LIMNOLOGICAL INVESTIGATION OF SELECTED KOOTENAY MOUNTAIN LAKES

SUMMER 1981

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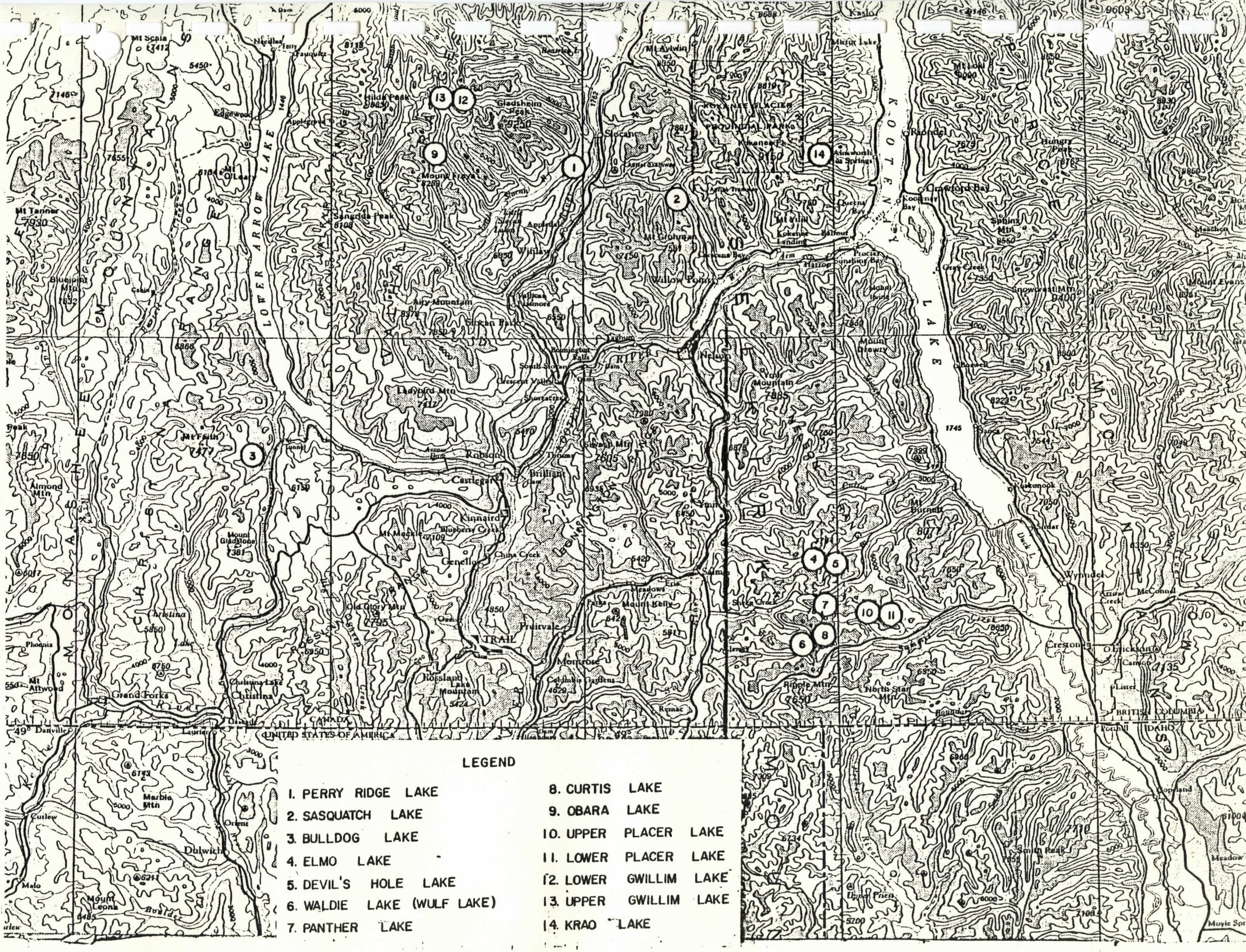
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Willow Point
Balfour
CANADA
UNITED STATES OF AMERICA
BRITISH COLUMBIA
IDAHO

PROJECT GOALS

This report contains basic limnological, biological and geomorphological information obtained by studying selected Kootenay mountain lakes. This study continues the work done in the summers of 1977, 1978 and 1980, that was contained in the reports "Limnological Investigation of Selected Kootenay Alpine Lakes" and "Limnology of Selected Kootenay Alpine Lakes" and"Limnological Investigation of Selected Kootenay Mountain Lakes", respectively.

The data collected on the lakes studied is significant in a number of ways. Some of these are:

A) From the basic information gained - appraisal of the potentiality for fish stocking can be gained. The Fish and Wildlife Service has agreed to stock those lakes which warrant it on the basis of the finished report. The added attraction of a sporting fishery would do so much in broadening the interest base of the lakes as a recreational resource.

B) Base data gained could be a starting point for future biologic/limnologic studies by Selkirk College Wildland Recreation students, Biology students or Fish and Wildlife Personnel. For example: changes in water quality due to pollution from Forestry practices; relationship between fish survival in mountain lakes and physical parameters outlined, etc.

C) Basic information about the mountain lakes could be used in teaching Limnology, Wildlife Biology and Ecology in Regional Post-Secondary Institutions.

D) Basic information would be of value to: any government resource agency or private company which may become concerned with Environmental impact, statements, or economical analyses of areas in multiple use/single use conflicts, and in adding to the present inventory of information available for larger lakes.

E) It would add to our total knowledge of our local resources and by its example stimulate more research activity directed at understanding our local environment.

F) Publication of the Access Route Descriptions and Hiking Time might better encourage more recreational use of these areas - and relieve pressure on overly crowded local parks.

INTRODUCTION

This project is a continuation of the work done by Louise Richards and Anne Quaedvlieg in 1977, Abram Davis and John MacDonald in 1978, and Bob Anderson, Judy Pryce, and Irene West in 1980. The present research team, like that of 1980, was composed of three members as the lakes could be studied with greater efficiency and speed. The layout of the report is similar to that of 1980. Two additions were made to the "Physical and Chemical Data" section - the littoral area, as suggested by the Fish and Wildlife Department, and the total volume of the lakes. We have also included a map showing the location of all the lakes that have been surveyed since this project first began and a summary chart of these lakes.

We tried to keep the "Project Goals" in mind when we selected the lakes. Although we did survey a number of lakes that were "fishless", we purposely studied several known fish lakes to provide information for local sportsmen. The lakes were also chosen for accessibility and the time of year. Low level lakes had to be surveyed at the beginning of the summer as the higher lakes were still iced over.

This summer we ran into a number of difficulties:

1. Donut Lake (like Johnianne Lake - both are near Rockslide Lake surveyed in 1980) turned out to be a slough.
2. Although we found our way to Bulldog Lake this year, we had to bushwack through a lot of deadfall around the lake.
3. Only five of our trips were endowed with sunshine. For the rest we had at least some rain, which makes sitting in the dinghy rather uncomfortable.
4. On our first attempt to survey Curtis Lake it was iced over and that was in the middle of July!

We all agree that our favorite trip was into the Gwillim Lakes in the beautiful Vahallas.

This project was a great learning experience for us and it enabled us to see more of the beautiful West Kootenays.

ACKNOWLEDGEMENTS

This project is funded by a grant from the Youth Employment Program of the B.C. Government.

Without the help and support of a number of individuals and institutions, this project would have been impossible.

Many thanks to Doug McBride for securing much needed funds, helping gain access as well as loaning his vehicle for access to the lakes, being available for consultation, and for giving us the opportunity to see more of the Kootenay area.

Thanks also go to:

- Moira Alexander and Walter Volovsek for helping in the lab and moral support.
- Bob Shepherd for his help in the Chemistry lab.
- Leslie Anderton for helping with the geomorphology.
- Slocan Forest Products, Ltd. for helping gain access to Perry Ridge Lake.
- Darkwoods Forestry, Ltd. and Forester-in-charge H. Tschechne for allowing access to their property and use of their Next Creek cabin.
- Peter Wood for taking us up to the Gwillim Lakes in the beautiful Valhallas.
- Lil Knowler for the seemingly endless typing of the final copy of the report.

The Castlegar Wildlife Association contributed to this project , which we greatly appreciate.

We'd also like to thank Selkirk College for the use of their facilities, especially the Department of Environmental Sciences. Thanks also go to the Department of Physical Sciences and the Department of Forest Technology.

PERRY RIDGE LAKE

PHOTOGRAPH UNAVAILABLE

DATE STUDIED: June 11th, 1981

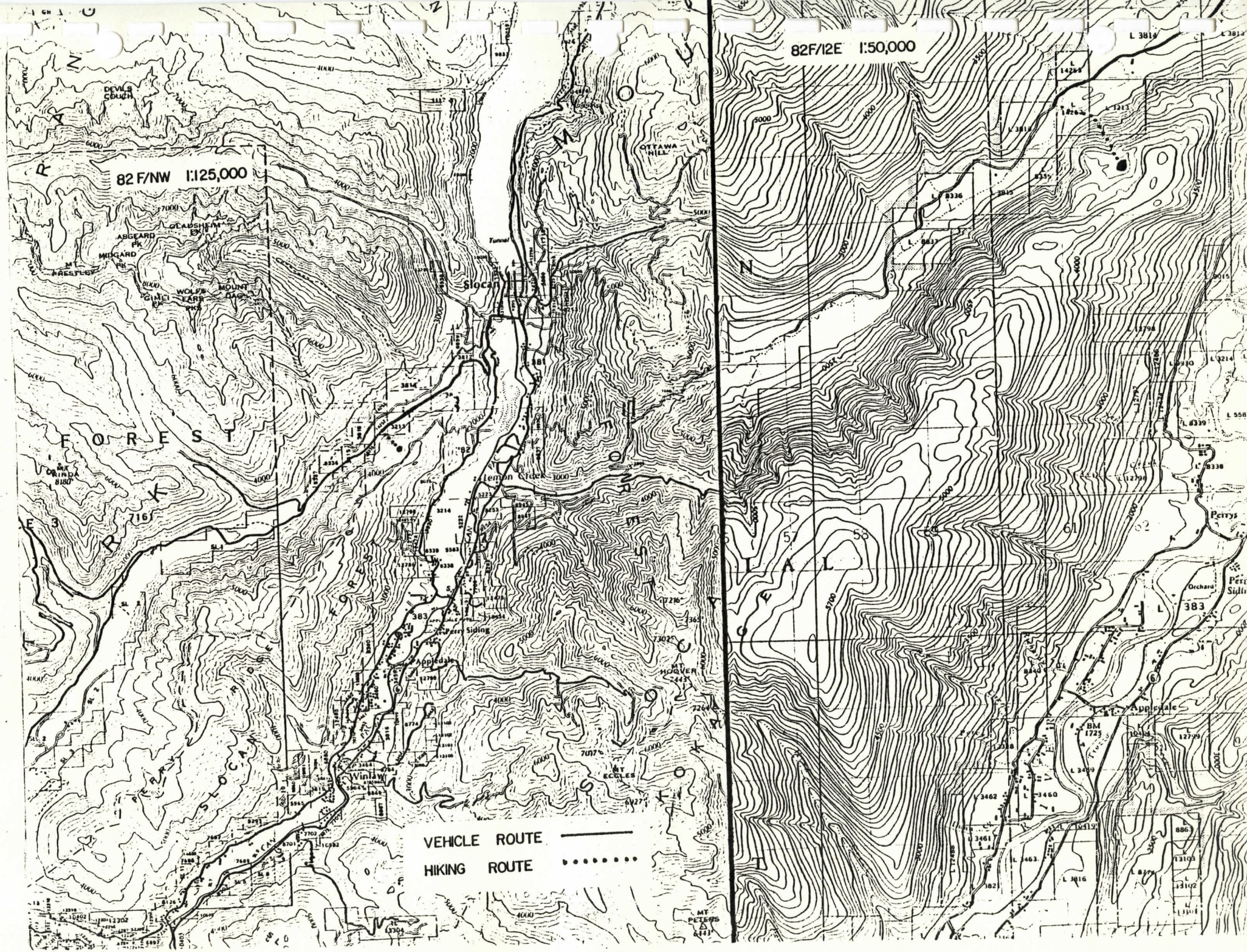
I. LOCATION:

- 49° 42.8' N. 117° 31.8' W
- Department of Mines and Technical Surveys Map: Passmore, B.C. 82F/12E, 1:50,000; Grid Reference 618067.
- Department of Lands, Forests and Water Resources Map: Slocan, B.C. 82F/NW, 1:125,000.
- Aerial photographs #BC 5352-179, #BC 5352-180

II. ACCESS:

By Vehicle

Drive to the Playmor Junction (junction of Highway 6 and Highway 3A) and turn onto Highway 6. From there, drive 46.7 kilometers and make a left turn on a paved road, and then proceed as follows:


82 F/NW 1:125,000
82F/12E 1:50,000
DEVILS COUCH
OTTAWA HILL
ASGEARD PK
MIDGARD PK
MT FREESTEL
GLADSHEIM PK
WOLFS EARS PK
MOUNT DAG
Slocan
Tunnel
Lemon Creek
Perry Siding
Appledale
Winlaw
MT HOOVER
MT ECCLES
MT PETLEY
Perrys
Orchard
BM 1725
VEHICLE ROUTE
HIKING ROUTE

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (km)		FEATURE	ROUTE
0.2	-	Fork in road (pavement ends)	L
0.4	-	Railway crossing	
0.6	-	Bridge	
0.8	-	Fork in road	L
1.0	-	Fork in road	L
1.1	-	Fork in road	L
1.15	-	Bridge	
1.6	-	Fork in road	R
1.8	-	Fork in road	L
2.4	-	Fork in road	R
2.8	-	Bridge	
3.25	-	Fork in road	R
8.9	-	Creek (start of hike)	

NOTE: Access by vehicle is up the main logging road.

Hiking Route

Follow the creek up to the lake. Hiking time is approximately 1 1/2 hours.

III. GENERAL DESCRIPTION:

Perry Ridge Lake is a small lake located at an elevation of 1112 meters. This southeasterly exposed lake is drained by one outflow stream but no inflow streams were found.

Surrounding the lake are clumps of skunk cabbage and an old cedar forest littered with windfall. The land around the lake is extremely moist. There is evidence of seepage up to 50 meters from the water's edge, which is perhaps due to the high water level of the lake at the time of this study.

One of the most notable features of Perry Ridge Lake is its floating Sphagnum moss islands. These islands form a circular pattern around the lake and range in length from 4 to 60 meters.

There is no suitable area for camping by the lake and no fish were observed in the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

Nymphaea polysepalum (Yellow Pond Lily) was found on the northeast corner of the lake beside one of the Sphagnum islands. Algal growth appeared minimal.

