth(m	<u>)</u>
X	С	Modera		.43		7		Low	1.5	
2 pool	% run	% riffle		ocket- ater	% class I pools	% clas II poo			lass pools	‰ class V pools
46	15	29		10	29	43	28	(0
		* bed mai	erial			D-90	2	Stability		ank
* fines	igravel	% rubbl	-	oulder	%bedrock	<u>(cm)</u>	gradient	rating	<u>f</u>	orm
10	40	30	2	0	0	39	0.7	117	Re	pose
Bank Process	Ba gene mater		Flood plain debri	C	Channel debris	% stal channe debr	el % cover		r sni	cover- orkel ction
Failing	Fluvia		Low	-	Low	40	1	1		9
Water chem	nistry data	•		1.						
Cond. (umohs/	Alk.	Total carbo		Total phos.	No 3	Ca ⁺⁺	Mg ⁺⁺	Na [†]	K ⁺	SO.,
cm)	(mg/1)	(mg/1		(2.5	(mg/l)	(mg/1)	(mg/1)	(mg/1)	(mg/1)	(mg/1)
240	146	0.8	7	.004		52.8	.105	2.3		13.3
Snawning c	da ta									
Number of				er of			Number of			
bull trout redds in	: Redd densit		bull redd	trout s in	Redd density		bull trout redds in	Redd density		
reach	(no/km			ach_	(no/km)	Year		(no/km)	<u>Year</u>	
4	0.2	80	1.5	5	3.1	81	12	2:4	82	
Fish popul	ation data									
Density (r	io/100 m² su	rface area	1)					Mounta	Other spe	ecies Eastern
T 0 - 4	Cutthroat	11 0	111+	100 0	Bull tro		Age 111+	White		Brk trout
Age 0 A).[<u>Age 0</u> O	Age I O	0	0.1	Р		٨
V	,	•	/ • L	J	U	U	0.1	ľ		A

Table 87. Stream habitat and fish population data for Strawberry Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundar	ry	Upper elev.(n	Lower reach n) boundary		Lower elev.(m)
Strawberry Creek	y 002	DCY	7.5	Middle Fork	E.F.	above Straw- Creek	1737.0		of Creek	1658.0
Physical H	abitat data						W 33			
	Drainage area(km²)	Ave. wetted width(m		h for cl	Ave. hannel idth(m)	Valley width(m)	Valley- channel <u>ratio</u>		Flow characteri	
4		10.2		22	26	200	8 .	Ro	lling, s	wirling
Confine-	Pattern	chann occurer	ne l nce	Average low flow	Flow du surve (m³/se	y	Average eak water temp(C)	Turbidity	Maximum pool depth(m	
X	P	Modera		pocket-	 ⊁ class	% c1a		Low lass %	1.9	‰ class
2 pool 14	<u>5 run</u> 63	% riffle 18		water	1 pools 25		001s <u>111</u>		pools 0	v pools O
fines 30	%gravel 40	% bed mat % rubbl 20		ooulder 9	%bedrock	D-90 (cm) 38	gradient 1.1	Stability rating 99	fo	enk epose
Bank Process	gene mater		Floor plair debr	n (hannel debris	char	cable nnel % cove		er sno	over- orkel tion
Failing	Fluvi	lal	Hig	h Mo	oderate	2.5	5 2	3]	.8
Water chem	istry data	i.								
(umohs/	Alk. (mg/l)	Total carbo (mg/l	n	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mg ⁺⁺ (mg/1)	Na ⁺ (mg/1) 	K ⁺ (<u>mg/l)</u>	50 ₄ (mg/1)
Spawning d	ata									
Number of bull trout redds in reach	Redd densit (no/km 0.8	y	bull redo re	per of trout in seach	Redd density (no/km)	Year 81	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u> 82	
Fish popula	tion data									
Density (no	Cutthroat			A -0.0	Bull tr			Mount White		Cies Eastern Brk trout
the state of the s	.7 Age		e 111+ .0	Age 0	$\frac{\text{Age } 1}{0.2}$	<u>Age 11</u> 0.2	0.3	A		A

