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**BIOPHYSICAL SURVEYS AND ENHANCEMENT
OPPORTUNITIES FOR TRIBUTARIES OF THE
UPPER COLUMBIA RIVER**



TRITON

Environmental Consultants Ltd.

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Prepared for:

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1.0 INTRODUCTION

In 1961 the British Columbia government issued a water licence which authorized the construction of the Mica Dam on the Columbia River 135 km north of Revelstoke. The construction began in 1965 and the facilities were declared operational in May 1973 with a total generating capacity of 1736 megawatts. The reservoir behind the dam has a total storage of 24.6 trillion cubic metres and flooded approximately 116 km of the Columbia River and 100 km of the Canoe River. The reservoir has a maximum surface area of 43,200 ha. The formation of the Kinbasket reservoir eliminated or reduced approximately 586 km of riverine habitat in the upper Columbia basin.

The original water license included a requirement for B.C. Hydro to compensate for any negative effects to fish and wildlife. In September 1990 the B.C. Ministry of Environment (MOE) and B.C. Hydro jointly formed a steering committee to provide overall guidance and direction in the development of a long term strategic management program for fish and wildlife in that portion of the Columbia River Basin affected by the Mica Dam and the creation of the Kinbasket Lake reservoir. Reporting to the steering committee are two technical committees; one for wildlife and one for fish. In 1991-1992 the technical committees undertook to develop management plans that will outline programs to be conducted over the next five years.

To facilitate the development of the management plans, Triton Environmental Consultants Ltd. was contracted in June 1991 to carry out a biophysical survey to identify present use and distribution of migratory and resident fish stocks and document potential enhancement opportunities for increasing the carrying capacity of six upper Columbia River tributaries. The tributaries included Blackwater Creek, Blaeberry River, Bluewater Creek, Beaverfoot River, Camp Creek, and the Spillimacheen River (Figure 1). Bobbie Burns Creek is the largest tributary to the Spillimacheen River and due to its size it will be discussed as a seventh tributary throughout this report.

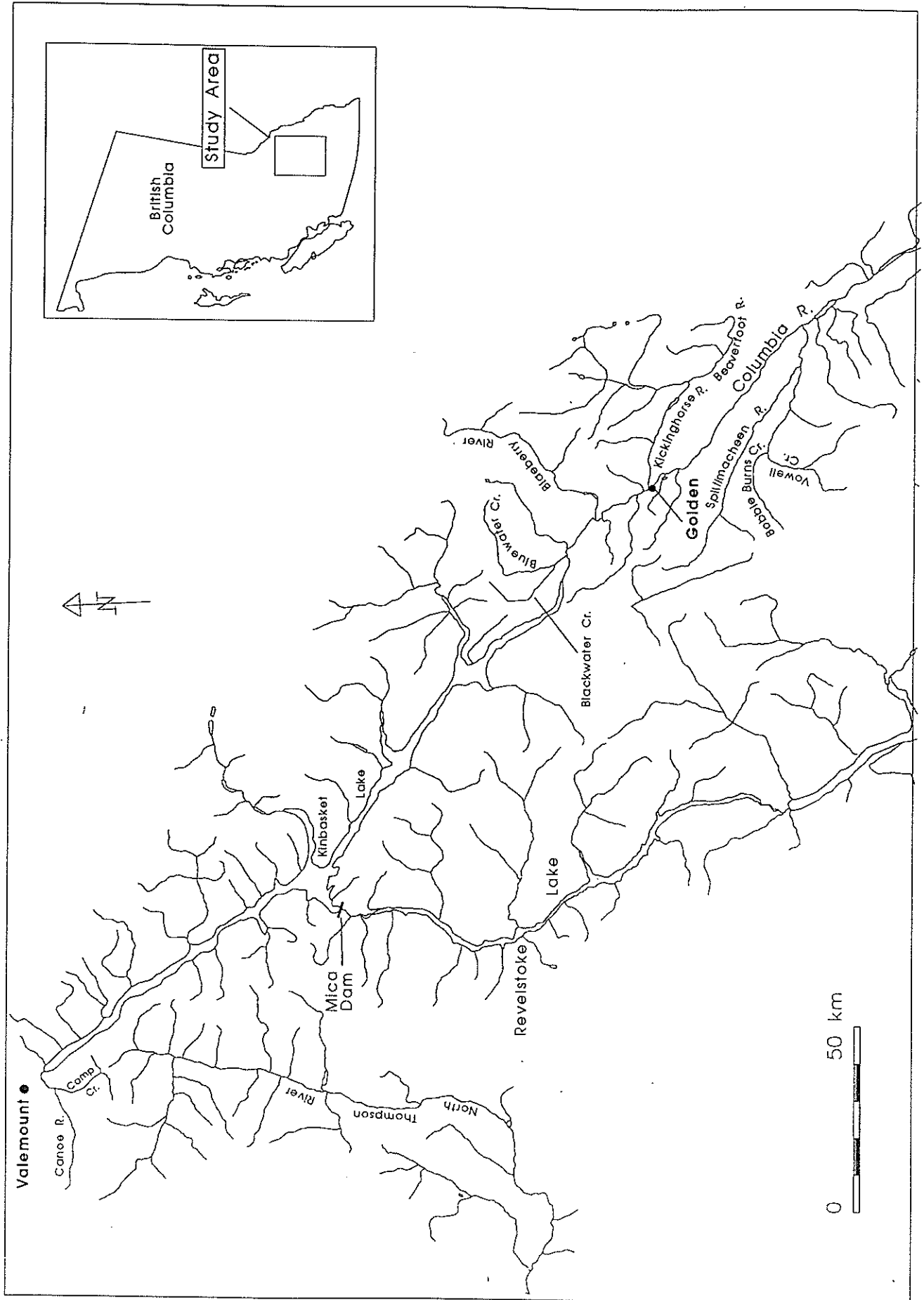


Figure 1: Location of Study Area and Tributaries

2.0 METHODS

Bio-reconnaissances were carried out in each of the six tributaries to collect the necessary fish and habitat information. Prior to going into the field 1:50,000 maps were used to develop longitudinal profiles and to roughly establish reach breaks. In the field, attempts were made to sample each reach to develop a profile of stream characteristics. For each sample site a DFO/MOE stream survey form was completed and for a majority of sample sites a Smith Root electroshocker was used to collect fish. Time did not allow for the application of multiple removal techniques to develop population estimates of fish at each sampling site. However, electrofishing was done as systematically as possible to allow comparisons of fish abundance between reaches and tributaries. Each fish collected was counted and identified to species. The sport fish species were measured for fork length and weighed to the nearest 10th of a gram. Scale samples were taken from fish over 60 mm long for aging. Appendix I provides a listing of all fish caught with lengths and weights of the sport fish, and the ages of the fish from which scales were taken. The field program took place between September 28 and October 30, 1991.

In the office the information recorded on the stream survey forms was transferred to dBase IV files to facilitate sorting and manipulation of the collected information. Appendix II contains a summary of the information recorded on the stream survey cards for each site sampled. Digitized "blue lines" showing all the rivers and streams on 1:50,000 NTS maps were provided by the Fisheries Branch (Inventory and Data Systems Unit) of the Ministry of Environment. "QuikMap" software was used to integrate the stream survey files and the blue lines, providing a geo-referenced database of all the sites sampled during the field program.

3.0 FISH DISTRIBUTION AND HABITAT ASSESSMENT

During the first part of the field program the weather was warm and water temperatures ranged from 5° to 7° C. However, during the last 10 days of the study the weather cooled and water temperatures dropped to between 0° and 5° C on the Beaverfoot and Spillimacheen Rivers. During this field study the stream waters

were generally clear but any rainfall quickly resulted in sediments entering the stream and the water became very coloured.

Fish captured in the course of the field program consisted of salmonids, sculpins, burbot, minnows and suckers. Specifically:

- Rainbow Trout (*Oncorhynchus mykiss*)
- Bull Trout (*Salvelinus confluentus*)
- Cutthroat Trout (*Oncorhynchus clarki lewisi*)
- Eastern Brook Trout (*Salvelinus fontinalis*)
- Mountain Whitefish (*Prosopium williamsoni*)
- Pygmy Whitefish (*Prosopium coulteri*)
- Burbot (*Lota lota*)
- Slimy Sculpin (*Cottus cognatus*)
- Torrent Sculpin (*Cottus rhotheus*)
- Longnose Dace (*Rhinichthys cataractoe*)
- Redsided Shinner (*Richardsonius balteatus*)
- Coarsescale Sucker (*Catastomus macroheilus*)

It was not possible to develop population estimates from the fish sampling program. However, the sampling was carried out systematically so that comparisons could be made among tributaries. The following table lists the average catch per unit area and catch per second for each of the major tributaries. Catch success for individual sampling site is presented in Appendix III.

Tributary	Catch per second	Catch per m ²
Beaverfoot R.	0.013	0.09
Blaeberry R.	0.030	0.10
Bluewater Cr.	0.012	0.10
Blackwater Cr.	0.04	0.33
Camp Cr.	0.012	0.17
Spillimacheen R.	0.015	0.11

Throughout the study area the highest catch per m² came from Blackwater Creek site 5 in reach 3 (Figure 10) with 0.8 fish per m². Blackwater Creek, reach 1 (site 8) and Camp Creek, reach 5 (site 11) Figure 12 had the next highest concentrations at approximately 0.4 fish per m². The highest catches per second were observed at the same site 5 on Blackwater Creek with 0.06 fish per second. This was followed by a catch success of 0.04 fish per second at the #2 site on the Blaeberry River, reach 5 and at its tributary Willowbank Creek Figure 6. The same catch rate was recorded on Whitepine Creek, a tributary of Bluewater Creek Figure 8. The descriptions and maps of the location of these sites follow in the stream by stream descriptions.

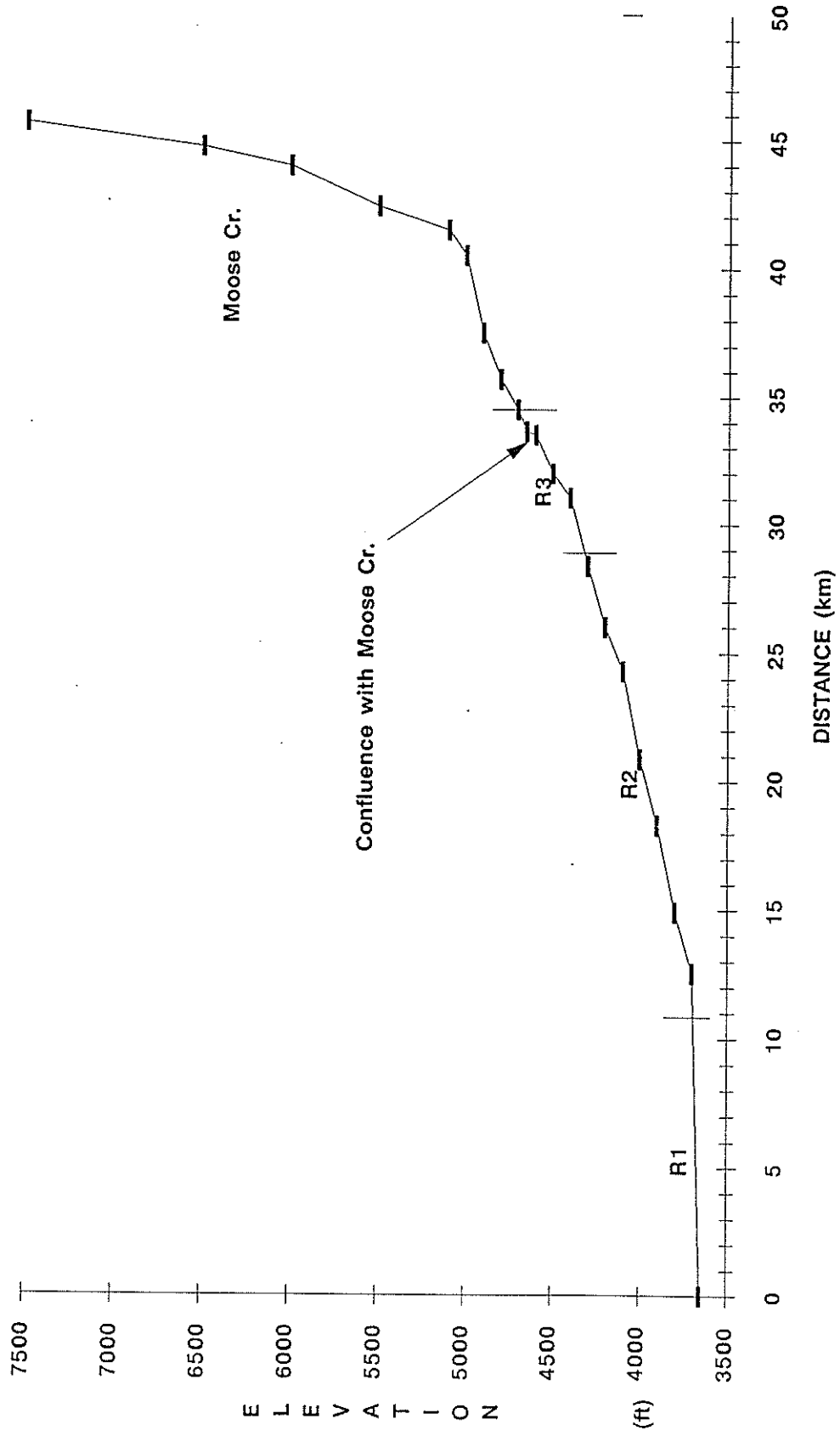
The maps provided for each river indicate the species of fish caught at each sampling site. The abbreviations used to indicate each species is taken from the *Stream Survey Field Guide* prepared by the Canada Dept. of Fisheries and Oceans and the B.C. Ministry of Environment (1989) except bull trout which is indicated by BT.

3.1 BEAVERFOOT RIVER

3.1.1 Introduction

This river flows approximately 33 km in generally a northerly direction into the Kicking Horse River. At the headwaters the Beaverfoot branches into Moose and Dinard Creeks with the longer, Moose Creek, extending another 11 km into the Vermillion Range. The stream profile (Figure 2) shows the confluence of the Beaverfoot River, Moose and Dinard Creeks at an elevation of 1400 m and the mainstem entering the Kicking Horse River at 1112 m. Moose Creek originates at an elevation of 2286 m. The Beaverfoot joins the Kicking Horse River approximately 300 m upstream of Wapta Falls, a 28 m high falls on the Kicking Horse River. The major tributaries include the above mentioned creeks as well as Fraser Creek and Ice River. The first 15 km of the Beaverfoot River and part of Ice River is bordered on the east and north bank by Yoho National Park with the rest of Ice River completely inside the park. There are no major barriers on the Beaverfoot River. There is a small lake not far from the junction of Moose and Dinard Creeks known as Moose Lake. The local guide/outfitter frequently takes

Figure 2. Beaverfoot River and Moose Creek Profile



clients to this lake for fishing in the summer months and the Fish and Wildlife Branch has stocked the lake with rainbow trout in recent years.

A rough estimate of discharge was taken approximately 5.5 km upstream from the confluence. In mid-October, 1991 the flow was estimated to be 2.3 m³/s. The Ice River contributes approximately 30% to the flow in the Beaverfoot River. During the latter part of October the air temperature dropped significantly at night and as a consequence the water temperature dropped to between 2.5° and 4.0° C while working on this river. The capture efficiency of electrofishing is reduced at temperatures below 4° as fish pass more quickly into a state of immobilization and are not as readily "drawn" by the electric field (Cowx and Lamarque 1990). Figure 3 shows the location of reach breaks and sample sites and Table 1 summarizes the main parameters of each reach sampled.

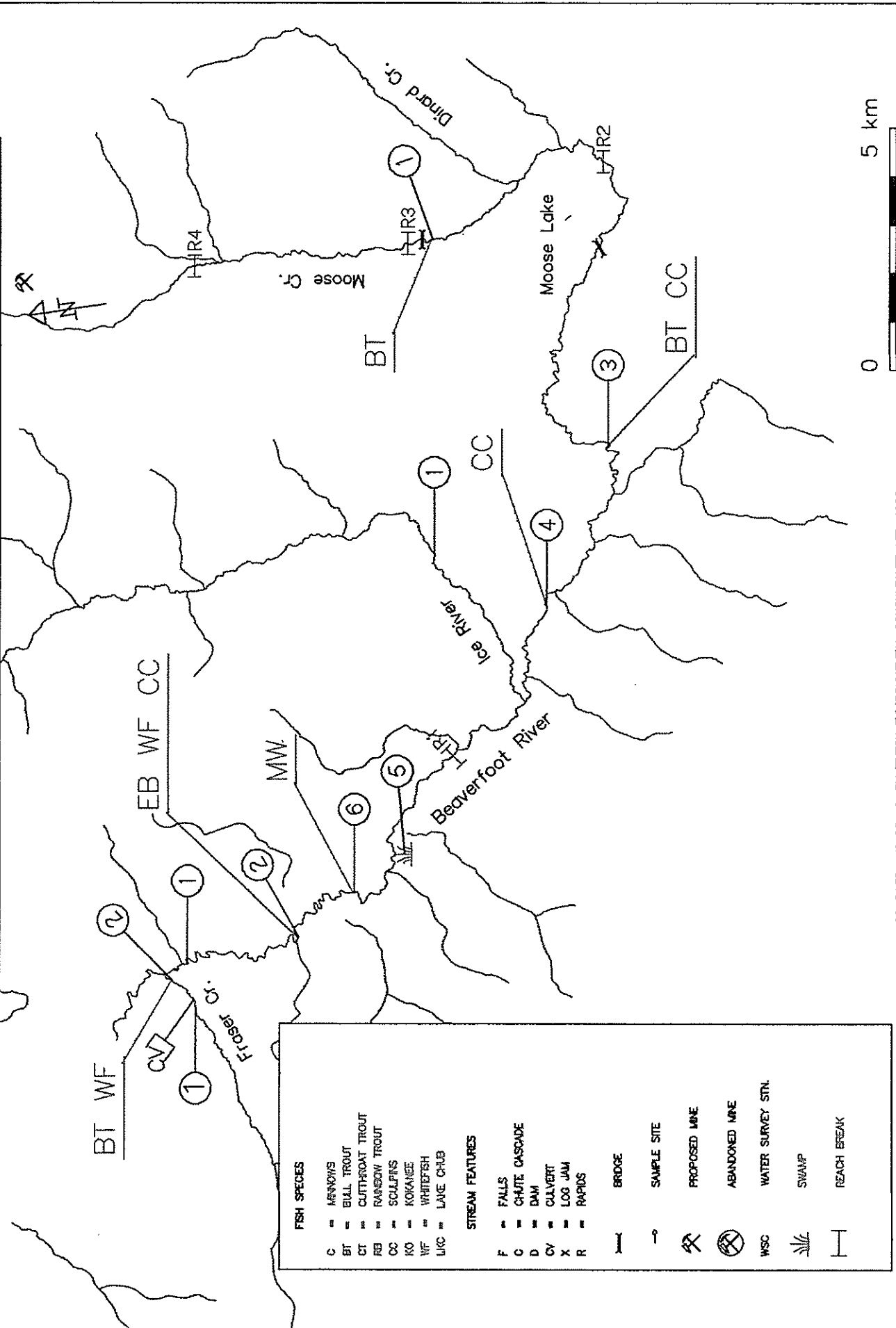
3.1.2 Summary by Reach

Reach 1 (1- 11 km)

The first reach extends approximately 11 km upstream from the confluence with the Kicking Horse River. It is generally a low gradient (0.5%), meandering section with deep runs (Photo 1). The right bank is vegetated by mature fir forest as this bank forms the boundary to Yoho National Park (Photo 2). The left bank has been logged in most areas or consists of open grass, shrub communities in low lying areas prone to flooding from beaver activity. There are many small side channels created by beaver activity in the deltas of the small creeks that flow into the Beaverfoot River (Photo 3).

This reach contains sections of suitable gravel for spawning although there are areas where fine sediment dominate in the slower deeper sections. There is considerable instream debris and cut banks to provide rearing habitat. Shocking in this reach (site 2) produced one 1+ eastern brook trout, whitefish, and torrent sculpins.

Figure 3: Beaverfoot River Sampling Sites and Habitat Map .



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Table 1: Summary of Reach Characteristics for Beaverfoot River

Reach Number	Reach Length (km)	Average Wetted Width (m)	Total Wetted Area (m ²)	Maximum Riffle Depth (cm)	Gradient (%)	Stream Character			Cover (% of wetted area)	Substrate			
						Percent Pool (%)	Percent Riffle (%)	Percent Run (%)		Fines (%)	Gravel (%)	Larges (%)	Bedrock (%)
1	11.2	17	190,400	25	0.5	33.3	13.3	53.4	14.3	18.3	61.7	20	0
2	18.0	10	180,000	25	1.4	25	35	40	11.5	7.5	67.5	25	0
3	5.5	6	33,000	10	1.6	5	60	35	10	10	50	40	0



Photo 1. Deep glide section at site 1, reach 1 of the Beaverfoot River.



Photo 2. Aerial view of top section of Beaverfoot River.

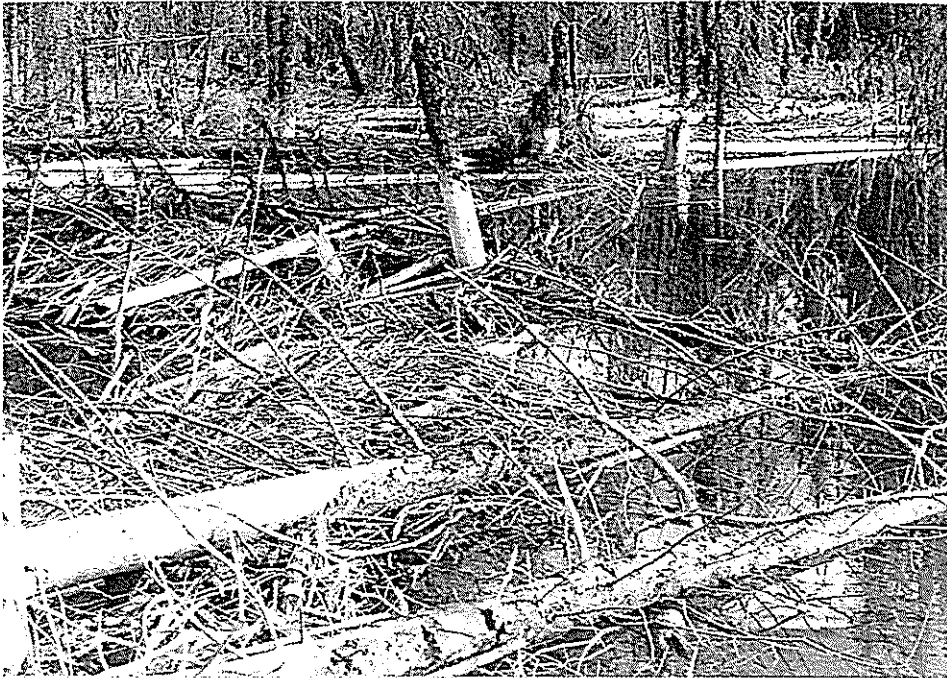


Photo 3. Beaver pond at site 5, reach 1 of the Beaverfoot River.



Photo 4. Riffle/run section of reach 2 at site 3, Beaverfoot River.

Reach 2 (11 - 29 km)

This section extends approximately 18 km upstream from the top of reach 1 and is very similar to the first reach but the gradient is somewhat steeper at 1.4%. The main channel is shallower, a greater percentage of riffle area, and higher water velocities (Photo 4). The stream channel meanders along the valley bottom and is generally bordered by older fir forest with some areas of extensive beaver activity that has resulted in flooded areas with small channels (Photo 5). The substrate in the main channel tends to slightly larger gravel and cobble than reach 1.

At the observed flow level there was considerable edge habitat consisting of LOD and cut banks. Electroshocking in the main channel produced bull trout and sculpins. The char ranged between 93 and 159 mm and 1 to 2+ in age. Two bull trout escaped capture, both between 200 to 250 mm. Only sculpins were taken from the side channel pictured in Photo 5.

Reach 3 (29 - 34.5 km)

This reach extends 5.5 km from the top of reach 2, beyond the confluence of Dinard and Moose Creeks, extending approximately 1.5 km into Moose Creek. In this area the creek is generally more confined, with a more riffle/run/pool character. The substrate is larger with greater occurrences of large cobble and boulders and in some spots bedrock is exposed. With greater down cutting that has created higher banks there are more sections of unstable banks. However, there is less accumulation of fines in this reach and there are sections of suitable spawning gravel (Photo 6).

Boulders, pools, with some LOD and cut banks along the margins provide fish habitat and in some areas there is crown closure. Local information suggests that bull trout utilize the first 2-3 km of Moose Creek, the top part of this reach, for spawning. Fish collection produced 4 bull trout between 53 and 96 mm with the largest being 1+. The four fish had an average condition factor of 1.2.



Photo 5. Swamp area created by beaver activity, site 4, reach 2, Beaverfoot River.

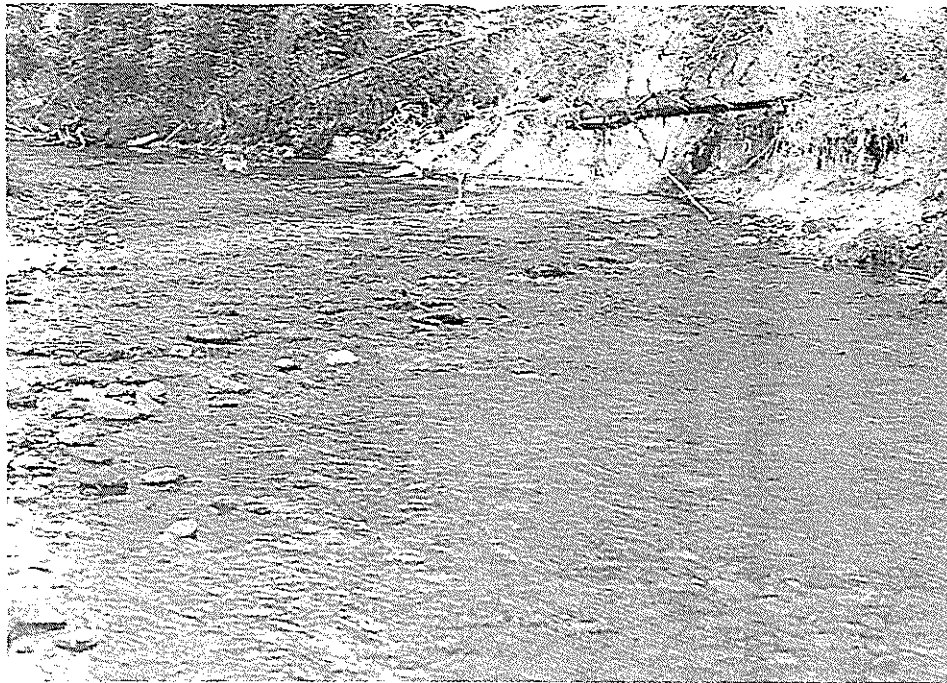


Photo 6. Riffle area of reach 3 (technically in Moose Creek). Bull trout reportedly spawn in this area.

Major Tributaries:

Fraser Creek.

Fraser Creek enters the Beaverfoot River approximately 2 km upstream of the confluence with the Kicking Horse River. The lower one kilometer of Fraser Creek is accessible to fish from the Beaverfoot. Three culverts placed for the logging road create a one metre high barrier blocking further upstream movement of fish (Photo 7). Bull trout and mountain whitefish were collected below the culverts but no fish were found upstream of the barrier. The lower section of this creek may provide spawning habitat for bull trout however, observations suggest that lower sections of this stream may be unstable during high spring flows (Photo 8).

Ice River:

Is the longest tributary flowing generally south for approximately 20 km through Yoho National Park entering the Beaverfoot River in the lower section of reach 2 (Photo 9). During this survey only the mouth and a location 4 km upstream were visited. In the lower 1.2 km, or the first reach of the Ice River the gradient is 3% and the stream is primarily tumbling riffle with large cobble and boulders. This is followed by a 1.7 km section of slower water with a 1.5% slope. At the point where the stream survey card was completed the stream gradient increased to 3.4% and was similar to the first reach. Since this river is primarily under the jurisdiction of Parks Canada a detailed study was not done, however studies by Parks Canada (Murdy 1975, Pole 1991) reported finding bull trout, pygmy whitefish, mountain whitefish, eastern brook trout, and slimy and torrent sculpins in the Ice River. Bull trout captured near the mouth of Ice River were between 98 and 196 mm and further upstream char up to 229 mm were captured along with mountain whitefish up to 258 mm (Pole 1991).



Photo 7. Culverts on Fraser Creek.



Photo 8. Fraser Creek at site 2.

Moose Creek:

The lower section of Moose Creek has been described as part of reach 3 of the Beaverfoot River. Moose Creek begins at the 2286 m elevation and drops to 1676 in the upper 6 km with stream gradients between 4 and 19% and from there slowly drops to 1112 m elevation (Figure 2). There is no road access to the upper section of Moose Creek so there was only a cursory evaluation of this area by helicopter. For approximately 5 km upstream of reach 3 the creek meanders through a forested valley with some open meadows with a gradient of 1 to 1.6%. The stream has sections of overstory cover and LOD is evident in the stream channel (Photo 10).

3.1.1 Resource Development

Logging and mining are the two main activities that are or will impact on the fisheries resource in this watershed. The Beaverfoot valley has been extensively logged along its length except for the majority of the Ice River watershed which is in Yoho National Park. Evans Forest Products holds the cutting rights for most of this valley and a review of their 5 year cutting plan is summarized in Table 2. Between 1991 and 1986 a total of 172 ha will be logged primarily in the Moose Creek drainage.

Mining has not been active in this watershed historically, but there are now 3-4 mineral claims in the area which may be potential sources of impacts on the Beaverfoot River fisheries resource. Currently there is a proposal to develop a magnetite/titanium mine in the headwaters of Moose Creek. Development of this mine would require upgrading existing logging roads and an extension of the roads into the headwaters of Moose Creek. With logging planned for the upper part of the Moose Creek drainage in 1995 and 1996 the extended logging roads will facilitate further mining exploration and the development of the mine in this area.



Photo 9. Confluence of Ice River and Beaverfoot River.



Photo 10. Meandering Section of Moose Creek.

3.2 BLAEBERRY RIVER

3.2.1 Introduction

The Blaeberry River flows approximately 64 km in a south westerly direction from the Waputik Mountains on the western edge of Banff National Park, into the Columbia River 18 km north of Golden, British Columbia. The total drainage area is approximately 738 km² beginning at an elevation of 1341 m and dropping to 790 m at the mouth (Figure 4). The river is relatively cold with much of the flow in the upper reaches coming from glacially fed streams. During this study the water was clear and cold, ranging between 3.5 and 7°C. At the time of this field study the WSC gauge near Ensign Creek (approximately 46 km upstream from the confluence) recorded discharges of approximately 3.2 m³/s and at the gauge near Willowbank Creek the discharge was 7.6 m³/s. The annual discharge profile based on 19 years of data (Environment Canada 1989) is presented in Figure 5.

The lower Blaeberry River is accessible to fish in the Columbia River but the upper reaches are cutoff by a canyon area that contains a falls 9 metres high. There has been considerable logging activity in the watershed with logging roads extending approximately 50 km up the valley. Figure 6 show the location of reach breaks and sample sites and Table 3 provides a summary of the characteristics of the reaches surveyed.

3.2.2 Summary by Reach

Reach 1 (0 - 5.5 km)

The first reach extends approximately 6 km upstream with an average gradient of less than 1% and generally exhibits long glides with riffle sections (Photo 11). Deep water in some of the glide sections, submerged LOD, and small boulders provide habitat for fish, however, the riffle sections tend to be wide and shallow with little cover for fish. There are deposits of clean gravels that would be suitable for

Table 2. Summary of logging activity in the Beaverfoot River watershed*.

(Area proposed for cutting in hectares)

Location	Year of Cut						Totals
	1991	1992	1993	1994	1995	1996	
Dinard Cr.	9	0	0	0	0	0	9
Moose Cr.	0	0	0	0	58	45	103
Mid-Section	0	30	30	0	0	0	60
Total	9	30	30	0	58	45	172

*The areas presented here are estimates taken from five year development plans and some of the cutting plans are not approved at this time (Nov. 1991).

Figure 4. BLAEBERRY CREEK PROFILE

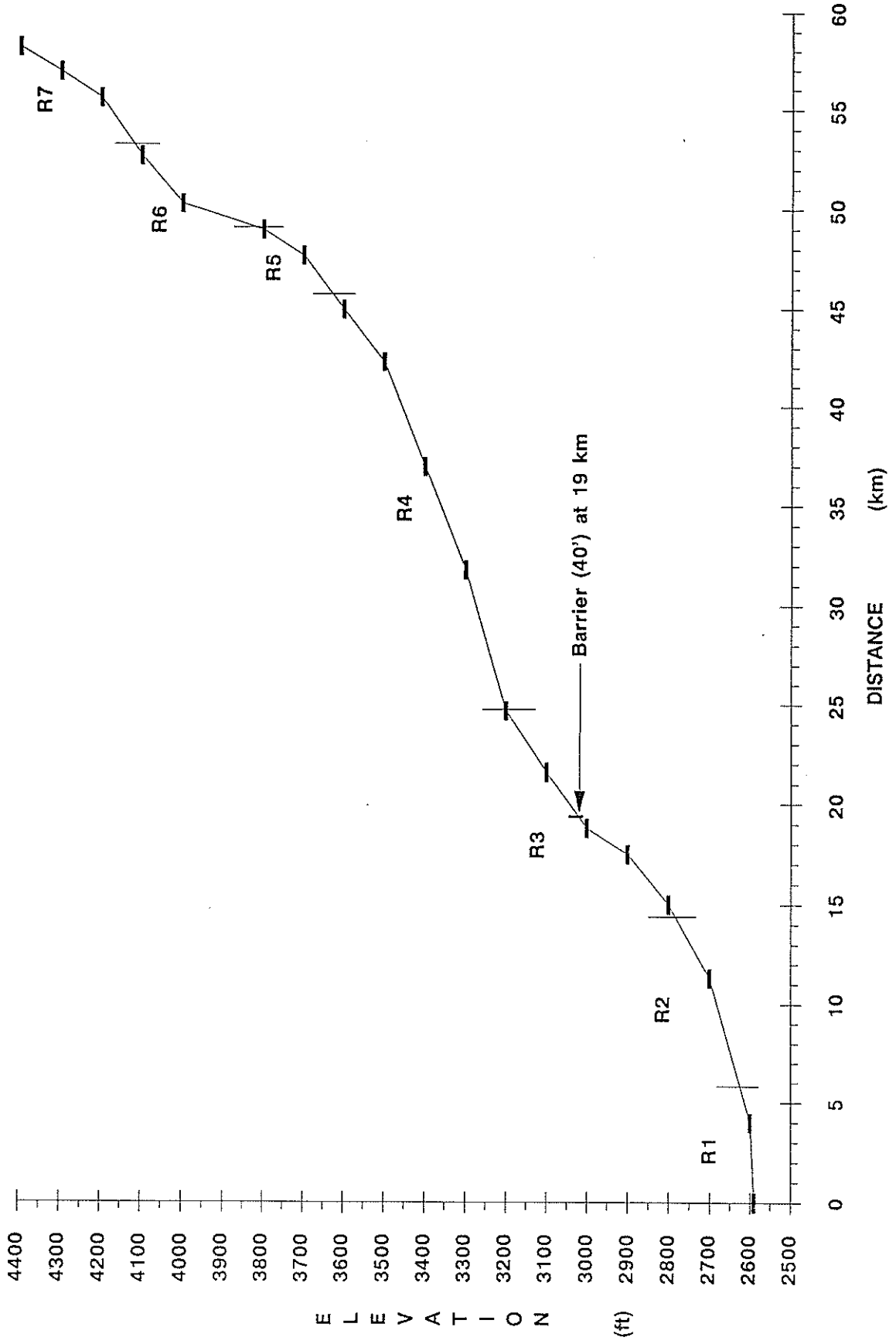


Figure 5. Blaeberry River Discharge (m^3/s)
near Willowbank Cr. (n=19 yrs)

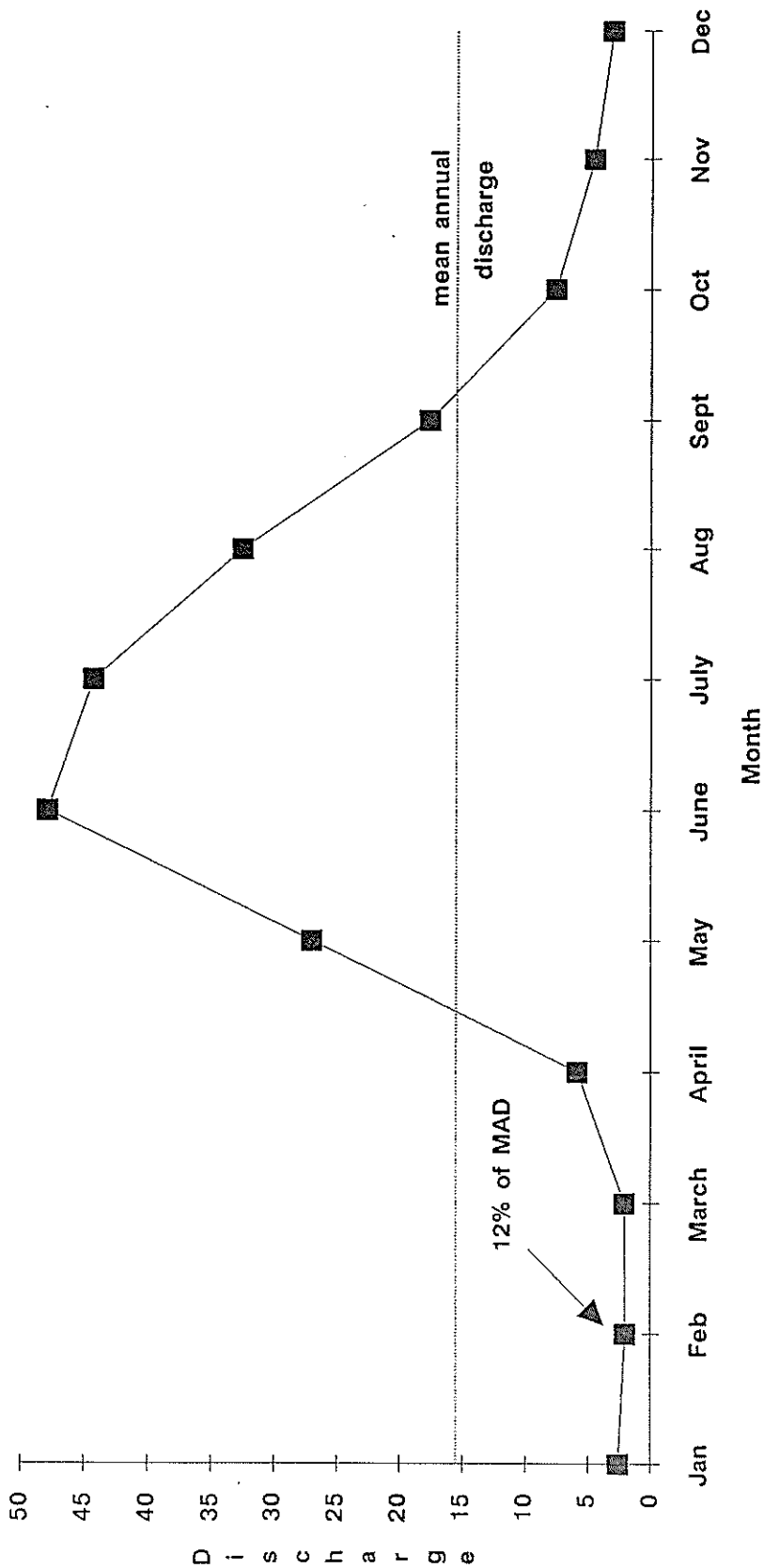






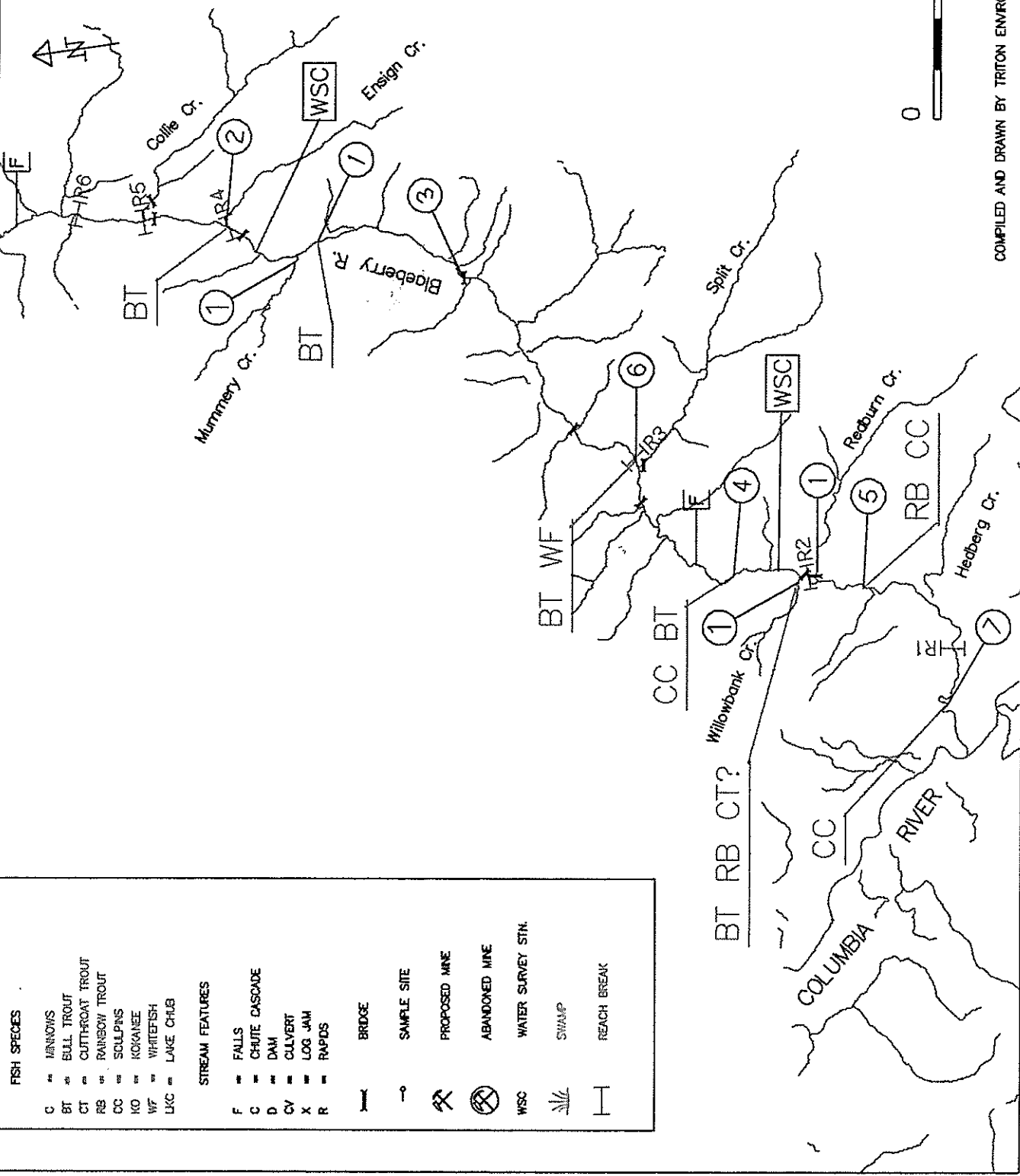


Figure 6: Blaeberry River Sampling Sites and Habitat Map .