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Sites

Perry Ridge Lake is located in the Interior Western Hemlock Biogeoclimatic Zone. The site areas are illustrated in Figure IA.

Perry Ridge Lake is formed from the Nelson Plutonic Rocks and the geological category characterized by gneiss and minor crystalline limestone and skarn. Gneiss is evident in the rock outcrops on the way up to the lake. However, there is no exposed rock within the immediate vicinity of the lake.

Although a soil pit was not dug, it is assumed that there would be a very thick duff layer surrounding the lake.

Accumulated debris, rotten logs, and fallen trees were numerous.

Site 1

This site ranged from a very moist regime at the Sphagnum islands near the lake edge to a damp regime about 50 meters back from the shore. The runoff from the surrounding hillsides contributed to the pools of water where the skunk cabbage was found.

Slope:	0° - 13°
Exposure:	West
Moisture Regime:	Very moist to damp
Vegetation Classification:	Slope Aralia-Gymnocarpium Association of the IWH Biogeoclimatic Zone*

Vegetation

Trees:

Pinus monticola (Western White Pine)

Tsuga heterophylla (Western Hemlock)

Thuja plicata (Western Red Cedar)

Taxus brevifolia (Western Yew)

Alnus tenuifolia (Mountain Alder)

Shrubs:

Linnaea borealis (Twin-Flower)

Gaultheria ovatifolia (Western Teaberry)

Ledum glandulosum (Mountain Labrador Tea)

Vaccinium spp. (Huckleberry)

Pachistima myrsinites (False Box)

Rhododendron albiflorum (White Rhododendron)

Ribes lacustre (Swamp Gooseberry)

Lycopodium lucidulum (Club Moss)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Flowers:

Menyanthes trifoliata (Buckbean)

Cornus canadensis (Bunchberry)

Clintonia uniflora (Queen's Cup)

Streptopus amplexifolius (Twisted Stalk)

Viola glabella (Yellow Violet)

Lysichiton kamtschatcense (Skunk Cabbage)

Veratrum eschocholtzii (Indian Hellebore)

Viola langsdorfii (Smooth Violet)

Ferns:

Gymnocarpium dryopteris (Oak-Fern)

Woodsia sp.

Mosses:

Sphagnum sp.

Rhytidiadelphus squarrosus

Lichens:

Alectoria sp. (Old Man's Beard)

Site 2

This site was in close proximity to the outflow stream on the northwest side of the lake. Windfall and rotten trees were more numerous at this site.

Slope: 0°

Exposure: East

Moisture Regime: Very moist

Vegetation Classification: Oplopanax Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Tsuga heterophylla (Western Hemlock)

Thuja plicata (Western Red Cedar)

Taxus brevifolia (Western Yew)

Alnus sinuata (Sitka Alder)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Shrubs:

Salix sitchensis (Sitka Willow)

Linnaea borealis (Twin-Flower)

Cornus stolonifera (Red-Osier Dogwood)

Amelanchier spp. (Saskatoon Berry)

Vaccinium spp. (Huckleberry)

Rubus parviflorus (Thimbleberry)

Rhododendron albiflorum (White Rhododendron)

Oplopanax horridus (Devil's Club)

Ribes sanquineum (Red-Flower Currant)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Cornus canadensis (Bunchberry)

Clintonia uniflora (Queen's Cup)

Streptopus amplexifolius (Twisted Stalk)

Adenocaulon bicolor (Silver-Green)

Viola glabella (Yellow Violet)

Senecio triangularis (Giant Ragwort)

Lysichiton kamtschatcense (Skunk Cabbage)

Tragopogon dubius (Oyster Plant)

Veratrum eschocholtzii (Indian Hellebore)

Ferns: Woodsia sp.

Mosses: Rhytidiadelphus squarrosus

Lichens: Alectoria sp. (Old Man's Beard)

Site 3

Sphagnum island vegetation

Slope: 0°

Moisture Regime: Permanently wet

Vegetation Classification: Sphagnum Association of the IWHa Biogeoclimatic Zone*

Vegetation

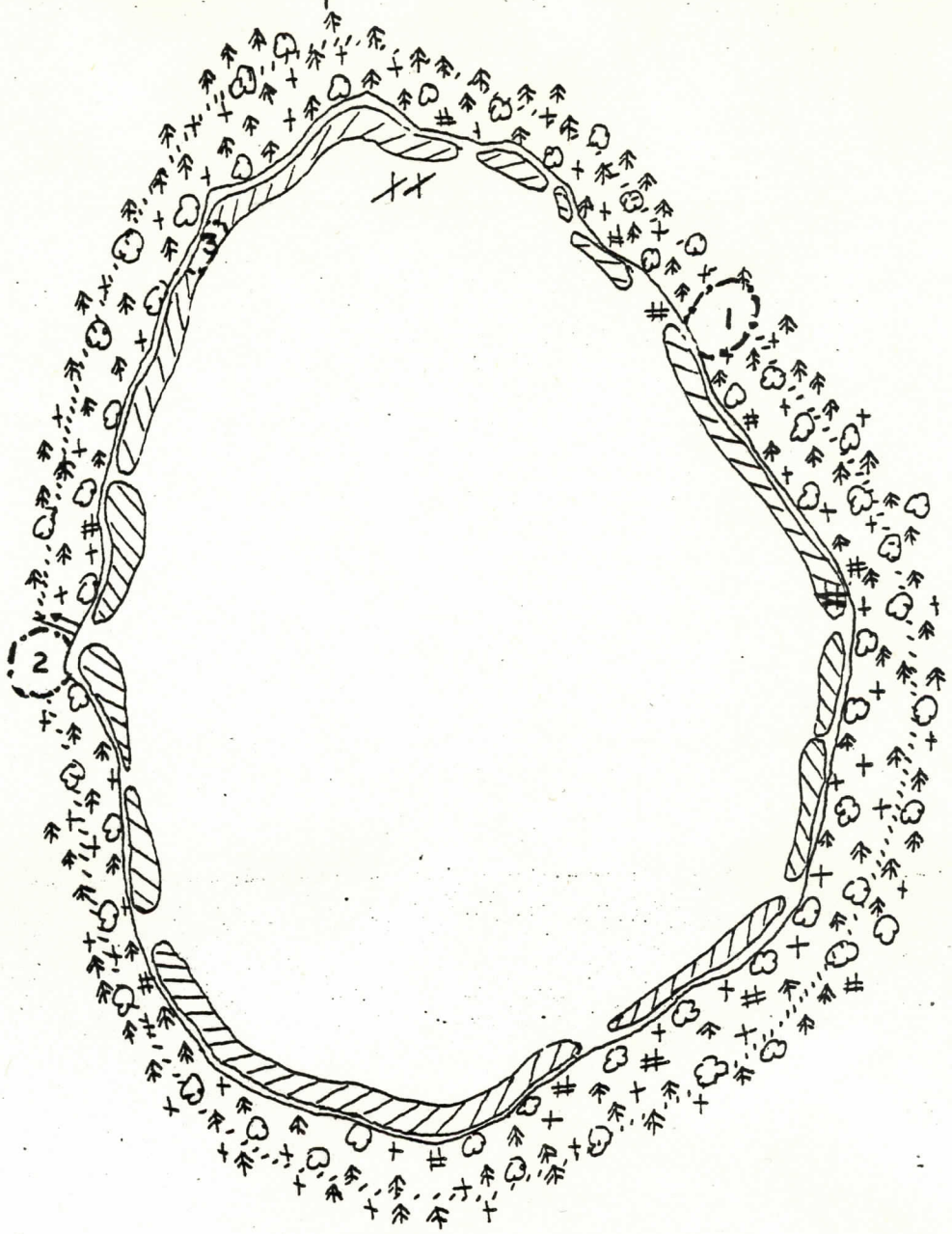
Shrubs:

Linnaea borealis (Twin-Flower)

Lycopodium lucidulum (Club Moss)

PERRY RIDGE LAKE 4

FIG. IA



LEGEND

- site boundaries
- 1,2,3 sites
- Sphagnum islands
- trees
- shrubs
- streams
- dead upright trees
- log debris
- seepage

VEGETATION

and

LANDFORMS

scale = 1:961

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Vegetation

Flowers:

Menyanthes trifoliata (Buckbean)

Eriophorum chamissonis (Cotton Grass)

Kalmia polifolia (Swamp Laurel)

Allium spp. (Onion)

Rubus arcticus (Arctic Raspberry)

Ferns: Woodsia sp.

Mosses: Sphagnum sp.

Sedges: Unidentified

* The association classifications for the sites were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Interior Western Hemlock Zone (IWHa).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

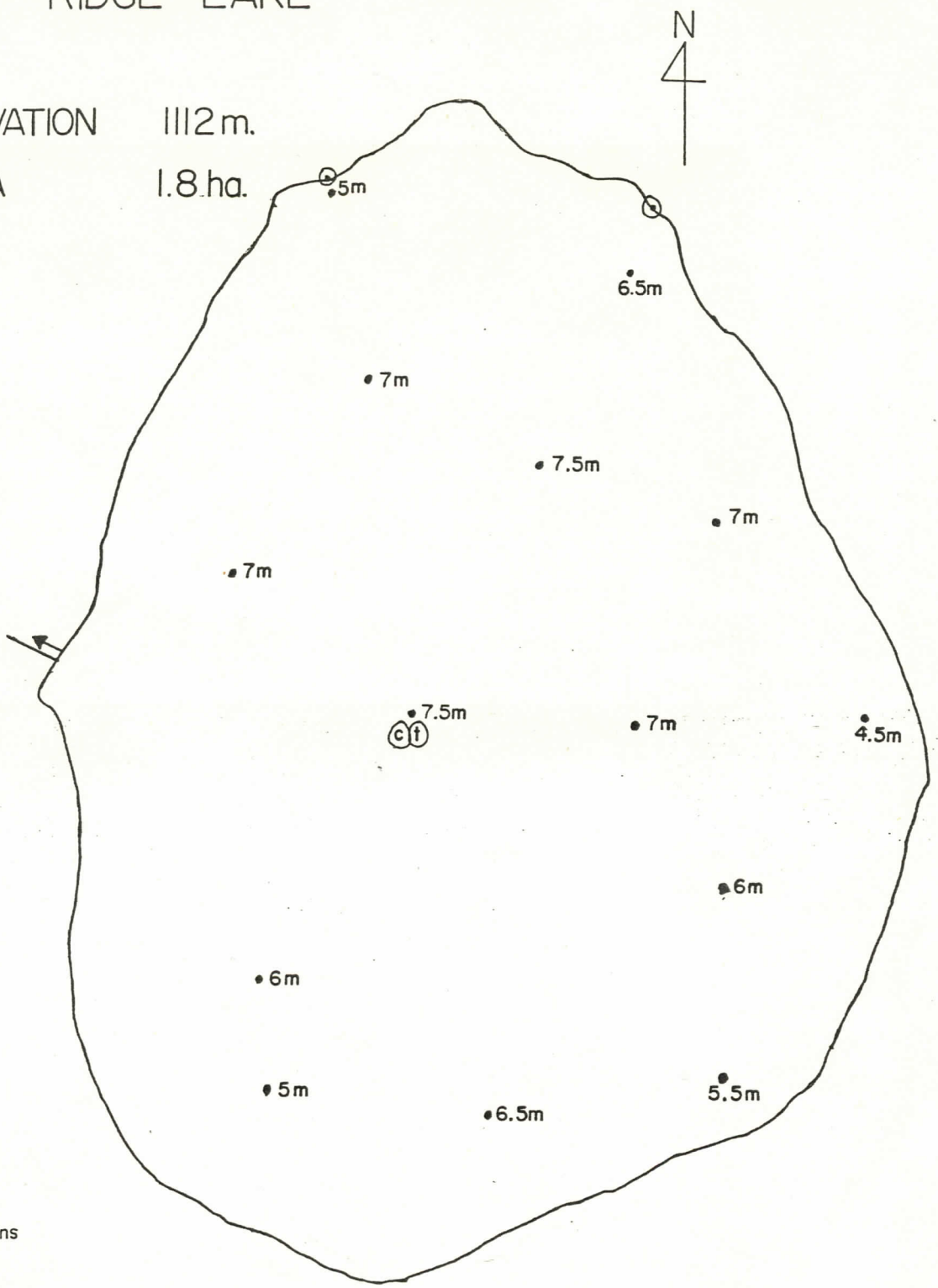
TEST		RESULT
Temperature	-	Top 15.0°C
	-	Bottom 13.0°C
Secchi Disc	-	Limit of visibility 5.3 m
	-	weather conditions: overcast with slight rain at 1:15 p.m.
	-	water conditions: ripples
Bottom Composition	-	humus, muck
pH	-	7.1
Total Alkalinity	-	39 ppm
Total Dissolved Solids	-	43 ppm
Lake Level	-	at high water level
Average Volume	-	1.1×10^8 litres
Littoral Area	-	$3.2 \times 10^3 m^2$

B) OUTFLOW STREAM

Average width	-	1.4 m
Average depth	-	10 cm
Velocity	-	0.3 meters/second
Volume of Flow	-	41 litres/second
Temperature	-	12°C
Bottom Composition	-	muck covering most of gravel and sand
Comments	-	outflow covered on bottom with bark and branch debris

