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SUMMARY DOCUMENT
PRAIRIE CREEK PROJECT
WATER QUALITY AND AQUATIC BIOLOGY

Prepared For

CADILLAC EXPLORATIONS LIMITED
CALGARY, ALBERTA

Prepared By

BEAK CONSULTANTS LIMITED
RICHMOND, B.C.

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1.0 INTRODUCTION

The following sections of this submission (i.e. 2.0 Water Quality and 3.0 Aquatic Biology) are a distillation of information generated from the appended works appearing in Sections A through E. Each report section provides only those data points that apply directly to the above noted topics. Consequently, page numbering, appendex numbering, etc., are not consequtive but remain consistent with the original document.

To faciliate relative completeness and clarity, the table of contents, summary and general introduction of each of the report sections C, D and E have been included. Section A and B reports contain complete submissions.

2.0 WATER QUALITY

Considerable data has been collected on the physical and chemical nature of Prairie Creek system throughout the exploration stages of the project. In 1975 (DIAND), several sets of water quality samples were collected for creeks and streams in the vicinity and downstream of the mine (Appendix 6, Section C). Further intensive sampling was initiated in April 1980 (Table 1, Section D) and again in July (Tables 6, 7, 8, 9, Section C) to ensure that adequate baseline data existed for water quality, mine drainage, sediments and local groundwaters prior to any potential mine operation.

Baseline water quality data indicated that waters of Prairie Creek were slightly alkaline in nature, exhibit moderate water hardness and generally low levels of trace elements (Table 6, Section C).

Groundwaters adjacent to the potential mine site and tailings pond site indicated their dependence upon the type of formation. Waters encountered in alluvial material were not dissimilar to Prairie Creek as would be expected (Table 7, Section C). Mine water quality was found to contain generally low dissolved trace element concentrations (Table 8, Section C).

Stream sediments of Prairie Creek were found to contain low levels of trace elements (Table 9, Section C).

The assessment of potential impacts of the proposed mine on water resources of Prairie Creek (Section C, Chapter 6) indicated that with the planned mitigation measures for treating surface runoff, sanitary sewage and mine waters the environmental effects would be minor. Seepage quantities expected from the proposed tailings disposal area were extremely low given the availability of a highly impermeable liner material for use in construction of the facility. Changes in the water quality of Prairie Creek due to the presence of an operating mine were projected to be minimal.

Subsequent to the impact assessment outlined in Section C, Chapter 6 of this Summary Document, a decision was made not to discharge industrial effluent to Prairie Creek unless the flow in Prairie Creek was at least 20 times as great as the rate of effluent discharge. In addition, it was decided to upgrade the quality of the industrial effluent entering Prairie Creek. Therefore impacts, previously determined as minimal, would be mitigated to an even greater degree.

3.0 AQUATIC BIOLOGY

Ker Priestman & Associates (1980, Section E) identified that site specific information was lacking with respect to the fisheries resource of water courses crossed by the proposed winter road alignment. The literature reported that the Grainger River supported Arctic Grayling, Northern Pike, Longnose Dase, and Longnose Sucker. Personal communications revealed that in the area where the assess road parallels Prairie Creek, Dolly Varden Char and Whitefish were angled. It should be interjected at this point that studies undertaken by Beak Consultants Limited in 1981 discovered that Dolly Varden Char were in fact Bull Trout. Henceforth in this discussion, Bull Trout will be substituted for the original term Dolly Varden Char wherever it appeared in the appended reports.

It was noted that the lower reaches of Prairie Creek within Nahanni Park supported Arctic Grayling, Bull Trout, Round Whitefish, Burbot, White Sucker and Slimy Sculpin. Fish habitat potential was recorded during a helicopter flight in April 1980 (Table 11, Section E). Aquatic invertebrate data from water courses traversed by the access road were negliable (Ker Priestman & Associates 1980, Section E). Major taxonomic orders and a limited number of genera were identified from the lower reaches of Prairie Creek within the Park.

Focusing on the mine/mill site (Ker Priestman & Associates 1980, Section D), again no site specific data were available. Limited fisheries studies on Prairie Creek in Nahanni Park indicated the observation or capture of six fish species (see above).

No fish data were available from Harrison Creek situated near the mine site. Harrison Creek was judged to have low fish potential. Prairie Creek was judged as exhibiting low to moderate habitat potential for fish. These habitat surveys were executed in April 1980.

Very little information regarding aquatic invertebrates in Prairie Creek was available; only personnal communications were reported.

In October 1980, Ker Priestman & Associates submitted the environmental evaluation for Cadillac Explorations Limited (Section C). This document summarizes some of the information presented in Section D and E reports with the additional focus of aquatic studies undertaken in July 1980. Sampling sites were established along the winter road (Figure 20, Section C) and near the mine site (Figure 21, Section C).

Sampling stations near the mine revealed that Harrison Creek did in fact exhibit poor fish habitat as only a few Slimy Sculpin were collected. A limited number of Bull Trout and Slimy Sculpin were recorded from Prairie Creek. Whitefish and Arctic Grayling were recorded near the mouth of Prairie Creek. Along the winter road alignment the Tetcela River appeared to support the most diverse fish population (Section C).

Samples of fish tissue were retained for trace metal analyses. Sample sizes were relatively low due to poor capture. In any event, data revealed that levels of certain metals were below concentrations set by the Canadian Food and Drug Directorate.

Bethic invertebrate studies indicated that population levels in Prairie Creek were low (Appendix 3, Tables 10 through 13, Section C). Larger populations of invertebrates were collected from a tributary of the Ram River and Fishtrap Creek (Appendix 3, Tables 10 through 13, Section C).

To avoid a lengthy reiteration of potential impacts and mitigations, the reader is directed to page 113 (Section C) for coverage of these topics. Additional aquatic studies were undertaken during the winter and spring of 1981 (Figures 1 and 2; Beak, 1981; Section B). In March 1981, sampling for water quality conditions upstream and downstream of the mine site (under the ice) was performed in Prairie Creek. Streams crossed by the winter road alignment were also examined (Table 1, Section B).

Based on observations made during this period it appeared that the Grainger and Tetcela Rivers possessed an overwintering potential due to presence of flowing water under ice and the presence of a relatively high dissolved oxygen concentration. However, all small streams including tributaries of the Grainger and Tetcela Rivers and the Sundog Creek and Ram River tributaries crossed or paralleled by the winter road were completely frozen, and, therefore, exhibited no overwintering potential.

Fishtrap Creek supported free water under the ice but possessed very low dissolved oxygen. Prairie Creek contained flowing water in March 1981 with high dissolved oxygen content and was considered as possessing some overwintering potential particularly in deep pools in downstream reaches.

In April/May 1981, a ground and aerial reconnaisance was made of streams crossed by the winter road which revealed conditions prior and subsequent to break up of these aquatic systems (Plates 1 through 4, Section B). Observations indicated minimal disturbance to aquatic habitat in terms of a temporary increase in suspended sediment loads. However, the duration of this condition was such that no sustained impact would be realized. No barriers to fish movement were in evidence.

Fishery studies in May 1981 (Tables 4 and 5, Section B) indicated that Arctic Grayling utilized the Grainger River, Tetcela River and a Sundog Creek tributary for spawning. Northern Pike also inhabitated the Grainger River. Within the Prairie Creek system, Grayling did not appear to migrate upstream of the Nahanni Park boundary. Trace metal studies revealed low levels of arsenic, copper, lead, zinc and mercury in fish musculature.

Benthic invertebrate data from Prairie Creek and select road crossings, as in 1980, indicated low productivity (Tables 11 and 12, Section B). Numbers of organisms were too low to facilitate reliable interpetations.

In September 1981 further aquatic studies were undertaken in Prairie Creek (Beak, 1981; Section A). Objectives were to quantify spawning habitat of fall spawners to determine relative numbers and distribution of fall spawners and document migration of spawning fish past the mine site.

This investigation revealed the presence of numerous areas that could be considered suitable spawning habitat upstream of the mine site (Figures I through 2F, Section A). On these areas, congregrations of Mountain Whitefish and Bull Trout were observed. Prairie Creek, downstream of the mine site, exhibited only limited potential spawning habitat (no fish congregrations were observed). Where groups of fish were noted, no actual spawning activity was observed. No data were available which suggested migration of potential spawners was occuring past the mine site. It was projected that Bull Trout may exist as a year round resident in Prairie Creek given the presence of potential overwintering habitat in this system.

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PRAIRIE CREEK PROJECT - FALL FISHERIES STUDY, 1981

A Report Prepared For:

CADILLAC EXPLORATIONS LIMITED
CALGARY, ALBERTA

Prepared By:

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SUMMARY

1. Prairie Creek, upstream of the mine site, exhibited several potential spawning habitats on which congregations of fish were observed.