Table 88. Stream habitat and fish population data for Strawberry Creek, Reach 3.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Strawberry Creek	003	DCX	5.1	Middle Fork	7.2 km above E.F. Straw-	1829.0	.1 km above E.F. Straw-	1737.0
					berry Creek		berry Creek	

Physical Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio		Flo characte	ristics
3		5.3	.21	19	100	5	Ro	lling,	broken
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	pe	verage ak water emp(C)	Turbidity	Maxim poo depth	1
C	N	Nil					Low	1.3	
pool	: run	i riffle	* pocket- water	F class I pools	% cla 11 po			class pools	% class V pools
13	67	20	0	8	0	ϵ	57	25	0
fines	%gravel	% bed mater % rubble	ial % boulder	%bedrock	D-90 (cm)	gradient	Stability rating		Bank form
38	17	10	15	20	86	1.9	102		Steep
Bank	Ba gene	ank etic	Flood plain	Channel	% sta chan	nel % cove		/er	% cover- snorkel
	<u>mater</u>		<u>debris</u> derate	_debris Low	debi	ris canor	overt 2		section 13
Process Failin	g Fluv	vial Mo					_		
Failin √ater che Cond.	<u>mater</u>	vial Mo					_		13
Failin Water che	mater g Fluv mistry data Alk. (mg/l)	vial Mo Total carbon	derate Total phos.	Low	2 Ca ⁺⁺	2 Mg ⁺⁺		κ ⁺	13
Failin Failin	mater g Fluv mistry data Alk. (mg/l) data t Redo densit (no/km	Total Mo Total carbon (mg/l)	Total phos. (mg/l) Number of bull trout redds in reach	No ₃ (mg/1) Redd density (no/km)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1) Number of bull trout redds in reach	Na ⁺ (mg/l) Redd density (no/km)	K [†] (mg/	13
Failin ater che ond. umohs/ cm) nawmine umber of ull trou edds in	mater g Flux mistry data Alk. (mg/l) data t Redo densit	Total carbon (mg/l)	Total phos. (mg/l) —— Number of bull trout redds in	Low No 3 (mg/1) Redd density	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/l) Number of bull trout redds in	Na ⁺ (mg/1) Redd density	K [†] (mg/	13
Failin fater che ond. umohs/ cm) nawming umber of ull trou edds in reach 0	mater g Fluv mistry data Alk. (mg/l) data t Redo densit (no/km	Total Mo Total carbon (mg/l)	Total phos. (mg/l) Number of bull trout redds in reach	No ₃ (mg/1) Redd density (no/km)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/1) Number of bull trout redds in reach	Na ⁺ (mg/l) Redd density (no/km)	K ⁺ (mg/)	13

0 0 0.2 0

Α

0.1

Table 89. Stream habitat and fish population data for Strawberry Creek, Reach 4.

Stream <u>Name</u> trawberry Creek	Reach number 004	number L	each Iribut ength of 2.3 Midd1 Fork	boundar	vaters	Upper elev.(m) 1854.0		
Physical Ha	abitat data							
	Drainage area(km²) 	Ave. wetted width(m) 4.3	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m) 700	valley- channel ratio 60		Flow haracteristics Ing, swirling
Confine- ment	Pattern	Side channel occurence		Flow durvey (m³/sec	y pea	verage k water mp(C)	urbidity	Maximum pool depth(m)
X	С	Low					Low	1.3
2 pool	: run	2 riffle	≈ pocket- water	2 class I pools	% clas 11 pod			ass % class ools V pools
50	45	5	0	7	27			
% fines	2grave1	% bed mater % rubble	h boulder	*bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
49	32	9	10	0	42	1.0	105	Steep
Bank Process Failing	gene mater Fluv	ial	Flood plain debris Low	Channel debris	% sta chann debr 7(el % cover is canopy		
Water chemi	stry data							
Cond. (unohs/ cm)	Alk. (mg/1)	Total carbon (mg/1)	Total phos. (mg/1)	No ₃ (mg/1)	Ca ⁺⁺ (mg/l)	Mq ⁺⁺ (mg/1) 	Na ⁺ (mg/1)	K ⁺ SO ₊ (mg/1)
Staweing da	ita							
Number of bull trout redds in reach	Redd densit (no/km 1.7	у	Number of bull trout redds in reach	Redd density (no/km)	Year 81		Redd density (no/km) 7.8	<u>Year</u> 82
Fish popula	tion data							
	Cutthroat			Bull tr			Mounta: Whitef	
	2 Age			Age 1 0.2	3.1	Age 111+	A	A

