

BZWN

Steel head trout

mm
P/FR/SK/21
c. 2

950-982

A FISHERIES SURVEY OF THE
UPPER ZYMOETZ RIVER SYSTEM
(HEADWATERS TO RED CANYON CREEK)
WITH PARTICULAR REFERENCE
TO STEELHEAD AND CUTTHROAT TROUT
HABITAT AND ENHANCEMENT OPPORTUNITIES

P/FR/SK/21
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FISHERIES SURVEY OF THE
UPPER ZYMOETZ RIVER SYSTEM
BZWN c. 2 mm SMITHERS

BY

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INTRODUCTION

This report presents the results and recommendations of a three month study of the upper Zymoetz River and five of its tributaries (Figure 1). The study was designed to obtain additional fisheries information in preparation for steelhead enhancement work under the Salmonid Enhancement Program (S.E.P.).

Some information on the aquatic life of the Zymoetz River is available from previous studies. Varney and Truelson (1975) conducted a stream survey of sections of the mainstem Zymoetz and some tributaries which provided limited data on instream features and fish species distribution; the Resource Analysis Branch (R.A.B.) has produced Aquatics Biophysical Maps of the watershed based on an overview inventory done in 1975; and an unpublished Fish and Wildlife Branch report, "Proposed Smithers Tree Farm Licence", outlines the fishery values of the upper river and lakes. Federal Fisheries escapement records date from 1932 but lack information on specific habitat utilization in the upper river.

This study then, is intended to provide detailed habitat evaluation and estimates of present habitat utilization in the upper Zymoetz River.

The objectives were to:

1. Determine the distribution of steelhead, rainbow and cutthroat trout, and coho salmon in the area.
2. Inventory existing fish habitat and assess present habitat utilization.
3. Recommend enhancement possibilities.

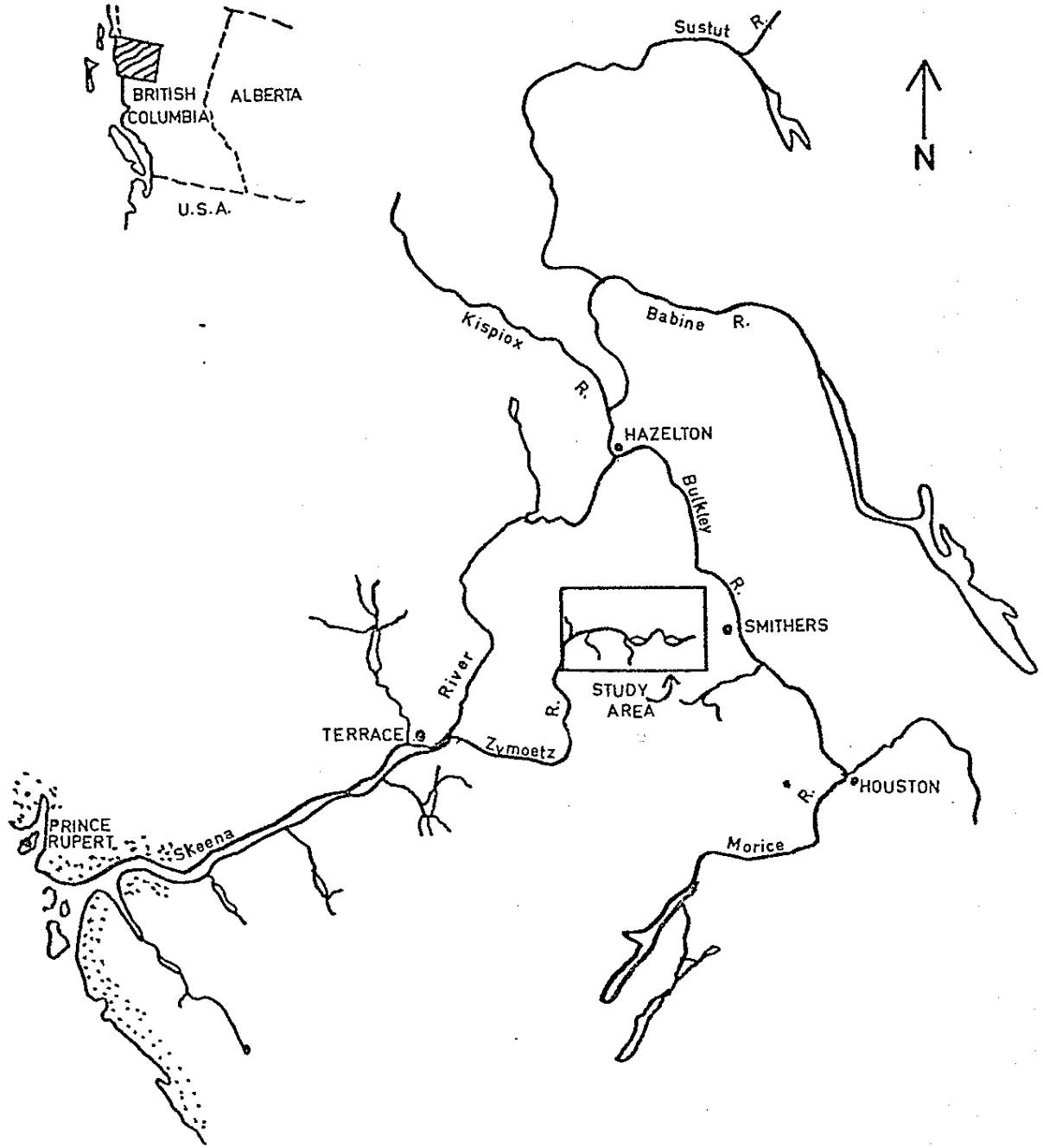


Fig.1 The Skeena River showing the Zymoetz River.

DESCRIPTION OF THE STUDY AREA

The Zymoetz River is known locally as the Copper River. It flows generally ^{south} northwest into the Skeena River nearly eight kilometers north-east of Terrace ($54^{\circ}33' N$ and $128^{\circ}29'W$). It drains an area of approximately 3,000 square kilometers and is about 100 kilometers long.

This study concentrated on the headwater region, specifically the tributaries and mainstem between McDonell, Dennis, and Aldrich Lakes (Figure 2). The Zymoetz above McDonell Lake has also been locally referred to as Dennis River. The river flows west to McDonell Lake and the three main tributaries surveyed here enter from the north. Less intensive work was done on the mainstem from McDonell Lake to the first major creek above Red Canyon Creek. Three minor streams entering McDonell Lake were also assessed. The region has had little commercial or industrial activity; other than limited selective logging, mineral exploration, mining, guiding and ranching. The mine near Aldrich Lake has had considerable affect on the water quality of Henderson Creek and possibly of Aldrich Lake (Photo 1). Its overall effect is localized. The only present activity is a guide outfitting and guest ranch on the east end of McDonell Lake (Photo 2). There are two privately-owned cabins on the west end.

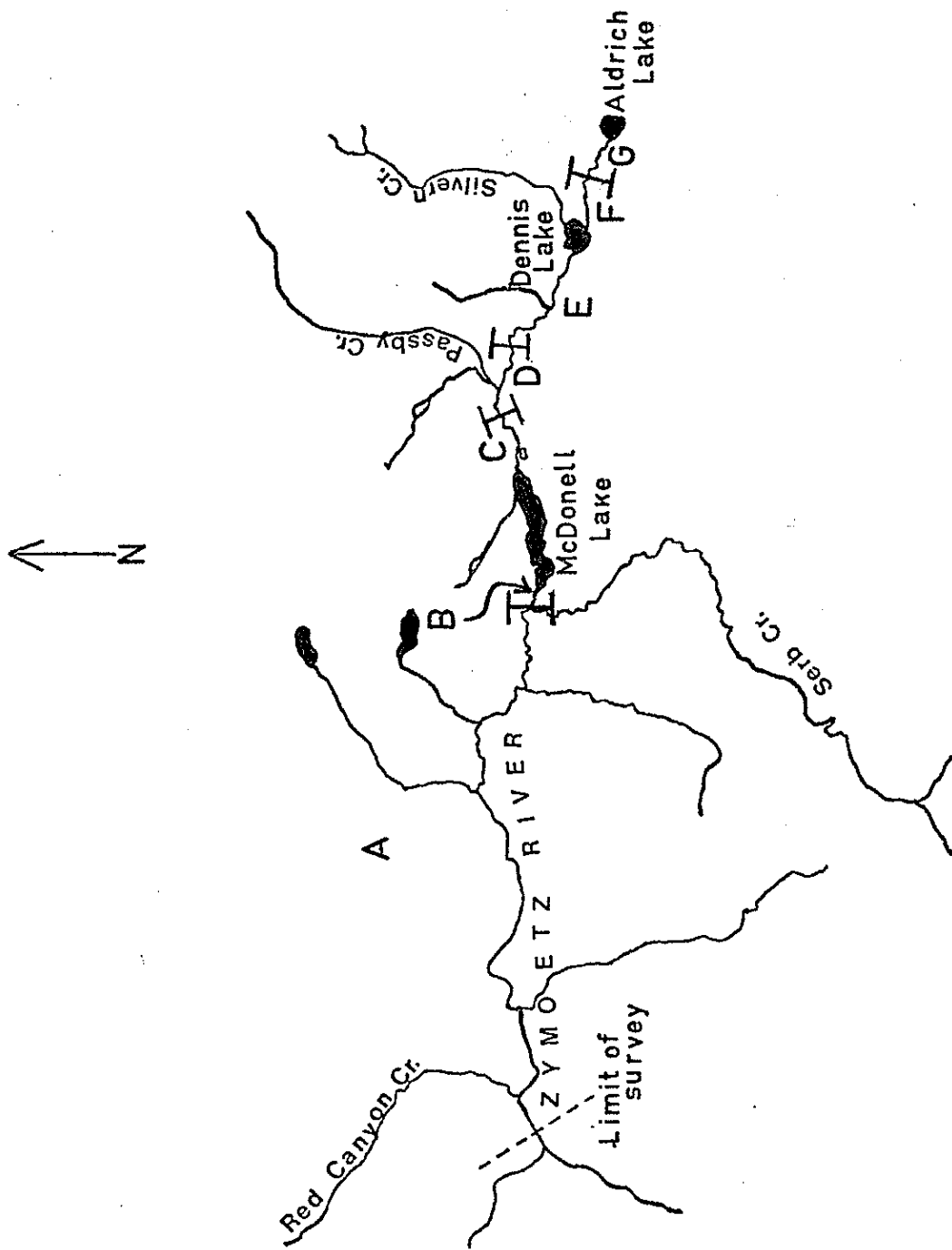


Fig. 2 Study area showing reaches A to G of the Zymoetz River.



Photo 1. May, 1978. Result of drainage from tailings pond. Stream drains to Aldrich Lake.

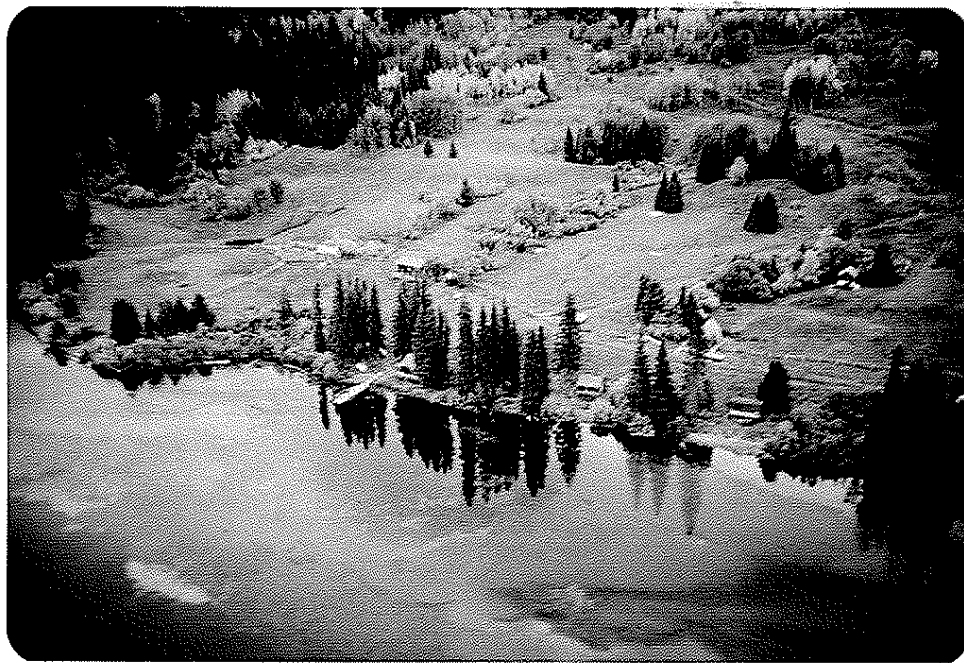


Photo 2. September, 1978. Copper River Ranch on the north side and east end of McDonnell Lake.

THE FISHERY

Steelhead trout and four species of Pacific salmon migrate to the Zymoetz River; only sockeye salmon, coho salmon and steelhead trout migrate to the study area. Rainbow and cutthroat trout, Dolly Varden char and Mountain whitefish are resident sportfish.

Few anglers were met during the study and it appeared most of their efforts were concentrated on lake fishing for cutthroat trout. Some steelhead fishing occurs in the fall on the Zymoetz just below the fishing closure boundary (pers. comm. L. O'Neill; Figure 4a). The mouth of the Zymoetz and upstream to the Clore River supports a large sports fishery for coho and steelhead.

METHODS

The 1977 field investigations began in late May and were conducted from a base camp at the Copper River Ranch. Repetitive fish sampling continued until the end of July. A helicopter survey of Coal Creek, Red Canyon Creek and the Zymoetz River from McDonell Lake to Red Canyon Creek was done on September 26 and 27.

At the onset of the study, we canoed the mainstem Zymoetz from Dennis Lake to McDonell Lake and walked from Aldrich Lake to Dennis Lake. From this trip we mapped reach breaks, obstructions, and possible barriers to fish passage, and recorded physical characteristics of reaches on tally cards (Figure 3a). We sampled for fish using a small dipnet for fry capture and spinning gear for larger fish.

Numerous stops were also made during the trip to record pertinent point sample data. This data serves to verify reach descriptions (which are "averaged"), and provides a description of unique and/or important fish habitat within a reach (Figures 3a and b). These data are located in Appendix I. Both point and reach cards were provided by the R.A.B.. Modification to the R.A.B. system of inventory was necessary to meet our objective because their inventory system does not provide for adequate habitat evaluation and description; these modifications included the extensive use of written comments while not recording some physical measurements and changes in the mapping format.

With this preliminary data, we then chose point samples or located additional sites that were accessible from the road and/or by foot. Repetitive fish sampling was done at these sites and changes in habitat availability and utilization noted. Point samples are located on maps accompanying each reach description.

Passby/Willow, Unnamed and Silvern Creeks were similarly surveyed on foot.

Fish presence was established by various methods; stream morphology, existing water levels, and stream accessibility determined the method used. Angling proved to be the most successful. Spinning gear was used during high flows and turbid water conditions while fly casting with small flies was most successful during low, clear water conditions.

Minnow traps set with salmon roe were very successful during the high water period at the beginning of the study. Seining and electroshocking were used infrequently due to unsuitable conditions such as deep water, fast flow and channel debris. Records were kept of fish observations and are tabulated in Tables 6 to 17.

The text of the report interprets and summarizes the field data to meet the three objectives of the study. Sections of the 1:20,000 forest inventory maps used in the field accompany each reach description. Referenced photographs appear in the text; a photograph of most point sample sites accompany the field data in Appendix 1.

RESULTS

FISH DISTRIBUTION

Fish presence and habitat use in the Zymoetz River and surveyed tributaries are shown in Tables 1 to 5. These tables have resulted from fish sampling results (Tables 6 to 17), and field observations. Figure 2 illustrates the reach locations.

Cutthroat trout were the most widely distributed species. They were the only species found in both the mainstem and tributaries. Coho salmon fry were the next most widely distributed, followed by rainbow trout. Steelhead were found only on or near spawning areas (reaches B and D of the Zymoetz River); it is suspected that they only spawn in the main river.

Water temperatures and low flows are the main limiting factors affecting species distribution in tributaries. Obstructions seriously influence distribution in Willow Creek; beaver dams in reach 1 pose a barrier and reduce coho salmon and cutthroat trout spawning habitat. Utilization of fish habitat could be enhanced in Silvern Creek through the removal of beaver dams and debris accumulation.

Species distribution in the mainstem above McDonell Lake is affected by one beaver dam in Reach E; sockeye salmon were unable to negotiate the dam during low water levels. It is not known how this affected coho salmon or steelhead trout.

Table 1. Summary of Fish Presence and Use by Reach and Species on the Zymoetz River, June - November, 1978.

Reach	Species				
	Sthd.	Rb.	Ct	Co	So
A	R(S)	R(S)	R(S)	-	-
B	RS	RS	RS	RS	-
Lake	-	-	R	R	R
C	R	R	R(S)	R	-
D	RS	R(S)	RS	R(S)	S
E	R(S)	(RS)	RS	R(S)	-
F	-	-	R	R	-
G	-	-	(R)S	R(S)	-

R = rear S = spawn () = Suspected

Table 2. Summary of Fish Presence and Use by Reach and Species on Passby Creek, June - November, 1978.

Reach	Species				
	Sthd	Rb	Ct	Co	So
1	R	R(S)	R(S)	R(S)	-
2	-	-	-	-	-
3	-	-	(RS)	-	-

R = rear S = spawn () = suspected

Table 3. Summary of Fish Presence and Use by Reach and Species on Willow Creek, June - November, 1978.

Reach	Species				
	Sthd	Rb	Ct	Co	So
1	-	-	R(S)	R(S)	-
2	-	-	R(S)	-	-
3	-	-	R(S)	-	-

R = rear S = spawn () = suspected

Table 4. Summary of Fish Presence and Use by Reach and Species on Unnamed Creek #5, June - November, 1978.

Reach	Species				
	Sthd.	Rb	Ct	Co	So
	-	-	-	(S)	-

Table 5. Summary of Fish Presence and Use by Reach and Species on Silvern Creek, June - November, 1978.

Reach	Species				
	Sthd	Rb	Ct	Co	So
1	-	-	R	R	-
2	-	-	RS	RS	-
3	-	-	-	-	-

R - rear S = spawn () = suspected

FISH HABITAT DESCRIPTIONS AND EVALUATIONS

This section contains summary descriptions and evaluations for each reach of the Zymoetz and the reaches of surveyed tributaries. The field data in Appendix 1 should be consulted for detailed information on point sample measurements.

Reaches are numbered sequentially upstream from the mouth of a watercourse (1, 2, 3 ...). The reaches of the Zymoetz are labelled alphabetically to accommodate further downstream inventory.

Each reach description is accompanied by a 1:20,000 biophysical map, a table of fish sampling results and photographs. Suggested enhancement actions have been included in this section in point form. In some instances, maintenance of existing conditions has been recommended to preserve habitat quality.

I. ZYMOETZ RIVER

The surveyed area of the Zymoetz lies in a general east-west direction. Seven reaches have been delineated and assessed for fish habitat suitability and present fish use. Summary information on McDonell, Dennis and Aldrich Lakes has been included.

Reach A

This reach extends from the furthest downstream limit of survey, at Red Canyon Creek, upstream to Serb Creek (Fig. 4 and 4a). It is a distance of 25 kilometers.

The Zymoetz forms a single channel and is occasionally confined by bedrock outcrops (Photo 3). Meander scars, gravel bars and bank slumps indicate moderate lateral channel movement (Photo 4 and 5) and one main channel diversion was seen at the mouth of Coal Creek (Photo 6). No barriers to fish passage were present. During September, the river below Serb Creek was clear and many areas appeared to have suitable gravel and water velocities for spawning coho and steelhead (Photo 7). Rearing areas and deep bedrock-controlled pools were also abundant. No fish were observed or captured in the lower reach during this time, but several juvenile rainbow trout and coho salmon fry were captured in July (Table 6).

In the warm summer months the glacial water from Serb Creek increased turbidity of the Zymoetz (Photo 8). One steelhead was captured in this reach in late July by an angler (pers. comm. L. O'Neil).

Recommendations

Insufficient work was done on this reach to recommend enhancement work.

Table 6. Numbers, size and species of fish sampled in Reach A of the Zymoetz River, 1978.

Date	Map Location*	Number	Species	Sizes Range (mm)	Comment
July 18	1 to 2	19	Rb	80 - 170	Angled
		4	Ct	100- 140	Angled
		20	Co	30 - 60	Observed in
		8	Ct	70 - 250	side channels
	3	1	Sthd	750	Scales taken

*See Figure 4

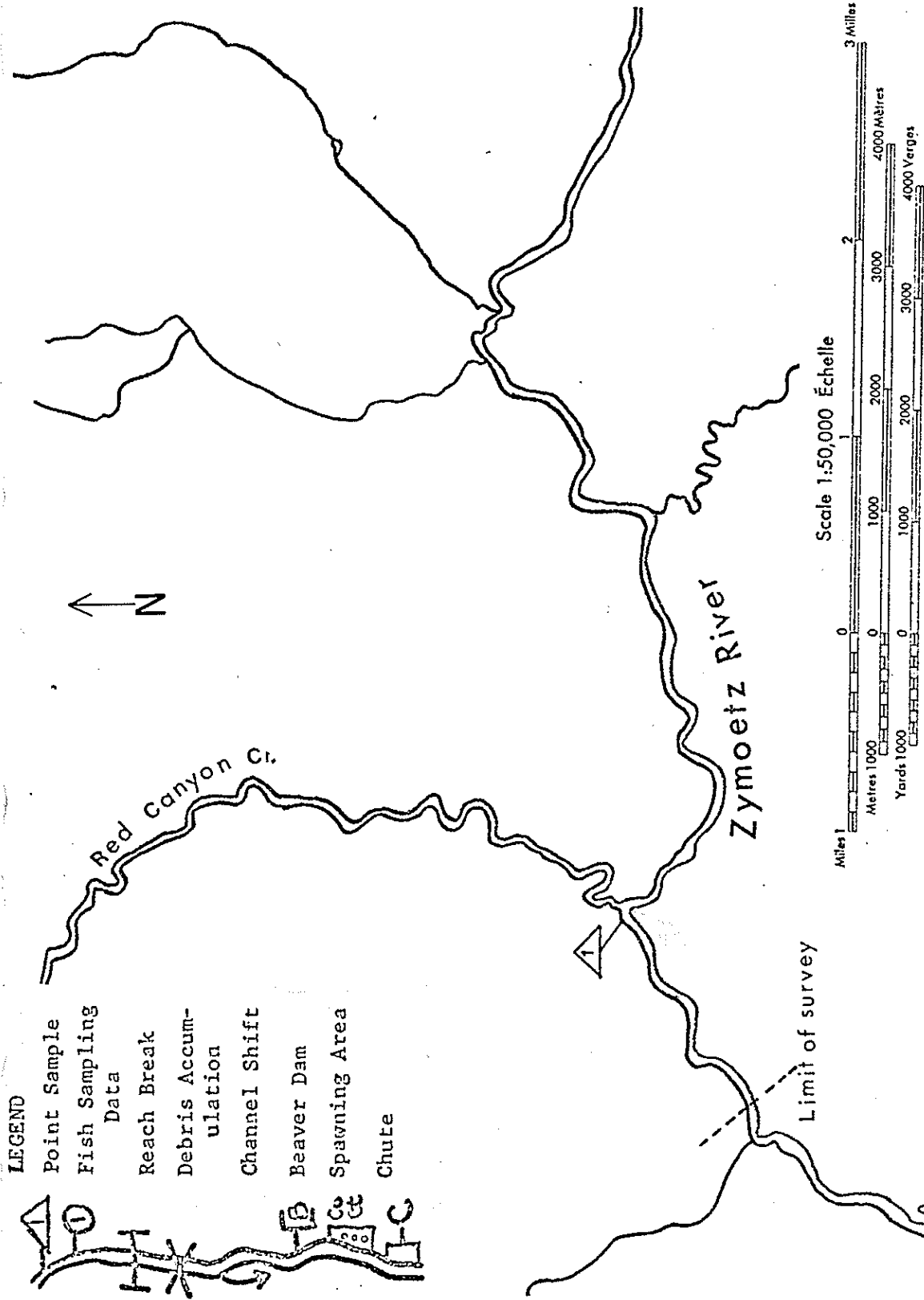


Fig.4 Lower section of reach A of the Zymoetz River

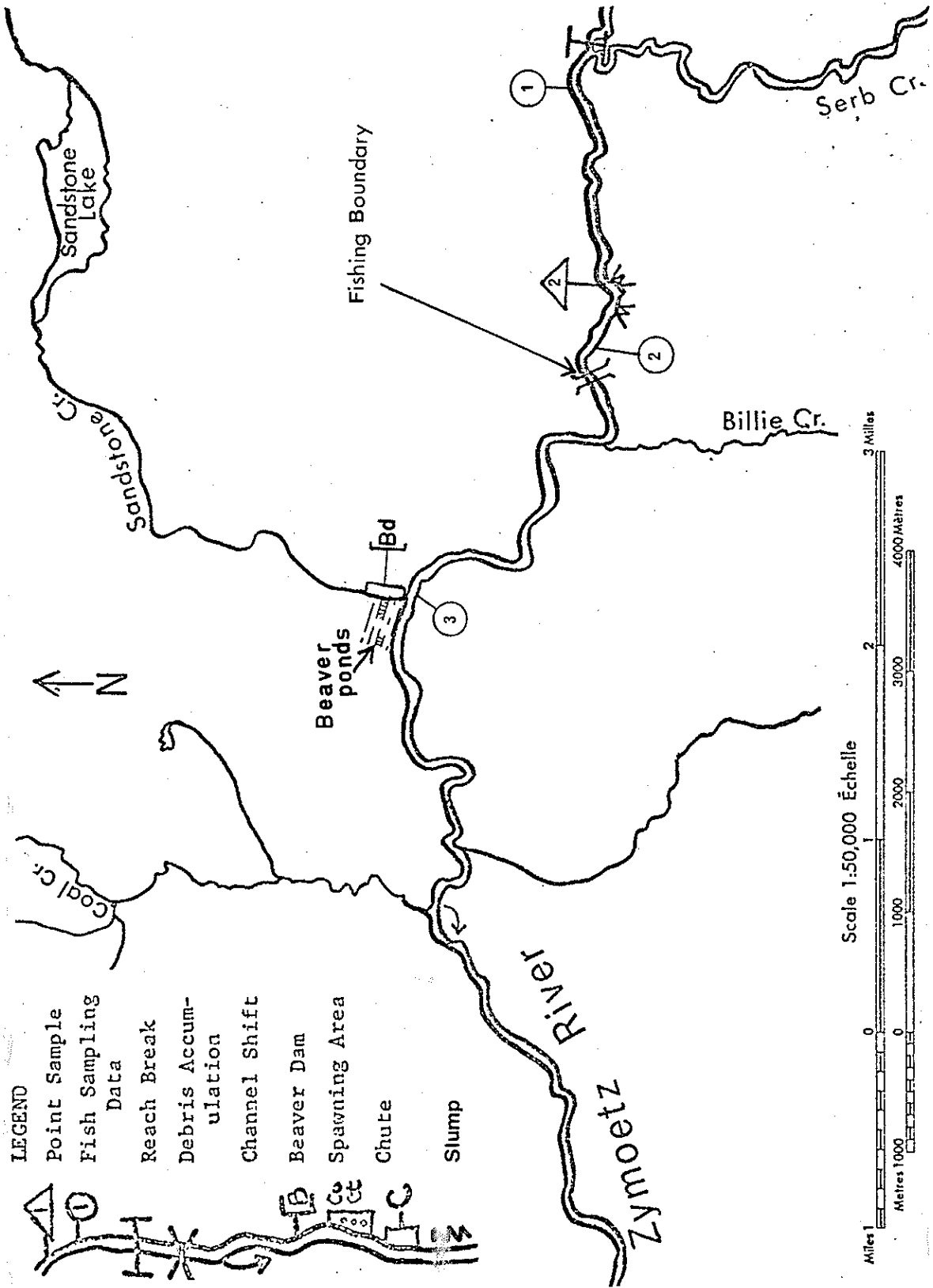


Fig.4a The Zymoetz River - Upper section of reach A



Photo 3. September, 1978. Zymoetz River. Looking upstream, note bedrock outcrop on the left. Outcrops occur frequently and create good holding water in reach A.



Photo 4. September 1978. Zymoetz River shows some lateral channel movement in reach A. Note meander cut-off on left and shifting gravel bars.

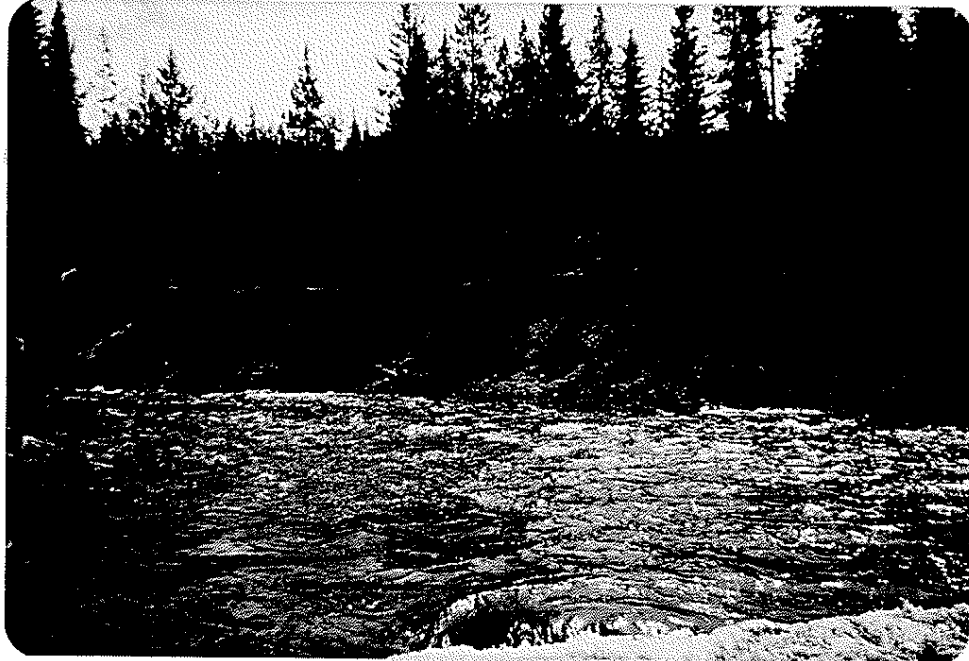


Photo 5. June, 1978. Zymoetz River in the Fisheries Closure area, looking upstream. Note course bank materials in slump.



Photo 6. September, 1978. Zymoetz River splits into two channels near Coal Creek. Main channel at bottom of photograph.

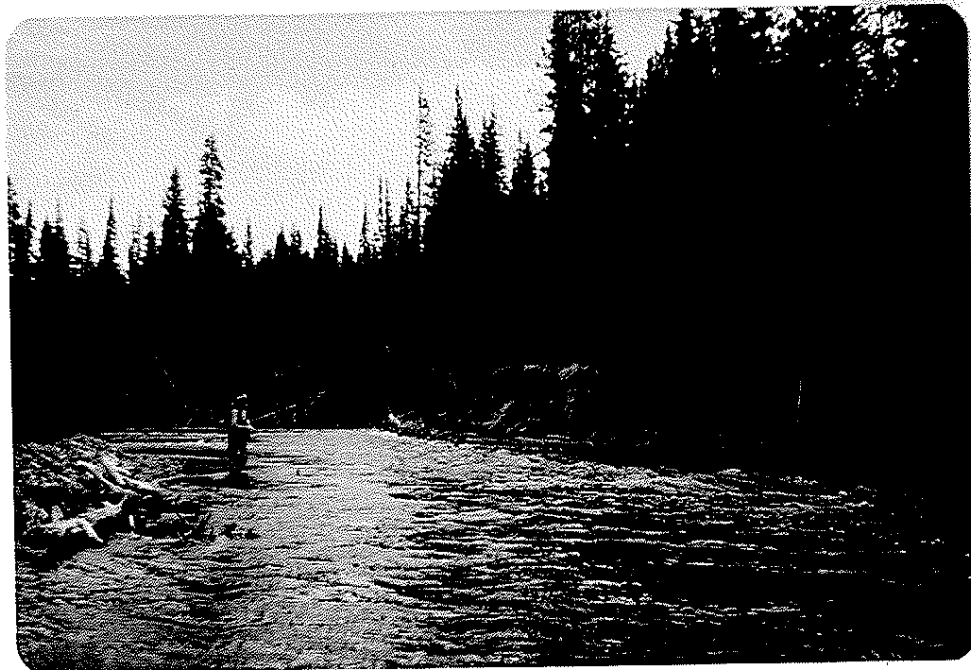


Photo 7. June, 1978. Point sample # 2
on Zymoetz River, below Serb Creek.
Water clear.