FISH SPECIES	
C	" MINNOWS
BT	" BULL TROUT
CT	" CUTTHROAT TROUT
RB	" RAINBOW TROUT
CC	" SCULPINS
KC	" KOKANEKE
WF	" WHITEFISH
LKC	" LAKE CHUB
STREAM FEATURES	
F	" FALLS
C	" CHUTE CASCADE
D	" DAM
CV	" CULVERT
X	" LOG JAM
R	" RAPIDS
	BRIDGE
	SAMPLE SITE
	PROPOSED MINE
	ABANDONED MINE
WSC	WATER SURVEY STN.
	SWAMP
	REACH BREAK



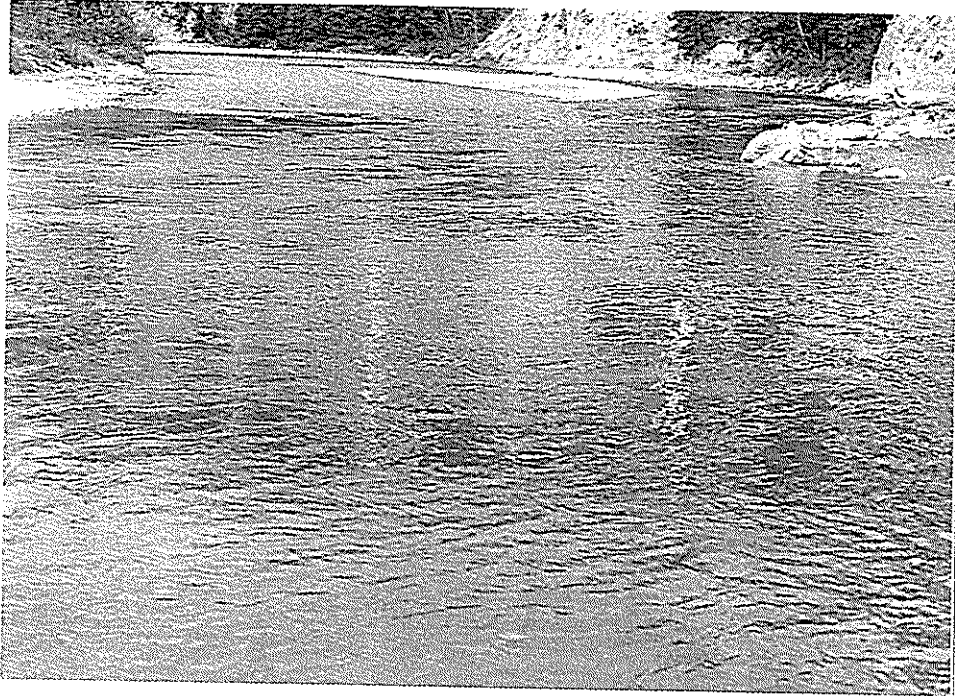


Photo 11. Run section of reach 1 of Blaeberry River.

spawning. Only one site was electroshocked in this reach producing only one sculpin.

Reach 2 (5.5 - 14 km)

Reach 2 extends approximately 8.5 km from the top of reach 1. This also has a low gradient but the valley is much wider where the stream is depositing gravels and in some sections is very braided with the wetted channel consisting primarily of shallow riffles (Photo 12). Most of the fish habitat in this section is associated with the stream banks where woody debris has fallen into the channel, cut banks or overhanging vegetation could be utilized. However, this covers only a small fraction of the wetted stream. LOD in mid-channel was sitting out of the water on gravel bars at the time of this survey.

A 26 m section of river bank and organic debris was shocked in this reach (Photo 13). Two rainbow trout and six sculpins were captured. Both trout were young of the year. Kokanee were observed migrating through and spawning in this reach.

Reach 3 (14 - 25 km)

This section of the river extends upstream for 11 km with an average gradient of 1.2%. This section flows through a more confined valley than the lower reaches and includes several areas where the channel cuts through bedrock forming canyon like sections (Photo 14). One such section includes Blaeberry Falls which is 9 m high. Between the sections of falls, chutes and deep pools, the stream consists of riffles separated by short runs and the stream channel predominantly consists of cobble and boulders (Photo 15).

Kokanee utilize the river up to the canyon section at Blaeberry Falls and were observed spawning in side channels. Electroshocking 29 m of edge habitat in the mainstem downstream of the falls produced 2 sculpins. Forty-six meters of an adjacent side channel was shocked and 1 bull trout 183 mm long and 10 sculpins were captured. The side channel contained greater proportion of gravels than the main channel which were being utilized by the spawning kokanee.

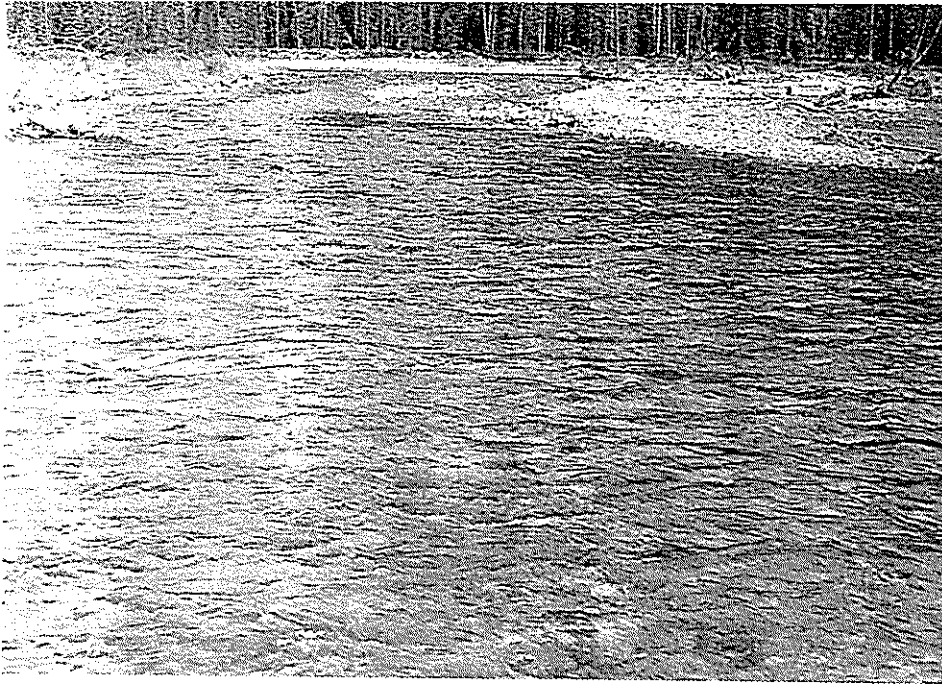


Photo 12. Typical stream character of reach 2, at site 5 of Blaeberry River.



Photo 13. Area electroshocked at site 5, reach 2, Blaeberry River.



Photo 14. Section of canyon in reach 3, Blaeberry River.

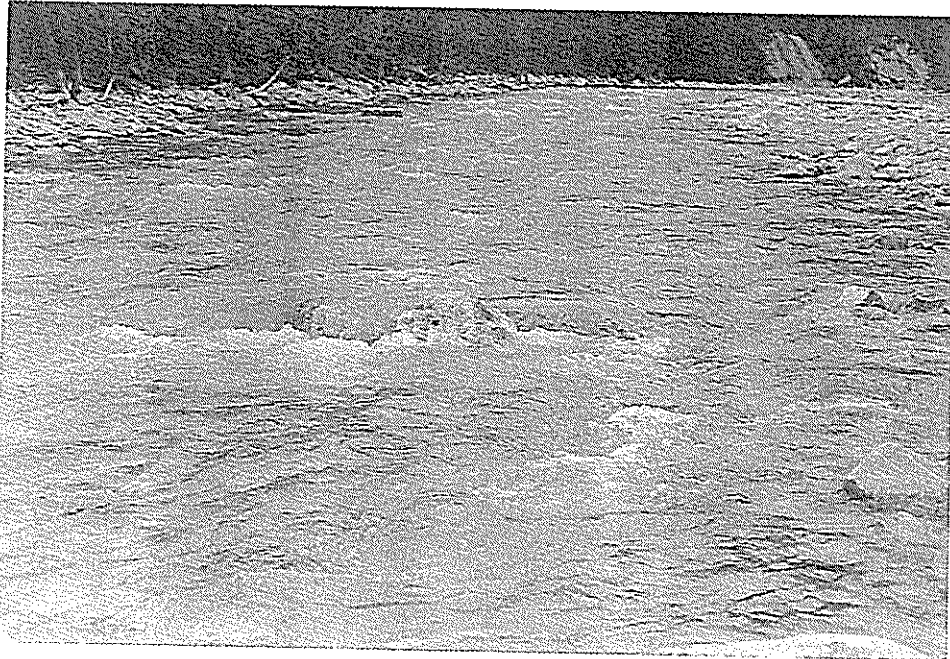


Photo 15. Riffle section of reach 3, at site 4, Blaeberry River.

Reach 4 (25 - 46 km)

This is the longest reach on the stream, extending for 21 km with a wide, low gradient valley. The stream channel is very wide and braided in this area (Photo 16). At the time of this survey an average of 30% of the stream channel was wetted, the rest consisted of dewatered bars. There was little habitat in the channels with considerable amounts of LOD deposited on the bars similar to reach 2. The substrate consisted of gravels and small cobble and the main fish cover was provided by the little LOD that was actually in the wetted channel, however, in some areas small boulders also provided fish habitat. The stream channel in this area was generally unstable.

Three sites were sampled in this reach capturing bull trout and mountain whitefish. Most of the fish were taken from quiet side channels and from a small tributary stream that meandered through a grassy meadow to the mainstem. 48 m of mainstem was shocked at site 3 but no fish were captured which was consistent with the minimal amount of fish habitat found in the mainstem (Photo 17). The bull trout ranged from 70 to 160 mm and 0+ to 3+ in age. The whitefish were all between 40 and 60 mm.

Reach 5 (46 - 50 km)

This reach is a relatively steep section with a gradient of 3.5% and approximately 3.6 km long. The substrate consists of mostly cobbles and boulders with some pockets of gravel. The stream is primarily riffles with some run and pool areas (Photo 18). Fish habitat is available in the form of LOD, boulders, and some cutbanks.

This section of stream seems to be prone to significant annual movements of bed material. Collie Creek which enters at the upstream end of this reach appears to have deposited a large volume of cobble and gravel into the Blaeberry River sometime in the past year (Photo 19). A bulldozer had been used to establish a new channel to divert the river away from the logging road on the right bank and a berm of loose cobble and gravel was built up possibly to try and minimize future damage to the logging road.

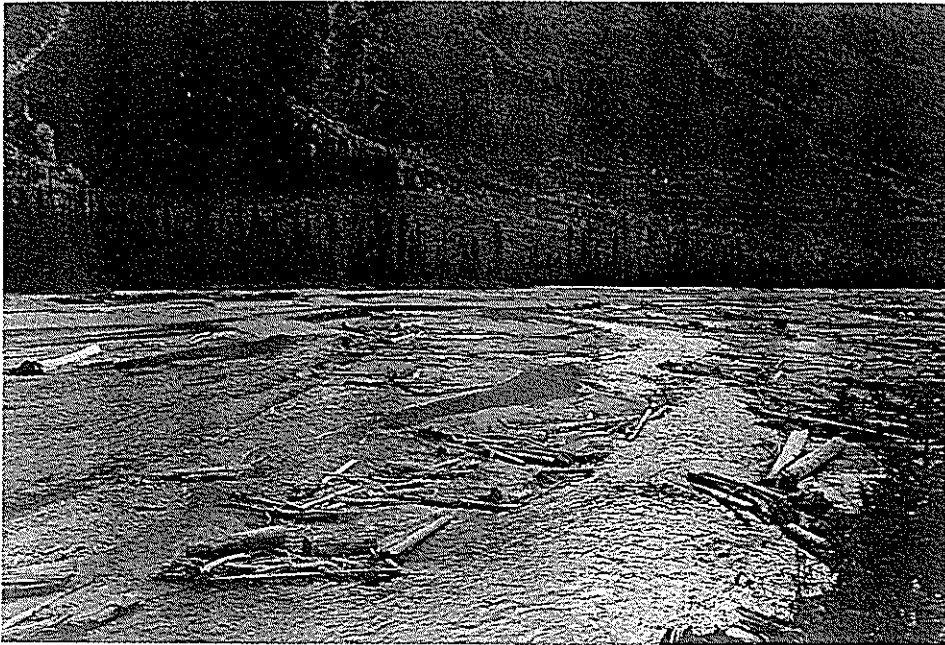


Photo 16. Braided section of reach 4, Blaeberry River.

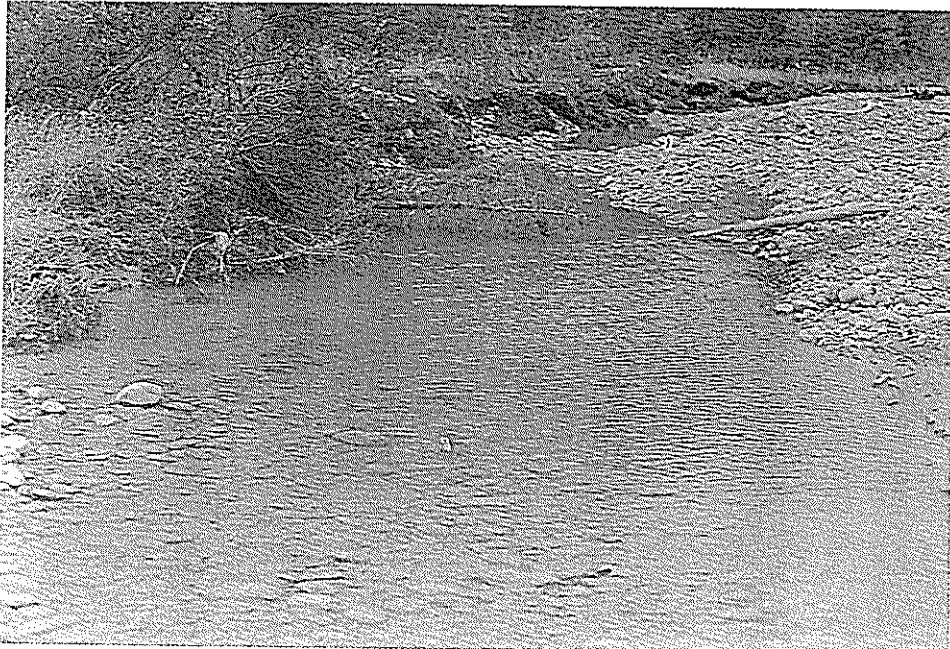


Photo 17. Side-channel at site 1, Blaeberry River, where bull trout were captured.



Photo 18. Steep section with boulders in reach 5 of Blaeberry River.



Photo 19. Mouth of Collie Creek showing deposits of bed load.

Electroshocking was carried out at the mouth of Ensign Creek, the side-channel that the creek flows into, and a 22 m section of the main channel. Two bull trout were taken from the mouth of Ensign Creek and 7 from the side channel but no fish were collected from the mainstem. The fish ranged from 50 to 200 mm fork length and ages 0+ to 3+.

Reach 6 (50 - 53 km)

This section of river is 2.7 km long with a low gradient of just over 1%. The valley is wide and the channel becomes very braided in this reach (Photo 20). The substrate consists of gravel, cobble, and sand with less LOD in the channel due to the reduced amount of logging in this upper section of the river. No electrofishing was carried out in this section and no fish were seen.

Reach 7 (53 - 65 km)

This reach appears to extend the final 10+ km up to the headwaters of the Blaeberry River. This section is fairly confined, primarily riffle with large substrate. The gradient is generally greater than 2% and there is a small falls approximately 2 km upstream of Wildcat Creek. The logging road extends only a short distance into this section of the valley which is generally unlogged. No electrofishing was done in this reach.

Tributaries

Split Creek:

Split Creek enters the Blaeberry River 24 km upstream of the Columbia River. The stream flows approximately 14 km originating at an elevation of 1900 m near the boundary to Yoho National Park. At the point where the logging road crosses this creek, approximately 200 m upstream from the Blaeberry River, the stream appears to be very unstable (Photo 21). There has been considerable instream work with heavy equipment to channelize the stream and protect the bridge crossing. This lower section of Split Creek contained minimal fish habitat.



Photo 20. Aerial view of braided channel in reach 6 of Blaeberry River.



Photo 21. Split Cr. just upstream of logging road crossing.

Redburn Creek

This creek flows 12 km from its headwaters entering the Blaeberry River 13 km upstream from its confluence with the Columbia River. The lower section of this creek was accessible and observed. It contained mostly cobble and boulders with small areas of gravel. The banks obviously erode during high water although at this time the stream flow was generally confined to a small channel away from the main stream banks. The gradient in this area was 3%. This lower section of the creek did not contain much suitable fish habitat although fish would be able to migrate through here.

Hedberg Creek

This small creek is 8 km long entering Blaeberry River 9 km upstream from its confluence with the Columbia River. At the time of this study this creek had almost no flow. The channel indicates that it is subjected to high flood flows and the channel configuration probably changes significantly during flood events. There appears to be little fisheries potential in this creek (Photo 22).

Willowbank Creek

This small creek is approximately 10 km long, entering Blaeberry River 14 km upstream of the confluence with the Columbia River. The lower 1 km of the creek remains unlogged and it was this section of stream that was surveyed. The wetted stream channel was 4 m across with complexes of LOD and boulders and stream side vegetation overhanging the channel. In one area just upstream from the logging road bridge crossing, a series of man-made pools had been created with small weirs of rocks and logs. Two of the pools were shocked and 12 rainbow trout between 38 and 125 mm were taken. These fish were 0+ to 2+ in age and had an average condition factor of 1.3. A riffle/pool area was shocked downstream of the bridge and 4 rainbow and 3 bull trout were collected (Photo 23). The bull trout were all young of the year while the largest rainbow, 208 mm, was 3+. These fish also had condition factors over 1. The rainbow trout showed some evidence of hybridization with cutthroat trout with characteristics such as spotted tails and yellowish marks on the throat but teeth were not evident on the base of the tongue.



Photo 22. Hedberg Creek just upstream of road crossing.



Photo 23. Willowbank Creek; section of creek that was electrofished.

3.2.3 Resource Development

Contemporary resource development in this watershed is centered around logging. The main logging road extends up to Collie Creek along the right bank of the river. The majority of the logging in this watershed has occurred on the north side of the valley. However areas have been logged along the south side of the valley up to Blaeberry Falls. Logging by independent contractors has focused on the area between Split and Redburn Creeks, which in the last 3 years accounted for approximately 150 ha being logged. According to the 5 year development plan, small business logging will continue to be focused on the lower half of the river with a total of 166 ha to be logged mostly from 1993 to 1996 (Table 4).

Evans Forest Products holds timber rights to land upstream of Split Creek as well as land in the Willowbank Creek drainage where 30 ha was logged in 1991. According to the development plan a greater amount of land was logged over the last few years than will be over the next 5. Most of the proposed logging will occur between 1993 and 1996 when approximately 331 ha will be logged above Split Creek. In total 527 ha or 0.7% of the entire land area of the watershed will be logged over the next five years.

3.3 BLUEWATER CREEK

3.3.1 Introduction

The lower 20 km of Bluewater Creek flows in a southerly direction, entering the Columbia River approximately 33 km north of Golden, British Columbia. The upper 23 km of the creek flows in a westerly direction, originating in the Campbell Ice Field at an elevation of 1980 m. The mouth of Bluewater Creek is approximately 777 m elevation. Water temperatures ranged between 3.5 and 7°C. The discharge in Bluewater Creek approximately 31 km upstream from the mouth was estimated to be 1.1 m³/s and 800 m from the mouth the flow was approximately 3.9 m³/s.

Table 4. Summary of logging activity in the Blaeberry River watershed*.

(Area proposed for cutting in hectares)

Organization	Location	Year of Cut						Totals
		1991	1992	1993	1994	1995	1996	
		0	12	78	0	16	60	166
Small Business	Split - Ensign	0	0	59	22	116	0	197
Evans Forest	Above Ensign	0	0	0	0	50	66	116
Products	Willowbank Cr.	30	0	0	0	0	18	48
Total		30	12	137	22	182	144	527

*The areas presented here are estimates taken from five year development plans and some of the cutting plans are not approved at this time (Nov. 1991).

Much of the creek flows through a well defined valley and is very confined in some areas producing chutes and sections of high velocities. The stream profile is presented in Figure 7. Figure 8 is a map of Bluewater Creek showing the location of reach breaks and sample sites, and major tributaries. Table 5 summarizes stream characteristics on a reach by reach basis.

Kokanee were observed spawning through the lower section of this creek. The study team worked in this area from October 6 to 12, 1991 and it appeared that the kokanee run in Bluewater Creek peaked around October 9th.

3.3.2 Summary by Reach

Reach 1 (0 - 4.5 km)

This reach extends 4.5 km up from the confluence with the Columbia River. Blackwater Creek empties into the Bluewater near the top of this section. This reach begins as a wide, braided channel at the confluence and proceeding upstream the stream character becomes primarily run/riffle with gravel and cobble substrate and has a gradient of approximately 0.5% (Photo 24 and 25). Cover for fish is provided primarily by boulders which are more numerous in the upper section of this reach than near the mouth. LOD has been deposited on the banks and provides some habitat along the margins of the stream channel.

Kokanee were observed throughout this reach during the survey between October 8 and 11, 1991. Fish were spawning and migrating through to the Blackwater and further up the Bluewater. Electroshocking captured 0+ and 1+ rainbow trout ranging between 35 and 95 mm as well as numerous sculpins. The condition factor of the rainbow caught in this reach ranged between 0.87 and 1.3 with a mean of 1.1.

Reach 2 (4.5 - 26 km)

This reach extends for 21 km through a fairly deep and steep sided valley so that the stream channel is generally well confined with numerous areas where the stream cuts through bedrock. There are two points where bedrock constrictions form falls and chutes. The falls, observed from helicopter, appeared to be in excess of 1 m

Figure 7. BLUEWATER CREEK PROFILE

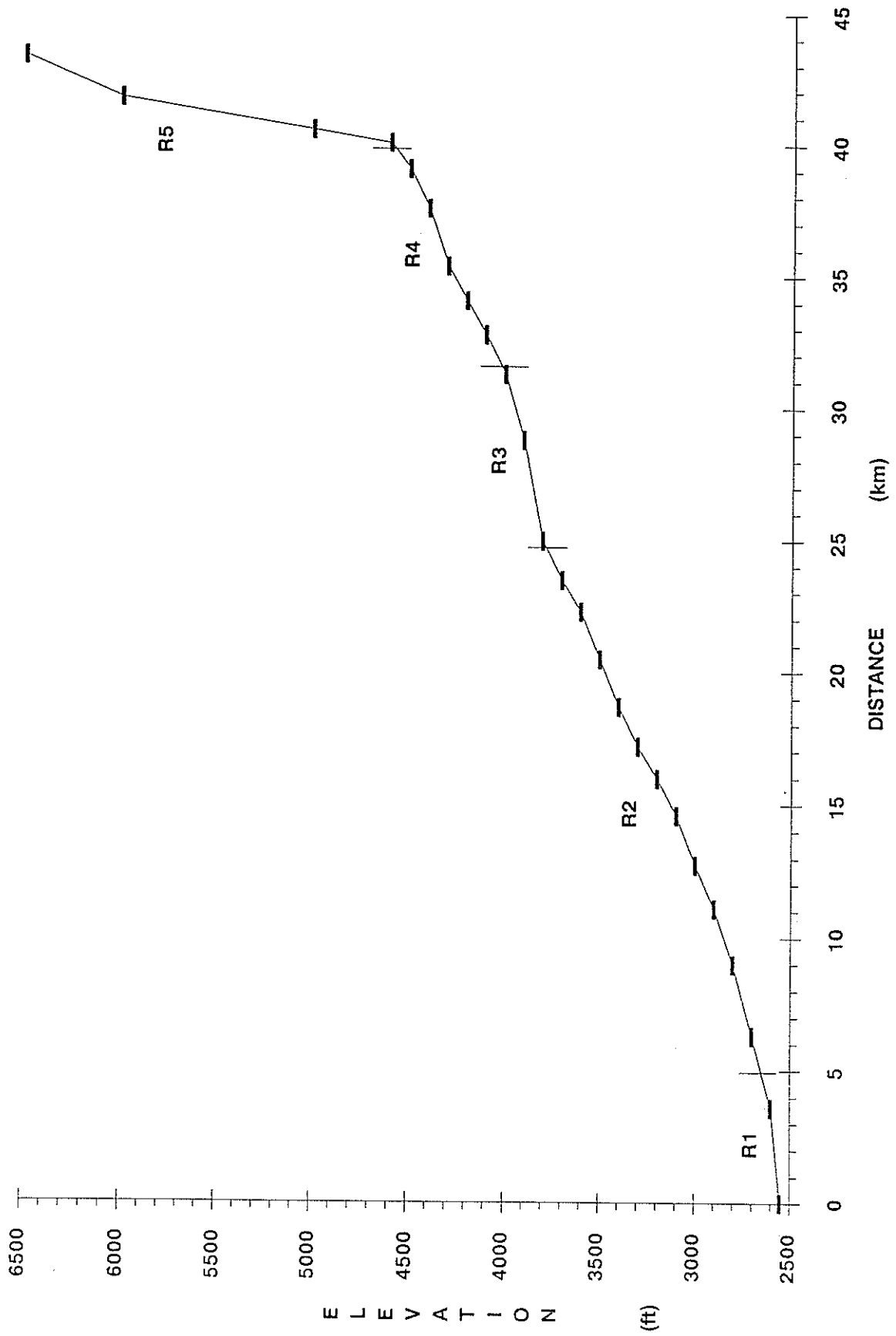
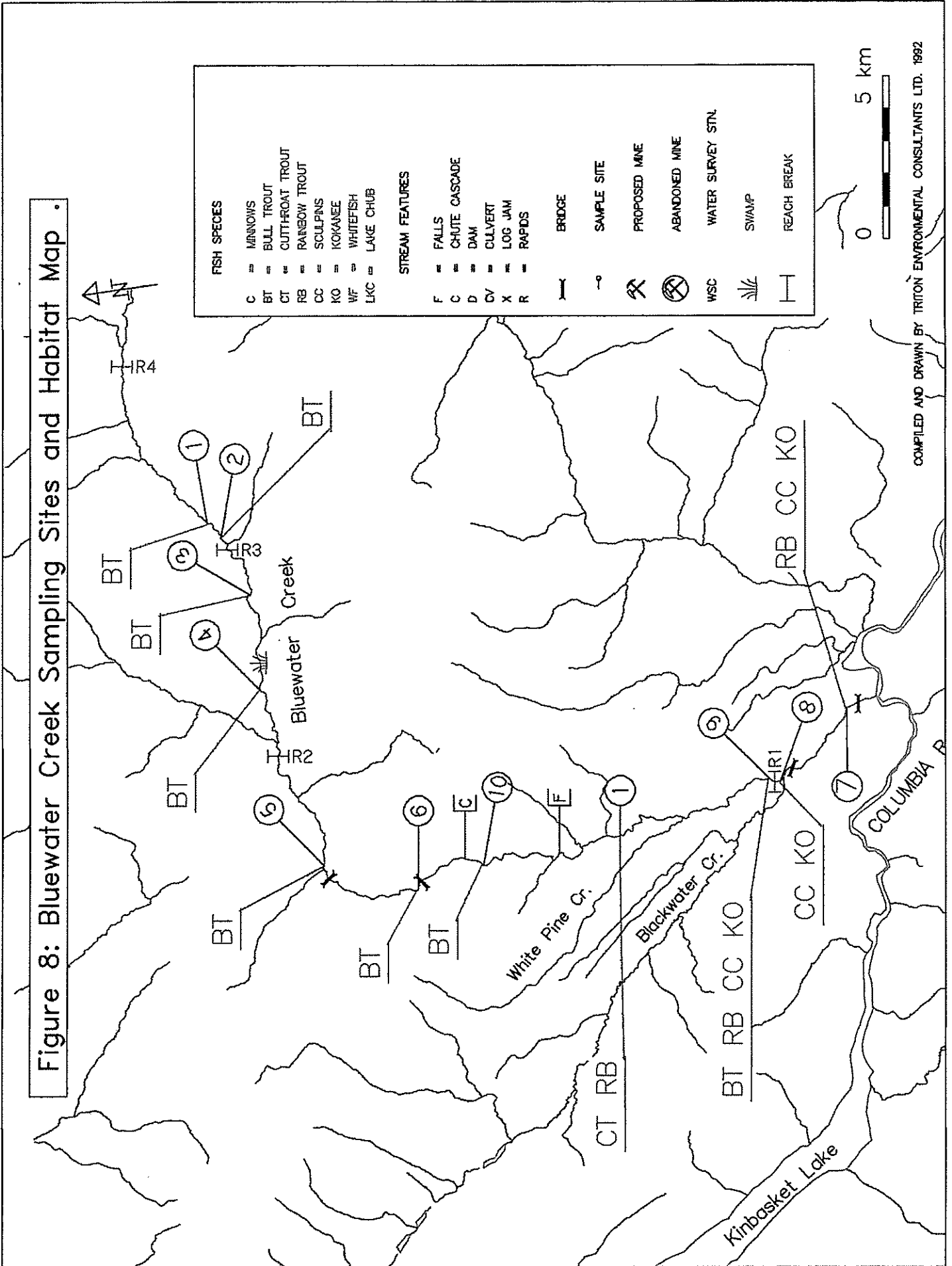


Figure 8: Bluewater Creek Sampling Sites and Habitat Map



COMPILED AND DRAWN BY TRITON ENVIRONMENTAL CONSULTANTS LTD. 1992



Photo 24. Looking downstream to the confluence of Bluewater Creek and the Columbia River.



Photo 25. Riffle section of reach 1 (site 7) of Bluewater Creek with LOD accumulation on left bank.

high and kokanee were holding below the falls (Photo 26). Kokanee were not observed upstream of this barrier. The gradient in this reach averaged 1.6%. The substrate consisted primarily of cobble, boulders, and bedrock with occasional pockets of gravel. The stream character was primarily riffle/run with pools (Photos 27 & 28). While there was not a lot of LOD, cutbanks, or overhanging vegetation to provide cover for fish there were large boulders scattered throughout the stream channel and deep pools.

Kokanee were observed spawning in this reach. Electroshocking was done at 4 sites with rainbow, bull trout, and sculpins found below the falls and only bull trout upstream of the falls. The rainbow trout were age 2+ between 100 and 130 mm with condition factors around 1.0. The bull trout were between 0+ and 3+, 40 and 200 mm long and the condition factors ranged between 0.83 and 1.26 (mean value = 0.96).

Reach 3 (26 - 33 km)

This reach extends for approximately 7.3 km through a wide, flat valley giving the stream a gradient of approximately 1.2%. The stream meanders down the valley with grassy, marsh areas on the inside of the major bends. Beaver activity has produced swamp and pool areas where small tributaries flow into the Bluewater (Photo 29). In the main channel the stream consists of long runs with shorter riffle areas and deep pools (Photo 30). The substrate is primarily gravel and cobble with deposits of sediment in the pools. Cover for fish is provided mainly by deep pools and LOD.

Only bull trout were captured in this reach, ranging from 40 to 140 mm, ages 0+ and 1+ and the condition factors ranged from 0.75 to 1.43 with a mean of 1.01 (Photo 31). The flow of Bluewater Creek in this reach was estimated to be 1.1 m³/s with an average velocity of 0.8 m/s.

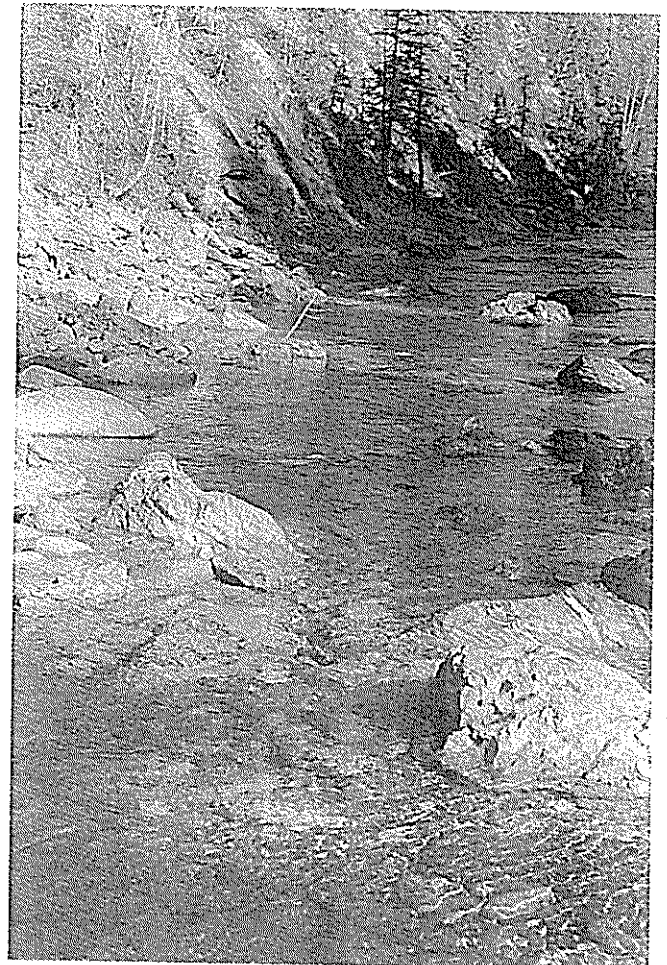
Reach 4 (33 - 40 km)

This reach is 7.1 km long with an average gradient of 2%. The logging road in this valley ends at the mid-point of this reach. The stream channel is more confined than the previous reach consisting primarily of riffles with small chutes and pools



Photo 26. Approximately 2 m high waterfall in middle of reach 2 of Bluewater Creek.

Photo 27. Run/riffle section of Bluewater Creek reach 2, site 9 with boulder habitat.



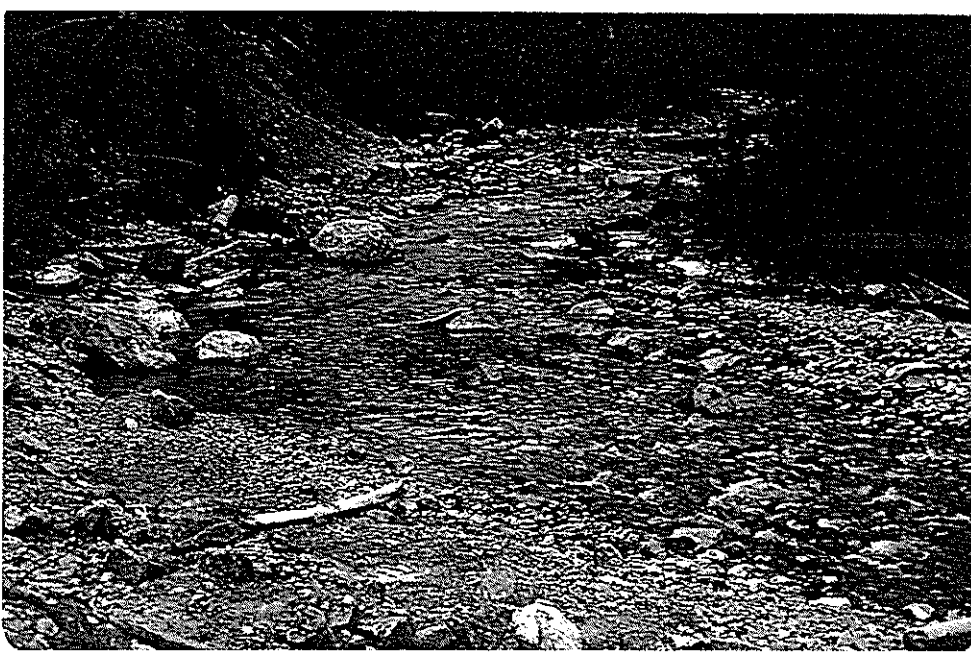


Photo 28. Typical stream character at the top of reach 2, site 5, Bluewater Creek.



Photo 29. Tributary channels enhanced by beaver activity, site 4, reach 3, Bluewater Creek.



Photo 30. Run/riffle and LOD in reach 3, site 4, Bluewater Creek.

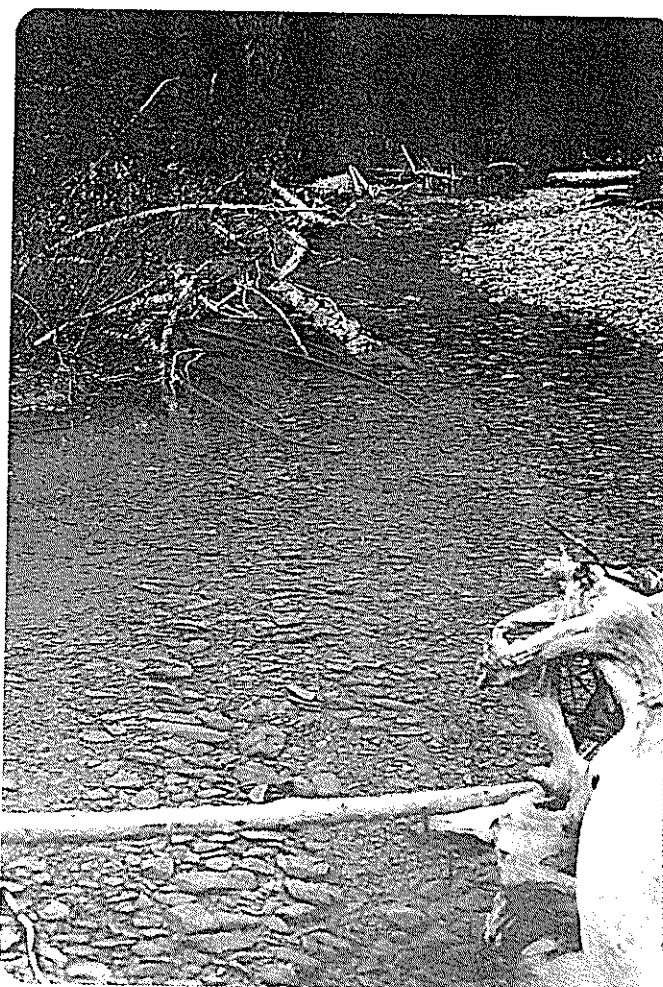


Photo 31. Side channel in reach 3, Bluewater Creek, where bull trout were collected.

around boulders and short glide sections (Photo 32). The substrate is mostly cobble and boulder with smaller gravels in the side-channels. The majority of cover for fish is provided by instream boulders and to a much lesser extent, LOD and cutbanks.