Table 90. Stream habitat and fish population data for Trail Creek, Reach 1.

Stream Name	Reach number		Reach Length	Tributar of	boundar		Upper elev.(Lower elev.(m)
Trail Creek	001	DC3	7.7	Straw- berry Creek	.3 km Jeff (below Creek	1752.0	Mouth Straw Creek	berry	1632.0
Physical	Habitat data	<u>a</u>								
Stream	Drainage	Ave. wetted	dept		Ave. hannel	Valley	Valley- channel		Flow	
order 3	$\frac{\text{area}(\text{km}^2)}{49.9}$	width(m) 7.1	.3		22	width(m) 170	<u>ratio</u> 8		Roll:	
Confine- ment	Pattern	Side channe occurenc	el ce	Average low flow	Flow dui survey (m²/sec	y j pe	verage ak water emp(C)	Turbidity	Maximum pool depth(m	
X	P	Modera		0.27 pocket-	 % class	% cla		Nil lass %	1.2 class	% class
1 pool	1 run	<pre>% riffle</pre>		water_	I pools	II po			/ pools	V pools
18	10	28		44	6	1	4	62	18	0
i fines	gravel	% bed mate % rubble		boulder	%bedrock	D-90 (cm)	radient	Stability rating		ank orm
8	17	34		40	1	41	1.6	106	_	epose
Bank Process	Ba gene mater		Floo plai debr	n	Channel debris	% sta chan debi	nel % cov		er sn	cover- orkel ction
Failing	g Fluv	ial M	odera	ite M	loderate	4	0 5	5	ı	14
Water che	mistry data	4								
Cond. (uniohs/ cm) 210	Alk. (mg/l) 158	Total carbon (mg/l)		Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1) 45.7	Mg ⁺⁺ (mg/1) .153	$\frac{\text{Na}^{+}}{(\text{mg/l})}$	K [†] (<u>mg/l)</u> 	so. (mg/1) 4.7
Seawning	data									
Number of bull trou redds in reach 31	t Redd densit (no/km 4.0	У.	bul rede re	per of trout ds in each	Redd density (no/km)	Year 81	Number of bull trout redds in reach	Redd density (no/km)	Year 82	
		23			J•4	01	50	J.7	02	
	lation data								Other sp	eciec
Density (no/100 m² su	rface area)		lia				tain	Eastern
	Cutthroat				Bull tr	out		Whit	efish	Srk trout

Cutthroat qc l Age II

Age 1 0

Age 0

Age 111+ 0.3 Age 0 0.7 Bull trout

Age 1 Age 11

0.4 0.7

Age 111+

0.5

Whitefish

Α

Brk trout

Α

Table 91. Stream habitat and fish population data for Trail Creek, Reach 2.