2. Prairie Creek, downstream of the mine site, displayed only limited potential spawning habitat and no fish congregations were observed in this area.

3. Fish congregations consisted of two fall spawning species, mountain whitefish and bull trout; no spawning activity was observed.

4. Gillnetting above and below the mine site suggested that no upstream migration of fall spawners occurred below or near the mine site during this investigation.

5. Bull trout may be a year round resident of Prairie Creek since the system does exhibit overwintering potential.

1.0 INTRODUCTION

Baseline fisheries investigations for Prairie Creek during the fall were requested by Environment Canada and subsequently undertaken in September 1981. Objectives of the fall survey were to:

a) quantify spawning habitat of fall spawning fish in Prairie Creek upstream of the Nahanni Park boundary;

b) determine relative numbers and distribution of fall spawning fish in Prairie Creek; and

c) document upstream movement of fish past the mine site.

2.0 METHODS

The fall survey was conducted by a two man crew from 22 to 26 September 1981. Investigations concentrated on Prairie Creek from the Nahanni Park boundary north to its headwaters in the Manetoe Range and Tundra Ridge. The area was accessed by helicopter with stations situated near the mine site being accessed by road.

Methods employed for the survey are detailed below.

2.1 Spawning Habitat

A study program was designed to determine the areas of potential spawning habitat for fall spawning fish in Prairie Creek within the study area delineated above.

The two fall spawning species known to occur in Prairie Creek are mountain whitefish (Prosopium williamsoni) and Dolly Varden (Salvelinus malma; BEAK, 1981). Recently, the Dolly Varden species complex was split into two species. These species are S. malma and S. confluentus - commonly named Dolly Varden and bull trout, respectively (Cavender, 1978). From the examination of samples from this fall survey, Dr. J.D. McPhail of the University of British Columbia (Vancouver, B.C.) has confirmed that the trout found in Prairie Creek are bull trout, S. confluentus. The Salvelinus species found in the spring by BEAK (1981) are, therefore, likely bull trout. The char species in this report are hence referred to as S. confluentus, or bull trout.

Characteristics of the preferred spawning habitats of mountain whitefish and bull trout in Prairie Creek are not documented in detail; however, it is known that mountain whitefish do not construct redds and require gravel or gravel and cobble substrate (Scott and Crossman, 1973). Much less is known of bull trout, but it can be assumed that spawning requirements described for Dolly Varden apply. Dolly Varden dig in a substrate of clean gravel of 0.6 to 5 cm in diameter in streams of moderate current with waters of at least 0.3 m deep (Morrow, 1980). Therefore, areas of Prairie Creek which exhibit a gravel substrate, moderate current and water depth of 0.3 m or more are reported as areas of potential spawning habitat.

These areas were identified during three helicopter flights at an elevation of approximately 100 m and recorded on topographical maps at a scale of 1:50,000. Characteristics of some of these areas were also verified by ground surveys.

2.2 Distribution and Movements of Fall Spawners

To determine movements of fall spawners in Prairie Creek, five gillnet locations were chosen following an aerial reconnaissance of the study area (Figure 1). Two locations were chosen downstream of the mine site (Plates 3 and 4) but upstream of the park boundary, one at the mine site (Plate 5) and two near the headwaters of Prairie Creek (Plates 7 and 8).

At each location, physical and chemical parameters were collected to provide a general description of the environment and to provide insight into the quality of habitat available for spawning. The parameters measured, together with the method of determination, were as follows:

a) water colour = visual evaluation;
b) water temperature = hand-held mercury thermometer ($\pm$ 0.5°C);
c) substrate particle size = qualitative judgement, classification after Hynes (1970; Table 1);
d) pH = Model OX-9 Hach Kit ($\pm$ 0.2);
e) dissolved oxygen = Model OX-9 Hach Kit ($\pm$ 1 mg/l); and
f) conductivity = Beckman Type RB-5 (microhms/cm at 25°C).

Gillnets were used to intercept spawners. The limited area at suitable gillnetting sites precluded the use of gang nets of variable size mesh. The mesh size and length of gillnets used are presented in Table 3.

Electroshockers (Smith-Root Type VII-A and VIII) were used in an attempt to determine the upstream extent of juvenile fish rearing. However, due to malfunction of both electroshockers limited sampling was undertaken at only one location.

Concurrent with the spawning habitat study, aerial reconnaissance by helicopter was conducted to locate congregations of fish present on, or enroute to spawning areas. Three helicopter surveys were flown at an elevation of approximately 100 m. Two observers wearing polaroid sunglasses made independent counts and recorded the location of fish on working copy maps. Photographs (35 mm) were taken of congregations of fish in an effort to determine the number of fish in each group located. This was unsuccessful due to surface disturbance caused by the helicopter. Where large congregations of fish were seen, the area was investigated to determine the presence of:

a) redds or bull trout defending a spawning territory;
b) spawning behaviour; and/or
c) ripe, partially-spent and spent trout or whitefish.

Gillnets were set in two areas (PC-3 and PC-4) where congregations of fish were observed. Fish collected were identified to species and enumerated. The reproductive condition of individuals was also noted with judgements based on size of the fish, presence of spawning colouration and the ability of the collector to cause reproductive products to be expressed upon the exertion of light pressure on the abdomen of the fish. All captured fish were retained and frozen for life history studies.

Catch per unit effort (C.P.U.E.) was determined for gillnetting and electroshocking; calculated by using the following formula (Table 3):

$$\text{Electroshocker C.P.U.E.} = \frac{\text{total no. fish caught or identified}}{\text{total no. minutes electrofishing}} = \text{fish/min}$$

$$\text{Gillnet C.P.U.E.} = \frac{\frac{\text{total no. fish caught}}{\text{total length of net (m)}}}{\text{soak time (1 hr)}} = \text{fish/m/hr.}$$

Life history data are summarized in Appendix I. Codes used in the summaries are as follows:

Species: BT - bull trout; RMWF - mountain whitefish
Gear: GN - gillnet; ES - electroshocking
Age: Sc - Scale; Oto - Otolith; R - regenerated scale
Sex: M - male; F - female; J - juvenile; A - adult
Maturity:

Female	Male	Condition	As described by Kesteven (1960)
1	6	Immature	Stage I
2	7	Maturing	Stage III and IV
3	8	Mature - Ripe	Stage V and VI
4	9	Spawning	Stage VII
5	10	Spent	Stage VIII

For all preserved fish the following features were recorded:

a) fork length;
b) weight;
c) sex;
d) maturity;
e) gonad weight and width of mature males;
f) egg size and counts of mature females;
g) age by scales and/or otoliths depending on species; and
h) qualitative stomach content analysis.

3.0 RESULTS AND DISCUSSION

3.1 Spawning Habitat

Results of the aerial investigation for the quantification of potential spawning habitat of fall spawning species in Prairie Creek are presented in Figure 2 (A-F). These areas were divided into two broad categories, areas of good and limited potential spawning habitat. Areas of good potential spawning habitat were only found upstream of the mine site (Figure 1). Those were characterized by stream sections of more than 100 m long which had pool/riffle development or moderately flowing channel areas composed, in part, of gravel substrate and exhibiting depth in excess of 0.25 m. Spawning habitats with limited potential were mainly located downstream of the mine site. These areas were characterized as less than 100 m long, usually containing only one large pool with rapids above and below the pool, with suitable gravel substrate limited to small patches among much coarser substrate including boulder size materials.

Typical stream habitat downstream of the mine site is illustrated in Plate 1. Prairie Creek in this section exhibited a trellis drainage pattern, a deep U-shaped valley with steep mountains paralleling the creek on both sides. In several areas the creek occupied the whole valley flat. The creek gradient was steep, causing fast-flowing character with numerous white rapids in its course and very little pool development. Substrate on the banks and creek bed (Plate 2) were composed mainly of boulders, cobble and pebbles with very little gravel. Only thirteen areas which displayed some gravel substrate, pool development or channels with moderate flows were identified from the mine site downstream to the park boundary (Figure 2). These areas were judged to provide only limited potential spawning habitat. Plate 3 illustrates a typical pool in this region while Plates 4 and 5 illustrate channels with moderate flowing waters. The substrate composition at these sites are presented in Table 2.