The only fish observed in this reach were bull trout. These fish ranged between 40 and 90 mm with condition factors around 1.0. The density of fish in this area was much less than in the reach immediately downstream.

Reach 5 (40 - 44.5 km)

This reach was not sampled. From the top of Reach 4 the gradient increases sharply and averages 25% over the next 4.5 km to the headwaters. This section of stream has minimal fish habitat.

Major Tributaries:

Whitepine Creek

This creek flows for 12 km before entering the Bluewater in the lower third of reach 2. Because of the general steep nature of the valley sides of Bluewater Creek the lower section of Whitepine Creek is very steep with the slope in the first 300 m averaging approximately 18%. The lower section was observed from a helicopter and appeared to consist of a series of stepped pools. Above this area the stream gradient decreases to less than 5% over the next 5 km. At the site sampled the gradient was 2% and the stream character was shallow riffle/glide with a gravel substrate (Photo 33). Algae was present on the rocks and overhanging vegetation covered much of the stream channel.

This stream appears to be very productive as 22 trout were collected from 34 m of pool/riffle section of stream. These fish appeared to be hybrids of cutthroat and rainbow trout. They had characteristics of both species but in fish over 100 mm long teeth on the back of the tongue were evident. On the smaller fish this characteristic was not as easily detected and there was a mix of fish with a red slash on the throat and those without. The fish captured ranged between 0+ and 3+ and 50 to 165 mm

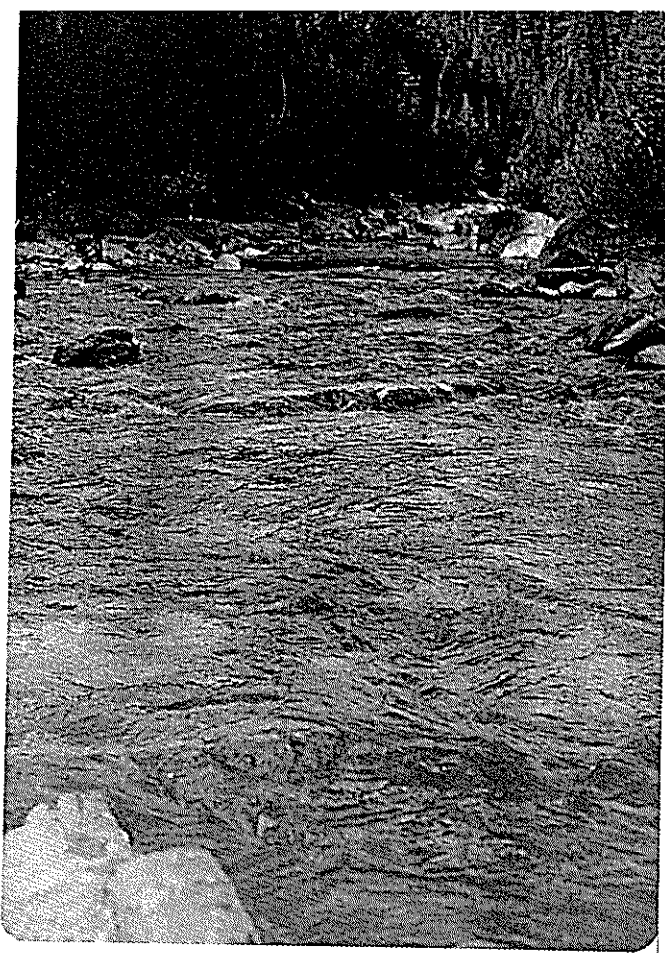


Photo 32. Typical stream character of reach 4, Bluewater Creek.



Photo 33. Sample site, typical of lower section of Whitepine Creek.

in fork length. The condition factor was between 0.77 and 1.25 with an average of 1.02.

3.3.3 Resource Development

The major resource development in this area is associated with logging. The provincial Forest Service has recently completed a logging road that extends up the valley for 38 km. Previous logging in the Bluewater Creek watershed has occurred around the lower 17 km with the upper areas so far being relatively untouched. All the logging planned for this watershed for the next five years will be carried out by independent contractors. Table 6 summarizes the annual logging activity with an anticipated total of 389 ha to be cleared by 1996 with the majority occurring in the top end of reach 2.

3.4 BLACKWATER CREEK

3.4.1 Introduction

This creek is the largest tributary to Bluewater Creek. It flows in a southerly direction for approximately 23 km entering Bluewater Creek 4 km upstream from the Columbia River at an elevation of 800 m. Sixteen kilometres upstream is Blackwater Lake which is fairly shallow, 1 km long by approximately 100 m wide at 950 m elevation. The watershed has been extensively logged. The provincial fisheries branch has stocked Blackwater Lake with rainbow trout beginning in 1939. From 1980 to 1990 the lake has been stocked annually with an average of 4400 fry or yearlings. In 1991 the lake was stocked with 2000 four gram, yearlings. The creek has been stocked with approximately 2000 yearling Gerrard strain rainbow trout annually between 1984 and 1989. In 1985 approximately 200,000 kokanee fry were released into the creek. In conjunction with stocking, the falls and chutes at the mouth of the Blackwater were reduced in height to facilitate access for returning spawners. The gradient profile is provided in Figure 9, reach breaks and sample sites are indicated on Figure 10 and a reach by reach summary of stream characteristics are provided in Table 7.

Table 6. Summary of logging activity in the Bluewater Creek watershed*.

(Area proposed for cutting in hectares)

Location	Year of Cut						Totals
	1991	1992	1993	1994	1995	1996	
Mid-section	40	102	0	0	0	0	142
Top end	0	0	77	41	61	68	247
Total	40	102	77	41	61	68	389

*The areas presented here are estimates taken from five year development plans and some of the cutting plans are not approved at this time (Nov. 1991).

Figure 9. BLACKWATER CREEK PROFILE

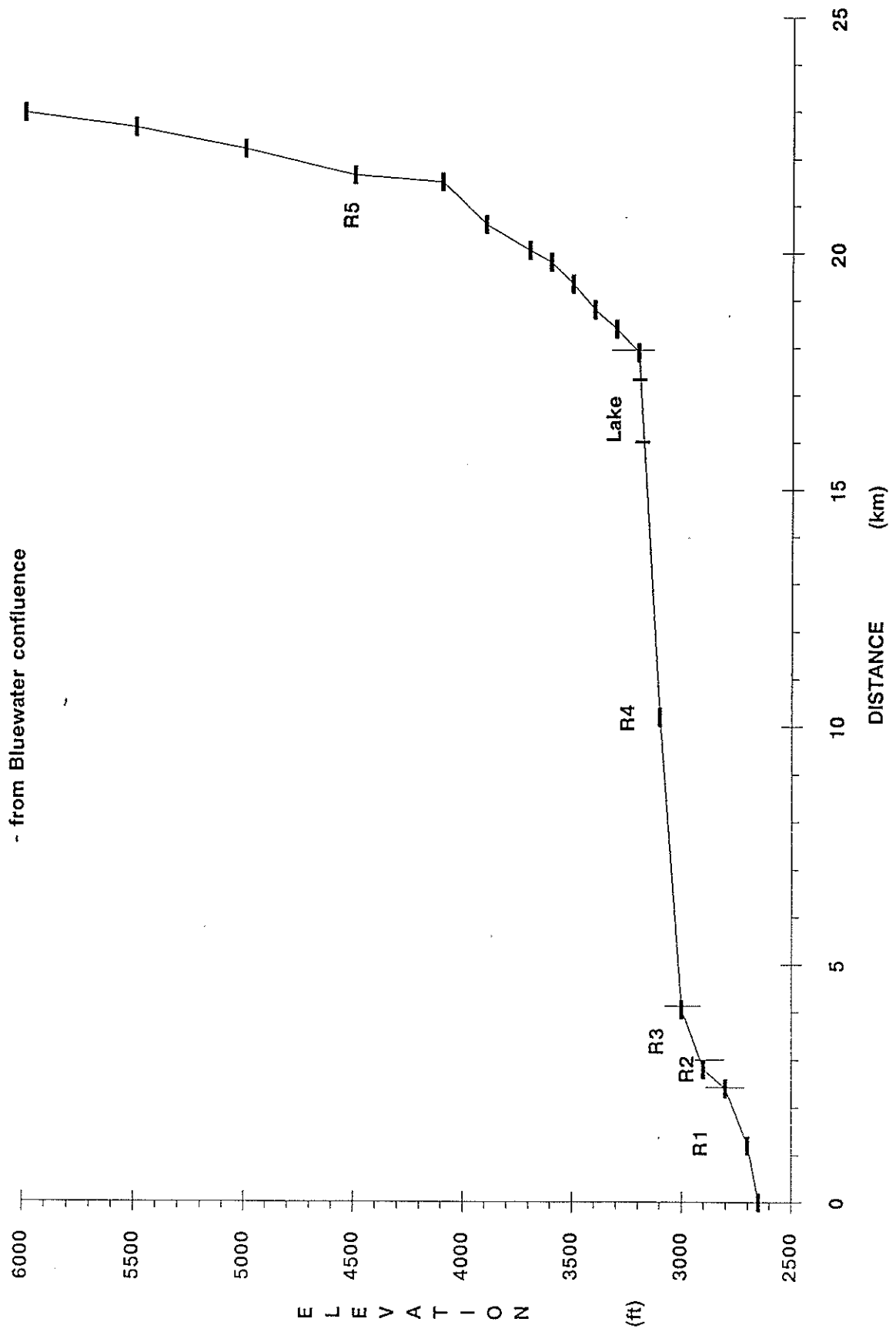
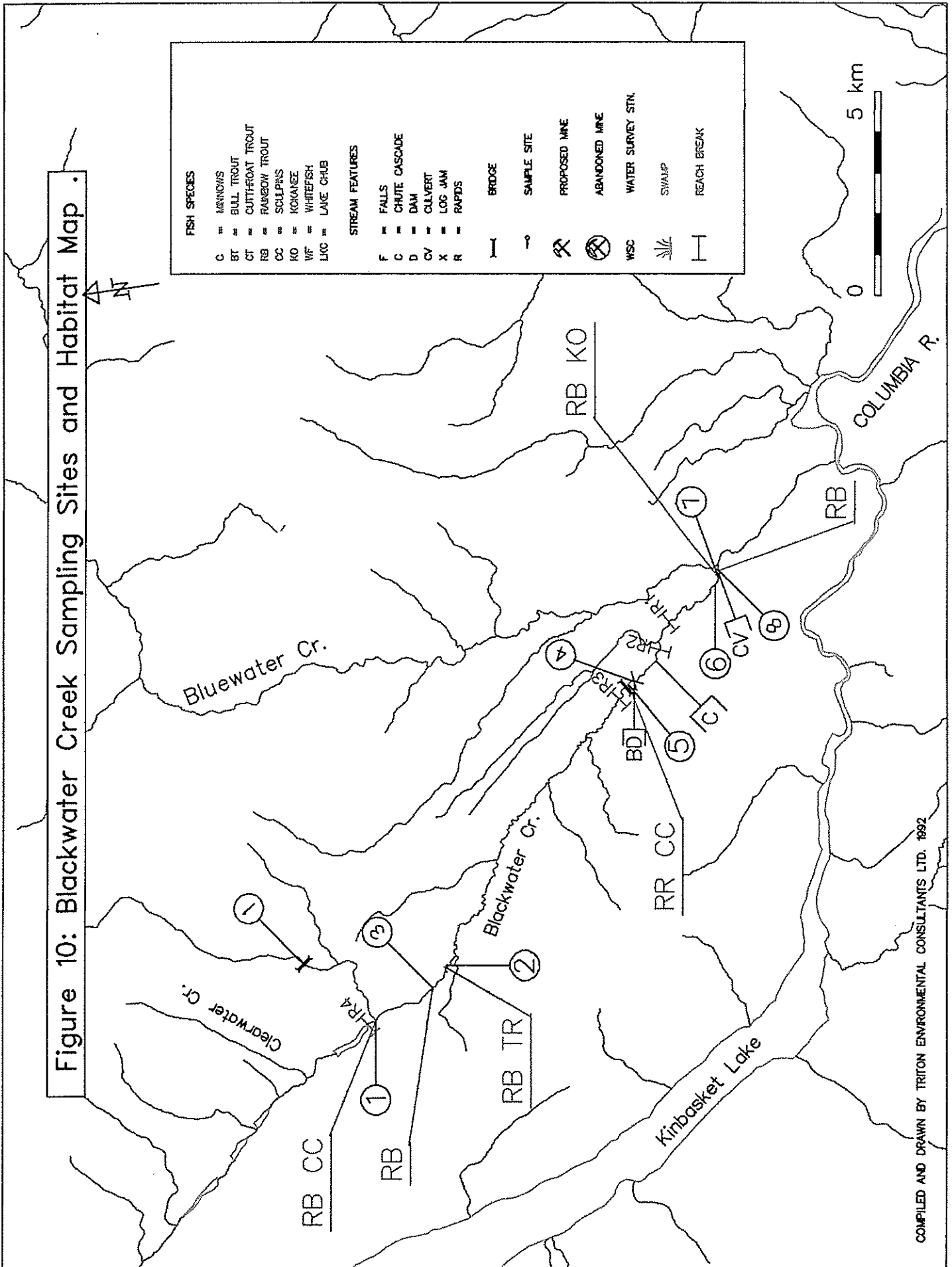


Figure 10: Blackwater Creek Sampling Sites and Habitat Map .

FISH SPECIES		STREAM FEATURES	
C	MINNOWS	F	FALLS
BT	BULL TROUT	C	CHUTE CASCADE
CT	CUTTHROAT TROUT	D	DAM
RB	RAINBOW TROUT	CV	CULVERT
CC	SCULPIN	X	LOG JAM
KO	KOKANEZE	R	RAPIDS
WF	WHITEFISH		BRIDGE
LKC	LAKE CHUB		SAMPLE SITE
			PROPOSED IRIE
			ABANDONED IRIE
			WATER SURVEY STIN.
			SWAMP
			REACH BREAK



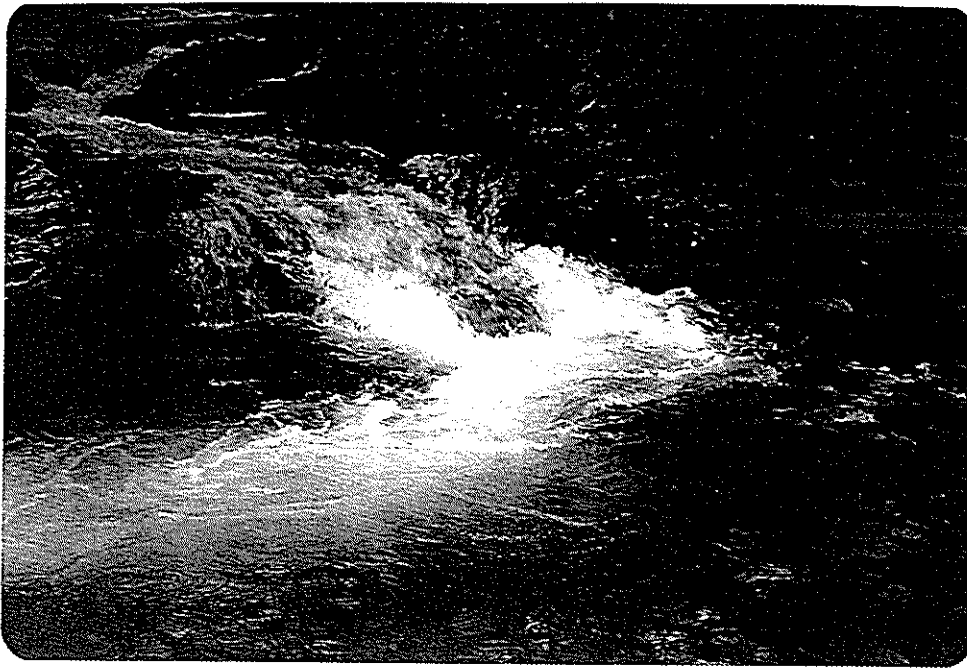


Photo 34. Waterfall at mouth of Blackwater Creek.

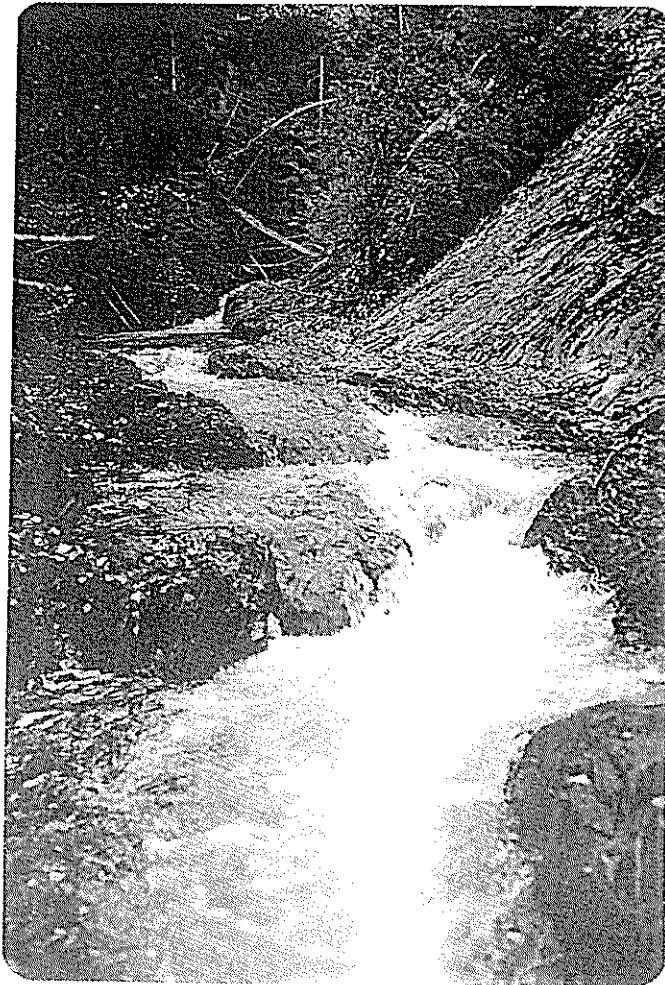


Photo 35. Chutes in reach 1 of Blackwater Creek.



Photo 36. Log jam/beaver dam in reach 3, Blackwater Creek.



Photo 37. LOD and boulders in riffle section, site 5, reach 3, Blackwater Creek.

gravels. Fish habitat throughout the section is provided by boulders, LOD, and to a lesser extent, instream and overstream vegetation (Photo 37).

Fish sampling was done upstream of the beaver dam and rainbow trout and sculpins were collected. A small school of approximately 15 trout (probably rainbow) between 100 and 200 mm were observed in the pool created by the beaver dam. The fish collected by electroshocking ranged between 35 and 104 mm and 0+ and 2+ in age. Condition factors were generally good, between 0.96 and 1.4 with a mean of 1.2.

Reach 4 (5 - 16.5 km)

This is a very low gradient section of the river with an average slope of 0.5% over its 11.5 km. In this section the valley is very wide and flat with the stream meandering through grassy, marsh areas. There is a lot of beaver activity in the area that has caused flooding and the creek flows unconfined through the trees and grass in several areas (Photo 38). Many of the trees on the valley floor have died or are dying from exposure to water from long term flooding. The stream consists of mostly deep glides connected by short, deep riffle sections (Photo 39). In the glide areas the substrate is fine, soft sediment with evidence of considerable biological decomposition occurring within the substrate based on the observed release of gasses while working in these areas. The substrate in the riffle sections is made up primarily of gravel with some fines.

A 30 m section of a deep glide was electroshocked (Photo 40). One 37 mm rainbow trout was captured and a salmonid approximately 100 mm long was observed. A second site in this reach representing the riffle character was shocked. This sampling collected 5 rainbow fry, all in the 0+ age group.

A third site was shocked at the upstream end of this reach just below the outlet of Blackwater Lake, where Clearwater Creek enters Blackwater Creek. While this area had a similar gradient to the rest of reach 3 the influence of Clearwater Creek has resulted in an increase in substrate size and there are more established side channels (Photo 41). Twenty-two rainbow trout and 6 sculpins were captured in this area. The condition factor of these trout ranged from 0.9 to 1.4 with a mean of 1.2. The largest fish, 134 and 152 mm long, were 2+.

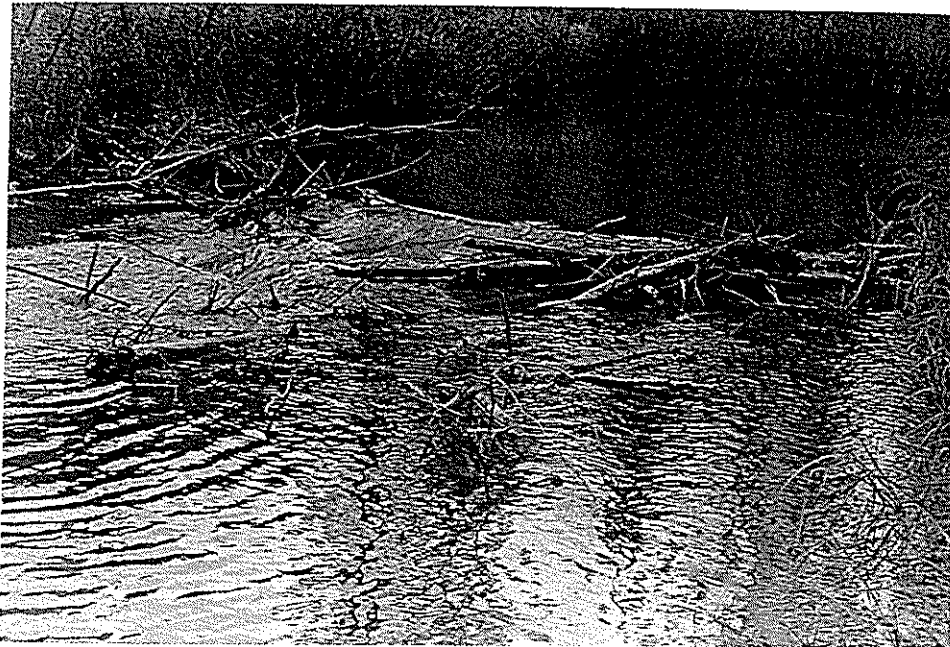


Photo 38. Beaver activity in reach 4 causing flooding in Blackwater Creek.



Photo 39. Section of faster water in reach 4, site 3, Blackwater Creek.



Photo 40. Section of stream electrofished at site 2, Blackwater Creek where one rainbow trout was collected.

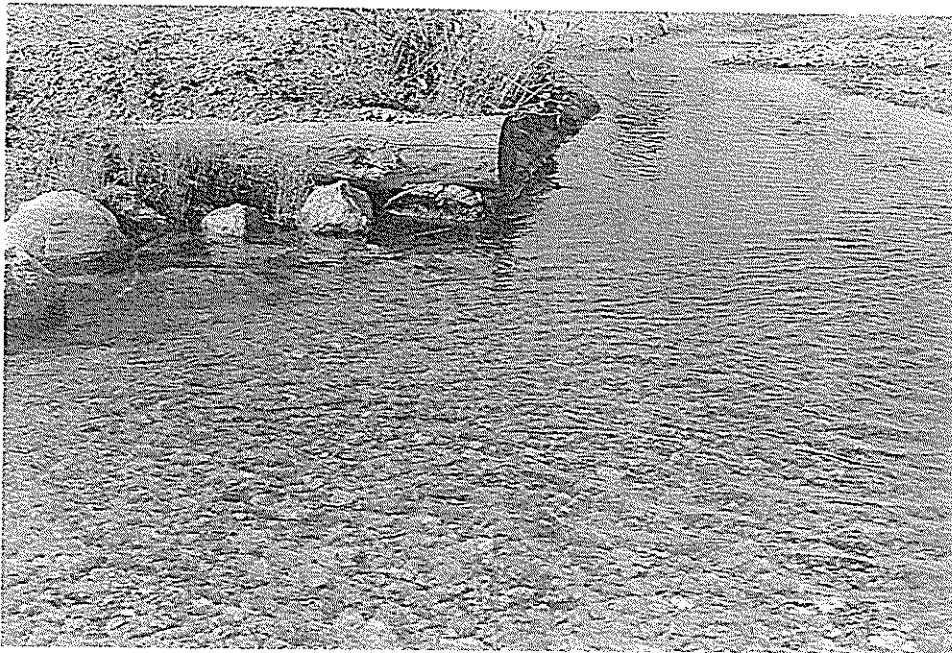


Photo 41. Blackwater Creek just below Blackwater Lake at site 1.

Reach 5 (16.5 - 23 km)

This section of stream was not sampled. Immediately upstream of the lake the stream gradient increases up to 50% as it flows out of the Blackwater Range.

Blackwater Lake:

This lake appears to be relatively shallow and approximately 1.1 km long. The lake contains aquatic vegetation along with grassy edge habitat at either end. The surrounding area has been logged and there is some old logging debris in the lake. A minnow trap was set over night at the south end of the lake but no fish were captured.

Major Tributaries.

Clearwater Creek

Clearwater Creek flows 10 km from small lakes on Blackwater Mountain entering Blackwater Creek just downstream of Blackwater Lake. The 200 m of Clearwater Creek just upstream of Blackwater Creek has a low gradient and substrate of gravel and cobble. Above this is a steep impassable section and a further 1 km upstream the creek opens out into a flat swampy area where the stream channel is very braided and unconfined. Specific observations were made at a logging road crossing 3 km upstream from Blackwater Creek. The substrate was primarily gravel and cobble and the stream channel was generally unconfined and unstable (Photo 42).

3.4.3 Resource Development

Logging is the primary activity in this watershed. The entire area has an extensive network of active and old logging roads and it appears that most of the drainage has been logged in the last 50 years. The five year development plans showed that very little logging is scheduled for this area.

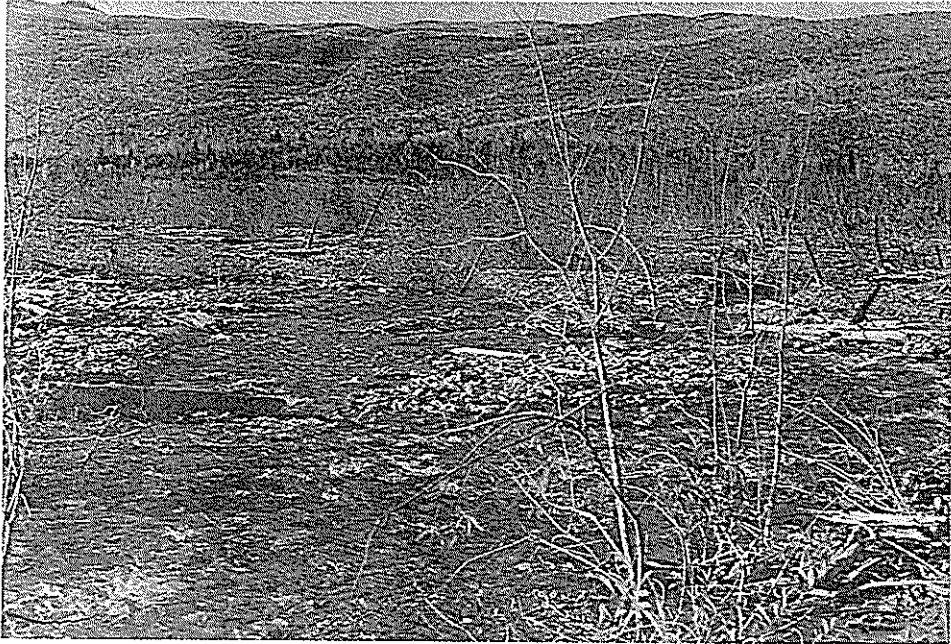


Photo 42. Braided channel of Clearwater Creek.

3.5 CAMP CREEK

3.5.1 Introduction

Camp Creek is a tributary to the Canoe River which flows into Canoe Reach at the north end of Kinbasket Lake. Camp Creek flows in an easterly direction from its origin for 12 km and then turns to a northerly flow for the remaining 18 km to Canoe River. The lower 18 km is a fairly low gradient, meandering channel accessible to migrating fish species and ranges in elevation between 775 and 915 m (Figure 11).

This creek is generally stable and in several sections has been confined by the Yellow Head Highway and the CN railway right-of-ways that border most of the lower 18 km of the creek. Logging has been carried out along the west side of the valley, however, in conjunction with the highway there is generally a good leave strip along most of the creek. Figure 12 shows the location of the major tributaries, reach breaks and sample sites and Table 8 summarizes information on each of the reaches sampled.

Prior to the construction of the Mica Dam large rainbow trout, between 4.5 and 9 kg, were known to spawn in Camp Creek. Peterson and Withler (1965) speculated that these trout were probably migrants known as the Arrow Lakes yellow fin rainbow trout. This report (Peterson and Withler 1965) does not provide details on the timing or numbers of fish that spawned in the creek but locals would fish for these trout in May and early June.

3.5.2 Summary by Reach

Reach 1 (0 - 9 km)

This reach is approximately 9 km long with an average gradient of 1.0%. The flow character is run-riffle with a substrate of gravel and cobble in sand. The channel appears to be stable with sections of cutbanks and overhanging vegetation. Boulders are also in the stream channel and provide habitat for fish. LOD is found

Figure 11. CAMP CREEK PROFILE

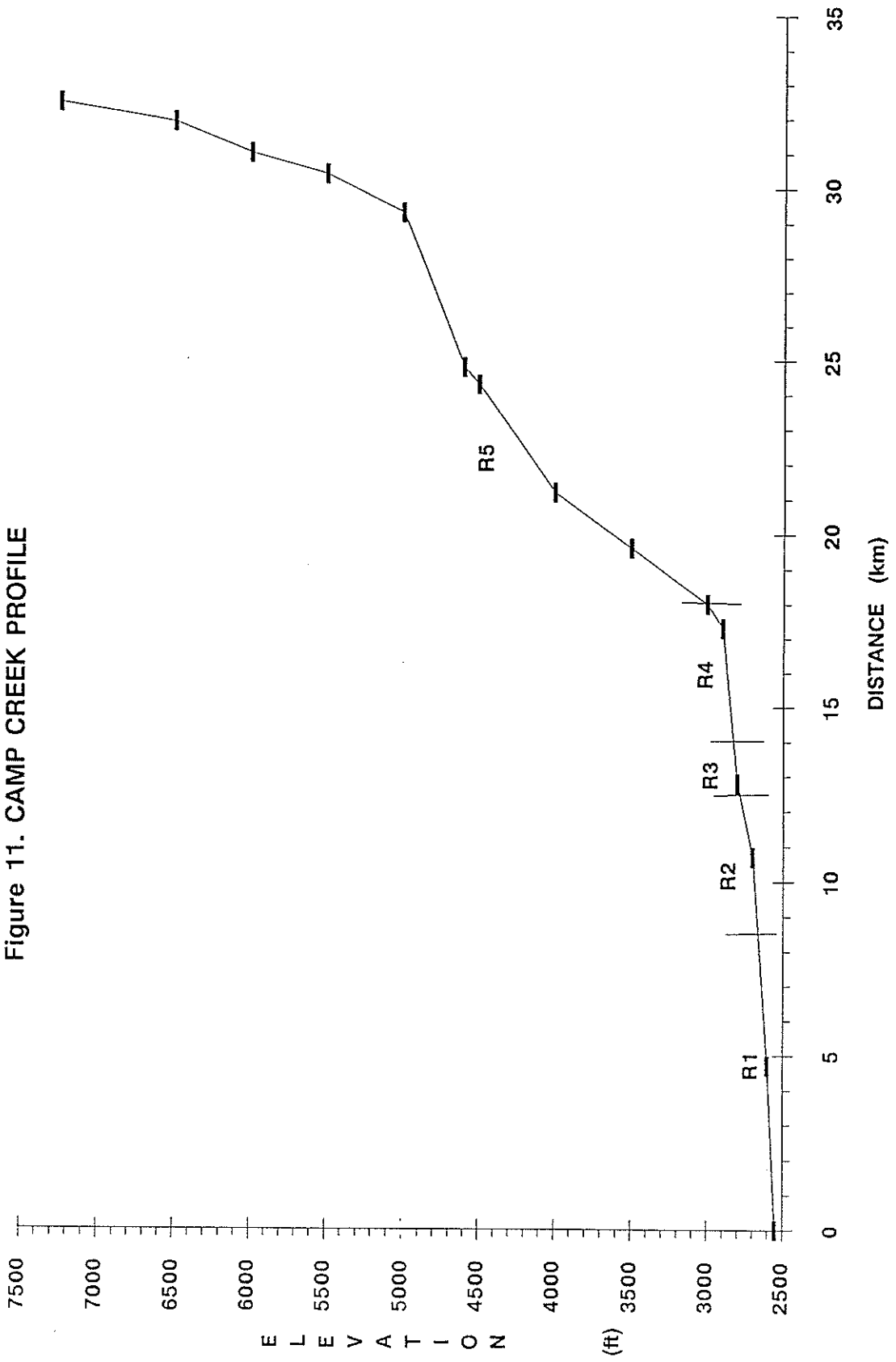
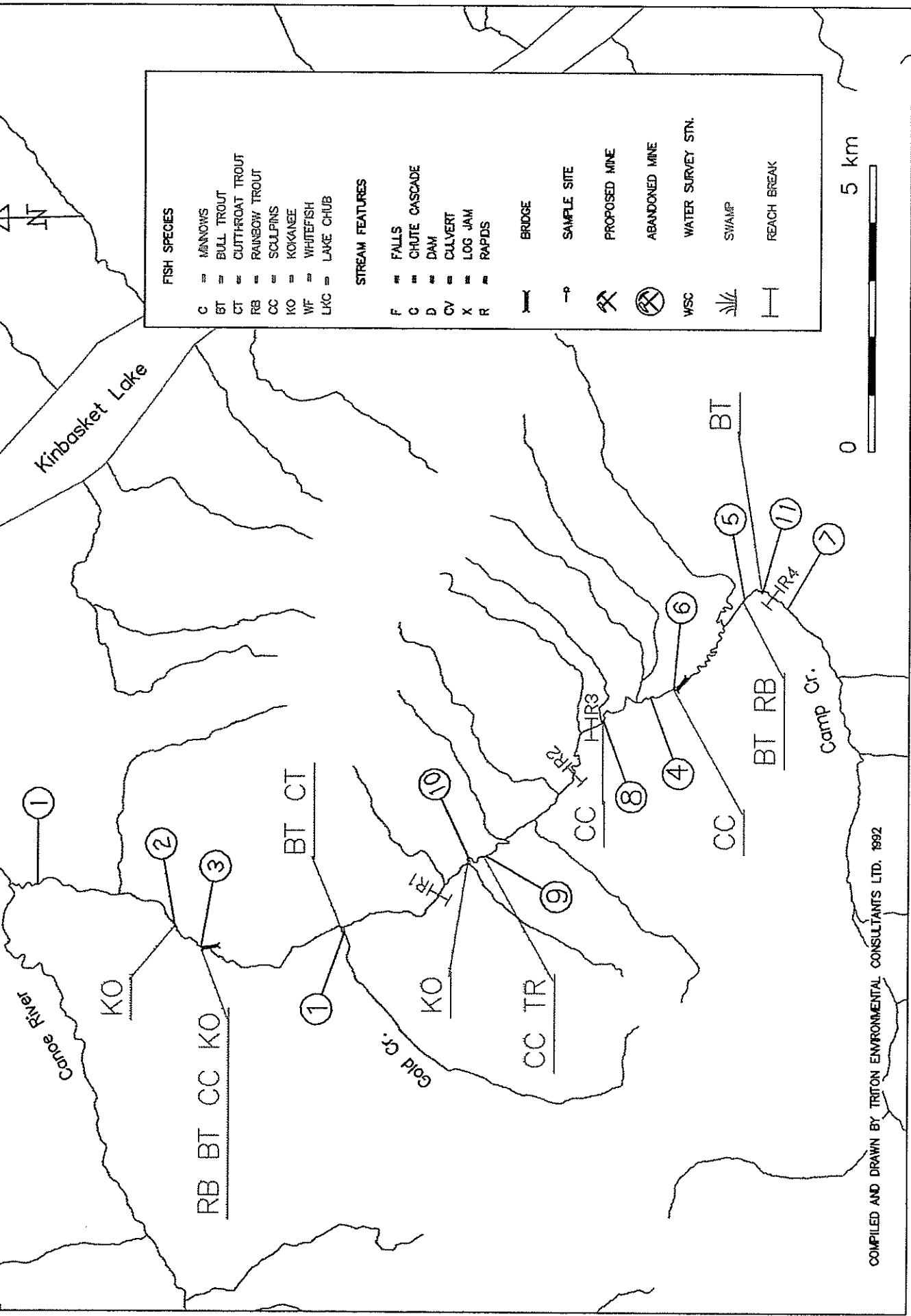


Figure 12: Camp Creek Sampling Sites and Study Map .



FISH SPECIES	
C	= MINNOWS
BT	= BULL TROUT
CT	= CUTTHROAT TROUT
RB	= RAINBOW TROUT
CC	= SCULPINS
KO	= KOKANECE
WF	= WHITEFISH
LKC	= LAKE CHUB

STREAM FEATURES	
F	= FALLS
C	= CHUTE CASCADE
D	= DAM
CV	= CULVERT
X	= LOG JAM
R	= RAPIDS

	BRIDGE
	SAMPLE SITE
	PROPOSED MINE
	ABANDONED MINE
	WATER SURVEY STN.
	SWAMP
	REACH BREAK

Table 8: Summary of Reach Characteristics for Camp Creek

Reach Number	Reach Length (km)	Average Wetted Width (m)	Total Wetted Area (m ²)	Maximum Riffle Depth (cm)	Gradient (%)	Stream Character			Cover (% of wetted area)	Substrate			
						Percent Pool (%)	Percent Riffle (%)	Percent Run (%)		Fines (%)	Gravel (%)	Larges (%)	Bedrock (%)
1	8.9	13.67	121,663	35	1.0	10	33.3	56.7	10	38	39	23	0
2	3.5	11.25	39,375	75	0.5	20	5	75	7.5	52.5	17.5	30	0
3	1.0				3.0								
4	5.0	9.5	47,500	33	<1.0	7	45	48	15.6	35	32	33	0
5	14.3	4.0	57,200	25	3.0 +	5	80	15	30	20	20	60	0

mostly on the banks and margins providing cover for fish. However, there is not an over abundance of cover for larger fish in this reach. A 35 m section of run/riffle edge habitat was electroshocked for fish (Photo 43). This produced four sculpins, one bull trout and one rainbow trout both less than 50 mm fork length. Several kokanee were also seen in this area.

Reach 2 (9 - 13 km)

Reach 2 is 3.5 km long with less gradient than the first reach and consists of riffle sections between long, slow meandering glide sections (Photo 44 & 45). In the glide areas the substrate was predominantly sand or sand over gravel while the riffle areas tended to gravel and some cobble. The stream channel is stable. LOD and large cobble or boulders and to a lesser extent overhanging vegetation provide cover for fish .

Despite sampling sections of this reach that contained suitable habitat for rearing trout, electrofishing produced only sculpins and one trout was observed but not captured.

Reach 3 (13 - 14 km)

This is a very short reach and is not evident from gradient analysis based on 1:50,000 maps. This section is 1 km long with a gradient of 3%. The flow character is primarily rolling white water and riffle (Photo 46). The substrate consists of cobble and boulder and overhanging vegetation lines the margins of the stream. While the water velocity in this area is fairly high it does not prohibit fish passage. No sampling was done in this reach.

Reach 4 (14 - 19 km)

This 5 km stretch of creek is generally low gradient with an average slope of less than 1% consisting of slow deep, meandering sections, and straight, steeper riffle areas (Photo 47). The presence of the railroad through this reach has confined the channel on the east bank as the grade is built up of rip-rap and gravel forming a berm through the marshy low land. The railroad grade has caused flooding on the



Photo 43. Run/riffle section of reach 1, site 3, Camp Creek. This site was electrofished.



Photo 44. Representative glide section of reach 2 (site 10), Camp Creek.



Photo 45. Riffle section in reach 2, site 9, Camp Creek.



Photo 46. Reach 3 of Camp Creek.



Photo 47. Straight glide in reach 4, Camp Creek.