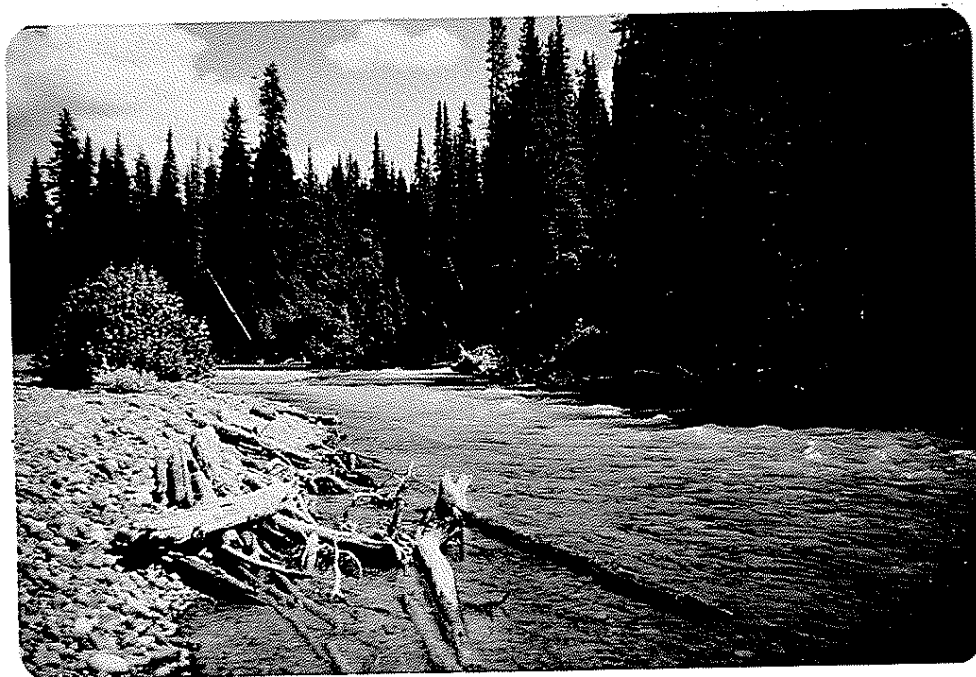


Photo 8. July, 1978. Same as Photo 7. Water
colour change due to glacial melt
from Serb Creek.

Reach B

This reach extends from Serb Creek upstream to McDonell Lake (Fig. 5). The Zymoetz forms a single channel throughout the reach. No bedrock outcrops were noted and undercut banks occur on both sides of the river. Approximately 20% of the banks are unstable and contribute a moderate amount of debris and silt to the river. One major slump is located immediately above Serb Creek on the right bank (Photo 9).

Two major steelhead spawning areas are located in this reach and an approximate total of 200 fish were observed in late May and early June (Table 7). Thirty redds were counted at each of the two sites and about eight redds were counted between them. Neither spawning area was considered to be of good quality: the substrate in the area immediately below the lake (Point Sample 4; Photo 10) has a heavy algae growth combined with slow moving water and the second area (Point sample 3) has large cobble substrate with some gravels and silt and also moderate algae growth (Photo 11).

Good rearing habitat can be found throughout the reach (Photo 12). Numerous cutthroat and rainbow trout were captured. Fewer coho fry were observed here than in the reaches above the lake.

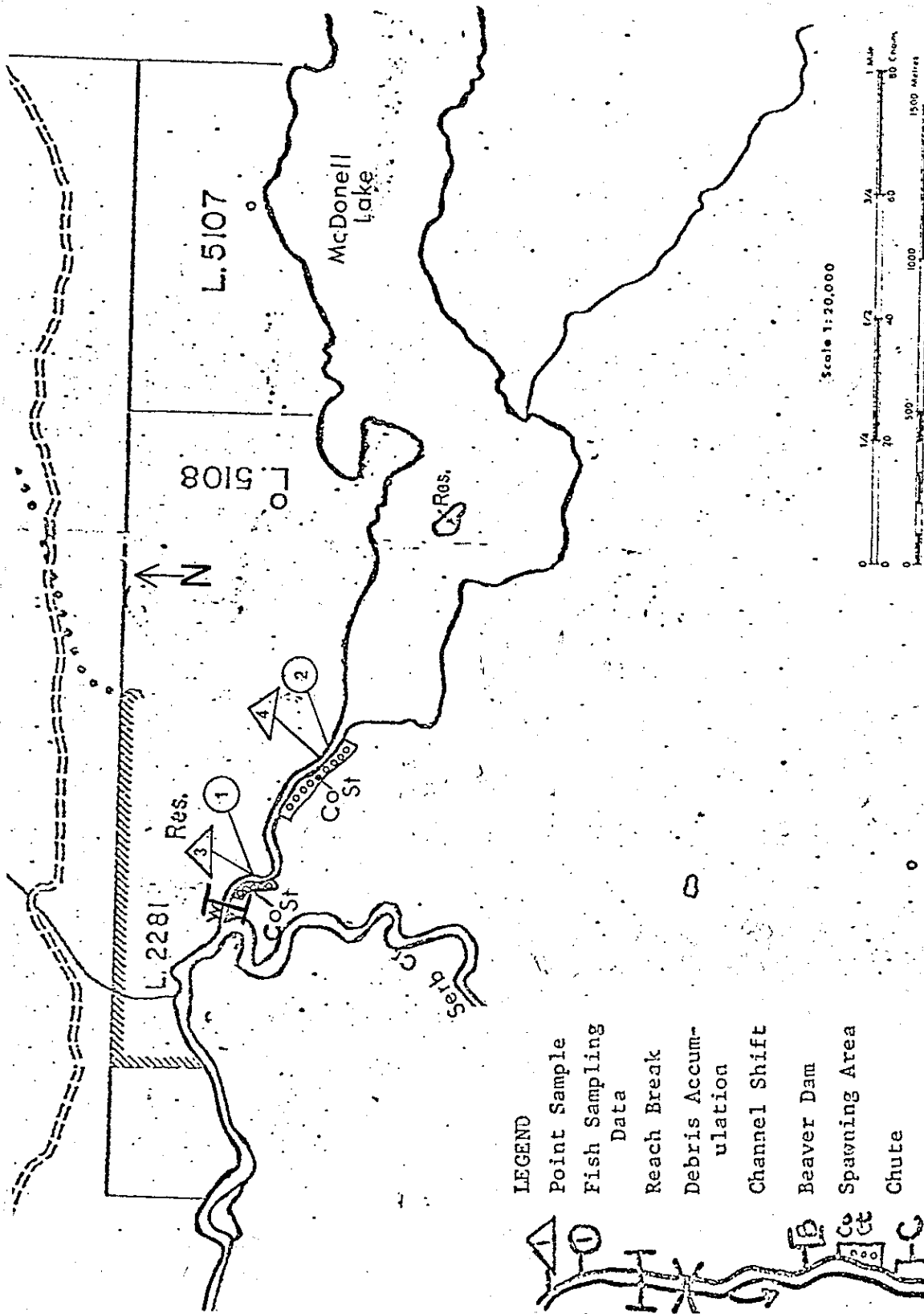


Fig. 5 Reach B of the Zymoetz River

Recommendations

Rake or flush silts from upper spawning area. Alter velocities or flow character to maintain algae - free state. Increase protective cover and holding area for fry and juveniles in upper section.

Table 7. Numbers, size and species of fish sampled in Reach B of the Zymoetz River, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comment
May 25	1	1	St	800	Angled; spawners
		100	St	800 - 950	observed
May 25 to July 26	throughout reach		Ct	100 - 200	Observed rising and angled
May 31	1	11	St	500 - 900	Spawning behaviour Angled; spawners
		60	St		Observed; spawners
		3	DV	250 - 450	Angled
		2	Ct	300	Angled
June 9	1	2	St	790 - 850	Angled; kelts
		50	St	790 - 850	Observed; paired and some spawning behaviour observed
June 15	1	1	St	-	Angled kelt; observed
		24	St		spawners
		1	Ct	305	Angled
July 13	1 to 2	21	Rb	60 - 345	Angled
		17	Ct	120 - 200	Angled
		1	MW	200	Angled
		1	Lns	350	Angled
		10	Co	fry	Observed
		10	Unidentified	fry	Observed around St redds; suspect dace.
July 26	1 to 2	15	Rb	80 - 250	Angled
		3	Ct	240 - 280	Angled
		1	Rb/Ct	150	Angled
		8	So	Adults	Observed
		100	Rb/Ct	fry	Observed; sampled but too small for identification

*See Figure 5



Photo 9. May, 1978. Bank slump at the beginning of Reach B, Zymoetz River.



Photo 10. July, 1978. Steelhead spawning section immediately below McDonell Lake. River very slow-moving and algae growth was heavy, see Point Sample # 4.

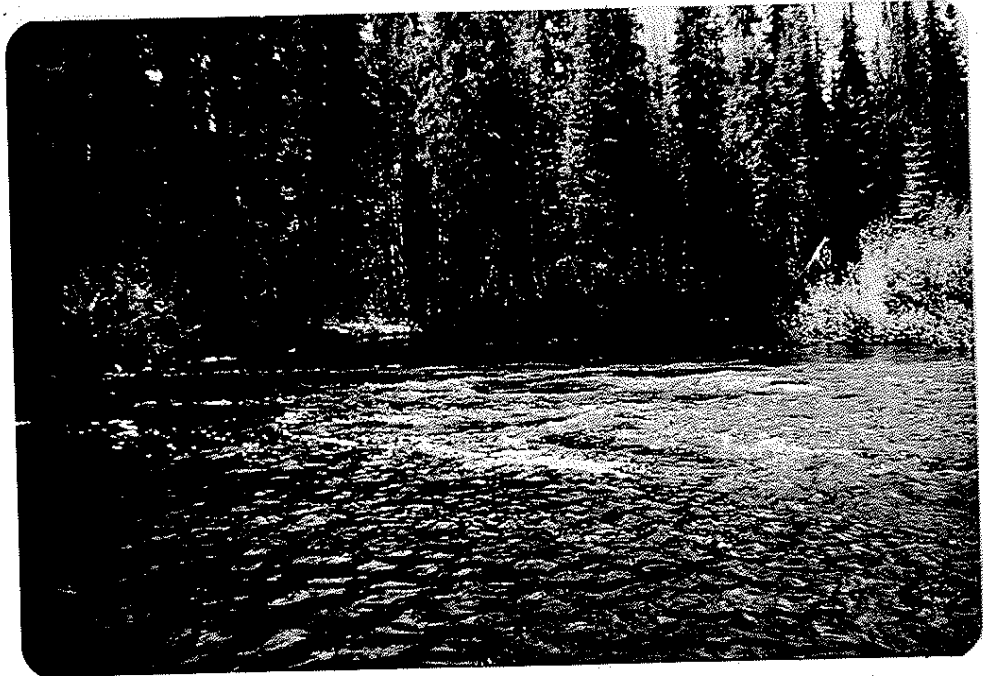


Photo 11. June, 1978. Looking downstream, steelhead spawning section (dated at end of riffle section. See point sample #3.



Photo 12. June, 1978. Upstream of Photo 11. Cutthroat angled throughout entire section. Large pool located above and below riffle.

McDonell Lake

McDonell Lake is approximately six kilometers long, lies in a general east-west direction and is surrounded by high mountains (Figure 6). Two islands are located on the west end of the lake. Sockeye, coho, cutthroat trout and Dolly Varden have been captured and observed in the lake. It is also suspected that steelhead may winter in the lake.

Three unnamed tributaries were assessed on the lake and one at the east end, near the Copper River Ranch. None of the streams were thought to contribute significantly to the fish population of the lake and would not support any spawning steelhead or coho.

Reach C

The reach starts at the inlet to McDonell Lake and extends 3.5 kilometers upstream (Figure 7). The river forms an irregular meander pattern through a marshy floodplain. No barriers to upstream fish movement were present in the stream, although debris accumulations have caused meander cutoffs and altered channel direction in several places (Photo 13). The channel is otherwise well-entrenched with steep and undercut banks (Photo 14).

Habitat types are limited to rearing and marginal spawning for cutthroat trout and Dolly Varden. The slow-moving water with deep pools and moderate amounts of debris accumulation provide good protective cover for rearing coho, rainbow, cutthroat and Dolly Varden; holding water is also created for sockeye, coho and steelhead migrating upstream.

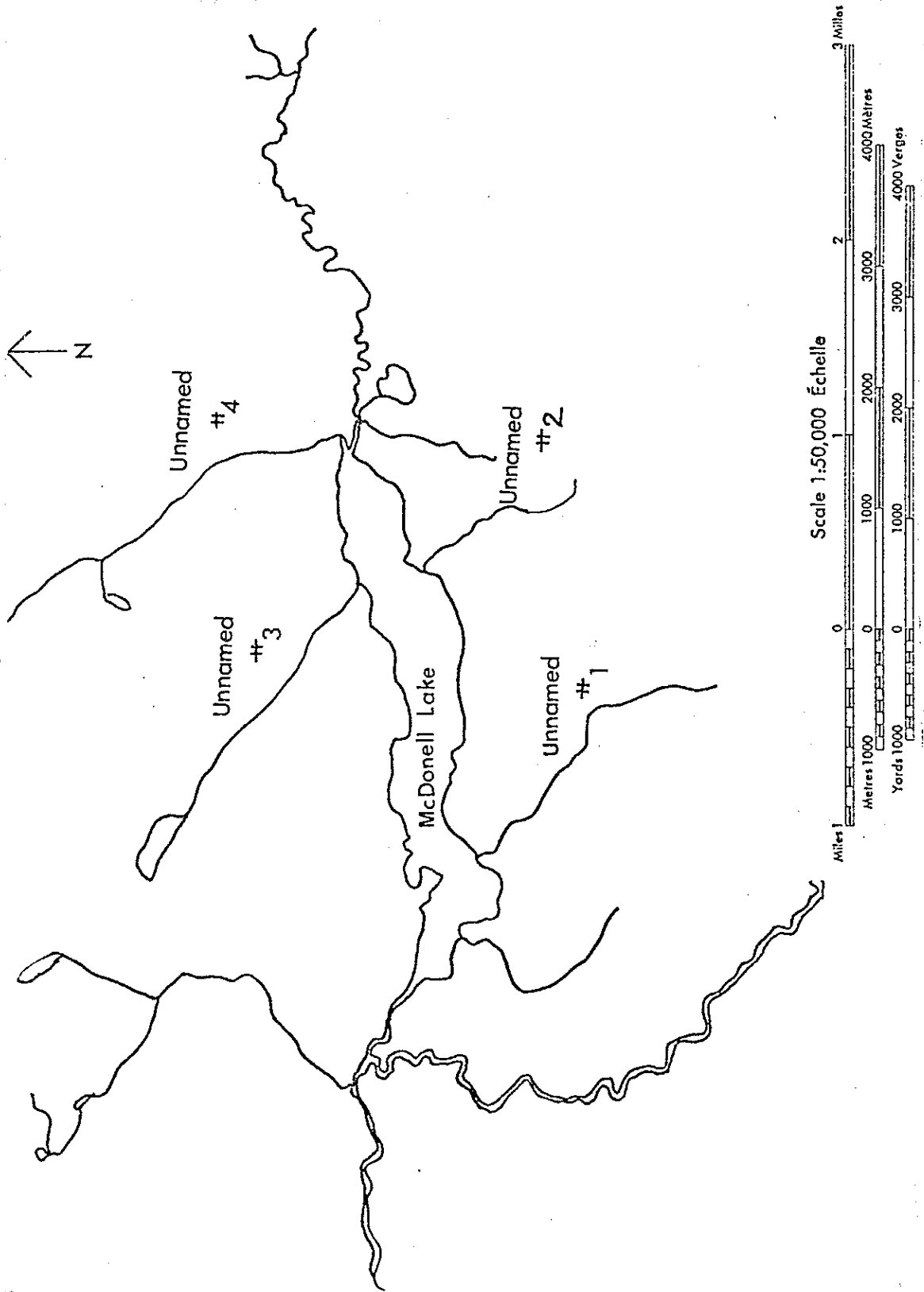
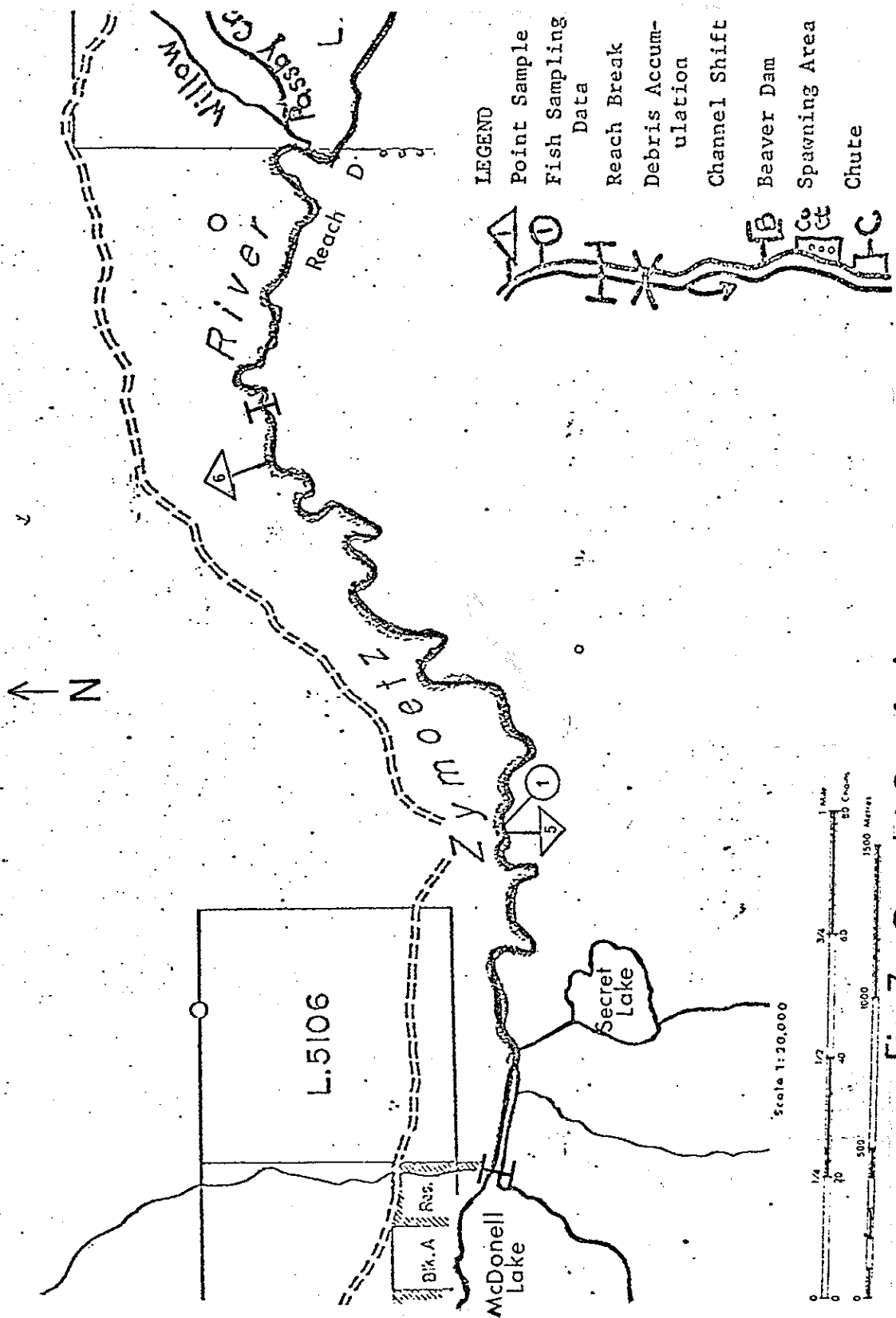


Fig. 6 McDonnell Lake and Unnamed Tributaries 1 to 4



Our fish sampling results show the presence of fry and juvenile coho, rainbow/cutthroat, and Dolly Varden (Table 8). No adult fish were captured, although we angled throughout the reach.

These results differ from reports of the Federal Fisheries and the R.A.B. Both agencies report salmonid spawning habitat immediately above McDonell Lake. The substrate consists of silt with small, infrequent gravel deposits; we feel there is no spawning habitat and no potential for development of coho, steelhead or sockeye spawning habitat.

Recommendations

Selective removal of some debris accumulations to prevent blockage of upstream fish movement.

Maintain vegetated banks to prevent extensive erosion and/or siltation.

Table 8. Numbers, size and species of fish sampled in Reach C of the Zymoetz River, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comment
May 26	throughout reach	few	Co	fry	Observed
June 14	1	50	Co	fry	Observed
July 6	1	16	Co	25 - 50	seine; many observed
		2	Sc	-	
July 7	1	10	Co	40 - 105	Gees trap set for 24 hrs.
		1	Ct	95	
		5	Rb/Ct	80 - 120	
		1	Rb	60	

*See Figure 7.



Photo 13. June, 1978. Debris accumulation in reach C has caused channel shift. Cut-offs areas provide good rearing habitat.

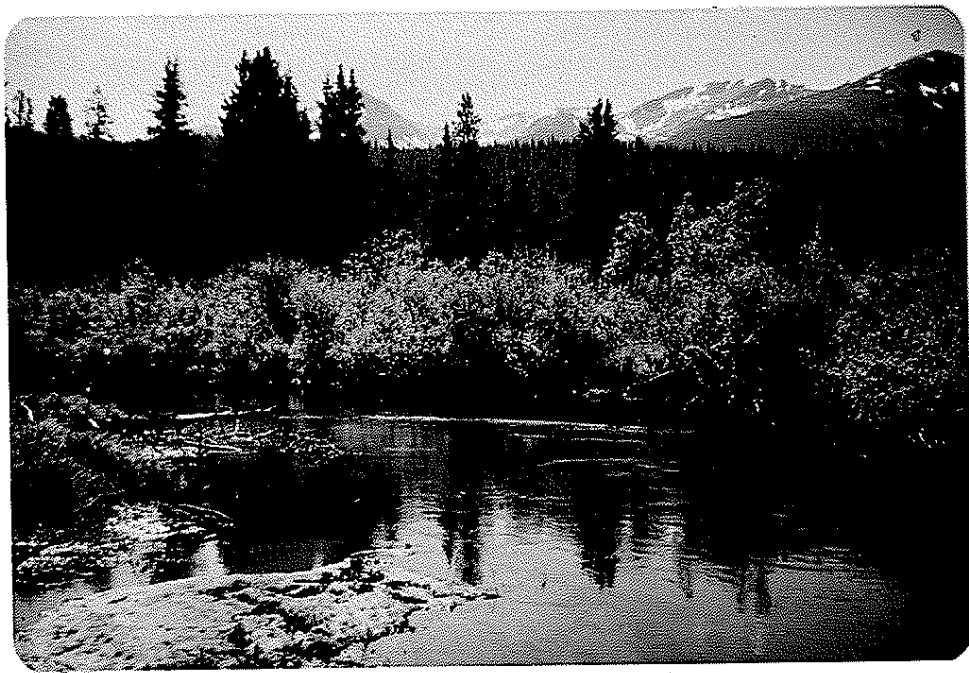


Photo 14. July, 1978. Point Sample # 5 in reach C. Although channel is unconfined, it is well-entrenched and banks are generally steep and/or undercut. Vegetation is typical of entire reach.

Reach D

Reach D is 2.5 kilometers long with an average slope of 1.5%.

This section of the Zymoetz offers the widest range of fish habitat seen in the study area (Figure 8).

Passby Creek enters the Zymoetz in Reach D. Above the Passby confluence, the gravel substrate is dark-stained, moderately compacted and angular. Spawning sockeye and cutthroat trout were captured and observed here (Table 9). We suspect this is the major spawning area above McDonell Lake for these species. Steelhead likely spawn here, but no redds or fish were observed. There are numerous side channels, undercut banks and deep pools that provide excellent rearing habitat. Many coho fry were observed here and the area is well-utilized (Photo 15).

Dolly Varden, sockeye and steelhead were observed and captured from the deep pool formed at the Passby/Zymoetz confluence. Large amounts of clean, medium-sized (2-64 mm) gravel are deposited downstream of the confluence (Photos 16 and 17).

Below the confluence, the gravel substrate remains clean and more compacted than in the upper reach. No mature fish were captured in the lower reach, although cutthroat and rainbow fry and juveniles were sampled and observed.

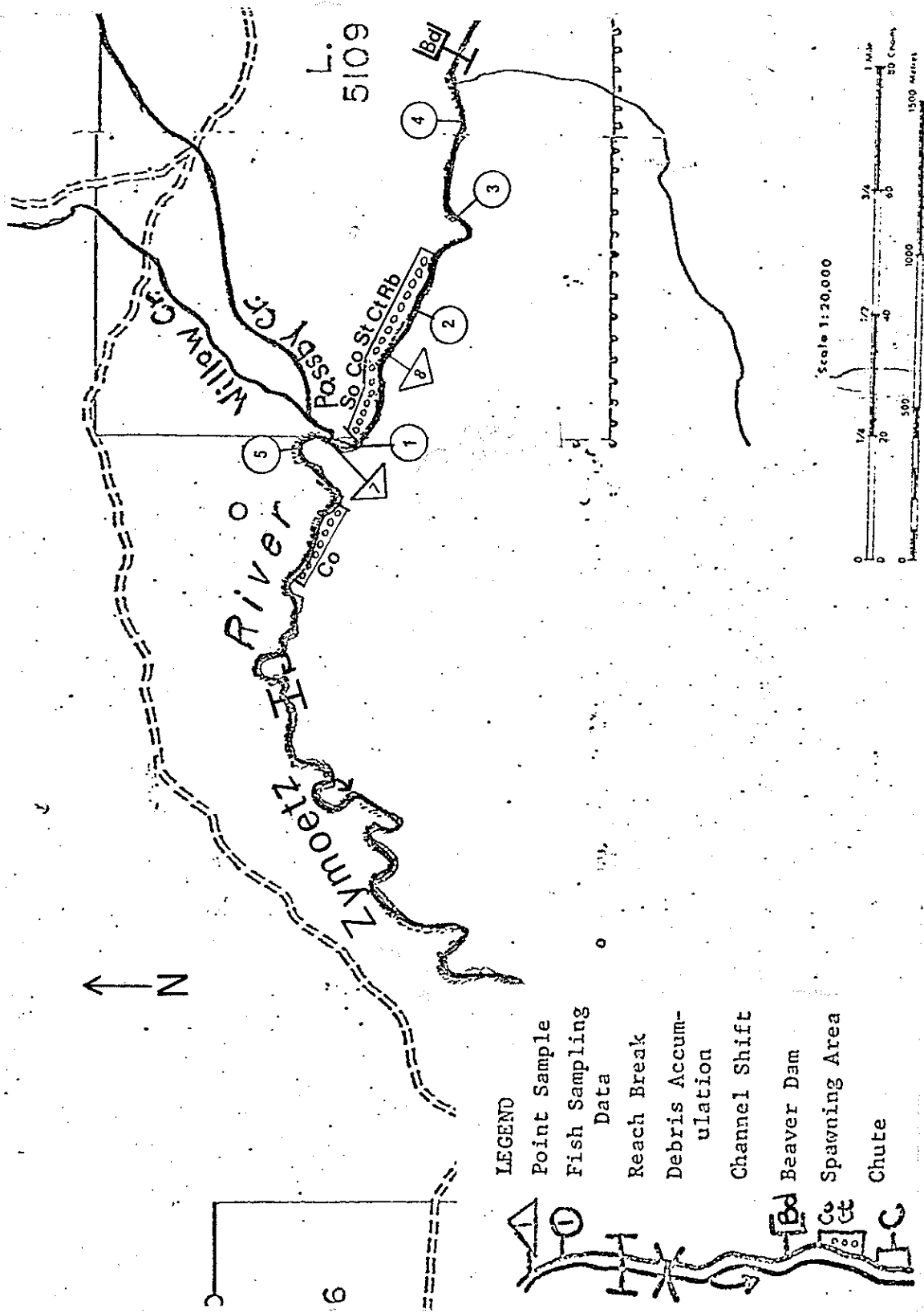


Fig. 8 Reach D of the Zymoetz River

Good quality rearing habitat continues through the area into reach C, but fewer coho fry were seen as compared to the upper reach. Steelhead spawning habitat is available but it is not known if the areas are utilized.

Recommendations

- Maintain stream cover and present bank conditions

- Further observation of spawning steelhead and coho during spawning periods to locate spawning areas.

- Consideration be given to a fisheries closure to protect spring spawners.

Table 9. Numbers, Size and Species of fish sampled in Reach D of the Zymoetz River, 1978

Date	Map Location*	Number	Species	Size Range	Comment
May 25	1	2	St	710-790	Angled; scales taken observed
	throughout reach	many	Co	Fry	
May 29	1	1	St	880	Angled; scales taken Pairing but no spawning observed.
		10	St	700-900	
		1	DV	480	Angled
	1 to 2	many	Co	fry	Observed
June 2	2	0	-	-	Gees trap set 2 hrs. and angled.
June 23	3	1	DV	-	Angled and lost
		6	Co	30-50	Electroshocking in side channel and main channel.
		2	So	120	
		1	Sc	-	Observed.
	2 to 4	many	Co	40-80	Observed.
	4	3	Ct	300-315	Angled; spawners
		3	Ct	300-315	Observed; spawners
July 4	2	2	MW	150-270	Angled
		4	Ct	250-350	Angled; Spawners
		6	Rb/Ct	60-80	Angled, not landed
July 6	2	1	Ct	190	Angled
		2	Ct	Juveniles	Observed
		many	Co	fry	observed
July 7	1 to 2	7	DV	375-550	Angled; most angled at Passby confluence
	2	3	Co	75-80	Gees trap set 24 hrs.
		7	Sc	80-120	
		1	Rb/Ct	100	
	1 to 5	2	Ct	350-375	Angled
		1	Rb/Ct	130	Angled
	1	1	Sc	-	Seine
July 27	1	5	DV	450-550	Observed
		6	So	450-650	Observed
	5	2	Rb	130-180	Angled
	5	30	Rb/Ct	fry	Observed

*See Figure



Photo 15. June, 1978. Reach D of the Zymoetz offers the widest range of fish habitat. Looking upstream, the top end of the reach is well-utilized by coho fry.



Photo 16. June, 1978. Steelhead caught at Passby confluence. Passby entering on left of photo.



Photo 17. June, 1978. Looking downstream at Passby/Zymoetz confluence. Passby entering on right, note gravel fan and water turbidity resulting from three-days of rainfall.

Reach E

This reach is 6.0 kilometers long and has a low gradient of 0.5%. Consequently, lower water velocity, higher debris accumulation and higher percentage of fines in the substrate occur, as compared to reach D. Beaver activity is evident in the reach below the logging bridge (Figure 9) and one dam proved to be a barrier to migrating sockeye (Photo 18). The beaver ponds, high overhang closure and slow water create good rearing habitat that is well-utilized (Table 10) meander cut-offs are also important rearing areas (Photo 19).

A 200 meter section of the reach below Dennis Lake contains some spawning-size gravel which is likely utilized by cutthroat, coho and Dolly Varden (Photo 20). All three species were found here (Table 10).

Recommendations

- Removal of beaver dams to facilitate fish passage.

- Maintenance of riparian vegetation to maintain habitat quality.

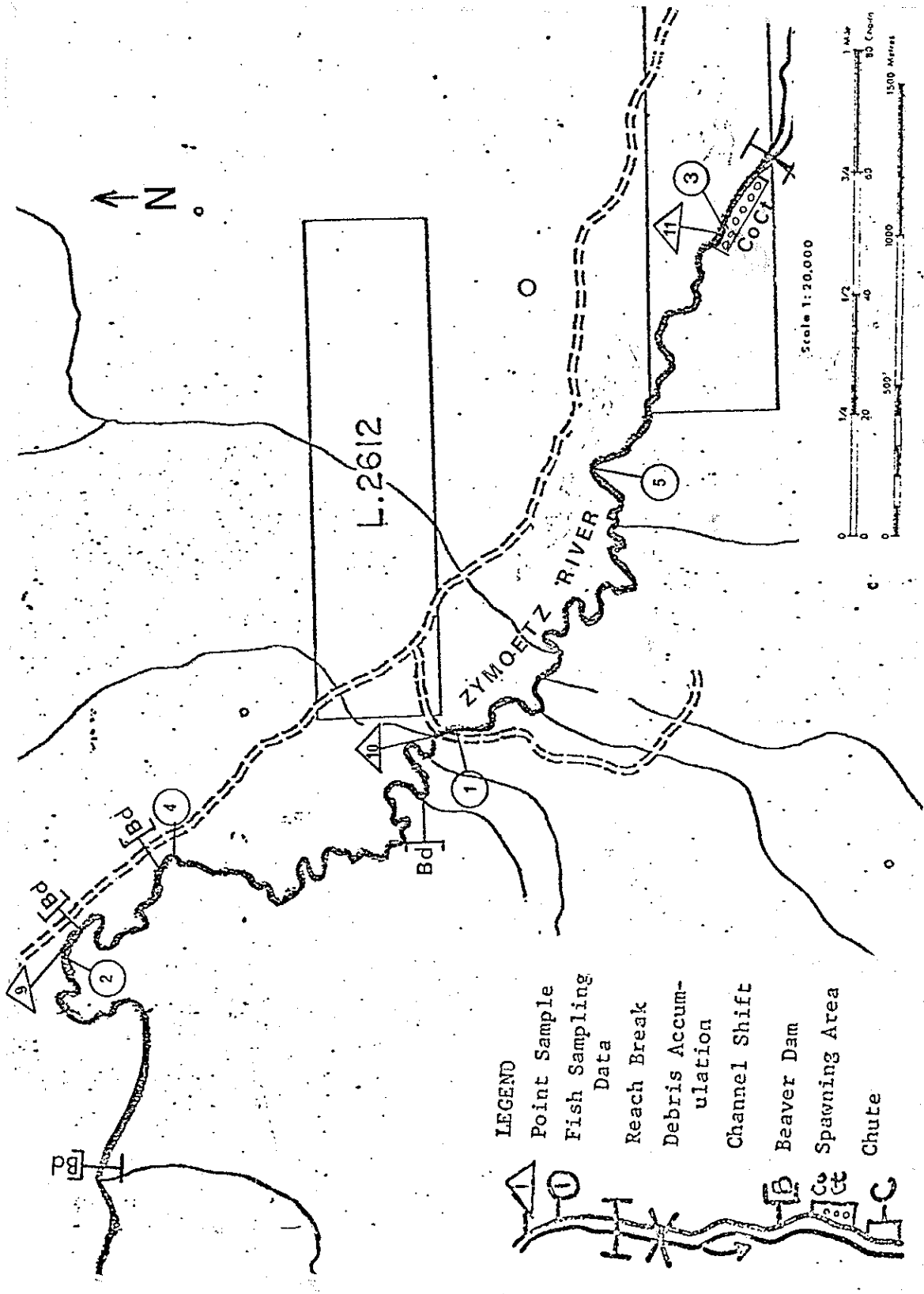


Fig. 9 Reach E of the Zymoetz River

Table 10. Numbers, Size and Species of Fish Sampled in Reach E of the Zymoetz, 1978

Date	Map Location*	Number	Species	Size Range (mm)	Comments
May 27	1	1	Co	110	Gees trap set 24 hrs.
	2	11	Co	55-110	Gees trap set 24 hrs.
May 28	1	21	Co	45-85	Gees trap set 24 hrs.
	2	0	-	-	-
May 29	1	9	Co	55-115	Gees trap set 24 hrs.
		3	Rb	60-100	
	2	15	Co	40-100	Gees trap set 24 hrs.
		2	Rb	105-110	
May 30	1	1	Rb	115	Gees trap set 6.5 hrs.
		1	DV	120	
		12	Co	60-130	
	3	1	DV	-	Angled - Mepps spinner
May 31	1	35	Co	60-150	Gees trap set 4 hrs.
	4	5	Co	40-60	Gees trap set 4 hrs. many Co observed
July 5	1	1	DV	320	Angled observed following angled fish. observed Angled - flycasting
		1	DV	450	
		15	MW	80-100	
		1	Co	80	
July 6	2	1	Ct	180	Angled - scales taken Angled
		1	Rb/Ct	145	
	5	1	Ct	230	Angled observed observed observed
		4	Ct	150-240	
		Many	Co	fry	
		20	unidentif- ied	50 - 150	
July 7	2	3	Co	80 - 90	Gees trap set 24 hrs.
		3	Rb/Ct	84 - 105	
		1	DV	110	
		1	Sc	113	
July 11	3	2	Ct	200 - 250	Angled - fly and Mepps spinner Angled - fly fish sampled observed
		2	Rb/Ct	105 - 180	
		20	Co	40 - 70	

* See Figure 9



Photo 18. May, 1978. Looking upstream at first beaver dam in reach E. during high water. Dam presented barrier to sockeye in July low water period.