Upstream of the mine site several areas where the valley broadens and the stream exhibits braided channels, glacial outwash plain and alluvial fans were evident. This is illustrated by the frontisepiece and Plate 6. The substrate in these areas was composed mainly of pebbles and gravel. The stream also exhibited pool/riffle development as shown in Plates 7 and 8 and many of these present good potential spawning habitat. Eleven such areas were identified upstream of the mine site (Figure 1), including two locations in the eastern branch of Prairie Creek, one of which contained a congregation of about 50 fish. In the western branch of the creek a large potential spawning area (number 24) was located near the headwaters (Plate 8). This area was located in a floodplain and contained good spawning substrate (Table 2), and a large congregation of about 200 fish. Fish congregations were also recorded downstream of this site, especially at Site 23. This site is shown in Plate 7 and illustrates good pool development and spawning substrate.

The area upstream of Site 24 near the headwaters of Prairie Creek was also investigated. The system at this location is much more braided and also shallower. Areas with extensive gravel substrate exist; however, no fish were observed. Possibly low water levels may have precluded the upstream migration of fall spawners to this reach.

3.2 Distribution and Movements of Fall Spawners

Physical and chemical data collected at the five gillnetting locations are presented in Table 2. Water quality at these sampling sites was similar, but substrate size and composition did vary. Creek waters were clear during the survey and allowed good visibility during aerial and ground reconnaissance activities.

Three helicopter surveys of Prairie Creek revealed that large congregations of fish were located upstream of the mine site. Species could not be differentiated from the air due to similarity of the dorsal coloration of bull trout and mountain whitefish at this time of year. Approximately 100 fish were noted in area 23 and 200 fish in area 25, while 50 were observed in area 18 on the eastern branch of the creek. All fish groups were near potential spawning habitats. Downstream of the mine site only one fish (bull trout) was seen. Similarly, fish sampling (i.e. electroshocking, gillnetting and angling) downstream from the mine site by Environment Canada (Environmental Protection Service of Yellowknife, N.W.T.) a week prior to this survey, yielded very low fish catches (D. Sutherland, pers.

comm.). According to D. Sutherland, less than 10 juvenile fish were captured. A large bull trout (about 2 kg), judged to be green, was taken by angling.

Of the five gillnetting stations, two were located where fish congregations had been observed. Results of this netting program are presented in Table 3. The catch revealed the presence of two species, mountain whitefish and bull trout, with the former being more abundant. Whitefish were in spawning condition with males having highly developed nuptial tubercles on their lateral margins and, when handled, were extremely rough to the touch. Milt was expressed from some males upon slight pressure on the abdomen, while eggs were expressed from only one female. No reproductive products could be expressed from any of the bull trout captured. However, the trout were believed to be near or in spawning condition as they exhibited some of the spawning coloration and morphological changes which Morrow (1980) describes for breeding Dolly Varden, although the coloration in the lower sides and belly was not as bright as reported by Morrow (1980). The pectoral, pelvic and anal fins did exhibit whitish leading edges, but no swollen or extended ovipositor or pronounced kype was noticed on any fish. J.D. McPhail (pers. comm.) reports that it is unlikely to catch ripe or spawning bull trout since the species displays rapid development and release of reproductive products. This fall survey may have been initiated too early to capture spawning bull trout.

Gillnet efforts confirmed the absence of fish made by aerial observations downstream of the mine site. No fish were caught in a 94 hour set. This suggests that there was little or no fish movement upstream of the park boundary or past the mine site during this investigation. It is not known if the fish groups observed above the mine site are the result of a fall migration of fish from the South Nahanni River, or if they are resident fish or fish which entered Prairie Creek in the spring then congregated in these headwater areas to spawn. Mountain whitefish spawning behaviour or migration patterns are unknown in this region (McPhail and Lindsey, 1970). Similarly, spawning movements of stream-resident bull trout are not well known (Morrow, 1980). Stream resident Dolly Varden in Alaska are commonly found near the headwaters of systems they inhabit. The species may possibly disperse to larger parts of the stream in summer and overwinter in deep pools or move downstream to lower reaches of the system. To date, such stream-resident fish are not known to enter major rivers (Morrow, 1980). It is possible that bull trout follow this Alaskan Dolly Varden pattern of distribution and reside in Prairie Creek year round, since Prairie Creek does have overwintering potential (BEAK, 1981).

Female mountain whitefish spawners ranged from 213-340 mm fork length, 107.7-411.4 g weight, and were 4-7 years old. Male spawners ranged from 219-285 mm fork length, 107.5-253.9 g weight, and were 4-6 years old. The dominant age group for both female and male spawners was 5 years (Table 4).

Scott and Crossman (1973) report mountain whitefish average fecundity to be 11,000 eggs per kilogram of female. The mean fecundity of mountain whitefish captured in this study was 11,470 eggs per kilogram of female. The average length of mountain whitefish in each age class captured fall well within their predicted ranges (Scott and Crossman, 1973).

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TABLES

TABLE I: Terminology for Substrate Particle Size Analysis*

Particle Size	Size Range mm
Boulder	>256
Cobble	64 - 256
Pebble	32 - 64
	16 - 32
Gravel	8 - 16
	4 - 8
	2 - 4
Very Coarse Sand	1 - 2
Coarse Sand	0.5 - 1
Medium Sand	0.25 - 0.5
Fine Sand	0.125 - 0.25
Very Fine Sand	0.0625 - 0.125
Silt	0.0039 - 0.0625
Clay	<0.0039

* From Hynes (1970)

TABLE 2: Fall Physical and Chemical Data from Sampling Locations on Prairie Creek above Nahanni National Park Boundary, 1981

Parameters	Stations PC-1	PC-2	PC-3	PC-4	PC-5
Date	22/09/81*	22/09/81	24/09/81	26/09/81	26/09/81
Air Temperature (°C)	7	6	1		
Water Temperature (°C)	3	4	1.5		
Water Colour	Clear	Clear	Clear	Clear	Clear
pH	7.8	7.8	7.9		
D.O. (mg/l)	12	11	11		
Conductivity (µmhos/cm)	360	395	370		
Substrate (%)					
Boulder	5	5			
Cobble	25	25	20	20	20
Pebble	50	40	40	40	40
Gravel	20	30	40	40	40
Sand					
Silt					

* 22/09/81 = 22 September 1981

TABLE 3: Fish Capture Results and Catch Per Unit Effort (C.P.U.E.) for Fall Survey of Prairie Creek, 1981

Station	Gillnet				Electroshocking		Catch		
	Mesh Size (mm)	Length (m)	Hrs	C.P.U.E. (fish/m/hr)	Distance (m)	C.P.U.E. (fish/min)	BT	RMWF	Total
PC-1	89	4.6	94.16	0.0	-	-	0	0	0*
PC-2	89	4.6	89.75	0.0	-	-	0	0	0
PC-3	51	15.0	48.25	0.076	-	-	3	52	55
PC-4	89	3.0	41.16	0.061	300	0.27	7	2	9
PC-5	38	15.0	45.5	0.0	-	-	0	0	0
						Total	10	54	64

* One Bushy-Tailed Wood Rat, Neotoma cinerea drummondii (Banfield, 1974), captured.

TABLE 4: Life History Characteristics of Fish Captured in the Prairie Creek Fall Survey, 1981.

Species	Age (yrs)	Number		Length (mm)		Weight (gm)		Fecundity*	
		Male	Female	Range	Mean	Range	Mean	Range	Mean
RMWF	7	0	2	301-340	320.5	281.9-411.4	346.7	3250	-
	6	1	2	232-254	-	148.8-179.2	-	1330-1380	1355
	5	15	15	213-310	251.6 ± 22.2	107.7-307.6	175.8 ± 46.5	1070-5630	2297 ± 1286
	4	7	8	214-277	240.5 ± 20.5	107.5-199.9	156.0 ± 39.4	1080-3390	1853

* Partially spawned females (Maturity = 4) were not included in fecundity calculations.