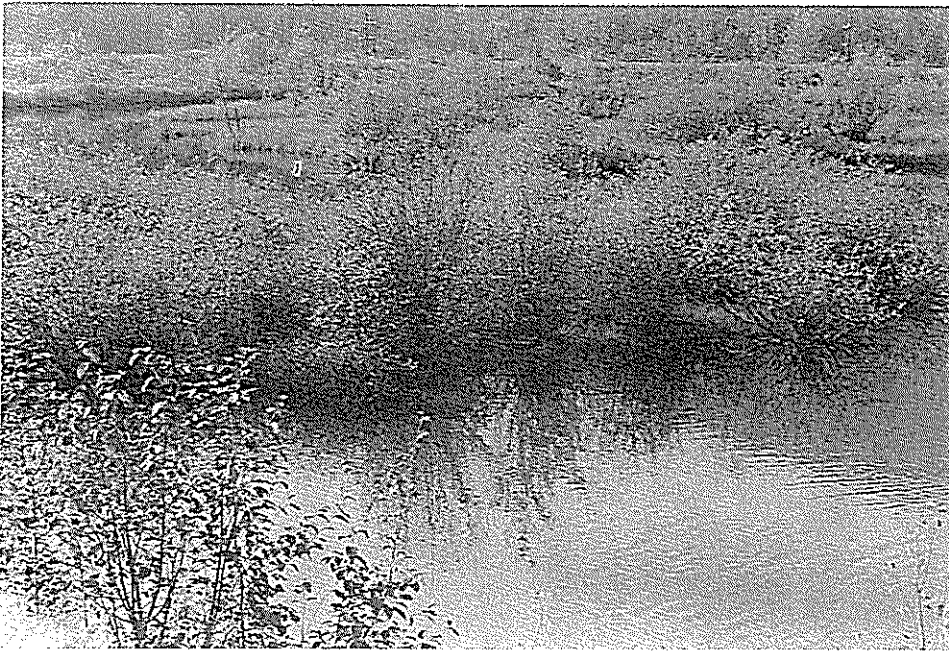


Photo 48. Ponds on east side of Camp Creek in reach 4.

east side of the berm creating a large pond (Photo 48) connected to the main channel through culverts passing under the right-of-way.

The substrate in this area consists of gravel and cobble with sediment build up in slow moving areas. Boulders, LOD, deep pools, and cutbanks are the primary types of cover available in this area (Photo 49). Bull trout (52 - 89 mm FL) and rainbow trout (63 - 73 mm FL) and sculpins were captured in this section of stream. One of the trout collected showed evidence of hybridization with cutthroat trout with a faint red slash under the chin but teeth at the base of the tongue were not evident, however, at this size they are sometimes difficult to detect. The trout had an average condition factor of 1.1.

Reach 5 (19 - 33 km)

This section of stream extends to the headwaters of the creek. The slope is relatively steep with a gradient ranging between 3 and 9% in the lower 10 km and increasing to 13 to 40% in the headwaters. Near the downstream end of this reach a natural gas pipeline crossing has been recently constructed. There is no road access to the upper parts of the reach. It appears that fish access and suitable habitat in this upper reach is somewhat limited.

One sample site was established in the lower section of this reach where the stream was tumbling/riffle with boulders and cobble substrate (Photo 50). Flood signs indicated that there is a fair amount of flood flow outside the main channel of the stream in this area. There also existed small side channels that contained small pools and flowing water where small fry were observed, possibly bull trout. Electroshocking was not done at this site.

Major Tributaries

Gold Creek

This creek enters Camp Creek 7.5 km upstream from the Camp Creek/Canoe River

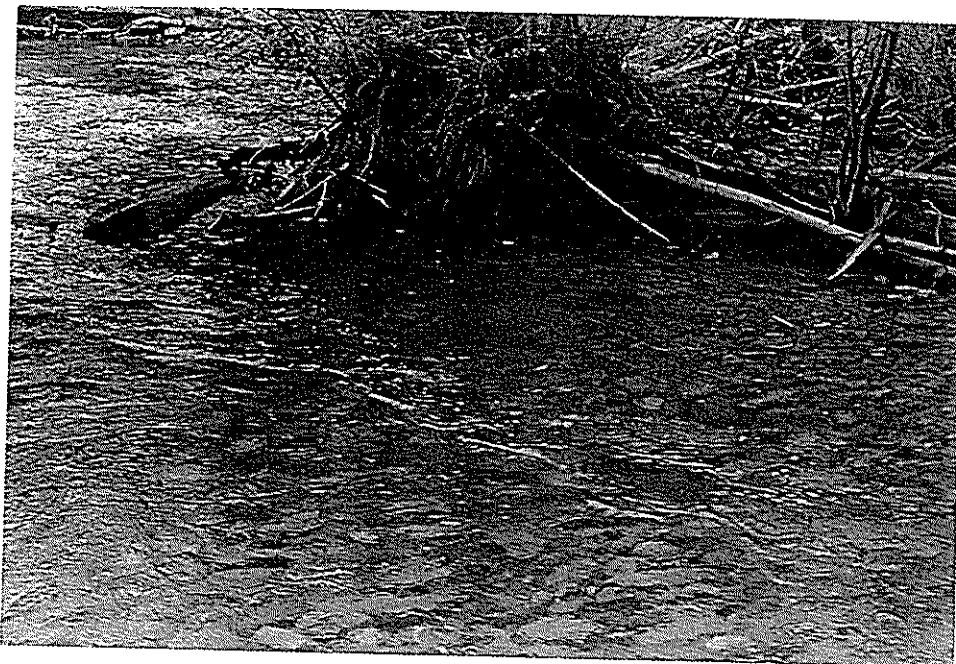


Photo 49. Bull trout fry were collected from this edge habitat in reach 4, site 11, Camp Creek.



Photo 50. Representative stream channel at the lower end of reach 5, Camp Creek.

confluence. Gold Creek is 8 km long and for the most part is steep and unsuitable for fish. However the lower 300 m of the stream has a gradient of 2 - 3% and has not been logged. In this section the 3 m wide stream channel is riffle/pool with gravel and small cobble substrate (Photo 51). LOD in the stream channel, overhanging vegetation, and sections of cutbanks provide cover for fish. This section of stream also has significant crown closure. Electroshocking produced one 120 mm bull trout and a 100 mm cutthroat trout.

3.5.3 Resource Development

Development of the Camp Creek valley has included logging, and the construction of railway right-of-way, gas pipeline, telephone light guide, and a highway. All of these activities have had an impact on the creek through the construction of bridges and buried crossings and of right-of-ways that force stream channelization and restricts the flow of water between tributaries and the main channel resulting in the formation of marshy areas and ponds.

Logging has occurred along most of the lower 18 km of the creek and has left buffers zones of uncut trees to protect the stream channel. Further logging in the watershed is planned for the lower reaches where there will be a few cut blocks of 24 ha or less cleared in the next two years. There has been limited logging in the upper section of the creek.

There have been several water licences granted to land owners along Camp Creek, generally within the first reach. The total allowable water abstraction from Camp Creek is approximately 2.6×10^{-4} m³/s and, according to the water licence summary provided by the Water Management Branch of the Ministry of Environment, the water is generally being used for agricultural purposes. Observations of the creek suggest that farming activity in the first few kilometres of reach 1 may be responsible for sections of unstable stream banks.



Photo 51. Lower section of Gold Creek.

3.6 SPILLIMACHEEN RIVER

3.6.1 Introduction

The Spillimacheen River flows south easterly through the Purcell Mountains draining 1430 km² which includes the drainages of the major tributaries such as Bobbie Burns and Vowell Creeks. The Spillimacheen enters the Columbia River approximately 61 km south of Golden and extends approximately 95 km upstream to Copperstain Mountain. At the time of the study the water was cold and clear ranging between 0° and 3° C, with ice forming along the margins of the main channel during the last days of the field study. This river was surveyed between October 24 and 29th, 1991. The profile of the Spillimacheen River is shown in Figure 13 and a map showing reach breaks, sample sites and barriers is provided on the maps in Figure 14a and 14b. Table 9 summarizes stream characteristics for each reach while details of specific sample sites can be found in Appendix II. The average annual discharge curve for the Spillimacheen River near its mouth is shown in Figure 15.

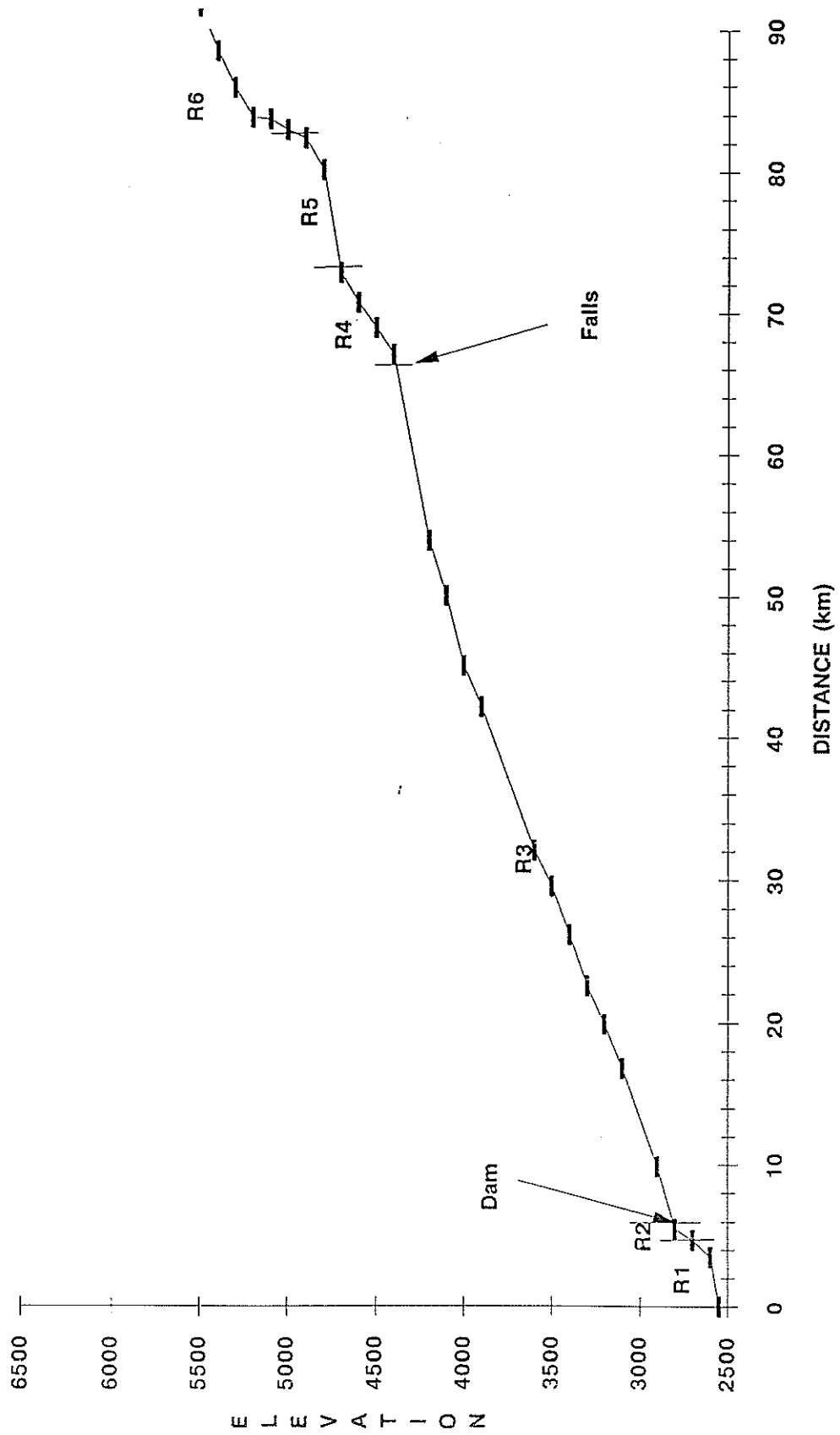
Logging, mining, and hydroelectric power generation are the main resource uses in this watershed. 2084 ha of the total 1430 km² will be logged throughout the Spillimacheen/Bobbie Burns watershed Between 1991 and 1995. The dam used to create a headpond for a run-of-the-river power generating station is situated 6 km upstream from the confluence. Mining activity is scattered throughout and in 1991 all mines were inactive however, there has been a long history of mining in the area.

3.6.2 Summary by Reach

Reach 1 (0 - 4.8 km)

This reach extends 4.8 km up to the B.C. Hydro powerhouse and is the only section accessible to migratory fish. In this section the river slowly meanders through the Columbia River valley to its confluence with the Columbia River (Photo 52). There are many side-channels branching off the main channel, some of which are quite

Figure 13. SPILLIMACHEEN RIVER PROFILE



Reach 2 of Vowell Creek contains a 7 m high falls and the creek above this point has been significantly impacted by logging with many sections where trees have been removed right to the stream edge. Stream gradients in the upper reaches are not high (Photo 75) but there are several areas where the stream channel does not appear to be very stable and are perhaps susceptible to considerable movement during floods. It is not until the last 4 km of the creek that the gradient increases above 5%.

Malachite Creek

This creek enters Bobbie Burns 5.5 km upstream from Vowell Creek and is approximately 15 km long. A site was sampled 150 m upstream of the confluence. In this area the stream gradient was 3% but just upstream the gradient increases to 15% before flattening out again. At the sample site the stream was characterized by run/riffle with pools scattered throughout (Photo 76). The substrate was mainly cobble and boulder with gravel and very little fine material. There was considerable overhanging vegetation in the form of *salix sp.* No fish were observed in this creek.

3.7.3 Resource Development

The Bobbie Burns Creek watershed is primarily exploited for mineral and forestry resources. The watershed is also part of TFL 14 managed by Crestbrook Forest Industries and has already been subjected to considerable logging. Logging from 1991 to 1995 will focus primarily on the upper areas of the drainage and in particular Vowell Creek. Logging in Vowell Creek and its tributaries will account for an estimated 329 ha of the expected 404 ha that will be logged between 1991 and 1995 (see Table 10).

There are three mines that have been active in the watershed (Figure 17). The longest operating mine is situated in the headwaters of Vermont Creek and has been active between 1892 and 1981 with the development of extensive underground workings. In 1981 the mine produced over 1.7 million grams of silver, 6521 kg of copper and 297,874 kg of lead as well as gold, cadmium, and zinc from 12,829 tonnes

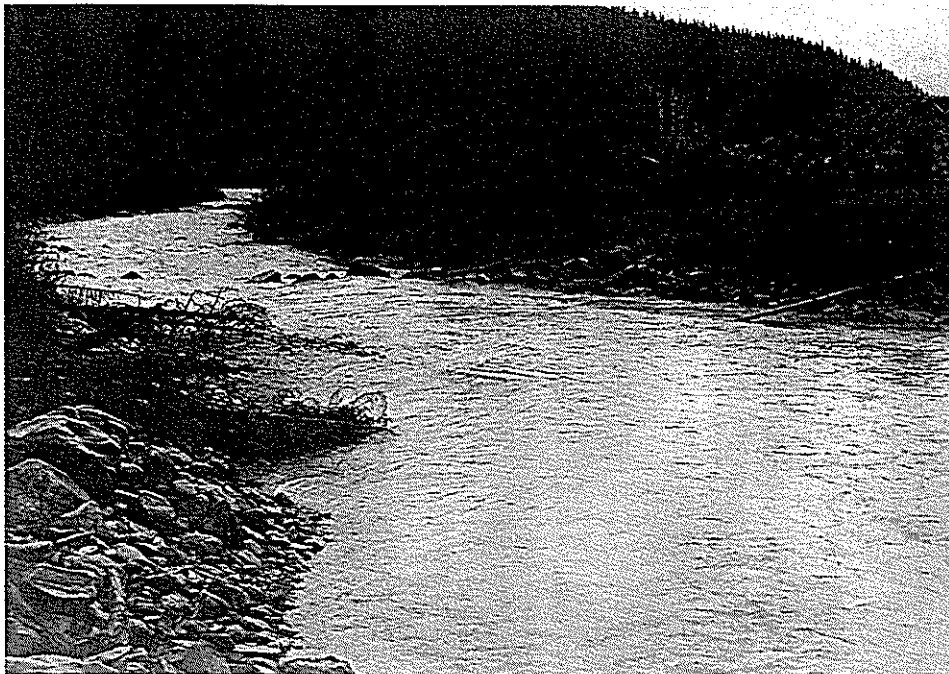


Photo 75. Typical stream character in reach 3 of Vowell Creek.



Photo 76. Lower section of Malachite Creek.

of ore (B.C. Min. Energy, Mines and Resources 1991). The other two mines are situated on the north side of Bobbie Burns Creek approximately half way up the valley at an elevation of 1800 m. Both mines only operated for a short period of time into the early 1900's.

4.0 ENHANCEMENT OPPORTUNITIES

4.1 Introduction

Approximately 586 km of riverine habitat was lost by the formation of the McNaughton Reservoir reducing spawning and rearing habitat for the riverine fish species that were frequently fished in the Columbia River. The 1963 water licence issued to B.C. Hydro approving the use of the water in the Columbia River above Mica stipulated that B.C. Hydro was responsible for offsetting impacts on fish and wildlife as a result of the Mica Dam project. The recently formed Mica Technical Committee has identified the need to increase fish production in the remaining riverine habitat as a strategy for mitigating the impact of the reservoir formation. Up to this point efforts have focused on providing sport fishing opportunities in the reservoir but this has not proven to be effective.

The terms of reference state that one of the objectives of this project is to identify potential enhancement opportunities to increase the carrying capacity of the study streams. The focus of this component has been on enhancement strategies that would result in increased production of riverine species of sport fish. The general opportunities for increasing production in This section of the Columbia River drainage could be achieved by accessing under utilized habitat or by increasing the carrying capacity of the existing habitat. However, other than in a few instances, it is difficult to recommend specific enhancement programs on the basis of a one time overview field study. The field program provided a general inventory of habitat availability and a distribution of fish in the study streams that allows for a basic identification of what could be done to increase production. However, there are inherent risks in proceeding with enhancement programs without further studies to accurately identify factors limiting production of resident and migratory sport fish. Components such as water quality, habitat availability at low water, and stream stability at high flows have a significant bearing on the type of enhancement

opportunities that would increase the carrying capacity of a stream but the scope of this project did not include the collection of this information.

4.1.1 Identification of Limiting Factors

To ensure the effectiveness of enhancement programs it is necessary to identify the factors limiting production of the sport fish. Generally there are several potential limiting factors that can be identified from the field observations including:

- overwinter, low flow conditions;
- nutrient loadings;
- water temperatures during the primary growing season;
- barriers restricting access to upstream areas; and
- lack of diversity of instream habitat in some sections of stream.

A review of the annual discharge of the gauged study streams, Blaeberry and Spillimacheen Rivers (Figures 5 and 15) and of gauged streams in the general vicinity indicate that the periods of lowest flow are February and March. In these months the mean monthly discharge is between 8 and 13% of the mean annual discharge. Raleigh et al. (1984) reported that, as a rule, streams with low flows that are less than 25% of the mean annual discharge are considered poor for maintaining good trout habitat. Therefore, habitat in these streams may be limiting during the winter low flow period. However, Blackwater Creek may maintain flows in late winter that are greater than 13% of the mean annual discharge because of the lake in the upper reach.

All the streams, except Blackwater Creek, are fed by snow and glacial melt water, particularly the streams on the west side of the Spillimacheen drainage. The contribution of glacial meltwater to the stream flow may also be responsible for maintaining low water temperatures in the stream even in the late summer. Cold water will limit the growth rate of fish even in conditions where there is good food sources. In the early days of October 1991 the water temperatures ranged between 5° and 7° C in Blaeberry River, Bluewater Creek, and Camp Creek despite the unusually warm weather, however, overnight air temperatures did drop below freezing. Blackwater Creek had slightly warmer water temperatures between 7° and

10° C which would be due to the influence of water stored in Blackwater Lake. For the sport fish encountered in the study area the optimal temperature for growth ranges between 12° and 15° C (Ford et al. 1992).

All the tributaries studied had partial or complete barriers that restricted access to stream sections that contained suitable trout habitat. The Beaverfoot River is just upstream of Wapta falls on the Kicking Horse River, there is a dam near the mouth of the Spillimacheen, and Blaeberry, Bluewater and Blackwater all have natural mainstem, barriers several kilometers upstream of the Columbia River that limit the utility of all streams to serve as spawning and rearing areas for trout populations in the Columbia River mainstem.

The fish sampling that was carried out for this study in October 1991, resulted in the capture of salmonids between the ages of 0+ and 3+. The largest 3+ fish caught was a 208 mm rainbow trout and the largest 2+ fish was a 159 mm bull trout. All fish captured generally had condition factors around one suggesting that growing conditions are sufficient for the number of fish currently in the streams. However, the lengths of rainbow at age were significantly less than the mean lengths given by Andrusak and Parkinson (1984) for rainbow trout from Kootenay Lake and Carlander (1969) for rainbow trout generally. This suggests that, while there are sufficient nutrients in the streams for the number of fish present, nutrient levels and/or water temperatures could be limiting the production of total numbers and growth rates of the sport fish in the streams.

Instream habitat for spawning and rearing is present in all streams in various mixes and concentrations but there are some sections that could accommodate more variation in habitat and perhaps support more fish. While it is possible to hypothesize which conditions are limiting production more data is required to confirm this. Also more details are required on river hydraulics to determine if it is feasible to install instream structures that would have a good chance of remaining in place long enough to have an impact on the stream carrying capacity. If an equilibrium between fish production and nutrients has been established then increasing the size or number of fish may require augmentation of factors associated with the stream's primary level of production.

4.1.2 Stream Rankings

Not all the streams studied are equally suited for enhancement requiring that some sort of priority be given to each of the streams. Factors considered in ranking the streams included access both to carry out instream work and for anglers, stability in flow regime and stream channel, existing fish populations, presence of barriers, and level of resource development activity in the watershed. Priority is given to those streams with potential for enhancing riverine populations of sport fish, thus opportunities that would improve kokanee production have not been considered although such opportunities do exist.

Mining has been active in several areas and as recently as 1981, but at this time there are no active mines in the watersheds under study. Mining exploration is ongoing throughout the area and there is the possibility of an old mine reopening but this depends primarily on the price of metals. There is a proposal to develop a magnetite/titanium mine in the headwaters of Moose Creek but it is only in the early proposal stages and no approvals have been issued at this time.

Even though the mines are not active it is possible that leechates from underground facilities and waste rock can enter creeks and impact water quality. Therefore, the seven creeks surveyed have been ranked below, from high to low, as to their risk from old mining activity or future mining activities:

- 1) Bobbie Burns Creek;
- 2) Beaverfoot River (proposed mine on Moose Creek);
- 3) Spillimacheen River; and
- 4) Blackwater Creek, Camp Creek, Bluewater Creek, and Blaeberry River (no mining activity on these creeks).

Logging is the most extensive resource use in all watersheds. During the field survey there were only a few areas where logging or associated activities appeared to have significant impacts on streams including removal of trees right up to the stream edge and increased sediment loadings from roads and stream crossings. In some areas enhancement should be avoided because of potential impacts from logging that could minimize effectiveness of enhancement. While in others a logged area may

benefit from instream habitat complexing to mitigate from such impacts as reduced instream LOD that is necessary to provide suitable fish cover. The following is a ranking of streams based on the negative impact current and future logging may have on the streams' productive capacity with streams at the top of the list having been subjected to the greatest amount of logging activity.

- 1) Blaeberry River
- 2) Blackwater Creek (primarily past logging)
- 3) Spillimacheen River
- 4) Bobbie Burns Creek
- 5) Camp Creek
- 6) Beaverfoot River (mostly past logging)
- 7) Bluewater Creek

4.2 Recommendations

Based on the above resource use rankings and the factors listed at the beginning of this section the tributary streams are listed below in order of preference for receiving further attention for enhancement.

Bluewater Creek

This stream was given top priority for potential enhancement as the stream character is generally run/riffle in a fairly confined, stable channel with substrates ranging from gravel to boulder. Past logging along this creek has been minimal and over the next five years is limited. Only bull trout were found above the barrier in the middle of the second reach and both rainbow and bull trout existed the barrier. At the time of this study kokanee were extensively using this part of the creek. One drawback with this creek is the deep and steep sided valley which makes access to much of the second reach difficult for anglers.

This creek is only 10 km upstream of the south end of Kinbasket Lake and accessible to migratory fish. Reach 1 and 2 would be suitable areas for enhancement as they have a low gradient and in some areas a fairly stable channel. There are sections of these first 2 reaches, particularly in the lower 10 km of the

creek that could benefit from improved spawning or rearing habitat. Possible enhancement activities that might increase rainbow and bull trout production include the installation of structures that increase habitat complexity (root wads or debris catchers) and those that could increase pool habitat. Reach 4 would be another area where habitat manipulation may be useful. The substrate is primarily boulders and cobble so the development of side channels that could provide additional areas for spawning and rearing may contribute to increased production of bull trout.

Camp Creek

The lower 18 km of this creek currently supports populations of rainbow, cutthroat, bull trout, and kokanee. Historically the large Arrow Lake yellow fin rainbow trout spawned in this creek (Peterson and Withler 1965). Logging appears to have been responsibly carried out in this watershed. There are sections of this stream where sand and silt have been deposited over gravels and cobbles, however, it was not possible to determine the source of these fines or if they are natural or man induced.

This stream appears to provide opportunities for enhancing fish production. The Mica Dam was probably responsible for the loss of the large rainbow trout that were known to spawn in Camp Creek. There does not appear to be any significant changes in this creek since the reconnaissance study by Tredger (1977) and the stream may still have the capacity to provide spawning and rearing habitat for the yellow fin rainbow trout. However, before steps are taken to introduce such a type of fish it is necessary to determine if Kinbasket Lake has the potential to support a population of trophy rainbow trout. The other question that would have to be addressed is the creek's ability to support egg production and juvenile rearing. Since the demise of the larger rainbow spawners the surviving resident populations may have increased to fill under utilized habitat. It may be necessary to augment rearing habitat to support resident and non-resident populations. If the reservoir is no longer capable of supporting Arrow Lake yellow fin rainbow trout, the creek could still be assessed for opportunities to increase production of resident trout. Spawning and rearing channels and increasing instream habitat complexity, particularly in reach 1 and 4 may be necessary if the creek is to produce more fish. This creek is close to Valemount and there is good access along the lower 18 km

that may make this creek an attractive opportunity for developing a river sport fishery.

Beaverfoot River

This river appears to have good potential for fish production with a mix of riffle/run/pool and LOD spread out over a relatively low gradient channel. Bull trout were found throughout and while no rainbow trout were collected local information suggests that they are found in the system. Eastern Brook trout were also captured. The lower 29 km has a good mix of fish habitat however, glacial inputs may keep water temperatures below optimum for most of the year. Logging has been extensive in the watershed but over the next five years only small areas will be logged in the upper areas of the Beaverfoot and into Moose Creek. Extensive areas will be left unlogged because Yoho National Park covers the north east section of the watershed. There is a mine development proposed for the headwaters of Moose Creek that could have impact on lower Moose Creek and upper Beaverfoot River. For most of the length of this river access is good.

Increasing habitat complexity in reach one is the most obvious enhancement opportunity. The long glides in this reach may benefit from the placement of debris catchers or other instream works that would increase habitat for juvenile and adult trout. Revetments may also be necessary to ensure bank stability in area where new structures are placed.

Blackwater Creek

This creek may have a more stable flow regime than the other 7 streams and water temperatures during the summer growing season may be closer to optimal because of Blackwater Lake. The watershed of this creek has been extensively logged but there is very little logging planned for the next five years. There is a log jam in reach 3 that restricts upstream movement of fish. However, reach 4 the longest reach in this stream (11.5 km), contains little habitat for rainbow trout and is not well suited for instream habitat development. Past enhancement in this creek has included reduction in the height of the falls at the mouth of the creek and rainbow trout have been stocked into the creek and lake however, there has been no assessment of these activities.

The falls and chutes in the first 200 m of this creek from the confluence upstream probably still impede access particularly during periods of high discharge in the spring when rainbow trout would be trying to migrate into Blackwater Creek for spawning. The falls and chutes could be reduced further. Also the beaver dam and chute in reach 3 could be modified to provide access to the entire stream up to Blackwater Lake.

Spillimacheen River

The Spillimacheen River had the greatest diversity of fish species including rainbow, eastern brook, and bull trout, mountain whitefish, and burbot. However, the river did not appear to be very productive with only a few fish captured during sampling, particularly upstream of the dam. Logging is active throughout the watershed providing easy access to most areas of the river. Only the first reach is accessible to migratory fish and there may be opportunities to increase the carrying capacity of spawning and rearing habitat of these fish species. However, there were also a number of coarse fish found in this reach which may also benefit from enhancement activities. Careful planning of enhancement options is required to ensure that habitat is created only for the target species.

Upstream of the dam enhancement opportunities for rainbow and bull trout exist. For the most part the stream channel is stable and would support instream enhancement activities. The long third reach which has a mix of run/riffle habitat where deflectors, boulder groupings, debris catchers or the placement of root wads could increase instream habitat in some areas. However, require careful review of location and design is necessary to ensure that structures will not be lost in high flow conditions. At the time of this field study no specific limiting factors were identified so that further study is required to focus any enhancement program. The areas of active logging should also be considered when determining the location and type of enhancement program.

Blaeberry River

Blaeberry River currently supports bull trout, rainbow trout and mountain whitefish below the falls and only rainbow trout are not found upstream of the falls. The

extent of logging in this watershed and the length of unstable, braided stream channel detract from the potential to enhance the carrying capacity of this river. Reach 2 and 4 are very braided with unstable stream channels. These two reaches account for a large amount of the wetted area of this river and both have limited opportunity for enhancement. A subjective rating developed by Rosgen and Fittante (1986) suggest that the success of habitat improvement structures in a braided stream channel is only fair to poor and requires careful evaluation before installation. However, in reach 2 the use of revetments on major bends in the channel may help stabilize the stream and provide the basis for other structures that would supply instream habitat.

There are sections of stream in reach 1 and reach 3 below the falls where enhancement could improve production of fish species that could utilize the Columbia River mainstem or Kinbasket Lake for rearing. Increased habitat complexity could be achieved through boulder placement or debris structures. There are also sections of reach 5 above the falls that could contribute to increased production of bull trout through similar enhancement. However, given the peak discharges recorded in this system careful consideration must be given to design and location of instream habitat complexing to ensure they are not destroyed during peak freshet flows.

Bobbie Burns Creek

Only one whitefish was caught in this creek, however, increased turbidity following a rainstorm may have reduced sampling effectiveness but only on one of the three days of sampling. Fish habitat conditions in Bobbie Burns Creek did not appear to be significantly different from the Spillimacheen River and further study would be required to confirm the reasons for the lack of fish found in this system. Logging and mining have impacted the watershed and could be contributing to the lack of fish found in the system. There was an unsubstantiated report that a tailings pond spilled contaminated water into Vowell Creek several years ago. However, because so few fish were sampled throughout Bobbie Burns Creek during the field study suggests that there may be some additional factors limiting production. There is considerable glacial input to this stream, particularly through Vowell Creek and overall productivity could be restricted by cold water temperatures, restricted nutrient levels and wide fluctuations in flow relative to the mean annual discharge.

Generally, Bobbie Burns Creek does not appear to be a good candidate for enhancement and should be considered a low priority for further work.

4.2.1 Detailed inventories

This project's one time observations of the study streams, in October 1991, provided only a limited assessment of the fisheries potential of the rivers. The field program provided the opportunity to identify fairly simple enhancement opportunities such as barrier removal but activities such as the above proposed instream habitat complexing or stream fertilization will require more detailed background information. Water quality (overall and seasonal), habitat availability at low water, and stream stability at high flows are a few parameters that could not be studied in this project but will have a significant bearing on the determination of appropriate enhancement opportunities necessary to increase stream carrying capacity. Therefore, more specific biological and physical data will be required before specific enhancement actions can be recommended and properly planned.

Detailed studies would be required to:

- identify the species/lifestage that would be targetted for enhancement;
- identify the specific factors limiting the carrying capacity within selected streams or reaches; and
- develop sufficient baseline data from which to monitor and assess the effectiveness of the chosen enhancement program and to make subsequent changes in strategies if necessary.

The following is a list of streams or stream sections that should receive detailed study to determine specific enhancement opportunities. The list is prioritized based on the 1991 field observations of existing fish populations and the potential for a stream to support enhancement activities.

- 1) Bluewater Creek - potential for enhancing resident rainbow and bull trout and migratory rainbow trout populations particularly in reaches 1 and 2.

- 2) Camp Creek - focus on determining potential to support a population of large rainbow trout and in particular, the ability of the reservoir to support such a population. If enhancement of trophy rainbow trout is not practical resident fish may be targeted.
- 3) Blackwater Creek - while this stream may have a better flow regime and water temperature than the others, the length of stream suitable for enhancement is much shorter than in other tributaries.
- 3) Beaverfoot River - potential for enhancing resident sport fish along its entire length.
- 4) Spillimacheen River - there appears to be substantial lengths of river (i.e. reach 3) that would be suitable for instream habitat improvement to enhance resident sport fish.
- 5) Blaeberry River - further study could be used to identify enhancement opportunities and suitability of stream sections for instream habitat development in the river below the falls.

4.2.2 Barrier Removal

The removal of barriers may help rainbow and bull trout access more spawning and rearing habitat, however, in all streams resident species of fish were found above and below the barriers. Removal, by itself, may not result in any improvement for river resident fish populations and there is the potential for natural populations upstream of a barrier to be displaced by fish from downstream areas. Barriers also blocked the upstream migration of the lake rearing kokanee and the removal of the blockages will definitely open up more area to kokanee for spawning. Tempered by the above comments, the following is a list of streams where barrier removal would be practical and may have an enhancement effect particularly for fish that utilize these creeks for spawning after maturing in the Columbia River.

- 1) Blackwater Creek - reduction of falls and chutes at the confluence with Bluewater Creek to improve access for rainbow trout.
- 2) Blackwater Creek - reduction of log jam/beaver dam in reach 3 to improve passage for rainbow trout.
- 3) Bluewater Creek - reduction of falls and chute in middle of reach 2 to improve access for rainbow and bull trout.

Note that since Blackwater Creek has been stocked with rainbow trout for many years, there is no concern of displacing natural populations by removing these barriers.

The bio-reconnaissance of the six main tributaries of the upper Columbia River has provided an overview of the stream characteristics of each tributary, the general distribution of fish species, and the location of barriers that influence the distribution. All study streams, with the exception of a few sites and small tributary creeks, supported relatively sparse populations of sport fish. Undoubtedly man's intervention through such activities as instream habitat improvement, stream fertilization, and barrier removal will increase the carrying capacity of the study streams. There did not appear to be any one stream or reach that could be modified to generate a significant increase in production in sport fish. Increasing the availability of sport fish in this area of the Columbia River will probably have to be accomplished through marginal increases in each stream. To choose the most appropriate enhancement options more detailed biological and physical information is required. This will ensure that monies will be spent effectively on the appropriate enhancement actions resulting in a long term benefit to the fisheries in the area.

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APPENDIX I
Lengths, Weights, Ages, and Condition Factors of Fish Sampled

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork		Scales			Condition Factor	
					Length (mm)	Weight (gm)	Slide #	Position	Age		
BEAVERFOOT RIVER											
Fraser		1	Oct 17/91	shocked 260 sec = 0 fish							
note: this site above impassable culverts at logging rd.											
Beaverfoot	1	2	Oct 17/91	EB	105	11.4	22	1	1+		
Beaverfoot	1	2	Oct 17/91	PW	105	10.8	-	-			
Beaverfoot	1	2	Oct 17/91	PW	111	12.1	-	-			
Beaverfoot	1	2	Oct 17/91	PW	104	10.1	-	-			
Beaverfoot	1	2	Oct 17/91	PW	58	1.6	-	-			
Beaverfoot	1	2	Oct 17/91	PW	59	1.7	-	-			
Beaverfoot	1	2	Oct 17/91	6 x Torrent CC		-	-	-			
Moose	3	1	Oct 17/91	BT	96	9.6	22	2	1+		
Moose	3	1	Oct 17/91	BT	59	2.3	-	-	0+		
Moose	3	1	Oct 17/91	BT	57	2.3	-	-	0+		
Moose	3	1	Oct 17/91	BT	53	1.7	-	-	0+		
Beaverfoot	2	3	Oct 18/91	BT	159	37.5	23	1	2+		
Beaverfoot	2	3	Oct 18/91	BT	164	39.8	23	2	2+		
Beaverfoot	2	3	Oct 18/91	BT	93	8.5	23	3	1+		
Beaverfoot	2	3	Oct 18/91	1 x Torrent CC		-	-	-			
note: 2 BT escaped (approx. 25cm)											
also... all fish from complex LOD; none from riffle or deep pool											
Beaverfoot	2	4	Oct 19/91	2 x CC		-	-	-			
note: observed one RB? in beaver channel.											
Fraser		2	Oct 19/91	WF	51	1.5	-	-	0+	1.13	
Fraser		2	Oct 19/91	WF	53	1.8	-	-	0+	1.21	
Fraser		2	Oct 19/91	WF	62	2.3	-	-	0+	0.97	
Fraser		2	Oct 19/91	BT	49	1.2	-	-	0+	1.02	
note: all fish from 1st pool.											
Beaverfoot	1	5	Oct 19/91	BT	55	-	-	-			
note: 2 Gee traps set = 1 CCG (1 dragonfly nymph: 3 water beetles)											

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork		Scales			Condition Factor	
					Length (mm)	Weight (gm)	Slide #	Position	Age		
BLAEBERRY RIVER											
Blaeberry	4	1	Oct 11/91	BT	153	36.5	15	1	2+	1.02	
Blaeberry	4	1	Oct 11/91	BT	152	37.6	15	2	2+	1.07	
Blaeberry	4	1	Oct 11/91	BT	135	27.1	15	3	2+	1.10	
Blaeberry	4	1	Oct 11/91	BT	158	42.2	16	1	2+	1.07	
Blaeberry	4	1	Oct 11/91	BT	121	17.4	16	2	1+	0.98	
Blaeberry	4	1	Oct 11/91	BT	104	11.7	16	3	1+	1.04	
Blaeberry	5	2	Oct 13/91	BT	166	47.5	17	1	2+	1.04	
Blaeberry	5	2	Oct 13/91	BT	206	75.6	17	2	3+	0.86	
Blaeberry	5	2	Oct 13/91	BT	139	26.3	17	3	2+	0.98	
Blaeberry	5	2	Oct 13/91	BT	125	17.9	18	1	1+	0.92	
Blaeberry	5	2	Oct 13/91	BT	83	6.4	18	2	1+	1.12	
Blaeberry	5	2	Oct 13/91	BT	92	7.7	18	3	1+	0.99	
Blaeberry	5	2	Oct 13/91	BT	54	1.8	-	-	0+	1.14	
Blaeberry	5	2	Oct 13/91	BT	83	5.3	-	-	-	0.93	
Blaeberry	5	2	Oct 13/91	BT	90	6.8	-	-	-	0.93	
Blaeberry		**	Oct 13/91	WF	53	-	-	-			
Blaeberry		**	Oct 13/91	WF	50	-	-	-			
Blaeberry		**	Oct 13/91	WF	46	-	-	-			
Blaeberry		**	Oct 13/91	WF	45	-	-	-			
Blaeberry		**	Oct 13/91	WF	44	-	-	-			
Blaeberry		**	Oct 13/91	WF	55	-	-	-			
** taken from quiet silty backwater... mid braided reach											
Blaeberry	4	3	Oct 13/91	shocked 250 sec = 0 fish							
Blaeberry	3	4a	Oct 13/91	2 x CC	-	-	-	-			
left bank edge habitat											
Blaeberry	3	4b	Oct 13/91	BT	183	-	-	-			
Blaeberry	3	4b	Oct 13/91	10 x CC	-	-	-	-			
side channel = pool/riffle (KO spawning d/s from shocking site)											
Willowbank		1a	Oct 14/91	RB	158	48.2	19	1	r	1.22	
Willowbank		1a	Oct 14/91	RB	123	23.0	19	2	2+	1.24	
Willowbank		1a	Oct 14/91	RB	208	112.0	19	3	3+	1.24	
Willowbank		1a	Oct 14/91	TR?	44	1.0	-	-	0+	1.17	
Willowbank		1a	Oct 14/91	BT	48	1.3	-	-	0+	1.18	

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork		Scales			Condition Factor
					Length (mm)	Weight (gm)	Slide #	Position	Age	
Willowbank		1a	Oct 14/91	BT	40	1.2	-	-	0+	1.88
Willowbank		1a	Oct 14/91	BT	60	2.6	-	-	0+	1.20
from d/s of bridge... riffle/pool.										
Willowbank		1b	Oct 14/91	RB	125	19.8	20	1	2+	1.01
Willowbank		1b	Oct 14/91	RB	118	23.2	20	2	1+	1.41
Willowbank		1b	Oct 14/91	RB	114	20.8	20	3	2+	1.40
Willowbank		1b	Oct 14/91	RB	124	26.3	21	1	2+	1.38
Willowbank		1b	Oct 14/91	RB	93	11.0	21	2	1+	1.37
Willowbank		1b	Oct 14/91	RB	97	13.1	21	3	2+	1.44
Willowbank		1b	Oct 14/91	RB	43	0.8	-	-	0+	1.01
Willowbank		1b	Oct 14/91	RB	96	9.3	-	-		1.05
Willowbank		1b	Oct 14/91	RB	37	0.8	-	-	0+	1.58
Willowbank		1b	Oct 14/91	RB	74	5.2	-	-	0+	1.28
Willowbank		1b	Oct 14/91	RB	38	0.8	-	-	0+	1.46
Willowbank		1b	Oct 14/91	RB	48	1.4	-	-	0+	1.27
from u/s of bridge... pools										
Blaeberry	2	5	Oct 14/91	RB	48	1.6	-	-	0+	1.45
Blaeberry	2	5	Oct 14/91	RB	73	5.1	-	-	0+	1.31
Blaeberry	2	5	Oct 14/91	6 x CC	-	-	-	-		
Blaeberry	1st bridge u/s of Trans Cdn Hwy... approx 50 WF range (5-8cm)									
Blaeberry	3	6	Oct 14/91	BT	153	35.2	-	-		0.98
Blaeberry	3	6	Oct 14/91	BT	120	17.3	-	-		1.00
Blaeberry	3	6	Oct 14/91	BT	68	3.3	-	-		1.05
Blaeberry	3	6	Oct 14/91	WF	46	0.9	-	-		0.92
Blaeberry	1	7	Oct 15/91	1 x CC	-	-	-	-		
BLUEWATER CREEK										
Bluewater	4	2	Oct 08/91	BT	83	5.3	-	-	-	0.93
Bluewater	4	2	Oct 08/91	BT	72	3.6	-	-	0+	0.96
Bluewater	4	2	Oct 08/91	BT	54	1.7	-	-	0+	1.08
Bluewater	4	2	Oct 08/91	BT	39	0.6	-	-	0+	1.01
Bluewater	3	3	Oct 09/91	BT	73	4.8	-	-	0+	1.23
Bluewater	3	3	Oct 09/91	BT	43	0.8	-	-	0+	1.01
Bluewater	3	3	Oct 09/91	BT	44	0.9	-	-	0+	1.06