Stream Name Trail Creek	Reach number 002	<u>number</u> <u>Le</u>	each Tribut ength of .0 Stra berr Cree	boundar w- Head y	lwaters	Upper <u>elev.(m</u> 1860.0		
Physical	Habitat data	<u>a</u>						
Stream order	Drainage area(km²)	Ave. wetted width(m) 3.1	Ave. depth for reach(m) .20	Ave. channel width(m) 8	Valley width(m)	Valley- channel ratio 17		Flow racteristics d, rolling
Confine- ment X	Pattern P	Side channel occurence Low	Average low flow	Flow du surve (m³/se	y pea	erage k water mp(C)	Turbidity Low	Maximum pool depth(m) 0.6
<u>1 pool</u>	%- <u>run</u> 40	triffle 30	pocket- water 0	2 class 1 pools 0	% clas 11 poo 9	ls III p		ools V pools
1 fines	igravel	% bed mater % rubble	ial % boulder	%bedrock	D-90 (cm)	% gradient	Stability rating	Bank form
20	35	40	5	0	24	2.7	77	Repose
Bank <u>Process</u> Failir	gene mater	<u>ia</u> l	Flood plain debris Low	Channel <u>debris</u> Moderate	% sta chann debr 40	el % cove is canop		2 cover- snorkel section 11
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No 3 (mg/1)	Ca ⁺⁺ (mg/1) 	Mq ⁺⁺ (mg/1) 	Na ⁺ (mg/1)	K [†] SO _* (mg/1)
Snawning	data							
Number of bull trou redds in reach 0		у	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km) Y	ear
Fish popu	lation data							
Age O	Cutthroat Age 1 Age 0.3 0	rface area) 11 Age 0.8	111+ Age 0 0	Bull tr Age 1 O	Age 11	Age 111+ 0.3	0 Mountai Whitefi A	

Table 92. Stream habitat and fish population data for S.F. Trail Creek, Reach 1.

Stream Name S.F. Trail Creek	Reach number 001		Reach Tribu Length 0 4.8 Trai Cree	f boundar 1 Head	waters	Upper elev.(m 1860.0			Lower elev.(m) 1680.0
	rainage rea(km²)	Ave. wetted width(m) 2.1	Ave. depth for reach(m)	Ave. channel width(m) 10	Valley width(m) 120	Valley- channel ratio 12	9	Flow characteri Rolli	stics
Confine- ment F	<u>Patiern</u>	Side channe occurenc Modera	l low e flow	surve (m³/se 	y pea c) te		Turbidity Nil	Maximum pool depth(m 0.6) .
<u>1 poal</u> 11		<pre># riffle 15 # bed mate</pre>	water 40			ols 111 p	ools IV	20 20	V pools O
fines 10	%gravel	* rubble		%bedrock 2	(cm) 30	gradient 3.8	rating 72	<u>fo</u>	pose
Bank Process Failing	Ba gene <u>mater</u> Fluv	ial	Flood plain debris Moderate	Channel debris High	% sta chann debr 60	nel % cover ris canopy	y overha	r sno	over- orkel ition 12
Water chemis Cond. (umphs/ cm)	Alk.	Total carbon (mg/l)		No ₃ - (mg/1)	Ca ⁺⁺ (mg/l) 	Mg ⁺⁺ (ng/1) 	Na [†] (mg/1)	κ ⁺ (<u>mg/l)</u> ——	\$0. (mg/1)
Number of bull trout redds in reach 0	Redd densit (no/km O	y	homber of buil trout redds in reach	Redd density (no/km) 	Year ——	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	
Fish populat Density (no/		rface area)				Mount	Other spe	cies Eastern

Table 93. Stream habitat and fish population data for Gateway Creek, Reach 1.