FIGURES

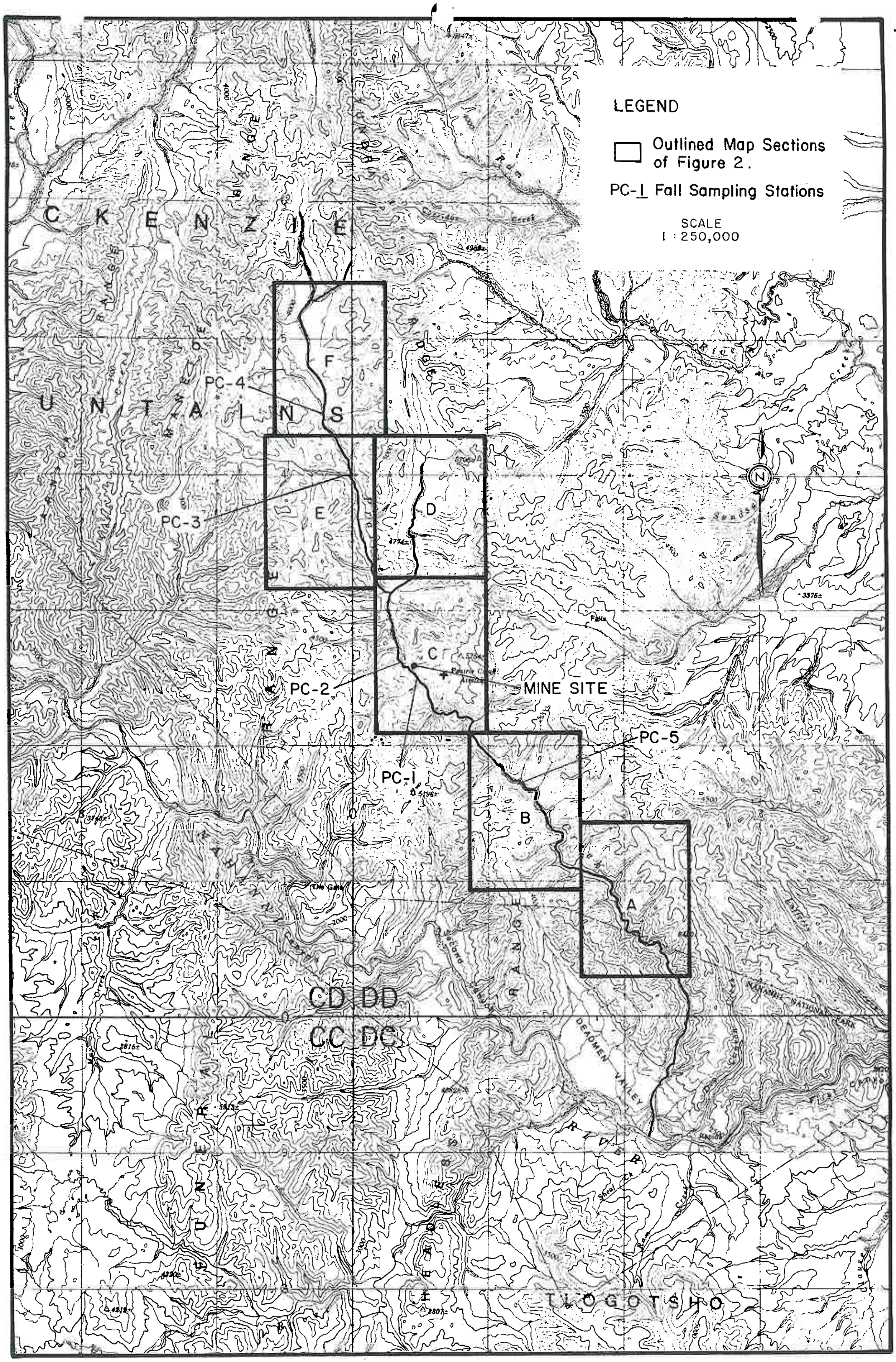

FIGURE 1 : Prairie Creek Overview Map.
(Revised Feb. 1982)

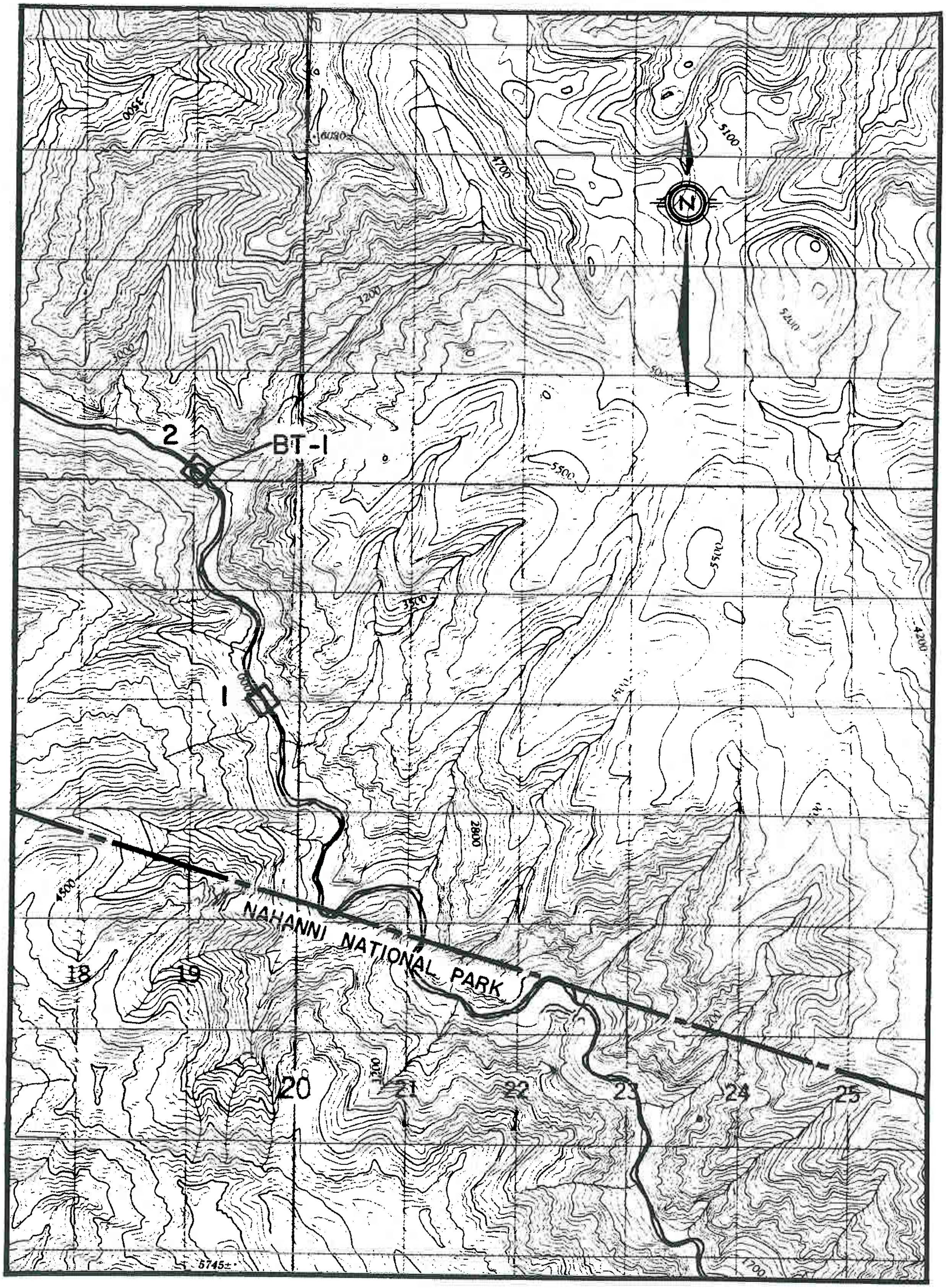

FIGURE 2A : Prairie Creek Section A .