Columbia River Tributaries Study (2009)

River	Reach	Site #	Date	Species	Fork	Weight	Scales		Age	Condition
					Length (mm)		Slide #	Position			Factor
Bluewater	3	3	Oct 09/91	BT	41	0.6	-	-	0+	0.87
Bluewater	3	3	Oct 09/91	BT	79	4.8	6	1	0+	0.97
Bluewater	3	3	Oct 09/91	BT	89	7.7	6	2	1+	1.09
Bluewater	3	3	Oct 09/91	BT	133	21.6	6	3	1+	0.92
Bluewater	3	3	Oct 09/91	BT	137	25.9	7	1	ur	1.01
Bluewater	3	4	Oct 09/91	BT	89	6.3	7	2	0+	0.89
Bluewater	3	4	Oct 09/91	BT	83	6.2	7	3	0+	1.08
Bluewater	3	4	Oct 09/91	BT	86	6.3	8	1	1+	0.99
Bluewater	3	4	Oct 09/91	BT	57	1.8	-	-	0+	0.97
Bluewater	3	4	Oct 09/91	BT	61	2.6	-	-	0+	1.15
Bluewater	3	4	Oct 09/91	BT	63	2.7	-	-	0+	1.08
Bluewater	3	4	Oct 09/91	BT	47	1.0	-	-	0+	0.96
Bluewater	3	4	Oct 09/91	BT	58	2.1	-	-	0+	1.08
Bluewater	3	4	Oct 09/91	BT	63	2.3	-	-	0+	0.92
Bluewater	3	4	Oct 09/91	BT	46	0.9	-	-	0+	0.92
Bluewater	3	4	Oct 09/91	BT	43	0.6	-	-	0+	0.75
Bluewater	3	4	Oct 09/91	BT	52	1.4	-	-	0+	1.00
Bluewater	3	4	Oct 09/91	BT	51	1.9	-	-	0+	1.43
Bluewater	3	4	Oct 09/91	BT	49	1.1	-	-	0+	0.93
Bluewater	2	5	Oct 09/91	BT	135	22.2	8	2	2+	0.90
Bluewater	2	5	Oct 09/91	BT	44	0.8	-	-	0+	0.94
Bluewater	2	6	Oct 09/91	BT	97	10.5	9	1	1+	1.15
Bluewater	2	6	Oct 09/91	BT	113	14.0	9	2	1+	0.97
Bluewater	2	6	Oct 09/91	BT	51	1.1	-	-	0+	0.83
Bluewater	2	6	Oct 09/91	BT	122	17.8	9	3	2+	0.98
Bluewater	2	6	Oct 09/91	BT	82	5.0	-	-	0+	0.91
Bluewater	2	6	Oct 09/91	BT	49	1.1	-	-	0+	0.93
Bluewater	2	6	Oct 09/91	BT	53	1.4	-	-	0+	0.94
Bluewater	2	6	Oct 09/91	BT	55	1.5	-	-	0+	0.90
Bluewater	2	6	Oct 09/91	BT	46	0.9	-	-	0+	0.92
Bluewater	2	6	Oct 09/91	BT	49	1.3	-	-	0+	1.10
Bluewater	2	6	Oct 09/91	BT	42	0.7	-	-	0+	0.94
Whitepine		1	Oct 10/91	CT	117	12.4	10	1	2+	0.77
Whitepine		1	Oct 10/91	CT	106	11.5	10	2	2+	0.97
Whitepine		1	Oct 10/91	CT	82	5.9	10	3	0+	1.07
Whitepine		1	Oct 10/91	CT	165	55.7	11	1	2+	1.24
Whitepine		1	Oct 10/91	CT	166	57.4	11	2	3+	1.25
Whitepine		1	Oct 10/91	CT	146	29.9	11	3	ur	0.96

Columbia River Tributaries Study (2009)

River	Reach	Site #	Date	Species	Fork	Weight	Scales		Age	Condition
					Length (mm)		Slide #	Position		
Whitepine		1	Oct 10/91	RB/CT	49	1.4	-	-	0+	1.19
Whitepine		1	Oct 10/91	RB/CT	82	5.2	-	-	0+	0.94
Whitepine		1	Oct 10/91	RB/CT	74	3.6	-	-	0+	0.89
Whitepine		1	Oct 10/91	RB/CT	83	6.2	-	-	0+	1.08
from pool below culvert										
Whitepine		1	Oct 10/91	CT	107	11.5	12	1	1+	0.94
Whitepine		1	Oct 10/91	CT	95	8.8	12	2	1+	1.03
Whitepine		1	Oct 10/91	CT	122	17.6	12	3	2+	0.97
Whitepine		1	Oct 10/91	RB/CT	51	4.3	-	-	0+	3.24
Whitepine		1	Oct 10/91	RB/CT	80	4.9	-	-	-	0.96
Whitepine		1	Oct 10/91	RB/CT	57	1.7	-	-	0+	0.92
Whitepine		1	Oct 10/91	RB/CT	50	1.4	-	-	0+	1.12
Whitepine		1	Oct 10/91	RB/CT	55	1.8	-	-	0+	1.08
Whitepine		1	Oct 10/91	RB/CT	54	1.4	-	-	0+	0.89
Whitepine		1	Oct 10/91	RB/CT	52	1.5	-	-	0+	1.07
Whitepine		1	Oct 10/91	RB/CT	67	3.0	-	-	0+	1.00
Whitepine		1	Oct 10/91	RB/CT	44	1.0	-	-	0+	1.17
Whitepine		1	Oct 10/91	RB/CT	50	1.3	-	-	0+	1.04
Whitepine		1	Oct 10/91	RB/CT	52	1.5	-	-	0+	1.07
Whitepine		1	Oct 10/91	RB/CT	52	1.3	-	-	0+	0.92
B/CT hybrid - no hyoid teeth detected on the smaller fish										
Bluewater	1	7a	Oct 10/91	RB	96	11.4	13	1	1+	1.29
Bluewater	1	7a	Oct 10/91	RB	93	9.5	13	2	1+	1.18
Bluewater	1	7a	Oct 10/91	RB	71	3.6	13	3	1+	1.01
Bluewater	1	7a	Oct 10/91	RB	51	1.4	-	-	0+	1.06
Bluewater	1	7a	Oct 10/91	RB	43	0.9	-	-	0+	1.13
Bluewater	1	7a	Oct 10/91	RB	42	0.9	-	-	0+	1.21
Bluewater	1	7a	Oct 10/91	RB	49	1.2	-	-	0+	1.02
Bluewater	1	7a	Oct 10/91	RB	44	0.8	-	-	0+	0.94
Bluewater	1	7a	Oct 10/91	RB	42	0.8	-	-	0+	1.08
Bluewater	1	7a	Oct 10/91	RB	39	0.6	-	-	0+	1.01
Bluewater	1	7a	Oct 10/91	RB	46	1.1	-	-	0+	1.13
Bluewater	1	7a	Oct 10/91	RB	47	1.0	-	-	0+	0.96
Bluewater	1	7a	Oct 10/91	RB	41	0.9	-	-	0+	1.31
Bluewater	1	7a	Oct 10/91	RB	41	0.6	-	-	0+	0.87
Bluewater	1	7a	Oct 10/91	RB	35	0.4	-	-	0+	0.93
Bluewater	1	7a	Oct 10/91	RB	42	0.7	-	-	0+	0.94
Bluewater	1	7a	Oct 10/91	RB	42	0.9	-	-	0+	1.21
Bluewater	1	7a	Oct 10/91	RB	46	1.0	-	-	0+	1.03
Bluewater	1	7a	Oct 10/91	RB	42	0.7	-	-	0+	0.94

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork	Weight (gm)	Scales		Age	Condition Factor
					Length (mm)		Slide #	Position		
Bluewater	1	7a	Oct 10/91	RB	36	0.6	-	-	0+	1.29
Bluewater	1	7a	Oct 10/91	RB	51	1.6	-	-	0+	1.21
Bluewater	1	7a	Oct 10/91	RB	50	1.4	-	-	0+	1.12
Bluewater	1	7a	Oct 10/91	RB	36	0.5	-	-	0+	1.07
Bluewater	1	7a	Oct 10/91	RB	47	1.0	-	-	0+	0.96
Bluewater	1	7a	Oct 10/91	RB	40	0.7	-	-	0+	1.09
Bluewater	1	7a	Oct 10/91	RB	35	0.5	-	-	0+	1.17
Bluewater	1	7a	Oct 10/91	RB	50	1.2	-	-	0+	0.96
Bluewater	1	7a	Oct 10/91	RB	37	0.6	-	-	0+	1.18
Bluewater	1	7a	Oct 10/91	RB	34	0.4	-	-	0+	1.02
Bluewater	1	7a	Oct 10/91	RB	36	0.5	-	-	0+	1.07
Bluewater	1	7a	Oct 10/91	5 x CC	-	-	-	-	-	-
from isolated pool laterally fed through ground from mainstem										
Bluewater	1	7b	Oct 10/91	RB	96	14.0	-	-	-	1.58
Bluewater	1	7b	Oct 10/91	RB	42	0.9	-	-	0+	1.21
Bluewater	1	7b	Oct 10/91	RB	45	1.0	-	-	0+	1.10
Bluewater	1	7b	Oct 10/91	RB	46	1.0	-	-	0+	1.03
Bluewater	1	7b	Oct 10/91	RB	36	0.6	-	-	0+	1.29
Bluewater	1	7b	Oct 10/91	3 x Torrent CC	-	-	-	-	-	-
from left bank of mainstem (run/riffle)										
Bluewater	1	8	Oct 10/01	2 x CCG	-	-	-	-	-	-
Bluewater	1	8	Oct 10/01	3 x Torrent CC	-	-	-	-	-	-
Bluewater	2	9	Oct 11/91	BT	204	88.0	14	1	3+	1.04
Bluewater	2	9	Oct 11/91	RB	127	21.2	14	2	2+	1.03
Bluewater	2	9	Oct 11/91	RB	111	17.3	14	3	2+	1.26
Bluewater	2	9	Oct 11/91	1 x Torrent CC	-	-	-	-	-	-
Bluewater	2	10	Oct 16/91	BT	87	-	-	-	-	-
helicopter drop-in										

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork		Scales			Condition
					Length (mm)	Weight (gm)	Slide #	Position	Age		Factor
BLACKWATER CREEK										
Blackwater	4	1	Oct 06/91	RB	53	1.5	-	-	0+	1.01
Blackwater	4	1	Oct 06/91	RB	44	0.8	-	-	0+	0.94
Blackwater	4	1	Oct 06/91	RB	51	1.6	-	-	0+	1.21
Blackwater	4	1	Oct 06/91	RB	49	1.3	-	-	0+	1.10
Blackwater	4	1	Oct 06/91	RB	57	2.1	-	-	0+	1.13
Blackwater	4	1	Oct 06/91	RB	46	1.1	-	-	0+	1.13
Blackwater	4	1	Oct 06/91	RB	45	1.2	-	-	0+	1.32
Blackwater	4	1	Oct 06/91	RB	62	2.4	-	-	0+	1.01
Blackwater	4	1	Oct 06/91	RB	65	3.0	-	-	0+	1.09
Blackwater	4	1	Oct 06/91	RB	43	0.8	-	-	0+	1.01
Blackwater	4	1	Oct 06/91	RB	48	1.0	-	-	0+	0.90
Blackwater	4	1	Oct 06/91	RB	57	2.6	-	-	0+	1.40
Blackwater	4	1	Oct 06/91	RB	52	1.7	-	-	0+	1.21
Blackwater	4	1	Oct 06/91	RB	49	1.5	-	-	0+	1.27
Blackwater	4	1	Oct 06/91	RB	54	1.8	-	-	0+	1.14
Blackwater	4	1	Oct 06/91	RB	134	32.8	2	1	2+	1.36
Blackwater	4	1	Oct 06/91	RB	152	40.1	2	2	2+	1.14
Blackwater	4	1	Oct 06/91	RB	77	6.0	2	3	1+	1.31
Blackwater	4	1	Oct 06/91	RB	100	12.6	3	1	ur	1.26
Blackwater	4	1	Oct 06/91	RB	49	1.5	-	-	0+	1.27
Blackwater	4	1	Oct 06/91	RB	51	1.9	-	-	0+	1.43
Blackwater	4	1	Oct 06/91	RB	66	3.8	-	-	0+	1.32
Blackwater	4	1	Oct 06/91	6 x CC	-	-	-	-		
Blackwater	4	1	Oct 06/91	1 x CCG	-	-	-	-		
note: see field notes for capture area breakdown										
also: approx 10 x RB (15cm) seen u/s of site, in lg beaver pool										
Blackwater	4	2	Oct 06/91	RB	37	-	-	-	0+	
note: observed 10cm salmonid										
Blackwater	4	3	Oct 06/91	RB	43	1.1	-	-	0+	1.38
Blackwater	4	3	Oct 06/91	RB	41	0.8	-	-	0+	1.16
Blackwater	4	3	Oct 06/91	RB	49	1.4	-	-	0+	1.19
Blackwater	4	3	Oct 06/91	RB	47	1.2	-	-	0+	1.16
Blackwater	4	3	Oct 06/91	RB	46	1.3	-	-	0+	1.34
Blackwater	4	3	Oct 06/91	3 x CC	-	-	-	-		
Blackwater	3	4	Oct 7/91	10 x RB	C. 80-150	-	-	-		
note: RB Observed in pool u/s of beaver dam. No card for these fish.										

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork	Weight	Scales		Age	Condition
					Length (mm)		Slide #	Position			Factor
Blackwater	3	5	Oct 07/91	RB	94	9.5	3	2	1+	1.14
Blackwater	3	5	Oct 07/91	RB	88	8.4	3	3	1+	1.23
Blackwater	3	5	Oct 07/91	RB	99	11.7	4	1	1+	1.21
Blackwater	3	5	Oct 07/91	RB	104	13.6	4	2	2+	1.21
Blackwater	3	5	Oct 07/91	RB	51	1.5	-	-	0+	1.13
Blackwater	3	5	Oct 07/91	RB	55	1.9	-	-	0+	1.14
Blackwater	3	5	Oct 07/91	RB	42	1.0	-	-	0+	1.35
Blackwater	3	5	Oct 07/91	RB	46	1.2	-	-	0+	1.23
Blackwater	3	5	Oct 07/91	RB	34	0.4	-	-	0+	1.02
Blackwater	3	5	Oct 07/91	RB	58	2.5	-	-	0+	1.28
Blackwater	3	5	Oct 07/91	RB	62	2.5	-	-	0+	1.05
Blackwater	3	5	Oct 07/91	RB	52	1.4	-	-	0+	1.00
Blackwater	3	5	Oct 07/91	RB	55	1.6	-	-	0+	0.96
Blackwater	3	5	Oct 07/91	RB	57	2.5	-	-	0+	1.35
Blackwater	3	5	Oct 07/91	RB	61	3.0	-	-	0+	1.32
Blackwater	3	5	Oct 07/91	RB	62	2.8	-	-	0+	1.17
Blackwater	3	5	Oct 07/91	RB	56	2.2	-	-	0+	1.25
Blackwater	3	5	Oct 07/91	RB	50	1.7	-	-	0+	1.36
Blackwater	3	5	Oct 07/91	RB	44	1.2	-	-	0+	1.41
Blackwater	3	5	Oct 07/91	RB	38	0.6	-	-	0+	1.09
Blackwater	3	5	Oct 07/91	RB	39	0.7	-	-	0+	1.18
Blackwater	3	5	Oct 07/91	RB	43	1.0	-	-	0+	1.26
Blackwater	3	5	Oct 07/91	6 x CCG		-	-	-		
Blackwater	3	5	Oct 07/91	4 x Torrent CC		-	-	-		
and first pass site #5										
Blackwater	3	5	Oct 07/91	RB	43	1.0	-	-	0+	1.26
Blackwater	3	5	Oct 07/91	RB	48	1.2	-	-	0+	1.09
Blackwater	3	5	Oct 07/91	RB	50	1.6	-	-	0+	1.28
Blackwater	3	5	Oct 07/91	RB	48	1.3	-	-	0+	1.18
Blackwater	3	5	Oct 07/91	RB	47	1.5	-	-	0+	1.44
Blackwater	3	5	Oct 07/91	RB	39	0.7	-	-	0+	1.18
Blackwater	3	5	Oct 07/91	RB	42	1.4	-	-	0+	1.89
Blackwater	3	5	Oct 07/91	RB	46	1.0	-	-	0+	1.03
Blackwater	3	5	Oct 07/91	RB	40	0.8	-	-	0+	1.25
Blackwater	3	5	Oct 07/91	5 x CCG		-	-	-		
Blackwater	3	5	Oct 07/91	3 x Torrent CC		-	-	-		
and second pass site #5										
Blackwater	1	8	Oct 08/91	RB	106	15.3	5	1	2+	1.28
Blackwater	1	8	Oct 08/91	RB	100	12.9	5	2	1+	1.29

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork	Weight	Scales		Age	Condition
					Length (mm)		Slide #	Position			Factor
Blackwater	1	8	Oct 08/91	RB	61	2.9	-	-	0+	1.28
Blackwater	1	8	Oct 08/91	RB	62	3.1	-	-	0+	1.30
Blackwater	1	8	Oct 08/91	RB	53	2.0	-	-	0+	1.34
Blackwater	1	8	Oct 08/91	RB	49	1.6	-	-	0+	1.36
Blackwater	1	8	Oct 08/91	RB	53	1.9	-	-	0+	1.28
Blackwater	1	8	Oct 08/91	RB	51	1.8	-	-	0+	1.36
Blackwater	1	8	Oct 08/91	RB	47	1.3	-	-	0+	1.25
Blackwater	1	8	Oct 08/91	RB	47	1.3	-	-	0+	1.25
Blackwater	1	8	Oct 08/91	RB	53	1.9	-	-	0+	1.28
Blackwater	1	8	Oct 08/91	RB	40	0.7	-	-	0+	1.09
Blackwater	1	8	Oct 08/91	RB	29	0.2	-	-	0+	0.82
CAMP CREEK										
Camp	1	3	Oct 01/91	RB	31	0.3	-	-	0+	1.01
Camp	1	3	Oct 01/91	BT	50	1.1	-	-	0+	0.88
Camp	1	3	Oct 01/91	4 x CC	-	-	-	-		
note: observed 2 KO holding in area										
Gold		1	Oct 01/91	BT	120	-	-	-		
Gold		1	Oct 01/91	CT	70	-	-	-		
Camp	4	5	Oct 10/91	CT	73	5.5	1	1	1+	1.41
Camp	4	5	Oct 10/91	BT	89	5.7	1	2	1+	0.81
Camp	4	5	Oct 10/91	RB	63	2.8	1	3	0+	1.12
Camp	4	5	Oct 10/91	BT	52	1.5	-	-	0+	1.07
Camp	2	9	Oct 03/91	2 x CCG	-	-	-	-		
Camp	2	10	Oct 03/91	3 x CC	-	-	-	-		
note: 1 salmonid escaped										
Camp	4	11	Oct 03/91	BT	43	0.8	-	-	0+	1.01
Camp	4	11	Oct 03/91	BT	44	0.8	-	-	0+	0.94
Camp	4	11	Oct 03/91	BT	44	0.9	-	-	0+	1.06
Camp	4	11	Oct 03/91	BT	47	1.0	-	-	0+	0.96
Camp	4	11	Oct 03/91	BT	43	0.8	-	-	0+	1.01

Columbia River Tributaries Study (2009)

River	Reach	Site #	Date	Species	Fork		Scales			Condition
					Length (mm)	Weight (gm)	Slide #	Position	Age		Factor
SPILLIMACHEEN RIVER										
Spillimacheen	5	1	Oct 23/91	RB	90	9.0	24	1	1+	1.23
Spillimacheen	5	1	Oct 23/91	RB	93	8.5	24	2	1+	1.06
Spillimacheen	5	1	Oct 23/91	RB	103	12.7	24	3	2+	1.16
Spillimacheen	5	1	Oct 23/91	RB	73	4.1	-	-		1.05
Spillimacheen	3	2	Oct 24/91	EB	100	10.2	25	1	1+	1.02
Spillimacheen	3	2	Oct 24/91	PW	91	5.9	-	-		0.78
Spillimacheen	3	2	Oct 24/91	3 x CCG	-	-	-	-		
Spillimacheen	3	3	Oct 24/91	3 x CC	-	-	-	-		
Spillimacheen	3	3	Oct 24/91	5 x WF	5mm: 4 @ 50mm)		-	-		
Spillimacheen	3	5	Oct 25/91	EB	113	16.7	25	2	1+	1.16
Spillimacheen	3	5	Oct 25/91	BT	111	14.5	25	3	1+	1.06
Spillimacheen	3	5	Oct 25/91	MW	62	2.0	-	-		0.84
Spillimacheen	3	5	Oct 25/91	MW	59	1.8	-	-		0.88
Spillimacheen	3	5	Oct 25/91	2 x CC	-	-	-	-		
note: Brook Trout taken from pool at mouth of small tributary										
Spillimacheen	1	6	Oct 26/91	3 x M (range 50 - 100mm)			-	-		
Spillimacheen	1	6	Oct 26/91	1 x SU (Coarse Scale)			-	-		
Spillimacheen	1	6	Oct 26/91	2 x CC (Torrent)			-	-		
helicopter drop-in										
Spillimacheen	1	7	Oct 27/91	shocked: 95 sec = 0 fish						
Spillimacheen	1	8	Oct 27/91	x CC (Torrent)			-	-		
Spillimacheen	1	8	Oct 27/91	1 x SU (Coarse Scale ~ 140mm)			-	-		
note: shocked 405 sec										
Spillimacheen	1	9	Oct 27/91	MW	80	-	-	-		
Spillimacheen	1	9	Oct 27/91	MW	80	-	-	-		
Spillimacheen	1	9	Oct 27/91	MW	50	-	-	-		
Spillimacheen	1	9	Oct 27/91	3 x RSC	range (50 - 90mm)		-	-		
Spillimacheen	1	10	Oct 28/91	shocked: 110 sec = 0 fish						
note: side channel with slush forming throughout instream										
Spillimacheen	1	11	Oct 28/91	MW	291	-	26	1	7+	

Columbia River Tributaries Study (2099)

River	Reach	Site #	Date	Species	Fork		Scales		Age	Condition
					Length (mm)	Weight (gm)	Slide #	Position		
Spillimacheen	1	11	Oct 28/91	MW	171	-	26	2	3+	
Spillimacheen	1	11	Oct 28/91	MW	195	69.4	26	3	ur	0.94
Spillimacheen	1	11	Oct 28/91	MW	142	28.4	27	1	2+	0.99
Spillimacheen	1	11	Oct 28/91	MW	132	20.1	27	2	ur	0.87
Spillimacheen	1	11	Oct 28/91	EB	99	11.1	27	3	1+	1.14
Spillimacheen	1	11	Oct 28/91	MW	121	17.9	-	-		1.01
Spillimacheen	1	11	Oct 28/91	MW	97	8.0	-	-		0.88
Spillimacheen	1	11	Oct 28/91	MW	104	8.2	-	-		0.73
Spillimacheen	1	11	Oct 28/91	MW	153	31.3	-	-		0.87
Spillimacheen	1	11	Oct 28/91	MW	111	11.6	-	-		0.85

note: larger MW found mid-channel/faster water... spawners???

Spillimacheen	1	12	Oct 28/91	BB	119	10.5	-	-		0.62
Spillimacheen	1	12	Oct 28/91	BB	144	17.5	-	-		0.59
Spillimacheen	1	12	Oct 28/91	BB	130	-	-	-		
Spillimacheen	1	12	Oct 28/91	BB	167	26.3	-	-		0.56
Spillimacheen	1	12	Oct 28/91	3 x DC	(Longnose)		-	-		
Spillimacheen	1	12	Oct 28/91	6 x CCG	-	-	-	-		

note: BB found below fast water in lg boulders/shallow water

BOBBIE BURNS CREEK

Bobbie Burns	2	1	Oct 21/91	PW	50	-	-	-		
Bobbie Burns	6	3	Oct 22/91	shocked: 288 sec = 0 fish						
McMurdo		1	Oct 22/91	shocked: 550 sec = no fish caught*						
				observed 2 fish (salmonids?)						
Chrystalline		1	Oct 26/91	shocked: 250 sec = 0 fish						
Bobbie Burns	3	4	Oct 29/91	shocked: 224 sec = 0 fish						

note: heave ice forming throughout. Edge iced with slush instream

APPENDIX II

Summary of DFO/MOEP Stream Survey Forms for Each Site
(Note that 999's are default values for fields with no recorded value)

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
Page: 1

BEAVERFOOT RIVER

Key BEAVER-1

Site No. 1

Length Surveyed 70m
Fish Card N
Survey Date 91/10/17
Location @ STEEP CR

Reach No 1.0
Reach Length 11.2 km
Access Foot

Measurement Method

Average Channel Width (m)	18.0	GE	Percent Pool	50%	Percent Side Channel	0%
Average Wetted Width (m)	15.0	GE	Percent Riffle	0%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	999	GE	Percent Run	50%	Percent Stable	70%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	0.5					

BED MATERIAL

Fines.....	30%
Gravels.....	60%
a) small (2-16 mm)	40%
b) large (16-64 mm)	20%
Larges.....	10%
a) small cobble (64-128 mm)	10%
b) large cobble (128-256 mm)	0%
c) boulder (>256 mm)	0%
Bedrock.....	0%
D90.....	3cm
Compaction.....	M

BANKS

Height (m) 1.0
Percent Unstable 50%
Texture F

VALLEY TYPE

Confinement OC
Valley Channel Ratio 10+
Braided N
Bars 0%
Water Temperature 3.5°C
Turbidity 9999

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
Page: 2

BEAVERFOOT RIVER

Key BEAVER-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	30%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
1	CV	0.0	
0		0.0	
0		0.0	

COMMENTS

1. YOHO NAT. PARK ON R-BANK; LOGGED ON L-BANK
2. LOTS OF LOD
3. NO SHOCKING @ THIS SITE
4. CULVERTS D/S ARE IMPASSABLE (1M DROP INTO PLUNGE POOL)
- 5.
6. PHOTO: 5-22 (LOOKING D/S... YOHO ON R-SIDE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
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BEAVERFOOT RIVER

Key BEAVER-2

Site No. 2
 Length Surveyed 60m
 Fish Card Y
 Survey Date 91/10/17
 Location BELOW LODGE @ KM 39.

Reach No 1.0
 Reach Length 11.2 km
 Access Foot

Measurement Method

Average Channel Width (m)	21.0	T	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	18.0	T	Percent Riffle	20%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	15	T	Percent Run	70%	Percent Stable	50%
Average Max. Pool Depth (cm)	120	T	Percent Other	0%		
Gradient	0.5					

BED MATERIAL		BANKS	
	Percent	Height (m)	VALLEY TYPE
Fines.....	10%	2.0	OC
Gravels.....	70%	Percent Unstable	Valley Channel Ratio 10+
a) small (2-16 mm)	40%	Texture	N
b) large (16-64 mm)	30%		Bars 5%
Larges.....	20%		Water Temperature 4.0°C
a) small cobble (64-128 mm)	10%		Turbidity 9999
b) large cobble (128-256 mm)	10%		
c) boulder (>256 mm)	0%		
Bedrock.....	0%		
D90.....	7cm		
Compaction.....	M		

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
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BEAVERFOOT RIVER

Key BEAVER-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	20.5
L.O.D.	30%	Mean Depth (m)	0.2
Boulder	0%	Mean Velocity (m/s)	0.8
In-Stream Vegetation	5%	Discharge (m ³ /s)	2.31
Over Vegetation	25%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		EB	1 105
0		WF	5 58-105
0		CC	6

COMMENTS

1. FINES CONFINED PRIMARILY TO POOL AREAS
2. SHOCKED: EB (BROOKTROUT); SCULPINS; WHITEFISH
3. MATURE SPRUCE FOREST ON EITHER SIDE
- 4.
5. PHOTO: A-16 (SHOCK SITE - LOOKING U/S)
6. PHOTO: A-17 (OVERALL HABITAT LOOKING U/S)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARY ASSESSMENT

Date: 92/04/2
Page: 5

BEAVERFOOT RIVER

Key BEAVER-3

Site 3
 Length Surveyed 60
 Fish Card Y
 Survey Date 91/10/18
 Reach No 2.0
 Reach Length 18.0 km
 Access Foot

Measurement Method

Average Channel Width (m)	12.0	T	Percent Pool	30%	Percent Side Channel	0-10%
Average Wetted Width (m)	8.0	T	Percent Riffle	30%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	30	T	Percent Run	40%	Percent Stable	40
Average Max. Pool Depth (cm)	150	GE	Percent Other	%		

BED MATERIAL

Fines.....	10%
Gravels.....	60%
a) small (2-16 mm)	25%
b) large (16-64 mm)	35%
Larges.....	30%
a) small cobble (64-128 mm)	15%
b) large cobble (128-256 mm)	10%
c) boulder (>256 mm)	5%
Bedrock.....	%
D90.....	7cm
Compaction.....	

BANKS

Height (m) 1.0
 Percent Unstable 50%
 Texture F

VALLEY TYPE

Confinement OC
 Valley Channel Ratio D
 Braided N
 Bars 5%
 Water Temperature 2.5°C
 Turbidity 9999

COLUMBIA RIVER TRIBUTARY ASSESSMENT

BEAVERFOOT RIVER

Key BEAVER-3

Site 3

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	9999.90
L.O.D.	45%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	393-159
0		CC	1
0		999	
		999	

COMMENTS

1. INSIDE OF BENDS = ALL FINES
2. POOLS = FINES W/SOME LARGE COBBLES AT BOTTOM
3. SHOCKED: POOL/GLIDE = CAUGHT 3 DV (ANOTHER 2 ESCAPED)
4. ALL FISH FOUND IN LOD
5. FOREST = MATURE SPRUCE W/ALDER & WILLOW ALONG BANK
- 6.
7. PHOTO: A-27 (SHOCK SITE - POOL)
8. PHOTO: A-28 (OVERALL HABITAT LOOKING D/S)
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
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BEAVERFOOT RIVER

Key BEAVER-4

Site No. 4
Length Surveyed 50m
Fish Card Y
Survey Date 91/10/19
Location APPROX 2.4KM U/S FROM ICE R.

Reach No 2.0
Reach Length 18.0 km
Access Foot

Measurement Method

Average Channel Width (m)	14.0	T	Percent Pool	20%	Percent Side Channel	0-10%
Average Wetted Width (m)	12.0	T	Percent Riffle	40%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	20	T	Percent Run	40%	Percent Stable	30%
Average Max. Pool Depth (cm)	60	T	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent	
		5%
Gravels.....		75%
a) small (2-16 mm)	25%	
b) large (16-64 mm)	50%	
Larges.....		20%
a) small cobble (64-128 mm)	15%	
b) large cobble (128-256 mm)	5%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		7cm
Compaction.....		M

BANKS

Height (m) 0.4
Percent Unstable 60%
Texture F

VALLEY TYPE

Confinement OC
Valley Channel Ratio 10+
Braided N
Bars 5%
Water Temperature 3.0°C
Turbidity 9999

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
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BEAVERFOOT RIVER

Key BEAVER-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	25%		
Cutbank	25%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	2
0			
0			

COMMENTS

1. DEBRIS ALONG CREEK SIDE, NOT INSTREAM
2. LEFT SIDE OF CREEK PILED BY BEAVERS
3. PRIMARILY FINES NEXT TO BANKS/BEAVER PONDS
4. ELECTROFISHED FOR: 500 SEC = 2 SCULPINS
5. BANKS = MARSHY/DECIDUOUS TREES/GRASSES
6. OUT OF MARSH = MATURE CONIFEROUS FOREST
7. PHOTO: A-30 (BACK CHANNELS OFF MAINSTEM)
8. PHOTO: A-31 (MAINSTEM WHERE IT OPENS INTO BACK CHANNELS)
9. PHOTO: A-32 (OVERALL HABITAT LOOKING D/S)
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

Date: 92/03/03
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BEAVERFOOT RIVER (SIDE CHANNEL-SWAMP)

Key BEAVER-5

Site No. 5
 Length Surveyed 0m
 Fish Card
 Survey Date 91/10/19
 Location 11.5 KM U/S FROM CONFL OF BEAVERFOOT AND KICKING HORSE

Reach No 1.0
 Reach Length 11.2 km
 Access

Measurement Method

Average Channel Width (m)
 Average Wetted Width (m)
 Average Max. Riffle Depth (cm) 0
 Average Max. Pool Depth (cm) 0.0
 Percent Pool 99%
 Percent Riffle 0%
 Percent Run 0%
 Percent Other 0%
 Percent Side Channel >40%
 Debris: Percent Area 5-15%
 Percent Stable 0%

BED MATERIAL		BANKS	
	Percent	Height (m)	%
Fines.....	%	Percent Unstable	%
Gravels.....	%	Texture	
a) small (2-16 mm)	%		
b) large (16-64 mm)	%		
Larges.....	%		
a) small cobble (64-128 mm)	%	Confinement	
b) large cobble (128-256 mm)	0%	Valley Channel Ratio	N/A
c) boulder (>256 mm)	0%	Braided	N
Bedrock.....	0%	Bars	0%
D90.....	0%	Water Temperature	0C
Compaction.....	cm	Turbidity	0

VALLEY TYPE

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BEAVERFOOT RIVER (SIDE CHANNEL-SWAMP)

Key BEAVER-5

Site No. 5

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	0.0
L.O.D.	0%	Mean Depth (m)	0.0
Boulder	0%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 55 mm
0		0	
0		0	
		0	

COMMENTS

1. BEAVER ACTIVITY AT BOTTOM END OF TRIB CREEK
2. SEVERAL PONDS AND FLOODING
3. DEAD TREES AND GRASSES AROUND PONDS
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BEAVERFOOT RIVER

Key BEAVER-6

Site No. 6
 Length Surveyed 60m
 Fish Card Y
 Survey Date 91/10/19
 Location JUST U/S FROM BEAVERFOOT LODGE

Reach No - 1.0
 Reach Length 11.2 km
 Access Foot

Measurement Method

Average Channel Width (m)	24.0	T	Percent Pool	40%	Percent Side Channel	0-10%
Average Wetted Width (m)	18.0	T	Percent Riffle	20%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	35	T	Percent Run	40%	Percent Stable	30%
Average Max. Pool Depth (cm)	200	GE	Percent Other	0%		
Gradient	0.5					

BED MATERIAL

Fines.....	Percent
Gravels.....	Percent
a) small (2-16 mm)	15%
b) large (16-64 mm)	55%
c) boulder (>256 mm)	25%
Larges.....	30%
a) small cobble (64-128 mm)	20%
b) large cobble (128-256 mm)	10%
c) boulder (>256 mm)	0%
Bedrock.....	0%
D90.....	7cm
Compaction.....	M

BANKS

Height (m) 1.0
 Percent Unstable 70%
 Texture F

VALLEY TYPE

Confinement OC
 Valley Channel Ratio 10+
 Braided N
 Bars 5%
 Water Temperature 4.0°C
 Turbidity 9999

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BEAVERFOOT RIVER

Key BEAVER-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	50%	Wetted Width (m)	
L.O.D.	25%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		MW	30
0			
0			

COMMENTS

1. SHOCKED: SIDE CHANNEL = 3 SCULPINS; 1 WHITEFISH
2. RIGHT SIDE = YOHO/MATURE FOREST
3. LEFT SIDE = FOREST/MARSH GRASS FLATS
4. SMALL SCHOOL OF WF SEEN IN AREA
5. PHOTO: B-2 (LOOKING U/S AT SHALLOW BEAVER POND)
6. PHOTO: B-3 (LOOKING D/S)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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FRASER CREEK

Key FRASER-1

Site No. 1
 Length Surveyed 25m
 Fish Card Y
 Survey Date 91/10/17
 Location 50M U/S OF LOGGING RD

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	7.0	T	Percent Pool	15%	Percent Side Channel	0-10%
Average Wetted Width (m)	2.0	T	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	15	T	Percent Run	25%	Percent Stable	50%
Average Max. Pool Depth (cm)	80	GE	Percent Other	0%		
Gradient	2.0					

BED MATERIAL	Percent	BANKS
Fines.....	5%	Height (m) 2.0
Gravels.....	35%	Percent Unstable 60%
a) small (2-16 mm)	15%	Texture G
b) large (16-64 mm)	20%	
Larges.....	60%	VALLEY TYPE
a) small cobble (64-128 mm)	20%	Confinement OC
b) large cobble (128-256 mm)	20%	Valley Channel Ratio 10+
c) boulder (>256 mm)	20%	Braided N
Bedrock.....	0%	Bars 10%
D90.....	25cm	Water Temperature 2.0°C
Compaction.....	M	Turbidity 9999

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FRASER CREEK

Key FRASER-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	30%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	10%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0			
0			
0			

COMMENTS

1. SHOCKED: 260 SEC OVER ENTIRE SITE = NO FISH
2. VALLEY LOGGED - LEAVE STRIP (MATURE SPRUCE) AROUND CREEK
- 3.
4. PHOTO: A-14 (SHOCK SITE - POOL)
5. PHOTO: A-15 (SHOCK SITE - RIFFLE)
6. PHOTO: 5-23 (IMPASSABLE CULVERT)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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FRASER CREEK

Key FRASER-2

Site No. 2
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/19
 Location 150M U/S FROM MOUTH

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	8.1	T	Percent Pool	20%	Percent Side Channel	0%
Average Wetted Width (m)	1.3	T	Percent Riffle	50%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	15	GE	Percent Run	30%	Percent Stable	20%
Average Max. Pool Depth (cm)	60	GE	Percent Other	0%		
Gradient	2.0					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 1.0	
Gravels.....	40%	Percent Unstable 70%	
a) small (2-16 mm)	15%	Texture G	
b) large (16-64 mm)	25%		
Larges.....	50%		
a) small cobble (64-128 mm)	30%	Confinement UC	
b) large cobble (128-256 mm)	15%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	5%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	999cm	Water Temperature 99.9°C	
Compaction.....	M	Turbidity 9999	

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FRASER CREEK

Key FRASER-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	65%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	10%		
Crown Closure	10%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	1 49
0		WF	3 50-60
0			

COMMENTS

1. SHOCKED: 3 POOLS... FIRST POOL = ALL THE FISH (SEE NOTES)
2. ABUNDANT COBBLE/DEBRIS INSTREAM
3. RIVER OBVIOUSLY TAKES DIFFERENT COURSES ON A REG BASIS
4. FOREST: MATURE SPRUCE
- 5.
6. PHOTO: A-35 (POOL A - NO FISH)
7. PHOTO: A-33 (POOL C - NO FISH)
8. PHOTO: A-34 (OVERALL HABITAT LOOKING U/S)
- 9.
- 10.
- 11.
- 12.

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ICE RIVER

Key ICE-1

Site No. 1
 Length Surveyed 100m
 Fish Card N
 Survey Date 91/10/18
 Location APPROX 200M D/S OF TRAIL CROSSING (FOOTBRIDGE)

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	8.0	T	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	6.0	T	Percent Riffle	80%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	T	Percent Run	15%	Percent Stable	50%
Average Max. Pool Depth (cm)	80	GE	Percent Other	0%		
Gradient	3.0					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	5%	Height (m) 1.0	
Gravels.....	30%	Percent Unstable 60%	
a) small (2-16 mm)	10%	Texture L	
b) large (16-64 mm)	20%		
Larges.....	65%		
a) small cobble (64-128 mm)	20%	Confinement OC	
b) large cobble (128-256 mm)	30%	Valley Channel Ratio N/A	
c) boulder (>256 mm)	15%	Braided N	
Bedrock.....	0%	Bars 5%	
D90.....	25cm	Water Temperature 2.0°C	
Compaction.....	M	Turbidity 9999	

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ICE RIVER

Key ICE-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	50%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	10%		
Crown Closure	10%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. NO FISH SEEN; NO SHOCKING DONE
2. MATURE SPRUCE FOREST
3. PARTIALLY IN YOHO NATIONAL PARK
4. RIVER LOOKS STABLE AT PRESENT FLOW
5. SMALL TREES AND MOSS GROWING CLOSE TO RIVER
- 6.
7. PHOTO: A-23 (NOT OF SITE...LOOKING U/S)
8. PHOTO: A-24 (NOT OF SITE...LOOKING D/S)
- 9.
- 10.
- 11.
- 12.