FIG. 1B

PERRY RIDGE LAKE

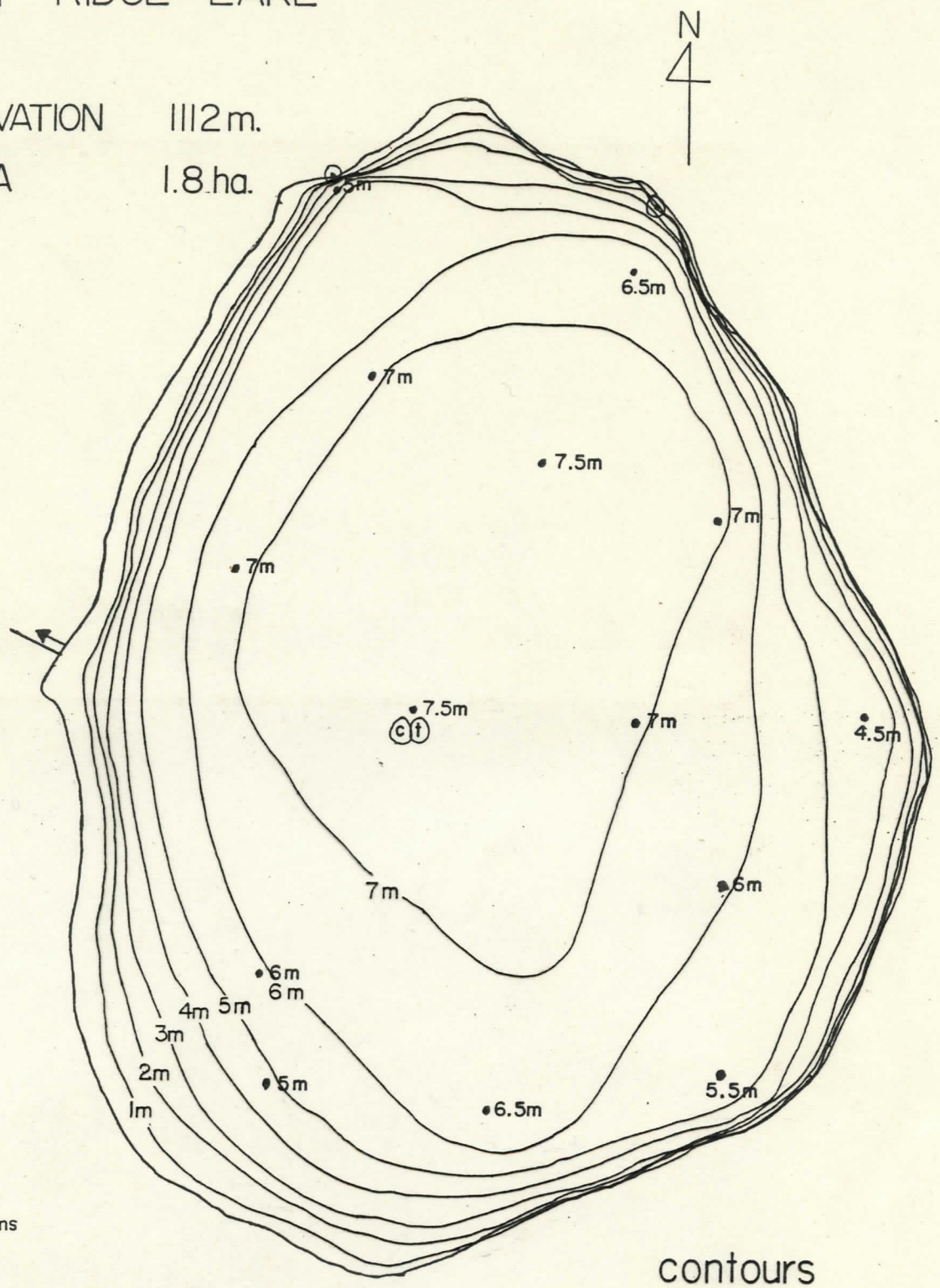


PLANE TABLE SURVEY

scale = 1:714

FIG. 1B

PERRY RIDGE LAKE



PLANE TABLE SURVEY

scale = 1:714

SASQUATCH LAKE

DATE STUDIED: June 25th, 1981

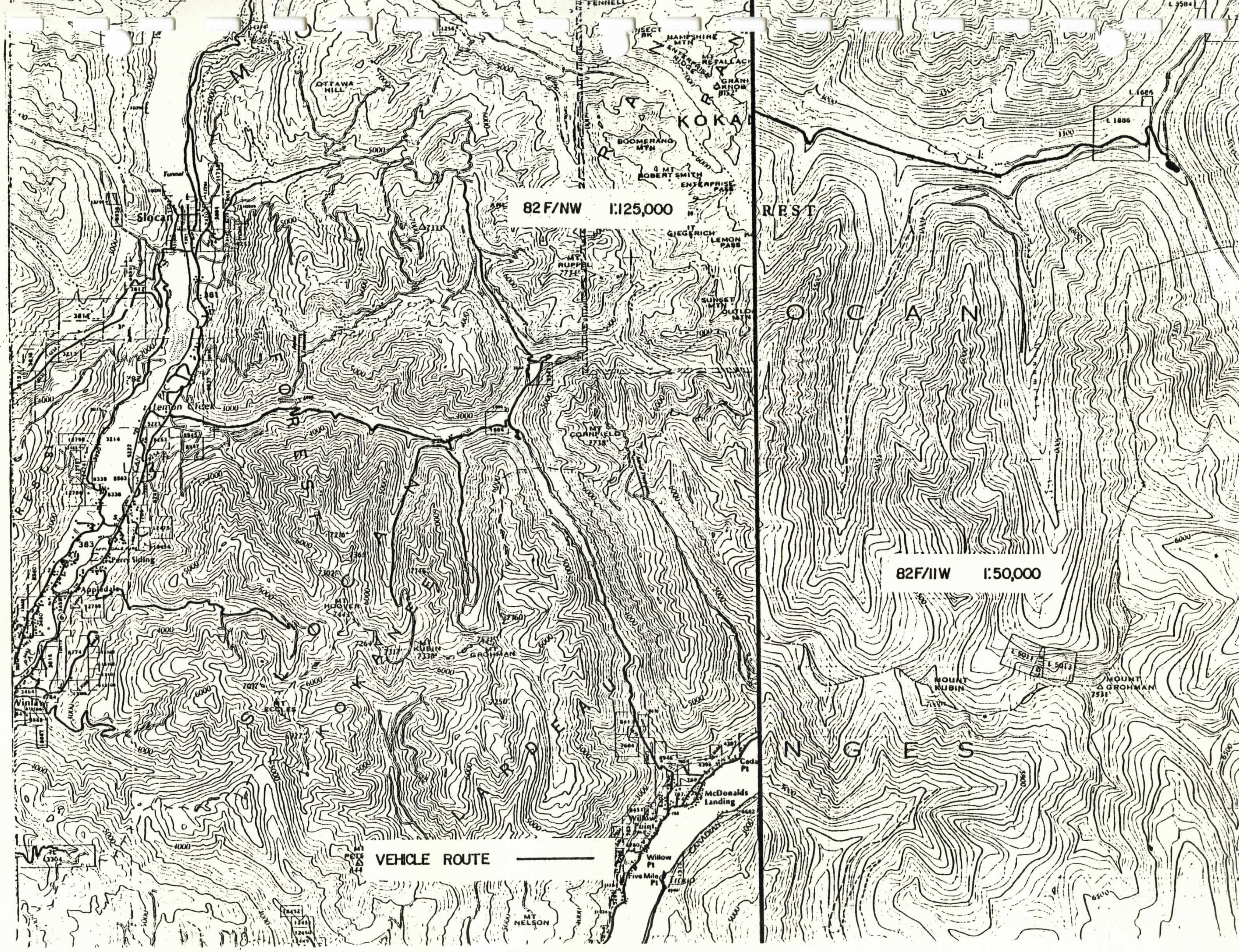
I. LOCATION:

- 49° 41.7' N., 117° 18.5' W
- Department of Mines and Technical Surveys Map: Kokanee Peak, B.C. 82F/11W, 1:50,000; Grid Reference: 779043
- Department of Lands, Forests, and Water Resources Map: Slocan, B.C. 82F/NW, 1:125,000.
- Aerial photographs: #BC 5356-014, #BC 5356-015.

II. ACCESS:

By Vehicle

Drive to the Playmor Junction and turn onto Highway 6. From there, drive 39.8 kilometers and make a right turn onto the dirt road just before the Lemon Creek bridge. Proceed as follows:



82 F/NW 1:125,000
82F/11W 1:50,000
VEHICLE ROUTE
OTTAWA HILL
BOOMERANG MTN
MT ROBERT SMITH
ENTERPRISE PASS
LEMON PASS
MT RUPPEL
SUNSET MTN
MT CORNFIELD 2738
Slocan
Tunnel
Lemon Creek
Perry Siding
Appledale
HOOVER
MT KUBIN 2330
MT GROHMAN
McDonalds Landing
Willow Pt
Five Mile Pt
MT NELSON
MOUNT KUBIN
MOUNT GROHMAN 2531

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)		FEATURE	ROUTE
0.2	-	sign: Lemon Creek Forest Road (use at own risk)	
0.4	-	Fork in road	L
3.3	-	Creek	
4.9	-	Fork in road	R
5.9	-	Fork in road	L
7.1	-	Fork in road	R
7.6	-	Creek	
9.2	-	Creek	
11.0	-	Bridge	
12.0	-	Fork in road	L
12.3	-	Creek	
14.9	-	Fork in road	R
15.5	-	Fork in road	R
15.6	-	Lake	

III. GENERAL DESCRIPTION:

Sasquatch Lake is clear, shallow, and small in size. There are two inflow streams, one of which is a minor underground stream, and an outflow stream.

A small talus slope exists on the south shore of the lake. The north and west shores of the lake are forested, whereas the eastern end is marshland.

Log debris was abundant around the entire shoreline but was primarily concentrated at the head of the outflow stream. Evidence of previous beaver activity was found along the northwest shore.

The British Columbia Forest Service maintains a campsite, with a picnic table and firepit, at the north end of the lake. There are also remains of old log cabins a short distance from the campsite.

No fish were caught, but a few rainbow trout, approximately 10 centimeters in length, were sighted.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

Algal growth along the shore was quite abundant. Rhizoclonium hookeri, Ulothrix aequalis, and a number of diatoms (i.e. Cymbella cistula, Pinnularia sp., Achnanthes sp.) were identified. Paramecium sp. were also found.

Log debris at outflow.

B.C. Forest Service campsite.

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Sites

Sasquatch Lake is situated in the Interior Western Hemlock Biogeoclimatic Zone, on the border of the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone. The site areas are illustrated in Figure 2A.

This lake is located in the Nelson Plutonic geological region. The small talus slope on the south shore of the lake is composed of non-porphyritic granite. Other talus slopes were observed at higher elevations on the hillsides surrounding the lake.

Site 1

This vegetation site was taken in close proximity to the inflow stream. The main channel of the inflow stream meanders through approximately 50 meters of marshland before reaching the lake.

Slope: 5°

Exposure: Northwest

Moisture Regime: Moist

Vegetation Classification: Slope Cornus-- Moss Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Alnus tenuifolia (Mountain Alder)

Shrubs:

Salix sitchensis (Sitka Willow)

Cornus stolonifera (Red-Osier Dogwood)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Habenaria dilatata (White Rein Orchid)

Eriogonum spp. (Eriogonum)

Viola langsdorfii (Smooth Violet)

Cicuta douglasii (Water-Hemlock)

Heracleum lanatum (Cow Parsnip)

Tragopogon dubius (Oyster Plant)

Geum macrophyllum (Large-Leaved Avens)

Epilobium angustifolium (Fireweed)

Equisetum hyemale (Scouring Rush)

Equisetum arvense (Common Horsetail)

IV. VEGETATION AND GEOMORPHOLOGY:

Vegetation (cont'd)

Ferns:

Dryopteris austriaca (Spiny Wood-Fern)

Grasses: Unidentified

Site 2

The forest floor at this site was relatively free from dense undergrowth. Near the shore of the lake shrubs were more prevalent.

Slope: 22°

Exposure: South

Moisture Regime: Moist to slightly dry

Vegetation Classification: slope *Aralia* - *Gymnocarpium* Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Pinus monticola (Western White Pine)

Tsuga heterophylla (Western Hemlock)

Pseudotsuga menziesii (Douglas Fir)

Thuja plicata (Western Red Cedar)

Abies lasiocarpa (Alpine Fir)

Alnus sinuata (Sitka Alder)

Acer glabrum var. douglasii (Douglas Maple)

Shrubs:

Linnaea borealis (Twin-Flower)

Cornus stolonifera (Red-Osier Dogwood)

Berberis nervosa (Oregon Grape)

Pachistima myrsinites (False Box)

Viburnum edule (Squashberry)

Lonicera utahensis (Red Twinberry)

Amelanchier alnifolia (Saskatoon Berry)

Rubus parviflorus (Thimbleberry)

Vaccinium membranaceum (Black Mountain Huckleberry)

Ribes lacustre (Swamp Gooseberry)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Flowers:

Cornus canadensis (Bunchberry)

Clintonia uniflora (Queen's Cup)

Smilacina amplexicaulis (False Solomon's Seal)

Eriogonum spp. (Eriogonum)

Fragaria glauca (Blueleaf Strawberry)

Cicuta douglasii (Water-Hemlock)

Chimaphila umbellata (Pipsissewa)

Pyrola spp. (Pyrola)

Rubus arcticus (Arctic Raspberry)

Lilium parviflorum (Wild Tiger Lily)

Tragopogon dubius (Oyster Plant)

Epilobium angustifolium (Fireweed)

Aralia nudicaulis (Sarsaparilla)

Equisetum arvense (Common Horsetail)

Rosa woodsii (Clustered Wild Rose)

Mosses:

Pohlia wahlenbergii

Dicranoweisia cirrhata

Aulacomnium palustre

Pohlia nutans

Lichens:

Cladonia sp. (Trumpet Lichen)

Alectoria sp. (Old Man's Beard)

Grasses: Unidentified

Site 3

The talus slope in this site was well vegetated with mosses, lichens, and ferns. Alder, dogwood and willow shrubs were found along the edges of the talus slope.

Slope: 22°

Exposure: North

Moisture Regime: Moist to slightly dry

Vegetation Classification: Lichen Association of the IWHa Biogeoclimatic Zone*

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3 (cont'd)

Vegetation

Shrubs:

Salix sitchensis (Sitka Willow)

Cornus stolonifera (Red-Osier Dogwood)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rubus idaeus (Red Raspberry)

Ribes lacustre (Swamp Gooseberry)

Lycopodium lucidulum (Club Moss)

Flowers:

Saxifraga bronchialis (Spotted Saxifrage)

Lomatium spp. (Spring Gold)

Arnica spp. (Arnica)

Ferns:

Dryopteris sp. (Shield Fern)

Gymnocarpium dryopteris (Oak-Fern)

Mosses:

Sphagnum sp.

Polytrichum juniperinum

Barbula cylindrica

Lichens:

Cladonia sp. (Trumpet Lichen)

Peltigera sp.

Cladina sp.

Lecanora sp.

* The association classifications for the sites were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Interior Western Hemlock Zone (IWHa).