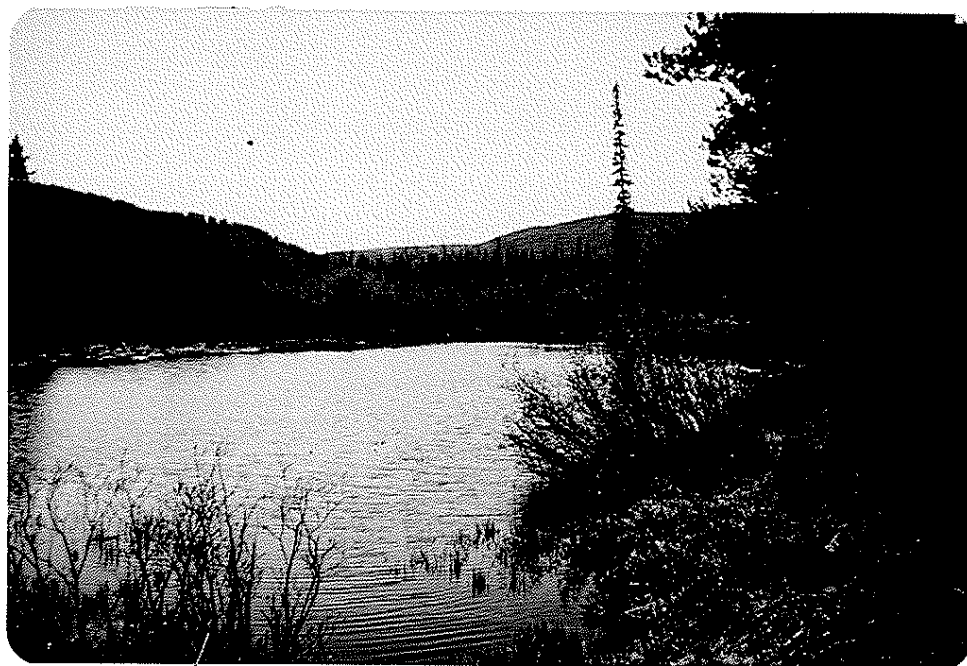


Photo 19. June, 1978. Meander cut-off in reach E that is utilized by coho fry and juveniles. Main Zymoetz in background of photo.



Photo 20. June, 1978. Top end of reach E immediately below Dennis Lake. Point sample #11 done here and Dolly Varden captured. Deep, slow-moving flow typical of reach.

Dennis Lake

Dennis Lake is approximately 1000 meters by 1250 meters with a maximum depth of six meters (Figure 10). Coho and cutthroat trout pass through the lake to Silvern Creek and possibly to the upper two reaches of the Zymoetz. Federal Fisheries report that sockeye also move through the area but none were observed above the beaver dam in reach E.

Two small tributaries on the south side of the lake were assessed and found to have no potential for development of fish habitat due to low water temperatures and flows.

Reach F

Most of the 2.0 kilometers of this reach is marshy lake margin and beaver ponds (Photo 21). The channel forms an unconfined, irregular meander pattern with undercut banks. Several beaver dams were noted but none appeared to be a barrier to fish passage. Riparian vegetation consists of a continuous dense cover of grasses and sedges with an occasional clump of willow (Photo 22). Flow is slow with deep runs and pools providing holding water and rearing habitat for cutthroat trout and Dolly Varden (Table 11). The substrate composition is mainly fines and no spawning is expected to occur in this reach. This is contrary to the findings of the Federal Fisheries and the R.A.B. whose reports indicate that spawning occurs in a section of the river immediately above Dennis Lake (Figure 10).

Recommendations

Maintenance of existing conditions.

Table 11. Numbers, Size and Species of Fish Sampled in Reach F of the Zymoetz River, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comments
June 1	1	Many	Unidentified fry and juveniles		Observed; suspect Ct and DV
July 11	2	0	-	-	Gees trap set 2 hrs.
	3	1	DV	370	Angled
	4 to 5	10	DV	80 - 200	Observed
		20	Unidentified juveniles		
		1	MW	150	
		4	Ct	180 - 200	Angled
5	1	Lns	350	Carcass found in beaver dam.	

*See Figure 10



Photo 21. June, 1978. Beaver pond in reach F could provide good rearing habitat for Dolly Varden, coho and cutthroat trout.



Photo 22. July, 1978. The Zymoetz River in the lower section of reach F is slow-moving and deep. Riparian vegetation is typically a continuous dense cover of grasses and sedges.

Reach G

This reach is confined in a narrow v-shaped valley for 1.75 kilometers below Aldrich Lake (Figure 11). Access to the stream is limited by the steep valley walls. The stream banks are low and willow growth create 20% overhang. The river channel is straight and shows very little sign of erosion or scouring. Debris accumulations have created some pools but the reach is mainly shallow riffle (Photo 23). The substrate consists of large angular gravel which is silted in the pools and has a heavy moss and algae growth in the riffle sections. A two meter high beaver dam obstructs flow and fish passage at the outlet of Aldrich Lake (Photo 24).

Spawning potential is severely limited by the poor substrate and low flow. Coho fry were found only in June and only in the lower end of the reach. Peamouth chub and longnose suckers and one mature cutthroat were the only other fish captured (Table 12).

Recommendations

Removal of the beaver dam at the outlet of Aldrich Lake. This may improve the substrate conditions by flush silt deposits and create spawning habitat for cutthroat trout.

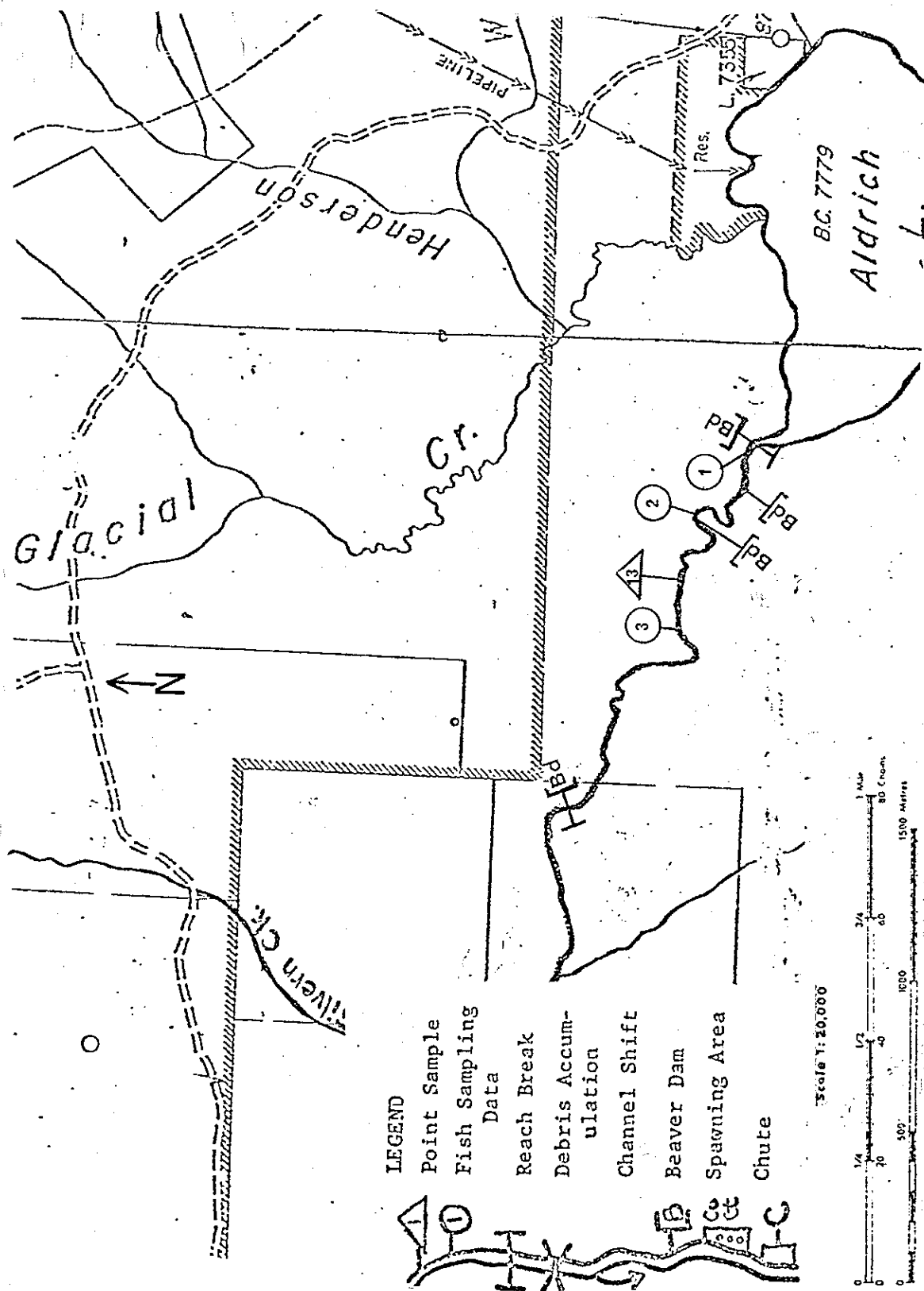


Fig. II Reach G of the Zymoetz River

Table 12. Numbers, Size and Species of Fish Sampled in Reach G of Zymoetz River, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comments
June 1	1 1 to 2	2 many	Ct Co	juveniles fry	Angled below beaver dam. Observed
June 7	1	6	Pmc	120 - 170	Carcasses of mature fish found on stream bank.
June 8	1 2	1 1	Co Co	30 30	Gees trap set 23 hrs. Gees trap set 23 hrs.
June 21	1 to 3	1 20	Lns Pmc	250 100-200	Electroshocking; Pmc observed.

*See Figure 11



Photo 23. June, 1978. Reach G of the Zymoetz is mainly shallow riffle with large angular gravel substrate.



Photo 24. July, 1978. The flow from Aldrich Lake is obstructed by a two meter high beaver dam. This dam also presents a barrier to cutthroat trout.

II. RED CANYON CREEK

This creek is unnamed on 1:50,000 topographic maps. The creek located 2000 meters downstream from here is reportedly misnamed Red Canyon Creek. Red Canyon is approximately 20 km long flowing generally northwest-southeast to its confluence with the Zymoetz, 20 km downstream of MacDonell Lake (Fig. 2).

Reach 1

This reach was flown in June and September, 1978. The stream is confined in a steep-walled canyon (Photo 25). The tumbling flow character, large substrate and low flows in September eliminate spawning potential but do not present barriers to fish passage. Some holding water is created by bedrock-controlled pools. Valley wall slumps are frequent, but instream debris accumulation are low (Photo 26). High water turbidity occurs during the spring and summer glacial melt. The reach was inaccessible and no fish sampling was done (Fig. 12).

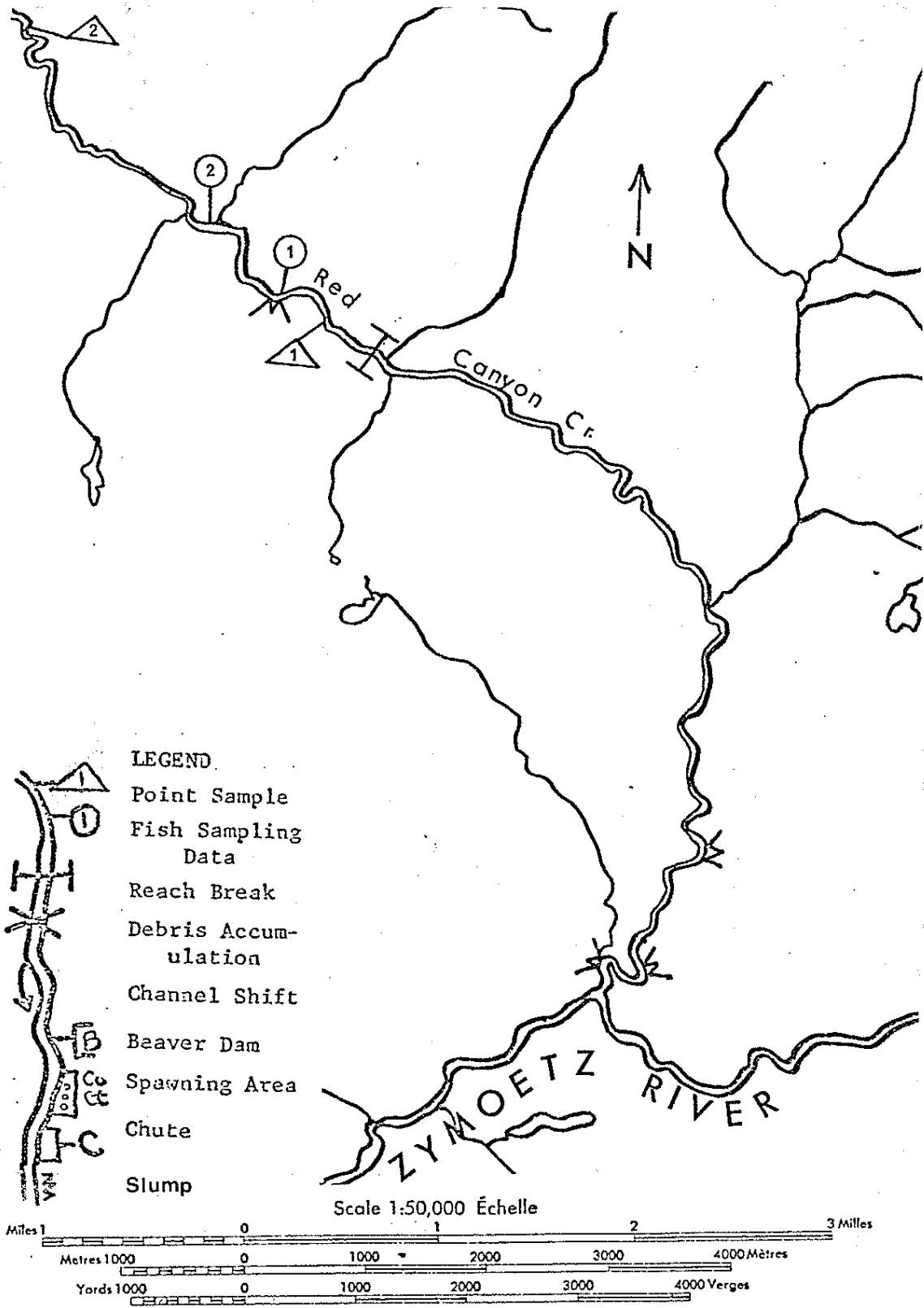


Fig.12 Red Canyon Creek

Reach 2

The creek flows in an irregular meander pattern forming numerous gravel bars and meander cut-offs (Photo 27). The substrate has an estimated 50% gravel composition which varies from moderate to high compaction (Photo 28). Deep pools are frequent and controlled by bedrock outcrops. Springs and small tributaries enter the reach in many places and riparian marshes occur throughout the reach (Photo 29, Figure 12).

Ample rearing habitat exists in the cut-offs and side channels (Photo 30 and 31) and areas of clean, gravel substrate and adequate water flows for spawning coho, steelhead and cutthroat are abundant but both habitats are not likely utilized because water temperatures, and glacial-silted water (Photo 27). Mature and juvenile Dolly Varden were captured and observed in September (Table 13). These fish were mature at only 100 mm.

Reach 3

This creek section was flown and no sampling was done. The broken flow character, large boulder and bedrock substrate and steep slope made access difficult and fish presence unlikely. No potential or existing spawning or rearing water was seen (Figure 12a).

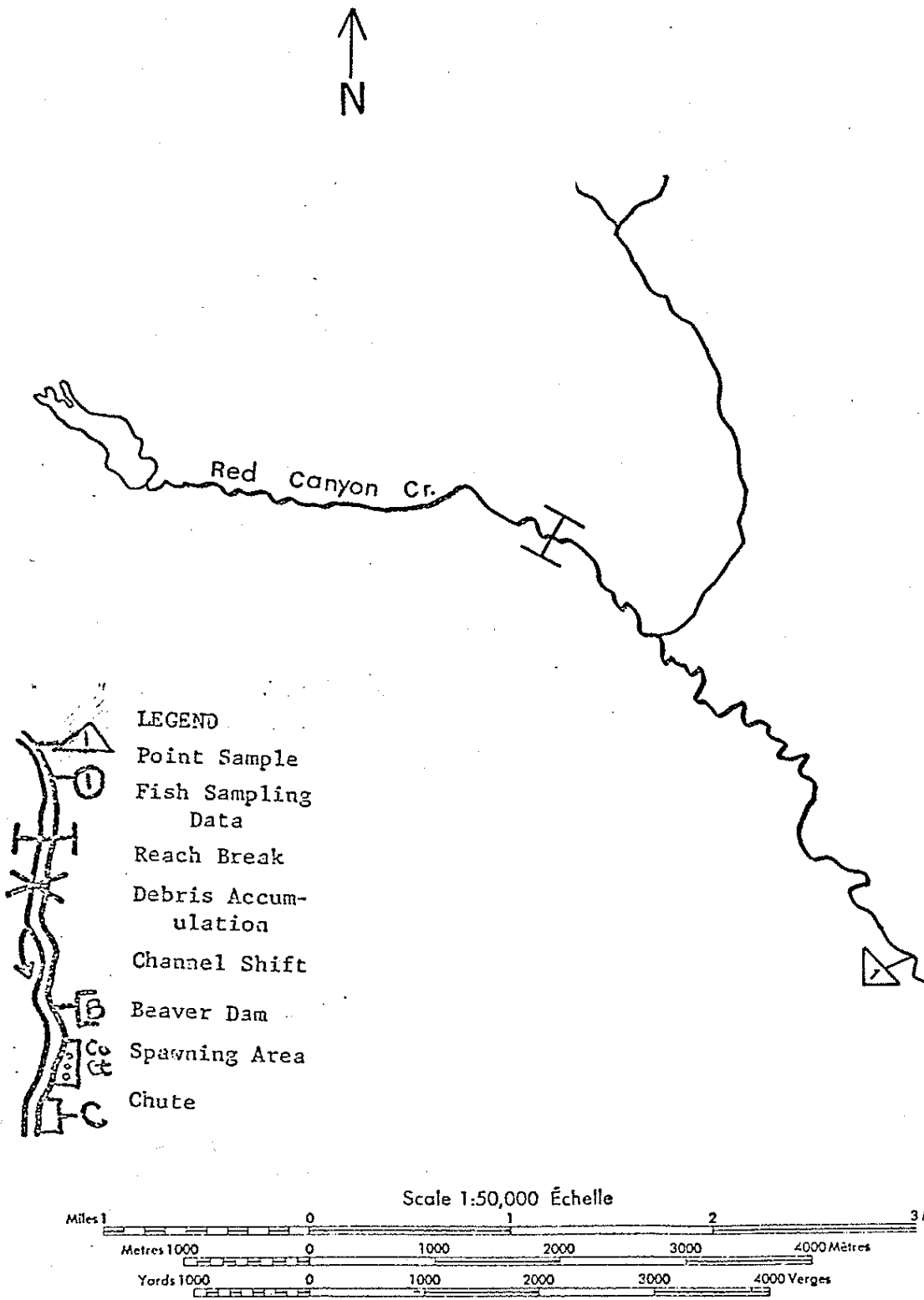


Fig. 12a Upper Red Canyon Creek

Table 13. Numbers, Size and Species of Fish Sampled in Red Canyon Creek, 1978.

"Red Canyon II"

Date	Map Location*	Number	Species	Size Range	Comments
Sept. 26	1	8	DV	100 - 160	Angled and observed.
Sept. 27	2		DV		Fish were mature. Gees trap set 8 hrs.

*See Figure 12 and 12a).

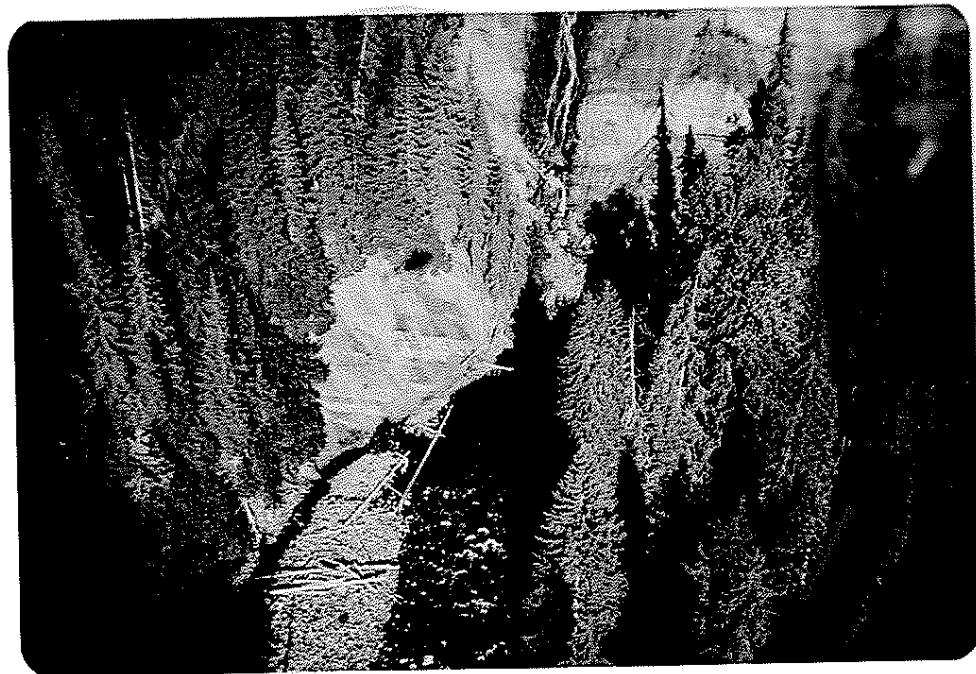


Photo 25. September, 1978. Reach 1 of Red Canyon Creek is characterized by steep canyon walls, tumbling flow character and boulder substrate.

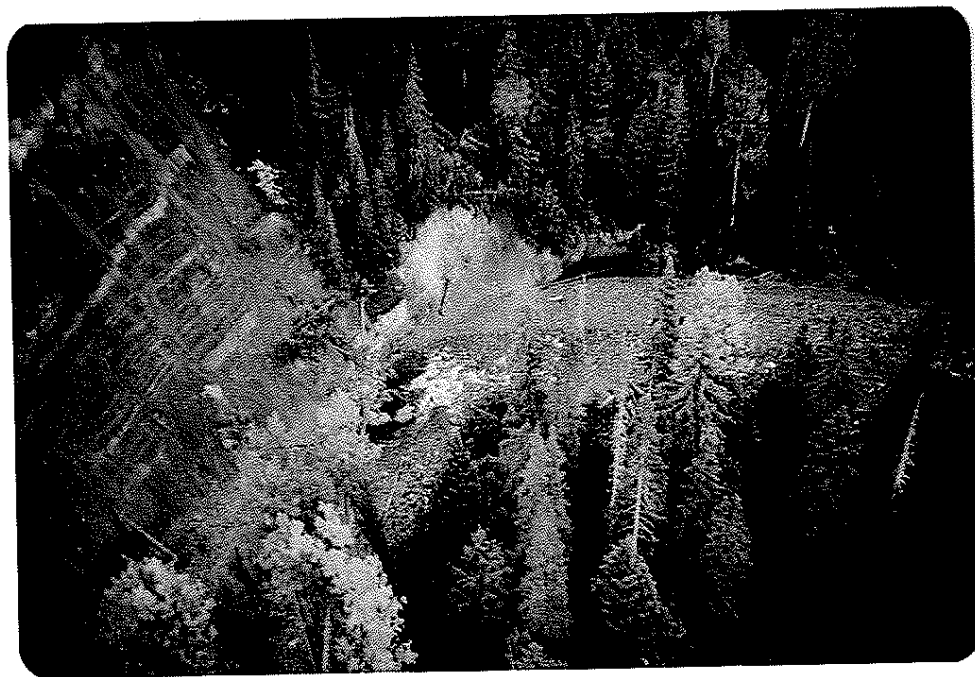


Photo 26. September, 1978. Slumps are frequent throughout reach 1 of Red Canyon Creek.



Photo 27. September, 1978. Red Canyon Creek in reach 2 flows in an irregular meander pattern, forming numerous meander cut-offs and side channels.

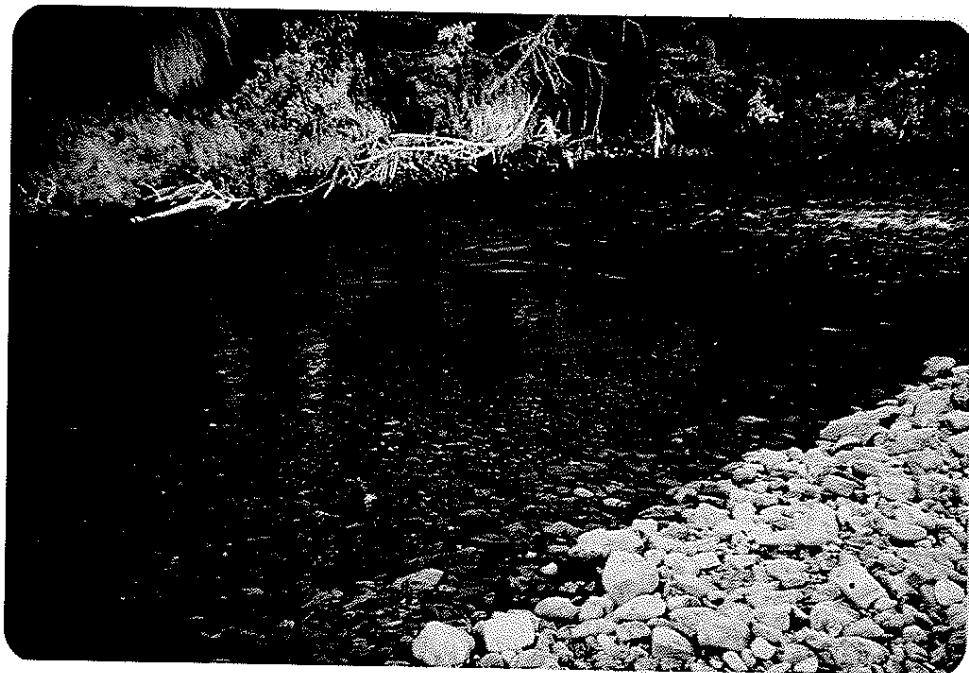


Photo 28. September, 1978. The substrate in reach 2 of Red Canyon Creek is mainly gravel but the low water temperatures limit spawning potential.

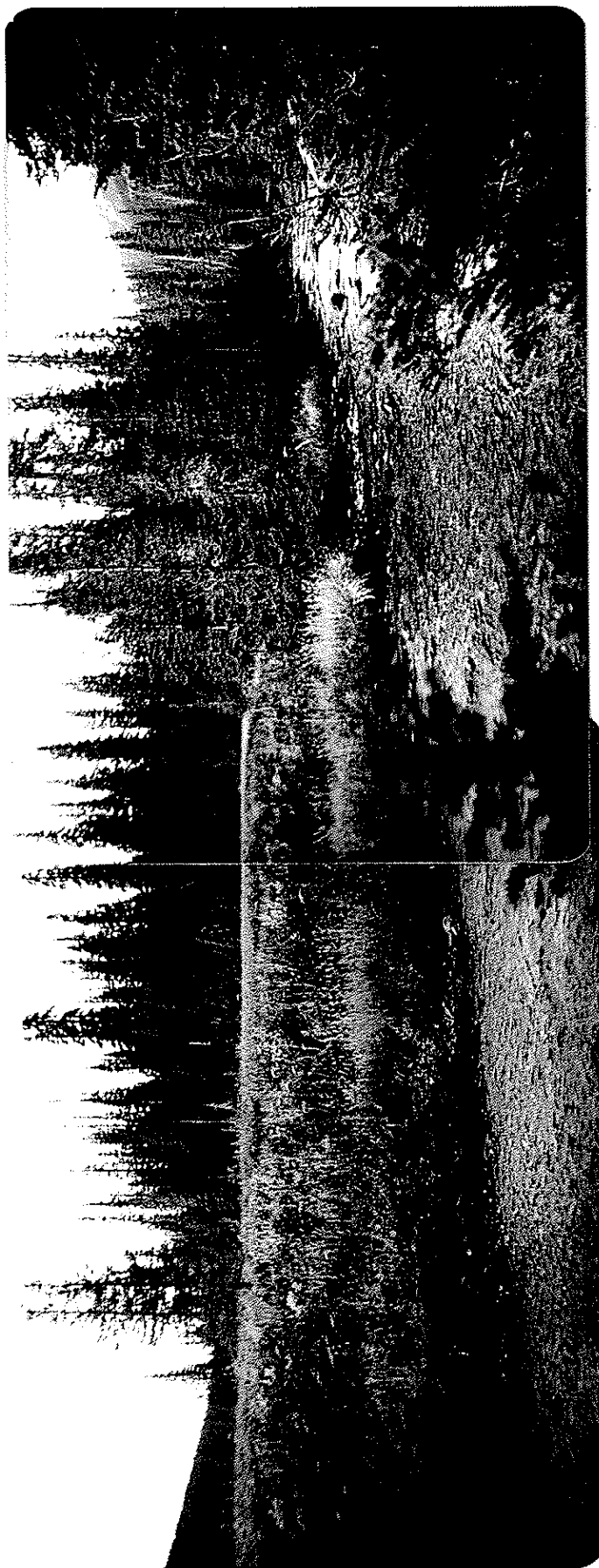


Photo 29. September, 1978. Riparian marshes and springs were common throughout reach 2.



Photo 30. September, 1978. No fish were observed in rearing habitats.

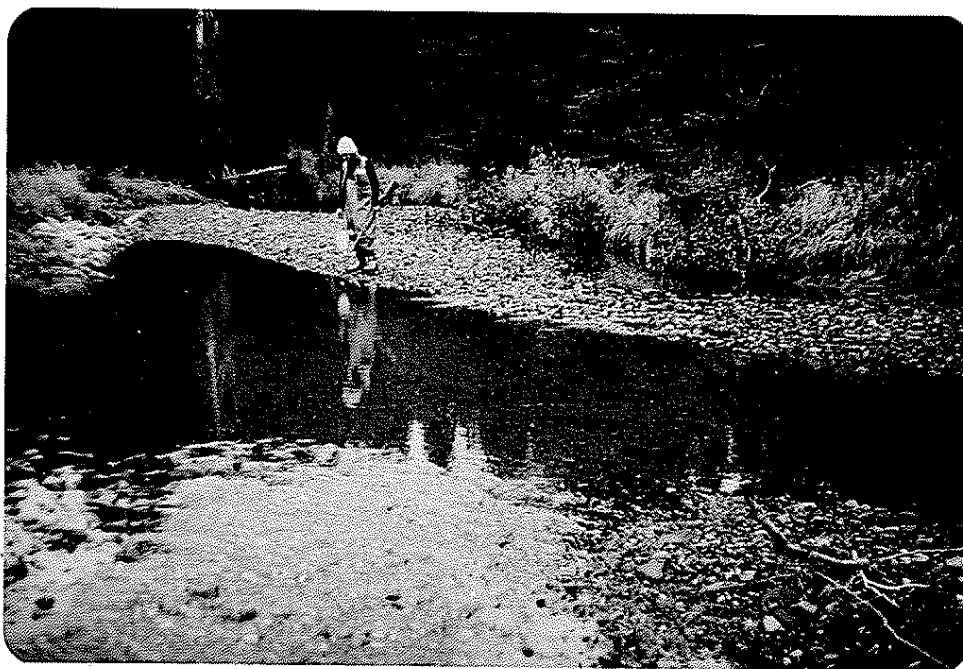


Photo 31. September, 1978. Mature Dolly Varden were captured in this side channel. The fish measured 100 mm.