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MOOSE CREEK

Key MOOSE-1

Site No. 1
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/17
 Location APPROX 100M D/S FROM FOOT BRIDGE

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	10.0	T	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	6.0	T	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	10	T	Percent Run	35%	Percent Stable	30%
Average Max. Pool Depth (cm)	40	T	Percent Other	0%		
Gradient	1.6					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 1.0	
Gravels.....	50%	Percent Unstable 60%	
a) small (2-16 mm)	20%	Texture G	
b) large (16-64 mm)	30%		
Larges.....	40%		
a) small cobble (64-128 mm)	20%	Confinement OC	
b) large cobble (128-256 mm)	15%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	5%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	999cm	Water Temperature 4.5°C	
Compaction.....	M	Turbidity 9999	

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MOOSE CREEK

Key MOOSE-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	50%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	25%		
Crown Closure	2%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	4 53-96
0			
0			

COMMENTS

1. SLUMPING (40M) ON L-BANK, OTHERWISE STABLE
2. SEE NOTES FOR FISH DATA
- 3.
4. PHOTO: A-21 (OVERALL HABITAT LOOKING U/S)
5. PHOTO: A-22 (SHOCK SITE - LOOKING U/S)
6. PHOTO: A-20 (NOT OF SITE... LOOKING U/S FROM FOOTBRIDGE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLAEBERRY RIVER

Key BLAE-1

Site No. 1

Length Surveyed	98m	Reach No	1.0
Fish Card	Y	Reach Length	5.6 km
Survey Date	91/10/12	Access	Foot
Location	APPROX 1KM D/S OF CONFLUENCE W/MUMMERY CR		
Measurement Method			
Average Channel Width (m)	167.0	Percent Pool	1%
Average Wetted Width (m)	57.0	Percent Riffle	80%
Average Max. Riffle Depth (cm)	30	Percent Run	19%
Average Max. Pool Depth (cm)	80	Percent Other	0%
Gradient	99.9	Percent Side Channel	0-10%
		Debris: Percent Area	0-5%
		Percent Stable	5%

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	15%	Height (m) 1.0	
Gravels.....	60%	Percent Unstable 50%	
a) small (2-16 mm)	30%	Texture G	
b) large (16-64 mm)	30%		
Larges.....	25%		
a) small cobble (64-128 mm)	20%	Confinement UC	
b) large cobble (128-256 mm)	5%	Valley Channel Ratio 0-2	
c) boulder (>256 mm)	0%	Braided Y	
Bedrock.....	0%	Bars 999%	
D90.....	999cm	Water Temperature 6.0°C	
Compaction.....		Turbidity 9999	

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BLAEBERRY RIVER
Site No. 1

Key BLAE-1

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	50%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	15%		
Cutbank	15%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	6 100-158
0			
0			

COMMENTS

1. AVG CHAN WIDTH (M) PACED ACROSS REPRESENTATIVE X-SECTION
2. ALMOST ALL DEBRIS ON BARS (DRY) NOT INSTREAM
3. 6 DV CAUGHT: 3/TRIP; 3/SIDE CHANNEL
4. GENERAL VEG: MATURE SPRUCE/WILLOW
5. UNSTABLE CHANNEL: VERY BRAIDED
6. PACED X-SEC = 8 CHANNELS
- 7.
8. PHOTO: 3-21: (SHOCK SITE- TRIB STREAM LOOKING U/S)
9. PHOTO: 3-22: (SHOCK SITE- SIDE CHANNEL LOOKING U/S)
10. PHOTO: 3-23; 3-24; 3-E (PAN [OVERLAP] SHOTS OF SITE 1)
- 11.
- 12.

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GOLD CREEK

Key GOLD-1

Site No. 999
 Length Surveyed 999m
 Fish Card Y
 Survey Date 91/10/01
 Location 150 M U/S FROM CAMP CREEK

Reach No 999.9
 Reach Length 999.9 km
 Access 4x2

Measurement

Average Channel Width (m)	4.0	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	3.0	Percent Riffle	50%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	15	Percent Run	40%	Percent Stable	99%
Average Max. Pool Depth (cm)	1	Percent Other	0%		
Gradient	1.5				

Method

GE
 GE
 GE
 GE

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	0%	
D90.....	999cm	
Compaction.....	M	

BANKS

Height (m)	0.5
Percent Unstable	999%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	N/A
Braided	N
Bars	999%
Water Temperature	99.9°C
Turbidity	9999

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GOLD CREEK

Key GOLD-1

Site No. 999

COVER		DISCHARGE	
Deep Pool	99%	Wetted Width (m)	
L.O.D.	99%	Mean Depth (m)	
Boulder	99%	Mean Velocity (m/s)	
In-Stream Vegetation	99%	Discharge (m ³ /s)	
Over Vegetation	99%		
Cutbank	99%		
Crown Closure	99%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	
		No.	Size (mm)

COMMENTS

1. LOTS OF INSTREAM LOD NATURAL AND FROM LOGGING
2. LOD HELPED FORM THE POOL HABITAT
3. GOOD POCKETS OF SPawning GRAVEL
4. RIFFLES OVER LARGE COBBLE
5. SECTION NEAR CONFL IS UNLOGGED, LOGGED FURTHER UP
6. VEG. IS FIR FOREST IN SHOCKING AREA
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLAEBERRY RIVER

Key BLAE-2

Site No. 2
 Length Surveyed 77m
 Fish Card Y
 Survey Date 91/10/13
 Location CONFLUENCE ENSIGN CR.
 Reach No 2.0
 Reach Length 8.5 km
 Access Foot

Measurement Method

Average Channel Width (m)	51.0	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	18.0	Percent Riffle	85%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	Percent Run	10%	Percent Stable	30%
Average Max. Pool Depth (cm)	80	Percent Other	0%		
Gradient	0.0				

BED MATERIAL

Fines.....	Percent	5%
Gravels.....	Percent	25%
a) small (2-16 mm)	10%	
b) large (16-64 mm)	15%	
Larges.....	Percent	70%
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	30%	
c) boulder (>256 mm)	20%	
Bedrock.....	Percent	0%
D90.....	Percent	20cm
Compaction.....	Method	M

BANKS

Height (m)	1.0
Percent Unstable	60%
Texture	L

VALLEY TYPE

Confinement	FC
Valley Channel Ratio	2-5
Braided	N
Bars	30%
Water Temperature	3.5°C
Turbidity	0

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLAEBERRY RIVER

Key BLAE-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	0.0
L.O.D.	20%	Mean Depth (m)	0.0
Boulder	40%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	5%		
Cutbank	30%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	9 54-206
0		0	
0		0	
0		0	

COMMENTS

1. SHOCKED: SIDE CHANNEL/TRIB & RIFFLE EDGE = 9 DV
2. SEE NOTES FOR VARIOUS SIZES OF 9 DV
3. DV FOUND MOSTLY AT EDGE OF FASTER WATER
4. MATURE SPRUCE FOREST... WILLOW/ALDER/GRASS ON BANKS
5. VALLEY BOTTOM NARROW WITH MOUNTAINS EITHER SIDE
6. LOD ON BANKS (DRY) NOT MUCH INSTREAM
7. GLACIAL WATER BUT FAIRLY CLEAR
- 8.
9. PHOTO: 4-2: (SHOCK SITE-POOL IN ENSIGN CR MOUTH D/S)
10. PHOTO: 4-3: (SHOCK SITE-SIDE CHANNEL ABOVE/BELOW CONFLU)
11. PHOTO: 4-4: (SHOCK SITE-LOOKING U/S)
12. PHOTO: 4-5: (OVERALL HABITAT LOOKING U/S)

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BLAEBERRY RIVER

Key BLAE-4

Site No. 4
 Length Surveyed 76m
 Fish Card N
 Survey Date 91/10/13
 Location U/S OF WSC GAUGE SITE (1.9KM U/S)

Reach No 3.0
 Reach Length 11.3 km
 Access Foot

Measurement Method

Average Channel Width (m)	45.0	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	23.0	Percent Riffle	70%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	Percent Run	25%	Percent Stable	20%
Average Max. Pool Depth (cm)	60	Percent Other	0%		
Gradient	99.9				

BED MATERIAL

Fines.....	5%
Gravels.....	20%
a) small (2-16 mm)	5%
b) large (16-64 mm)	15%
Larges.....	75%
a) small cobble (64-128 mm)	20%
b) large cobble (128-256 mm)	30%
c) boulder (>256 mm)	25%
Bedrock.....	0%
D90.....	20cm
Compaction.....	M

BANKS

Height (m) 1.0
 Percent Unstable %
 Texture G

VALLEY TYPE

Confinement OC
 Valley Channel Ratio 2-5
 Braided N
 Bars 30%
 Water Temperature 6.0°C
 Turbidity 9999

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLAEBERRY RIVER

Key BLAE-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	20%	Mean Depth (m)	
Boulder	40%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	12
0		DV	1 183
0			

COMMENTS

1. SHOCKED: 2 SCULPINS (MAIN CHAN); 10 SCULPINS (SIDE CHAN)
2. KO SPawning IN SIDE CHANNEL
3. DV FROM SIDE CHANNEL
4. LOGGING ON LEFT BANK SLOPES - APPROX 50M LEAVE STRIP
5. MOST DEBRIS DRY/BARS (NOT INSTREAM)
6. EDGE BOULDERS PROVIDE MAJORITY OF COVER IN FAST RIFFLE
- 7.
8. PHOTO: 4-19: (SHOCK SITE: SIDE CHANNEL)
9. PHOTO: 4-18: (SHOCK SITE: SIDE CHANNEL - OVERALL HABITAT)
10. PHOTO: 4-17: (OVERALL HABITAT LOOKING U/S)
11. PHOTO: 4-16: (SHOCK: LEFT EDGE - LOOKING U/S)
- 12.

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BLAEBERRY RIVER

Key BLAE-5

Site No. 5
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/14
 Location APPROX 100M U/S FROM POLECABIN CR

Reach No 2.0
 Reach Length 8.5 km
 Access Foot

Measurement Method

Average Channel Width (m)	79.0	GE	Percent Pool	5%	Percent Side Channel	>40%
Average Wetted Width (m)	39.0	GE	Percent Riffle	60%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	60	GE	Percent Run	35%	Percent Stable	30%
Average Max. Pool Depth (cm)	110	GE	Percent Other	0%		
Gradient	99.9					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 1.0	
Gravels.....	40%	Percent Unstable 60%	
a) small (2-16 mm)	15%	Texture G	
b) large (16-64 mm)	25%		
Larges.....	50%		Confinement OC
a) small cobble (64-128 mm)	30%		Valley Channel Ratio 10+
b) large cobble (128-256 mm)	15%		Braided Y
c) boulder (>256 mm)	5%		Bars 20%
Bedrock.....	0%		Water Temperature 7.0°C
D90.....	13cm		Turbidity 9999
Compaction.....	M		

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BLAEBERRY RIVER

Key BLAE-5

Site No. 5

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	20%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	15%		
Cutbank	15%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	2 48-73
0		CC	6
0			

COMMENTS

1. KOKANEE SPawning IN AREA
2. RB FRY (2) REMOVED FROM SLOW WATER LEFT BANK
3. IMMATURE PINE/FIR FOREST
- 4.
5. PHOTO: 5-7 (SHOCK SITE: SIDE CHANNEL)
6. PHOTO: 5-8 (SHOCK SITE: MAIN CHANNEL)
7. PHOTO: 5-9 (MAIN CHANNEL)
- 8.
- 9.
- 10.
- 11.
- 12.

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BLAEBERRY RIVER

Key BLAE-6

Site No. 6
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/14
 Location JUST U/S FROM RECREATION SITE NEAR SPLIT CR

Reach No 3.0
 Reach Length 11.3 km
 Access Foot

Measurement Method

Average Channel Width (m) 22.0 GE Percent Pool 0% Percent Side Channel 0%
 Average Wetted Width (m) 18.0 GE Percent Riffle 60% Debris: Percent Area 0-5%
 Average Max. Riffle Depth (cm) 47 T Percent Run 40% Percent Stable 30%
 Average Max. Pool Depth (cm) 9999 Percent Other 0%
 Gradient 99.9

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	5%	Height (m) 2.0	
Gravels.....	25%	Percent Unstable 50%	
a) small (2-16 mm)	10%	Texture F	
b) large (16-64 mm)	15%		
Larges.....	70%		
a) small cobble (64-128 mm)	25%	Confinement OC	
b) large cobble (128-256 mm)	30%	Valley Channel Ratio 0-2	
c) boulder (>256 mm)	15%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	15cm	Water Temperature 10.0°C	
Compaction.....	M	Turbidity 9999	

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BLAEBERRY RIVER

Key BLAE-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	18.0
L.O.D.	75%	Mean Depth (m)	0.5
Boulder	20%	Mean Velocity (m/s)	1.4
In-Stream Vegetation	0%	Discharge (m ³ /s)	9.45
Over Vegetation	5%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	2 120-153
0		DV*	1 68
0		WF*	1 46

COMMENTS

1. DV PULLED OUT FROM LOD/LARGE COBBLE
2. IMMATURE CEDAR/FIR FOREST, SOME JUNIPER
3. SITE IS JUST BELOW BRAIDED REACH
4. RIVER BECOMES RIFFLE/RUN AT TOP OF CANYON AREA
5. *FISH FROM A NEARBY SIDE CHANNEL
6. PHOTO: 5-13 (OVERALL HABITAT LOOKING U/S)
7. PHOTO: 5-12 (SHOCK SITE LOOKING U/S)
- 8.
- 9.
- 10.
- 11.
- 12.

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BLAEBERRY RIVER

Key BLAE-7

Site No. 7
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/15
 Location APPROX 100M U/S FROM HWY

Reach No 1.0
 Reach Length 5.6 km
 Access Foot

Measurement Method

Average Channel Width (m) 30.0 T
 Average Wetted Width (m) 21.0 T
 Average Max. Riffle Depth (cm) 100 GE
 Average Max. Pool Depth (cm) 200 GE
 Gradient 0.5

Percent Pool 15%
 Percent Riffle 55%
 Percent Run 30%
 Percent Other 0%

Percent Side Channel 0%
 Debris: Percent Area 0-5%
 Percent Stable 50%

BED MATERIAL		BANKS	
	Percent	Height (m)	VALLEY TYPE
Fines.....	10%	2.0	FC
Gravels.....	30%	30%	10+
a) small (2-16 mm)	10%	Texture	N
b) large (16-64 mm)	20%		30%
Larges.....	60%		8.0°C
a) small cobble (64-128 mm)	25%		9999
b) large cobble (128-256 mm)	20%		
c) boulder (>256 mm)	15%		
Bedrock.....	0%		
D90.....	999cm		
Compaction.....	M		

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BLAEBERRY RIVER

Key BLAE-7

Site No. 7

COVER		DISCHARGE	
Deep Pool	45%	Wetted Width (m)	
L.O.D.	20%	Mean Depth (m)	
Boulder	35%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	1

COMMENTS

1. OVERSTORY= MATURE PINE/FIR
2. ACTIVELY ERODING SHALE CLIFF BANK
3. SHOCKED: 28M = 1 SCULPIN (NO KO OBSERVED)
- 4.
5. PHOTO: 5-14 (SHOCK SITE LOOKING U/S)
6. PHOTO: 5-15 (OVERALL HABITAT)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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MUMMERY CREEK

Key MUM-1

Site No. 1
 Length Surveyed 40m
 Fish Card N
 Survey Date 91/10/13
 Location JUST U/S OF LOGGING RD BRIDGE

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	6.0	Percent Pool	15%	Percent Side Channel	0-10%
Average Wetted Width (m)	4.0	Percent Riffle	65%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	20	Percent Run	20%	Percent Stable	40%
Average Max. Pool Depth (cm)	100	Percent Other	0%		
Gradient	1.0				

BED MATERIAL

Fines.....	Percent	5%
Gravels.....	Percent	30%
a) small (2-16 mm)		10%
b) large (16-64 mm)		20%
Larges.....	Percent	65%
a) small cobble (64-128 mm)		23%
b) large cobble (128-256 mm)		23%
c) boulder (>256 mm)		19%
Bedrock.....	Percent	0%
D90.....		15cm
Compaction.....		M

BANKS

Height (m) 1.0
 Percent Unstable 30%
 Texture G

VALLEY TYPE

Confinement OC
 Valley Channel Ratio 2-5
 Braided N
 Bars 10%
 Water Temperature 3.0°C
 Turbidity 4

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MUMMERY CREEK

Key MUM-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	15%	Wetted Width (m)	
L.O.D.	35%	Mean Depth (m)	
Boulder	30%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. MORE GLACIAL THAN BLAEBERRY; DIRECTLY GLACIER FED
2. INVERTS UNDER ALMOST EVERY ROCK IN RIFFLE AREA
3. NO SHOCKING DONE HERE
4. PHOTO: 4-7 (NOT OF SITE - BUT CLOSE PROXIMITY)
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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REDBURN CREEK

Key RED-1

Site No. 1
 Length Surveyed 50m
 Fish Card N
 Survey Date 91/10/14
 Location APPROX 500M U/S FROM BRIDGE

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	4.5	T	Percent Pool	0%	Percent Side Channel	0%
Average Wetted Width (m)	3.0	T	Percent Riffle	80%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	25	GE	Percent Run	20%	Percent Stable	30%
Average Max. Pool Depth (cm)	3.0		Percent Other	0%		

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 1.0	
Gravels.....	20%	Percent Unstable 80%	
a) small (2-16 mm)	5%	Texture L	
b) large (16-64 mm)	15%		
Larges.....	70%		
a) small cobble (64-128 mm)	20%	Confinement OC	
b) large cobble (128-256 mm)	20%	Valley Channel Ratio 5-10	
c) boulder (>256 mm)	30%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	16cm	Water Temperature 7.0°C	
Compaction.....	M	Turbidity 9999	

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REDBURN CREEK

Key RED-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	60%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	5%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	
No. Size (mm)			

COMMENTS

1. NO FISH OBSERVED
2. LITTLE OVERSTREAM COVER OR INSTREAM LOD
3. POCKETS OF GRAVEL SUITABLE FOR SPAWNING
4. FRY PROBABLY MOVE INTO BLAEBERRY
- 5.
6. PHOTO: 5-11 (~500M U/S FROM BRIDGE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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WILLOWBANK CREEK

Key WILLOW-1

Site No. 1
 Length Surveyed 30m
 Fish Card Y
 Survey Date 91/10/14
 Location APPROX 50M D/S FROM BRIDGE

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	6.0	T	Percent Pool	15%	Percent Side Channel	0%
Average Wetted Width (m)	4.0	T	Percent Riffle	75%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	15	GE	Percent Run	10%	Percent Stable	40%
Average Max. Pool Depth (cm)	50	GE	Percent Other	0%		
Gradient	99.9					

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	15%	
b) large (16-64 mm)	25%	
Larges.....	50%	
a) small cobble (64-128 mm)	30%	
b) large cobble (128-256 mm)	15%	
c) boulder (>256 mm)	5%	
Bedrock.....	0%	
D90.....	10cm	
Compaction.....	M	

BANKS

Height (m)	1.0
Percent Unstable	50%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	15%
Water Temperature	5.0°C
Turbidity	9999

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WILLOWBANK CREEK

Key WILLOW-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	20%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	20%		
Cutbank	10%		
Crown Closure	10%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	3 40-60
0		RB	15 40-208
0		CT*	1 44

COMMENTS

1. *CT COULD BE CT/RB HYBRID, HAD TEETH AT BACK OF MOUTH
2. SOME DV FRY
3. GOOD HABITAT
4. MORE STABLE THAN TRIBS UP VALLEY
5. LOTS OF LOD ON BANKS/INSTREAM
6. MATURING CEDAR/FIR FOREST
- 7.
8. PHOTO: 5-6 (AT SITE LOOKING U/S)
9. PHOTO: 5-5 (AT SITE LOOKING U/S)
10. PHOTO: 5-4 (UPSTREAM SHOT OF POOLS)
11. PHOTOS: 5-1; 5-2; 5-3: HYBRID CT/RB?? FROM SITE.
- 12.

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BLUEWATER CREEK

Key BLUE-6

Site No. 6
Length Surveyed 69m
Fish Card Y
Survey Date 91/10/08
Location AT 47KM BRIDGE

Reach No 2.0
Reach Length 21.2 km
Access Foot

Measurement Method

Average Channel Width (m)	40.0	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	13.0	Percent Riffle	75%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	40	Percent Run	20%	Percent Stable	30%
Average Max. Pool Depth (cm)	100	Percent Other	0%		
Gradient	1.5				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	5%	Height (m) 1.0	
Gravels.....	15%	Percent Unstable 50%	
a) small (2-16 mm)	5%	Texture L	
b) large (16-64 mm)	10%		
Larges.....	80%		
a) small cobble (64-128 mm)	20%	Confinement FC	
b) large cobble (128-256 mm)	40%	Valley Channel Ratio 2-5	
c) boulder (>256 mm)	20%	Braided Y	
Bedrock.....	0%	Bars 60%	
D90.....	20cm	Water Temperature 5.5°C	
Compaction.....	L	Turbidity 9999	

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BLUEWATER CREEK

Key BLUE-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	65%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	5%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	13 42-113
0			
0			

COMMENTS

1. DEBRIS MOSTLY ON DRY AREAS OR BARS (NOT INSTREAM)
2. *SEE SITE #5 CARD- AREA VERY SIMILAR
3. SHORT RIFFLE SECTIONS W/BIG DROPS (10M LONG X 1M DROP)
4. RIFFLE/DROP/RUN/RIFFLE ETC...
- 5.
6. SLIDE: 2-25: (ABOVE BRIDGE @ SITE 6 -USED TO CROSS RIVER)
7. SLIDE: 2-24: (SHOCK SITE: RIFFLE)
8. SLIDES: 2-22; 2-23: (SHOCK SITE: POOL)
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLUEWATER CREEK

Key BLUE-7

Site No. 7
 Length Surveyed 100m
 Fish Card Y
 Survey Date 91/10/10
 Location APPROX 800M U/S FROM MOUTH

Reach No 1.0
 Reach Length 4.5 km
 Access Foot

Measurement Method

Average Channel Width (m)	26.3	Percent Pool	0%	Percent Side Channel	>40%
Average Wetted Width (m)	16.6	Percent Riffle	40%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	Percent Run	60%	Percent Stable	30%
Average Max. Pool Depth (cm)	9999	Percent Other	0%		
Gradient	0.5				

BED MATERIAL

Fines.....	10%
Gravels.....	30%
a) small (2-16 mm)	10%
b) large (16-64 mm)	20%
Larges.....	60%
a) small cobble (64-128 mm)	30%
b) large cobble (128-256 mm)	20%
c) boulder (>256 mm)	10%
Bedrock.....	0%
D90.....	12cm
Compaction.....	L

BANKS

Height (m)	1.0
Percent Unstable	80%
Texture	L

VALLEY TYPE

Confinement	UC
Valley Channel Ratio	5-10
Braided	N
Bars	0%
Water Temperature	7.0°C
Turbidity	9999

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BLUEWATER CREEK

Key BLUE-7

Site No. 7

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	17.2
L.O.D.	20%	Mean Depth (m)	0.3
Boulder	60%	Mean Velocity (m/s)	1.0
In-Stream Vegetation	10%	Discharge (m ³ /s)	3.87
Over Vegetation	0%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB*	30 35-100
0		CC*	5
0		RB	5 36-96

COMMENTS

1. SIDE CHANNELS EXIST BUT NOT WETTED AT THIS WATER LEVEL
2. LOD= ON DRY BANKS (NOT INSTREAM) AT THIS WATER LEVEL
3. SHOCKED: L-BANK FOR JUV... KO HOLDING OVER REDDS THROUGHOUT
4. *'D FISH TAKEN FROM STRANDED S-CHANNEL OTHERS FROM MAIN CHAN
5. SLIDE: 2-33: (OVERALL HABITAT)
6. SLIDE: 2-31: (SHOCK SITE 7A- ISOLATED POOL)
7. SLIDE: 2-32: (SHOCK SITE 7B- L-BANK LOOKING U/S)
- 8.
- 9.
- 10.
- 11.
- 12.

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BLUEWATER RIVER

Key BLUE-8

Site No. 8
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/10
 Location @ FOREST SERVICE REC SITE JUST U/S OF BLACKWATER CONFL

Reach No 1.0
 Reach Length 4.6 km
 Access 4x2

Measurement Method

Average Channel Width (m)	20.0	Percent Pool	15%	Percent Side Channel	>40%
Average Wetted Width (m)	15.0	Percent Riffle	50%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	Percent Run	35%	Percent Stable	40%
Average Max. Pool Depth (cm)	90	Percent Other	0%		
Gradient	99.9				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	5%	Height (m) 1.5	
Gravels.....	40%	Percent Unstable 999%	
a) small (2-16 mm)	%	Texture G	
b) large (16-64 mm)	%		
Larges.....	55%		
a) small cobble (64-128 mm)	%	Confinement OC	
b) large cobble (128-256 mm)	0%	Valley Channel Ratio N/A	
c) boulder (>256 mm)	0%	Braided N	
Bedrock.....	0%	Bars 999%	
D90.....	999cm	Water Temperature 99.9°C	
Compaction.....		Turbidity 9999	

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BLUEWATER RIVER

Key BLUE-8

Site No. 8

COVER		DISCHARGE	
Deep Pool	20%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	45%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	
0			Spp
0			CC
0			KO
		No.	Size (mm)
		5	
		300	200-300

COMMENTS

1. ELECTRO FISHING PRODUCED ONLY SCULPINS
2. KOKANEE HOLDING AND SPAWNING IN THE AREA
3. APPROX. 300 KO HERE TODAY
4. MUCH GREATER NUMBER HERE ON OCT. 6
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLUEWATER CREEK

Key BLUE-9

Site No. 9
 Length Surveyed 80m
 Fish Card Y
 Survey Date 91/10/11
 Location 200M U/S OF OLD LOGGING RD BRIDGE SITE/REC SITE

Reach No 2.0
 Reach Length 21.2 km
 Access Foot

Measurement Method

Average Channel Width (m)	17.0	T	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	14.0	T	Percent Riffle	50%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	GE	Percent Run	40%	Percent Stable	0%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.2					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 15.0	
Gravels.....	20%	Percent Unstable 50%	
a) small (2-16 mm)	10%	Texture G	
b) large (16-64 mm)	10%		
Larges.....	50%		
a) small cobble (64-128 mm)	10%	Confinement CO	
b) large cobble (128-256 mm)	25%	Valley Channel Ratio 0-2	
c) boulder (>256 mm)	15%	Braided N	
Bedrock.....	20%	Bars 0%	
D90.....	20cm	Water Temperature 5.5°C	
Compaction.....	M	Turbidity 9999	

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BLUEWATER CREEK

Key BLUE-9

Site No. 9

COVER		DISCHARGE	
Deep Pool	25%	Wetted Width (m)	
L.O.D.	5%	Mean Depth (m)	
Boulder	65%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 204
0		RB	2 120
0		CC	1

COMMENTS

1. STREAM VALLEY VERY CONFINED HERE
2. SINGLE & CLUSTER BOULDERS THROUGHOUT AREA
3. 2000+ KO SPawning ADJACENT TO REC SITE
4. 1000'S OF KO HOLDING THROUGHOUT/SPawning ON GRAVEL POCKETS
5. BT/RB CAUGHT ADJACENT (IN BOULDERS) TO KO SPawNERS
6. MATURE FIR FOREST/ SOFT ERODING SLATE BEDROCK ON L-BANK
7. UNCONSOLIDATED MATERIAL ON R-BANK
8. NO OVERHANGING VEG. & ONLY FEW OCCURANCES OF LOD IN CHANNEL
- 9.
10. PHOTO: 3-8: (SHOCK R-EDGE: LOOKING U/S)
11. PHOTO: 3-9: (OVERALL HABITAT LOOKING U/S)
12. PHOTO: 3-10: (FISH PULLED FROM THESE BOULDERS)

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

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BLACKWATER CREEK

Key BLKWTR-1

Site No. 1

Length Surveyed 50m Reach No 4.0
Fish Card Reach Length 11.5 km
Survey Date 91/10/06 Access 4X4
Location CONFLUENCE BLACKWATER/CLEARWATER CREEKS

Measurement Method

Average Channel Width (m)	100.0	GE	Percent Pool	5%	Percent Side Channel	>40%
Average Wetted Width (m)	9.0	T	Percent Riffle	75%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	15	T	Percent Run	20%	Percent Stable	10%
Average Max. Pool Depth (cm)	70	T	Percent Other	0%		
Gradient	0.5					

BED MATERIAL

Fines.....	Percent	
		20%
Gravels.....		65%
a) small (2-16 mm)		40%
b) large (16-64 mm)		25%
Larges.....		15%
a) small cobble (64-128 mm)		8%
b) large cobble (128-256 mm)		5%
c) boulder (>256 mm)		2%
Bedrock.....		0%
D90.....		4cm
Compaction.....		

BANKS

Height (m)	1.0
Percent Unstable	20%
Texture	G

VALLEY TYPE

Confinement	UC
Valley Channel Ratio	0-2
Braided	Y
Bars	60%
Water Temperature	9.0°C
Turbidity	9999

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BLACKWATER CREEK

Key BLKWTR-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	35%	Discharge (m ³ /s)	
Over Vegetation	15%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	22 44-152
0		CC	7
0			

COMMENTS

1. EVIDENCE OF TRUCKS CROSSING THRU CHANNEL
2. WHERE CLEARWATER COMES IN- BRAIDED OVER GRAVEL ON L-SIDE
3. " " MULTIPLE CHANNELS THRU GRASS/SWAMP ON R-SIDE
4. 2 SHOCK AREAS: SIDE CHAN RUN/MAIN CHAN POOL = CC/RB
5. LOW NUMBERS OF AQUATIC INVERTS ON UNDERSIDES OF ROCKS
- 6.
7. PHOTO: BLUE-3A: (SHOCK SIDE CHANNEL RUN)
8. PHOTO: BLUE-4A: (SITE 1A- MAINCHANNEL POOL LOOKING D/S)
9. PHOTO: BLUE-5A: (SITE 1A- MAINCHANNEL POOL LOOKING U/S)
10. PHOTOS: BLUE 6-A, 7-A: (CONFLUENCE CLEARWATER/BLACKWATER)
- 11.
- 12.

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BLACKWATER CREEK

Key BLKWTR-2

Site No. 2
 Length Surveyed 20m
 Fish Card
 Survey Date 91/10/06
 Location APPROX 2.8KM BELOW BLACKWATER LK.
 Reach No 4.0
 Reach Length 11.5 km
 Access Foot

Measurement Method

Average Channel Width (m)	7.0	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	6.0	Percent Riffle	0%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	999	Percent Run	90%	Percent Stable	40%
Average Max. Pool Depth (cm)	120	Percent Other	0%		
Gradient	0.4				

BED MATERIAL

Fines.....	Percent	
		90%
Gravels.....		8%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....		2%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		1cm
Compaction.....		L

BANKS

Height (m)	1.0
Percent Unstable	60%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	0%
Water Temperature	8.0°C
Turbidity	9999

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BLACKWATER CREEK

Key BLKWTR-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	70%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	1 37
0		TR	1 100
0			

COMMENTS

1. SIDE CHANNELS IN REACH- BUT NOT THIS SITE
2. WETTED CHAN MEANDERS THRU MARSH. 30CM RISE=FLOODING
3. ABUNDANT INSTREAM VEGETATION; RIPARIAN DECID TREES=DEAD
4. AVG - MAX GLIDE DEPTH.
5. ONLY OLD BEAVER DAM PARTWAY ACROSS CREEK
6. SHOCKED: 20M L BANK = 1 SMALL RB/ 1 LARGER (10CM) SALMONID
7. RIPARIAN = GRASS/DEAD DECIDUOUS TREES
8. GASSES BUBBLING OUT OF SEDIMENT ON CHANNEL SIDES
- 9.
10. PHOTO: BLUE-8A: (SHOCK SITE: LOOKING D/S)
11. PHOTO: BLUE-9A: (OVERALL HABITAT LOOKING D/S)
12. PHOTO: BLUE-10A: (OVERALL HABITAT LOOKING U/S)

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BLACKWATER CREEK

Key BLKWTR-3

Site No. 3
 Length Surveyed 22m
 Fish Card
 Survey Date 91/10/06
 Location APPROX 2KM BELOW BLACKWATER LK.
 Reach No 4.0
 Reach Length 11.5 km
 Access Foot

Measurement Method

Average Channel Width (m)	5.5	Percent Pool	20%	Percent Side Channel	0%
Average Wetted Width (m)	5.5	Percent Riffle	0%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	Percent Run	80%	Percent Stable	50%
Average Max. Pool Depth (cm)	100	Percent Other	0%		
Gradient	0.5				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	40%	Height (m) 1.0	
Gravels.....	55%	Percent Unstable 50%	
a) small (2-16 mm)	40%	Texture F	
b) large (16-64 mm)	15%		
Larges.....	5%		Confinement OC
a) small cobble (64-128 mm)	5%		Valley Channel Ratio 5-10
b) large cobble (128-256 mm)	0%		Braided N
c) boulder (>256 mm)	0%		Bars 999%
Bedrock.....	0%		Water Temperature 8.0°C
D90.....	2cm		Turbidity 9999
Compaction.....	L		

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BLACKWATER CREEK

Key BLKWTR-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	5.5
L.O.D.	15%	Mean Depth (m)	0.4
Boulder	0%	Mean Velocity (m/s)	0.4
In-Stream Vegetation	5%	Discharge (m ³ /s)	0.71
Over Vegetation	40%		
Cutbank	35%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	5 41-49
0			
0			

COMMENTS

1. RIFFLE DEPTH HERE IS AVG DEPTH OF RUN
2. SHOCKED: 22.5M X 1M OF L-SIDE = 5 RBT'S
3. RIPARIAN= WILLOW/GRASSES/DEAD DECID TREES ON BANKS
4. GENERALLY MARSHY - MEANDERS FROM VALLEY WALL TO WALL
- 5.
6. PHOTO: BLUE-11A (SHOCK SITE: L-SIDE LOOKING U/S)
7. PHOTO: BLUE-12A (OVERALL HABITAT LOOKING U/S)
- 8.
- 9.
- 10.
- 11.
- 12.

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BLACKWATER CREEK

Key BLKWTR-4

Site No. 4
 Length Surveyed 30m
 Fish Card
 Survey Date 91/10/07
 Location BEAVER DAM 300 M D/S OF LOGGING RD BRIDGE, D/S OF SITE

Reach No 3.0
 Reach Length 1.9 km
 Access

Measurement Method

Average Channel Width (m)
 Average Wetted Width (m)
 Average Max. Riffle Depth (cm) 0
 Average Max. Pool Depth (cm) 0.0
 Gradient
 Percent Pool 80%
 Percent Riffle 0%
 Percent Run 20%
 Percent Other 0%
 Percent Side Channel >40%
 Debris: Percent Area 5-15%
 Percent Stable 80%

BED MATERIAL		BANKS	
	Percent	Height (m)	%
Fines.....	%	Percent Unstable	%
Gravels.....	%	Texture	
a) small (2-16 mm)	%		
b) large (16-64 mm)	%		
Larges.....	%		
a) small cobble (64-128 mm)	%	Confinement	
b) large cobble (128-256 mm)	0%	Valley Channel Ratio	N/A
c) boulder (>256 mm)	0%	Braided	N
Bedrock.....	0%	Bars	0%
D90.....	0%	Water Temperature	OC
Compaction.....	0%	Turbidity	0

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BLACKWATER CREEK

Key BLKWTR-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	40%	Wetted Width (m)	0.0
L.O.D.	30%	Mean Depth (m)	0.0
Boulder	0%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	10%	Discharge (m ³ /s)	0.00
Over Vegetation	20%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
2	BD 3.9	RB	12 80-150
0	0.0	0	
0	0.0	0	

COMMENTS

1. THIS CARD DESCRIBES LOCATION AND SIZE OF BEAVER DAM
2. RB SEEN IN POND BEHIND DAM
3. OTHER THAN BEAVER POND STREAM CHARACTER AS AT SITE #5
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLACKWATER CREEK

Key BLKWTR-5

Site No. 5
 Length Surveyed 27m Reach No 3.0
 Fish Card Y Reach Length 1.8 km
 Survey Date 91/10/07 Access Foot
 Location JUST D/S OF BRIDGE

	Measurement Method	Percent Pool	5%	Percent Side Channel	0%
Average Channel Width (m)	T	7.0	5%	Debris: Percent Area	0-5%
Average Wetted Width (m)	T	5.3	65%	Percent Stable	30%
Average Max. Riffle Depth (cm)	GE	20	30%		
Average Max. Pool Depth (cm)	GE	40	0%		
Gradient		2.0			

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	15%	Height (m) 1.0	
Gravels.....	30%	Percent Unstable 30%	
a) small (2-16 mm)	10%	Texture G	
b) large (16-64 mm)	20%		
Larges.....	55%		
a) small cobble (64-128 mm)	30%	Confinement UC	
b) large cobble (128-256 mm)	15%	Valley Channel Ratio 5-10	
c) boulder (>256 mm)	10%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	12cm	Water Temperature 7.0°C	
Compaction.....	M	Turbidity 0	

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BLACKWATER CREEK

Key BLKWTR-5

Site No. 5

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	4.5
L.O.D.	40%	Mean Depth (m)	0.2
Boulder	20%	Mean Velocity (m/s)	0.5
In-Stream Vegetation	25%	Discharge (m ³ /s)	0.34
Over Vegetation	15%		
Cutbank	0%		
Crown Closure	20%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	27 38-104
0		CC	16
0		0	
		0	

COMMENTS

1. MUCH OF OVERHANGING ALDER APPEARS RECENTLY DEAD
2. SHOCKED: L BANK (1.5M WIDE) = RB/SCULPINS (SEE NOTES)
3. APPROX 200M D/S = IMPASSABLE BEAVER DAM
4. SURROUNDING AREA HAS BEEN LOGGED 15-20 YRS PRIOR
5. GRASSES/WILLOW ALONG STREAM BANKS
6. PHOTO = SLIDE 1-20,1-21(SHOCKING SITE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLACKWATER CREEK

Key BLKWTR-6

Site No. 6
 Length Surveyed 60m
 Fish Card
 Survey Date 91/10/08
 Location LOWER END, 300 M U/S OF MAIN LOGGING ROAD CROSSING OF C

Reach No 1.0
 Reach Length 2.3 km
 Access Foot

Measurement Method

Average Channel Width (m)	6.0	T	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	4.5	T	Percent Riffle	50%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	40	T	Percent Run	40%	Percent Stable	40%
Average Max. Pool Depth (cm)	80	GE	Percent Other	0%		
Gradient	1.5					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 15.0	
Gravels.....	20%	Percent Unstable 60%	
a) small (2-16 mm)	10%	Texture L	
b) large (16-64 mm)	10%		
Larges.....	70%		
a) small cobble (64-128 mm)	20%	Confinement FC	
b) large cobble (128-256 mm)	30%	Valley Channel Ratio 0-2	
c) boulder (>256 mm)	20%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	15cm	Water Temperature 7.0°C	
Compaction.....	M	Turbidity 9999	

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BLACKWATER CREEK

Key BLKWTR-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	999.0
L.O.D.	35%	Mean Depth (m)	
Boulder	30%	Mean Velocity (m/s)	1.0
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	20%		
Cutbank	0%		
Crown Closure	15%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. MATURE CONIFER FOREST/NARROW VALLEY/UNVEGETATED STEEP SIDES
2. KOKANEE OBSERVED IN AREA
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLACKWATER CREEK

Key BLKWTR-7

Site No.	7	Reach No	1.0
Length Surveyed	999m	Reach Length	2.3 km
Fish Card		Access	Foot
Survey Date	91/10/08	Access	
Location	JUST D/S OF SITE #6		

Average Channel Width (m)	5.0	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	3.0	Percent Riffle	70%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	Percent Run	10%	Percent Stable	10%
Average Max. Pool Depth (cm)	100	Percent Other	10%		
Gradient	3.5				

Measurement Method

		T			
		T			
		GE			
		GE			

BED MATERIAL

Fines.....	Percent	5%
Gravels.....	Percent	10%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	15%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	70%	
D90.....	cm	
Compaction.....	H	

BANKS

Height (m)	2.0
Percent Unstable	50%
Texture	L

VALLEY TYPE

Confinement	CO
Valley Channel Ratio	2-5
Braided	N
Bars	0%
Water Temperature	7.0°C
Turbidity	0

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BLACKWATER CREEK

Key BLKWTR-7

Site No. 7

COVER		DISCHARGE	
Deep Pool	40%	Wetted Width (m)	0.0
L.O.D.	20%	Mean Depth (m)	0.0
Boulder	20%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		KO	0
0		0	0
0		0	0
COMMENTS			
1. MORE LIKE A SMALL CASCADE THAN A RIFFLE			
2. DEEP POOL COVER IS DEEP PART OF MAIN CHANL UNDER WHITE WATER			
3. LEFT BANK =STEEP ERODING SLOPE			
4. RIGHT BANK = LESS HEIGHT WITH BENCH			
5. VEG = MATURING CONIFEROUS FOREST			
6. KOKANEE PASSING THROUGH THIS FAST SECTION			
7.			
8. SLIDE 1-23			
9.			
10.			
11.			
12.			