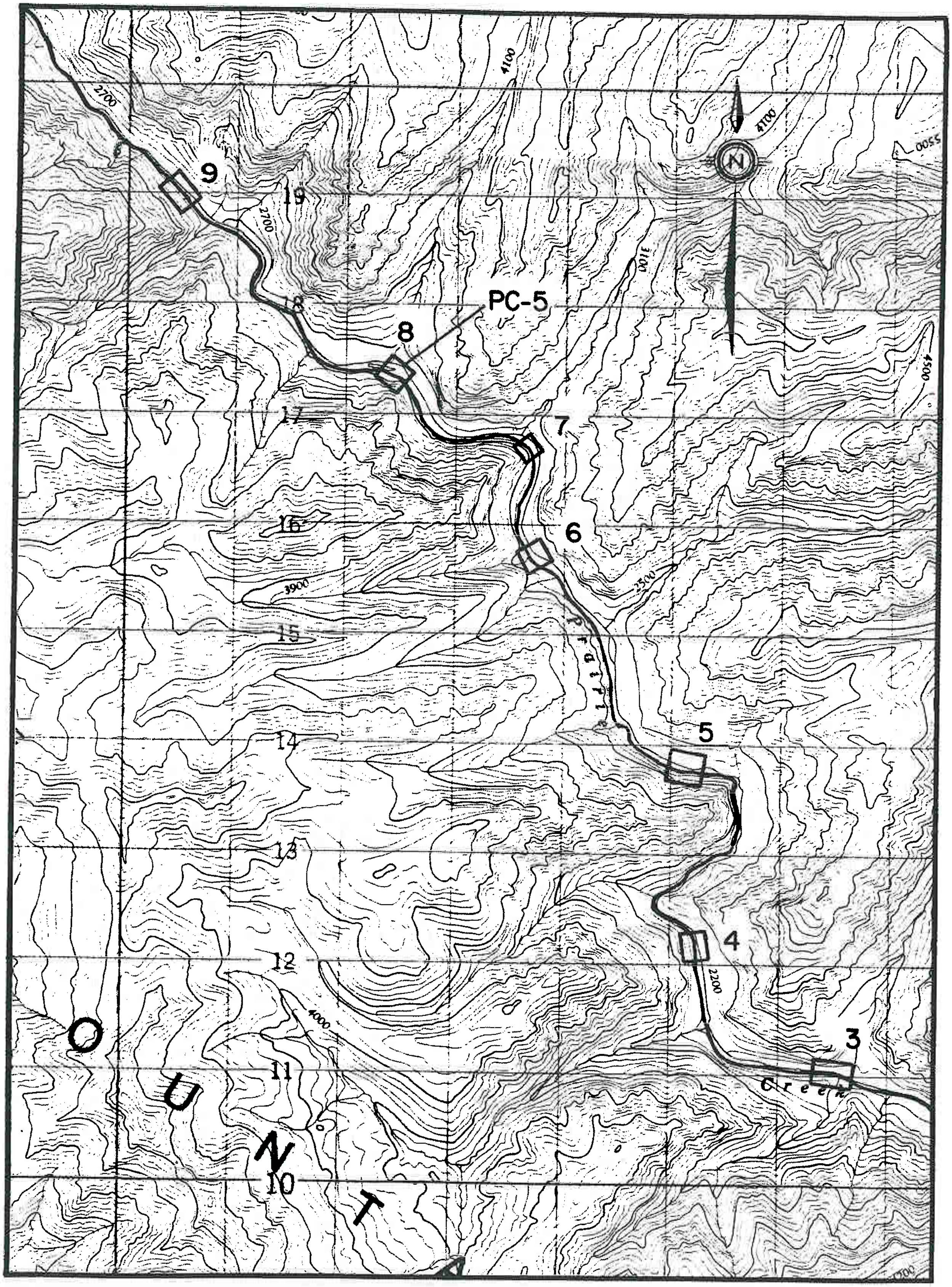

FIGURE 2B : Prairie Creek Section B .

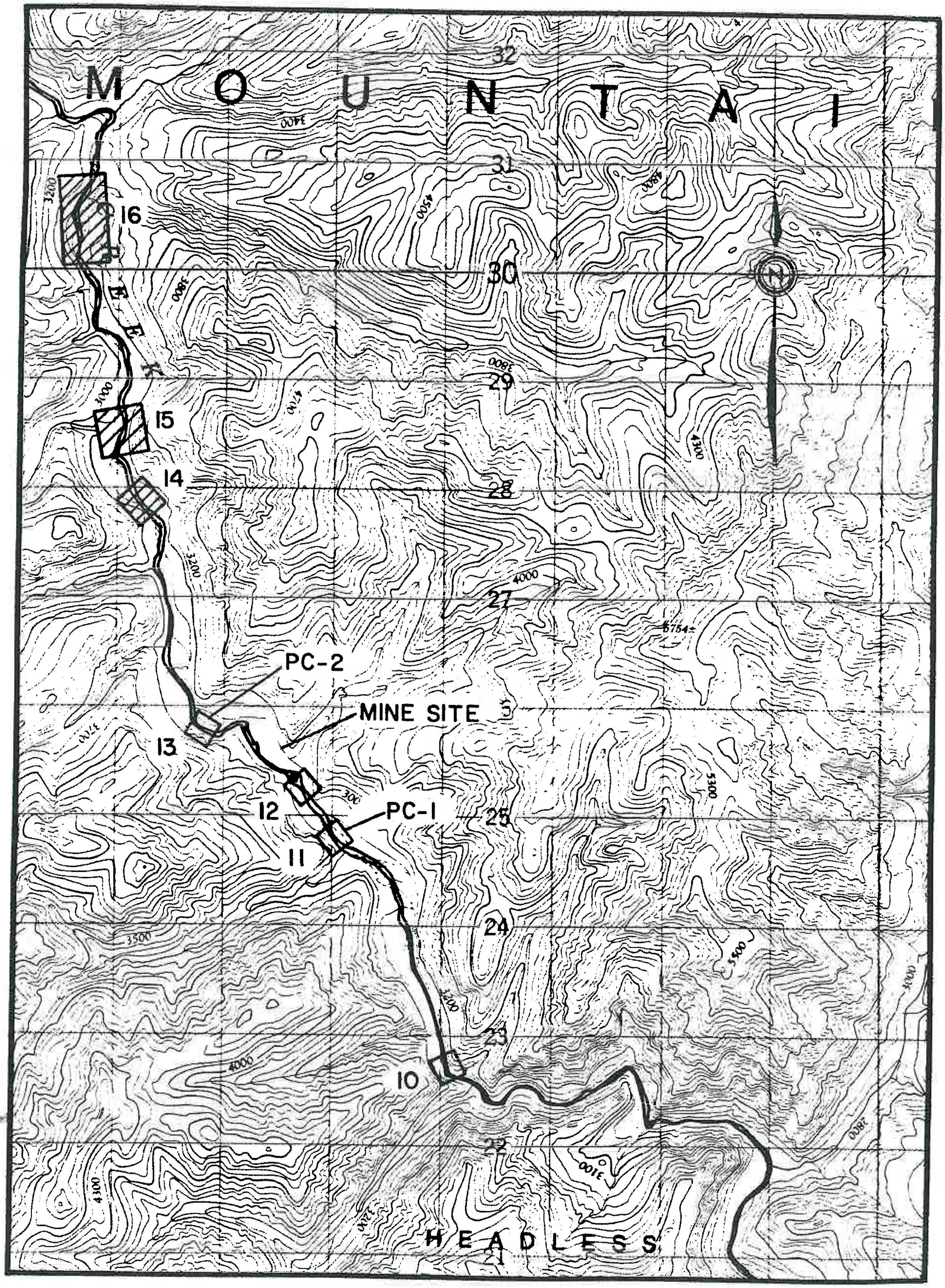

FIGURE 2C : Prairie Creek Section C. (Revised Feb. 1982)

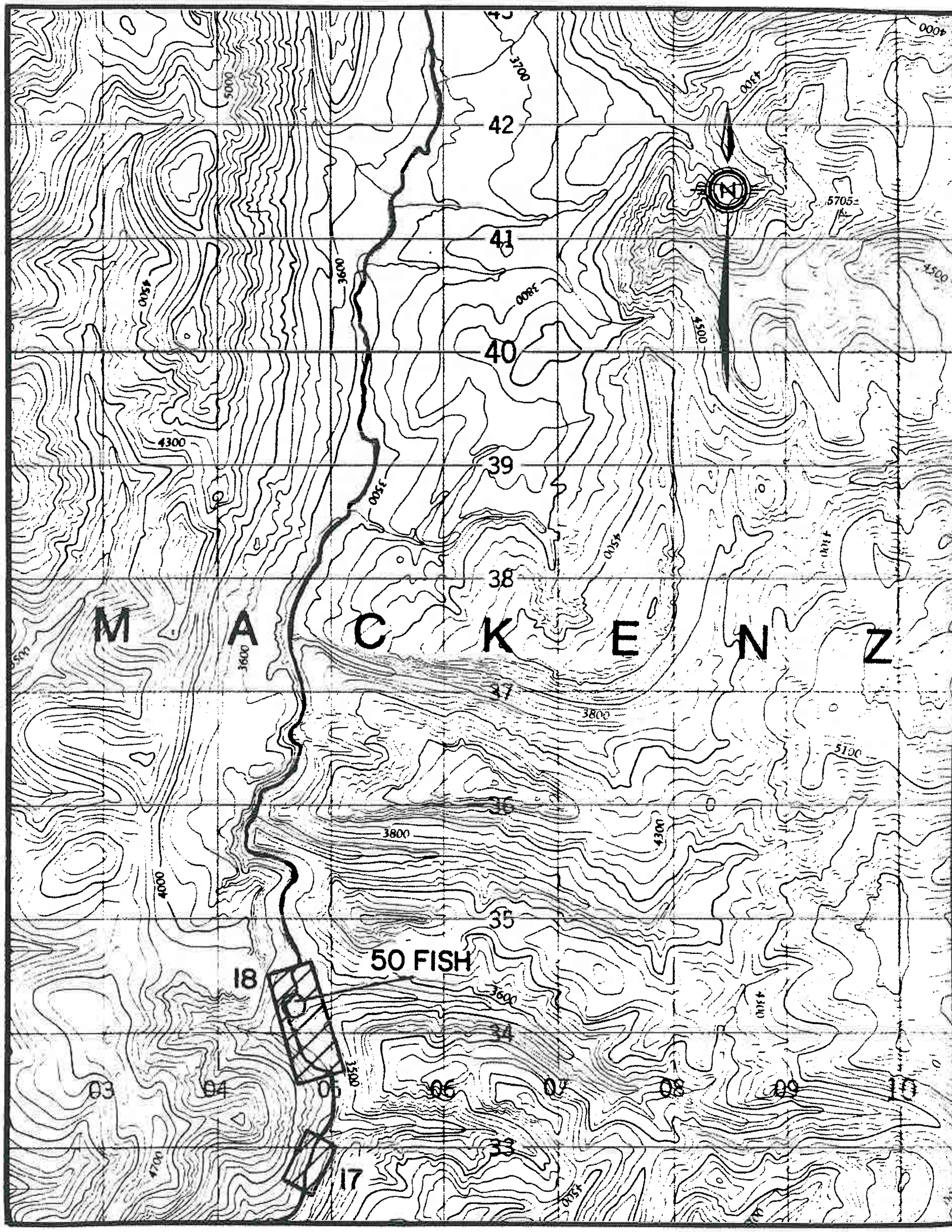

FIGURE 2D : Prairie Creek Section D.