III. SANDSTONE CREEK

Sandstone Creek was flown in June. Very low water levels make this system unsuitable for steelhead habitat. A large beaver swamp is located at the mouth of Sandstone Creek (Photo 32). The creek supports a resident population of cutthroat trout.



Photo 32. September, 1978. Low water levels and the large beaver swamp obstructing the mouth of Sandstone Creek eliminate steelhead spawning habitat

IV. SERB CREEK

Serb Creek was surveyed by helicopter in September and one point sample was done in May (Figure 13). Further work was not conducted as the creek had consistently low temperatures (5°C) and high turbidity (Photo 33).

A log jam upstream from the mouth of Serb Creek has caused several small diversions of the main flow (Photo 34). The diversions indicate some instability in the lower end of Serb Creek (Photo 35). An increase in the flow through these diversion channels may result in a reduction of the quality of the large steelhead spawning areas on the Zymoetz (Figure 5, Photo 36).

Further information will be available in a forthcoming report from the Habitat Improvement Section of the Fish and Wildlife Branch.

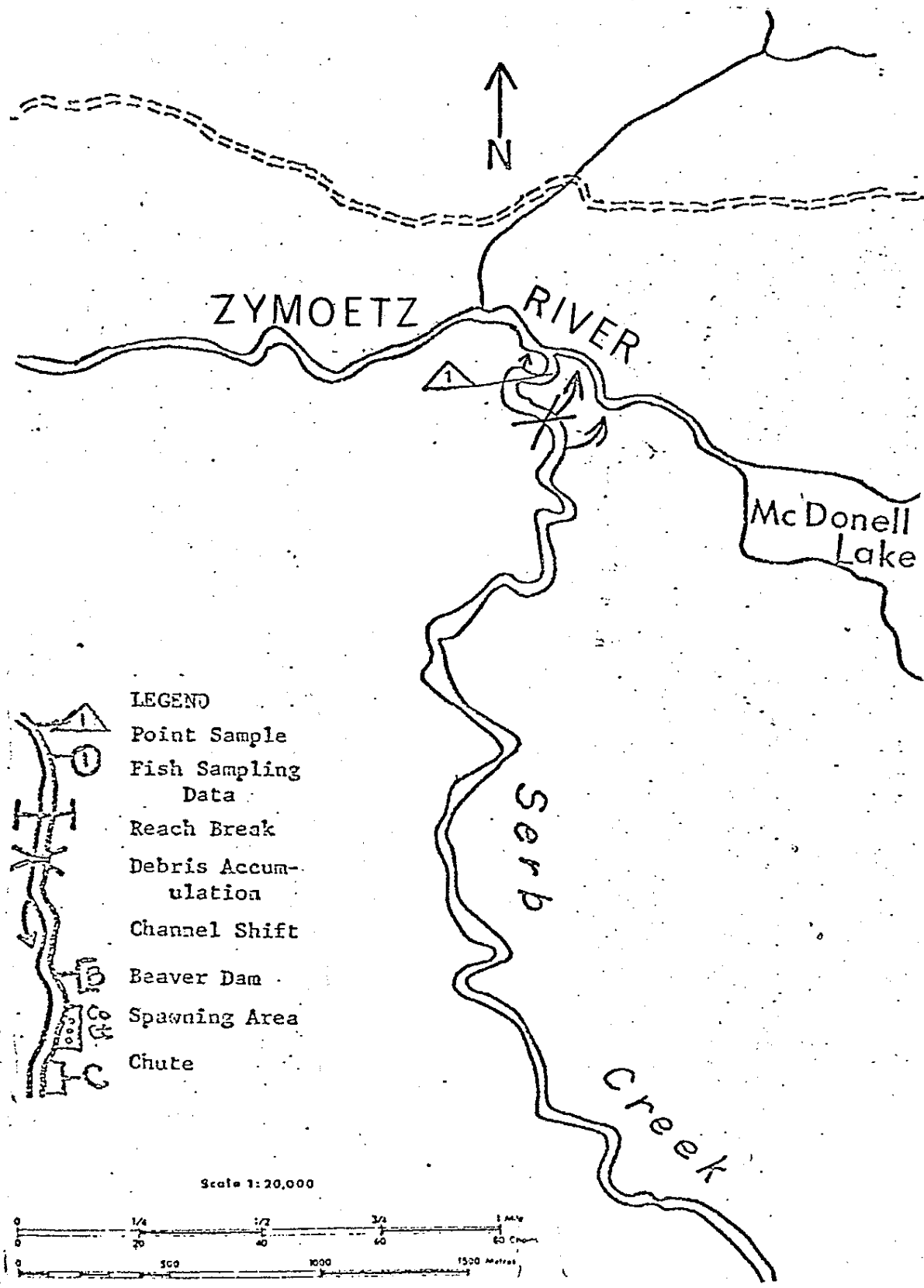


Fig.13 Serb Creek



Photo 33. June, 1978. The glacial origins of Serb Creek create low water temperatures and high turbidity throughout the creek.

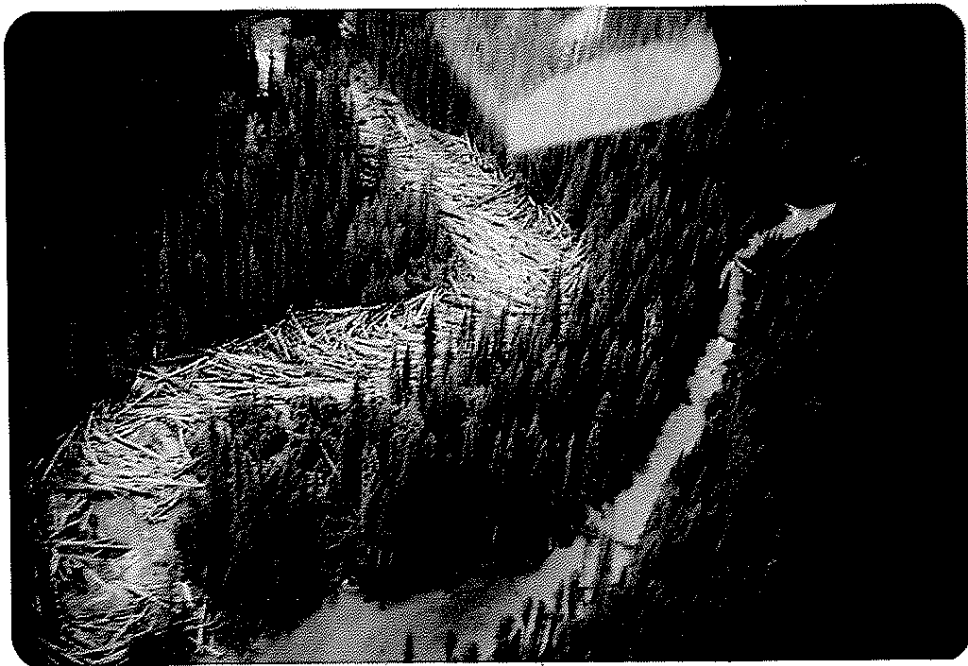


Photo 34. June, 1978. This extensive log jam on the lower end of Serb Creek has caused several channel diversions.



Photo 35. September, 1978. The confluence of Serb Creek and the Zymoetz River, at the beginning of reach B on the Zymoetz.



Photo 36. July, 1978. One of the small diversions from Serb Creek in the background. Note the difference in water colour. Temperature of diversion = 5°C ; Zymoetz River temperature = 11°C .

V. PASSBY CREEK

Passby Creek flows from the north into reach D of the Zymoetz River (Photo 37, Figure 14). Willow Creek is a major tributary to Passby and comprises approximately one-third of the flow at their confluence (Figure 14). Both systems show evidence of previous lateral channel movement.

Reach 1

The lower section of this reach has small to medium-sized, clean gravel substrate (16 mm to 40 mm) and could provide spawning coho, cutthroat and rainbow trout (Photo 38). Steelhead were captured at the mouth of Passby Creek, in the Zymoetz but none were observed in Passby (Table 15). Field observations suggest that this lower section provides holding water for fry and juveniles from the Zymoetz during high water conditions.

Conditions for rearing are good - 40% overhang, constant water flow and in-channel debris create slack water and protective cover.

Reach 2

This reach is a beaver swamp and the creek does not form a definite channel. It is difficult to determine the direction of flow, but it appears that some of the water enters a swamp east of the main Passby/Zymoetz confluence and some flows into Willow Creek above the main Passby/Willow confluence.

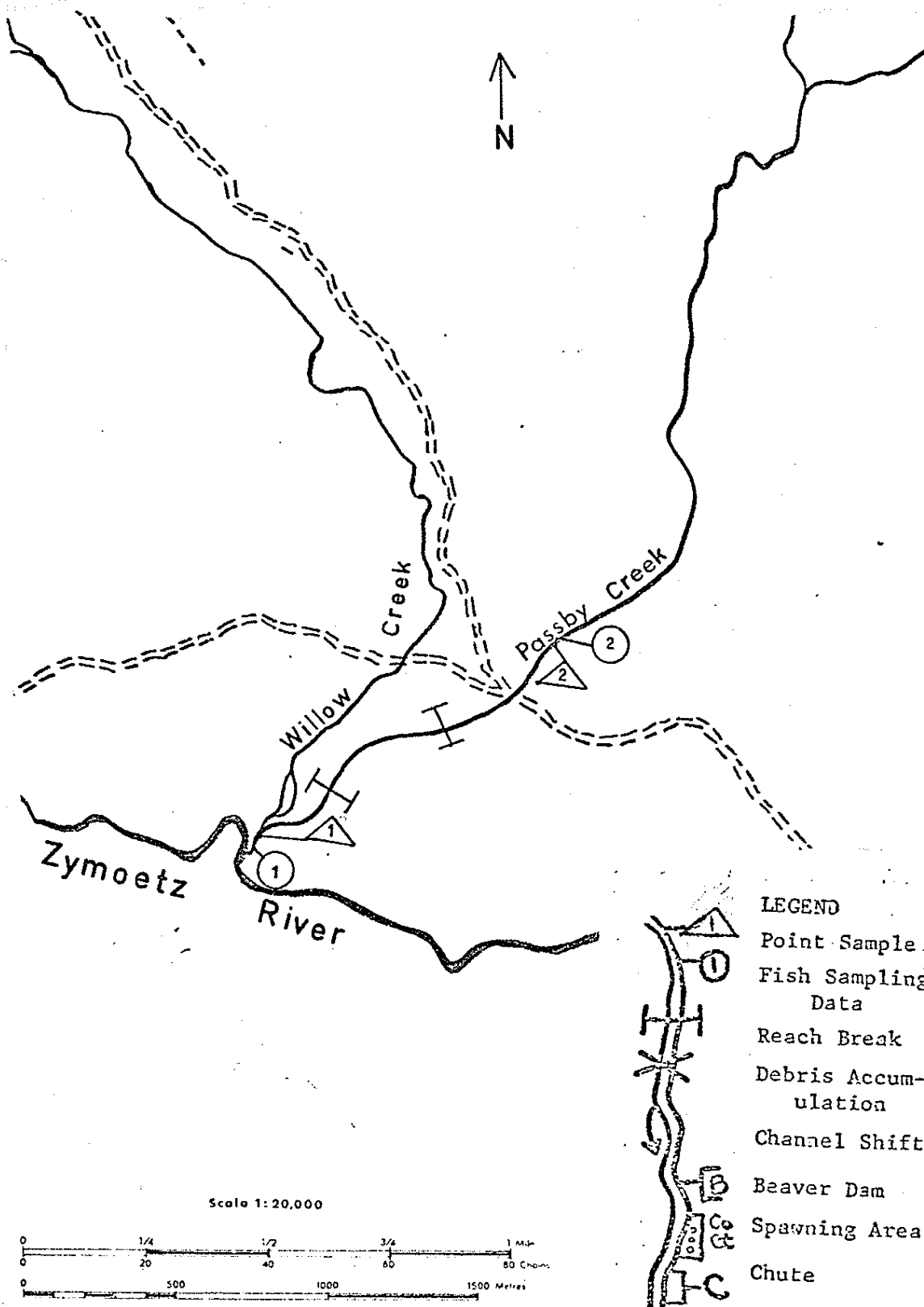


Fig.14 Passby Creek

Reach 3

The survey of this reach extends above the road crossing approximately 1 km. The reach is characterized by a steep slope with broken flows over large substrate. Pools form less than 10% of the flow character. No fish were captured during our study. The R.A.B. reported capturing DV above one road crossing.

Spawning is not expected to occur in Reach 3. Rearing habitat is low to nil (Photo 39).

Table 15. Numbers, Size and Species of Fish Sampled in Passby Creek, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comments
May 29	1	0	-	-	Angling
June 13	1	0	-	-	Angling
June 14	1	20	Co	20 - 40	Electroshocked
		7	Rb/Ct	30 - 50	and observed
June 22	2 to 3	0	-	-	Electroshock
June 23	3	0	-	-	Electroshock
July 27	1	20	Rb/Ct	fry	Observed

*See Figure 14



Photo 37. September, 1978. The confluence of Passby Creek and the Zymoetz River.



Photo 38. July, 1978. Looking upstream at the mouth of Passby Creek. Note gravel deposits.



Photo 39. June, 1978. Reach 3 at the road crossing. Note previous channel on left bank.

VI. WILLOW CREEK

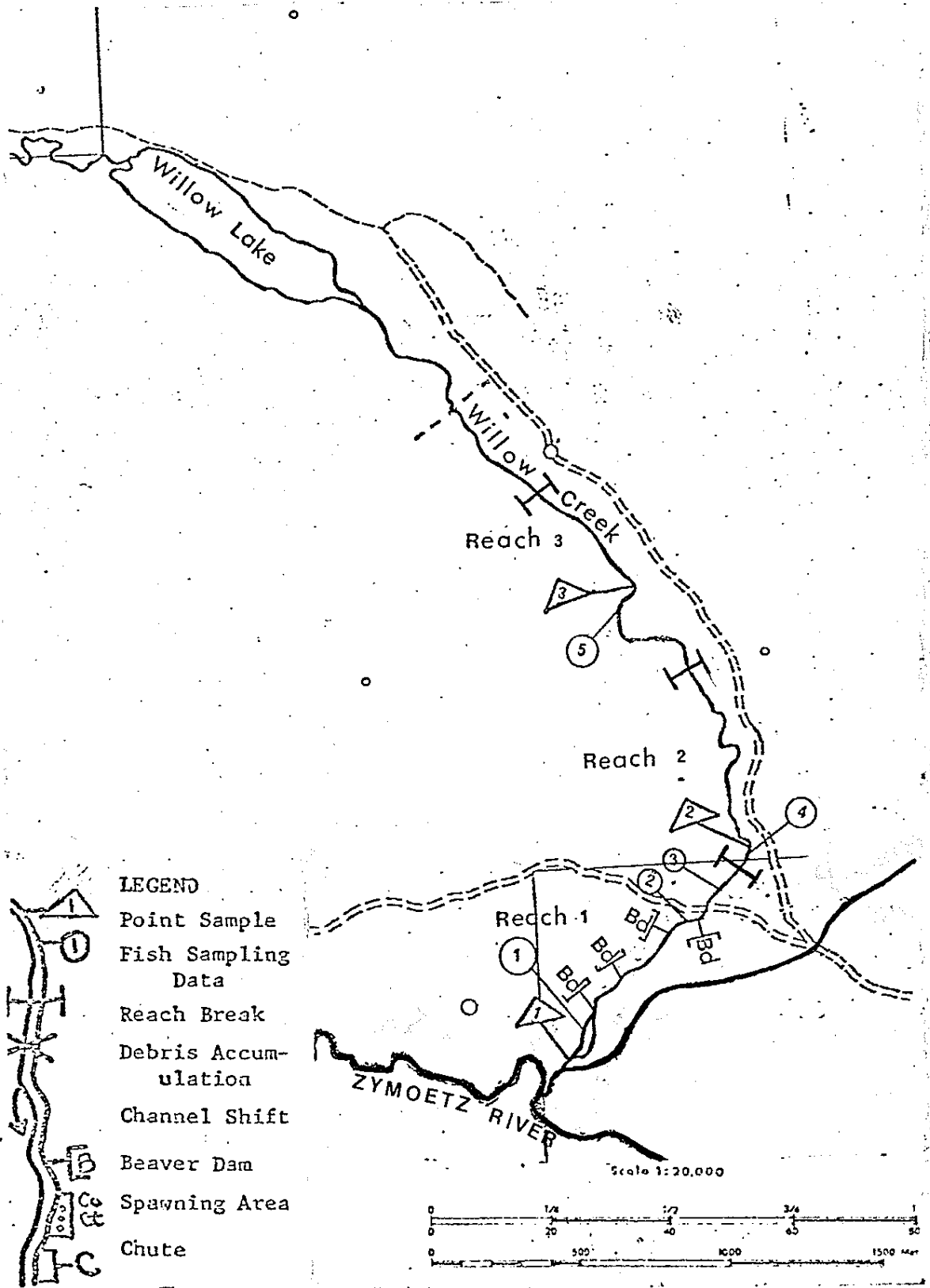
Willow Creek is the major tributary to Passby Creek (Fig. 15).

Reach 1

Reach 1 extends approximately .7 kilometers upstream from Passby Creek. Four beaver dams obstruct the flow of Willow Creek and form barriers to fish passage.

The first dam located 200 meters from the confluence with Passby, has broken in several places. The old channel at this point serves as a rearing area for coho fry (Photo 40, Table 16). The pond behind this dam has drained, leaving heavy silt deposits along both stream banks but exposed a medium-sized gravel substrate in the main stream. This is the only potential spawning habitat in the reach and is approximately 40 meters long.

The second dam is two meters high with no breaks (Photo 41). Nearly an acre of land is flooded behind the dam. No fish were observed or captured in the pond and the dam is expected to be a barrier to upstream fish movements.



- LEGEND**
- Point Sample
 - Fish Sampling Data
 - Reach Break
 - Debris Accumulation
 - Channel Shift
 - Beaver Dam
 - Spawning Area
 - Chute

Fig.15 Willow Creek

The third and fourth dams have caused the formation of large deep ponds. Juvenile cutthroat trout were captured above the fourth dam, near to the road crossing (Photo 42).

Reach 2

This reach is a canyon section (Photo 43). The creek is highly entrenched and the many chutes and bedrock constrictions probably present barriers to fish passage at high flows. Many small cutthroat trout were angled from deep pools in the lower section of the reach (Table 16). These pools are likely unconnected during low flows.

Spawning habitat is extremely limited. Short sections of gravel occur at the outlets of the pools. Rearing and holding water is created by debris jams and canyon pools.

Reach 3

Reach 3 opens into a broader steep-walled valley and the gradient decreases from reach 2. There is evidence of beaver activity. The top end of the reach is a marsh at the outlet of Willow Lake.

There is good rearing habitat provided in side channels and in the main stem where the overhang is as high as 20%. Some spawning gravels are present, however, low water levels and heavy moss and algae growth likely limit resident cutthroat trout spawning to small sections of the creek. Cutthroat trout were angled in the reach (Photo 44).

Recommendations

Removal of beaver dams in Reach 1 could flush silt deposits and expose gravel substrate for the creation of coho and cutthroat trout spawning habitat.

Table 16. Numbers, Size and Species of Fish Sampled on Willow Creek, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comments
June 13	1	10	Co	fry	Observed in old channel.
	2	0	-	-	Gees traps
	3	0	-	-	set 6 hrs.
June 15	4	6	Ct	60 - 100	Angled
June 16	5	0	-	-	Gees trap 3 hrs.
July 19	5	1	Ct	juvenile	Angled; scales taken.
July 6	2	6	Ct	juvenile	Observed
		2	MW	juvenile	Electroshocking ineffectual
July 8	4	9	Ct	100 - 210	Angled
		18	Ct	100 - 210	Observed
June/July	Lake	Many	Ct	160 - 250	Angled and observed.

*See Figure 15.



Photo 40. June, 1978. Old channel of Willow Creek. Beaver dam upstream has diverted flow. Note staining on willow, indicating previous high water levels.



Photo 41. June, 1978. two meter beaver dam upstream of first dam. This is a probable barrier to anadromous fish.

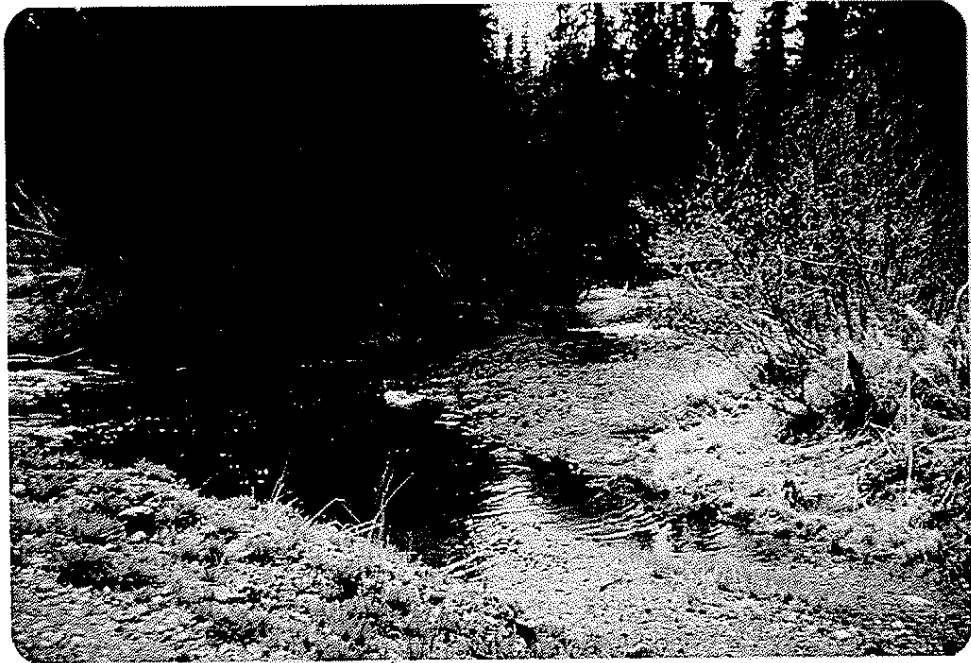


Photo 42. June, 1978. Willow Creek at road crossing. Vehicles frequently drive through creek. Cutthroat trout observed in pools at this point.



Photo 43. June, 1978. Reach 2 is a canyon. Deep pools hold cutthroat trout.



Photo 44. June, 1978. Old beaver pond in reach 3. Cutthroat trout spawning habitat available. Area subject to low flows due to upstream beaver dams.

VII UNNAMED CREEK #5

This small stream offers little potential or existing fish habitat due to low flows, lack of holding water and unsuitable spawning substrate (Photo 45). One Dolly Varden juvenile was electroshocked below the road crossing (Photo 46). Coho fry were captured near the confluence with the Zymoetz (Photo 47).

Table 14. Numbers, size and species of Fish Sampled on Unnamed Creek #5, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comments
June 22	1	1	DV	80	Electro-shocked Observed in side channel.
		20	Co	30 - 50	

* See Figure 16

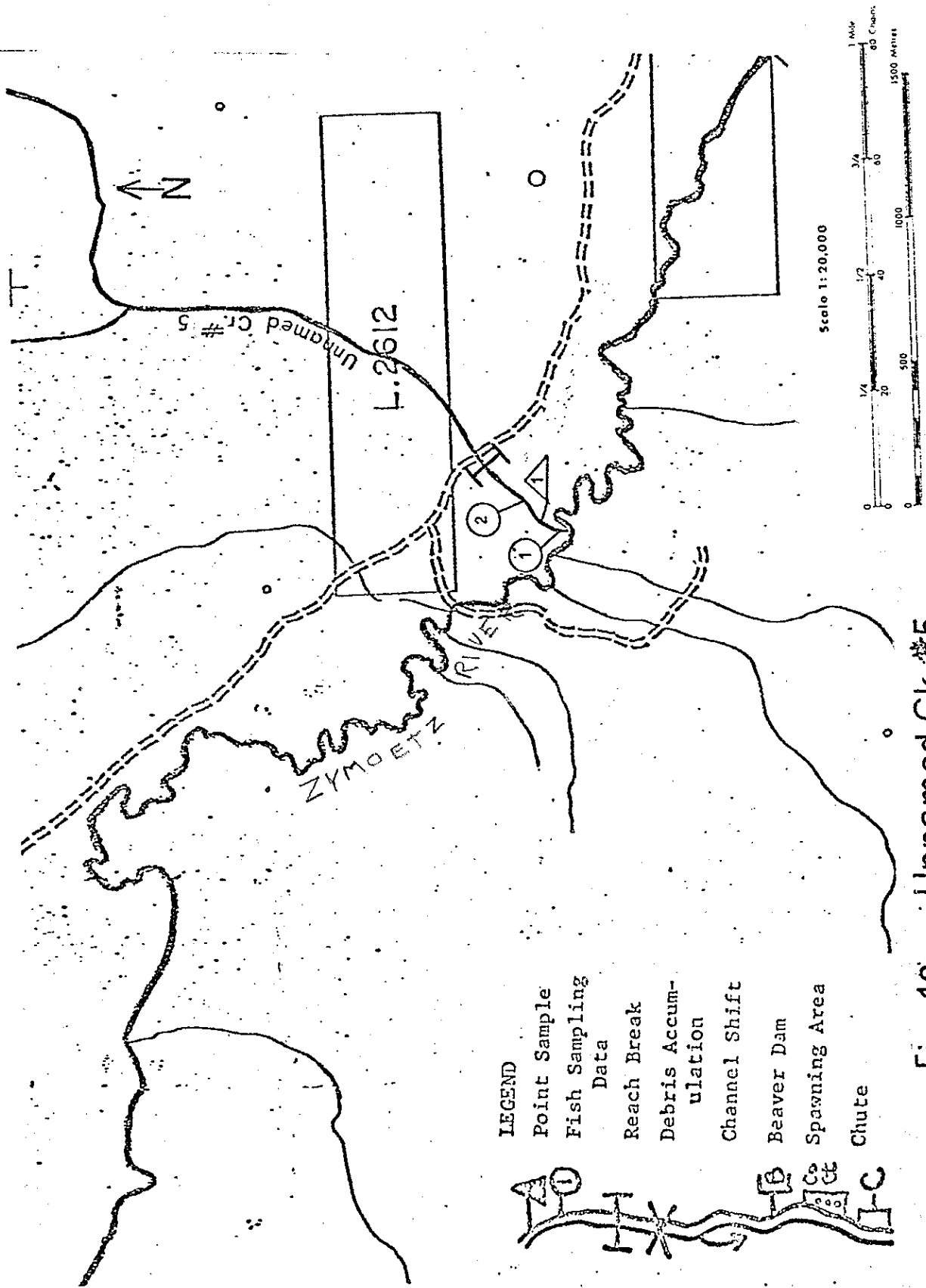


Fig. 16 Unnamed.Ck.#5



Photo 45. June, 1978. Looking downstream at the beginning of reach 1 of Unnamed Creek #5.



Photo 46. June, 1978. Reach 1 on Unnamed Creek #5, point sample #1. Note green algae on substrate.



Photo 47. June, 1978. Rearing habitat created at the confluence of Unnamed Creek #5 and the Zymoetz River.

VIII. SILVERN CREEK

Silvern Creek headwaters on Hudson Bay Mountain and flows south into Dennis Lake (Fig. 17).

Reach 1

In this reach there is extensive braiding and lateral channel movement due to beaver activity. Beaver ponds are heavily silted (Photo 48). Small sections of gravel occur in areas of higher velocity. The outlet to Dennis Lake is a marsh.

Numerous unidentified fry were observed in the ponds and Dolly Varden and coho fry were sampled (Table 17). The reach provides excellent rearing habitat but spawning habitat is poor due to unsuitable substrate.

Reach 2

Reach 2 is more confined than reach 1, however, some lateral channel movement is evident. (The stream course has altered since the Forest Cover mapping and we have shown the approximate new course in Figure 16). One major slump was noted and failing undercut banks occur throughout the reach. In particular, two hundred meters of stream bank above and below the road crossing have collapsed and contributed much debris to the creek (Photo 49).

Moderately compacted gravels provide some spawning habitat for coho, cutthroat and Dolly Varden (Photo 50). Rearing habitat is poor due to lack of slack water. A large beaver dam above the road crossing is probably a barrier to anadromous fish (Photo 51).

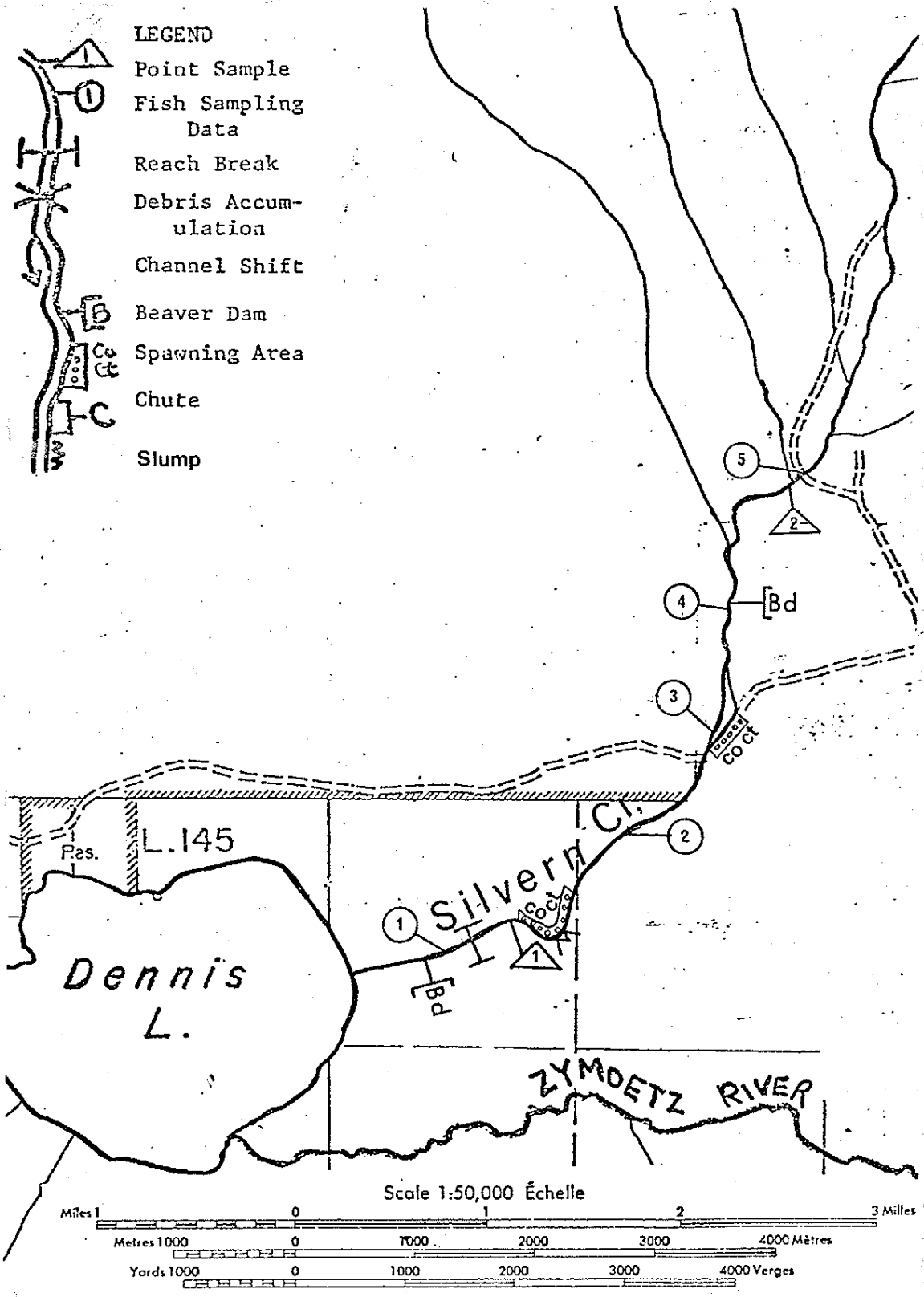


Fig.17 Silvern Creek.

Dolly Varden and coho fry were found below the dam (Table 17). Adult coho were observed spawning immediately above the road crossing on November 2. One mature cutthroat was captured in the same area in June.

The stream section above the beaver dam had a high accumulation of debris resulting from extensive bank slumping (Photo 52). Limited survey work was done in this area, but we suspect the large beaver ponds helps create warmer water temperatures downstream.

Recommendations

- Removal of debris in reach 2 above and below road crossing.

- Define channel in beaver dams and ponds in Reach 1 - to ensure upstream passage.

Table 17. Numbers, Size and Species of Fish Sampled on Silvern Creek, 1978.

Date	Map Location*	Number	Species	Size Range (mm)	Comment
May 31	2	0	-	-	Gees traps set 3 hrs.
	4	4	DV	100 - 140	
June 8	1	100+	Co	30 - 60	Observed and found one adult carcass on bank.
	5	0	-	-	
June 21	3	1	Ct	320	Mature fish electroshocked.
June 22	1	7	Co	48 - 60	Electroshocked, many observed.
		1	DV	58	
July 10	4	18	DV	55 - 95	Gees trap set 1 hr.
		2	Co	64 - 87	
Nov. 2	3	30	Co	300 - 500	Observed spawning in side channel at road crossing.