Stream Name	Reach number		Reach Tri Length	butary r	Jpper reach boundai	ry	Upper elev.(m	Lower reach boundary		Lower elev.(m)
Gateway Creek	001	DDV 2	be	raw- rry eek		km below Creek	1743.	5 Mouth Strawb Creek	perry	1670.3
Physical	Habitat dat						V-11-			
Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth fo reach(m		ne 1	Valley width(m)	Valley- channel _ratio		Flow character	istics
3	19.6	4.5	.19	27	7	100	4	Swi	rling,	rolling
Confine-	Pattern	Side channe occurenc	l lo	~	low du surve (m³/se	y pea	verage ik water emp(C)	Turbidity Low	Maximur pool depth(r	
X	P	Hig	h 0.11		—— class	% clas	 s % c		ı.o class	% class
: pool 7	57	z riffle 26	wate		pools		ols III t	oools <u>IV</u>	<u>pools</u>	V pools
		% bed mate				D-90	°	Stability	E	Bank
i fines	*gravel	% rubble		der %be	edrock 5	(cm) 51	gradient 2.9	rating 100	_	orm
15	50	20	10		3	51	2.9	100	K	epose
Bank Process	gene mater		Flood plain debris	_det	nnel bris	% sta chann debr	el 3 cove is canon	<u>oy</u> overh	er sn ang se	cover- orkel ction
Failin	g Fluv	ia1	High	H	igh	20	15	i 1	6	14
Water cher	mistry data	•								
Cond. (umphs/ cm) 275	Alk. (mg/1) 163	Total carbon (mg/l)	(mg/) (mg	1/1)	Ca ⁺⁺ (mg/1) 59.3	Ma ⁺⁺ (nig/1) •194	Na [†] (mg/1) 1.8	K [†] (mg/1)	SO. (mg/1) 21.4
Spawning	data									
Number of built trout redds in reach	t Redo densit (no/km O	. y	Number of bull tro redds in reach	out o de	Redd ensity no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u>	
Fish popu	lation data									
Density (r	no/100 m² su Cutthroat				Bull to		600 XIII	Mount White		ecies Eastern Brk trout
Age D A	0 0.				.4	Ao∈ 11 0.5	0.2	A		Α

Table 94. Stream habitat and fish population data for Gateway Creek, Reach 2.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	002	DDW	2.2	Straw- berry Creek	2 km above Shin Creek	1828.8	.15 km below Shin Creek	1743.5

Stream order	Drainage area(km²)	Ave. wetted width(m)	Ave. depth for reach(m)	Ave. channel width(m)	Valley width(m)	Valley- channel ratio		Flow - characteristics
3		3.6	.19	20	50	2	Tu	mbling, broker
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	pea	verage sk water emp(C)	Turbidity	Maximum pool depth(m)
E	P	Moderate	e				Nil	0.9
2 pool	1 run	% riffle	pocket- water	2 class 1 pools	% clas			class & class pools V pools
9	23	32	36	0	33	6	7	0 0
fines 20	*gravel	% bed mater % rubble 10	10	%bedrock 40	D-90 (cm) 76	gradient 4.0	Stability rating 97	Bank <u>form</u> Repose
Bank Process	Ba gene <u>ma t</u> er		Flood plain debris	Channel debris	% sta chann debr	nel % cov		
ailing	Coll	luvial M	oderate	Low	10	1	1	6
Water cher	mistry data	š.						
Cond. (umohs/	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/l)	Ca ⁺⁺ (mq/l)	Mg ⁺⁺ (mg/1)	Na [†] (mg/l)	k SO. (mg/l)
-				<u>(1.1971)</u>	1119/1/	(hig/1)	Tuidy 1 /	- -
Camping (da t <i>a</i>							
Number of bull trou redds in reach	t Redo densit <u>(no/k</u> m	<u>Ly</u>	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	80						

0

Bull trout

Age 1 Age 11

0

Age 1114

Density (no/100 mi surface area)

Cutthroat
Age I Age II
0 0.4

1.3

AGE (

0

Other species

Mountain

Whitefish

A

Eastern

Brk trout

A

Table 95. Stream habitat and fish population data for Gateway Creek, Reach 3.