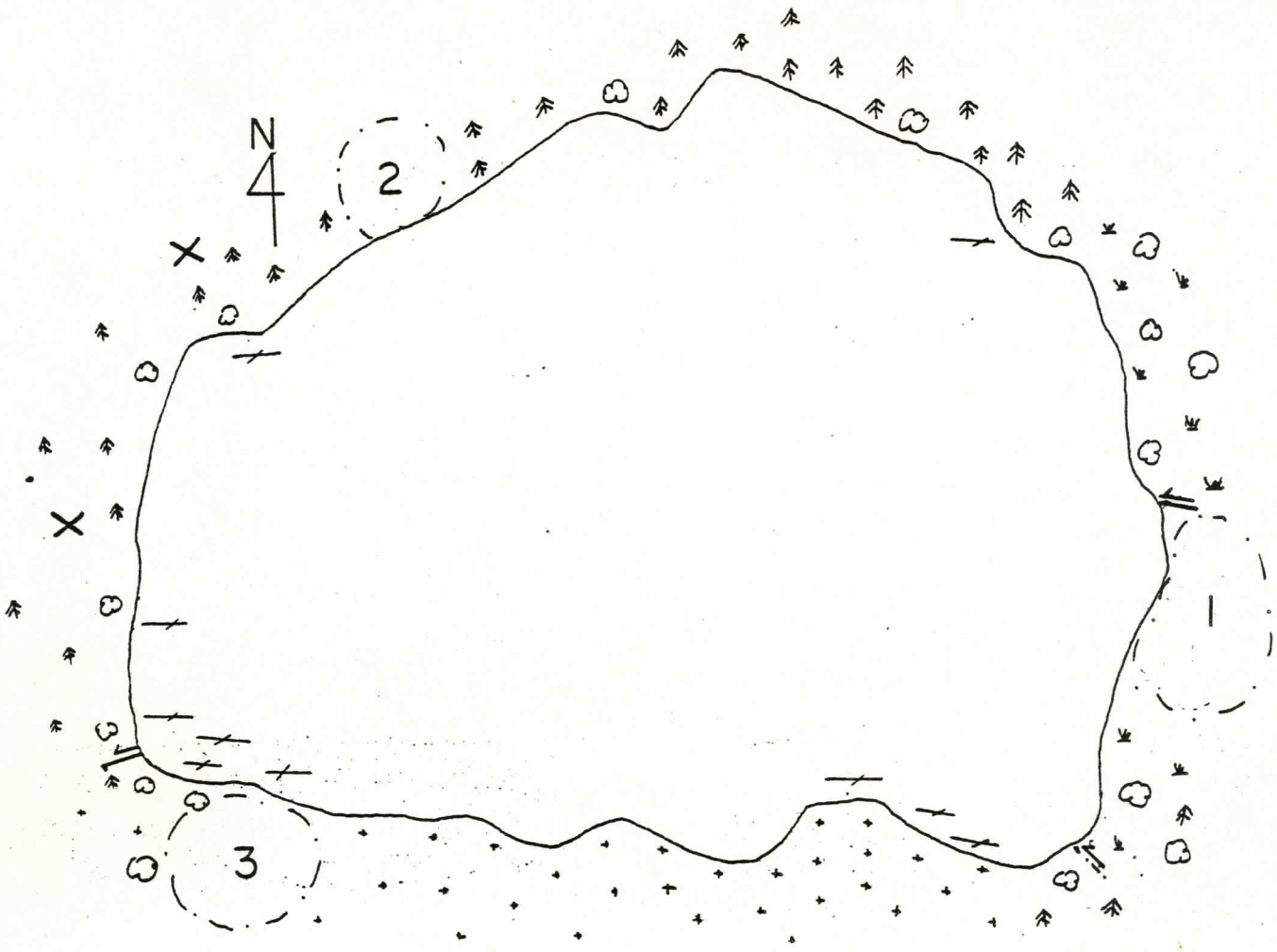
V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- surface 8.0°C
	- bottom 9.0°C

SASQUATCH LAKE

FIG.2A



LEGEND

	site boundaries
1,2,3	sites
	trees
	shrubs
	log debris
	streams
	grass
X	campsite

VEGETATION and LANDFORMS

scale = 1:926

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE (cont'd)

TEST	RESULT
Secchi Disc	- Limit of visibility - visible on lake bottom of 4.5 meters
	- Weather conditions - clear, sunny
	- Water conditions - calm (11:45 a.m.)
Bottom Composition	- Fine sand, some large rocks
pH	- 6.8
Total Alkalinity	- 31 ppm
Total Dissolved Solids	- 46 ppm
Lake Level	- 0.5 meters below high water level
Average Volume	- 6.4×10^7 litres
Littoral Area	- 3.1×10^3 m^2

B) INFLOW STREAM

Average Width	- 150 cm
Average Depth	- 28 cm
Velocity	- 0.35 meters/second
Volume of Flow	- 150 litres/second
Temperature	- 6.0°C
Bottom Composition	- Few rocks, mostly fine sand

C) OUTFLOW STREAM

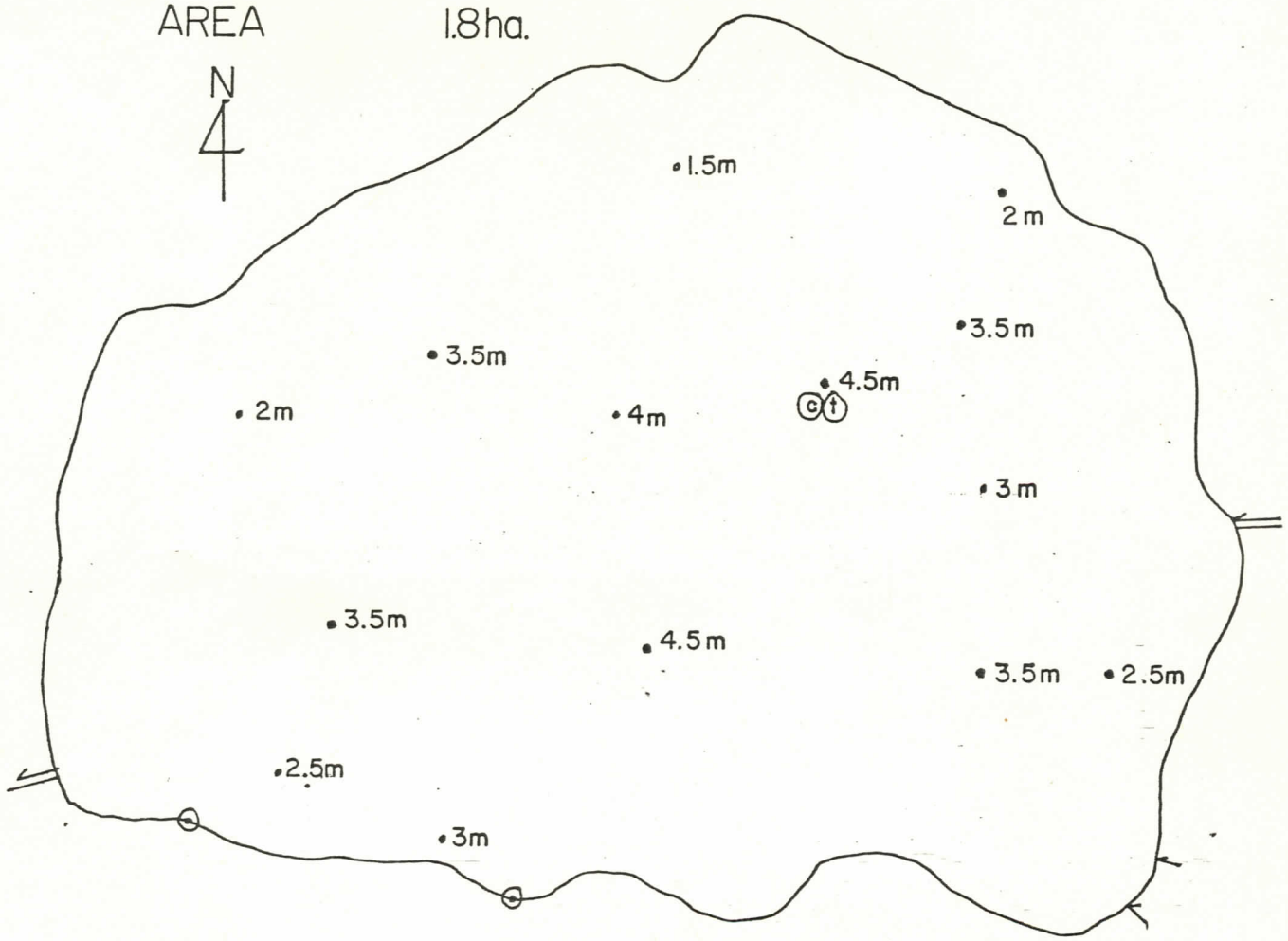
Average Width	- 450 cm
Average Depth	- 50 cm
Velocity	- 0.31 meters/second
Volume of Flow	- 700 litres/second
Temperature	- 8.0°C
Bottom Composition	- Few rocks, fine sand, some log debris

SASQUATCH LAKE

FIG. 2B

ELEVATION 1052m.

AREA 1.8ha.



LEGEND

- plane table stations
- chemical record
- temperature record
- depth soundings
- inflow/outflow streams

PLANE TABLE SURVEY

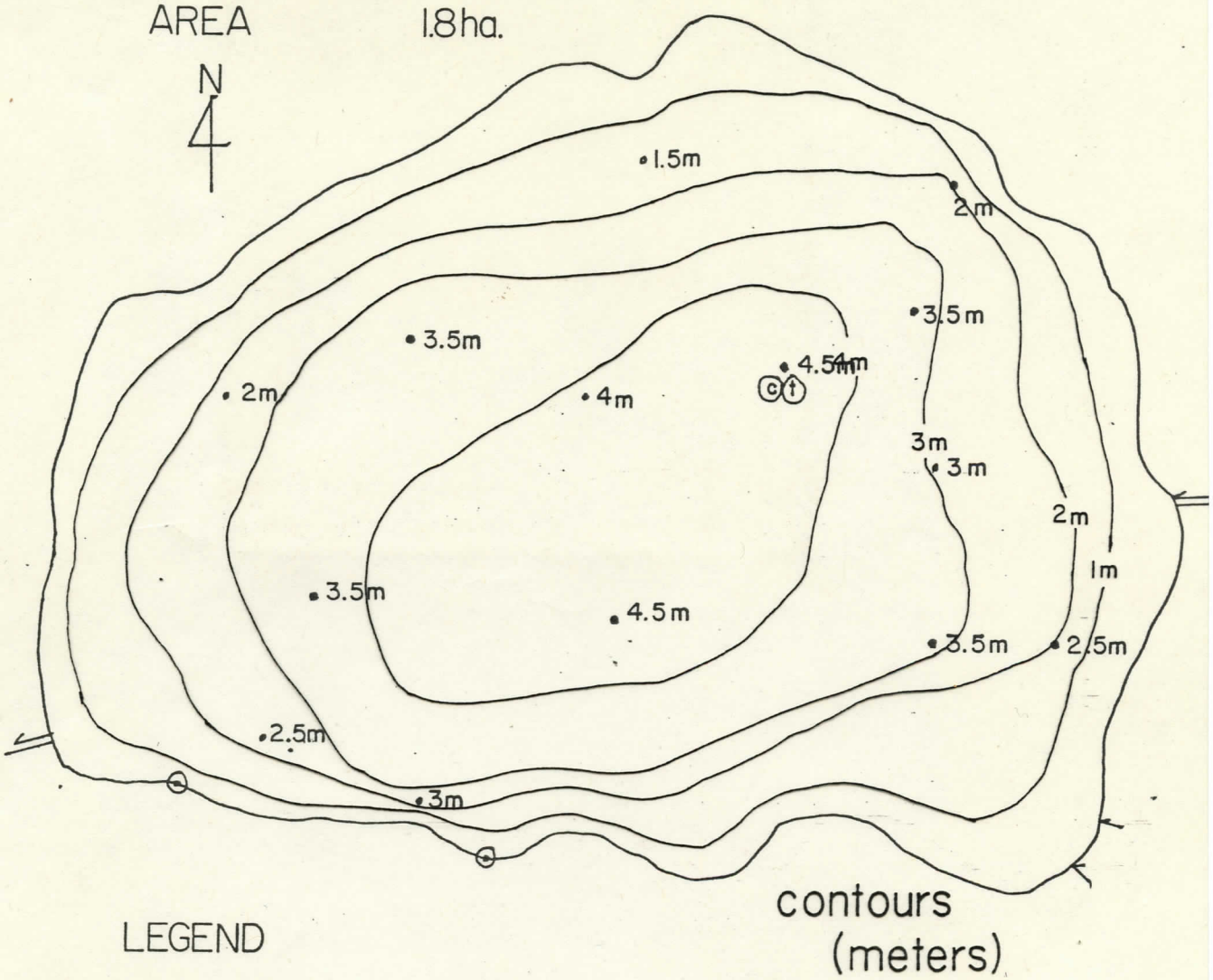
scale = 1:806

SASQUATCH LAKE

FIG. 2B

ELEVATION 1052m.

AREA 1.8ha.



LEGEND

- plane table stations
- chemical record
- temperature record
- depth soundings
- inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:806

BULLDOG LAKE

DATE STUDIED: July 1st and 2nd, 1981

I. LOCATION:

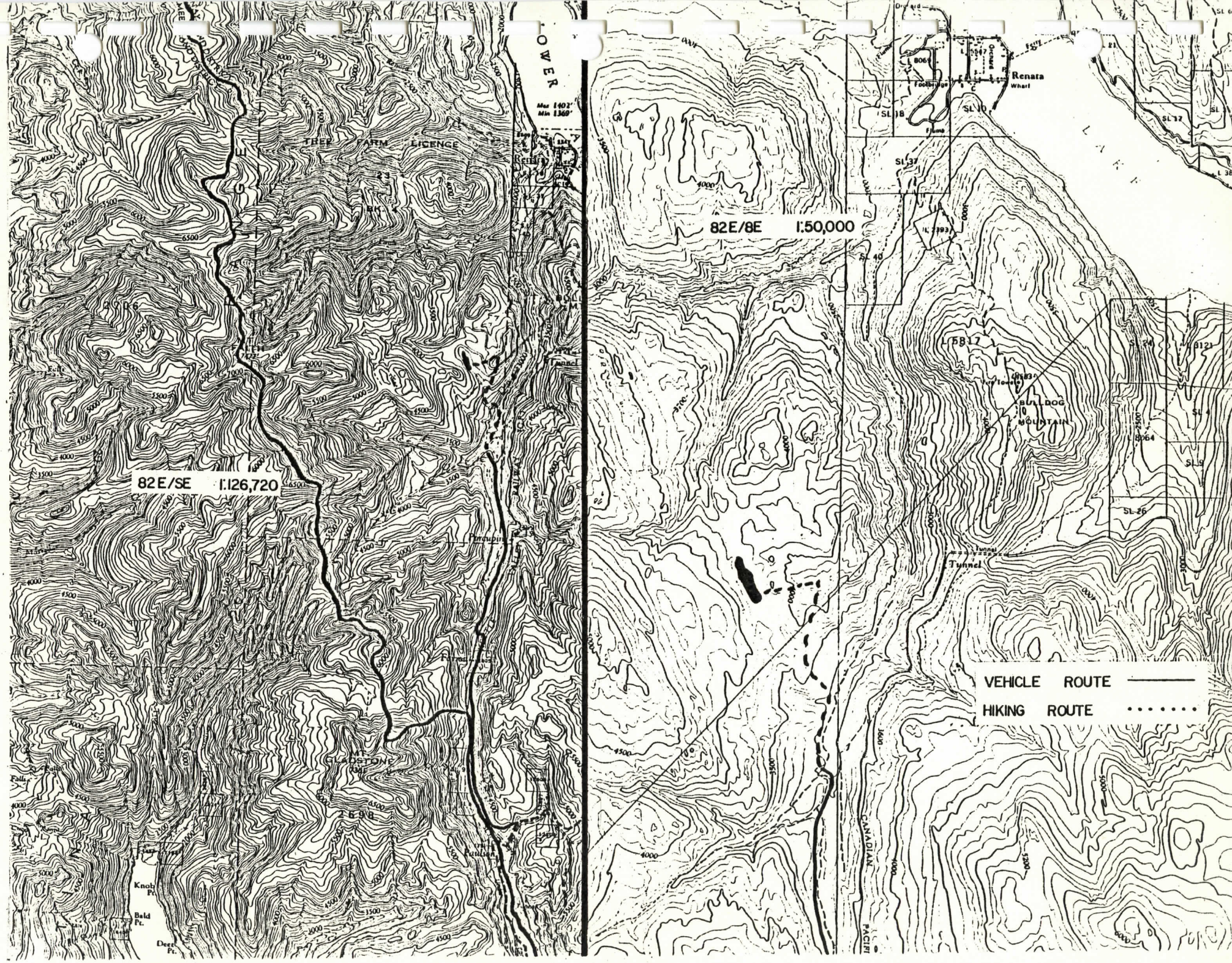
- 49° 22' N., 118° 0.8' W.
- Department of Mines and Technical Surveys Map: Renata, B.C. 82E/8E, 1:50,000; Grid Reference 174685
- Department of Lands and Forests Map: Grand Forks, B.C. 82E/SE, 1:126,720
- Aerial photographs #BC 7466-252, #BC 7466-253