*See Figure 17

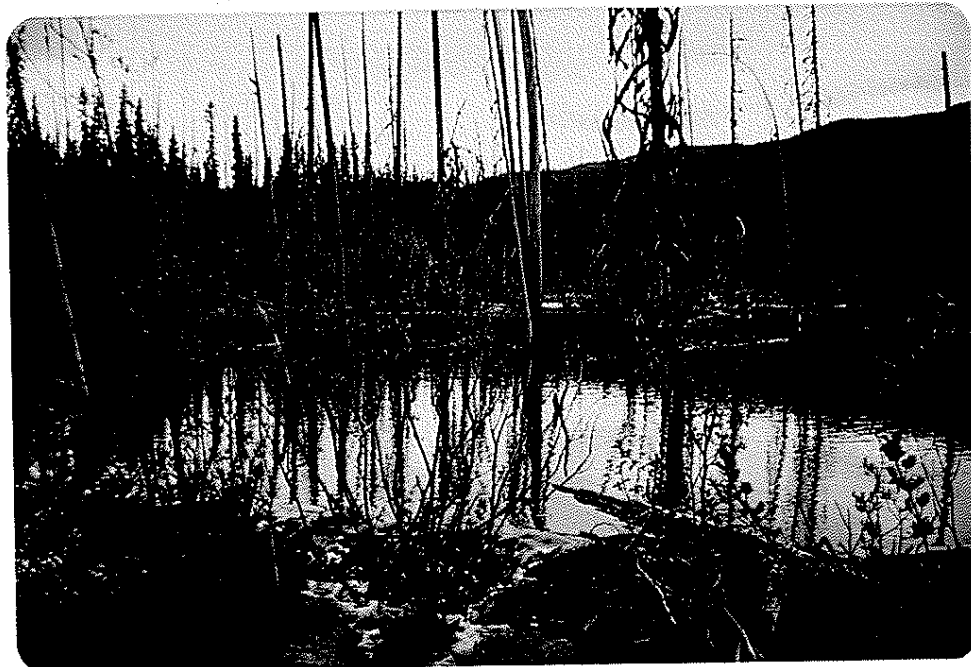


Photo 48. June, 1978. Reach 1 of Silvern Creek is a series of beaver ponds which are heavily silted. Numerous coho and Dolly Varden fry were captured in this area.



Photo 49. June, 1978. Debris in Silvern Creek obstructs flow in reach 2. Several coho carcasses were found in the log jams.



Photo 50. June, 1978. Reach 2 has several sections of spawning-sized gravel. Rearing habitat is limited. Photo taken from the top of slumping terrace.

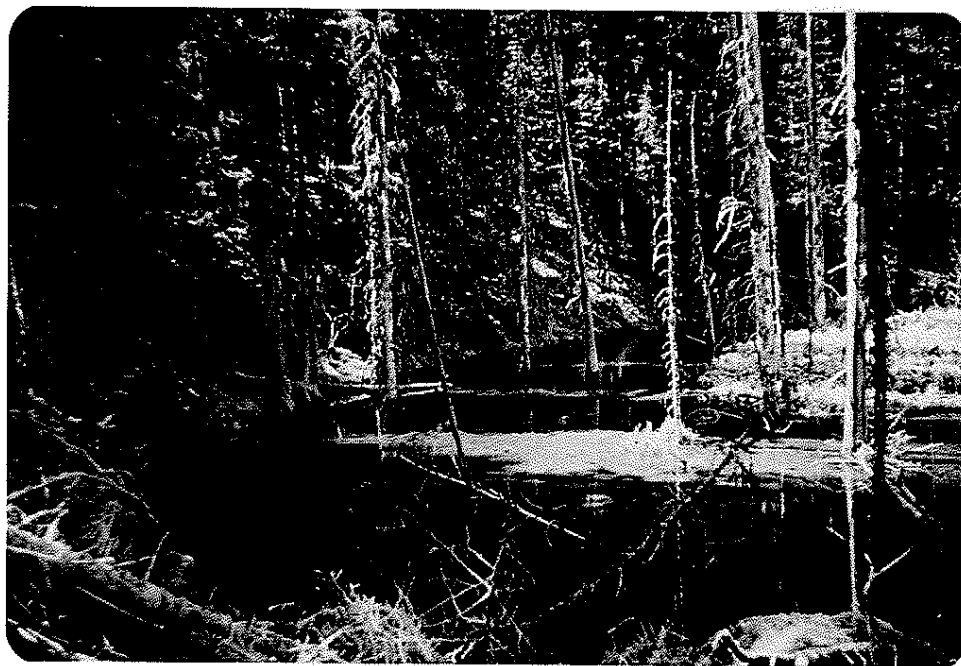


Photo 51. June, 1970. The lower pond above the road crossing supports many Dolly Varden and coho fry. No fish were observed above this pond.

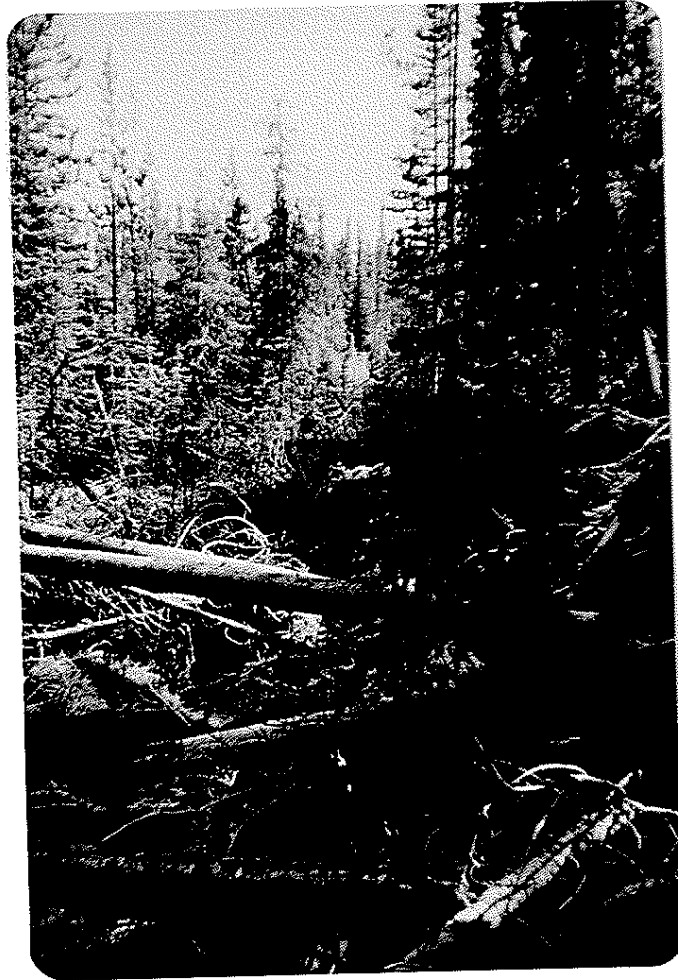


Photo 52. June, 1978. Silvern Creek above the beaver dam shows channel instability. Flow is obstructed by debris accumulations.

REFERENCES

B.C. Fish and Wildlife Branch, Fisheries Capability Map (Proposed Smithers TFL), 1975.

O'Neill, L. Owner-operator. Copper River Guest Ranch

Resource Analysis Branch, Aquatic Biophysical Map, 93L/14 and L/13

Varney, B. and B. Truelson, MS 1975. The Zymoetz River system. Stream files of B.C. Fish and Wildlife Branch, Smithers, B. C.

APPENDIX I
REACH AND POINT SAMPLE DATA

REACH

Reach No. A

ACTIVE VALLEY WALL PROCESS			C3 CHANNEL WIDTH (m):			SYSTEM NAME (or Alias) <u>Zymoetz</u>						
Rock / Soil falls	Nil	(L) M H	BED MATERIAL (%)			SYSTEM NO. _____						
Mud / Snow flows	Nil	(L) M H	C4 Fines clay silt sand			Compiling Agency _____ Access _____ NTS Map(s) _____						
Slumps / Glides	Nil	(L) M H	Gravel (2-64 mm)			Field Obs _____ Date _____ Weather _____						
Slides	Nil	(L) M H	Large (64 mm+)			Field Photo Y N Photo _____ yr mo day Roll _____ Frames _____						
Gullies	Nil	(L) M H	Bedrock			Air Photos Init _____ Photo # _____ Yr _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER			C6 FISH SUMMARY			STREAM FEATURE			
Side / Point	Nil	(L) M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
Mid Channel	Nil	(L) M H	Crown	0								
Transverse	Nil	(L) M H	Overhang	10								
Junction	Nil	(L) M H	RIPARIAN VEG.									
C1 Diamond / Braiding	Nil	(L) M H	Storey	Sp	Distr.							
Lee	Nil	(L) M H	Coniferous									
Dunes	Nil	(L) M H	Deciduous									
Islands	Nil	(L) M H	Understorey									
LATERAL CHANNEL MOVEMENT			Ground									
C2 Apparently Stable	Yes	(No)	C5 TOTAL POOLS (%)									
Bar Veg. Progressions	Nil	(L) M H	Bedrock control (%)									
Cut-Offs / Oc Bows	Nil	(L) M H	Stages	Dry	(L) M H Fld	Channel Debris	Nil	(L) M H	% Stable Debris			
Meander Scars	Nil	(L) M H	Flow Char.	P	S (R) (B) T	Floodplain Debris	Nil	(L) M H				
Avulsions	Yes	(No)	Valley: Coan	0-2	2-5 5-10 10+ N/A	(Fish) _____						
Terraces	Yes	No	Confinement	Ent	Conf Fr (Oc) Un N/A							
Constrictions	Yes	No	Pattern	St	Sin Ir (Im) Rm Tm							
Unstable Banks (%)		100%	Vert. Stab.	Deg	? Agr N/A							
			Side Chan	Nil	(L) M H	(Width) (Val: Chan) (Slope)	(Bed Material)					

Comments (C)

- C1 River channel divides into two active channels near Coal Ck.
- C2 Recent activity of river evidenced by gravel bars and back channels.
- C3 Channel width not estimated, Varney and Truelson (1975) state "30 m. active width; 20 m wetted width"
- C4 Estimated from helicopter.
- C5 Pools created by bedrock outcrops and meanders. Some log jams are present.
- C6 Lots of holding water at this time of year. Rearing areas in back channels and old meanders. Many areas appeared to have good spawning potential but glacial water from serb may lower quality. Sthd., Coho, Ct. and Rb. likely present during the year.

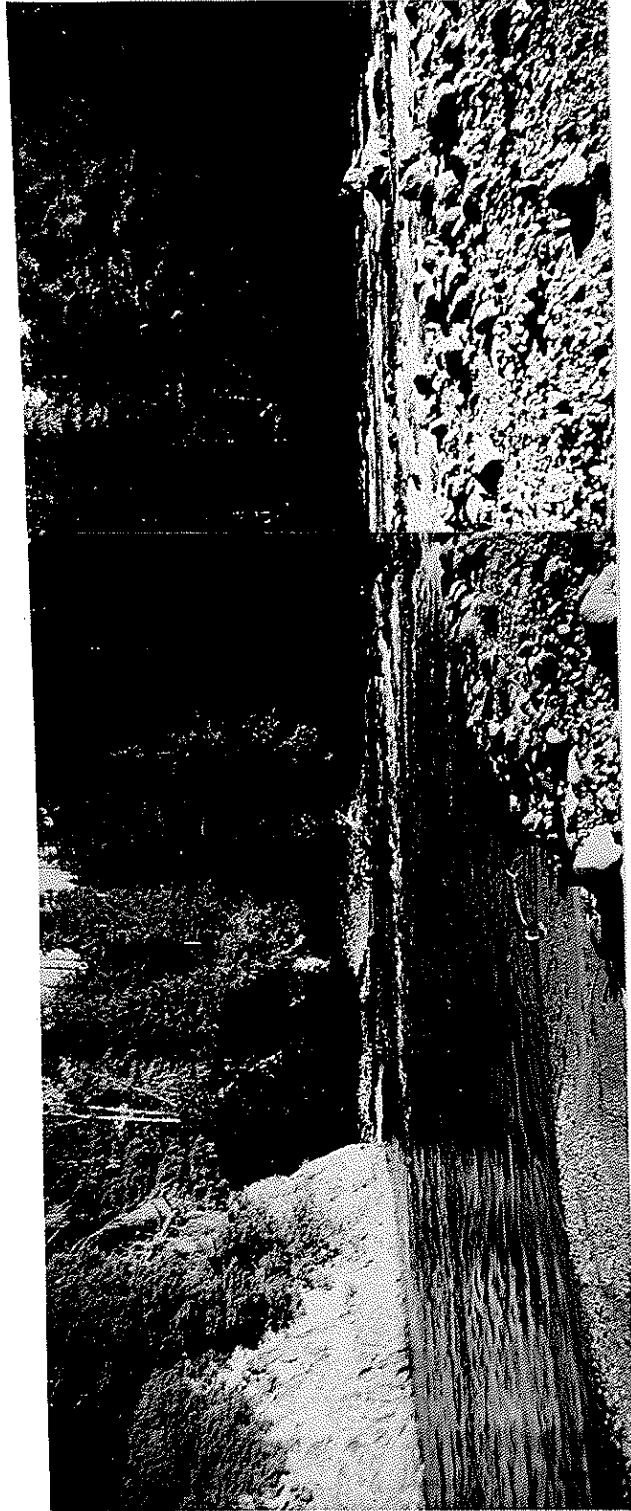
POINT SAMPLE

Point No. 1 of 13

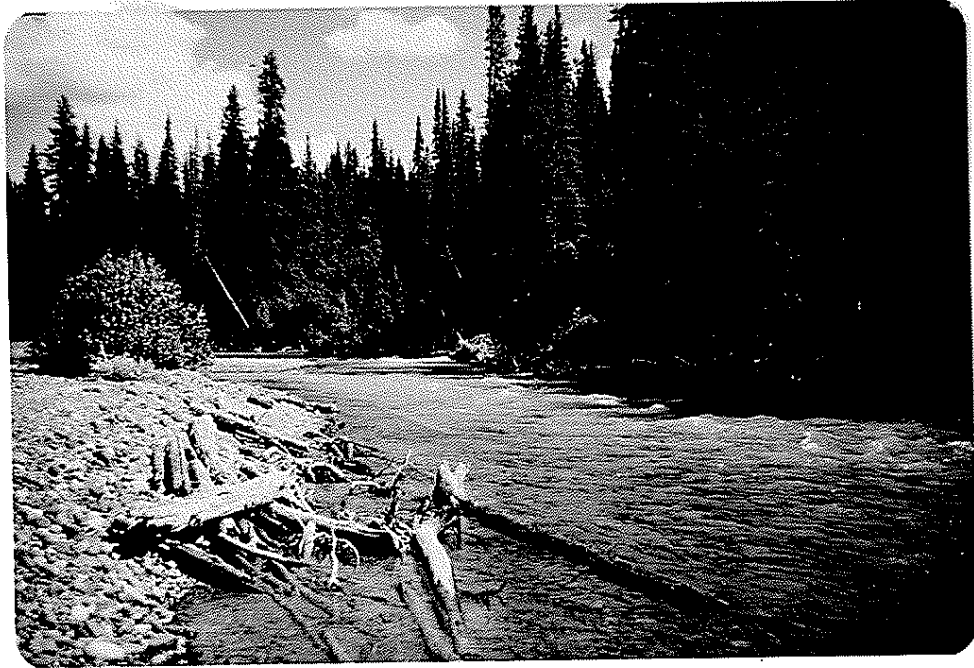
L BANK				R				BED MATERIAL			
C1 F		Form	S	Ice Scouring		Y ? N	Texture %				
Genetic Mat.				Imbric		Nil L M H	Organic				
Texture %				Compac		Nil L (M) H	Clay				
Organic				Lag		Nil L M H	Silt		20		
Clay				D ₉₀ (cm)				Sand			
Silt				HYDRAULICS				Mann			
Silt				Valley Flat W(m)				S. Grav.		40	
Sand				Chan Width (m)				L. Grav.			
S Grav.				C2 Wet Width (m)		20 Est		Cobbie		30	
L Grav.				Slope (%)				Bedrock		10	
Cobble				Max Depth (cm)				C3 FISH SPECIES PRESENT:		Ø	
Boulder				Avg. Depth (cm)							
Distri. Sp		VEG.		Wet X-sec area							
9		Conif.		8		Velocity (m/sec)					
Shrub		Under				Flow (m ³ /sec)					
Ground						Bank Height (m)					
CHANNEL COVER				Bank Ice Scour				Y ? N			
Distri. Area		Level		Area		Distri.		Stage		Dry (L) M H Fld	
Ø		Crown		Ø				Flow Char.		P S R (B) T	
Ø		Overhang		Ø				Valley Chan		(0-2) 2-5 5-10 10+ N/A	
BIOTA				Side Chan				(Nil) L M H			
Aquatic Veg.				Channel				Nil (L) M H			
Invertebrates				Stable %							
Algae				Floodplain				Nil (L) M H			

Comments (C)

- C1 Red Canyon Creek enters Zymoetz at this point. Left bank is gravel with conifers set well back from stream.
- C2 Not able to wade stream.
- C3 Large pool at confluence. Water very clear, no fish observed or angled.



Point sample at the confluence of Red Canyon creek and the Zymoetz River. Red Canyon Creek entering on right. Sept. 1978.



Point sample #2 on Zymoetz River, below Serb
Creek. Note glacial flour. July 1978.

REACH

Reach No. B

ACTIVE VALLEY WALL PROCESS				CHANNEL WIDTH (m) <u>25</u>				SYSTEM NAME (or Alias) <u>Zymoetz</u>						
<u>C1</u>	Rock / Soil falls	<u>Nil</u>	L M H	BED MATERIAL (%)				SYSTEM NO. _____						
	Mud / Snow flows	<u>Nil</u>	L M H	Fines	clay silt sand	<u>30</u>	Compiling Agency _____ Access _____ NTS Map(s) _____							
	Slumps / Glides	<u>Nil</u>	L M H	Grovel	(2-64mm)	<u>50</u>	Field Obs _____ Date: <u>7/8/03</u> Weather _____							
	Slides	<u>Nil</u>	L M H	Large	(64 mm+)	<u>20</u>	Field Photo Y N Photog. _____ yr mo day Roll _____ Frames _____							
	Gullies	<u>Nil</u>	L M H	Bedrock		<u>0</u>	Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____							
BAR PRESENCE				CHANNEL COVER				C4 FISH SUMMARY						
	Side / Point	<u>Nil</u>	L M H	Level	% Area	Distr.	Species	Use	Ref	Map	STREAM FEATURE			
	Mid Channel	<u>Nil</u>	L M H	Crown	<u>10</u>		<u>Sthd</u>				Type	Ht (m)		
	Transverse	<u>Nil</u>	L M H	Overhang	<u>20</u>	<u>8</u>	<u>So</u>					Length (m)		
	Junction	<u>Nil</u>	L M H	RIPARIAN VEG.				<u>Co</u>						
	Diamond / Braiding	<u>Nil</u>	L M H	Storey	Sp	Distr.	<u>Rb</u>							
	Lee	<u>Nil</u>	L M H	Coniferous	<u>8</u>		<u>Ct</u>							
	Dunes	<u>Nil</u>	L M H	Deciduous	<u>2</u>		<u>RAW</u>							
<u>C2</u>	Islands	<u>Nil</u>	L M H	Understorey	<u>8</u>		<u>LNS</u>							
				Ground	<u>8</u>		<u>DV</u>							
LATERAL CHANNEL MOVEMENT				TOTAL POOLS (%) <u>20</u>										
	Apparently Stable	<u>Yes</u>	No	Bedrock control (%)				<u>0</u>						
	Bar Veg. Progressions	<u>Nil</u>	L M H	Stage	Dry	<u>(L)</u> M H Fld	Channel Debris	<u>Nil</u>	<u>(L)</u> M H	% Stable Debris	<u>80</u>			
	Cut-Offs / Ox Bows	<u>Nil</u>	L M H	Flow Char.	<u>(P)</u> S <u>(R)</u> B T		Floodplain Debris	<u>Nil</u>	<u>(L)</u> M H					
	Meander Scars	<u>Nil</u>	<u>(L)</u> M H	Valley Chan	0-2	<u>(2-5)</u> 5-10 10+ N/A	(Fish)							
	Avulsions	Yes	No	Confinement	Ent	Cent						Fr	<u>(Oc)</u> Un	N/A
	Terraces	<u>Yes</u>	No	Pattern	St	Sin						<u>(Ir)</u> Im	Rm	Tm
	Constrictions	Yes	<u>(No)</u>	Vert. Stab.	Deg	?						Agr	<u>(N/A)</u>	
	Unstable Banks (%)	<u>20</u>		Side Chan	<u>Nil</u>	<u>(L)</u> M H								

Comments (c)

- C1 Valley walls not visible throughout entire reach.
- C2 One island present in upper reach. One gravel bar during low flow at lower spawning area - point sample site #3.
- C3 Reach visited frequently. Water levels vary from flood to low stages.
- C4 Major steelhead spawning areas located at point sample sites 3 and 4. Approximately eight redds seen between sites. Approximately 200 steelhead seen. Adult rainbow and cutthroat captured. Many rainbow juveniles also sampled.

POINT SAMPLE

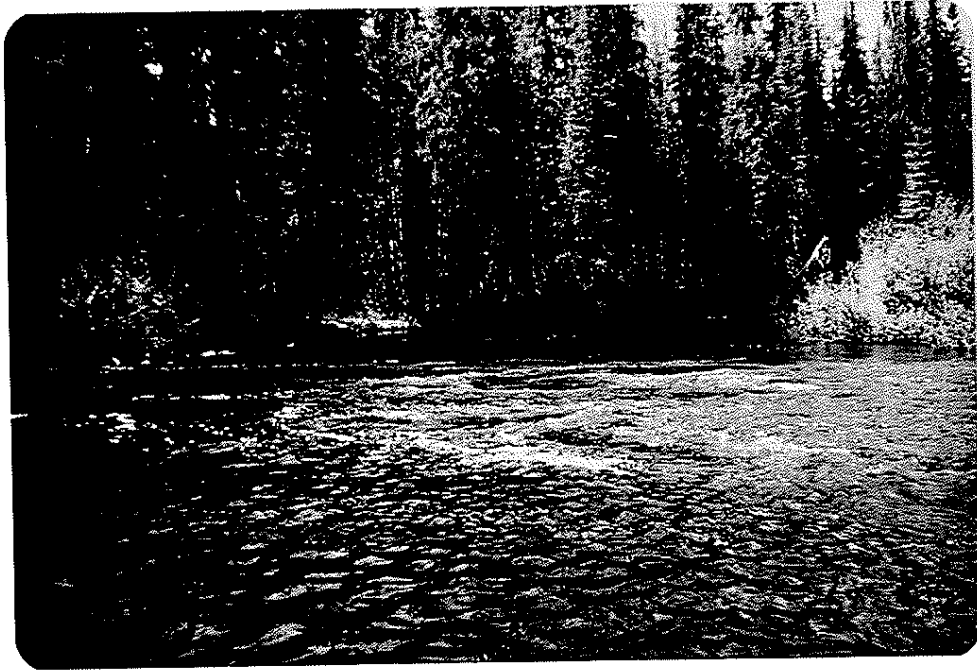
Point No 3 of 13

L		BANK		R		BED MATERIAL						
U		Form		F		Ice Scouring	Y	(?)	N	Texture %		
Genetic Mat.		Imbric		Nil (L) M H		Organic						
Texture %		Compac		Nil (L) M H		Clay						
Organic		Lag		Nil L M H		Silt		10				
Clay 004		D ₉₀ (cm)				Sand		10				
Silt 052		HYDRAULICS		Meth		S. Grav.		20				
10 Sand 2		Valley Flat W(m)				L. Grav.		30				
30 S. Grav. 15		Chan Width (m)		25.6		Cobbie		30				
60 L. Grav. 63		Wet Width (m)		24.6		Boulder		Tr				
Cobble 236		Slope (%)		15		Bedrock						
Boulder		Max Depth (cm)		70		C1 FISH SPECIES PRESENT:		Rb Ct Co Sthd So DV LNS				
Bedrock		Avg. Depth (cm)		45		WATER QUALITY		Water temp. 16 °C		Turbidity m cm		
Distr.	Sp	VEG.	Sp	Distr	Wet X-sec area	STREAM CROSS-SECTION (looking downstream)						
7		Conif.		7	Velocity (m/sec)							
0		Decid.		0	Flow (m ³ /sec)							
6		Under		8	Bank Height (m)							
9		Ground		9	Flood Signs Ht Type							
CHANNEL COVER						Bank Ice Scour Y ? N						
Distr.	% Area	Level	% Area	Distr.	Stage	Dry	L (M) H	Fld				
6	25	Crown	25	6	Flow Char.	(P) S	R	B	T			
6	10	Overhang	10	8	Valley: Chan	0-2 2-5 5-10 10+ N/A						
BIOTA						Side Chan Nil (L) M H						
Aquatic Veg.		Sp		Abun		Channel		Nil (L) M H				
Invertebrates		Stone				Stable %		80				
Algae		H				Floodplain		Nil L M H				

Comments (C)

C1 Steelhead spawning area. Site visited frequently and measurements made.

Velocity: 06/15 .7 m/s over spawning area
 1.6 m/s average over area
 07/13 1 m/s average over area



Point sample #3 on Zymoetz River. Steelhead spawning area immediately below this pool. July 1978.

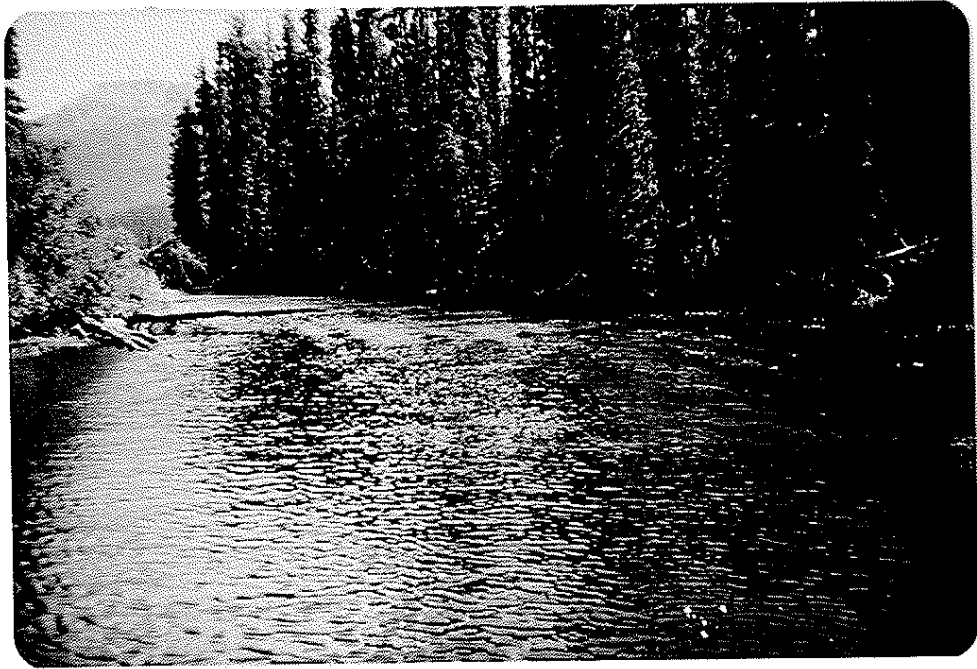
POINT SAMPLE

Point No 4 of 13

L		BANK		R		BED MATERIAL			
U	Form	F				Ice Scouring	Y ? N	Texture %	
Genetic Mat.						Imbric	(Nil) L M H	Organic	
Texture %						Compac	(Nil) L M H	Clay	
	Organic					Lag	(Nil) L M H	Silt	30
	Clay					D ₉₀ (mm)		Sand	
	004					HYDRAULICS Meth		S. Grav.	20
	Silt					Valley Flat W(m)		L. Grav.	30
	062					Chan Width (m)	28.7	Cobbie	10
	Sand					Wet Width (m)	28	Boulder	10
	2					Slope (%)		Bedrock	
	S. Grav.					Max Depth (cm)	85	C3 FISH SPECIES PRESENT: Co Ct Rb Sthd	
	16					Avg. Depth (cm)	45	L R	
	L. Grav.					Wet X-sec area		STREAM CROSS-SECTION	
	64					Velocity (m/sec)	.56	(looking downstream)	
	Cobble					Flow (m ³ /sec)			
	256					Bank Height (m)			
	Boulder					Flood Signs Ht			
	Bedrock					Type			
						Bank Ice Scour	Y ? N		
Distr.	Sp	VEG.	Sp	Distr.		Stage Dry	L (M) H Fld		
8		Conif.				Flow Char.	(P) S R B T		
0		Decid.				Valley-Chan	(0-2) 2-5 5-10 10+ N/A		
3		Under	8			Side Chan	(Nil) L M H		
3		Ground				Channel	(Nil) L M H		
CHANNEL COVER									
Distr.	% Area	Level	% Area	Distr.		Stable %	80		
0		Crown	0			Floodplain	(Nil) L M H		
0		Overhang	0						
BIOTA									
		Aquatic Veg.							
		Invertebrates							
C1		Algae							

Comments (c)

- C1 Algae is long filamentous and white. Very heavy growth immediately below Lake at Pt. sample site the growth is moderate.
- C2 Debris is from bank collapse and slumping.
- C3 30 Sthd. redds counted. Rearing habitat is good but little cover available.
- C4 Springs on left bank.



Point Sample #4 on the Zymoetz, immediately below McDonell Lake. This is a major steelhead spawning area. July 1978.

REACH

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m)			SYSTEM NAME (or Alias) <u>McDonnell Lake</u> <small>Reach No. _____</small>					
Rock / Soil falls			BED MATERIAL (%)			SYSTEM NO. _____					
Mud / Snow flows			Fines clay silt sand			Compiling Agency _____ Access _____ NTS Map(s) _____					
Slumps / Glides			Gravel (2-64 mm)			Field Obs. _____ Date <u> </u> / <u> </u> / <u> </u> Weather _____					
Slides			Large (64 mm+)			Field Photo Y N Protog. <u> </u> / <u> </u> / <u> </u> yr mo day Roll _____ Frames _____					
Gullies			Bedrock			Air Photos Init. _____ Photo # _____ Yr _____ Photo Scale(s) _____					
BAR PRESENCE			CHANNEL COVER			FISH SUMMARY			STREAM FEATURE		
Side / Point			Level			Species			Type		
Mid Channel			Crown			Use Ref Mod			Ht (m) Length (m)		
Transverse			Overhang								
Junction			RIPARIAN VEG.								
Diamond / Braiding			Storey								
Lee			Coniferous								
Dunes			Deciduous								
Islands			Understorey								
			Ground								
LATERAL CHANNEL MOVEMENT			TOTAL POOLS (%)								
Apparently Stable			Bedrock control (%)								
Bar Veg. Progressions			Stage			Channel Debris			% Stable Debris		
Cut-Offs / Ox Bows			Flow Char.			Floodplain Debris					
Meander Scars			Valley: Chan			(Fish)					
Avalutions			Confinement								
Terraces			Pattern								
Constrictions			Vert. Stab.								
Unstable Banks (%)			Side Chan								
			Dry L M H Fid			Nil L M H					
			P S R B T			Nil L M H					
			0-2 2-5 5-10 10+ N/A								
			Ent Conf Fr Oc Un N/A								
			St Sin Ir Im Rm Tm								
			Deg ? Agr N/A								
			Nil L M H								

Comments (C)

McDonnell Lake is nearly 6 kilometers long with a surface area of 551 acres. The lake is surrounded by high, snow-covered mountains. The lake lies at an elevation of 2735 feet.

Sockeye, coho, cutthroat trout and Dolly Varden have been caught and observed in the lake. Steelhead are reported to winter in the lake.

REACH

Reach No. 2

ACTIVE VALLEY WALL PROCESS				CHANNEL WIDTH (m)		SYSTEM NAME (or Alias) Unnamed Trib. #2												
Rock / Soil falls	Nil	L	M	H	BED MATERIAL (%)					SYSTEM NO. [] [] [] [] [] [] [] [] [] [] [] [] [] [] []								
Mud / Snow flows	Nil	L	M	H	Fines	clay	silt	sand	Compiling Agency _____ Access _____ NTS Map(s) _____									
Slumps / Glides	Nil	L	M	H	Gravel (2-64 mm)				Field Obs. _____ Date [] [] [] [] [] [] [] [] [] [] [] [] [] [] [] Weather _____									
Slides	Nil	L	M	H	Large (64 mm+)				Field Photo Y N Photog _____ yr mo day Roll _____ Frames _____									
Gullies	Nil	L	M	H	Bedrock					Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____								
BAR PRESENCE				CHANNEL COVER				FISH SUMMARY				STREAM FEATURE						
Side / Point	Nil	L	M	H	Level	% Area	Distr	Species	Use	Ref	Map	Type	Ht (m)	Length (m)				
Mid Channel	Nil	L	M	H	Crown													
Transverse	Nil	L	M	H	Overhang													
Junction	Nil	L	M	H	RIPARIAN VEG.													
Diamond / Braiding	Nil	L	M	H	Storey	Sp	Distr											
Lee	Nil	L	M	H	Coniferous													
Dunes	Nil	L	M	H	Deciduous													
Islands	Nil	L	M	H	Understorey													
LATERAL CHANNEL MOVEMENT				TOTAL POOLS (%)														
Apparently Stable	Yes	No			Bedrock control (%)													
Bar Veg. Progressions	Nil	L	M	H	Stags	Dry	L	M	H	Fld	Channel Debris	Nil	L	M	H	% Stable Debris		
Cut-Offs / Ox Bows	Nil	L	M	H	Flow Char.	P	S	R	B	T	Floodplain Debris	Nil	L	M	H			
Meander Scars	Nil	L	M	H	Valley Chan	0-2	2-5	5-10	10+ N/A	(Fish)								
Avulsions	Yes	No	**		Confinement	Ent	Con?	Fr	Oc	Un	N/A							
Terraces	Yes	No	**		Pattern	St	Sin	Ir	Im	Rm	Tm							
Constrictions	Yes	No	**		Vert. Stab.	Deg	?	Ag	N/A									
Unstable Banks (%)					Side Chan	Nil	L	M	H									

Comments (C)

Unnamed trib. to McDonnell Lake entering on south side. Low flows and temperatures during summer. Possibly minor spawning for Ct and DV.