Stream Name	Reach number		Reach Tribut Length of		у	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
Gateway Creek	003	DAA	1.8 Stra berr Cree	y Shin	m above Creek	1914.1	2 km ab Shin Cr	
Physical Stream	Habitat dat	a Ave. wetted	Ave. depth for	Ave. channel	Valley	Valley- channel		Flow
order 2	area(km²)	width(m) 2.9	reach(m)	width(m)	width(m)	ratio	-	characteristics
2	-		.13	11	75	7	Bro	oken, tumbling
Confine- ment	Pattern	Side channe occurenc	l low	Flow dui survey (m³/sec	y pea	verage ak water emp(C)	Turbidity	Maximum pool depth(m)
С	N	Modera	te				Nil	0.6
<u>1 pool</u>	1 run 55	riffle 15	% pocket- water 30	i class I pools	% clas II pod O		ools IV	class & class pools V pools 0
U	<i>)</i>	% bed mate		U	D- 90	3	, Stability	Bank
3 fines	%gravel 30	% rubble		%bedrock 5	(cm) 56	gradient 4.8	rating 104	form Repose
Bank Process	Ba gene mater		Flood plain debris	Channel debris	% sta chann debr	iel % cover		
Failing	F1uv	, ial	Low	Low	5	1	1	9
Water che	mistry data							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (ng/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/l)	Na [†] (mg/l <u>)</u>	K ⁺ SO ₊ (mg/1) (mg/1)
								·
Scawning	da t <u>a</u>							
Number of bull trou redds ir reach		y	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 popu	lation data							
Density (no/100 m² su	rface area)				i . 	Other species
The Tall	Cutthroat]]]+ Age 0	Bull tr Age 1	out Age II	Age III+	Mount <u>White</u>	

Α

Table 96. Stream habitat and fish population data for Gateway Creek, Reach 4.

Stream <u>Name</u> Gateway Creek	Reach number 004	Serial number DAB	Reach Length 1.1	Tributary of Straw- berry Creek	Upper reach boundary Headwaters	Upper elev.(m) 1926.3	lover reach boundary 3.8 km above Shin Creek	Lower elev.(m) 1914.1
Physical Ha	ubitat data	1						

Physical	Habitat data	Ave.	Ave.	Ave.		Valley-			
Stream order	Drainage area(km²)	wetted width(m)	depth for reach(m)	channel	Valley width(m)	channel ratio		Flow characteri	
2		3.3	.23	4	200	50		Placid	
Confine-	Pattern	Side channel occurence	Average low flow	Flow dur survey (m³/sec	реа	verage sk water emp(C)	Turbidity	Maximum pool depth(m	
U	С	Low			-		Ni1	1.2	
£ pool	<u>% run</u>	% riffle	≈ pocket- water	i class 1 pools	% clas 11_poc			class V pools	% class V pools
25	65	10	0	0	50		50	0	0
9 6	• • • • • • • • • • • • • • • • • • • •	% bed mater:	al & boulder	%bedrock	D-90	, acadiant	Stability		ank
2 fines 45	<u>%gravel</u> 53	% rubble 2	0	0	(cm) 16	gradient 1.2	rating 85		orm
43	23	۷	U	U	10	1.4	ره	Ste	eep
Bank Process	Ba gene mater	tic	Flood plain debris	Channel debris	% sta chann _debr	el % cov		ver sno	cover- orkel ction
Stable Water chem	Organ Fluvi mistry data	Lal	Low	Ni1	0	0	8	3 8	30
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ - (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/l)	Na ⁺ (mg/1)	κ [†] (<u>mg/l)</u> ——	SO. (mg/l)
Smawning o	ia t <u>a</u>								
buther of bull trout redds in reach	Redd density (no/km O		humber of bull trout redds in reach	Redd density (no/km) 	<u>Year</u>	Number of bull trout redds in reach	Redd density (no/km)	<u>Year</u> 	
Fish popul	ation data								
Density (n	o/100 m² sur	face area)		- ۱۱ درو				Other spe	Eastern
7 6	Cutthroat	11 / 1	11. 700 /	Bull tro)ut	7	KINT	efish	Brk trous

	(00/100	m: surface	2503					Other	species
DELISIT	Cuttl		r area)		Bull 1	trout		Mountain Whitefish	Eastern Brk trout
Aug 0	Age 1	Age 11	Age 111+	Age (Age 1	Age 11	Apr 111+		
2.0	1.8	18.7	6.7	0	0	0	0	A	A

Table 97. Stream habitat and fish population data for E.F. Strawberry Creek, Reach 1.