II. ACCESS:

By Vehicle

From Selkirk College travel west on Highway #3 towards Christina Lake for 46.7 km. Turn off to the right on a dirt road and proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
8.0	- fork in road	R
8.2	- fork in road	R
9.2	- railway crossing	
9.5	- wash-out	through creek (4 wheel drive needed as wash-out is very rough)
10.8	- bridge	
11.9	- bridge	


82 E/SE 1:126,720
82 E/8E 1:50,000
VEHICLE ROUTE
HIKING ROUTE
TREE FARM LICENCE
Renata
Wharf
BULLDOG MOUNTAIN
Tunnel
MT. GLADSTONE
CANADIAN PACIFIC
Knob Pt.
Bald Pt.
Deer Pt.

II. ACCESS: (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
13.0	- bridge	
13.4	- bridge	
16.1	- fork in road	L
16.3	- end of road	

Hiking Route

Cross the creek and follow it down for 10 minutes. From there, follow the old logging road (now an animal trail which, at times, goes through a creek bed) for approximately 45 minutes. Then start hiking up the ridge at a 30° angle until a clearing is reached. Head up at the same angle (staying in the clearing) to the Bulldog Lake outflow creek. Cross the creek and head up over the knoll (the lake should be visible from the top of the knoll). Proceed straight down to the lake. Total hiking time is 4 hours.

NOTE: There may be flagging along part of the hiking route until the clearing is reached.

III. GENERAL DESCRIPTION:

Bulldog Lake is large and relatively deep at an elevation of 1143 meters. Sphagnum islands, covered in sedges, border the shoreline. At both the north and south ends, the lake trails into marshlands of Sphagnum and sedge.

The most noticeable feature at Bulldog Lake is the beaver activity. The entire shoreline of the lake bears evidence to both past and recent beaver residency. Two old beaver lodges remain on the east shore, and the outflow stream is barricaded by three beaver dams. Access to and around the lake is difficult due to the number of trees felled by beaver.

Other wildlife is evident at Bulldog Lake. Many birds, deer, and signs of bear were observed. Frogs and leaches inhabit the shallower waters of the lake. Fish are not present.

The only suitable camping area was on the top of the cliff on the extreme northeast end of the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

Algal growth was observed. Nymphaea polysepalum (Yellow Pond Lily) was found around the Sphagnum moss islands.

Sites

Bulldog Lake is located in the Interior Western Hemlock Biogeoclimatic zone. See Figure 3A for the site areas.

Bulldog Lake lies in a heavily forested area. Granodiorite rock was evident on the steep slopes and rocky outcrops around the lake.

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Site 1

This site was located at one of the few open areas around the lake. The forest started approximately 65 meters above the shoreline in this site. Therefore, the vegetation there received 85 - 100% crown closure.

Slope: 10°

Exposure: Southwest

Moisture Regime: Moist

Vegetation Classification: Alluvial Normal Moss Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Pinus contorta latifolia (Lodgepole Pine)

Larix occidentalis (Western Larch)

Pseudotsuga menziesii (Douglas Fir)

Thuja plicata (Western Red Cedar)

Alnus tenuifolia (Mountain Alder)

Tsuga heterophylla (Western Hemlock)

Shrubs:

Salix scouleriana (Scouler Willow)

Arctostaphylos Uva-ursi (Kinnikinnick)

Berberis nervosa (Oregon Grape)

Pachistima myrsinites (False Box)

Lonicera utahensis (Red Twinberry)

Amelanchier alnifolia (Saskatoon Berry)

Flowers:

Fragaria spp. (Strawberry)

Galium spp. (Bedstraw)

Chimaphila umbellata (Pipsissewa)

Lilium spp. (Lily)

Hieracium albiflorum (White Hawkweed)

Rosa spp. (Rose)

Gentianella amarella (Northern Gentian)

Equisetum hyemale (Scouring Rush)

Equisetum arvense (Common Horsetail)

Mosses:

Polytrichum juniperinum

Brachythecium asperrimum

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Grasses: unidentified

Sedges: unidentified

Site 2

This site was on a moist shady slope. The forest came down to the lakeshore.

Slope: 20°

Exposure: Southwest

Moisture Regime: Damp

Vegetation Classification: Alluvial Normal Moss Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Pseudotsuga menziesii (Douglas Fir)

Thuja plicata (Western Red Cedar)

Alnus tenuifolia (Mountain Alder)

Shrubs:

Linnaea borealis (Twin-Flower)

Sorbus sitchensis (Sitka Mountain Ash)

Berberis aquifolium (Tall Mahonia)

Pachistima myrsinites (False Box)

Lonicera utahensis (Red Twinberry)

Amelanchier alnifolia (Saskatoon Berry)

Shepherdia canadensis (Soopolallie)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Smilacina amplexicaulis (False Solomon's Seal)

Fragaria spp. (Strawberry)

Chimaphila umbellata (Pipsissewa)

Pyrola spp. (Pyrola)

Lilium spp. (Lily)

Gentianella amarella (Northern Gentian)

Equisetum arvense (Common Horsetail)

Hieracium albiflorum (White Hawkweed)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Mosses:

Pohlia nutans

Rhytidiadelphus squarrosus

Lichens:

Alectoria sp. (Old Man's Beard)

Site 3

Sphagnum island vegetation

Slope: 0°

Exposure: North

Moisture Regime: Permanently Wet

Vegetation Classification: Sphagnum Association of the IWHa Biogeoclimatic Zone*

Vegetation

Trees:

Alnus tenuifolia (Mountain Alder)

Flowers:

Listera sp. (Twayblade)

Eriophorum chamissonis (Cotton Grass)

Mosses:

Aulacomnium androgynum

Sphagnum sp.

Grasses: Unidentified

Sedges: Unidentified

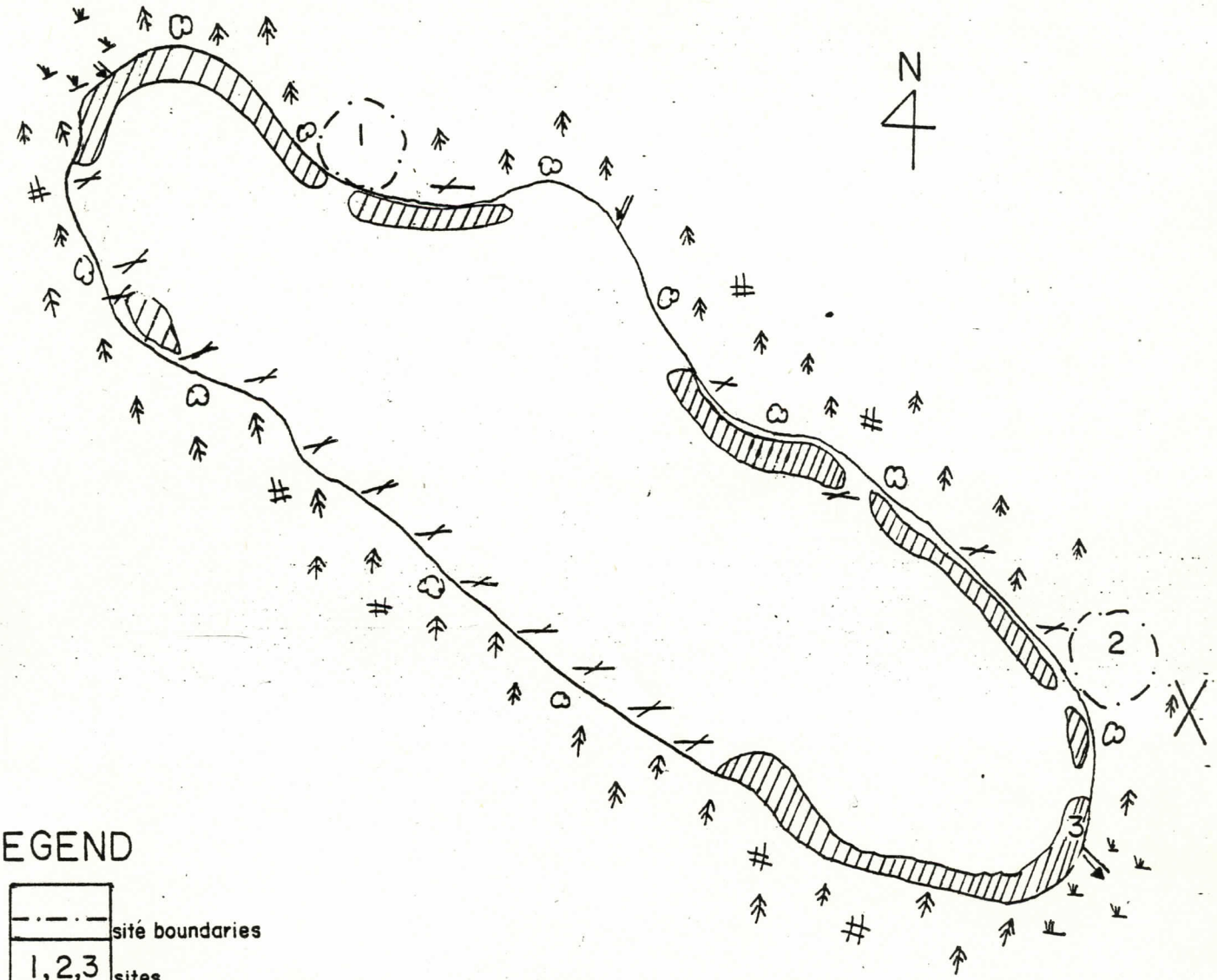
* The association classifications for the sites were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Interior Western Hemlock Zone (IWHa).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- surface 17.0°C
	- bottom 15.0°C
Secchi Disc	- Limit of visibility - 4.5 meters
	- Weather conditions - clear, sunny
	- Water conditions - calm (7:25 p.m.)

BULLDOG LAKE



LEGEND

- site boundaries
- 1, 2, 3 sites
- Sphagnum islands
- trees
- shrubs
- inflow/outflow streams
- dead upright trees
- log debris
- marsh
- campsite

VEGETATION and LANDFORMS

scale = 1:2843

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE (cont'd)

TEST	RESULT
Bottom Composition	- Muck
pH	- 6.6
Total Alkalinity	- 35 ppm
Total Dissolved Solids	- 17 ppm
Lake Level	- 0.5 meters below high water level
Average Volume	- 1.1×10^9 litres
Littoral Area	- 1.0×10^4 m^2

B) INFLOW STREAMS

Average Width	- 25 cm
Average Depth	- 5 cm
Velocity	- 0.17 meters/second
Volume of Flow	- 2.1 litres/second
Temperature	- 6.0°C
Bottom Composition	- Rocky with some log debris
Comments	- Both the major inflow and outflow streams were inaccessable to obtain physical data

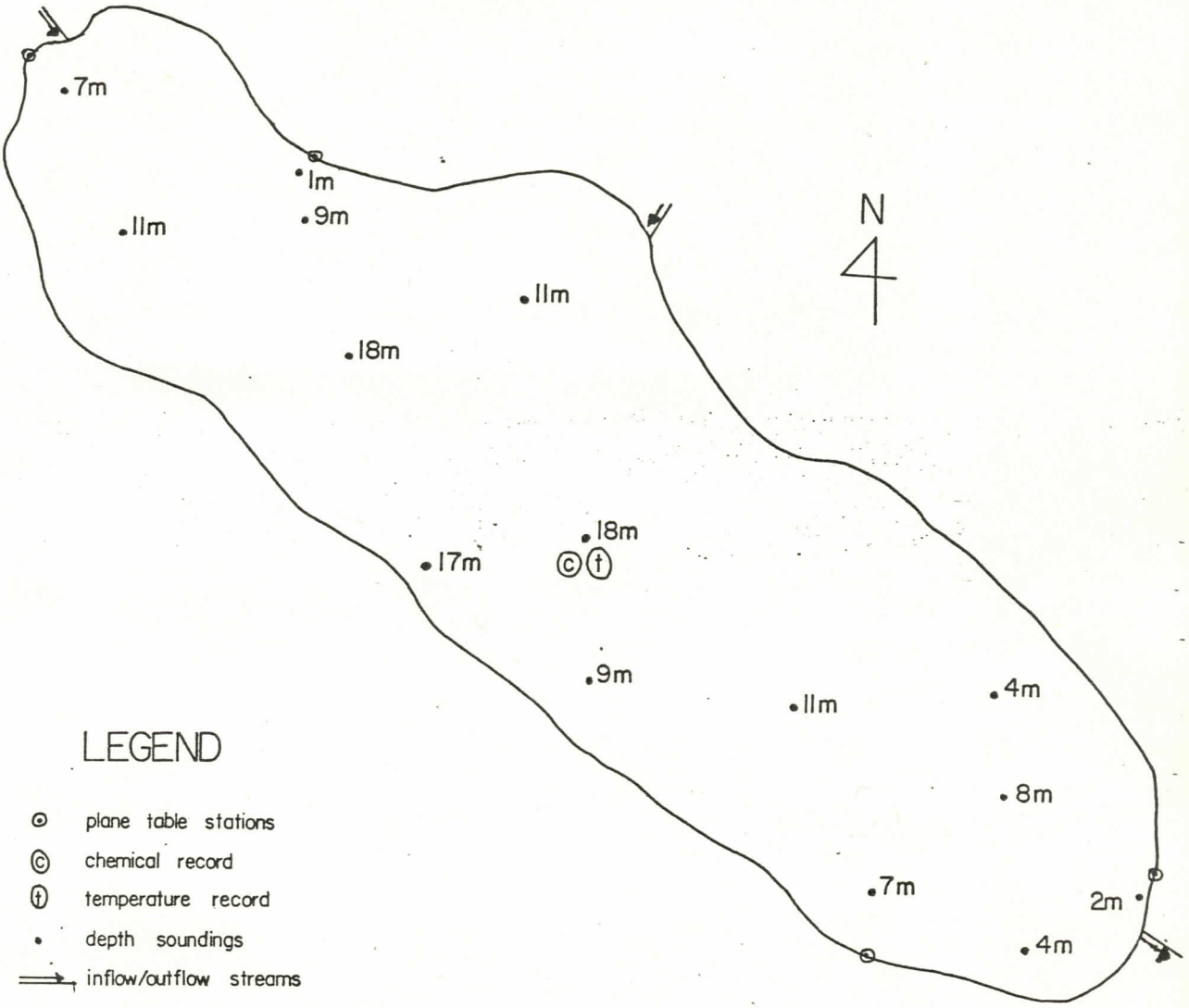
Plane table station. Campsite in background.