Seining at mouth June 13; 7 coho fry and 3 sculpins picked up.

Lake drops sharply away from gravel fan.

REACH

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m)			SYSTEM NAME (or Alias) <u>Unnamed Trib. #4</u> Reach No. _____														
Rock / Soil falls			Nil L M H			BED MATERIAL (%)														
Mud / Snow flows			Nil L M H			Fines clay silt sand														
Slumps / Glides			Nil L M H			Gravel (2-54mm)														
Slides			Nil L M H			Large (64 mm+)														
Gullies			Nil L M H			Bedrock														
BAR PRESENCE			CHANNEL COVER			FISH SUMMARY			STREAM FEATURE											
Side / Point			Nil L M H			Level			Species			Type			HI (m)			Length (m)		
Mid Channel			Nil L M H			Crown			Use Ref Map											
Transverse			Nil L M H			Overhang														
Junction			Nil L M H			RIPARIAN VEG.														
Diamond / Braiding			Nil L M H			Storey			Sp Distr											
Lee			Nil L M H			Coniferous														
Dunes			Nil L M H			Deciduous														
Islands			Nil L M H			Understorey														
LATERAL CHANNEL MOVEMENT			Ground			TOTAL POOLS (%)														
Apparently Stable			Yes No			Bedrock control (%)														
Bar Veg. Progressions			Nil L M H			Stage			Dry L M H Fid			Channel Debris			Nil L M H			% Stable Debris		
Cut-Offs / Ox Bows			Nil L M H			Flow Char.			P S R B T			Floodplain Debris			Nil L M H					
Meander Scars			Nil L M H			Valley Chan			0-2 2-5 5-10 10+ N/A			(Fish)								
Avulsions			Yes No			Confinement			Ent Conf Fr Oc Un N/A											
Terraces			Yes No			Pattern			St Sin Ir Im Rm Tm											
Constrictions			Yes No			Vert. Stab.			Deg ? Agr N/A											
Unstable Banks (%)						Side Chan			Nil L M H											
												(Width) (Vert. Chan) (Slope) (Bed Material)								

Comment (C)

Tributary enters McDonnell Lake from the north near the Zymoetz inlet. Cutthroat trout could spawn here but low flows in summer would preclude any large resident populations. Rearing habitat for Ct, DV and Co formed at confluence with lake.

REACH

Reach No. C

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>15</u>		SYSTEM NAME (or Alias) <u>Zymoetz</u>						
<u>C1</u>	Rock / Soil falls	Nil L M H	BED MATERIAL (%)		SYSTEM NO. <u>11111111111111111111</u>						
	Mud / Snow flows	Nil L M H	Fines	clay silt sand	Compiling Agency _____ Access _____ NTS Map(s) _____						
	Slumps / Glides	Nil L M H	Gravel (2-54 mm)	<u>20</u>	Field Obs. _____ Date <u>7/8/06/13</u> Weather _____						
	Slides	Nil L M H	Large (64 mm+)		Field Photo Y N Photo _____ yr mo day Roll _____ Frames _____						
	Gullies	Nil L M H	Bedrock		Air Photos Init: _____ Photo # _____ Yr _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER		C6 FISH SUMMARY			STREAM FEATURE			
Side / Point	Nil (L) M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
Mid Channel	Nil L M H	Crown	<u>0</u>		<u>C0</u>						
Transverse	Nil L M H	Overhang	<u>10</u>	<u>8</u>	<u>Rb/Ct</u>						
Junction	Nil L M H	RIPARIAN VEG.			<u>DV</u>						
Diamond / Braiding	Nil L M H	Storey	Sp	Distr.							
Lee	Nil L M H	Coniferous	<u>7</u>								
Dunes	Nil L M H	Deciduous	<u>2</u>								
Islands	Nil L M H	Understorey WILLOW	<u>8</u>								
LATERAL CHANNEL MOVEMENT			Ground GRASS/SEDGE		<u>9</u>						
<u>C2</u>	Apparently Stable	(Yes) No	C5 TOTAL POOLS (%)								
	Bar Veg. Progressions	(Nil) L M H	Bedrock control (%)		<u>0</u>						
	Cut-Offs / Ot Bows	Nil (L) M H	Stage	Dry L M (H) Fld	<u>C7</u>	Channel Debris	Nil L (M) H	% Stable Debris	<u>80</u>		
	Meander Scars	Nil L (M) H	Flow Char.	P (S) R B T		Floodplain Debris	Nil (L) M H				
	Avulsions	Yes (No) *	Valley Chan	0-2 2-5 (5-10) 10+ N/A		(Fish)					
<u>C3</u>	Terraces	(Yes) No *	Confinement	Ent Cont Fr (C) Un N/A							
	Constrictions	Yes (No) *	Pattern	St Sin (Ir) Im Rm Tm							
<u>C4</u>	Unstable Banks (%)	<u>20</u>	Vert. Stab.	Deg ? Agr (N/A)							
			Side Chan	Nil L M (H)							

Comments (C)

- C1 Valley walls not evident.
- C2 Channel movement caused by debris jams.
- C3 Terrace on right bank.
- C4 Bank collapse due to undercutting. Vegetated banks stable.
- C5 River is deep with low velocity water. Channel is well-entrenched with high banks.
- C6 Little spawning potential; small sections of gravel suitable for Ct are sporadic, substrate mostly fines and silts. Rearing habitat is presently utilized by Coho, Ct, DV, and Rb. Grass-covered overhanging banks, debris-controlled pools and side channels are abundant. Fewer coho fry observed in this reach and seining produced very few fish. Federal Fisheries report spawning area immediately above McDonnell Lake. This is questionable; as gravels are very small and heavily silted.
- C7 Windfalls, log jams and some beaver activity creates channel debris.

POINT SAMPLE

Point No 5 of 13

L BANK				R				BED MATERIAL			
Genetic Mat.		Texture %		Ice Scouring Y (7) N		Texture %		Imbric Nil L M H		Organic	
Clay 90		Silt 90		Compac Nil L (M) H		Clay		Log Nil L M H		Silt 50	
S. Grav. 10		Sand 10		D ₉₀ (cm) .5		Sand 30		HYDRAULICS		Meth	
L Grav.		S. Grav.		Valley Flat W(m)		S. Grav. 20		Chan Width (m)		L. Grav.	
Cobble		Boulder		Wet Width (m)		Cobble		Slope (%) 2.5		Boulder	
Bedrock				Max Depth (cm) 140		Bedrock		Avg. Depth (cm) 80		FISH SPECIES PRESENT: Co DV Rb Ct	
Distr. Sp		VEG. Sp		Wet X-sec area		Velocity (m/sec) .6		Flow (m ³ /sec)		Bank Height (m) .5 .5	
61 Conif.		6		Flood Signs HI		Type		Bank Ice Scour Y ? N		Stage Dry L (M) H Fld	
01 Decid.		0		Flow Char. (P) (S) R B T		Valley:Chan 0-2 2-3 3-10 10+ N/A		Side Chan Nil L (M) H		Channel Nil (L) M H	
91 Under		8		Channel Stable % 90		Floodplain Nil (L) M H		Aquatic Veg. M		Invertebrates stone	
91 Ground		8		Algae -							

SYSTEM NAME (or Alias) Zymoetz		SYSTEM NO.		Location of site (specific) Near to Secret Lake		Reach No. C	
Crew		Agency		Date 7/8/07		Time 10:00	
NTS Map		Access		Photographer		Roll Frames	
Weather		Fish Sample Card: No Yes		Air Temp. °C 24		Water Sample No.	
WATER QUALITY		Water temp. 11.5 °C		Turbidity m cm		TDS	
						D.O.	
						pH	

L STREAM CROSS-SECTION R

(looking downstream)

Comments (c)

- C1 Excellent rearing habitat - deep, slowmoving water and cover (debris and vegetation). Beaver lodge on Rt. bank downstream of point sample. Seining and trapping produced Co, DV and Ct/Rb. Many Co observed. No other fish captured.



Point sample #5 in reach 'C' of the Zymoetz.
Undercut banks and overhang vegetation -
provide cover for fry. July 1978.

POINT SAMPLE

Point No 6 of 13

L BANK		R		BED MATERIAL			
U	Form	U		Ice Scouring	Y <input checked="" type="checkbox"/> N	Texture %	
	Genetic Mat.			Imbric	Nil L M H	Organic	
	Texture %			Compac	Nil L M H	Clay	
	Organic			Log	Nil L M H	Silt	50
100	Clay 004	100		D ₉₀ (cm)		Sand	30
	Silt 062			HYDRAULICS Meth		S. Grav.	20
	Sand 2			Valley Flat W(m)		L. Grav.	
	S. Grav. 16			Chan Width (m)	14 Est	Cobbie	
	L. Grav. 64			Wet Width (m)	14 Est	Boulder	
	Cobble 236			Slope (%)		Bedrock	
	Boulder			Max Depth (cm)	150	FISH SPECIES PRESENT: <u>Co</u>	
	Bedrock			Avg. Depth (cm)	65	WATER QUALITY	
Distr.	Sp	VEG.	Sp	Distr.	Wet X-sec area	Water temp.	Turbidity
7		Conif.	7		Velocity (m/sec)	9.5 °C	m cm
1		Decid.	1		Flow (m ³ /sec)		
6		Under	6		Bank Height (m)		
9		Ground	9		Flood Signs HI	.5	Type Debris
CHANNEL COVER				Bank Ice Scour Y <input checked="" type="checkbox"/> N			
Distr.	% Area	Level	% Area	Distr.	Stage	Dry	L M H Fld
		Crown			Flow Char.	P (S) R B T	
		Overhang			Valley:Chan	0-2 2-5 (5-20) 20+ N/A	
BIOTA				Side Chan Nil L M H			
Aquatic Veg.		Sp	Abun	DEBRIS	Channel	Nil L M H	
Invertebrates					Stable %	100	
Algae					Floodplain	(Nil) L M H	

L **STREAM CROSS-SECTION** R

(looking downstream)

Comments (c)

Water flowing very high and turbid. Coho fry seen but in fewer numbers than in above reach. Lots of good rearing water in side channels and debris - controlled slack water. No spawning potential.

REACH

Reach No. D

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>17</u>			SYSTEM NAME (or Alias) <u>Zymoetz</u>							
<u>C1</u>	Rock / Soil falls	Nil L M H	BED MATERIAL (%)			SYSTEM NO. _____							
	Mud / Snow flows	Nil L M H	<u>C4</u>	Fines	clay silt sand	<u>30</u>	Compiling Agency _____ Access _____ NTS Map(s) _____						
	Slumps / Glides	Nil L M H		Gravel (2-64 mm)		<u>70</u>	Field Obs. _____ Date <u>7.8.05.26</u> Weather _____						
	Slides	Nil L M H		Large (64 mm+)			Field Photo Y N Photog. _____ yr mo day _____ Roll _____ Frames _____						
	Gullies	Nil L M H		Bedrock			Air Photos Init: _____ Photo # _____ Yr _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER			<u>C6</u> FISH SUMMARY			STREAM FEATURE				
<u>C2</u>	Side / Point	Nil L M H	Level		% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
	Mid Channel	Nil <u>(L)</u> M H	Crown		<u>0</u>								
	Transverse	Nil L M H	Overhang		<u>20</u>	<u>6</u>	<u>Co</u>						
	Junction	Nil L M H	RIPARIAN VEG.				<u>Rb</u>						
	Diamond / Braiding	Nil L M H	Storey		Sp	Distr.	<u>Ct</u>						
	Lee	Nil L M H	Coniferous		<u>8</u>		<u>sthd</u>						
	Dunes	Nil L M H	Deciduous		<u>5</u>		<u>So</u>						
	Islands	Nil L M H	Understorey		<u>WILLOW</u>	<u>7</u>	<u>DV</u>						
LATERAL CHANNEL MOVEMENT			Ground		<u>7</u>		<u>MW</u>						
	Apparently Stable	Yes <u>(No)</u>	TOTAL POOLS (%)			<u>30</u>							
	Bar Veg. Progressions	Nil L M H	Bedrock control (%)			<u>0</u>							
	Cut-Offs / Ox Bows	Nil <u>(L)</u> M H	Stage	Dry	L <u>(M)</u> H	Fid	Channel Debris	Nil L <u>(M)</u> H	% Stable Debris				
	Meander Scars	Nil <u>(L)</u> M H	Flow Char	P	<u>(S)</u> <u>(R)</u>	B T	Floodplain Debris	Nil <u>(L)</u> M H					
	Avulsions	Yes <u>(No)</u> *	Valley Chan	0-2	<u>(2-5)</u>	5-10 10+ N/A	(Fish)						
	Terraces	Yes <u>(No)</u> *	Confinement	Ent	Conf	Fr <u>(Oc)</u> Un N/A							
	Constrictions	Yes <u>(No)</u> *	Pattern	St	Sin <u>(Ir)</u>	Im Rm Tm							
<u>C3</u>	Unstable Banks (%)	<u><10</u>	Vert. Stab.	Deg	? Agr	<u>(N/A)</u>							
			Side Chan	Nil	L M <u>(H)</u>								

Comments (c)

- C1 Valley wall rises on left bank; wall is steep and well-vegetated with conifers, no slumps.
- C2 Few bars present during low water.
- C3 Right banks are steep and erosion occurs; bank materials are mostly coarse gravel. Undercutting throughout.
- C4 At beginning of reach, silt deposits occur. Below Passby Creek confluence, gravel is cleaner, and silts are deposited in side channels and in bends.
- C5 Pools are numerous and deep. Excellent angling water in pools and runs.
- C6 This reach offers widest range of habitat. Spawning potential is excellent and presently used by sockeye, steelhead, and cutthroat. Suspect Coho also use the reach for spawning. Gravels are moderately compacted and clean, due to water velocities and flows. Rearing habitat is also excellent; debris, pools and slack water are distributed throughout. Coho, DV, Ct, and Rb fry, juveniles and adults captured in this reach.

POINT SAMPLE

Point no 7 of 13

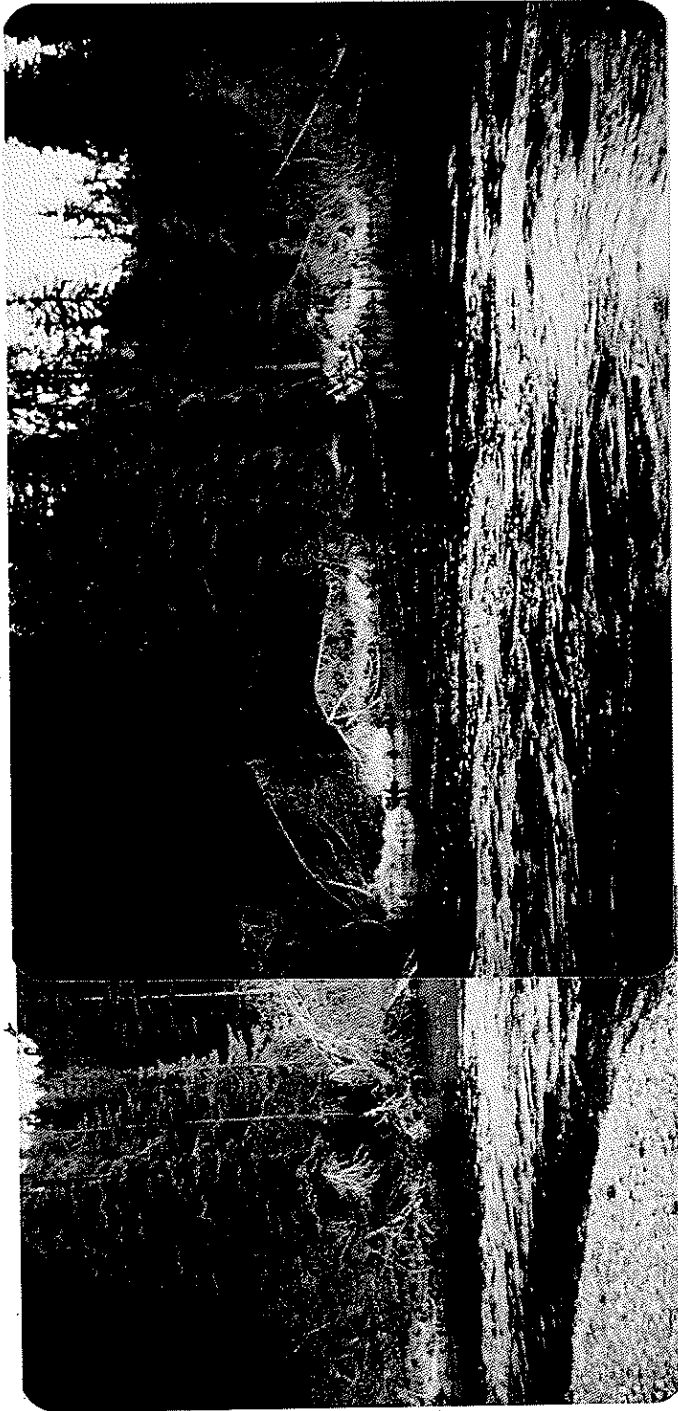
L BANK		R		BED MATERIAL			
W	Form	F		Ice Scouring	Y ? N	Texture %	
Genetic Mat.				Inbric	(Nil) L M H	Organic	
Texture %			C3	Compac	(Nil) L M H	Clay	
Organic				Lang	(Nil) L M H	Silt 10	
Clay				D ₉₀ (mm)	6	Sand 20	
Silt				HYDRAULICS		S. Grav 20	
Sand				Valley Flat W(m)		L. Grav 50	
C1/100				Chan Width (m)	15	Cobble	
				Wet Width (m)	15	Boulder	
				Slope (%)	.5	Bedrock	
				Max Depth (cm)	80	C6 FISH SPECIES PRESENT: Sthd So Co Rb Ct DV MW	
				Avg. Depth (cm)	50		
				Wet X-sec area			
				Velocity (m/sec)	0.8		
				Flow (m ³ /sec)			
				Bank Height (m)	L 3.5		
				Flood Signs Ht	Type		
C2/91				Bank Ice Scour	Y ? N		
CHANNEL COVER				Stage	Dry L (M) H FID		
Distr	% Area	Level	% Area	Flow Char.	P (S) R B T		
		Crown		Valley Chan	0-2 2-3 3-9 10+ N/A		
		Overhang		Side Chan	Nil L (M) H		
BIOTA				Channel	Nil (L) M H		
Aquatic Veg.				Stable %	100		
Invertebrates				Floodplain	(Nil) L M H		
Algae							

Distr	Sp	VEG.	Sp	Distr
	7	Conif.		6
	0	Decid.		0
		Under		
		Ground		

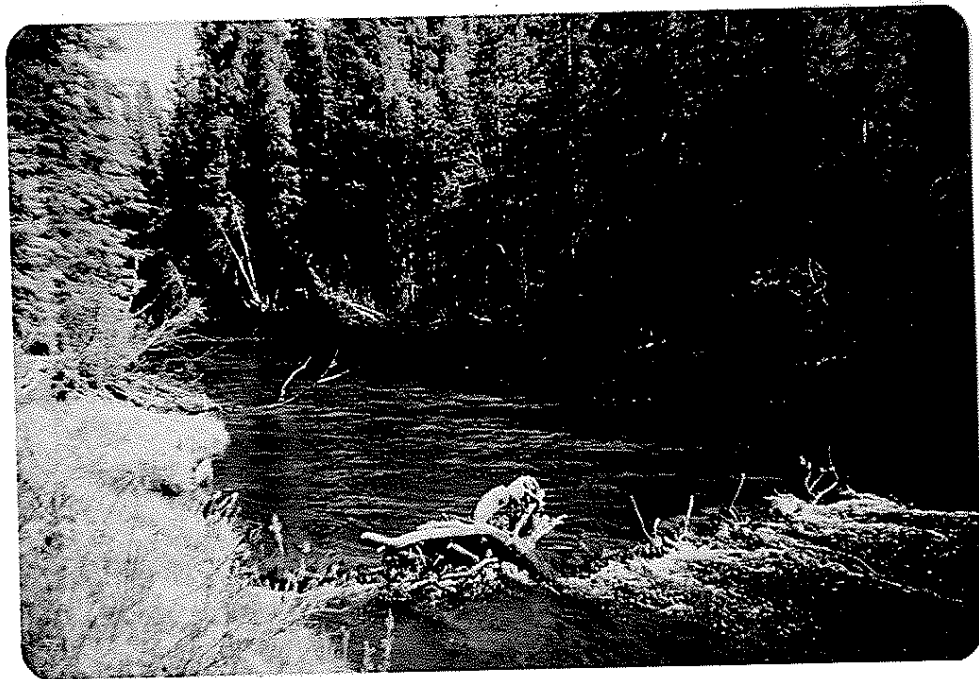
STREAM CROSS-SECTION
(looking downstream)

Comments (c)

- C1 Rt bank is gravel fan from Passby Creek. Bank materials upstream and downstream from this pt. are mostly fines/larges.
- C2 Vegetation on gravel bar is minimal. Some willow herb established.
- C3 Gravel downstream from Passby is clean and compaction increased.
- C4 Site was visited frequently. 78/06/02 at 1430: "Sampling done on 4th day of hot spell. Passby flowing high and dirty and 8 C. Zymoetz very turbid and 12 C. Air temp. 19°C."
- C5 Side channel approx. 15 m above Passby.
- C6 Sthd, So, Co, Rb, Ct and DV angled and observed. Pool at confluence is holding water for fish moving upstream to spawn. Rearing habitat at point is minimal.



Point sample #7 on the Zymoetz at the confluence of Passby Creek. Adult steelhead were found holding in this pool. Passby Creek entering on left. June 1978.



Point sample #8 on the Zymoetz above
Passby Creek. Note recent beaver activity.
June 1978.

REACH

Reach No. E

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>15</u>		SYSTEM NAME (or Alias) <u>Zymoetz</u>				
<u>C1</u>	Rock /Sail falls	Nil L M H	<u>C6</u> BED MATERIAL (%)		SYSTEM NO. _____				
	Mud / Snow flows	Nil L M H	Fines	clay silt sand	60				
	Slumps / Glides	Nil L M H	Gravel (2-64mm)		30				
	Slides	Nil L M H	Large (64mm+)		10				
	Gullies	Nil L M H	Bedrock						
BAR PRESENCE			CHANNEL COVER		FISH SUMMARY			STREAM FEATURE	
	Side /Point	Nil L M H	Level	% Area	Distr.	Species	Use	Ref	Map
<u>C2</u>	Mid Channel	Nil <u>(L)</u> M H	Crown	0		DV			
	Transverse	Nil L M H	Overhang	40	8	Ct			
	Junction	Nil L M H	RIPARIAN VEG.			Co			
	Diamond /Braiding	Nil L M H	Storey	Sp	Distr.	MW			
	Lee	Nil L M H	Coniferous	PINE	6	So			
	Dunes	Nil L M H	Deciduous		2	Rb			
	Islands	Nil L M H	Understorey	WILLOW	8				
LATERAL CHANNEL MOVEMENT			Ground	GRASS MOSS	9				
<u>C3</u>	Apparently Stable	Yes <u>(No)</u>	<u>C7</u> TOTAL POOLS (%)		30				
	Bar Veg. Progressions	Nil L M H	Bedrock control (%)		0				
	Cut-Offs /Ox Bows	Nil L <u>(M)</u> H	Stage	Dry	L M H	Fid	Channel Debris	Nil L M <u>(H)</u>	% Stable Debris
	Meander Scars	Nil L <u>(M)</u> H	Flow Char.	P S R B T			Floodplain Debris	Nil L <u>(M)</u> H	
	Avulsions	Yes <u>(No)</u> *	<u>C8</u> Valley:Chon		0-2	(2-5)	5-10	(10+)	N/A
<u>C4</u>	Terraces	<u>(Yes)</u> No *	<u>C9</u> Confinement		Ent	Cont	Fr	<u>(Oc)</u>	Un N/A
	Constrictions	<u>(Yes)</u> No *	Pattern	St	Sin	Ir	(Im)	Rm	Tm
<u>C5</u>	Unstable Banks (%)	10	Vert. Stab.	Deg	?	Agr	<u>(N/A)</u>		
			Side Chan	Nil	L	M	<u>(H)</u>		
					(Width) (Val:Chan) (Slope) (Bed Material)				

Comments (c)

- C1 Valley walls not visible throughout reach.
- C2 No bars seen. Shallow water mid-stream due to gravel deposits.
- C3 Stream diversions occurring due to debris accumulations and beaver dams.
- C4 Low terraces present from Dennis Lake to logging bridge - km. downstream.
- C5 Failing banks due to undercutting. Banks generally well-vegetated.
- C6 Approximately 200 m. from Dennis Lake, patches of dark-stained gravel occur. High % of fines in the gravel.
- C7 Log jams and beaver dams cause pool formation and meander cut-offs.
- C8 2-5 ratio applies to area above logging bridge; 10+ ratio applies to area below bridge.
- C9 Channel narrows below logging bridge, beaver activity increases and ponding creates deeper water. Confinement occurs occasionally above bridge.
- C10 Pools, overhanging vegetation, channel debris and deep water create excellent rearing habitat that appears to be well utilized. Spawning potential is limited by scattered gravel beds; section immediately below Dennis Lake offers good potential for spawning for Ct and Rb. Sockeye were observed below 1 meter high beaver dam below logging bridge; they appeared to be unable to move upstream: Ct, Rb, DV, Co fry caught in minnow traps.

POINT SAMPLE

Point No. 9 of 13

L BANK				R				BED MATERIAL				SYSTEM NAME (or Alias) <u>Z4MOETZ</u>	
Genetic Mat.				Ice Scouring		Y (?) N		Texture %				SYSTEM NO. <u>LLLLLLLLLLLLLLLLLLLLLLLL</u>	
Texture %				Imbric		Nil L M H		Organic				Location of site (specific)	
20 Organic		20		Compac		Nil L (M) H		Clay				<u>1st Beaver Dam in Reach</u> Reach No. <u>E</u>	
80		80		Lag		Nil L M H		Silt		50		Crew _____ Agency _____ Date <u>7 8 07 06</u> Time <u>LL</u>	
Clay 004				D ₉₀ (mm)				Sand		10		NTS Map _____ yr. mo. day Access _____	
Silt 062				HYDRAULICS				S. Grav.		30		Photographer _____ Roll _____ Frames _____	
Sand 2				Valley Flat W(m)				L. Grav.				Weather _____ Fish Sample Card: No Yes #	
S. Grav. 13				Chan Width (m)				Cobbie		10		Air Temp °C <u>28</u> Water Sample No. _____	
L. Grav. 64				Wet Width (m)		8		Boulder				WATER QUALITY	
Cobble 256				Slope (%)				Bedrock				Water temp. Turbidity TDS D.O. pH	
Boulder				Max Depth (cm)		.90		FISH SPECIES PRESENT: <u>Ct Rb Co So</u>					
Bedrock				Avg. Depth (cm)		.70							
Distri. Sp		VEG. Sp		Distri		Wet X-sec area							
1		Conif.		7		Velocity (m/sec)						.6	
0		Decid.		0		Flow (m ³ /sec)							
9		Under		7		Bank Height (m)							
91		Ground		9		Flood Signs		HI Type					
CHANNEL COVER				Bank Ice Scour				Y (?) N					
Distri. % Area		Level % Area		Distri.		Stage		Dry L (M) H Fld					
- -		Crown - -		- -		Flow Char.		P(S) R B T					
9 20		Overhang		10 8		Valley:Chon		0-2 2-3 3-10 (2) N/A					
BIOTA				Sp Abon				Side Chon				Nil L (L) M H	
Aquatic Veg.				H				Channel				Nil L (M) H	
Invertebrates								Stable %					
Algae				H				Floodplain				Nil L M H	

Comments (c)

Good rearing habitat - slack water, debris and cover. Sockeye observed here, unable to negotiate beaver dam. Minnow trapping very successful. No spawning potential at point.

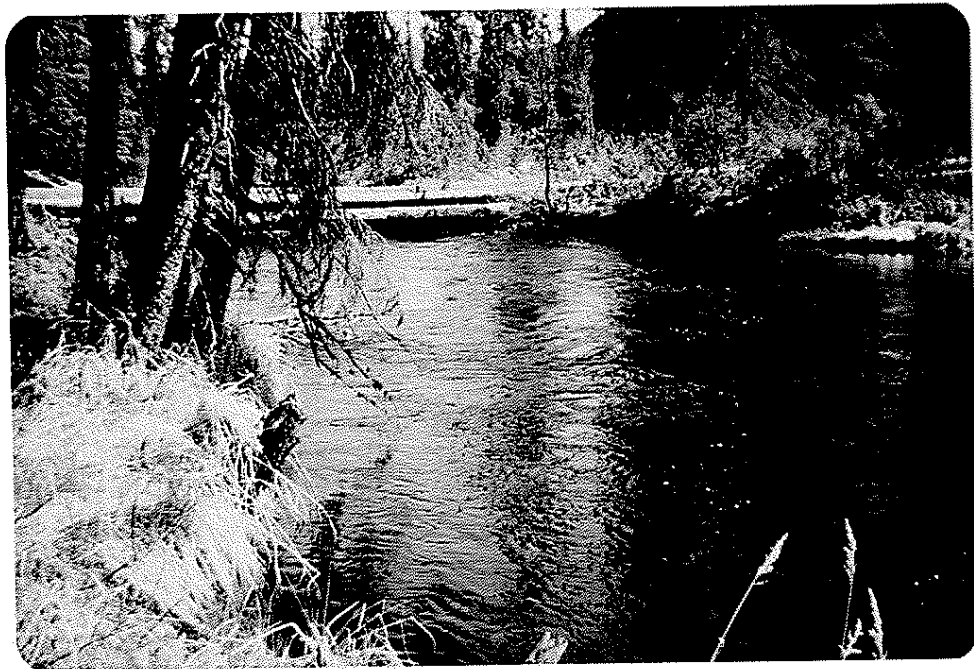
POINT SAMPLE

Point No 10 of 13

L BANK				R				BED MATERIAL			
U	Form	U		Ice Scouring	Y ? N	Texture %					
Genetic Mot.				Imbric	Nil L M H	Organic					
Texture %				Compac	Nil L M H	Clay					
Organic				Lag	Nil L M H	Silt		40			
C1	Clay			D ₅₀ (cm)		Sand		20			
	Silt			HYDRAULICS		Meth		S. Grav.		20	
	Sand			Valley Flat W(m)		L. Grav.		10			
	S Grav.	20		Chan Width (m)		Cobble		10			
	L Grav.	30		Wet Width (m)		Boulder					
	Cobble			Slope (%)	.5	Bedrock					
	Boulder			Max Depth (cm)	150 Est	FISH SPECIES PRESENT:		Ct Rb Co DV Mw			
	Bedrock			Avg. Depth (cm)	60						
Distr.	Sp	VEG.	Sp	Distr	Wet X-sec area						
6		Conif.		6	Velocity (m/sec)						
0		Decid.		0	Flow (m ³ /sec)						
9		Under		8	Bank Height (m)						
9		Ground		9	Flood Signs HI	Type					
CHANNEL COVER.				Bank Ice Scour				Y ? N			
Distr.	% Area	Level	% Area	Distr.	Stage	Dry	L M H	Fld			
5	0	Crown	25	2	Flow Char.	P S R B T					
8	20	Overhang	20	8	Valley:Chan	0-2 (2.5) 3-10 10+ N/S					
BIOTA				Side Chan				Nil L M H			
Aquatic Veg.				Channel				Nil L M H			
Invertebrates				Stable %				80			
Algae				Floodplain				Nil L M H			

Comments (c)

- C1 Unable to see left bank due to overhanging vegetation.
- C2 Site visited frequently.
- C3 Minnow traps, angling and observing produced the results. Appears to be used by anglers. Rearing habitat well-utilized by species indicated. Limited spawning potential immediately below bridge for Ct, DV and Rb.