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BLACKWATER CREEK

Key BLKWTR-8

Site No. 8
 Length Surveyed 40m
 Fish Card Y
 Survey Date 91/10/07
 Location 150 D/S CULVERT IN MAIN HAUL ROAD

Reach No 1.0
 Reach Length 2.3 km
 Access

Measurement Method

Average Channel Width (m)	9.0	Percent Pool	20%	Percent Side Channel	0%
Average Wetted Width (m)	6.0	Percent Riffle	30%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	Percent Run	30%	Percent Stable	50%
Average Max. Pool Depth (cm)	160	Percent Other	20%		
Gradient	3.5				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 1.0	FC
Gravels.....	30%	Percent Unstable 60%	Valley Channel Ratio 2-5
a) small (2-16 mm)	10%	Texture L	Braided N
b) large (16-64 mm)	20%		Bars 99%
Larges.....	40%		Water Temperature 7.0°C
a) small cobble (64-128 mm)	20%		Turbidity 9999
b) large cobble (128-256 mm)	10%		
c) boulder (>256 mm)	10%		
Bedrock.....	20%		
D90.....	13cm		
Compaction.....	M		

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Key BLKWTR-8

BLACKWATER CREEK

Site No. 8

COVER		DISCHARGE	
Deep Pool	40%	Wetted Width (m)	7.3
L.O.D.	20%	Mean Depth (m)	0.3
Boulder	30%	Mean Velocity (m/s)	1.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	1.64
Over Vegetation	0%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	
0			Spp
0			RB
0			No. 13
			Size (mm) 30-106

COMMENTS

1. OTHER HABITAT = CHUTE 2M LONG BY 0.5M HIGH
2. SITE APPEARS TO BE OLD BRIDGE CROSSING
3. LEFT BANK = EXPOSED, ERODING SHALE
4. CONIFEROUS/DECIDUOUS FOREST
5. STREAM CHARACTER = PLUNGE POOLS, CHUTES - RIFFLE/RUN
6. SHOCKED LEFT AND RIGHT BANK, ONLY RB COLLECTED
7. KO HOLDING IN POOL BELOW CHUTE.
8. PHOTOS: SLIDES 1-26,1-29,1-30.
- 9.
- 10.
- 11.
- 12.

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CLEARWATER CREEK

Key CLRWTR-1

Site No. 1
 Length Surveyed 60m
 Fish Card
 Survey Date 91/10/11
 Location APPROX. 3 KM U/S OF CONFL WITH BLACWATER CR.

Reach No 0.0
 Reach Length 0.0 km
 Access

Measurement Method

Average Channel Width (m)
 Average Wetted Width (m)
 Average Max. Riffle Depth (cm) 0
 Average Max. Pool Depth (cm) 0.0
 Percent Pool 5%
 Percent Riffle 60%
 Percent Run 35%
 Percent Other 0%
 Percent Side Channel >40%
 Debris: Percent Area 5-15%
 Percent Stable 50%

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	10%	Height (m) 0.5	
Gravels.....	50%	Percent Unstable 50%	
a) small (2-16 mm) %		Texture G	
b) large (16-64 mm) %			
Larges.....	40%		
a) small cobble (64-128 mm) %		Confinement UC	
b) large cobble (128-256 mm) 0%		Valley Channel Ratio N/A	
c) boulder (>256 mm) 0%		Braided Y	
Bedrock.....	0%	Bars 70%	
D90.....	cm	Water Temperature °C	
Compaction.....		Turbidity 0	

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CLEARWATER CREEK

Key CLRWTR-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	0.0
L.O.D.	60%	Mean Depth (m)	0.0
Boulder	0%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	30%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		0	
0		0	
0		0	

COMMENTS

1. ABOVE THIS SITE THE CREEK IS VERY CONFINED AND PASSES
2. THROUGH A CHUTE, BOULDERS AND COBBLE IN CHANNEL
3. THE CREEK THEN OPENS OUT TO VERY BRAIDED CHANNEL
4. NO SHOCKING DONE HERE
5. SURROUNDING AREA HAS BEEN LOGGED
6. STREAM CHANNEL AREA IS GRASS AND DECIDUOUS TREES
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BEAVERFOOT RIVER

Key BEAVER-3

Site No. 3
 Length Surveyed 60m
 Fish Card Y
 Survey Date 91/10/18
 Location APPROX 5.8KM D/S FROM BRIDGE (SECONDARY LOGGING RD)
 Reach No 2.0
 Reach Length 18.0 km
 Access Foot

Measurement Method

Average Channel Width (m)	12.0	T	Percent Pool	30%	Percent Side Channel	0-10%
Average Wetted Width (m)	8.0	T	Percent Riffle	30%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	30	T	Percent Run	40%	Percent Stable	40%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.5					

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	10%	
b) large (16-64 mm)	60%	
c) boulder (>256 mm)	25%	
Larges.....	35%	
a) small cobble (64-128 mm)	30%	
b) large cobble (128-256 mm)	15%	
c) boulder (>256 mm)	10%	
Bedrock.....	5%	
D90.....	0%	
Compaction.....	7cm	

BANKS

Height (m) 1.0
 Percent Unstable 50%
 Texture F

VALLEY TYPE

Confinement OC
 Valley Channel Ratio 10+
 Braided N
 Bars 5%
 Water Temperature 2.5°C
 Turbidity 9999

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BEAVERFOOT RIVER

Key BEAVER-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	45%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	3 93-159
0		CC	1
0			

COMMENTS

1. INSIDE OF BENDS = ALL FINES
2. POOLS = FINES W/SOME LARGE COBBLES AT BOTTOM
3. SHOCKED: POOL/GLIDE = CAUGHT #3DV (ANOTHER 2 ESCAPED)
4. ALL FISH FOUND IN LOD
5. FOREST = MATURE SPRUCE W/ALDER & WILLOW ALONG BANK
- 6.
7. PHOTO: A-27 (SHOCK SITE - POOL)
8. PHOTO: A-28 (OVERALL HABITAT LOOKING D/S)
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

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BLUEWATER CREEK

Key BLUE-1

Site No. 1

Length Surveyed 200m Reach No 4.0
Fish Card N Reach Length 7.1 km
Survey Date 91/10/08 Access Foot
Location APPROX 64.2KM ON LOGGING RD

Measurement Method

Average Channel Width (m)	11.0	T	Percent Pool	0%	Percent Side Channel	0-10%
Average Wetted Width (m)	6.0	T	Percent Riffle	90%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	G \bar{E}	Percent Run	10%	Percent Stable	0%
Average Max. Pool Depth (cm)	9999		Percent Other	0%		
Gradient	1.3					

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	5%	
b) large (16-64 mm)	10%	
Larges.....	Percent	
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	45%	
c) boulder (>256 mm)	10%	
Bedrock.....	0%	
D90.....	15cm	
Compaction.....	M	

BANKS

Height (m) 2.0
Percent Unstable 80%
Texture L

VALLEY TYPE

Confinement OC
Valley Channel Ratio 5-10
Braided Y
Bars 4%
Water Temperature 4.0°C
Turbidity 9999

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BLUEWATER CREEK

Key BLUE-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	
L.O.D.	20%	Mean Depth (m)	
Boulder	70%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	0%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 70
0			
0			

COMMENTS

1. ICE ON QUIET BACKWATER OF STREAM
2. ENTIRE SECTION = ROCKY RIFFLE W/ONE SIDE CHANNEL
3. REMOVED (BY HAND) ONE 7CM BT FROM SIDE CHANNEL
4. OBSERVED ANOTHER FISH APPROX. 4CM IN SIDE CHANNEL
5. PHOTO: SLIDE 1-34.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

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BLUEWATER CREEK

Key BLUE-10

Site No. 10
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/16
 Location FROM HELICOPTER

Reach No 2.0
 Reach Length 21.2 km
 Access Helicopter

Measurement Method

Average Channel Width (m)	25.0	T	Percent Pool	10%	Percent Side Channel	10-40%
Average Wetted Width (m)	18.0	T	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	GE	Percent Run	30%	Percent Stable	0%
Average Max. Pool Depth (cm)	100	GE	Percent Other	0%		
Gradient	2.0					

BED MATERIAL

Fines.....	Percent	
	5%	
Gravels.....	10%	
a) small (2-16 mm)	5%	
b) large (16-64 mm)	5%	
Larges.....	75%	
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	30%	
c) boulder (>256 mm)	25%	
Bedrock.....	10%	
D90.....	23cm	
Compaction.....	M	

BANKS

Height (m) 2.0
 Percent Unstable 50%
 Texture G

VALLEY TYPE

Confinement FC
 Valley Channel Ratio 0-2
 Braided N
 Bars 30%
 Water Temperature 7.5°C
 Turbidity 9999

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BLUEWATER CREEK

Key BLUE-10

Site No. 10

COVER		DISCHARGE	
Deep Pool	40%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	50%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 87
0			
0			

COMMENTS

1. HIGH UNCONSOLIDATED BANKS & JUST D/S OF SLATE ROCK FACE
2. REACH IS GENERALLY CONFINED TO NARROW VALLEY W/DEEP CUT
3. MATURE SPRUCE/FIR FOREST

- 4.
5. PHOTO: A-6; A-7 (SHOCK SITE LOOKING U/S)
6. PHOTO: A-8 (OVERALL HABITAT LOOKING D/S)

- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLUEWATER CREEK

Key BLUE-2

Site No. 2
 Length Surveyed 40m
 Fish Card Y
 Survey Date 91/10/08
 Location APPROX 63.5KM ON LOGGING RD

Reach No 4.0
 Reach Length 7.1 km
 Access Foot

Measurement Method

Average Channel Width (m)	9.0	T	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	7.0	T	Percent Riffle	75%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	35	GE	Percent Run	20%	Percent Stable	0%
Average Max. Pool Depth (cm)	50	GE	Percent Other	0%		
Gradient	2.0					

BED MATERIAL

Fines.....	Percent
Gravels.....	Percent
a) small (2-16 mm)	5%
b) large (16-64 mm)	10%
Larges.....	70%
a) small cobble (64-128 mm)	25%
b) large cobble (128-256 mm)	35%
c) boulder (>256 mm)	10%
Bedrock.....	0%
D90.....	15cm
Compaction.....	M

BANKS

Height (m)	2.0
Percent Unstable	60%
Texture	L

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	2-5
Braided	N
Bars	0%
Water Temperature	5.0°C
Turbidity	9999

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BLUEWATER CREEK

Key BLUE-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	15%	Wetted Width (m)	
L.O.D.	15%	Mean Depth (m)	
Boulder	70%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	4 40-83
0			
0			

COMMENTS

1. SHOCKED: 26.5M X 1M R-BANK EDGE HABITAT
2. RIPARIAN= WILLOW/SMALL FIR TREES
3. SURROUNDING AREA= GENERALLY WILLOW/FIR
4. DEBRIS CHUTES ALONG VALLEY CONTRIBUTE MOSTLY LG BED MATTER
5. HIGH GRADIENT AREAS AT EITHER END OF SITE...
6. CHUTES & POOLS WITH DROPS UP TO 30CM W/LG BOULDERS.
- 7.
8. SLIDE 2-4: (SHOCK SITE LOOKING U/S)
9. SLIDE 3-5: (OVERALL HABITAT LOOKING U/S)
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLUEWATER CREEK

Key BLUE-3

Site No.	3	Reach No	3.0
Length Surveyed	50m	Reach Length	7.3 km
Fish Card	Y	Access	Foot
Survey Date	91/10/09		
Location	ACCESS @ KM 61 OFF LOGGING RD		

Average Channel Width (m)	22.0	Percent Pool	15%	Percent Side Channel	10-40%
Average Wetted Width (m)	14.5	Percent Riffle	25%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	15	Percent Run	60%	Percent Stable	30%
Average Max. Pool Depth (cm)	130	Percent Other	0%		
Gradient	2.0				

Measurement Method

Measurement Method	T
Measurement Method	T
Measurement Method	GE
Measurement Method	GE

BED MATERIAL

Fines.....	Percent	
		10%
Gravels.....	Percent	60%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	30%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		7cm
Compaction.....		M

BANKS

Height (m)	1.0
Percent Unstable	50%
Texture	F

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	40%
Water Temperature	3.0°C
Turbidity	9999

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BLUEWATER CREEK

Key BLUE-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	50%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	0.5
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	8 41-137
0			
0			

COMMENTS

1. SHOCKED: 32M OF EDGE= BULLTROUT (SEE NOTES)
2. STREAM CHANNEL IN WIDE VALLEY- MEANDERS FROM SIDE/SIDE
3. PRIMARILY WILLOW/FIR WITH MARSH GRASSES IN SOME AREAS
4. ACTIVE EROSION ON MOUNTAIN SLOPES= CHUTES/AVALANCHE PATHS
5. LOTS OF LOD DEPOSITED ON BARS BUT NOT INSTREAM
- 6.
7. SLIDE 2-12; 2-13; 2-14: (SHOCK SITE: SIDE CHANNEL)
- 8.
- 9.
- 10.
- 11.
- 12.

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BLUEWATER RIVER (CHANNEL IN MARSH)

Key BLUE-4A

Site No. 4
 Length Surveyed 20m Reach No 3.0
 Fish Card Y Reach Length 7.3 km
 Survey Date 91/10/09 Access 4x2
 Location @ KM 58 ON LOGGING RD, SIDECANNEL

Measurement Method

Average Channel Width (m)	2.0	Percent Pool	10%	Percent Side Channel	>40%
Average Wetted Width (m)	2.0	Percent Riffle	5%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	Percent Run	85%	Percent Stable	80%
Average Max. Pool Depth (cm)	70	Percent Other	0%		
Gradient	0.2				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	70%	Height (m) 0.3	
Gravels.....	25%	Percent Unstable 50%	
a) small (2-16 mm)	%	Texture	
b) large (16-64 mm)	%		
Larges.....	5%		Confinement UC
a) small cobble (64-128 mm)	%		Valley Channel Ratio N/A
b) large cobble (128-256 mm)	0%		Braided N
c) boulder (>256 mm)	0%		Bars 999%
Bedrock.....	0%		Water Temperature 5.0°C
D90.....	999cm		Turbidity 9999
Compaction.....	L		

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BLUEWATER RIVER (CHANNEL IN MARSH)

Key BLUE-4A

Site No. 4

COVER		DISCHARGE	
Deep Pool	15%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	10%	Discharge (m ³ /s)	
Over Vegetation	20%		
Cutbank	25%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	14 47-90
0			
0			

COMMENTS

1. MARSHY AREA WITH MUCH BEAVER ACTIVITY
2. ENTIRE AREA CONTAINS SMALL CHANNELS WITH SMALL DAMS
3. TYPICAL HABITAT ON THE INSIDE OF BENDS IN MAIN CHANNEL
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BLUEWATER RIVER (MAIN CHANNEL)

Key BLUE-4B

Site No. 4
 Length Surveyed 50m Reach No 2.0
 Fish Card Y Reach Length 21.2 km
 Survey Date 91/10/09 Access 4X2
 Location @ KM 58 OF LOGGING RD, MAIN CHANNEL

Measurement Method

Average Channel Width (m)	15.0	GE	Percent Pool	15%	Percent Side Channel	0-10%
Average Wetted Width (m)	10.0	GE	Percent Riffle	45%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	20	T	Percent Run	40%	Percent Stable	40%
Average Max. Pool Depth (cm)	120	T	Percent Other	0%		
Gradient	99.9					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	15%	Height (m) 1.0	
Gravels.....	50%	Percent Unstable 20%	
a) small (2-16 mm)	20%	Texture G	
b) large (16-64 mm)	30%		
Larges.....	35%		
a) small cobble (64-128 mm)	25%	Confinement OC	
b) large cobble (128-256 mm)	10%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	0%	Braided N	
Bedrock.....	0%	Bars 10%	
D90.....	999cm	Water Temperature 3.0°C	
Compaction.....	M	Turbidity 9999	

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BLUEWATER RIVER (MAIN CHANNEL)

Key BLUE-4B

Site No. 4

COVER		DISCHARGE	
Deep Pool	35%	Wetted Width (m)	9.9
L.O.D.	50%	Mean Depth (m)	0.2
Boulder	0%	Mean Velocity (m/s)	0.8
In-Stream Vegetation	0%	Discharge (m ³ /s)	1.13
Over Vegetation	5%		
Cutbank	10%		
Crown Closure	99%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 70
0			
0			

COMMENTS

1. SHOCKED AREA = 16 M X 2M NO FISH CAUGHT
2. SHOCKED IN AND AROUND LOG JAM
3. SEE SITE BLUE-3 FOR OTHER DETAILS OF THIS AREA
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BLUEWATER CREEK

Key BLUE-5

Site No. 5
 Length Surveyed 80m
 Fish Card Y
 Survey Date 91/10/08
 Location APPROX .75KM U/S OF 51KM BRIDGE (N.SIDE)

Reach No 2.0
 Reach Length 21.2 km
 Access Foot

Measurement Method

Average Channel Width (m)	20.0	T	Percent Pool	10%	Percent Side Channel	0-10%
Average Wetted Width (m)	18.6	T	Percent Riffle	50%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	70	T	Percent Run	40%	Percent Stable	0%
Average Max. Pool Depth (cm)	120	T	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	5%	Percent
Gravels.....	15%	
a) small (2-16 mm)	5%	
b) large (16-64 mm)	10%	
Larges.....	80%	
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	40%	
c) boulder (>256 mm)	20%	
Bedrock.....	0%	
D90.....	20cm	
Compaction.....	L	

BANKS

Height (m) 1.0
 Percent Unstable 50%
 Texture L

VALLEY TYPE

Confinement FC
 Valley Channel Ratio 2-5
 Braided N
 Bars 5%
 Water Temperature 6.0°C
 Turbidity 9999

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Key BLUE-5

BLUEWATER CREEK

Site No. 5

COVER		DISCHARGE	
Deep Pool	35%	Wetted Width (m)	
L.O.D.	5%	Mean Depth (m)	
Boulder	60%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	2 44-135
0			
0			

COMMENTS

1. VALLEY NARROWER THAN U/S REACHES
2. VALLEY WALLS W/AVALANCHE CHUTES/FLUVIAL FANS
3. ABUNDANT EVIDENCE OF REGULAR DEBRIS FLOWS INTO CREEK
4. LG BOULDERS (UP TO 2M DIAM) EVERYWHERE INSTREAM
5. FINES/GRAVEL ON CHANNEL EDGES W/COBBLES/BOULDERS IN CENTRE
6. SOME GRAVEL POCKETS D/S OF BOULDERS & POOLS
- 7.
8. SLIDE: 2-19: (TRIB STREAM: LOOKING U/S)
9. SLIDE: 2-20: (TRIB STREAM: LOOKING U/S)
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-1

Site No. 1

Length Surveyed 50m Reach No 1.0
 Fish Card N Reach Length 8.9 km
 Survey Date 91/10/01 Access Foot
 Location NEAR CONFLUENCE WITH CANOE R.

Measurement Method

Average Channel Width (m) 15.0 GE Percent Pool 20% Percent Side Channel 0%
 Average Wetted Width (m) 13.0 GE Percent Riffle 0% Debris: Percent Area 5-15%
 Average Max. Riffle Depth (cm) 999 GE Percent Run 80% Percent Stable 10%
 Average Max. Pool Depth (cm) 150 GE Percent Other 0%
 Gradient 1.0

BED MATERIAL

Fines..... 60%
 Gravels..... 40%
 a) small (2-16 mm) 25%
 b) large (16-64 mm) 15%
 Larges..... %
 a) small cobble (64-128 mm) %
 b) large cobble (128-256 mm) 0%
 c) boulder (>256 mm) 0%
 Bedrock..... 0%
 D90..... 999cm
 Compaction..... L

BANKS

Height (m) 1.0
 Percent Unstable 10%
 Texture F

VALLEY TYPE

Confinement UC
 Valley Channel Ratio 10+
 Braided N
 Bars 5%
 Water Temperature 7.0°C
 Turbidity 9999

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CAMP CREEK

Key CAMP-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	30%		
Cutbank	50%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. INSECT PRODUCTION VERY EVIDENT
2. BANKS=RELATIVELY STABLE BUT FINES CLOG SUBSTRATE
3. POTENTIAL FRY RELEASE SITE
4. WIDE VALLEY--CONIFER/DECID MIX W/GRASS/SHRUBS/SOME SWAMP
5. SUBSTRATE IN DEEPER GLIDES = UP TO 100% FINES
- 6.
7. NO RIFFLE HERE
- 8.
9. NO PHOTO
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-10

Site No.	10	Reach No	2.0
Length Surveyed	50m	Reach Length	3.8 km
Fish Card	N	Access	4x2
Survey Date	91/10/03		
Location	APPROX 9.4KM U/S FROM MOUTH		

Average Channel Width (m)	12.0	Percent Pool	40%	Percent Side Channel	0%
Average Wetted Width (m)	10.0	Percent Riffle	0%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	999	Percent Run	60%	Percent Stable	60%
Average Max. Pool Depth (cm)	150	Percent Other	0%		
Gradient	0.5				

Measurement Method

GE	GE
GE	GE
GE	GE

BED MATERIAL

Fines.....	Percent	70%
Gravels.....	Percent	20%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	10%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		999cm
Compaction.....		M

BANKS

Height (m)	1.0
Percent Unstable	60%
Texture	F

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	0%
Water Temperature	5.0°C
Turbidity	0

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CAMP CREEK

Key CAMP-10

Site No. 10

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	0.0
L.O.D.	40%	Mean Depth (m)	0.0
Boulder	30%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	5%	Discharge (m ³ /s)	0.00
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		KO	40 200-300
0			
0			

COMMENTS

1. MEANDER W/2-3M DRY SAND DEPOSIT ON INSIDE OF BEND
2. D/S OF SITE - SIDE CHANNELS EXIST IN AREA
3. APPROX 40 KO SPAWNING/ 10 REDDS
4. KO DIGGING ACTIVITY DISPLACING FINES/ GRAVEL SOLID
5. TWO DAYS PRIOR... KO ACTIVITY NOT OBSERVED
- 6.
7. PHOTO: CAMP-19: LOOKING D/S
8. PHOTO: CAMP-21: KO SPAWNING AT SITE.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-11

Site No. 11
 Length Surveyed 47m
 Fish Card N
 Survey Date 91/10/03
 Location APPROX 17.8KM U/S FROM MOUTH

Reach No 4.0
 Reach Length 5.0 km
 Access Foot

Measurement Method

Average Channel Width (m)	20.0	T	Percent Pool	20%	Percent Side Channel	10-40%
Average Wetted Width (m)	14.0	T	Percent Riffle	40%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	20	T	Percent Run	40%	Percent Stable	40%
Average Max. Pool Depth (cm)	110	GE	Percent Other	0%		
Gradient	1.5					

BED MATERIAL

Fines.....	15%
Gravels.....	50%
a) small (2-16 mm)	20%
b) large (16-64 mm)	30%
Larges.....	35%
a) small cobble (64-128 mm)	20%
b) large cobble (128-256 mm)	10%
c) boulder (>256 mm)	5%
Bedrock.....	0%
D90.....	12cm
Compaction.....	

BANKS

Height (m)	1.0
Percent Unstable	60%
Texture	F

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	Y
Bars	999%
Water Temperature	4.0°C
Turbidity	9999

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CAMP CREEK

Key CAMP-11

Site No. 11

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	60%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	
0			Spp
0			BT
0			No.
			5
			Size (mm)
			45

COMMENTS

1. MUCH LESS FINES IN SUBSTRATE THAN IN OTHER AREAS D/S
2. DV FROM 30CM DEEP MUD/GRAVEL/LEAF LITTER IN SIDE CHANNEL
3. LOW VEL. AREA (1ST/2ND POOL) YIELDED NO FISH
4. EQUAL DECID/CONIFER RIPARIAN MIX; WILLOW UNDERSTORY
- 5.
6. PHOTO: CAMP 22,23,24.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-2

Site No. 2
 Length Surveyed 80m
 Fish Card
 Survey Date 91/10/01
 Location 650 M D/S OF HIGHWAY 5 BRIDGE

Reach No 1.0
 Reach Length 8.9 km
 Access 4X2

Measurement Method

Average Channel Width (m)	16.0	GE	Percent Pool	0%	Percent Side Channel	>40%
Average Wetted Width (m)	13.0	GE	Percent Riffle	80%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	20	GE	Percent Run	20%	Percent Stable	50%
Average Max. Pool Depth (cm)	9999		Percent Other	0%		
Gradient	0.5					

BED MATERIAL

Fines.....	Percent	
		15%
Gravels.....		25%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....		60%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		999cm
Compaction.....		

BANKS

Height (m)	0.5
Percent Unstable	30%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	N/A
Braided	N
Bars	0%
Water Temperature	99.9°C
Turbidity	9999

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Key CAMP-2

CAMP CREEK

Site No. 2

COVER		DISCHARGE	
Deep Pool	99%	Wetted Width (m)	
L.O.D.	99%	Mean Depth (m)	
Boulder	99%	Mean Velocity (m/s)	
In-Stream Vegetation	99%	Discharge (m ³ /s)	
Over Vegetation	99%		
Cutbank	99%		
Crown Closure	30%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	
0			Spp
0			KO
0			No. Size (mm)
			1

COMMENTS

1. GAS PIPELINE AND LIGHTGUIDE STREAM CROSSINGS HERE
2. FIR FOREST WITH ALDER UNDERSTORY AND SHRUBS

- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-3

Site No. 3
 Length Surveyed 100m
 Fish Card N
 Survey Date 91/10/01
 Location APPROX 200M D/S HWY 5 BRIDGE

Reach No 1.0
 Reach Length 8.9 km
 Access 4X2

Measurement Method

Average Channel Width (m)	17.0	GE	Percent Pool	10%	Percent Side Channel	10-40%
Average Wetted Width (m)	15.0	T	Percent Riffle	20%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	50	GE	Percent Run	70%	Percent Stable	50%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	0.5					

BED MATERIAL

Fines.....	40%
Gravels.....	50%
a) small (2-16 mm)	%
b) large (16-64 mm)	%
Larges.....	10%
a) small cobble (64-128 mm)	%
b) large cobble (128-256 mm)	0%
c) boulder (>256 mm)	0%
Bedrock.....	0%
D90.....	cm
Compaction.....	M

BANKS

Height (m) 1.0
 Percent Unstable 50%
 Texture F

VALLEY TYPE

Confinement UC
 Valley Channel Ratio 10+
 Braided N
 Bars 20%
 Water Temperature 7.0°C
 Turbidity 0

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CAMP CREEK

Key CAMP-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	0.0
L.O.D.	75%	Mean Depth (m)	0.0
Boulder	5%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	5%	Discharge (m ³ /s)	0.00
Over Vegetation	5%		
Cutbank	5%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	1 31
0		BT	1 50
0		CC	4
		KO	3

COMMENTS

1. VERY CLEAN WATER
2. 2 KOKANEE SPAWNERS IN AREA
3. SCULPINS = 3 TORRENT/ 1 SLIMY ??
4. BANK VEGETATION = ALDER/SOME CONIFERS
- 5.
6. PHOTO: CAMP-2: SHOCK SITE LOOKING D/S
7. PHOTO: CAMP-3: SHOCK SITE LOOKING D/S
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-4

Site No. 4
 Length Surveyed 40m
 Fish Card
 Survey Date 91/10/02
 Location 10 KM U/S FROM HWY 5 BRIDGE

Reach No 4.0
 Reach Length 5.0 km
 Access

Measurement Method

Average Channel Width (m)	6.5	Percent Pool	0%	Percent Side Channel	>40%
Average Wetted Width (m)	6.0	Percent Riffle	80%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	Percent Run	20%	Percent Stable	40%
Average Max. Pool Depth (cm)	9999	Percent Other	0%		
Gradient	1.0				

BED MATERIAL

Fines.....	.....	Percent	
Gravels.....	.....	Percent	
a) small (2-16 mm) %		
b) large (16-64 mm) %		
Larges.....	.....	Percent	
a) small cobble (64-128 mm) %		
b) large cobble (128-256 mm)	0%		
c) boulder (>256 mm)	0%		
Bedrock.....	.....	0%	
D90.....	.....	999cm	
Compaction.....	.....	

BANKS

Height (m)
 Percent Unstable 999%
 Texture

VALLEY TYPE

Confinement
 Valley Channel Ratio N/A
 Braided N
 Bars 999%
 Water Temperature 99.9°C
 Turbidity 9999

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CAMP CREEK

Key CAMP-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	35%	Mean Velocity (m/s)	
In-Stream Vegetation	10%	Discharge (m ³ /s)	
Over Vegetation	35%		
Cutbank	5%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. NO ELECTRO SHOCKING
2. JUST A CURSORY LOOK AT THIS SITE
3. SITE #6 IS JUST UPSTREAM AND MORE DETAIL IS RECORDED
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-5

Site No. 5
 Length Surveyed 28m
 Fish Card Y
 Survey Date 91/10/02
 Location APPROX 17.5KM U/S FROM MOUTH

Reach No 4.0
 Reach Length 5.0 km
 Access Foot

Measurement Method

Average Channel Width (m)	9.5	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	9.5	Percent Riffle	0%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	55	Percent Run	95%	Percent Stable	5%
Average Max. Pool Depth (cm)	9999	Percent Other	0%		
Gradient	99.9				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	40%	Height (m) 2.0	
Gravels.....	30%	Percent Unstable 30%	
a) small (2-16 mm)	10%	Texture F	
b) large (16-64 mm)	20%		
Larges.....	30%		
a) small cobble (64-128 mm)	20%	Confinement UC	
b) large cobble (128-256 mm)	10%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	0%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	999cm	Water Temperature 4.0°C	
Compaction.....	M	Turbidity 9999	

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CAMP CREEK

Key CAMP-5

Site No. 5

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	
L.O.D.	0%	Mean Depth (m)	
Boulder	20%	Mean Velocity (m/s)	0.3
In-Stream Vegetation	20%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	50%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		DV	2 50-90
0		RB	2 65
0			

COMMENTS

1. WATER VERY CLEAR
2. PARALLELS CN RAILWAY TRACKS - HERBICIDES ??
3. MARSH ABOVE AND BELOW AREA
4. RUN DEPTH 55 CM
5. PHOTO: CAMP 13.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-6

Site No.	6	Reach No	4.0	Percent Side Channel	0%
Length Surveyed	50m	Reach Length	5.0 km	Debris: Percent Area	5-15%
Fish Card	N	Access	Foot	Percent Stable	40%
Survey Date	91/10/02				
Location	D/S OF RAIL CROSSING				

Average Channel Width (m)	14.0	Percent Pool	5%
Average Wetted Width (m)	12.0	Percent Riffle	85%
Average Max. Riffle Depth (cm)	30	Percent Run	10%
Average Max. Pool Depth (cm)	1.7	Percent Other	0%

Measurement Method

GE	14.0
GE	12.0
T	30
	1.7

BED MATERIAL

Fines.....	Percent	20%
Gravels.....	Percent	30%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	50%
a) small cobble (64-128 mm)	15%	
b) large cobble (128-256 mm)	20%	
c) boulder (>256 mm)	15%	
Bedrock.....	0%	
D90.....	20cm	
Compaction.....	H	

BANKS

Height (m)	2.0
Percent Unstable	20%
Texture	L

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	0%
Water Temperature	5.5°C
Turbidity	9999

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CAMP CREEK

Key CAMP-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	12.0
L.O.D.	20%	Mean Depth (m)	0.4
Boulder	50%	Mean Velocity (m/s)	0.7
In-Stream Vegetation	10%	Discharge (m ³ /s)	2.52
Over Vegetation	10%		
Cutbank	5%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. LEFT BANK = NO COVER; RAIL GRADE
2. INSTREAM STEPS PROVIDED BY OLD RAILWAY BRIDGE SUPPORTS
- 3.
4. NO PHOTO ?!
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

CAMP CREEK

Key CAMP-7

Site No.	7	Reach No	5.0
Length Surveyed	50m	Reach Length	14.3 km
Fish Card	N	Access	Foot
Survey Date	91/10/02		
Location	NEAR OIL PIPELINE CROSSING		

Average Channel Width (m)	6.0	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	4.0	Percent Riffle	80%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	25	Percent Run	15%	Percent Stable	50%
Average Max. Pool Depth (cm)	100	Percent Other	0%		
Gradient	3.0				

Measurement Method

GE-	6.0
GE	4.0
GE	25
GE	100
	3.0

BED MATERIAL	Percent	BANKS
Fines.....	20%	Height (m) 1.0
Gravels.....	20%	Percent Unstable 40%
a) small (2-16 mm) %		Texture L
b) large (16-64 mm) %		
Larges.....	60%	VALLEY TYPE
a) small cobble (64-128 mm) %		Confinement UC
b) large cobble (128-256 mm) 0%		Valley Channel Ratio 10+
c) boulder (>256 mm) 0%		Braided Y
Bedrock.....	0%	Bars 20%
D90.....	10cm	Water Temperature 4.5°C
Compaction.....	M	Turbidity 9999

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CAMP CREEK

Key CAMP-7

Site No. 7

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	30%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	5%		
Crown Closure	20%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0			
0			
0			
COMMENTS			
1. DEBRIS= PRIMARILY FALLEN TREES; SOME DEBRIS FROM U/S			
2. RIPARIAN= PRIMARILY CONIFEROUS/SOME DECIDUOUS			
3. FISH RESTING AREAS= BOULDERS/LG ROCKS; FISH PASSAGE OK HERE			
4. FLOODCHANNELS= MUCH SAND - DEPOSITED BY RECENT FRESHET ??			
5. CREEK GETS STEEP FROM HERE UP (ALMOST CASCADE)			
6.			
7. PHOTO: CAMP-14.			
8.			
9.			
10.			
11.			
12.			

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CAMP CREEK

Key CAMP-8

Site No. 8
 Length Surveyed 45m
 Fish Card Y
 Survey Date 91/10/03
 Location @ LOGGING RD BRIDGE C. 12.5 KM U/S CONFLUENCE

Reach No 4.0
 Reach Length 5.0 km
 Access 4x2

Measurement Method

Average Channel Width (m)	7.0	GE	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	6.0	GE	Percent Riffle	20%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	GE	Percent Run	75%	Percent Stable	50%
Average Max. Pool Depth (cm)	100	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent	70%
Gravels.....	Percent	20%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	Percent	10%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	0%	
D90.....	2cm	
Compaction.....	L	

BANKS

Height (m)
 Percent Unstable 999%
 Texture

VALLEY TYPE

Confinement OC
 Valley Channel Ratio N/A
 Braided N
 Bars 999%
 Water Temperature 99.9°C
 Turbidity 9999

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CAMP CREEK

Key CAMP-8

Site No. 8

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	35%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	5%		
Crown Closure	2%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	
0			Spp
0			CC
0			No.
			Size (mm)
			30-60

COMMENTS

1. SHOCKED FOR 248 SEC OVER 15 M SQUARE AREA
2. SHOCKED ALONG SUBMERGED LOD AND AQUATIC VEG
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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CAMP CREEK

Key CAMP-9

Site No. 9
Length Surveyed 50m
Fish Card N
Survey Date 91/10/03
Location APPROX 9.9KM U/S FROM MOUTH

Reach No 2.0
Reach Length 3.8 km
Access 4X2

Measurement Method

Average Channel Width (m)	12.5	Percent Pool	0%	Percent Side Channel	0%
Average Wetted Width (m)	12.5	Percent Riffle	10%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	75	Percent Run	90%	Percent Stable	70%
Average Max. Pool Depth (cm)		Percent Other	0%		
Gradient	0.5				

BED MATERIAL	Percent	BANKS
Fines.....	35%	Height (m) 1.0
Gravels.....	15%	Percent Unstable 40%
a) small (2-16 mm)	5%	Texture F
b) large (16-64 mm)	10%	
Larges.....	50%	VALLEY TYPE
a) small cobble (64-128 mm)	15%	Confinement OC
b) large cobble (128-256 mm)	20%	Valley Channel Ratio 10+
c) boulder (>256 mm)	15%	Braided N
Bedrock.....	0%	Bars 0%
D90.....	18cm	Water Temperature 5.0°C
Compaction.....	H	Turbidity 0

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CAMP CREEK

Key CAMP-9

Site No. 9

COVER		DISCHARGE	
Deep Pool	0%	Wetted Width (m)	12.5
L.O.D.	20%	Mean Depth (m)	0.4
Boulder	20%	Mean Velocity (m/s)	0.8
In-Stream Vegetation	10%	Discharge (m ³ /s)	2.81
Over Vegetation	10%		
Cutbank	40%		
Crown Closure	30%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	3
0		TR	1
0			
COMMENTS			
1. CROWN CLOSURE= FIR/CEDAR; UNDERSTORY= SCRUB/THIN ALDER			
2. ROCKS= SOLID/COMPACTED; FINES= MOBILE/LOOSE			
3. RUN/RIFLE BETWEEN SLOW SANDY MEANDERING SECTIONS			
4. SHOCKED: R BANK= 20M X 1.5M			
5. SHOCKED: L BANK= 16M X 1.5M			
6.			
7. PHOTO: CAMP-17: LOOKING D/S (L-SIDE)			
8. PHOTO: CAMP-18: LOOKING D/S (R-SIDE)			
9.			
10.			
11.			
12.			

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WHITEPINE CREEK

Key WHTPNE-1

Site No. 1
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/10
 Location AT LOGGING RD CROSSING

Reach No 999.9
 Reach Length 999.9 km
 Access 4x4

Measurement Method

Average Channel Width (m)	5.0	T	Percent Pool	10%	Percent Side Channel	0-10%
Average Wetted Width (m)	3.0	T	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	10	GE	Percent Run	30%	Percent Stable	0%
Average Max. Pool Depth (cm)	100	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	20%
Gravels.....	60%
a) small (2-16 mm)	25%
b) large (16-64 mm)	35%
Larges.....	20%
a) small cobble (64-128 mm)	15%
b) large cobble (128-256 mm)	5%
c) boulder (>256 mm)	0%
Bedrock.....	0%
D90.....	5cm
Compaction.....	M

BANKS

Height (m) 1.0
 Percent Unstable 40%
 Texture G

VALLEY TYPE

Confinement OC
 Valley Channel Ratio 10+
 Braided N
 Bars 5%
 Water Temperature 6.0°C
 Turbidity 9999

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WHITEPINE CREEK

Key WHTPNE-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	15%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	65%		
Cutbank	5%		
Crown Closure	20%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CT*	25 49-166
0			
0			

COMMENTS

1. COVER MOSTLY SMALL ALDER/WILLOW (OVERHANGING CREEK)
2. MOST COVER= WITHIN 1M OF WATER SURFACE
3. SOME TALLER TREES PROVIDE CROWN CLOSURE
4. ALL SUBSTRATE WITH LIGHT COATING OF SILT/ALGAE
5. LG ROCKS SITTING ATOP GRAVEL
6. SEE FIELDNOTES- ALL FISH APPEARED TO BE CUTTHROAT
7. ID OF FISH UNCERTAIN HAD CT ADN RB CHARACTERISTICS
8. SLIDE: 2-29: (LOOKING D/S FROM BRIDGE)
9. SLIDE: 2-30: (OVERALL HABITAT LOOKING U/S)
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

MC MURDO CREEK

Key MURDO-1

Site No. 1

Length Surveyed	50m	Reach No	999.9
Fish Card	Y	Reach Length	999.9 km
Survey Date	91/10/22	Access	Foot
Location	APPROX 200M U/S FROM BRIDGE		
Measurement Method			
Average Channel Width (m)	10.0	Percent Pool	25%
Average Wetted Width (m)	7.0	Percent Riffle	40%
Average Max. Riffle Depth (cm)	30	Percent Run	35%
Average Max. Pool Depth (cm)	90	Percent Other	0%
Gradient	0.5	Percent Side Channel	>40%
		Debris: Percent Area	0-5%
		Percent Stable	40%

BED MATERIAL	Percent	BANKS
Fines.....	10%	Height (m) 1.0
Gravels.....	40%	Percent Unstable 50%
a) small (2-16 mm)	15%	Texture G
b) large (16-64 mm)	25%	
Larges.....	50%	VALLEY TYPE
a) small cobble (64-128 mm)	35%	Confinement OC
b) large cobble (128-256 mm)	10%	Valley Channel Ratio 10+
c) boulder (>256 mm)	5%	Braided N
Bedrock.....	0%	Bars 30%
D90.....	12cm	Water Temperature 1.50C
Compaction.....	M	Turbidity 9999

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MC MURDO CREEK

Key MURDO--1

Site No. 1

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	10%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	15%		
Cutbank	15%		
Crown Closure	5%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0			
0			
0			

COMMENTS

1. SHOCKED: 25M OF EDGE LOD = 2 FISH SEEN/ NONE CAPTURED
2. MATURE FIR AROUND CREEK
3. CREEK HABITAT LOOKS GOOD IN THIS SECTION (APPROX 3KM)
4. ABUNDANT LOD INSTREAM/CROWN CLOSURE/POCKETS SPAWNING GRAVEL
- 5.
6. PHOTO: B-20 (LOOKING U/S FROM BRIDGE AT LOWER END)
7. PHOTO: B-22 (SHOCK SITE LOOKING D/S)
8. PHOTO: B-21 (OVERALL HABITAT LOOKING D/S)
- 9.
- 10.
- 11.
- 12.