J. J. at depth sounding station.

BULLDOG LAKE

ELEVATION 1143m.

AREA 10.7 ha.



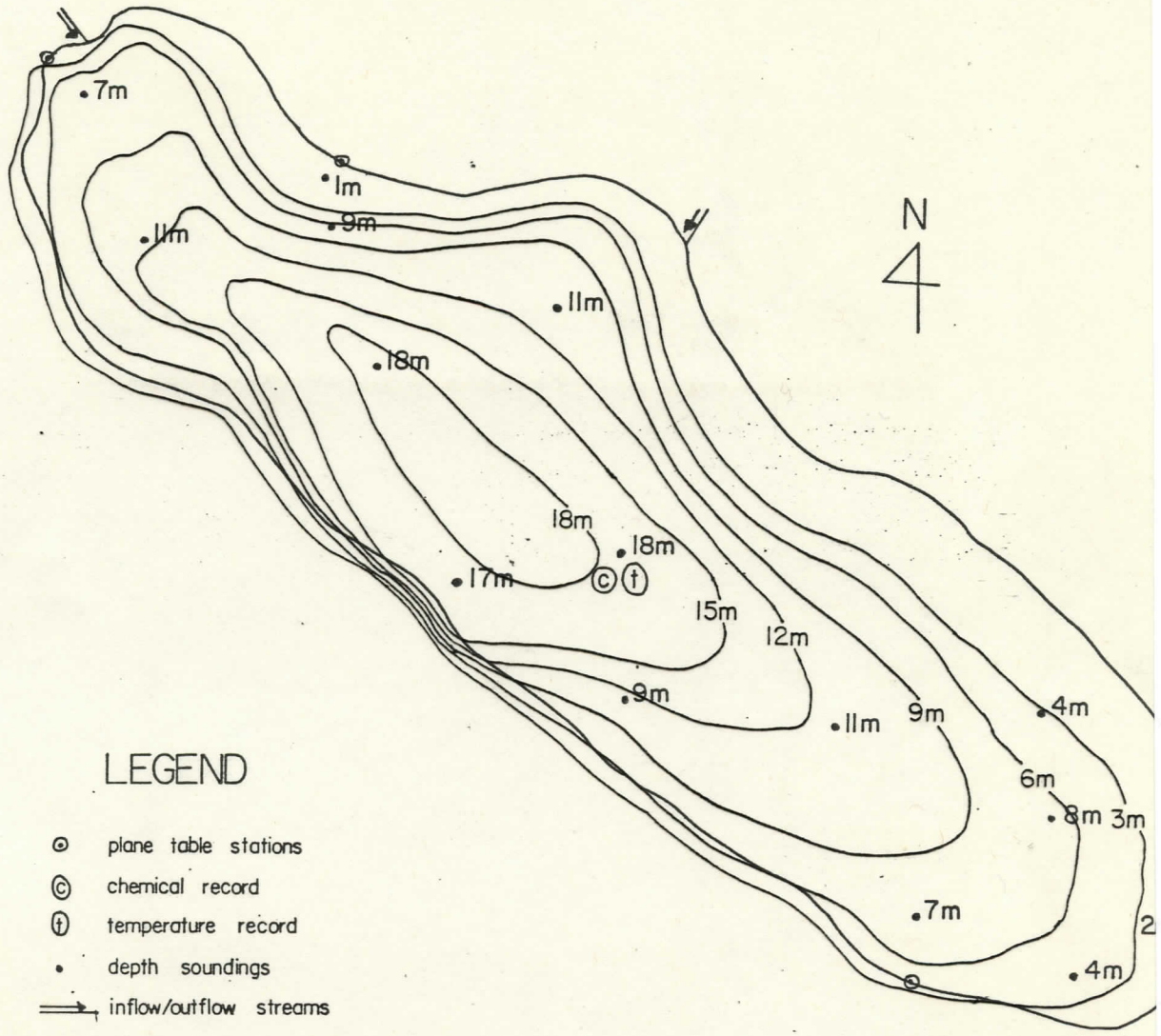
PLANE TABLE SURVEY

scale = 1:2636

BULLDOG LAKE

ELEVATION 1143m.

AREA 10.7 ha.



contours (meters)

PLANE TABLE SURVEY

scale = 1:2636

DEVIL'S HOLE LAKE

DATE STUDIED: July 16th, 1981

I. LOCATION:

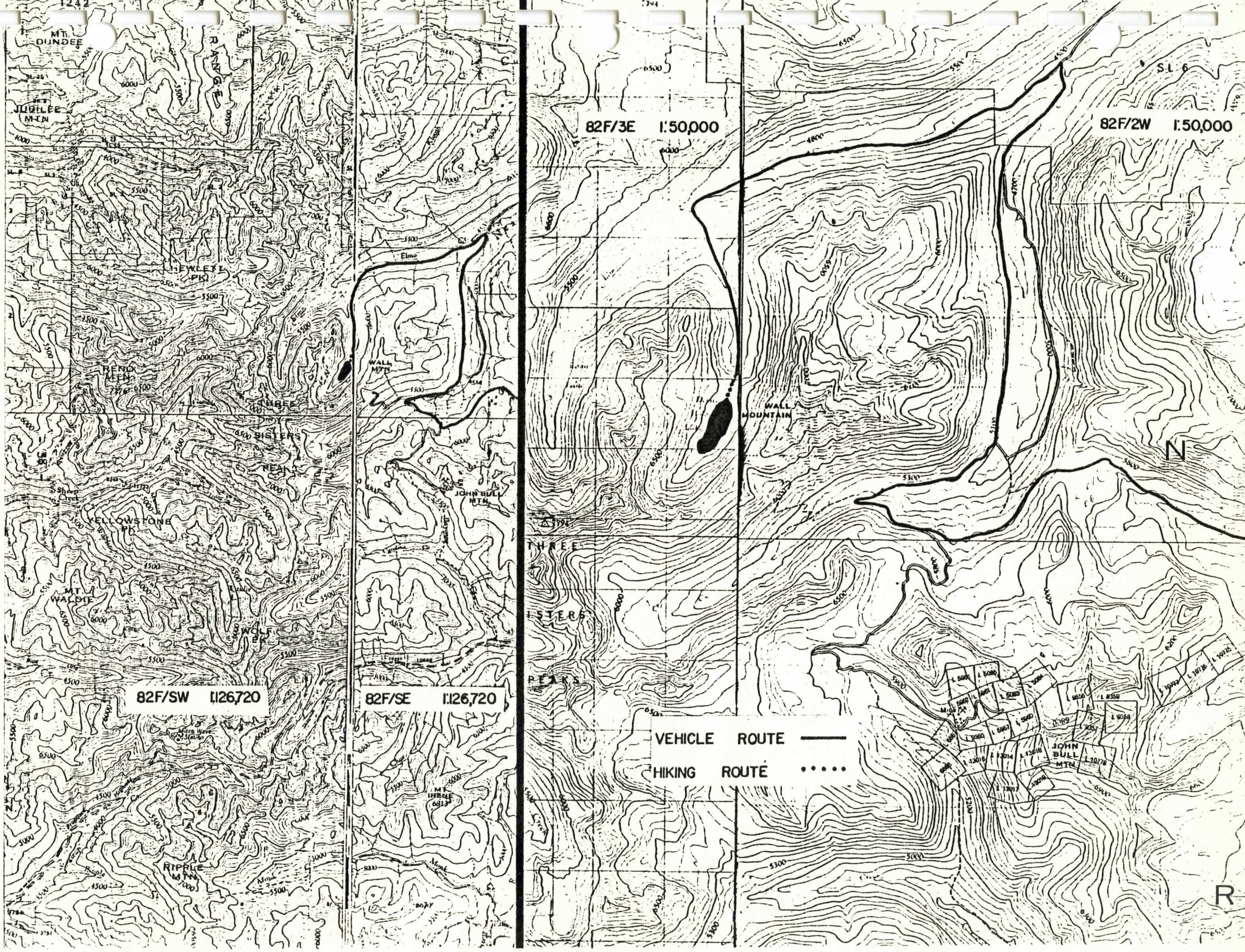
- 49° 11.5' N., 117° 00.5' W.
- Department of Mines and Technical Surveys Map: Salmo, B.C. 82F/3E, 1:50,000; Grid Reference: 998485
- Department of Lands and Forests Map: Trail, B.C. 82F/SW, 1:126,720
- Aerial photographs #BC 5348-122, #BC 5348-123

II. ACCESS:

By Vehicle

Starting from Salmo turnoff on Highway #3 proceed towards Creston as follows:

DISTANCE (Km)	FEATURE	ROUTE
94.3	- Beginning of Blazed Creek	L
94.5	- Bridge	
98.4	- Fork in road	L
98.6	- Fork in road	R
99.3	- Creek	
100.0	- Bridge	
102.0	- Fork in road	R
102.7	- Fork in road	R
103.8	- Fork in road	R



82F/3E 1:50,000
82F/2W 1:50,000
82F/SW 1:126,720
82F/SE 1:126,720
VEHICLE ROUTE
HIKING ROUTE
MT. DUNDEE
JUBILEE MTN
HEWLETT PK
RENO MTN
THREE SISTERS
WALL MTN
WALL MOUNTAIN
JOHN BULL MTN
YELLOWSTONE PK
MT. WALDIE
WOLF
RIPPLE MTN
MT. IRENE
THREE SISTERS PEAKS

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
104.3	- Creek	
104.4	- Darkwoods Forestry Boundary Sign	
104.5	- Creek	
105.3	- Creek	
106.0	- Creek	
107.2	- Creek	
107.6	- Creek	
108.8	- Fork in road	L
109.4	- Fork in road	R
110.0	- Fork in road	R
110.6	- Creek	
110.8	- Creek	
110.0	- Fork in road	R
111.6	- Creek	
112.0	- Fork in road and washout (4 wheel drive)	R
112.2	- Creek	
112.4	- Fork in road	R
112.7	- Creek	
112.8	- Fork in road	L
113.8	- Fork in road	L
114.6	- Creek	
116.8	- Creek	
117.4	- Creek	
117.7	- Fork in road	R
118.3	- Fork in road	R
119.6	- Fork in road	L
120.8	- Fork in road	R
121.3	- Creek	
121.6	- Fork in road	R
123.0	- Creek	
123.3	- Creek	
123.9	- Creek	
124.1	- Fork in road	L
124.4	- Creek	
124.5	- Creek	

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
125.0	- Fork in road	R
125.4	- Creek	
125.5	- Fork in road	L
126.3	- Creek	
126.7	- Fork in road	L
126.8	- Fork in road	L
127.0	- Fork in road (4 wheel drive)	R
127.1	- Creek	
127.4	- Creek	
127.6	- End of road	

Hiking Route

From the end of the road follow the outflow creek to the lake. Hiking time is approximately 30 minutes.

NOTE: Part of the access to Devil's Hole Lake is on private property (permission to utilize roadways and area must be obtained from Darkwoods Forestry Ltd., Nelson, B.C.)

III. GENERAL DESCRIPTION:

Located at an elevation of 1783 meters, Devil's Hole Lake is a large, relatively deep, northernly exposed lake situated in a large glacial basin.

There are three major inflow streams and the only outflow stream drains into Elmo Creek.

The marshlands on the southern shore and the talus slope on the eastern shore are the only unsuitable areas for camping.

Rocky Mountain Cutthroat Trout, approximately twenty-eight centimeters in length, were caught and Rainbow Trout were also observed. Fish were spawning in the inflow at the south end of the lake.

A Woodland Cariboo was sighted at the marsh at the southern end of the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was observed in the lake.

Sites

Devil's Hole Lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone. The site areas are illustrated in Figure 5A.

If present, fish samples were taken at all lakes.

IV. VEGETATION AND GEOMORPHOLOGY:

Sites (cont'd)

Devil's Hole Lake is situated in a glacially carved U-shaped valley. This valley is part of the Nelson Plutonic Rock geographical classification.

About four-fifths of the western shore of the lake is granodiorite talus slope. The snow covered headwall at the south end of this valley provides a beautiful backdrop for the lake.

Site 1

This site was in the moist forested area at the southeast end of the lake.

Slope: 8°

Exposure: West

Moisture Regime: Moist

Vegetation Classification: Menziesia-Tiarella Association for the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Lycopodium lucidulum (Club Moss)

Flowers:

Saxifraga lyallii (Lyall's Saxifrage)

Streptopus amplexifolius (Twisted Stalk)

Tiarella unifoliata (Foam Flower)

Valeriana sitchensis (Mountain Valerian)

Trollius laxus (Globe Flower)

Viola glabella (Yellow Violet)

Senecio triangularis (Giant Ragwort)

Pedicularis bracteosa (Wood Betony)

Geum macrophyllum (Large-Leaved Avens)

Mertensia ciliata (Mountain Bluebell)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Mosses:

Mnium glabrescens

Pohlia nutans

Site 2

This site is located in the forested area on the west shore of the lake.