Point sample #10 on the Zymoetz River. This area is accessible via an old logging road from the McDonnell Lake Road. June 1978

POINT SAMPLE

Point No 11 of 13

L BANK				R				BED MATERIAL			
U		Form		U		Ice Scouring Y (?) N		Texture %			
Genetic Mat.				Imbric (Nil) L M H				Organic			
Texture %				Compac Nil (L) M H				Clay			
Organic				Lag (Nil) L M H				Silt			
C1 Clay				C2 0-90 (cm)				Sand 60			
C1 Silt				HYDRAULICS Meth				S. Grav. 20			
C1 0-2 Sand				Valley Flat W(m)				L. Grav. 10			
C1 15 S Grav.				Chan Width (m) 15				Cobble 10			
C1 54 L Grav.				Wet Width (m) 15				Boulder			
C1 258 Cobble				Slope (%) 0.5				Bedrock			
C1 Boulder				Max Depth (cm)				FISH SPECIES PRESENT: DV Ct Co			
Bedrock				Avg. Depth (cm) 80							
Distr. Sp		VEG. Sp		Distr.		Wet X-sec area					
7		Conif.		7		Velocity (m/sec) 0.6					
0		Decid.		0		Flow (m ³ /sec)					
8		Under		8		Bank Height (m) 50 EST					
8		Ground		8		Flood Signs HI Type					
CHANNEL COVER.				Bank Ice Scour Y (?) N				Stage Dry L (M) H Fld			
Distr. % Area		Level % Area		Distr.		Flaw Char. (P) S (R) B T		Valley Chan 0-2 (2-5) 5-10 10+ N/A			
5 15		Crown		5 5		Side Chan Nil L (M) H					
7 15		Overhang		15 7		Channel Nil L M (H)					
BIOTA Sp Abun				Stable % 60				Floodplain Nil L M H			
C1 Aquatic Veg.				M				DEBRIS			
Invertebrates				M				Channel Nil L M (H)			
Algae				M				Stable % 60			
								Floodplain Nil L M H			

SYSTEM NAME (or Alias) Zymoetz
 SYSTEM NO. 11111111111111111111
 Location of site (specific) Below Dennis Lake Reach No. E
 Crew _____ Agency _____ Date 7 8 05 Time 30
 NTS Map _____ yr _____ mo _____ day Access _____
 Photographer _____ Roll _____ Frames _____
 Weather _____ Fish Sample Card: No Yes
 Air Temp °C _____ Water Sample No. _____

WATER QUALITY	Water temp.	Turbidity	TDS	D. O.	pH
	<u>11.5 °C</u>	<u>m cm</u>			

Comments (C)

- C1 Grass growing in water
- C2 Gravel 5 - 10 cm
- C3 Site visited frequently.
- C4 Much sand/silt interstitially
- C5 Good rearing and holding water created by debris and overhang.

REACH

Reach No. _____

ACTIVE VALLEY WALL PROCESS				CHANNEL WIDTH (m)				SYSTEM NAME (or Alias) <u>Dennis Lake</u>				SYSTEM NO. _____											
Rock / Soil falls		Nil L M H		BED MATERIAL (%)				Compiling Agency _____ Access _____ NTS Map(s) _____				Field Obs _____ Date _____ Weather _____											
Mud / Snow flows		Nil L M H		Fines		clay silt sand		Field Photo Y N Photog. _____ yr mo day _____ Roll _____ Frames _____				Air Photos Init _____ Photo # _____ Yr. _____ Photo Scale(s) _____											
Slumps / Glides		Nil L M H		Gravel (2-54mm)																			
Slides		Nil L M H		Large (64 mm +)																			
Gullies		Nil L M H		Bedrock																			
BAR PRESENCE				CHANNEL COVER				FISH SUMMARY				STREAM FEATURE											
Side / Point		Nil L M H		Level		% Area		Distr.		Species		Use		Ref		Map		Type		Ht (m)		Length (m)	
Mid Channel		Nil L M H		Crown																			
Transverse		Nil L M H		Overhang																			
Junction		Nil L M H		RIPARIAN VEG.																			
Diamond / Braiding		Nil L M H		Storey		Sp		Distr.															
Lee		Nil L M H		Coniferous																			
Dunes		Nil L M H		Deciduous																			
Islands		Nil L M H		Understorey																			
LATERAL CHANNEL MOVEMENT				Ground				TOTAL POOLS (%)															
Apparently Stable		Yes No		Bedrock control (%)																			
Bar Veg. Progressions		Nil L M H		Stage		Dry		L M H		Fid		Channel Debris		Nil L M H		% Stable Debris							
Cut-Offs / Ox Bows		Nil L M H		Flaw Char.		P S R B T						Floodplain Debris		Nil L M H									
Meander Scars		Nil L M H		Valley Chan		0-2 2-5 5-10 10+ N/A																	
Avulsions		Yes No		Confinement		Ent Conf Fr Oc Un N/A																	
Terraces		Yes No		Pattern		St Sin Ir Im Rm Tm																	
Constrictions		Yes No		Vert. Stab.		Deg ? Agr N/A																	
Unstable Banks (%)				Side Chan		Nil L M H																	

Comments (C)

Dennis Lake is approximately 1200 meters by 1000 meters. It is extremely shallow (max. depth 6 m) with a mud bottom. Two small tributaries on the south side were assessed; low water temperatures and flows reduce the potential of these streams. They both contribute gravel to the lake and may presently support a small population of cutthroat trout.

Emergent vegetation, overhand and submerged debris have created an excellent cutthroat trout rearing area at the outlet of the lake. The inlet is a long marsh area with a mud-bottom. The river is very shallow and slow.

REACH

Reach No. F

ACTIVE VALLEY WALL PROCESS				C4	CHANNEL WIDTH (m)	5	SYSTEM NAME (or Alias) <u>Zymoetz</u>												
C1	Rock / Soil falls	Nil	L	M	H	BED MATERIAL (%)				SYSTEM NO. _____									
	Mud / Snow flows	Nil	L	M	H	Fines	clay silt sand	70	Compiling Agency _____ Access _____ NTS Map(s) _____										
	Slumps / Glides	Nil	L	M	H	Gravel (2-54 mm)		30	Field Obs. _____ Date <u>18 06 01</u> Weather _____										
	Slides	Nil	L	M	H	Large (64 mm+)			Field Photo Y N Photog _____ yr mo day Roll _____ Frames _____										
	Gullies	Nil	L	M	H	Bedrock			Air Photos Init. _____ Photo # _____ Yr _____ Photo Scale(s) _____										
BAR PRESENCE				CHANNEL COVER				C7 FISH SUMMARY				STREAM FEATURE							
	Side / Point	Nil	L	M	H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)				
	Mid Channel	Nil	L	M	H	C5 Crown	0		DV										
	Transverse	Nil	L	M	H	Overhang	20	9	Ct										
JUNCTION				RIPARIAN VEG.															
	Diamond / Braiding	Nil	L	M	H	Storey	Sp	Distr.											
	Lee	Nil	L	M	H	C5 Coniferous	SPRUCE	6											
	Dunes	Nil	L	M	H	Deciduous	PINE	0											
	Islands	Nil	L	M	H	Understorey	WILLOW	7											
LATERAL CHANNEL MOVEMENT				TOTAL POOLS (%)															
	Apparently Stable	Yes	(No)					80											
	Bar Veg. Progressions	Nil	L	M	H	Bedrock control (%)	0												
	Cut-Offs / Ox Bows	Nil	(L)	M	H	Stage	Dry	L	(M)	H	Fld	Channel Debris	Nil	L	M	(H)	% Stable Debris	80	
	Meander Scars	Nil	(L)	M	H	Flow Char	(P)	(S)	R	B	T	Floodplain Debris	Nil	(L)	M	H			
	Avulsions	Yes	(No)					C6	Valley Chan	0-2	2-5	5-10	10+ N/A	(Fish)					
C2	Terraces	(Yes)	No					Confinement	Ent	Conf	Fr	Oc	(Un)	N/A					
	Constrictions	Yes	No					Pattern	St	Sin	Ir	(Im)	Rm	Tm					
C3	Unstable Banks (%)					Vert. Stab.	Deg	?	Agg	(N/A)									
						Side Chan	Nil	L	M	(H)									

Comments (C)

- C1 Beaver dams and ponds, swampy lake margin - no valley walls present.
- C2 Terrace on right bank in upper part of reach.
- C3 Banks undercut with many beaver trails and indentations, side channels and cut-offs.
- C4 Ponding throughout - measurement from occasional defined channel.
- C5 Conifers located away from river. Area heavily vegetated with grasses and sedges and clumps of willow.
- C6 Upper reach ratio 0-2; Most of the reach is swamp and lake margin of Dennis Lake.
- C7 Many Ct and DV fry observed. Ct and DV juveniles and adults angled and observed. Rearing habitat and holding water excellent and appears well utilized by these species.

Deep water, low velocities and poor substrate eliminates spawning potential.

POINT SAMPLE

Point No. 12 of 13

L BANK				R				BED MATERIAL			
U		Form		U		Ice Scouring Y ? N		Texture %			
Genetic Mat.				Imbric Nil (L) M H				Organic			
Texture %				Compac Nil (L) M H				Clay			
Organic				Lag Nil (L) M H				Silt 40			
Clay 004				Dgg (cm)				Sand 60			
Silt 002				HYDRAULICS Meth				S. Grav.			
Sand 2				Valley Flat W(m)				L. Grav.			
S. Grav. 15				Chan Width (m) 8 Est				Cobbie			
L. Grav. 64				Wet Width (m) 8 Est				Boulder			
Cobble 238				Slope (%)				Bedrock			
Boulder				Max Depth (cm) 150 Est				FISH SPECIES PRESENT: DV Ct			
Bedrock				Avg. Depth (cm) 70 Est				WATER QUALITY			
Distr. Sp VEG. Sp Distr				Wet X-sec area				Water temp. 15 °C			
0 Conit. 0				Velocity (m/sec) .55				Turbidity m cm			
0 Decid. 0				Flow (m ³ /sec)				TDS			
7 Under 8				Bank Height (m)				D.O.			
9 Ground 9				Flood Signs HI .5 Type D				pH			
CHANNEL COVER.				Bank Ice Scour Y ? N				<div style="text-align: center;"> <p>L STREAM CROSS-SECTION R</p> <p>(looking downstream)</p> </div>			
Distr. % Area Level % Area Distr.				Stage Dry L (M) H Fld							
0 Crown 0				Flow Char. (P) S R B T							
7 40 Overhang 30 8				Valley: Chan 0-2 2-3 3-5 5-10 N/A							
BIOTA				Side Chan Nil (L) M H							
Aquatic Veg.				Channel Nil (L) M H							
Invertebrates				Stable %							
Algae				Flouppin: Nil (L) M H							

Comments (c)

- C1 Excellent rearing habitat created by pools and deep slow runs. No spawning habitat observed.

REACH

Reach No. G

ACTIVE VALLEY WALL PROCESS				C5 CHANNEL WIDTH (m) 8		SYSTEM NAME (or Alias) <u>Zymoetz</u>							
C1	Rock / Soil falls	Nil	L M H	BED MATERIAL (%)		SYSTEM NO. _____							
	Mud / Snow flows	Nil	L M H	Fines	clay silt sand	30							
	Slumps / Glides	Nil	L M H	Gravel (2-54 mm)		40							
	Slides	Nil	L M H	Large (64 mm+)		30							
	Gullies	Nil	L M H	Bedrock									
BAR PRESENCE			CHANNEL COVER			FISH SUMMARY			STREAM FEATURE				
C2	Side / Point	Nil	L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
	Mid Channel	Nil	L M H	C6 Crown	10	5	DV						
	Transverse	Nil	L M H	Overhang	20	7	Ct						
	Junction	Nil	L M H	RIPARIAN VEG.			Peamouth Chub						
	Diamond / Braiding	Nil	L M H	Storey	Sp	Distr.	Longnose Sucker						
	Lee	Nil	L M H	Coniferous	PINE	7	Co						
	Dunes	Nil	L M H	Deciduous		0							
	Islands	Nil	L M H	Understorey	WILLOW	7							
LATERAL CHANNEL MOVEMENT				TOTAL GRASS / SEDG (%)		TOTAL POOLS (%)							
	Apparently Stable	(Yes)	No	Bedrock control (%)		0							
	Bar Veg. Progressions	(Nil)	L M H	Stage	Dry	L (M) H Fld	Channel Debris	Nil	L (M) H	% Stable Debris			
	Cut-Offs / Ox Bows	(Nil)	L M H	Flow Char.	P S (R) B T		Floodplain Debris	Nil	(L) M H				
	Meander Scars	(Nil)	L M H	Valley Chan	(0-2) 2-5 5-10 10+ N/A		(Fish)						
	Avulsions	Yes (No)	**	Confinement	Ent (Conf) Fr Oc Un N/A								
C3	Terraces	(Yes)	No **	Pattern	St Sin Ir (Im) Rm Tm								
	Constrictions	Yes (No)	**	Vert. Stab.	Deg ? Agr (N/A)								
C4	Unstable Banks (%)	< 10%		Side Chan	Nil (L) M H		(Width) (Val: Chan) (Slope)			(Bed Material)			

Comments (C)

- C1 Narrow v-shaped valley with gullies high on terraces. Well vegetated with conifers.
 - C2 Straight channel with no bar formations.
 - C3 River confined on both sides by high terraces.
 - C4 Most of the banks are low. Undercutting and slumping occurs on higher banks.
 - C5 Flood plain width approximately 20 m.
 - C6 Little exposure of stream to sunlight due to high terraces and coniferous growth.
 - C7 Reach is mostly riffle. Pools are 100% debris controlled.
 - C8 Minnow Trap: 2 Coho 3.0 cm.
Electroshocking: Peamouth Chub, Longnose Sucker
Angling: 1 Ct
Observation: Coho fry
- Spawning potential severely limited by poor substrate; gravels (40%) not found in patches or sections but distributed throughout. Overhanging vegetation, some pools and slack water create good rearing habitat in reach. Low water levels pose some limitations. Low water in riffle section offer little holding water for adult Ct. or Rb. Heavy moss growth on substrate.

POINT SAMPLE

Point No. 13 of 13

L		BANK		R		BED MATERIAL			
C1	U	Form	U	Ice Scouring	Y ? N	C4	Texture %		
		Genetic Mat.		Imbric	(Nil) L M H	Organic			
		Texture %		Compac	Nil L (M) H	Clay			
		Organic		Lag	Nil L M H	Silt			20
		Clay		D ₉₀ (cm)	2.5	Sand			
100		Silt	100	HYDRAULICS Meth		S. Grav.			50
		Sand		Valley Flat W(m)	10.6	L. Grav.			
		S. Grav.		Chan Width (m)	8.6	Cobbie			
		L. Grav.		Wet Width (m)	8.6	Boulder			30
		Cobble		Slope (%)	1.5	Bedrock			
		Boulder		Max Depth (cm)		FISH SPECIES PRESENT:			
		Bedrock		Avg. Depth (cm)	30				
Distr.	Sp	VEG.	Sp	Distr	Wet X-sec area				
7		Conif.	7		Velocity (m/sec)				
0		Decid.	0		Flow (m ³ /sec)				
7		Under	7		Bank Height (m)				
8		Ground	8		Flood Signs Ht				
CHANNEL COVER				Bank Ice Scour		Y ? N			
Distr.	Area	Level	% Area	Distr.	Stage	Dry	L (M) H	Fld	
6	5	Crown	5	6	05	Flow Char.	P (S) (R) B T		
7	10	Overhang	10	7	Valley Chan	0-2 2-3 3-10 10+ N/A			
BIOTA				Side Chan		Nil (L) M H			
Aquatic Veg.				Channel		Nil L (M) H			
C2	Invertebrates			Stable %					
C3	Algae			Floodplain		Nil L M H			

Comments (c)

- C1 Low banks with some undercutting.
- C2 Stone and Caddis in low to moderate abundance.
- C3 Heavy slime-like deposit on substrate. Moss growth also heavy in spots.
- C4 Silt/Sand interstitial.
- C5 Riffle approx. 70%.
- C6 Point lacks good rearing and spawning habitat. Some pools located upstream. No fish caught at point; but coho, cutthroat, peamouth Chub and longnose sucker found upstream.

REACH

Reach No. 1

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>10</u>		SYSTEM NAME (or Alias) <u>Red Canyon Creek</u>						
<input type="checkbox"/>	Rock / Soil falls	Nil L <input checked="" type="radio"/> M H	BED MATERIAL (%)		SYSTEM NO. _____						
<input checked="" type="checkbox"/>	Mud / Snow flows	Nil L M H	Fines	clay silt sand	<u>10</u>	Compiling Agency _____ Access _____ NTS Map(s) _____					
	Slumps / Glides	Nil L M H	<u>C2</u>	Gravel (2-64mm)	<u>20</u>	Field Obs. _____ Date <u>7/21/09</u> <u>27</u> Weather _____					
	Slides	Nil L M H		Large (64mm+)	<u>40</u>	Field Photo Y N Photog. _____ yr mo day Roll _____ Frames _____					
	Gullies	Nil L M H		Bedrock	<u>30</u>	Air Photos Init: _____ Photo * _____ Yr. _____ Photo Scale(s) _____					
BAR PRESENCE			CHANNEL COVER		C4 FISH SUMMARY			STREAM FEATURE			
Side / Point	Nil L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Hi (m)	Length (m)
Mid Channel	Nil L <input checked="" type="radio"/> M H	Crown	<u>0</u>								
Transverse	Nil L M H	Overhang	<u>10</u>	<u>2</u>	<u>DV?</u>						
Junction	Nil L M H	RIPARIAN VEG.									
Diamond / Braiding	Nil L M H	Storey	Sp	Distr.							
Lee	Nil L M H	Coniferous									
Dunes	Nil L M H	Deciduous									
Islands	Nil L M H	Understorey									
LATERAL CHANNEL MOVEMENT			Ground								
Apparently Stable	Yes <input checked="" type="radio"/> No	TOTAL POOLS (%)		<u>10</u>							
Bar Veg. Progressions	Nil L M H	Bedrock control (%)	<u>100</u>								
Cut-Offs / Ox Bows	Nil L M H	Stage	Dry <input checked="" type="radio"/> M H Fld		Channel Debris	Nil L <input checked="" type="radio"/> M H	% Stable Debris				
Meander Scars	Nil L M H	Flow Char.	P S <input checked="" type="radio"/> R <input checked="" type="radio"/> B T		Floodplain Debris	Nil L M H					
Avulsions	Yes No *	Valley Chan	<u>0-2</u> 2-5 5-10 10+ N/A		(Fish)						
Terraces	Yes <input checked="" type="radio"/> No *	Confinement	(Ent) Cont Fr Oc Un N/A								
Constrictions	Yes <input checked="" type="radio"/> No *	Pattern	St Sin Ir Im Rm <input checked="" type="radio"/> Tm								
Unstable Banks (%)	<u>30</u>	Vert. Stab.	(Deg) ? Agr N/A								
		Side Chan	(Nil) L M H		(Width) (Valley Chan) (Slope)	(Bed Material)					

Comments (C)

- C1 Canyon section - Bedrock walls.
- C2 Algae density high - large green patches throughout reach.
- C3 Few good holding pools.
- C4 Poor rearing and spawning habitat. Water clear in Sept. Very milky in June.

REACH

Reach No. 2

ACTIVE VALLEY WALL PROCESS				C4 CHANNEL WIDTH (m) 15				SYSTEM NAME (or Alias) <u>Red Canyon Creek</u>					
Rock / Soil falls Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				BED MATERIAL (%)				SYSTEM NO. _____					
Mud / Snow flows Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Fines clay silt sand		10		Compiling Agency _____ Access _____ NTS Map(s) _____					
Slumps / Glides Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Gravel (2-54 mm)		50		Field Obs. _____ Date: <u>7/8/09</u> <u>27</u> Weather _____					
Slides Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Large (64 mm+)		30		Field Photo Y N Photo _____ yr mo day Roll _____ Frames _____					
Gullies Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Bedrock		10		Air Photos Inlet: _____ Photo # _____ Yr. _____ Photo Scale(s) _____					
BAR PRESENCE				CHANNEL COVER				C8 FISH SUMMARY					
Side / Point Nil <input type="radio"/> L <input checked="" type="radio"/> M <input type="radio"/> H				Level		% Area		Species		Use Ref Map		STREAM FEATURE	
Mid Channel Nil <input type="radio"/> L <input checked="" type="radio"/> M <input type="radio"/> H				Crown		0						Type	
Transverse Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Overhang		10		DV				Ht (m)	
Junction Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				RIPARIAN VEG.								Length (m)	
Diamond / Braiding Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Storey		Sp Distr							
Lee Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Coniferous									
Dunes Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Deciduous		25							
Islands Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Understorey									
Ground													
LATERAL CHANNEL MOVEMENT				C6 TOTAL POOLS (%) 30									
C1 Apparently Stable Yes <input checked="" type="radio"/> No <input type="radio"/>				Bedrock control (%)		80							
Bar Veg. Progressions Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H				C7 Stage		Dry <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H Fld		Channel Debris Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H		% Stable Debris			
C2 Cut-Offs / Ox Bows Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Flow Char.		P S <input checked="" type="radio"/> R B T		Floodplain Debris Nil <input type="radio"/> L <input type="radio"/> M <input type="radio"/> H					
Meander Scars Nil <input checked="" type="radio"/> L <input type="radio"/> M <input type="radio"/> H				Valley:Chon		0-2 2-5 <input checked="" type="radio"/> 5-10 10+ N/A							
Avulsions Yes <input type="radio"/> No <input checked="" type="radio"/> #				Confinement		Ent Conf Fr <input checked="" type="radio"/> Oc Un N/A							
C3 Terraces Yes <input checked="" type="radio"/> No <input type="radio"/> # 2				Pattern		St Sin <input checked="" type="radio"/> Ir Im Rm Tm							
Constrictions Yes <input checked="" type="radio"/> No <input type="radio"/> #				Vert. Stab.		<input checked="" type="radio"/> Deg ? Agr N/A							
Unstable Banks (%) 20				Side Chan		Nil <input type="radio"/> L <input checked="" type="radio"/> M <input type="radio"/> H							

Comments:

- C1 Old channels evident. Frequent channel shift - map inaccurate.
 - C2 Back channels and cut-offs numerous.
 - C3 Terrace on both banks approx. 4-5 m. high. Marshes on top of terraces with standing water. Many springs.
 - C4 Estimated.
 - C5 Banks well vegetated with carex, sedges and huckleberry. Spruce and pine grow away from stream.
 - C6 Pools are deep and provide good holding habitat.
 - C7 Algae density is high throughout reach - green filamentous algae.
 - C8 Only DV captured and observed. Reach has compacted and imbricated gravel substrate.
- Limited spawning potential.
- Low temp. of water may limit other spawning and rearing fish.
- Excellent rearing throughout reach in cut offs and old meander - ox bows.
- Many springs and tributaries entering. Approx. 20 DV observed and captured. 15 cm ripe ♂ captured.

POINT SAMPLE

Point No. L of 1

L BANK R				BED MATERIAL					
C2	U		F	Ice Scouring	Y ? N	Texture %			
Genetic Mat.				Imbric	Nil L (M) H	Organic			
Texture %				Compoc	Nil L (M) H	Clay			
Organic				Lag	Nil L M H	Silt	10		
Clay 004				D ₅₀ (cm)		Sand	20		
Silt 062				HYDRAULICS Math					
Sand 2				Volley Flat W(m)		S. Grav.	20		
50		40		Chan Width (m)	30	L. Grav.	30		
S Grav. 15				Wet Width (m)	8.2	Cobbie	10		
10		20		Slope (%)	1.5	Boulder	10		
L Grav. 54				Max Depth (cm)	65	Bedrock			
Cobbie 236				Avg. Depth (cm)	30	WATER QUALITY			
Boulder				Wet X-sec area		Water temp.	10 °C		
Bedrock				Velocity (m/sec)	0.75	Turbidity	m cm		
Distr.	Sp	VEG.	Sp	Dist.		TDS			
9		Conif.		0		D. O.			
0		Decid.		0		pH			
0		Under		0		FISH SPECIES PRESENT: <u>DV</u>			
9		Ground		0					
CHANNEL COVER				Bank Ice Scour	Y ? N				
Distr.	% Area	Level	% Area	Dist.					
2	10	Crown		0					
BIOTA				Stage	Dry L M H Fld				
Aquatic Veg.				Flow Char.	P (S) (R) B T				
C1		Invertebrates	MAY	H					
Algae				Volley: Chan	0-2 2-5 (5-10) 10+ N/A				
				Side Chan	Nil L M H				
				Channel	Nil L M H				
				Stable %	10				
				Floodplain	Nil L M H				

Comments:

- C1 May fly larvae very abundant.
- C2 Left bank slumping.
- C3 Spawning potential good for reach, but gravel compacted at this point.



Point sample #1 on Red Canyon Creek.
September 1978.

REACH

Reach No. 3

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>5</u>		SYSTEM NAME (or Alias) <u>Red Canyon</u>						
<u>C1</u>	Rock / Soil falls	Nil L M H	BED MATERIAL (%)			SYSTEM NO. _____					
	Mud / Snow flows	Nil L M H	Fines clay silt sand	<u>10</u>		Compiling Agency _____ Access _____ NTS Map(s) _____					
	Slumps / Glides	Nil L M H	Gravel (2-54 mm)	<u>20</u>		Field Obs. _____ Date _____ Weather _____					
	Slides	Nil L M H	Large (64 mm+)	<u>60</u>		Field Photo Y N Photog. _____ yr mo day Roll _____ Frames _____					
	Gullies	Nil L M H	Bedrock	<u>10</u>		Air Photos Init: _____ Photo # _____ Yr _____ Photo Scale(s) _____					
BAR PRESENCE			CHANNEL COVER			<u>C3</u> FISH SUMMARY			STREAM FEATURE		
Side / Point	Nil L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	HI (m)	Length (m)
Mid Channel	Nil L M H	<u>C2</u> Crown									
Transverse	Nil L M H	Overhang									
Junction	Nil L M H	RIPARIAN VEG.									
Diamond / Braiding	Nil L M H	Storey	Sp	Distr.							
Lee	Nil L M H	Coniferous									
Dunes	Nil L M H	<u>C2</u> Deciduous									
Islands	Nil L M H	Understorey									
LATERAL CHANNEL MOVEMENT			TOTAL POOLS (%)								
Apparently Stable	Yes No		Bedrock control (%)	<u>100</u>							
Bar Veg. Progressions	Nil L M H	Stage	Dry	L M H Fld	Channel Debris	Nil L M H	% Stable Debris				
Cut-Offs / Ox Bows	Nil L M H	Flow Char.	P S R B T		Floodplain Debris	Nil L M H					
Meander Scars	Nil L M H				(Fish)						
Avulsions	Yes No *	Volley: Chan	0-2 (2-5) 5-10 10+ N/A								
Terraces	Yes No *	Confinement	Ent Conf (Fr) Oc Un N/A								
Constrictions	Yes No *	Pattern	(S1) Sin Ir Im Rm Tm								
Unstable Banks (%)	<u>10</u>	Vert. Stab.	Deg ? Agr (N/A)								
		Side Chan	(Nil) L M H								

Comments (C)

- C1 Bedrock walls throughout.
- C2 Sub-alpine area.
- C3 No spawning, rearing or good holding habitat seen. Area is sub-alpine and creek drops rapidly from the Lake. No fish expected. No ground checks done.

REACH

Reach No. _____

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m)			SYSTEM NAME (or Alias) <u>Serb Crk.</u>						
Rock / Soil falls	Nil	L M H	BED MATERIAL (%)			SYSTEM NO. _____						
Mud / Snow flows	Nil	L M H	Fines	clay silt sand		Compiling Agency _____ Access _____ NTS Map(s) _____						
Slumps / Glides	Nil	L M H	Gravel (2-64 mm)			Field Obs. _____ Date _____ Weather _____						
Slides	Nil	L M H	Large (64 mm+)			Field Photo Y N Photo _____ yr mo day Roll _____ Frames _____						
Gullies	Nil	L M H	Bedrock			Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER			FISH SUMMARY			STREAM FEATURE			
Side / Point	Nil	L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
Mid Channel	Nil	L M H	Crown									
Transverse	Nil	L M H	Overhang									
Junction	Nil	L M H	RIPARIAN VEG.									
Diamond / Braiding	Nil	L M H	Storey	Sp	Distr.							
Lee	Nil	L M H	Coniferous									
Dunes	Nil	L M H	Deciduous									
Islands	Nil	L M H	Understorey									
LATERAL CHANNEL MOVEMENT			Ground									
Apparently Stable	Yes	No	TOTAL POOLS (%)									
Bar Veg. Progressions	Nil	L M H	Bedrock control (%)									
Cut-Offs / Ox Bows	Nil	L M H	Stags	Dry	L M H Fld	Channel Debris	Nil	L M H	% Stable Debris			
Meander Scars	Nil	L M H	Flow Char.	P	S R B T	Floodplain Debris	Nil	L M H				
Avulsions	Yes	No	Valley Chan	0-2	2-5 5-10 10+ N/A	<div style="text-align: center;">(Fish)</div> <hr style="width: 100%;"/> <div style="display: flex; justify-content: space-around;"> {Width} {Valley Chan} {Slope} {Bed Material} </div>						
Terraces	Yes	No	Confinement	Ent	Conf Fr Oc Un N/A							
Constrictions	Yes	No	Pattern	St	Sin Ir Im Rm Tm							
Unstable Banks (%)			Vert. Stab.	Deg	? Agr N/A							
			Side Chan	Nil	L M H							

No reach description done. Log jam in first kilometer of stream.

POINT SAMPLE

Point No. 1 of 1

L BANK R				BED MATERIAL											
Form				Ice Scouring Y ? N				Texture %							
Genetic Mat.				Imbric Nil L M H				Organic							
Texture %				Compac Nil L (M) H				Clay							
Organic				Log Nil L M H				Silt							
Clay 00-4				D ₉₀ (cm)				Sand 20							
Silt 052				HYDRAULICS Meth				S. Grav. 40							
Sand 2				Valley Flat W(m)				L. Grav. 40							
S. Grav. 16				Chan Width (m) 45				Cobble 40							
L. Grav. 54				Wat Width (m)				Boulder							
Cobble 256				Slope (%)				Bedrock							
Boulder				Max Depth (cm)				C5 FISH SPECIES PRESENT:							
Bedrock				Avg. Depth (cm)											
Distr	Sp	VEG.	Sp	Distr	Sp	VEG.	Sp					Distr	Sp	VEG.	Sp
8	-	Conif.	-	8	-	Decid.	-					8	-	Under	-
6	-	Under	-	6	-	Ground	-					6	-	Ground	-
2	-	Ground	-	2	-	Bank Ice Scour	-					2	-	Y ? N	-
CHANNEL COVER				Stags Dry L M H Fld				Flow Char. P S (R) B T							
Distr	% Area	Level	% Area	Distr	% Area	Level	% Area	Distr	% Area	Level	% Area				
C2	-	Crown	-	C2	-	Overhang	-	C2	-	Valley-Chan	0-2 2-5 5-10 10+ N/A				
BIOTA				Side Chan Nil L (L) M H				Channel Nil L M (H)							
Aquatic Veg.				Stable % 80				Floodplain Nil L M H							
Invertebrates															
Algae															

Comments (C)

- C1 Gravel bars on both sides of creek.
- C2 Gravel bars - no overhang.
- C3 Small tributary enters on right bank.
- C4 Water is moderately silted.
- C5 No fish caught. Holding water present. Good spawning gravels but water temperature low.



Point sample #1 on Serb Creek. September
1978.

REACH

Reach No. 3

ACTIVE VALLEY WALL PROCESS			C3 CHANNEL WIDTH (m) 8		SYSTEM NAME (or Alias) <u>Passby</u>							
C1	Rock / Soil falls	Nil (L) M H	BED MATERIAL (%)			SYSTEM NO. _____						
	Mud / Snow flows	Nil L M H	Fines	clay silt sand	10	Compiling Agency _____ Access _____ NTS Map(s) _____						
	Stumps / Glides	Nil L M H	Gravel (2-64mm)		10	Field Obs. _____ Date <u>18 06 22</u> Weather _____						
	Slides	Nil (L) M H	Large (64mm+)		80	Field Photo Y N Photog _____ Roll _____ Frames _____						
	Gullies	Nil (L) M H	Bedrock			Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER			C5 FISH SUMMARY			STREAM FEATURE			
	Side / Point	Nil (L) M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
	Mid Channel	Nil (L) M H	Crown	10	4							
	Transverse	Nil L M H	Overhang	20	8							
JUNCTION			RIPARIAN VEG.									
	Diamond / Braiding	Nil L M H	Storey	Sp	Distr.							
	Lee	Nil L M H	Coniferous		7							
	Dunes	Nil L M H	Deciduous		7							
	Islands	Nil L M H	Understorey		9							
LATERAL CHANNEL MOVEMENT			GROUND									
	Apparently Stable	(Yes) No	C4 TOTAL POOLS (%) 40									
	Bar Veg. Progressions	(Nil) L M H	Bedrock control (%) 0									
	Cut-Offs / Ox Bows	(Nil) L M H	Stage	Dry L (M) H Fld		Channel Debris	Nil (L) M H	% Stable Debris				
C2	Meander Scars	Nil (L) M H	Flow Char.	P S R (B) T		Floodplain Debris	(Nil) L M H					
	Avulsions	Yes No *	Valley Chan	(0-2) 2-5 5-10 10+ N/A		(Fish)						
	Terraces	(Yes) No *	Confinement	Ent Cont (Fr) Oc Un N/A								
	Constrictions	Yes (No) *	Pattern	St Sin (r) Im Rm Tm								
	Unstable Banks (%)	10	Vert. Stab.	(Deg) ? Agr N/A								
			Side Chan	Nil (L) M H								

Comments (C)

- C1 Valley wall begins upstream of bridge on Rt. bank. No wall evident on east side. One major slump noted.
- C2 Old channel and meander scars evident but no recent activity.
- C3 Approximated width. Unable to wade stream.
- C4 Reach is very low in pool or holding water.
- C5 Poor habitat throughout due to large substrate, broken flow character and steep slope. RAB (1975) captured DV; Varney and Truelson observed Co and DV at road crossing. The latter's description of stream suggests they were not on Passby. No fish captured during our study.