Stream Name	Reach number	Serial number	Reach Length	Tributary of	Upper reach boundary	Upper elev.(m)	Lower reach boundary	Lower elev.(m)
E.F. Straw-	001	DCV	3.0	Straw-	3 km above	1902.0	Junction w/	1740.0
berry Cr.				berry	Strawberry		Strawberry	
				Creek	Creek		Creek	

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 characteri	
3	10.0	2.9	.13	11	30	3		Tumb 1	ing
Confine- ment	Pattern	Side channel occurence	Average low flow	Flow dur survey (m²/sec)	pea	verage ak water emp(C)	Turbidity	Maximum pool depth(m	
E	P	Low					Nil	0.7	
2 pool	2 run	2 riffle	<pre>pocket- water</pre>	class 1 pools	2 clas			class V pools	% clas V pool
20	49	1	30	0	20	8	0	0	0
fines :	%grave)	% bed mater	2 boulder	*bedrock	D-90 (cm)	gradient	Stability rating		ank orm
25	25	15	5	30	63	5.2	100	Sto	еер
Bank Process	gene mater		Flood plain debris	Channel debris	2 sta chann debr	el % cov		ver sno	over- orkel tion
ailing	F1uv	ial Mo	derate	Moderate	5	1	6	7	1.4
Water chem	mistry data	•							
Cond. (umohs/ cm)	Alk. (mg/l)	Total carbon (mg/l)	Total phos. (mg/l)	No ₃ (mg/1)	Ca ⁺⁺ (mg/1)	Mg ⁺⁺ (mg/l)	Na [†] (mg/1) 	κ [†] (<u>mg/l)</u> ——	SO. (mg/
Spawpine d	ia t a								
Number of bull trout redds in reach_	Redd densit (no/km	у	Number of bull trout redds in reach	Redd density (no/km)	Year	Number of bull trout redds in reach	Redd density (no/km)	Year	
oull trout edds in	densit	y	bull trout redds in	density	<u>Year</u>	bull trout redds in	density	<u>Year</u>	
oull trout redds in reach O	densit (no/km	y) Year	bull trout redds in	density	<u>Year</u>	bull trout redds in	density	<u>Year</u> 	

Mountain

Whitefish

Eastern

A

Brk trout

0 0.6

Age 111+

Ace 0

9.6

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APPENDIX A

Number caught, angler hours, number measured, minimum length, maximum length and mean length of westslope cutthroat trout captured during Department angling surveys of Middle Fork tributaries during 1980 and 1981.