Slope: 10°

Exposure: East

Moisture Regime: Moist

Vegetation Classification: Engelmann Spruce-Alpine Fir - Black Huckleberry Association of the ESAF Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Salix spp. (Willow)

Rubus pedatus (Trailing Rubus)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Lycopodium lucidulum (Club Moss)

Flowers:

Streptopus amplexifolius (Twisted Stalk)

Tiarella unifoliata (Foam Flower)

Senecio triangularis (Giant Ragwort)

Mosses:

Hygrohypnum luridum

Pohlia nutans

Lichens:

Cladonia sp. (Trumpet Lichen)

Alectoria sp. (Old Man's Beard)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Site 3 was situated on the northeastern shore of the lake between two inflow streams.

Slope: 8°

Exposure: South

Moisture Regime: Moist

Vegetation Classification: Xerophyllum Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Salix spp. (Willow)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Lycopodium lucidulum (Club Moss)

Flowers:

Leptarrhena amplexifolia (Leptarrhena)

Actaea rubra (Baneberry)

Trollius laxus (Globe Flower)

Valeriana sitchensis (Mountain Valerian)

Viola glabella (Yellow Violet)

Senecio triangularis (Giant Ragwort)

Pedicularis bracteosa (Wood Betony)

Geum macrophyllum (Large-Leaved Avens)

Xerophyllum tenax (Bear-Grass)

Veratrum eschocholtzii (Indian Hellebore)

Mosses:

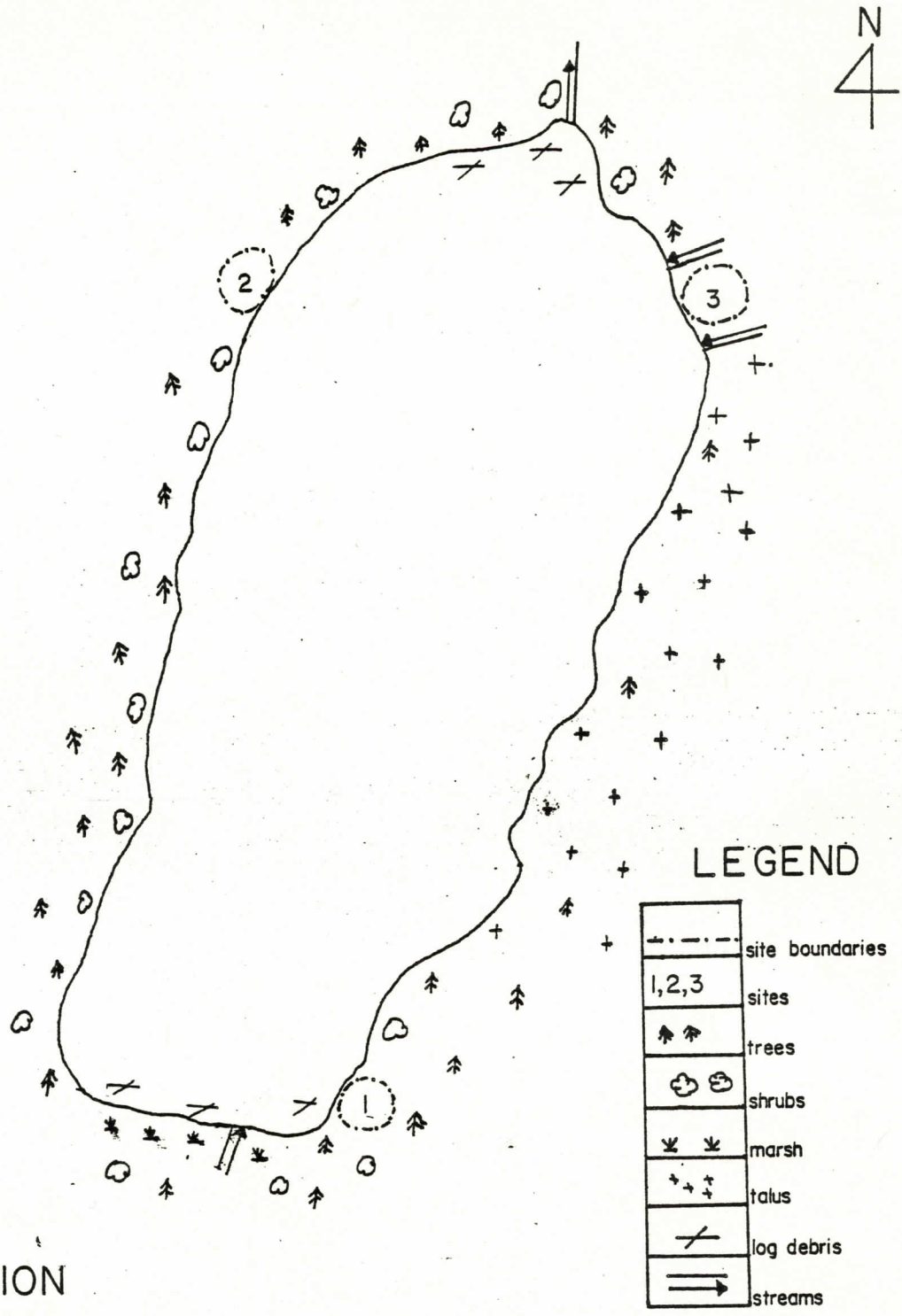
Mnium glabrescens

Pohlia nutans

* The association classifications for sites 1 and 3 were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw). The association for site 2 was classified within the association given by the Forestry Handbook for British Columbia under the biogeoclimatic zone Engelmann Spruce-Alpine Fir Zone (ESAF).

FIG. 5A

DEVIL'S HOLE LAKE



VEGETATION

AND

LANDFORMS

scale = 1:3125

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 8.0°C
	- Bottom 7.0°C
Secchi Disc	- Limit of visibility - 7.5 meters
	- Weather conditions - mainly overcast, some sunny periods
	- Water conditions - calm
Bottom Composition	- Rocks, sand
pH	- 6.6
Total Alkalinity	- 18 ppm
Total Dissolved Solids	- 31 ppm
Lake Level	- At high water mark
Average Volume	- 1.9×10^9 liters
Littoral Area	- 1.1×10^4 m^2

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 75 centimeters
Average Depth	- 15 centimeters
Velocity	- 0.38 meters/second
Volume of Flow	- 42 litres/second
Temperature	- 3.0°C
Bottom Composition	- Fine and coarse sand, some rocks and log debris

ii) Inflow #2

Average Width	- 90 centimeters
Average Depth	- 20 centimeters
Velocity	- 0.5 meters/second
Volume of Flow	- 90 litres/second
Temperature	- 3.0°C
Bottom Composition	- Fine to coarse sand, few rocks, pebbles, log debris

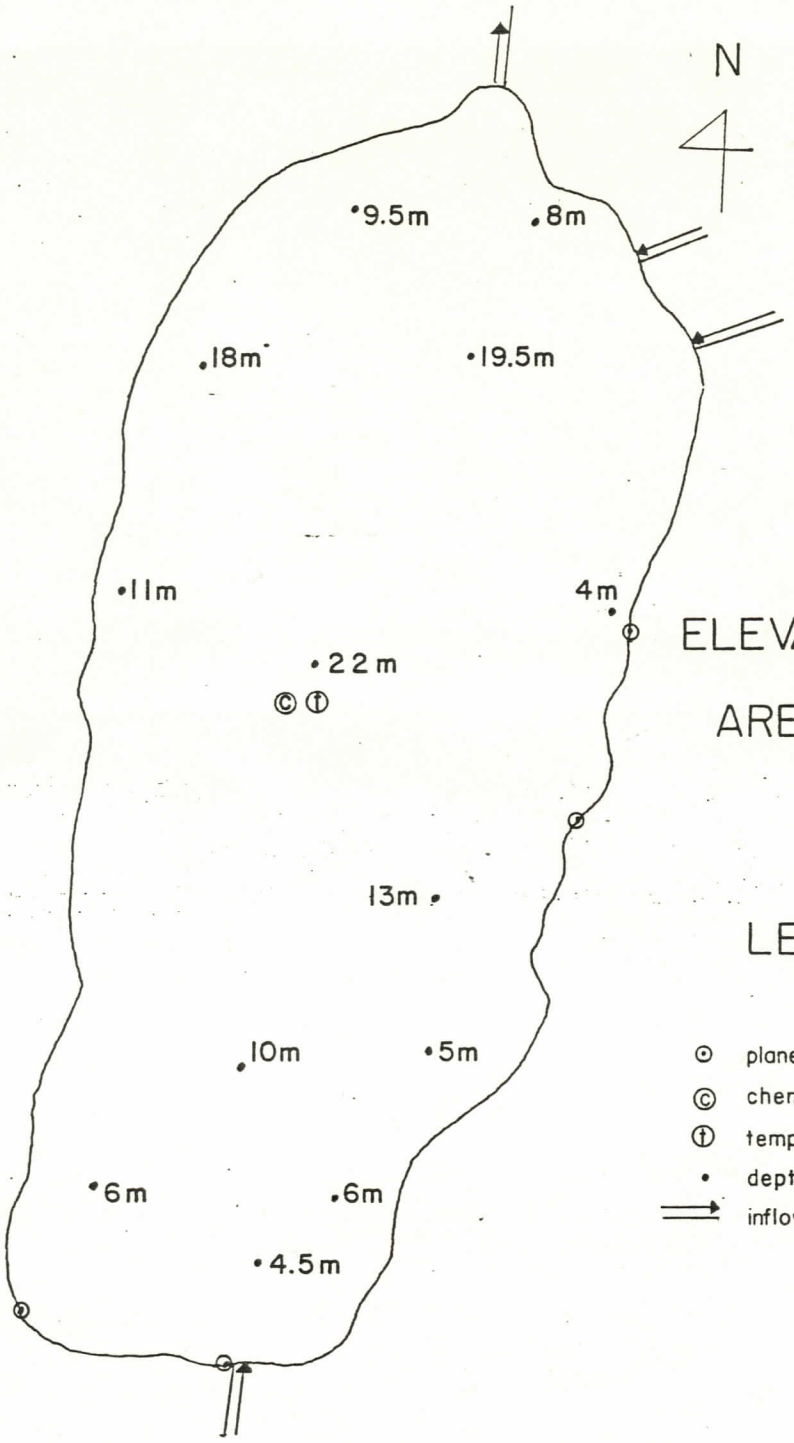
V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

TEST	RESULT
iii) Inflow #3	
Average Width	- 2.0 meters
Average Depth	- 35 centimeters
Velocity	- 0.63 meters/second
Volume of Flow	- 440 litres/second
Temperature	- 6.0°C
Bottom Composition	- Gravel, fine to coarse sand, some log debris
Comments	- Rocky Mountain Cutthroat Trout Spawning
C) OUTFLOW STREAM	
Average Width	- 6.0 meters
Average Depth	- 75 centimeters
Velocity	- 0.14 meters/second
Volume of Flow	- 640 liters/second
Temperature	- 8.0°C
Bottom Composition	- Fine to coarse sand, few rocks, pebbles, log debris

DEVIL'S HOLE LAKE

FIG. 5B



ELEVATION 1783m

AREA 14.3 ha.

LEGEND

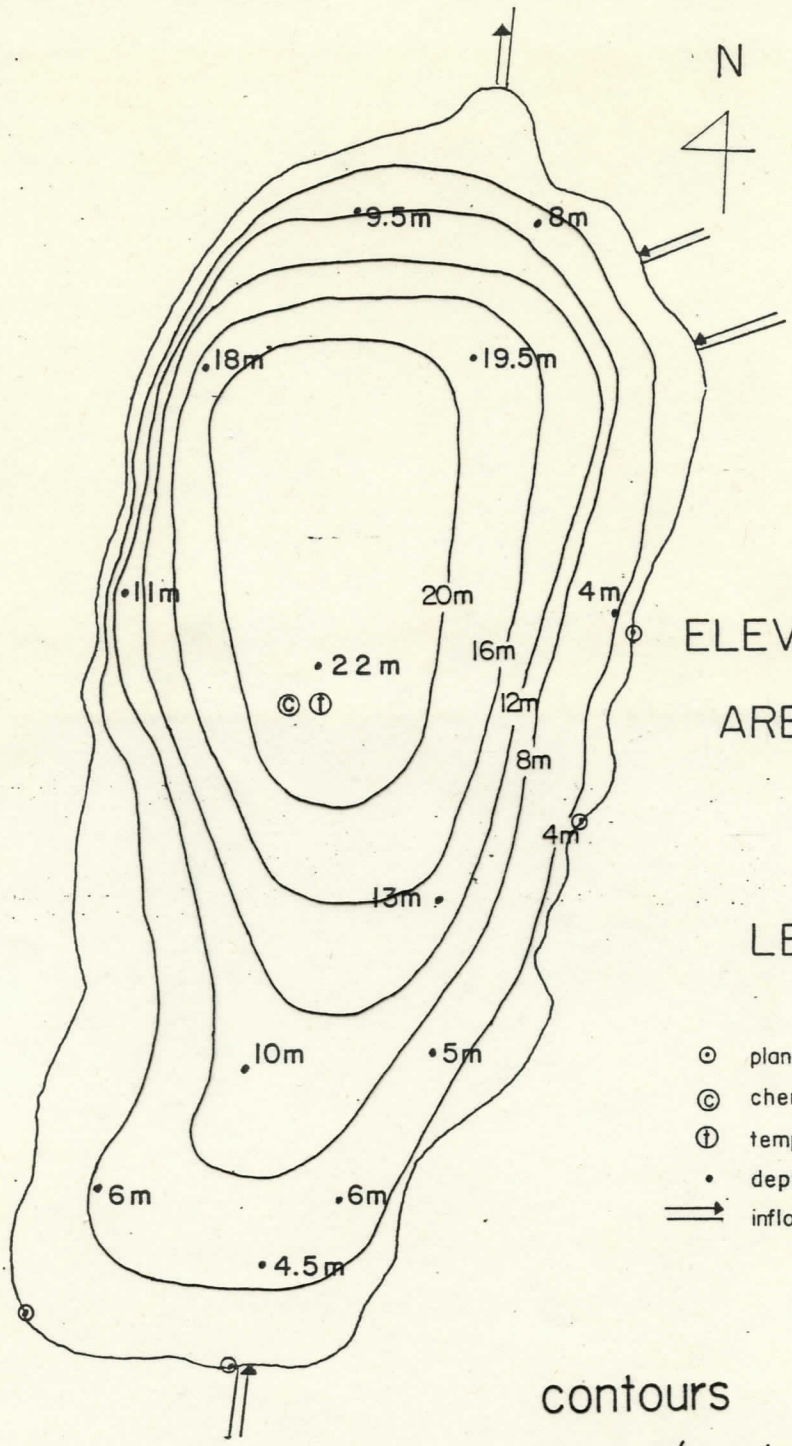
- ⊙ plane table stations
- © chemical record
- ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:2841

DEVIL'S HOLE LAKE

FIG. 5B



ELEVATION 1783m

AREA 14.3 ha.