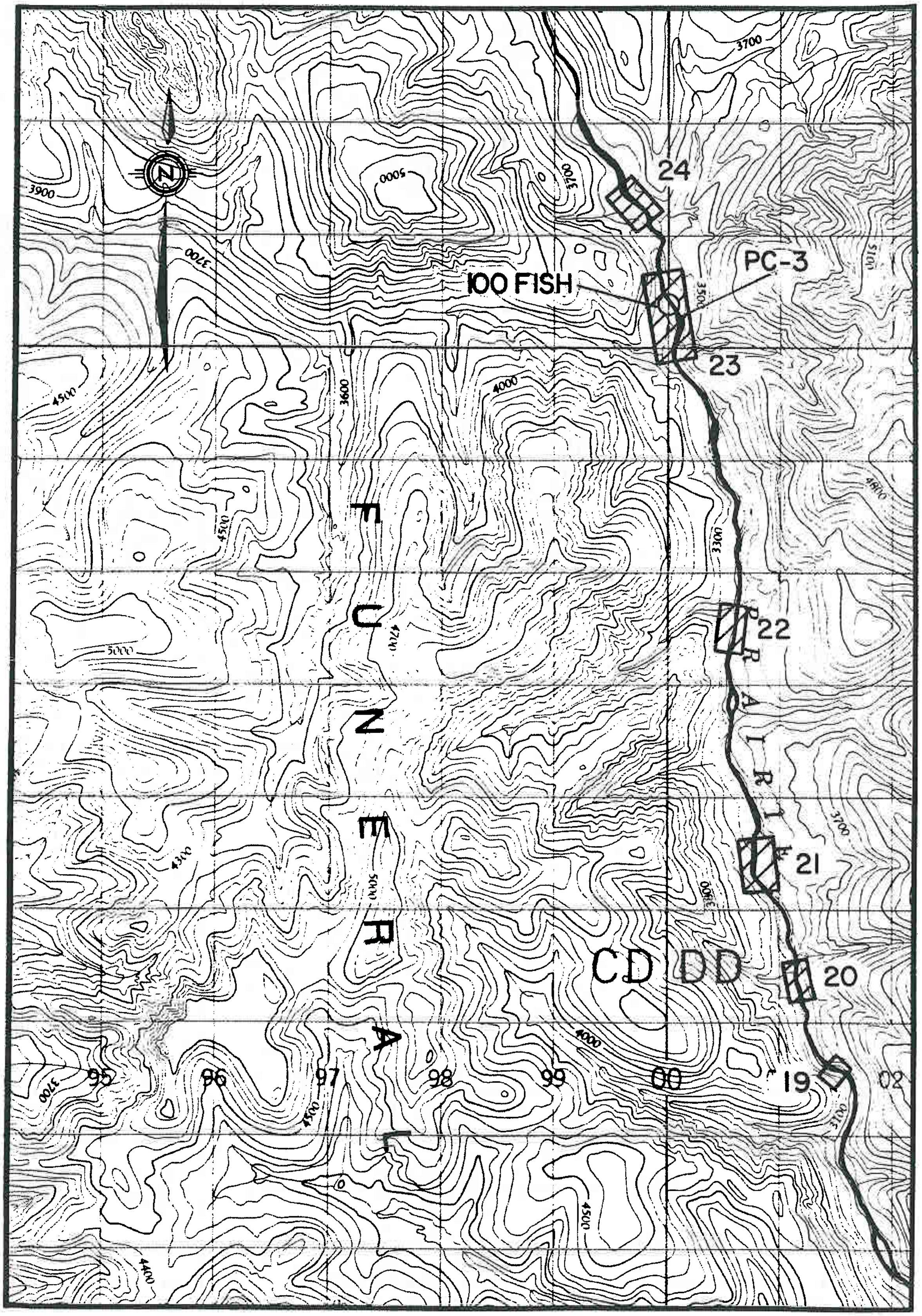

FIGURE 2E : Prairie Creek Section E .

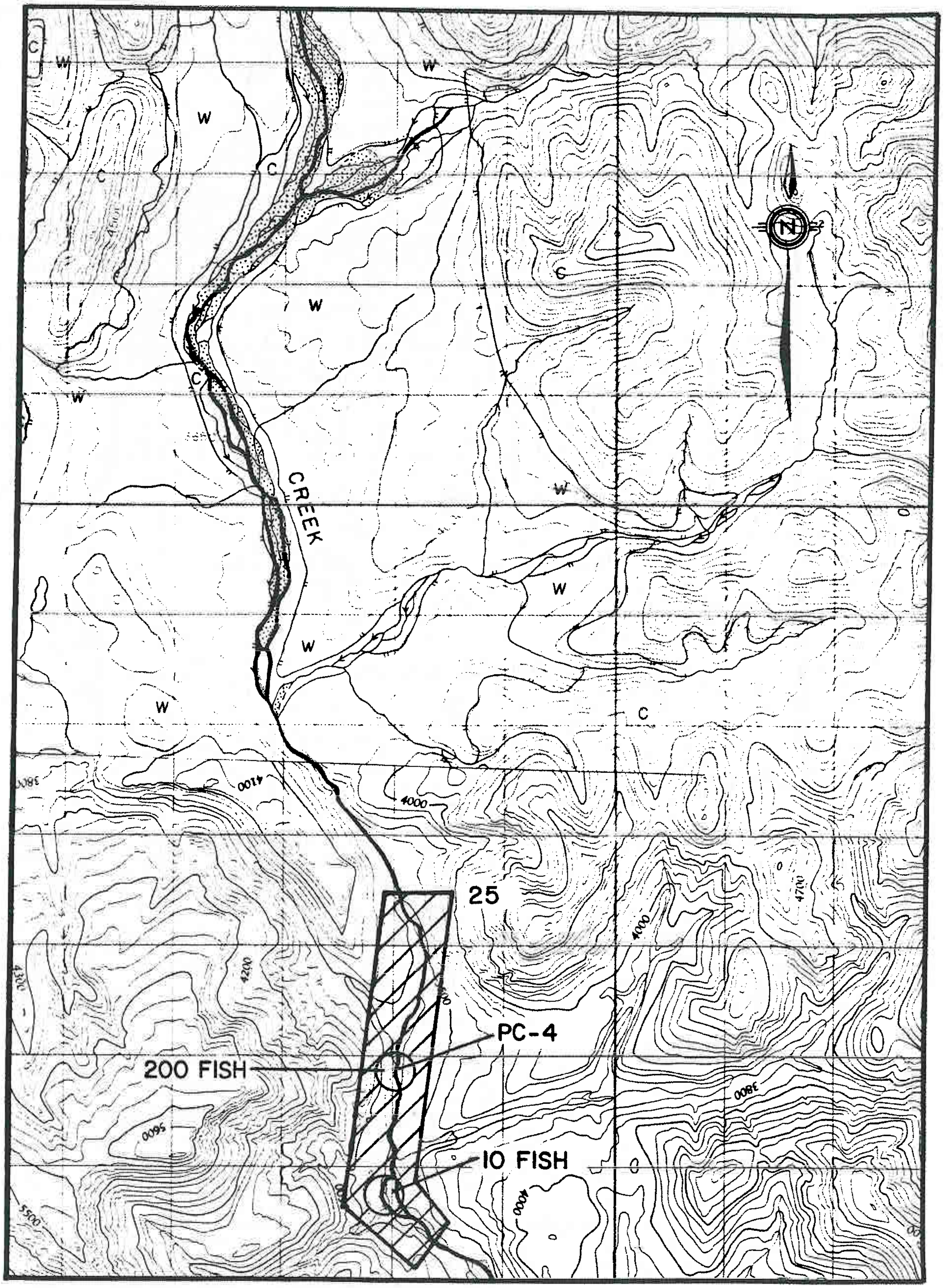

FIGURE 2F: Prairie Creek Section F.