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BOBBY BURNS CREEK

Key BB-1

Site No. 1

Length Surveyed	50m	Reach No	2.0
Fish Card	Y	Reach Length	17.5 km
Survey Date	91/10/21	Access	Foot
Location	BELOW 29KM BRIDGE		

		Measurement	
Average Channel Width (m)	38.0	Method	T
Average Wetted Width (m)	29.0		T
Average Max. Riffle Depth (cm)	50		GE
Average Max. Pool Depth (cm)	9999		GE
Gradient	1.5		

Percent Side Channel	0-10%
Debris: Percent Area	0-5%
Percent Stable	10%

BED MATERIAL

Fines.....	Percent	
		10%
Gravels.....		25%
a) small (2-16 mm)	10%	
b) large (16-64 mm)	15%	
Larges.....		70%
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	30%	
c) boulder (>256 mm)	20%	
Bedrock.....		0%
D90.....		30cm
Compaction.....		

BANKS

Height (m)	2.0
Percent Unstable	50%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	N/A
Braided	N
Bars	0%
Water Temperature	4.0°C
Turbidity	9999

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

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BOBBY BURNS CREEK

Key BB-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	40%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		PW	1 50
0			
0			

COMMENTS

1. SHOCKED: SIDE CHANNEL = 1 WHITEFISH
2. WATER VERY COLORED; VIS = APPROX 30CM
3. ALONG BANKS= FIR FOREST/WILLOW/GRASS
4. LOD = LOGGING DEBRIS...MOSTLY ON BARS/NOT INSTREAM
- 5.
6. PHOTO: B-7 (LOWER END LOOKING U/S)
7. PHOTO: B-8 (TOP END LOOKING D/S)
- 8.
- 9.
- 10.
- 11.
- 12.

COLUMBIA RIVER TRIBUTARIES ASSESSMENT

BOBBY BURNS CREEK

Key BB-2

Site No. 2
 Length Surveyed 50m
 Fish Card N
 Survey Date 91/10/21
 Location AT 36KM BRIDGE

Reach No 3.0
 Reach Length 2.6 km
 Access Foot

Measurement Method

Average Channel Width (m)	25.0	T	Percent Pool	0%	Percent Side Channel	>40%
Average Wetted Width (m)	15.0	T	Percent Riffle	10%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	999		Percent Run	90%	Percent Stable	99%
Average Max. Pool Depth (cm)	9999		Percent Other	0%		
Gradient	3.0					

BED MATERIAL		BANKS	
Fines.....	Percent	Height (m)	3.0
Gravels.....	%	Percent Unstable	100%
a) small (2-16 mm)	%	Texture	R
b) large (16-64 mm)	%		
Larges.....	25%		
a) small cobble (64-128 mm)	%	Confinement	EN
b) large cobble (128-256 mm)	0%	Valley Channel Ratio	N/A
c) boulder (>256 mm)	0%	Braided	N
Bedrock.....	75%	Bars	999%
D90.....	999cm	Water Temperature	4.0°C
Compaction.....		Turbidity	9999
			VALLEY TYPE

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BOBBY BURNS CREEK

Key BB-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	99%	Wetted Width (m)	
L.O.D.	99%	Mean Depth (m)	
Boulder	99%	Mean Velocity (m/s)	
In-Stream Vegetation	99%	Discharge (m ³ /s)	
Over Vegetation	99%		
Cutbank	99%		
Crown Closure	99%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	No. Size (mm)
0		0.0	
0		0.0	

COMMENTS

1. TOO TURBID TO SEE SUBSTRATE FOR ACCURATE ASSESSMENT
2. NOTABLE AREA BECAUSE OF CHUTE UNDER BRIDGE
3. PHOTO: 6-1A (CHUTE AT 36KM BRIDGE LOOKING U/S)
4. PHOTO: 6-2A (AT 36KM BRIDGE LOOKING D/S)
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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BOBBY BURNS CREEK

Key BB-3

Site No. 3
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/22
 Location APPROX 1.8KM D/S FROM MALACHITE CR

Reach No 6.0
 Reach Length 11.4 km
 Access Foot

Measurement Method

Average Channel Width (m)	15.0	GE	Percent Pool	10%	Percent Side Channel	>40%
Average Wetted Width (m)	10.0	T	Percent Riffle	20%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	T	Percent Run	70%	Percent Stable	50%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.5					

BED MATERIAL

Fines.....	Percent	
		10%
Gravels.....	Percent	50%
a) small (2-16 mm)	20%	
b) large (16-64 mm)	30%	
Larges.....	Percent	40%
a) small cobble (64-128 mm)	15%	
b) large cobble (128-256 mm)	15%	
c) boulder (>256 mm)	10%	
Bedrock.....	Percent	0%
D90.....		13cm
Compaction.....		M

BANKS

Height (m)	1.0
Percent Unstable	50%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	5-10
Braided	N
Bars	999%
Water Temperature	2.0°C
Turbidity	9999

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BOBBY BURNS CREEK

Key BB-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	8.7
L.O.D.	25%	Mean Depth (m)	0.6
Boulder	20%	Mean Velocity (m/s)	0.6
In-Stream Vegetation	0%	Discharge (m ³ /s)	2.35
Over Vegetation	10%		
Cutbank	5%		
Crown Closure	99%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0			
0			
0			

COMMENTS

1. SHOCKED: 13M ON L-BANK/8M ON R-BANK (288 SEC) = 0 FISH
2. LOGGED ON L-SIDE/MATURE FIR FOREST ON R-SIDE.
- 3.
4. APPROX 4.8KM FROM WEATHER STATION
5. WEATHER STATION = 8.5KM TO BRANCH IN ROAD TO VOWELL CR.
- 6.
7. PHOTO: B-18 (SHOCK SITE LOOKING U/S)
8. PHOTO: B-19 (OVERALL HABITAT LOOKING U/S)
- 9.
- 10.
- 11.
- 12.

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BOBBY BURNS CREEK

Key BB-4

Site No. 4
 Length Surveyed 50m
 Fish Card N
 Survey Date 91/10/29
 Location JUST U/S FROM BRIDGE

Reach No 3.0
 Reach Length 2.6 km
 Access Foot

Measurement

Method

Average Channel Width (m)	26.0	Percent Pool	20%	Percent Side Channel	0%
Average Wetted Width (m)	20.0	Percent Riffle	40%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	Percent Run	40%	Percent Stable	30%
Average Max. Pool Depth (cm)	150	Percent Other	0%		
Gradient	2.0				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	5%	Height (m) 1.0	
Gravels.....	30%	Percent Unstable 999%	
a) small (2-16 mm)	10%	Texture L	
b) large (16-64 mm)	20%		
Larges.....	65%		
a) small cobble (64-128 mm)	20%	Confinement FC	
b) large cobble (128-256 mm)	30%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	15%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	999cm	Water Temperature 0.5°C	
Compaction.....		Turbidity 9999	

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BOBBY BURNS CREEK

Key BB-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	10%	Mean Depth (m)	
Boulder	40%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	
COMMENTS			

1. 2M HIGH FALLS APPROX 100M U/S
2. SHOCKED: 257 SEC (22 M OF EDGE) = NO FISH
3. SURROUNDING = MATURING FIR FOREST/WILLOW
4. U/S AND D/S EXPOSED BEDROCK
5. 5-10M HIGH CANYON D/S - ESPECIALLY BELOW BRIDGE
6. HEAVY ICE FORMING EVERYWHERE
- 7.
8. PHOTO: C-31 (SHOCK SITE)
9. PHOTO: C-30 (FALLS ABOVE SHOCK SITE)
- 10.
- 11.
- 12.

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CRYSTALLINE CREEK

Key CRY5-1

Site No. 1
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/26
 Location APPROX 5.3KM U/S FROM CONFL. VOWEL CR

Reach No 999.9
 Reach Length 999.9 km
 Access 4x4

Measurement Method

Average Channel Width (m)	20.0	T	Percent Pool	30%	Percent Side Channel	0-10%
Average Wetted Width (m)	10.0	T	Percent Riffle	20%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	20	T	Percent Run	50%	Percent Stable	50%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent	
	50%	
Gravels.....	45%	
a) small (2-16 mm)	25%	
b) large (16-64 mm)	20%	
Larges.....	5%	
a) small cobble (64-128 mm)	5%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	0%	
D90.....	3cm	
Compaction.....	L	

BANKS

Height (m)	2.0
Percent Unstable	60%
Texture	F

VALLEY TYPE

Confinement	UC
Valley Channel Ratio	10+
Braided	N
Bars	999%
Water Temperature	0.5°C
Turbidity	9999

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CRYSTALLINE CREEK

Key CRY5-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. NO FISH CAUGHT AFTER 250 SEC
2. UNLOGGED MATURE SPRUCE/GRASSES/WILLOW
3. SOME LOGGING FARTHER DOWN
4. AVALANCH CHUTE ON R-SIDE OF VALLEY
5. HELICOPTER ACCESS
- 6.
7. PHOTO: C-10 (BOTTOM END OF SHOCK SITE LOOKING D/S)
8. PHOTO: C-11 (TOP END OF SHOCK SITE LOOKING U/S)
9. PHOTO: C-12 (OVERALL HABITAT LOOKING D/S)
- 10.
- 11.
- 12.

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MALACHITE CREEK

Key MALA-1

Site No. 1
 Length Surveyed 50m
 Fish Card N
 Survey Date 91/10/22
 Location 150M U/S FROM MOUTH

Reach No 999.9
 Reach Length 999.9 km
 Access Foot

Measurement Method

Average Channel Width (m)	8.0	Percent Pool	10%	Percent Side Channel	0-10%
Average Wetted Width (m)	4.0	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	35	Percent Run	30%	Percent Stable	30%
Average Max. Pool Depth (cm)	70	Percent Other	0%		
Gradient	99.9				

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	5%	
b) large (16-64 mm)	40%	
a) small cobble (64-128 mm)	15%	
b) large cobble (128-256 mm)	25%	
c) boulder (>256 mm)	15%	
Larges.....	55%	
Bedrock.....	0%	
D90.....	cm	
Compaction.....	M	

BANKS

Height (m)	1.0
Percent Unstable	40%
Texture	G

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	5-10
Braided	N
Bars	0%
Water Temperature	°C
Turbidity	0

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MALACHITE CREEK

Key MALA-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	0.0
L.O.D.	20%	Mean Depth (m)	0.0
Boulder	20%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	40%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0			
0			
0			

COMMENTS

1. COVER = OVERHANGING UP TO 50% IN SOME PLACES
2. ABUNDANT LG BOULDERS AROUND AND INSTREAM
- 3.
4. PHOTO: B-16 (SITE LOOKING U/S)
5. PHOTO: B-17 (MOUTH... INTO BOBBY BURNS)
6. PHOTO: B-15 (~50M BELOW SITE-LOOKING U/S)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-1

Site No. 1
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/23
 Location APPROX 100M D/S FROM 57KM BRIDGE

Reach No 5.0
 Reach Length 10.8 km
 Access 4X2

Measurement Method

Average Channel Width (m)	15.0	Percent Pool	20%	Percent Side Channel	0-10%
Average Wetted Width (m)	11.0	Percent Riffle	30%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	25	Percent Run	50%	Percent Stable	40%
Average Max. Pool Depth (cm)	120	Percent Other	0%		
Gradient	1.3				

BED MATERIAL

Fines.....	Percent	5%
Gravels.....	Percent	30%
a) small (2-16 mm)	10%	
b) large (16-64 mm)	20%	
Larges.....	Percent	45%
a) small cobble (64-128 mm)	15%	
b) large cobble (128-256 mm)	15%	
c) boulder (>256 mm)	15%	
Bedrock.....	Percent	20%
D90.....	999cm	
Compaction.....	M	

BANKS

Height (m)	1.0
Percent Unstable	999%
Texture	G

VALLEY TYPE

Confinement	FC
Valley Channel Ratio	10+
Braided	N
Bars	999%
Water Temperature	1.0°C
Turbidity	9999

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SPILLIMACHEEN RIVER

Key SPILLI-1

Site No. 1

COVER		DISCHARGE	
Deep Pool	25%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	30%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RB	4 70-100
0			
0			

COMMENTS

1. SHOCKED: 4 RB OUT OF LG (50-100CM) BOULDERS UP TO 80CM DEEP
- 2.
3. PHOTO: B-27 (RB FROM SITE)
4. PHOTO: B-28 (SHOCK SITE 1A-LOOKING U/S)
5. PHOTO: B-29 (SHOCK SITE 1B-LOOKING U/S)
6. PHOTO: B-30 (OVERALL HABITAT LOOKING U/S)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-10

Site No. 10

COVER		DISCHARGE	
Deep Pool	15%	Wetted Width (m)	0.0
L.O.D.	50%	Mean Depth (m)	0.0
Boulder	0%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	20%		
Cutbank	15%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	No.	Size (mm)
0			
0			
0			

COMMENTS

1. HAD TO BREAK ICE TO SHOCK POOL AREA
2. NO FISH COLLECTED AFTER 110 SEC SHOCKING
3. POOLS = LOTS OF FINES BUT THE REST HAS GOOD SUBSTRATE
4. LOTS OF ICE FORMING EVERY WHERE
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-11A

Site No. 11
Length Surveyed 90m
Fish Card Y
Survey Date 91/10/28
Location SIDE CHANNEL

Reach No 1.0
Reach Length 4.8 km
Access Foot

Measurement Method

Average Channel Width (m)	14.0	T	Percent Pool	10%	Percent Side Channel	>40%
Average Wetted Width (m)	10.0	T	Percent Riffle	30%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	T	Percent Run	60%	Percent Stable	30%
Average Max. Pool Depth (cm)	70	T	Percent Other	0%		
Gradient	0.5					

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	15%	Height (m) 2.0	
Gravels.....	60%	Percent Unstable 999%	
a) small (2-16 mm)	25%	Texture G	
b) large (16-64 mm)	35%		
Larges.....	25%		
a) small cobble (64-128 mm)	20%	Confinement OC	
b) large cobble (128-256 mm)	5%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	0%	Braided N	
Bedrock.....	0%	Bars 999%	
D90.....	3cm	Water Temperature OC	
Compaction.....	L	Turbidity 9999	

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SPILLIMACHEEN RIVER

Key SPILLI-11A

Site No. 11

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	30%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	20%		
Cutbank	20%		
Crown Closure	30%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		EB	1 100
0		WF	10 100-300
0			

COMMENTS

1. SHOCKED: 524 SECONDS (SEE NOTES)
2. PRIMARILY DECIDUOUS TREES ON BANK
3. SIDE CHANNEL ON R-SIDE OF RIVER
4. ABUNDANT BEAVER ACTIVITY
5. LARGER WHITEFISH IN MID-CHANNEL/FASTER WATER.
6. SHOCKED 90 M X 3 M
7. PHOTO: C-25 (SIDE CHANNEL LOOKING U/S)
8. MANY MORE WHITEFISH WERE IN THIS AREA
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-11B

Site No. 11
 Length Surveyed 50m Reach No 1.0
 Fish Card N Reach Length 4.8 km
 Survey Date 91/10/28 Access Foot
 Location MAINSTEM D/S OF BRIDGE ON MAIN ROAD

Measurement

Method	Percent Pool	10%	Percent Side Channel	10-40%
T	40.0	10%	Percent Debris	0-5%
T	30.0	40%	Percent Stable	30%
T	40	50%		
GE	150	0%		
	0.8			

BED MATERIAL		BANKS	
	Percent	Height (m)	1.0
Fines.....	10%	Percent Unstable	%
Gravels.....	20%	Texture	L
a) small (2-16 mm)	10%		
b) large (16-64 mm)	10%		
Larges.....	70%		
a) small cobble (64-128 mm)	20%	Confinement	OC
b) large cobble (128-256 mm)	30%	Valley Channel Ratio	10+
c) boulder (>256 mm)	20%	Braided	N
Bedrock.....	0%	Bars	30%
D90.....	16cm	Water Temperature	OC
Compaction.....		Turbidity	0

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SPILLIMACHEEN RIVER

Key SPILLI-11B

Site No. 11

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	0.0
L.O.D.	20%	Mean Depth (m)	0.0
Boulder	30%	Mean Velocity (m/s)	0.0
In-Stream Vegetation	0%	Discharge (m ³ /s)	0.00
Over Vegetation	20%		
Cutbank	20%		
Crown Closure	1%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	
COMMENTS			

1. NEAR SHORE AREAS ALL COVERED BY FINE SILT
2. SAND BETWEEN BOULDERS
3. FOREST = FIR/BIRCH
4. WATER TURBID - BARELY 40CM VISIBILITY
5. THE CARD FOR MAINSTEM, DID NOT SHOCK
6. PHOTO: C-28 (MAINSTEM D/S FROM BRIDGE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-12

Site No. 12
 Length Surveyed 60m
 Fish Card Y
 Survey Date 91/10/28
 Location 50M U/S OF BRIDGE
 Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement Method

Average Channel Width (m)	26.0	Percent Pool	5%	Percent Side Channel	>40%
Average Wetted Width (m)	25.0	Percent Riffle	10%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	999	Percent Run	85%	Percent Stable	10%
Average Max. Pool Depth (cm)	200	Percent Other	0%		
Gradient	1.0				

BED MATERIAL

Fines.....	Percent	
	%	
Gravels.....	20%	
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	60%	
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	20%	
D90.....	999cm	
Compaction.....		

BANKS

Height (m) 2.0
 Percent Unstable 999%
 Texture L

VALLEY TYPE

Confinement EN
 Valley Channel Ratio 0-2
 Braided N
 Bars 0%
 Water Temperature 0.5°C
 Turbidity 9999

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SPILLIMACHEEN RIVER

Key SPILLI-12

Site No. 12

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	0%	Mean Depth (m)	
Boulder	70%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	0%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BB	4 119 - 170mm
0		DC	3
0		CCG	3

COMMENTS

1. BURBOT/LONGNOSE DACE FROM BETWEEN EDGE BOULDERS
2. TRANSITION AREA BETWEEN CANYON/RIVER BELOW BRIDGE
3. VALLEY SIDES = BEDROCK/CLIFFS
4. CANYON = APPROX 100M U/S
5. ICE COMING DOWN RIVER
6. TOO DEEP FOR ACCURATE SUBSTRATE COMPOSITION OR DEPTH
7. MAIN CHANNEL MOSTLY RUN
8. SITE IS 30M BELOW A FAST (TUMBLE) RIFFLE
- 9.
10. PHOTOS: C-26; C-27; C-29.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-2

Site No. 2
 Length Surveyed 80m
 Fish Card Y
 Survey Date 91/10/24
 Location LOGGING RD AT 36.5KM

Reach No 3.0
 Reach Length 8.7 km
 Access 4x4

Measurement Method

Average Channel Width (m)	28.0	T	Percent Pool	0%	Percent Side Channel	0-10%
Average Wetted Width (m)	20.0	T	Percent Riffle	10%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	30	GE	Percent Run	90%	Percent Stable	40%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	10%
Gravels.....	60%
a) small (2-16 mm)	25%
b) large (16-64 mm)	35%
Larges.....	30%
a) small cobble (64-128 mm)	20%
b) large cobble (128-256 mm)	10%
c) boulder (>256 mm)	0%
Bedrock.....	0%
D90.....	7cm
Compaction.....	M

BANKS

Height (m)	2.0
Percent Unstable	40%
Texture	F

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	Y
Bars	40%
Water Temperature	0.5°C
Turbidity	9999

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SPILLIMACHEEN RIVER

Key SPILLI-2

Site No. 2

COVER		DISCHARGE	
Deep Pool	25%	Wetted Width (m)	
L.O.D.	25%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	20%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		EB	1 100
0		PW	1 91
0		CC	3

COMMENTS

1. SHOCKED: 374 SEC = 1 WHITEFISH/1 CHAR/2 SCULPINS
- 2.
3. PHOTO: B-33 (BROOKTROUT FROM SHOCK SITE)
4. PHOTO: B-34 (SIDE CHANNEL LOOKING U/S)
5. PHOTO: B-35 (OVERALL HABITAT LOOKING U/S)
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-3

Site No. 3
 Length Surveyed 60m
 Fish Card Y
 Survey Date 91/10/24
 Location 27KM ROAD BRIDGE

Reach No 3.0
 Reach Length 59.5 km
 Access 4X4

Measurement Method

Average Channel Width (m)	30.0	T	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	16.0	T	Percent Riffle	60%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	40	GE	Percent Run	35%	Percent Stable	50%
Average Max. Pool Depth (cm)	100	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent	
Gravels.....	Percent	
a) small (2-16 mm)	20%	
b) large (16-64 mm)	30%	
Larges.....	Percent	
a) small cobble (64-128 mm)	10%	
b) large cobble (128-256 mm)	20%	
c) boulder (>256 mm)	15%	
Bedrock.....	0%	
D90.....	999cm	
Compaction.....	M	

BANKS

Height (m)	1.0
Percent Unstable	40%
Texture	F

VALLEY TYPE

Confinement	OC
Valley Channel Ratio	10+
Braided	N
Bars	999%
Water Temperature	0.5°C
Turbidity	9999

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SPILLIMACHEEN RIVER

Key SPILLI-3

Site No. 3

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	
L.O.D.	70%	Mean Depth (m)	
Boulder	5%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	10%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	3
0		WF	5 50-95
0			

COMMENTS

1. ALL FISH FROM AROUND LOD
2. SHOCKED: 380 SEC = WF/CC
3. SUBSTRATE = LEAF LITTER/COBBLE/FINE SEDIMENT.
- 4.
5. PHOTO: B-36 (SHOCK SITE SIDE CHANNEL LOOKING U/S)
6. PHOTO: B-37 (OVERALL HABITAT LOOKING U/S FROM 27KM BRIDGE)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-4

Site No. 4
 Length Surveyed 60m
 Fish Card N
 Survey Date 91/10/25
 Location APPROX 6KM U/S FROM HOBO CR.

Reach No 3.0
 Reach Length 59.5 km
 Access 4x4

Measurement Method

Average Channel Width (m)	23.0	T	Percent Pool	5%	Percent Side Channel	0%
Average Wetted Width (m)	21.0	T	Percent Riffle	70%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	GE	Percent Run	25%	Percent Stable	0%
Average Max. Pool Depth (cm)	70	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent	
		10%
Gravels.....	Percent	30%
a) small (2-16 mm)	10%	
b) large (16-64 mm)	20%	
Larges.....	Percent	60%
a) small cobble (64-128 mm)	20%	
b) large cobble (128-256 mm)	25%	
c) boulder (>256 mm)	15%	
Bedrock.....	Percent	0%
D90.....		26cm
Compaction.....		

BANKS

Height (m)	2.0
Percent Unstable	30%
Texture	L

VALLEY TYPE

Confinement	FC
Valley Channel Ratio	0-2
Braided	N
Bars	0%
Water Temperature	1.0°C
Turbidity	9999

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SPILLIMACHEEN RIVER

Key SPILLI-4

Site No. 4

COVER		DISCHARGE	
Deep Pool	5%	Wetted Width (m)	
L.O.D.	15%	Mean Depth (m)	
Boulder	50%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	15%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. BOTH BANKS= MATURING FIR/SOME DECIDUOUS TREES
2. LOGGING ROAD ON L-BANK
3. R-BANK = EXPOSED BEDROCK/CLIFFS IN SOME AREAS
4. MINIMAL DEBRIS ON SIDE/NONE INSTREAM
5. NO E/SHOCKING AT THIS SITE
6. PHOTO: 6-7A (LOOKING D/S)
7. PHOTO: 6-8A (LOOKING U/S)
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-5

Site No. 5
 Length Surveyed 150m
 Fish Card Y
 Survey Date 91/10/25
 Location APPROX 3.4KM D/S FROM BOBBY BURNS CONFL. (@ UNNAMED TRIB

Reach No 3.0
 Reach Length 10.8 km
 Access Foot

Measurement Method

Average Channel Width (m)	30.0	T	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	20.0	T	Percent Riffle	70%	Debris: Percent Area	0%
Average Max. Riffle Depth (cm)	50	GE	Percent Run	25%	Percent Stable	0%
Average Max. Pool Depth (cm)	150	GE	Percent Other	0%		
Gradient	1.0					

BED MATERIAL

Fines.....	Percent
Gravels.....	Percent
a) small (2-16 mm)	5%
b) large (16-64 mm)	10%
c) boulder (>256 mm)	15%
Larges.....	Percent
a) small cobble (64-128 mm)	20%
b) large cobble (128-256 mm)	30%
c) boulder (>256 mm)	30%
Bedrock.....	0%
D90.....	30cm
Compaction.....	

BANKS

Height (m)	2.0
Percent Unstable	999%
Texture	L

VALLEY TYPE

Confinement	FC
Valley Channel Ratio	0-2
Braided	N
Bars	0%
Water Temperature	2.0°C
Turbidity	9999

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SPILLIMACHEEN RIVER

Key SPILLI-5

Site No. 5

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	0%	Mean Depth (m)	
Boulder	60%	Mean Velocity (m/s)	
In-Stream Vegetation	5%	Discharge (m ³ /s)	
Over Vegetation	5%		
Cutbank	0%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		BT	1 111
0		EB	1 113
0		WF	2 60
		CC	2

COMMENTS

1. SIDE CHANNEL NOT VERY DISTINCT
2. NO DEBRIS INSTREAM - ONLY A LITTLE AT HIGH WATER MARK
3. FINES COVER ALL SUBSTRATE IN QUIET AREAS
4. FREQUENT SECTIONS OF EXPOSED BEDROCK DICTATING RIVER COURSE
5. DV FROM SIDE CHANNEL AND BROOK TROUT FROM TRIB.
6. MATURING FIR FOREST ON EITHER BANK
- 7.
- 8.
9. PHOTO: C-2 (SHOCK SITE 5A-ROCKY SIDE CHANNEL U/S)
10. PHOTO: C-4 (SHOCK SITE 5B-POOL @ MOUTH OF UNNAMED TRIB)
11. PHOTO: C-3 (OVERALL HABITAT LOOKING U/S)
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-6

Site No. 6
 Length Surveyed 80m
 Fish Card Y
 Survey Date 91/10/26
 Location NEAR COLUMBIA RIVER CONFLUENCE

Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement Method

Average Channel Width (m)	40.0	Percent Pool	0%	Percent Side Channel	0-10%
Average Wetted Width (m)	30.0	Percent Riffle	1%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	50	Percent Run	99%	Percent Stable	30%
Average Max. Pool Depth (cm)	9999	Percent Other	0%		
Gradient	0.3				

BED MATERIAL	Percent	BANKS	VALLEY TYPE
Fines.....	80%	Height (m) 2.0	
Gravels.....	20%	Percent Unstable 80%	
a) small (2-16 mm)	15%	Texture G	
b) large (16-64 mm)	5%		
Larges.....	%		
a) small cobble (64-128 mm)	%	Confinement UC	
b) large cobble (128-256 mm)	0%	Valley Channel Ratio 10+	
c) boulder (>256 mm)	0%	Braided N	
Bedrock.....	0%	Bars 0%	
D90.....	1cm	Water Temperature 1.0°C	
Compaction.....	L	Turbidity 9999	

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SPILLIMACHEEN RIVER

Key SPILLI-6

Site No. 6

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		C	3 50-100
0		SU	1 60
0		CC	2

COMMENTS

1. MEANDER IN MARSH IN COLUMBIA VALLEY
2. SHOCKED: 454 SEC = ALL FISH FROM SIDE CHANNEL
3. TOO DEEP AND TOO TURBID FOR ACCURATE SUBSTRATE COMPOSITION
- 4.
5. PHOTO: C-16 (SHOCK SITE)
6. PHOTO: C-17 (OVERALL HABITAT LOOKING D/S)
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-7

Site No. 7
 Length Surveyed 60m
 Fish Card N
 Survey Date 91/10/27
 Location APPROX 2.4KM U/S FROM MOUTH

Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement

Average Channel Width (m)	30.0	T	Percent Pool	10%	Percent Side Channel	0%
Average Wetted Width (m)	20.0	T	Percent Riffle	0%	Debris: Percent Area	5-15%
Average Max. Riffle Depth (cm)	999		Percent Run	90%	Percent Stable	99%
Average Max. Pool Depth (cm)	9999		Percent Other	0%		
Gradient	0.3					

BED MATERIAL

Fines.....	Percent	70%
Gravels.....	Percent	30%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....	%	
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....	0%	
D90.....	1cm	
Compaction.....	L	

BANKS

Height (m) 2.0
 Percent Unstable 999%
 Texture F

VALLEY TYPE

Confinement UC
 Valley Channel Ratio 10+
 Braided N
 Bars 999%
 Water Temperature 1.0°C
 Turbidity 9999

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SPILLIMACHEEN RIVER

Key SPILLI-7

Site No. 7

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	10%		
Cutbank	20%		
Crown Closure	0%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type	Location	Spp
0		0.0	
0		0.0	
0		0.0	

COMMENTS

1. NOT REALLY POOLS - JUST DEEP GLIDE SECTIONS 1.5 TO 2 M DEEP
2. FASTER/DEEPER SECTION TOO TURBID FOR SUBSTRATE COMPOSITION
3. GRAVEL IN AREAS BELOW FASTER SECTIONS
4. SHOCKING PRODUCED NO FISH
5. PHOTO: C-18
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-8

Site No. 8
 Length Surveyed 55m
 Fish Card Y
 Survey Date 91/10/27
 Location JUST U/S FROM MAIN FORK IN CHANNEL GOING TO COLUMBIA

Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement

Average Channel Width (m)	68.0	Percent Pool	5%	Percent Side Channel	0-10%
Average Wetted Width (m)	45.0	Percent Riffle	20%	Debris: Percent Area	0-5%
Average Max. Riffle Depth (cm)	60	Percent Run	75%	Percent Stable	50%
Average Max. Pool Depth (cm)	9999	Percent Other	0%		
Gradient	0.5				

Method

GE
 GE
 60
 9999
 0.5

BED MATERIAL

Fines.....	Percent	
		30%
Gravels.....		45%
a) small (2-16 mm)	%	
b) large (16-64 mm)	%	
Larges.....		25%
a) small cobble (64-128 mm)	%	
b) large cobble (128-256 mm)	0%	
c) boulder (>256 mm)	0%	
Bedrock.....		0%
D90.....		cm
Compaction.....		L

BANKS

Height (m) 2.0
 Percent Unstable 60%
 Texture F

VALLEY TYPE

Confinement UC
 Valley Channel Ratio N/A
 Braided N
 Bars 5%
 Water Temperature 1.0°C
 Turbidity 0

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SPILLIMACHEEN RIVER

Key SPILLI-8

Site No. 8

COVER		DISCHARGE	
Deep Pool	10%	Wetted Width (m)	35.0
L.O.D.	60%	Mean Depth (m)	50.0
Boulder	0%	Mean Velocity (m/s)	0.6
In-Stream Vegetation	0%	Discharge (m ³ /s)	840.00
Over Vegetation	0%		
Cutbank	30%		
Crown Closure	1%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		CC	1
0		CSU	1 140
0			

COMMENTS

1. MOSTLY DECIDUOUS FOREST WITH SOME FIR
2. LOTS OF BEAVER ACTIVITY
3. CUT BANKS ARE GENERALLY ABOVE CURRENT WATER LEVEL
4. WATER IS MURKY
5. MOST OF THE DEBRIS IS SITTING ON BANKS AND BARS
6. MOSTLY RUN BUT SOME SHALLOWER RIFFLE SECTIONS
7. SHOCKED 405 SEC, 80 X 2 M OF SIDE CHANNEL
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLMACHEEN RIVER

Key SPILLI-9

Site No. 9
 Length Surveyed 50m
 Fish Card Y
 Survey Date 91/10/27
 Location SEE MAP, SIDE CHANNEL THAT WAS SHOCKED

Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement Method

Average Channel Width (m) 9999.9
 Average Wetted Width (m) 9999.9
 Average Max. Riffle Depth (cm) 999
 Average Max. Pool Depth (cm) 100 T
 Gradient 0.3

Percent Pool 30%
 Percent Riffle 20%
 Percent Run 50%
 Percent Other 0%

Percent Side Channel >40%
 Debris: Percent Area 0-5%
 Percent Stable 60%

BED MATERIAL		BANKS	
	Percent	Height (m)	999%
Fines.....	30%	Percent Unstable	
Gravels.....	45%	Texture	
a) small (2-16 mm)	%		
b) large (16-64 mm)	%		
Larges.....	25%	Confinement	
a) small cobble (64-128 mm)	%	Valley Channel Ratio	N/A
b) large cobble (128-256 mm)	0%	Braided	N
c) boulder (>256 mm)	0%	Bars	999%
Bedrock.....	0%	Water Temperature	1.0°C
D90.....	999cm	Turbidity	9999
Compaction.....	L		

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SPILLIMACHEEN RIVER

Key SPILLI-9

Site No. 9

COVER		DISCHARGE	
Deep Pool	30%	Wetted Width (m)	
L.O.D.	40%	Mean Depth (m)	
Boulder	0%	Mean Velocity (m/s)	
In-Stream Vegetation	0%	Discharge (m ³ /s)	
Over Vegetation	25%		
Cutbank	5%		
Crown Closure	2%		
OBSTRUCTIONS		SPECIES	
Height (m)	Type Location	Spp	No. Size (mm)
0		RSC	3 50-90
0		MW	3 50-80
0			

COMMENTS

1. SID-CHANNEL, POOL AREA THAT WAS SHOCKED FOR 237 SEC
2. AREA APPROX 33 X 2 M.
3. DEAD-END SIDE CHANNEL WITH LATERAL INFLOW
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

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SPILLIMACHEEN RIVER

Key SPILLI-10

Site No. 10
 Length Surveyed 40m
 Fish Card Y
 Survey Date 91/10/28
 Location S-CHANNEL THAT BRANCHES OFF JUST DOWNSTREAM OF POWER HO

Reach No 1.0
 Reach Length 4.8 km
 Access Foot

Measurement

Method	Percent Pool	Percent Side Channel
GE	20%	>40%
GE	50%	Debris: Percent Area 5-15%
GE	30%	Percent Stable 40%
GE	0%	

Average Channel Width (m) 6.0
 Average Wetted Width (m) 4.0
 Average Max. Riffle Depth (cm) 20
 Average Max. Pool Depth (cm) 90
 Gradient 1.5

BED MATERIAL	Percent	BANKS
Fines.....	15%	Height (m) 1.0
Gravels.....	45%	Percent Unstable 60%
a) small (2-16 mm)	20%	Texture F
b) large (16-64 mm)	25%	
Larges.....	40%	VALLEY TYPE
a) small cobble (64-128 mm)	20%	Confinement OC
b) large cobble (128-256 mm)	20%	Valley Channel Ratio N/A
c) boulder (>256 mm)	0%	Braided N
Bedrock.....	0%	Bars 0%
D90.....	cm	Water Temperature OC
Compaction.....		Turbidity 0

APPENDIX III
Catch per Unit Effort at Each Fish Sampling Site

COLUMBIA RIVER TRIBUTARY STUDY								
Electrofishing catch and effort								
Site	Reach	No. of Trout	No. of course fish	Time Shocked (sec)	Area Shocked (m ²)	Total Catch per second	Total Catch per area	Comments
BEAVERFOOT RIVER								
Beaver-1	1							no shocking
Beaver-2	1	6	6	400	73	0.03	0.16	
Beaver-3	2	3	1	352	58	0.01	0.07	
Beaver-4	2	1	2	570		0.01		
Beaver-6	1		1	350		0.00		
Fraser-1		0	0	260				
Fraser-2		4	0	248	64	0.02	0.06	
Ice -1								no shocking
Moose-1		4	0	341	75	0.01	0.05	
BLACKWATER CREEK								
Blkwtr-1	4							
pass #1		13	1	217	46.5	0.06	0.30	
pass #2		3	0	237				
total		16	1	454	46.5	0.04	0.37	
Blkwtr-1a	4							
pass #1		4	0	206	26.3	0.02	0.15	
pass #2		3	6	194				
total		7	6	400	26.3	0.03	0.49	
Blkwtr-2	4	2	0	170	60	0.01	0.03	
Blkwtr-3	4	5			33.8		0.15	
Blkwtr-5	3							
pass #1		22	10	500	40.5	0.06	0.79	
pass #2		9	8	400				
total		31	18	900	40.5	0.05	1.21	
Blkwtr-6	1							no shocking
Blkwtr-7	1							no shocking
Blkwtr-8	1	13	0		33.8		0.38	
BLAEBERRY RIVER								
Blae-1	4	6	0		180		0.03	
Blae-2	5	9	0	200	44	0.05	0.20	
Blae-3	4	0	0	250	96	0.00	0.00	

COLUMBIA RIVER TRIBUTARY STUDY								
Electrofishing catch and effort								
Site	Reach	No. of Trout	No. of course fish	Time Shocked (sec)	Area Shocked (m ²)	Total Catch per second	Total Catch per area	Comments
Blae-4	3	1	12	258	58	0.05	0.22	
Blae-5	2	2	6	276	51	0.03	0.16	
Blae-6	3	4	0	225	68	0.02	0.06	
Blae-7	1	0	1		42		0.02	
Willow-1 (pool)		12	0	350	60	0.03	0.20	
Willow-1 (riffle)		7	0	166	55.2	0.04	0.13	
Mumm-1								no shocking
Redburn-1								no shocking
BLUEWATER CREEK								
Blue-1	4	1	0					not from shocking
Blue-2	4	4	0		26.5		0.15	
Blue-3	3							
pass #1		5	0	335	64	0.01	0.08	
pass #2		3	0	253				
total		8	0	588	64	0.01	0.13	
Blue-4a	3	14	0		40		0.35	
Blue-4b	3	1	0		32		0.03	
Blue-5	2	5	0	586	64	0.01	0.08	
Blue-6	2	13	0	620	76.5	0.02	0.17	
Blue-7	1	5	3	521	56.3	0.02	0.14	only from main channel
Blue-8	1	0	5		31		0.16	
Blue-9	2	3	1		43.5		0.09	
Blue-10	2	1	0	360	74	0.00	0.01	
Whtpne-1 (riffle)								
pass #1		14	0	280	56	0.05	0.25	
pass #2		1	0	308				
total		15	0	588	56	0.03	0.27	
Whtpne-1 (pool)		10	0	224	28	0.04	0.36	

COLUMBIA RIVER TRIBUTARY STUDY								
Electrofishing catch and effort								
Site	Reach	No. of Trout	No. of course fish	Time Shocked (sec)	Area Shocked (m2)	Total Catch per second	Total Catch per area	Comments
CAMP CREEK								
Camp-1	1							no shocking
Camp-2	1							no shocking
Camp-3	1							
pass #1		1	3	281	70	0.01	0.06	
pass #2		1	1	318				
total		2	4	599	70	0.01	0.09	
Camp-4	4							no shocking
Camp-5	4							
pass #1		4	0	424	56	0.01	0.07	
pass #2		0	0	360				
total		4	0	784	56	0.01	0.07	
Camp-6	4							no shocking
Camp-7	5							no shocking
Camp-8	4	0	2	248	15	0.01	0.13	
Camp-9	2	1	3	440	24	0.01	0.17	
Camp-10	2							no shocking
Camp-11	4	5	0	200	12	0.03	0.42	
Gold-1		2	0		50		0.04	
SPILLIMACHEEN RIVER								
Spilli-1	5	4	0	254	25	0.02	0.16	
Spilli-2	3	2	3	374	80	0.01	0.06	
Spilli-3	3	5	3	380	80	0.02	0.10	
Spilli-4	3							no shocking
Spilli-5	3	3	0	480	126	0.01	0.02	from main channel
Spilli-5	3	3	0	100	5	0.03	0.60	from mouth of trib.
Spilli-6	1	0	6	454	180	0.01	0.03	
Spilli-7	1	0	0	95	20	0.00	0.00	
Spilli-8	1	0	2	405	258	0.00	0.01	
Spilli-9	1	3	3	237	66	0.03	0.09	
Spilli-10	1							from side-channel
Spilli-11a	1	11	0	532	270	0.02	0.04	More MW not captured
Spilli-11b	1							no shocking
Spilli-12	1	4	6	477	69	0.02	0.14	

COLUMBIA RIVER TRIBUTARY STUDY								
Electrofishing catch and effort								
Site	Reach	No. of Trout	No. of course fish	Time Shocked (sec)	Area Shocked (m2)	Total Catch per second	Total Catch per area	Comments
McMurdo-1		2	0	550	50	0.00	0.04	2 fish seen but not captured
BOBBIE BURNS CREEK								
BB-1	2	1						
BB-2	3							no shocking
BB-3	6	0	0	280	46	0.00	0.00	
BB-4	3	0	0	224	44	0.00	0.00	
Crystalline -1		0	0	250				
Malachite-1		0						no shocking