Lincoln 08-4170 Miner 08-4780 Walton 08-7630 Morrison 08-4940 Deerlick 08-2080 Lodgepole 08-4240 Harrison 08-3290 Whistler 08-7760 Nyack 08-5130 Schafer 08-6160 Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0800 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-6700 Giefer 08-2960 Gateway 08-2460 Skyland 08-6420 E.F. Strawberry 08-2460	Stream Name	Code #	Stream Name	Code #
Walton 08-7630 Morrison 08-4940 Deerlick 08-2080 Lodgepole 08-4240 Harrison 08-3290 Whistler 08-7760 Nyack 08-5130 Schafer 08-6160 Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2260 Charlie 08-0640 E.F. Strawberry 08-2260 Twenty-five Mile <td>McDonald</td> <td>08-4630</td> <td>Lake</td> <td>08-3956</td>	McDonald	08-4630	Lake	08-3956
Deerlick 08-2080 Lodgepole 08-4240 Harrison 08-3290 Whistler 08-7760 Nyack 08-5130 Schafer 08-6160 Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7020 Gear 08-0540 S.F. Trail 08-6700 Giefer 08-0540 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five M	Lincoln	08-4170	Miner	08-4780
Harrison 08-3290 Whistler 08-7760 Nyack 08-5130 Schafer 08-6160 Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2260 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480	Walton	08-7630	Morrison	08-4940
Nyack 08-5130 Schafer 08-6160 Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0820 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Deerlick	08-2080	Lodgepole	08-4240
Coal 08-1630 Dolly Varden 08-2280 Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7020 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Harrison	08-3290	Whistler	08-7760
Pinchot 08-5530 Argosy 08-0300 Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Nyack	08-5130	Schafer	08-6160
Stanton 08-6980 W.F. Schafer 08-7670 Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Coal	08-1630	Dolly Varden	08-2280
Tunnel 08-7440 Calbick 08-1080 Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Pinchot	08-5530	Argosy	08-0300
Muir 08-4950 Cox 08-1740 Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Stanton	08-6980	W.F. Schafer	08-7670
Paola 08-5340 Clack 08-1500 Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Tunnel	08-7440	Calbick	08-1080
Park 08-5365 Bowl 08-0820 Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Muir	08-4950	Cox	08-1740
Dickey 08-2180 Basin 08-0500 Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Paola	08-5340	Clack	08-1500
Ole 08-5150 Strawberry 08-7020 Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Park	08-5365	Bow1	08-0820
Essex 08-2620 Trail 08-7320 Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Dickey	08-2180	Basin	08-0500
Bear 08-0540 S.F. Trail 08-6700 Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	01e	08-5150	Strawberry	08-7020
Giefer 08-2960 Gateway 08-2940 Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Essex	08-2620	Trail	08-7320
Skyland 08-6420 E.F. Strawberry 08-2460 Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Bear	08-0540	S.F. Trail	08-6700
Charlie 08-1400 Dodge 08-2260 Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Giefer	08-2960	Gateway	08-2940
Long 08-4280 Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Skyland	08-6420	E.F. Strawberry	08-2460
Bersicker 08-0640 Twenty-five Mile 08-7480 Granite 08-3080	Charlie	08-1400	Dodge	08-2260
Twenty-five Mile 08-7480 Granite 08-3080	Long	08-4280		
Granite 08-3080	Bersicker	08-0640		
	Twenty-five Mile	08-7480		
Challenge 08-1420	Granite	08-3080		
	Challenge	08-1420		

APPENDIX B

State water code numbers for each Middle Fork tributary surveyed.

Stream name	Number caught	Angler hours	Number measured	Minimum length (mm)	Maximum length (mm)	x Length
Lincoln	41	5	40	128	282	177
Walton	29		28	121	190	158
Coa1	78	8.8	78	110	244	168
Pinchot	36	4.0	36	112	300	196
Stanton	12	2.0	12	104	280	179
Muir	167	14.5	53	102	265	173
Park	60	3.5	60	122	258	185
01e	87	11.0	75	132	330	209
Essex	24	4.0	11	147	325	224
Giefer	5	1.0	5	114	203	150
Granite	15	3.5	15	220	325	265
Dodge	3	1.0	3	122	260	206
Challenge	42	4.0	34	123	335	210
Lake	4		4	230	280	254
Morrison	6	5.5	4	255	310	293
Lodgepole	4	2.0	3	120	162	143
Schafer	30	6.0	30	105	228	153
Dolly Varden	6	13.0	3	187	248	217
Cox	15	6.0	12	135	216	176
Bow1	24	4.0	24	101	250	146
Basin	7 5	6.0	75	75	202	134
Strawberry	8	4.0	4	135	310	192
Trail	10	3.0	9	120	240	180
Gateway	1	1.5	1	252	252	252