PLATES

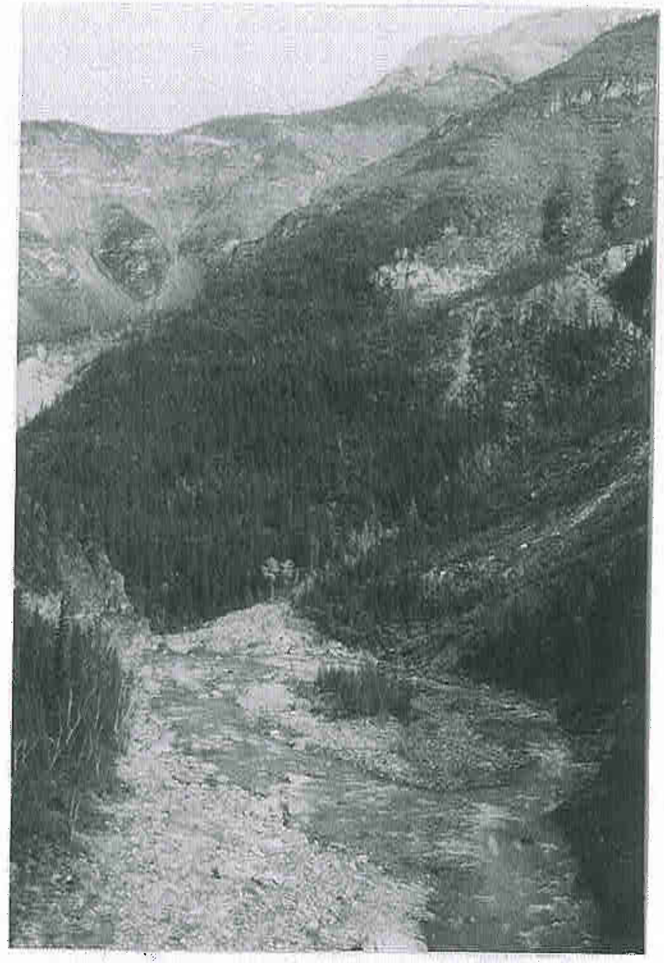

PLATE 1: Looking south on Prairie Creek below mine site near PC-5. September 1981

PLATE 2: Looking south on Prairie Creek below mine site near PC-5. September 1981