POINT SAMPLE

Point No 22 of 2

L BANK				R				BED MATERIAL			
Genetic Mat.				Ice Scouring Y ? N				Texture %			
Texture %				Imbric Nil L M H				Organic			
Organic				Compoc Nil L M (H)				Clay			
Clay 004				Lag Nil L M H				Silt			
Silt 062				Ogg (cm)				Sand			
Sand 2				HYDRAULICS				Meth			
S Grav 10				Valley Flat W(m)				S Grav. 20			
L Grav 20				Chan Width (m) 15 Est				L Grav. 20			
Cobble 30				Wet Width (m) 4				Cobble 50			
Boulder 40				Slope (%)				Bedrock 10			
Bedrock 10				Max Depth (cm) 40				FISH SPECIES PRESENT:			
Distr. Sp VEG. Sp Distr				Wet X-sec area							
1 Canif. 1				Velocity (m/sec)							
7 Decid. 7				Flow (m ³ /sec)							
6 Under 9				Bank Height (m)							
5 Ground 4				Flood Signs HI Type							
CHANNEL COVER.				Bank Ice Scour Y ? N							
Distr. % Area Level % Area Distr.				Stage Dry (L) M H Fld							
0 Crown 0				Flow Char. P S (R) B T							
2 410 Overhang 50 8				Valley:Chan 0-2 2-5 5-10 10+ 4/5							
BIOTA Sp Abun				Side Chan Nil (L) M H							
Aquatic Veg. -				Channel Nil (L) M H							
Invertebrates -				Stable %							
Algae -				Flouclon Nil (L) M H							

Comments (C)

- C1 Left bank formed by gravel deposit.
- C2 Flood channel on left bank.
- C3 Water very clear and only one pool to fish. Possibly DV in reach, but very poor habitat for spawning or rearing. Water too fast and substrate too large.

POINT SAMPLE

Point No. L of 3

L BANK				R				BED MATERIAL							
Form		U		Ice Scouring		Y (7) N		Texture %							
Genetic Mat.				Imbric				Nil L M H		Organic					
Texture %				Compac				Nil L (M) H		Clay					
Organic				Lag				Nil L M H		Silt		10			
Clay 004				P ₉₀ (cm)						Sand		20			
Silt 002				HYDRAULICS				Math		S. Grav.		30			
Sand 2				Valley Flat W(m)						L. Grav.		40			
S. Grav. 15				Chan Width (m)				7		Cobbie					
L. Grav. 53				Wet Width (m)				7		Boulder					
Cobble 236				Slope (%)						Bedrock					
Boulder				Max Depth (cm)				30		FISH SPECIES PRESENT:		C0			
Bedrock				Avg. Depth (cm)				25		WATER QUALITY					
Dist.		Sp		VEG.		Sp		Dist.		Water temp. °C					
7		Conit.		7		Water X-sec area		Velocity (m/sec)		Turbidity m cm					
0		Decid.		0		Flow (m ³ /sec)		0.9		TDS					
3		Under		9		Bank Height (m)		RE .20		D.O.					
9		Ground		9		Flood Signs Mt		Type		pH					
CHANNEL COVER				Bank Ice Scour				Y ? N							
Dist.		% Area		Level		% Area		Dist.		Stage		Dry L (M) H Fld			
0		Crown		0		0		0		Flow Char.		P S (R) B T			
6		30 Overhang		30		6		02		Valley:Chan		0-2 2-5 5-10 10+ N/A			
BIOTA				Sp Abun				Side Chan				Nil L (M) H			
Aquatic Veg.				C3				Channel				Nil L M (H)			
Invertebrates MAY				DEBRIS				Stable %				60			
Algae				Floodplain				Nil L M H							

L 3 STREAM CROSS-SECTION R

(looking downstream)

Comments (c)

- C1 Flow broken due to debris and windfalls.
- C2 Floodplain shows much evidence of meanders.
- C3 Undercut banks and unstable channel movement creating much debris and bank sloughing.
- C4 Extremely small pools for fry. No spawning potential due to debris, unstable flows and Channel pattern. Substrate composition also limits potential.

REACH

Reach No. 2

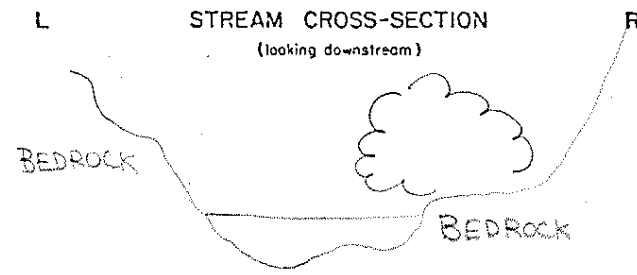
ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) 10		SYSTEM NAME (or Alias) <u>Willow</u>				
Rock / Soil falls	Nil	(L) M H	BED MATERIAL (%)		SYSTEM NO. _____				
Mud / Snow flows	Nil	L M H	Fines clay silt sand		Compiling Agency _____ Access _____ NTS Map(s) _____				
Slumps / Glides	Nil	L M H	Gravel (2-64 mm)	10	Field Obs. _____ Date <u>7/20/19</u> Weather _____				
Slides	Nil	L M H	Large (64 mm+)	50	Field Photo Y N Photog. _____ yr ms day Roll _____ Frames _____				
Gullies	Nil	L M H	Bedrock	40	Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____				
BAR PRESENCE			CHANNEL COVER		06 FISH SUMMARY			STREAM FEATURE	
Side / Point	Nil	L M H	Level	% Area	Distr.	Species	Use	Ref	Map
Mid Channel	Nil	L M H	Crown	10	7				
Transverse	Nil	L M H	Overhang	30	8	Ct			
Junction	Nil	L M H	RIPARIAN VEG.						
Diamond / Braiding	Nil	L M H	Storey	Sp	Distr.				
Lee	Nil	L M H	Coniferous		8				
Dunes	Nil	L M H	Deciduous		5				
Islands	Nil	L M H	Understorey		8				
LATERAL CHANNEL MOVEMENT			Ground		8				
Apparently Stable	(Yes)	No	04 TOTAL POOLS (%)		40				
Bar Veg. Progressions	Nil	L M H	Bedrock control (%)		100				
Cut-Offs / Ox Bows	Nil	L M H	Stage	Dry	L (M) H Fld	Channel Debris	Nil (L) M H	% Stable Debris	30
Meander Scars	Nil	L M H	Flow Char.	P	S (R) (B) T	Floodplain Debris	Nil (L) M H		
Avulsions	Yes (No)	"	05 Valley Chan		0-2 (2-5) 5-10 10+ N/A	(Fish)			
01 Terraces	(Yes)	No "2"	Confinement	(En)	Conf Fr Cc Un N/A				
02 Constrictions	(Yes)	No "MANY"	Pattern	(S)	Sin Ir Im Rm Tm				
Unstable Banks (%)		10	Vert. Stab.	(Deg)	? Agr N/A				
			Side Chan	(Nil)	L M H				

Comments (C)

- C1 Terraces evident above canyon walls.
- C2 Many rock-controlled chutes and constrictions. Barrier to upstream migration during low flows. Possible velocity barrier during high flows.
- C3 Vegetation description for top of canyon walls.
- C4 Numerous pools between chutes and short riffle sections provide habitat for Ct juveniles and adults. Stream is small however and habitat is very limited.
- C5 Ratio for reach above bedrock canyon.
- C6 Spawning habitat is very limited in canyon section, possible to migrate downstream to the top of Reach 1. Rearing habitat available in pools. Section above canyon has some spawning and rearing habitat; but low flows could be a problem. Individuals caught here are small and lack red slash of Ct. No mature fish captured.

POINT SAMPLE

Point No 2 of 3

L BANK		R		BED MATERIAL			
S	Form	S		Ice Scouring	Y (7) N	Texture %	
Genetic Mat.				Imbric	(Nil) L M H	Organic	
Texture %				Compac	(Nil) L M H	Clay	
Organic				Leg	(Nil) L M H	Silt	
10	Clay 004	10		D ₉₀ (cm)		Sand 10	
	Silt 062			HYDRAULICS		S. Grav. 20	
	Scnd 2			Valley Flat W(m)	6	L. Grav. 30	
C1	S. Grav. 15	C2		Chan Width (m)	6	Cobbie 10	
10	L. Grav. 63			Wet Width (m)	49	Boulder 10	
	Cobble 23a			Slope (%)	25	Bedrock 20	
10	Boulder	10		Max Depth (cm)	50	FISH SPECIES PRESENT:	
70	Bedrock	80		Avg. Depth (cm)	12		
Distr.	Sp	VEG.	Sp	Distr	Wet X-sec area	L STREAM CROSS-SECTION R	
7		Conit.		2	Velocity (m/sec)	(looking downstream)	
0		Decid.		0	Flow (m ³ /sec)		
2		Under		7	Bank Height (m)	BEDROCK	
71		Ground		0	Flood Signs HI Type	BEDROCK	
CHANNEL COVER.				Bank Ice Scour Y ? N			
Distr.	% Area	Level	% Area	Distr.	Stage	Dry L (M) H Fld	
0		Crown		0	Flow Char.	P (S) (R) B T	
4	<10	Overhang	30	8	Valley: Chan	(0-2) 2-3 3-10 10+ 1/2	
BIOTA				Side Chan Nil (L) M H			
Aquatic Veg.				Channel Nil (L) M H			
Invertebrates				Stable %			
Algae				Floodplain Nil L M H			

Comment (c)

- C1 Left bank sloughing bedrock into Creek.
 - C2 Channel movement very controlled by bedrock.
 - C3 Bedrock outcrops create slack water.
 - C4 Ct angled in small pools. Very easily caught. Fish lack red slash of Ct but have hyoid teeth.
- Rearing habitat is good, pools are small but deep. Very limited as to numbers and area of rearing habitat. Spawning potential minimal.

POINT SAMPLE

Point No 33 of 33

L BANK		R		BED MATERIAL			
<u>R</u>	Form	<u>F</u>		Ice Scouring	Y ? N	Texture %	
Genetic Mat.				Imbric	Nil L M H	Organic	
Texture %				Compac	Nil L <u>(M)</u> H	Clay	
Organic				Log	Nil L M H	Silt	
<u>50</u>	Clay	<u>50</u>		D ₉₀ (cm)		Sand <u>30</u>	
	S. Grav.			HYDRAULICS Meth:		S. Grav.	<u>60</u>
	Silt			Valley Flat W(m)		L. Grav.	<u>10</u>
	Sand			Chan Width (m)	<u>19</u>	Cobbie	
<u>20</u>	S. Grav.	<u>20</u>		Wet Width (m)	<u>3</u>	Boulder	
<u>30</u>	L. Grav.	<u>30</u>		Slope (%)		Bedrock	
	Cobble			Max Depth (cm)	<u>25</u>	FISH SPECIES PRESENT:	
	Boulder			Avg. Depth (cm)	<u>20</u>		
	Bedrock			Wet X-sec area			
Distr.	Sp	VEG.	Sp	Velocity (m/sec)	<u>.06</u>		
<u>6</u>		Conif.	<u>6</u>	Flow (m ³ /sec)			
<u>2</u>		Decid.	<u>0</u>	Bank Height (m)			
<u>8</u>		Under	<u>7</u>	Flood Signs	Ht Type		
<u>9</u>		Ground	<u>9</u>	Bank Ice Scour	Y ? N		
CHANNEL COVER				Stage	Dry <u>(L)</u> M H Fld		
Distr.	% Area	Level	% Area	Flow Char.	<u>(P)</u> <u>(S)</u> R B T		
<u>0</u>		Crown	<u>10</u>	Valley Chan	<u>0-2</u> <u>(2-5)</u> 5-10 10+ N/A		
<u>0</u>		Overhang	<u>20</u>	Side Chan	Nil L M <u>(H)</u>		
BIOTA				Channel	Nil <u>(L)</u> M H		
<u>0</u>	Aquatic Veg.		<u>H</u>	Stability %	<u>100</u>		
	Invertebrates	<u>CADDIS</u>		Floodplain	Nil L <u>(M)</u> H		
	Algae		<u>H</u>				

Comments (c)

- C1 Old beaver swamp with many snags and pockets of silt, now revegetated. Stream channel gravelly with fine bank material.
 - C2 Moss, slime and algae growth on substrate.
 - C3 Rearing habitat in old pools and backwater is excellent. No fry observed. Water level may pose limitations to rearing and spawning.
- 1 Ct angled.

REACH

3

Willow Creek

Reach No. _____

ACTIVE VALLEY WALL PROCESS				CHANNEL WIDTH (m)				SYSTEM NAME (or Alias) _____												
Rock / Soil falls	Nil	L	M	H	BED MATERIAL (%)				SYSTEM NO. _____											
Mud / Snow flows	Nil	L	M	H	Fines	clay silt sand			Compiling Agency _____ Access _____ NTS Map(s) _____											
Slumps / Glides	Nil	L	M	H	Gravel (2-54 mm)				Field Obs. _____ Date _____ Weather _____											
Slides	Nil	L	M	H	Large (64 mm+)				Field Photo Y N Photog. _____ yr mo day _____ Roll _____ Frames _____											
Gullies	Nil	L	M	H	Bedrock				Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____											
BAR PRESENCE				CHANNEL COVER				FISH SUMMARY				STREAM FEATURE								
Side / Point	Nil	L	M	H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)						
Mid Channel	Nil	L	M	H	Crown															
Transverse	Nil	L	M	H	Overhang															
Junction	Nil	L	M	H	RIPARIAN VEG.															
Diamond / Branding	Nil	L	M	H	Storey	Sp	Distr.													
Lee	Nil	L	M	H	Coniferous															
Dunes	Nil	L	M	H	Deciduous															
Islands	Nil	L	M	H	Understorey															
LATERAL CHANNEL MOVEMENT				Ground																
Apparently Stable	Yes	No		TOTAL POOLS (%)																
Bar Veg. Progressions	Nil	L	M	H	Bedrock control (%)															
Cut-Offs / Oxbows	Nil	L	M	H	Stage	Dry	L	M	H	Fid	Channel Debris	Nil	L	M	H	% Stable Debris				
Meander Scars	Nil	L	M	H	Flow Char	P S R B T				Floodplain Debris	Nil	L	M	H						
Avulsions	Yes	No	"		Valley Chan	0-2	2-5	5-10	10+	N/A	(Fish)									
Terraces	Yes	No	"		Confinement	Ent	Conf	Fr	Oc	Un	N/A									
Constrictions	Yes	No	"		Pattern	St	Sin	Ir	Im	Rm	Tm									
Unstable Banks (%)					Vert. Stab.	Deg	?	Agr	N/A											
				Side Chan	Nil	L	M	H					(Width) (Val-Chan) (Slope)	(Bed Material)						

Comments (C) _____

- C1 Old beaver ponds present. Channel meanders through silt deposits.
- C2 Heavy shrub growth in sections. Old beaver pond area slowly revegetating, snags and logs present.
- C3 Spawning habitat available - rearing also. Not likely to be very productive.

REACH

Reach No. _____

ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>6</u>		SYSTEM NAME (or Alias) <u>Unnamed</u>							
	Rock / Soil falls	Nil L M H	BED MATERIAL (%)		SYSTEM NO. _____							
C1	Mud / Snow flows	Nil L M H	Fines	clay silt sand	<u>20</u>	Compiling Agency _____ Access _____ NTS Map(s) _____						
	Slumps / Glides	Nil L M H	Gravel (2-64mm)		<u>60</u>	Field Obs _____ Date _____ Weather _____						
	Slides	Nil L M H	Large (64 mm+)		<u>20</u>	Field Photo Y N Photog. _____ yr mo day _____ Roll _____ Frames _____						
	Gullies	Nil L M H	Bedrock			Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER		C4 FISH SUMMARY			STREAM FEATURE				
	Side / Point	Nil L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	HI (m)	Length (m)
	Mid Channel	Nil L <u>(M)</u> H	Crown	<u>10</u>	<u>5</u>							
	Transverse	Nil L M H	Overshang	<u>20</u>	<u>6</u>	DV						
	Junction	Nil L M H	RIPARIAN VEG.			Co						
	Diamond / Braiding	Nil L <u>(M)</u> H	Storey	Sp	Distr.							
	Lee	Nil L M H	Coniferous		<u>7</u>							
	Dunes	Nil L M H	Deciduous		<u>1</u>							
	Islands	Nil L M H	Understorey		<u>8</u>							
			Ground		<u>8</u>							
LATERAL CHANNEL MOVEMENT			TOTAL POOLS (%)									
C2	Apparently Stable	Yes <u>(No)</u>	Bedrock control (%)		<u>10</u>							
	Bar Veg. Progressions	Nil <u>(L)</u> M H	Stage	Dry	L <u>(M)</u> H	Fld	Channel Debris	Nil L M H	% Stable Debris			
	Cut-Offs / Ox Bows	Nil <u>(L)</u> M' H	Flow Char.	P	S <u>(R)</u> B T		Floodplain Debris	Nil L M H				
	Meander Scars	Nil L M H	Valley: Chan	0-2	2-5	5-10	10+ N/A	(Fish)				
	Avulsions	Yes <u>(No)</u> #	Confinement	Ent	Conf	Fr <u>(Og)</u>	Un	N/A				
	Terraces	Yes <u>(No)</u> #	Pattern	St	Sin <u>(lr)</u>	lm	Rm	Tm				
	Constrictions	Yes <u>(No)</u> #	Vert. Stab.	Deg	? <u>(Agr)</u>	N/A						
C3	Unstable Banks (%)	<u>10-20</u>	Side Chan	Nil	L <u>(M)</u> H	(Width) (Vall Chan) (Slope) (Bed Material)						

Comments (C)

- C1 Large gravel fan into Zymoetz.
- C2 Left bank is steeper and higher than right bank and erosion is occurring.
- C3 See C2. Bank material mostly gravel and sand.
- C4 1 DV juvenile shocked. Coho captured near mouth in back channel. Very few coho fry observed and none trapped. Stream offers little potential or existing fish habitat due to low flows, moderate slope with no holding water and unsuitable spawning substrate.

REACH

Reach No. 1

ACTIVE VALLEY WALL PROCESS			C3 CHANNEL WIDTH (m) 40		SYSTEM NAME (or Alias) <u>Silvern</u>								
C1	Rock / Soil falls	Nil L M H	BED MATERIAL (%)		SYSTEM NO. _____								
	Mud / Snow flows	Nil L M H	C4	Fines clay silt sand	90	Compiling Agency _____ Access _____ NTS Map(s) _____							
	Slumps / Glides	Nil L M H		Gravel (2-54mm)	10	Field Obs. _____ Date <u>28/06/08</u> Weather _____							
	Slides	Nil L M H		Large (64mm+)		Field Photo Y N Photog _____ yr mo day _____ Roll _____ Frames _____							
	Gullies	Nil L M H		Bedrock		Air Photos Init: _____ Photo # _____ Yr. _____ Photo Scale(s) _____							
BAR PRESENCE			CHANNEL COVER		C7 FISH SUMMARY			STREAM FEATURE					
	Side / Point	Nil L M H		Level	% Area	Distr.	Species	Use	Ref	Map	Type	HI (m)	Length (m)
	Mid Channel	Nil L M H	C5	Crown	0		Coho						
	Transverse	Nil L M H		Overhang	30		DV						
	Junction	Nil L M H	RIPARIAN VEG.										
C2	Diamond / Braiding	Nil L M (H)		Storey	Sp	Distr.							
	Lee	Nil L M H		Coniferous									
	Dunes	Nil L M H	C5	Deciduous									
	Islands	Nil L M H		Understorey									
LATERAL CHANNEL MOVEMENT			Ground										
C2	Apparently Stable	Yes (No)	C6	TOTAL POOLS (%)									
	Bar Veg. Progressions	Nil L M H		Bedrock control (%)									
	Cut-Offs / Ox Bows	Nil L M H		Stage	Dry L (M) H Fid	Channel Debris		Nil L (M) H	% Stable Debris				
	Meander Scars	Nil L M H	C6	Flow Char.	(P) S (R) B T	Floodplain Debris		Nil (L) M H					
	Avulsions	Yes No #		Valley: Chan	0-2 2-5 5-10 (10) N/A	(Fish)							
	Terraces	(Yes) No #		Confinement	Ent Conf Fr Oc (Un) N/A								
	Constrictions	Yes (No) #		Pattern	St Sin (Ir) Im Rm Tm								
	Unstable Banks (%)			Vert. Stab.	Deg ? Agr (N/A)								
				Side Chan	Nil L M (H)	{Width} {Val: Chan} {Slope}		{Bed Material}					

Comments (C)

- C1 Beaver pond and lake margin - no valley walls present.
- C2 Extensive braiding and channel movement through beaver ponds.
- C3 Estimated width of braided area.
- C4 Ponds are heavily silted and shallow. Small sections of gravel occur in higher water velocity areas.
- C5 Grassy hummocks with undercut banks and high grass and sedge growth create overhang. Some willow and sherperdia present.
- C6 Area is shallow and ponding estensive.
- C7 Coho and DV fry shocked and observed. Large numbers of fry seen but no adults or juveniles. Coho (?) carcass found. Reach is likely impassable during low flows. Spawning habitat nil, rearing habitat good.

REACH

Reach No. 2

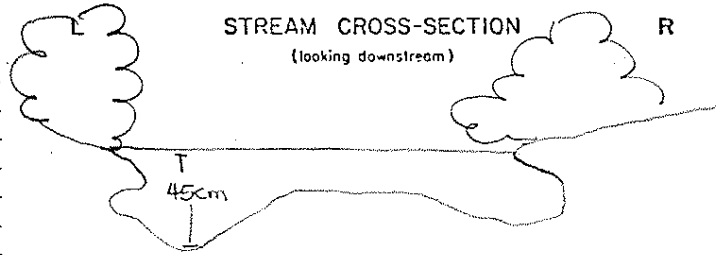
ACTIVE VALLEY WALL PROCESS			CHANNEL WIDTH (m) <u>8</u>		SYSTEM NAME (or Alias) <u>Silvern</u>						
Rock / Soil falls	(Nil) L M H	BED MATERIAL (%)			SYSTEM NO. _____						
Mud / Snow flows	(Nil) L M H	Fines	clay silt sand	<u>30</u>	Mapping Agency _____ Agency _____ NRS Map(s) _____						
<u>C1</u> Slumps / Glides	Nil L (M) H	Gravel (2-64 mm)		<u>70</u>	Field Obs. _____ Date _____ Weather _____						
Slides	(Nil) L M H	Large (64 mm+)			Field Photo Y N Photog. _____ yr mo day Roll _____ Frame _____						
Gullies	(Nil) L M H	Bedrock			Air Photos Initt. _____ Photo # _____ Yr. _____ Photo Scale(s) _____						
BAR PRESENCE			CHANNEL COVER		C5 FISH SUMMARY			STREAM FEATURE			
Side / Point	(Nil) L M H	Level	% Area	Distr.	Species	Use	Ref	Map	Type	Ht (m)	Length (m)
<u>C2</u> Mid Channel	Nil L M H	Crown	<u>20</u>	<u>6</u>	<u>Ct</u>						
Transverse	Nil L M H	Overshang	<u>60</u>	<u>7</u>	<u>DV</u>						
Junction	Nil L M H	RIPARIAN VEG.			<u>Co</u>						
Diamond / Braiding	Nil L M H	Storey	Sp	Distr.							
Lee	Nil L M H	Coniferous		<u>7</u>							
Dunes	Nil L M H	Deciduous		<u>4</u>							
Islands	(Nil) L M H	Understorey	WILLOW	<u>8</u>							
LATERAL CHANNEL MOVEMENT			Ground		TOTAL POOLS (%)						
<u>C3</u> Apparently Stable	Yes (No)	TOTAL POOLS (%)		<u>20</u>							
Bar Veg. Progressions	(Nil) L M H	Bedrock control (%)		<u>0</u>							
Cut-Offs / Ox Bows	(Nil) L M H	Stage	Dry	L (M) H	Fid	Channel Debris		Nil L M H	% Stable Debris		
Meander Scars	Nil (L) M H	Flow Char.	P	(S) (R)	B T	Floodplain Debris		Nil L M H			
Avulsions	Yes (No) *	Valley Chan	0-2	2-5	5-10	(10+) N/A	(Fish)				
Terraces	Yes No *	Confinement	Ent	Conf	Fr	(O) Un N/A					
Constrictions	Yes (No) *	Pattern	St	Sin	(Ir)	Im Rm Tm					
<u>C4</u> Unstable Banks (%)		Vert. Stab.	Deg	?	Agr	N/A					
		Side Chan	Nil	L (M) H							
					[Width] (Valley Chan) (Slope)			[Bed Material]			

Comment (C)

- C1 Floodplain still wide (approx 800 m), no valley walls close to stream.
- C2 Gravel found midchannel and some could be exposed during low flows.
- C3 Channel has moved since Forest Cover mapping. Old channels are revegetated. New channel course approximated on our maps.
- C4 Undercut banks are failing. One major slump noted. This appears to be recent and is possibly associated with channel shift. Uprooted vegetation prevalent.
- C5 Spawning habitat for Ct, Rb and DV is limited only by a moderately high gravel compaction. This reach lacks slack water and pools for rearing. DV juveniles and fry and 1 coho fry found above road crossing and one mature Ct angled at bridge. Coho observed spawning Nov. 2.

POINT SAMPLE

Point No. 3 of 3

L BANK		R		BED MATERIAL				SYSTEM NAME (or Alias) <u>Silvern Crk.</u>	
<u>U</u>	Form	<u>U</u>		Ice Scouring	Y ? N	Texture %		SYSTEM NO. _____	
Genetic Mat.				Imbric	Nil L M H	Organic		Location of site (specific) _____	
Texture %				Compac	Nil L <u>(M)</u> H	Clay		Reach No. _____	
Organic				Lag	Nil L M H	Silt		Crew _____ Agency _____ Date <u>18</u> <u>06</u> <u>07</u> Time _____	
Clay				D ₉₀ (cm)		Sand		yr mo day Access _____	
Silt				HYDRAULICS Meth		S. Grav.		Photographer _____ Roll _____ Frames _____	
Sand				Valley Flat W(m)		L. Grav.		Weather _____ Fish Sample Card: No Yes # _____	
S. Grav.		<u>100</u>		Chan Width (m)	<u>7.2</u>	Cobbie		Air Temp. °C <u>11</u> Water Sample No. _____	
L. Grav.		<u>100</u>		Wet Width (m)	<u>7.2</u>	Boulder		WATER QUALITY	
Cobble				Slope (%)	<u>41</u>	Bedrock			
Boulder				Max Depth (cm)	<u>45</u>	Bedrock		Water temp. <u>6</u> °C	
Bedrock				Avg. Depth (cm)	<u>30</u>	Bedrock		Turbidity _____ m cm	
Dist. Sp		VEG. Sp Dist		Wet X-sec area		TDS _____		D. O. _____	
<u>7</u>		Conif.		Velocity (m/sec)	<u>1</u>	pH _____		C2 FISH SPECIES PRESENT:	
<u>4</u>		Decid.		Flow (m ³ /sec)		STREAM CROSS-SECTION R			
<u>8</u>		Under		Bank Height (m)	<u>.40</u>	(looking downstream)			
Ground				Flood Signs HI	Type				
CHANNEL COVER				Bank Ice Scour	Y ? N				
Dist. Area		Level % Area		Stage	Dry L <u>(M)</u> H Fld				
<u>7</u> <u>20</u>		Crown <u>20</u> <u>7</u>		Flow Char.	P <u>(S)</u> <u>(R)</u> B T				
<u>8</u> <u>30</u>		Overhang <u>30</u> <u>8</u>		Valley Chan	0-2 2-3 3-10 <u>(30)</u> N/A				
BIOTA		Sp Abun		Side Chan	Nil <u>(L)</u> M H				
Aquatic Veg.				Channel	Nil L <u>(M)</u> H				
Invertebrates				Stable %	<u>70</u>				
Algae				Floodplain	Nil L M H				

Comments (C)

- C1 No recent evidence of flooding but extensive floodplain shows old meander scars and pockets of gravel.
- C2 Spawning potential for Rb and Ct is good but no fry or adults found. Rearing habitat is limited to bank overhang areas and debris-controlled pools. Water was very clear and there was little protective cover in channel.

POINT SAMPLE.

Point No 2 of 3

L		BANK		R		BED MATERIAL							
U	Form					Ice Scouring	Y ? N	Texture %					
Genetic Mat.						Inbric	Nil L M H	Organic					
Texture %						Compac	Nil L M H	Clay					
Organic						Log	Nil L M H	Silt					
100	Clay			100		D ₅₀ (mm)		Sand			20		
	Silt					HYDRAULICS			S. Grav.			40	
	Sand					Valley Flut W(m)		L. Grav.			40		
	S. Grav.					Chan Width (m)	18	Cobbie					
	L. Grav.					Wet Width (m)	7	Boulder					
	Cobbie					Slope (%)	15	Bedrock					
	Boulder					Max Depth (cm)	15	C FISH SPECIES PRESENT:					
	Bedrock					Avg. Depth (cm)	8	<div style="text-align: center;"> <p>L STREAM CROSS-SECTION R</p> <p>(looking downstream)</p> </div>					
Cstr.	Sp	VEG.	Sp	Distr		Wet X-sec area							
		Conif.				Velocity (m/sec)	1						
		Decid.				Flow (m ³ /sec)							
		Under				Bank Height (m)							
		Ground				Flood Signs	HT Type						
CHANNEL COVER				Bank Ice Scour								Y ? N	
Distr.	Area	Level	Area	Distr		Stage	Dry L (M) H Fld						
12	110	Crown	0			Flow Char.	P S (R) B T						
12	110	Overhang	2	110		Valley Chan	0-2 2-5 5-10 (10) 10/A						
BIOTA				Sp Abun		Side Chan		Nil L (M) H					
Aquatic Veg.				L		Channel		Nil L M H					
Invertebrates		MA		Y		Stable %							
Algae				L		Flouphm		Nil L M H					

Comments (C)

C1 Angling produced no fish. Water very cold, beaver pond immediately below here must act as warming reservoir, as water is warmer in lower reaches. Spawning gravels are good and rearing habitat available in beaver pond. Habitat above this point diminishes rapidly, as slope and velocity increases.

POINT SAMPLE

Point No. 3 of 3

Silvern

L BANK				R				BED MATERIAL			
U	Dist	Form	Dist	Ice Scouring	Y	N	Texture %				
		Genetic Mat.		Imbric	Nil	L M H	Organic				
		Texture %		Compac	Nil	L M H	Clay				
		Organic		Log	Nil	L M H	Silt				
		Clay .004		Dgg (cm)			Sand				
		Silt .052		HYDRAULICS Meth				S. Grav.	20		
		Sand 2	40	Valley Flat W(m)			L. Grav.	20			
		S. Grav. 16		Chan Width (m)			Cobble	60			
		L. Grav. 64		Wet Width (m)	5.6		Boulder				
		Cobble 256		Slope (%)	2.5		Bedrock				
		Boulder		Max Depth (cm)	65		C4 FISH SPECIES PRESENT:				
		Bedrock		Avg. Depth (cm)	45		<p>STREAM CROSS-SECTION (looking downstream)</p> <p>gravel</p>				
		Distr. Sp	VEG. Sp	Distr.	Wet X-sec area						
		Conif.			Velocity (m/sec)	1.6					
		Decid.			Flow (m ³ /sec)						
		Under			Bank Height (m)	1.35					
		Ground		C3	Flood Signs Ht	1 Type Debris					
CHANNEL COVER				Bank Ice Scour				Y ? N			
	Distr.	% Area	Level	% Area	Distr.	Stage	Dry	L (M) H	Fld		
			Crown			Flow Char.	P	S	R	(B) T	
			Overhang			Valley Chan	0-2	2-5	5-10	10-20	N/A
BIOTA				Side Chan				Nil (L) M H			
		Aquatic Veg.				Channel	Nil	(L) M H			
		Invertebrates				Stable %					
		Algae				Floodplain	Nil	(L) M H			

Comments (C)

- C1 Rt bank 10% Bare rest of area heavily covered with willow, few conifer and rare deciduous. Lt bank - camping area grassy and shrubs to stream.
- C2 Many stone and caddis seen.
- C3 Low debris. Some has accumulated in trees. Stream channel unstable during flood.
- C4 - No fish expected - due to tumbling flow and low temp.

APPENDIX I I

GLOSSARY OF TERMS

Point and reach tally cards were supplied by the Resource Analysis Branch and were used to record data relevant to our stated objectives. Fish habitat evaluations were recorded in the "Comments (C)" section of the cards.

Definitions of the terms used on the tally cards are found in the "Glossary of Terminology" (R.A.B., 1978). The following definitions are included here to facilitate interpretation of our field data:

- active valley wall process - describes the movement of materials on valley walls.
- apparently stable - no obvious signs of lateral channel instability. Described by yes or no.
- bank form - the form of the bank is described as being F flat, R repose (32° - 37°), S steep or U undercut.
- confinement - the degree to which the river channel interacts with terraces and valley walls.

The channel is either:

Ent - entrenched

Conf - confined - in continuous or repeated contact at the outside of meander bends.

Fr - frequently confined

Oc - occasionally confined

Un - unconfined - not touching

N/A - not applicable (e.g. no valley walls exist).

- distribution - numerical code to describe abundance of riparian vegetation

- 1 rare individual plant
- 2 a few scattered individual plants
- 3 a single patch of a species
- 4 several scattered individuals
- 5 a few (small) patches of a species
- 6 several well-spaced patches of a species
- 7 continuous cover of well-spaced individuals
- 8 continuous dense cover with a few openings
- 9 continuous dense cover uninterrupted

- flow character - the surface expression of the water. It is described at the time of survey as:

- p - placed - tranquil, sluggish
- s - swirling - eddies, boils, swirls
- r - rolling - unbroken standing waves
- b - broken - standing waves are broken
- t - tumbling - cascades, usually over large boulders or rock outcrops.

Two terms may be used to describe flow character.

- pattern - the channel pattern for the reach is described in terms of curvature:

- St - straight - very little curvature within the reach
- Sin - sinuous - slight curvature within a belt of less than approximately two channel widths.

Ir - irregular - no repeatable pattern

Im - irregular meander - a repeated pattern is vaguely present
in the channel

Rm - regular meander - a clearly repeated pattern.

Bm - a tortuous meanders - a repeated pattern characterized
by angles greater than 90° .