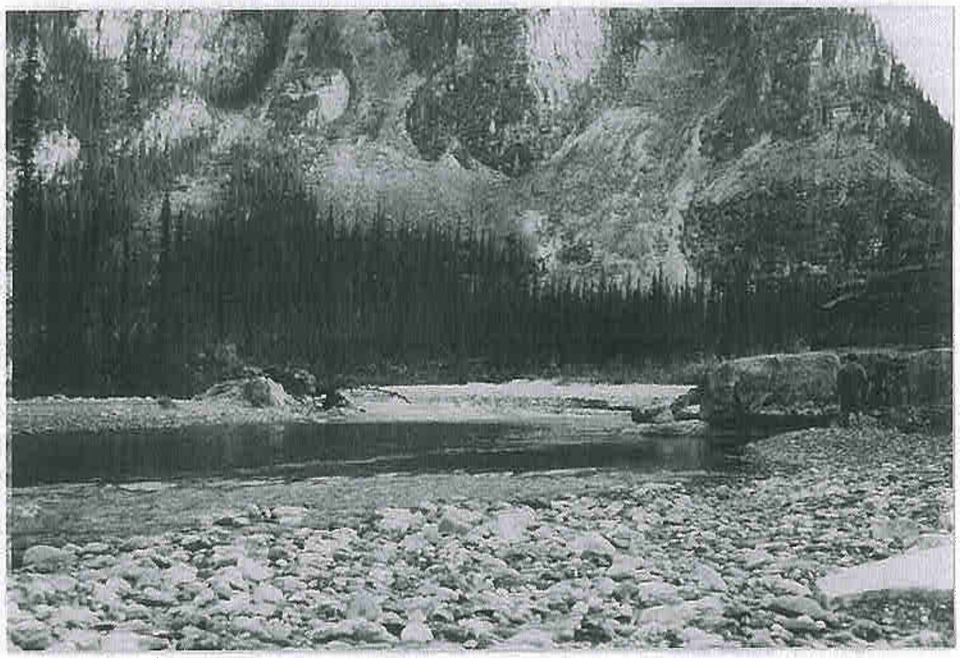

PLATE 3: Looking north on sampling location PC-5, September 1981

PLATE 4: Looking east on sampling location PC-1, September 1981

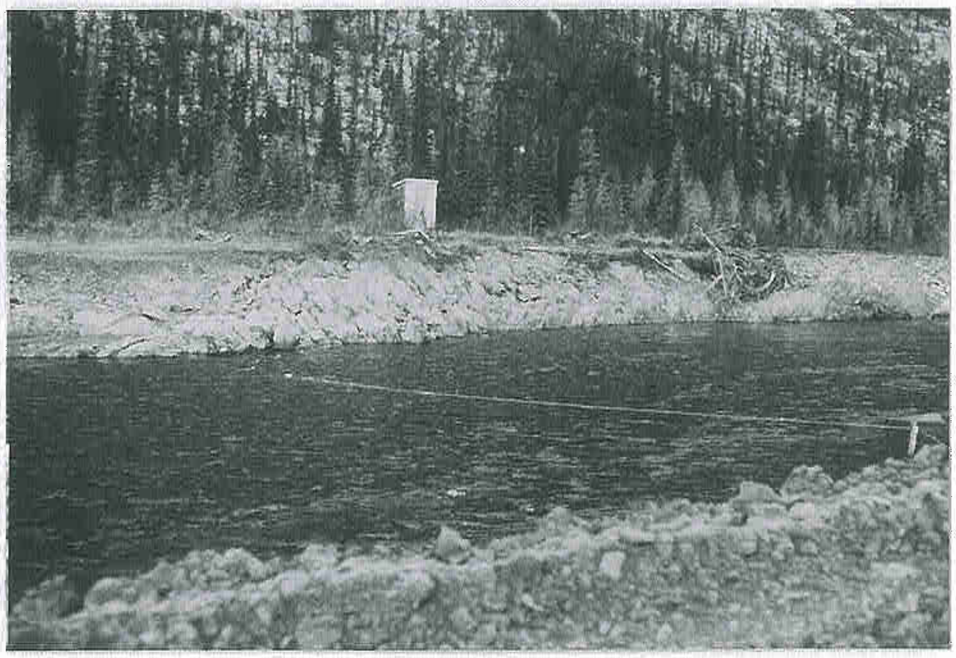

PLATE 5: Looking west on sampling location PC-2, September 1981

PLATE 6: Looking north in area near headwaters of Prairie Creek, September 1981

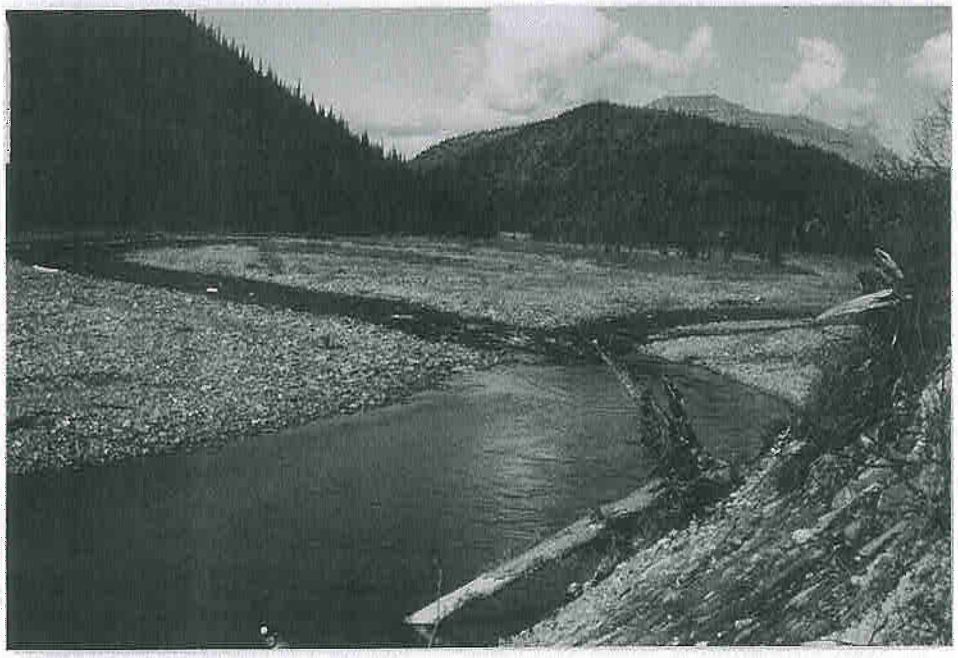

PLATE 7: Looking north on sampling location PC-3, September 1981

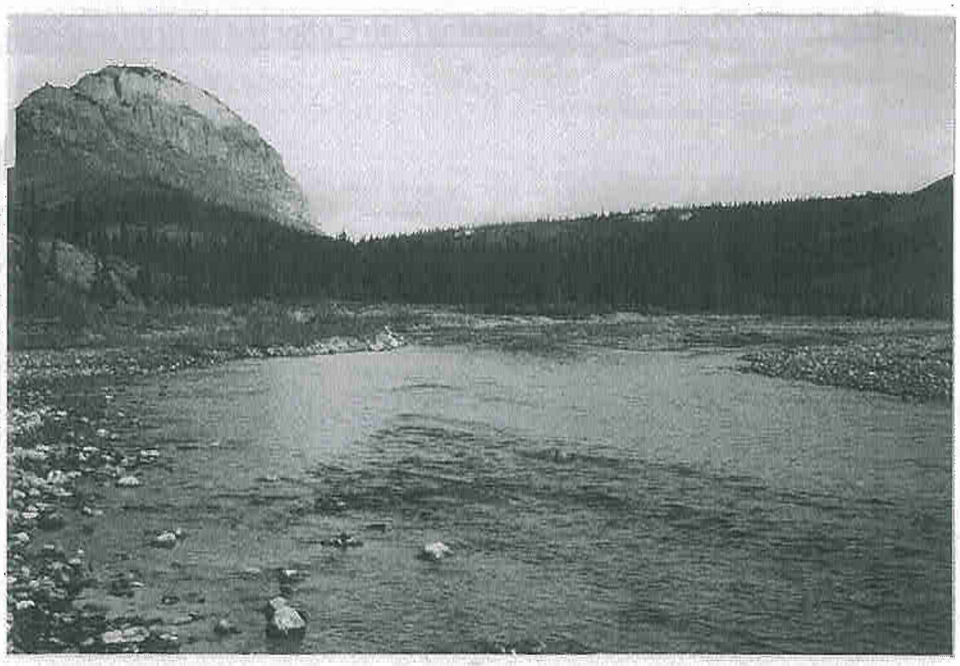

PLATE 8: Looking north on sampling location PC-4, September 1981

APPENDIX I

Life History Data for Fall Spawning Fish Collected in Prairie Creek, N.W.T., 1981

APPENDIX I: Life History Data for Fall Spawning Fish Collected in Prairie Creek, N.W.T, 1981.

Station Date	Species	Gear	Fork Length (mm)	Weight (g)	Age: Scale	Age: Otolith	Sex	Maturity	Eggs: Size (mm)	Eggs: Number	Gonad: Weight (g)	Gonad: Width (mm)
PC-3 24/09/81	RMWF	GN	340	411.4	7		F	4*	2.7	-	-	-
	RMWF	GN	235	152.5	5		M	8	-	-	10.4	22
	RMWF	GN	246	190.9	5		F	3	2.9	2100	31.6	22
	RMWF	GN	247	193.1	5		F	3	2.8	3400	39.4	34
	RMWF	GN	242	174.8	4		F	4	2.4	950	18.4	12
	RMWF	GN	223	132.7	5		M	9	-	-	5.0	10
	RMWF	GN	266	180.0	5		M	8	-	-	9.8	18
	RMWF	GN	262	193.1	5		M	8	-	-	15.5	25
	RMWF	GN	243	153.3	4		M	9	-	-	8.3	12
	RMWF	GN	277	247.2	4		F	3	2.4	3390	41.2	30
	RMWF	GN	310	307.6	5		F	3	2.8	5630	73.1	36
	RMWF	GN	236	122.8	4		M	8	-	-	9.1	21
	RMWF	GN	240	172.2	5		M	8	-	-	11.5	19
	RMWF	GN	224	156.1	4		F	4	2.1	1090	16.9	16
PC-3 25/09/81	RMWF	GN	232	148.8	6		F	3	2.4	1380	10.6	14
	RMWF	GN	240	149.6	5		F	3	2.0	1340	12.4	20
	RMWF	GN	256	160.1	5		M	7	-	-	9.0	22
	RMWF	GN	234	141.7	5		M	7	-	-	7.5	13
	RMWF	GN	250	149.4	5		M	8	-	-	11.7	20
	RMWF	GN	213	107.7	5		F	3	2.3	1070	11.5	15
	RMWF	GN	236	157.6	5		F	3	2.8	1430	16.0	23
	RMWF	GN	278	192.0	5		M	8	-	-	8.8	16
	RMWF	GN	214	129.9	4		F	3	2.5	1090	13.3	20
	RMWF	GN	216	125.8	4		F	1	-	-	-	-
	RMWF	GN	269	199.9	4		M	8	-	-	10.9	18
	RMWF	GN	232	130.4	4		F	3	2.2	1080	12.1	17
	RMWF	GN	245	169.3	R		M	8	-	-	10.9	18
	RMWF	GN	260	185.5	R		M	8	-	-	6.4	18
	RMWF	GN	234	143.3	5		M	8	-	-	6.4	21
	RMWF	GN	225	117.3	5		F	1	-	-	-	3
	RMWF	GN	233	152.2	5		F	3	2.2	1150	5.4	13
	RMWF	GN	247	179.2	6		F	3	3.0	1330	18.3	26
	RMWF	GN	228	129.8	5		M	8	-	-	7.6	18
	RMWF	GN	257	185.6	5		F	3	2.2	1900	.7	25
	RMWF	GN	301	281.9	7		F	3	2.6	3250	44.3	30
	RMWF	GN	236	132.4	5		F	3	1.7	1420	7.0	17
	RMWF	GN	269	186.9	5		F	3	1.3	2370	34.0	23
	RMWF	GN	254	159.3	6		M	8	-	-	8.5	20
	BT	GN	287	255.3								
	BT	GN	291	290.6								
PC-3 26/09/81	RMWF	GN	260	178.4	4		F	4	1.5	-	6.6	8
	RMWF	GN	219	107.5	4		M	8	-	-	3.6	17
	RMWF	GN	244	132.3	5		M	8	-	-	5.6	11
	RMWF	GN	255	171.2	5		F	3	2.0	1730	16.7	15
	RMWF	GN	269	209.2	5		M	8	-	-	18.3	28
	RMWF	GN	233	140.4	4		M	8	-	-	4.7	24
	RMWF	GN	255	182.2	4		M	8	-	-	13.6	22
	RMWF	GN	286	282.5	R		F	3	2.5	3640	51.2	36
	RMWF	GN	266	194.2	4		F	4	2.2	1990	32.8	27
	RMWF	GN	262	210.5	5		F	3	2.3	2090	32.1	25
	RMWF	GN	294	294.2	5		F	3	2.2	3270	55.4	32
	RMWF	GN	273	205.3	5		M	9	-	-	11.2	18
	RMWF	GN	228	119.6	4		M	8	-	-	5.0	10
	RMWF	GN	248	177.6	5		F	4	2.4		19.5	18
	BT		241	134.3	6		M	7	-	-	-	1
PC-4 24/09/81	RMWF	GN	285	253.9	5		M	8	-	-	27.2	26
	BT	GN	286	252.9	-		M	6	-	-	-	-
	BT	GN	348	427.7	-		M	7	-	-	1.0	0.5
	BT	GN	326	345.2	-		M	7	-	-	1.2	0.7
PC-4 25/09/81	RMWF	GN	227	118.2	4		M	8	-	-	4.5	16
	BT	GN	357	439.1	-		M	-	-	-	1.0	4
	BT	GN	316	373.4	-		F	-	0.8	-	3.2	10
	BT	ES	325	341.1	-		F	-	1.0	-	5.4	14
	BT	ES	334	435.4	-		F	-	1.0	-	7.8	16

* partially spawned females.

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PRAIRIE CREEK PROJECT - FISHERIES AND INVERTEBRATE STUDIES, 1981

A Report Prepared For:

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CALGARY, ALBERTA

Prepared By:

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