LEGEND

- ⊙ plane table stations
- © chemical record
- ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

contours (meters)

PLANE TABLE SURVEY

scale = 1:2841

ELMO LAKE

DATE STUDIED: July 15th, 1981

I. LOCATION:

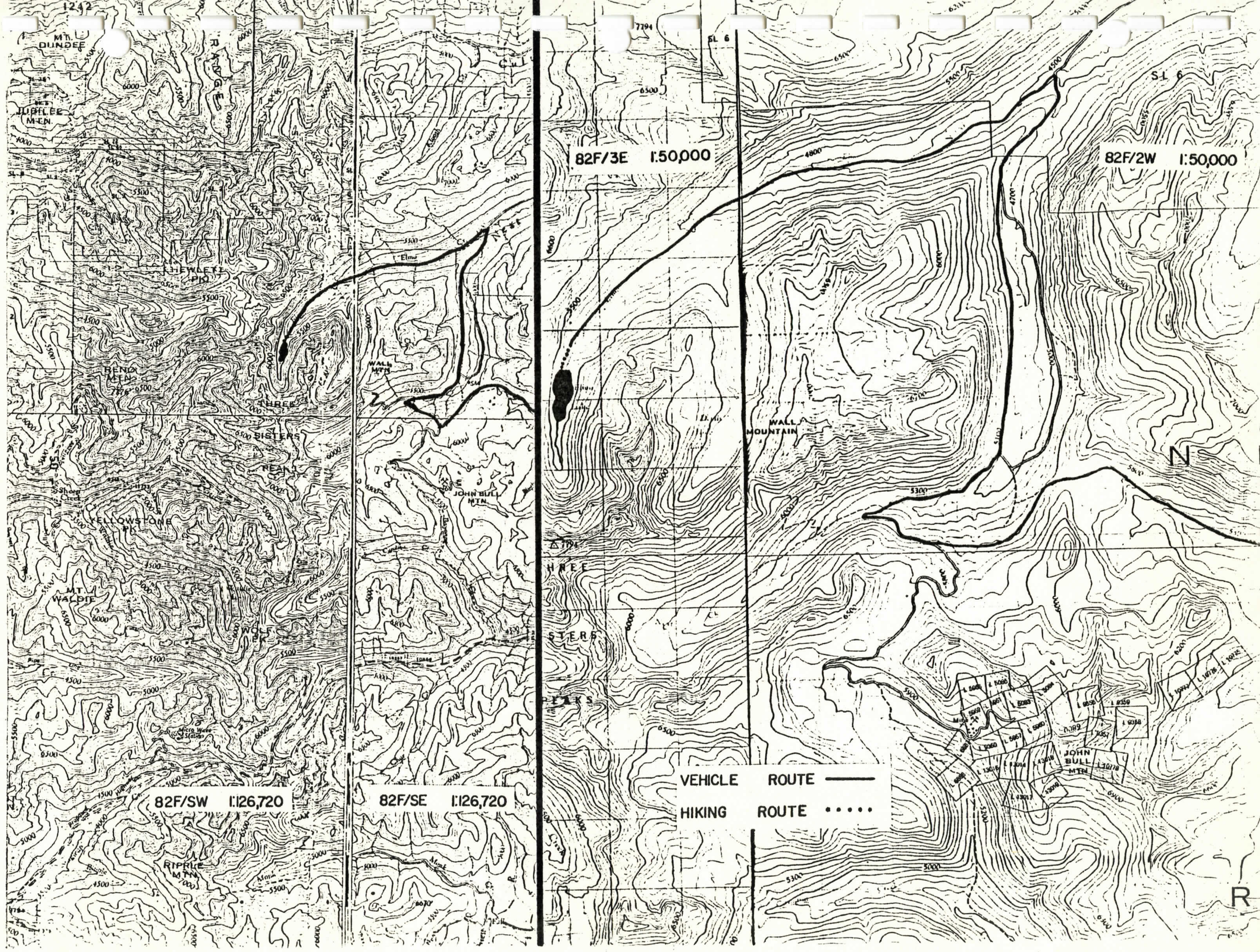
- 49° 12' N., 117° 02' W.
- Department of Mines and Technical Surveys Map: Salmo, B.C. 82F/3E, 1:50,000; Grid Reference: 975490
- Department of Lands and Forests Map: Trail, B.C. 82F/SW, 1:126,720
- Aerial photographs #BC 5348-122, #BC 5348-123

II. ACCESS:

By Vehicle

Starting from Salmo turnoff on Highway #3 proceed towards Creston as follows:

DISTANCE (Km)	FEATURE	ROUTE
94.3	- Beginning of Blazed Creek logging road	L
94.5	- Bridge	
98.4	- Fork in road	L
98.6	- Fork in road	R
99.3	- Creek	
100.0	- Bridge	
102.0	- Fork in road	R
102.7	- Fork in road	R



82F/3E 1:50,000
82F/2W 1:50,000
82F/SW 1:126,720
82F/SE 1:126,720
VEHICLE ROUTE
HIKING ROUTE
MT. DUNDEE
JUBILEE MTN
HEWLETT PK
RENO MTN
THREE SISTERS
YELLOWSTONE PK
MT. WALDIE
WOLF PK
RIPRAP MTN
WALL MTN
JOHN BULL MTN
WALL MOUNTAIN
JOHN BULL MTN

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
103.8	- Fork in road	R
104.3	- Creek	
104.4	- Darkwoods Forestry Boundary Sign	
104.5	- Creek	
105.3	- Creek	
106.0	- Creek	
107.2	- Creek	
107.6	- Creek	
108.8	- Fork in road	L
109.4	- Fork in road	R
110.0	- Fork in road	R
110.6	- Creek	
110.8	- Creek	
111.0	- Fork in road	R
111.6	- Creek	
112.0	- Fork in road and washout (4 wheel drive)	R
112.2	- Creek	
112.4	- Fork in road	R
112.7	- Creek	
112.8	- Fork in road	L
113.8	- Fork in road	L
114.6	- Creek	
116.8	- Creek	
117.4	- Creek	
117.7	- Fork in road	R
118.3	- Fork in road	R
119.6	- Fork in road	L
120.8	- Fork in road	R
121.3	- Creek	
121.6	- Fork in road	R
123.0	- Creek	
123.3	- Creek	

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
123.9	- Creek	
124.1	- Fork in road	R
125.5	- Elmo Creek Bridge	
126.0	- Creek	
126.1	- Fork in road	R
127.4	- Creek	
127.5	- Creek	
127.8	- Creek	
128.0	- Fork in road	L
128.3	- Creek	
128.4	- Fork in road	R
128.6	- End of road	

Hiking Route

Follow the old road which eventually becomes a path. Follow the path to the lake. (The outflow can be heard from the path.) Hiking time is approximately 20 minutes.

NOTE: Part of the access to Elmo Lake is on private property (permission to utilize roadways and area must be obtained from Darkwoods Forestry Ltd., Nelson, B.C.).

III. GENERAL DESCRIPTION:

Although large, Elmo Lake is surprisingly shallow. It lies at an elevation of 1661 meters and has a northern exposure.

This lake has four major inflow streams and only one outflow stream - Elmo Creek - that joins Next Creek, which eventually drains into Kootenay Lake.

Rainbow Trout, up to twenty-eight centimeters in length, were caught and many were found spawning in the only outflow stream at the northwest end of the lake.

An adequate camping spot may be found south of the talus slope on the west shore of the lake. Other camping spots may be found but damp ground, thick brush, and steep slopes are a hindrance.

Mountainous backdrop at west end of lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No aquatic vegetation was observed.

Sites

Elmo Lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone. The three vegetation sites are illustrated in Figure 4A.

This lake lies in a glacially carved U-shaped valley. The talus slope on the west side of the lake is composed of quartz and quartzite rock. The west side of Elmo Lake lies in the Quartzite Range Formation and the east side of the lake is part of the Three Sisters Formation.

Site 1

This site was taken in the forested area of the east side of the lake.

Slope: 18°

Exposure: West

Moisture Regime: Moist

Vegetation Classification: Menziesia Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Rubus pedatus (Trailing Rubus)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Clintonia uniflora (Queen's Cup)

Streptopus amplexifolius (Twisted Stalk)

Mosses:

Hookeria lucens

Pohlia nutans

Lichens:

Alectoria sp. (Old Man's Beard)

Cladonia sp. (Trumpet Lichen)

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Site 2

Site 2 was on the marshy land near the inflow stream at the south end of the lake. Most of the vegetation at this site was growing on a Sphagnum moss base.

Slope: 0°

Exposure: North

Moisture Regime: Very Wet

Vegetation Classification: Sphagnum Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Leptarrhena amplexifolia (Leptarrhena)

Actaea rubra (Baneberry)

Streptopus amplexifolius (Twisted Stalk)

Habenaria dilatata (White Rein Orchid)

Kalmia polifolia (Swamp Laurel)

Senecio triangularis (Giant Ragwort)

Pedicularis groenlandica (Elephant Head)

Viola langsdorfii (Smooth Violet)

Xerophyllum tenax (Bear-Grass)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

Mosses: Sphagnum sp.

Grasses: Unidentified

Site 3

This site was located in the forested area on the west side of the lake near an inflow stream. The soil was slightly more moist than that of site 1.

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3 (cont'd)

Slope: 0°

Exposure: Southeast

Moisture Regime: Moist

Vegetation Classification: Menziesia-Tiarella Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Tsuga heterophylla (Western Hemlock)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Rubus pedatus (Trailing Rubus)

Rhamnus alnifolia (Alderleaf Buckthorn)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Actaea rubra (Baneberry)

Trillium ovatum (Western Trillium)

Clintonia uniflora (Queen's Cup)

Streptopus amplexifolius (Twisted Stalk)

Tiarella unifoliata (Foam Flower)

Valeriana sitchensis (Mountain Valerian)

Senecio triangularis (Giant Ragwort)

Geum macrophyllum (Large-Leaved Avens)

Veratrum eschocholtzii (Indian Hellebore)

Ferns: Gymnocarpium dryopteris (Oak-Fern)

Mosses:

Sphagnum sp.

Dicranella heteromalla

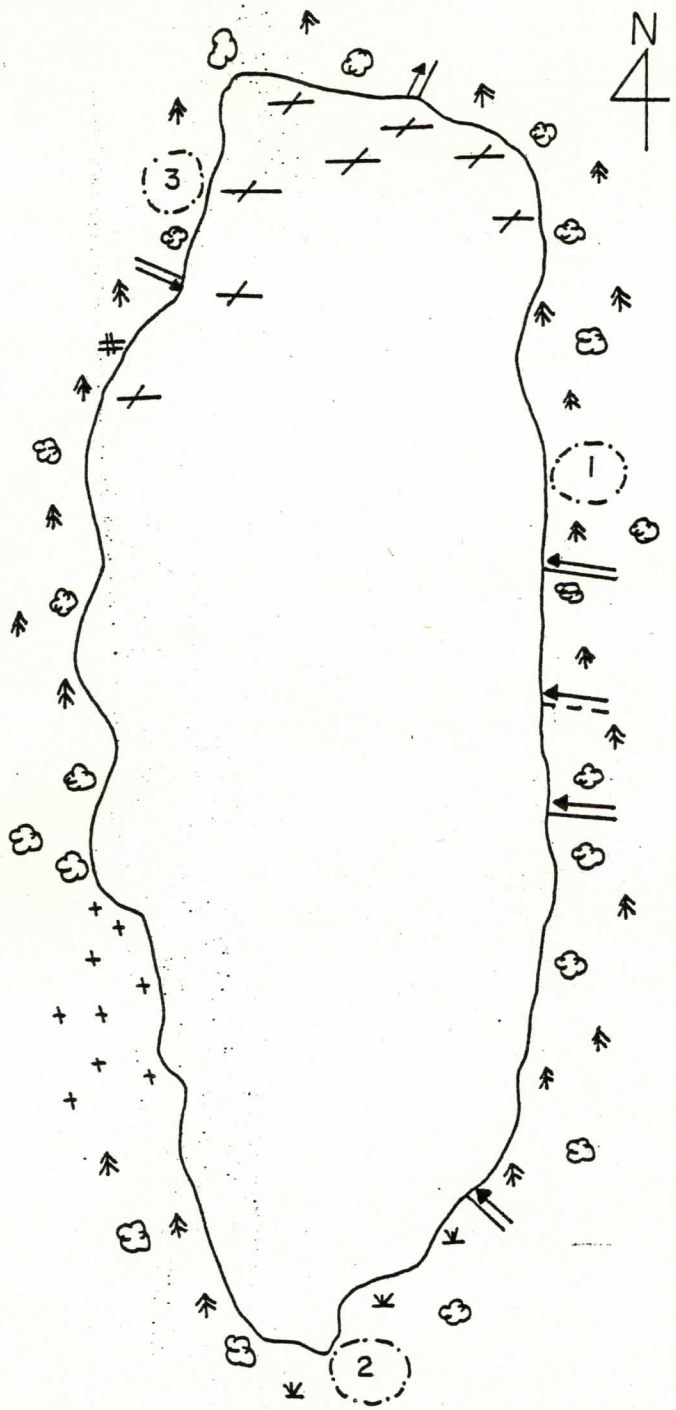
Mnium glabrescens

Lichens: Alectoria sp. (Old Man's Beard)

* The association classification for each site was developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw).

FIG. 1A

ELMO LAKE



LEGEND

	site boundaries
1,2,3	sites
	trees
	shrubs
	marsh
	log debris
	dead upright trees
	talus
	streams

VEGETATION and LANDFORMS

scale = 1:3125

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 8.0°C
	- Bottom 7.0°C
Secchi Disc	- Limit of visibility - 7 meters
	- Weather conditions - overcast but clearing slightly; Water conditions - ripples
Bottom Composition	- Rocks, sand, muck
pH	- 6.9
Total Alkalinity	- 6 ppm
Total Dissolved Solids	- 21 ppm
Lake Level	- At high water mark
Average Volume	- 7.0×10^8 liters
Littoral Area	- 1.2×10^4 m^2

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 4 meters
Average Depth	- 75 centimeters
Velocity	- 0.26 meters/second
Volume of Flow	- 790 liters/second
Temperature	- 4.0°C
Bottom Composition	- Large quartzite rocks, fine sand, some log debris

ii) Inflow #2

Average Width	- 1.5 meters
Average Depth	- 8 centimeters
Velocity	- 0.5 meters/second
Volume of Flow	- 60 liters/second
Temperature	- 5.0°C
Bottom Composition	- Small rocks, coarse sand, some log debris

V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAM (cont'd)

iii) Inflow #3

TEST	RESULT
Average Width	- 50 centimeters
Average Depth	- 15 centimeters
Velocity	- 0.25 meters/second
Volume of Flow	- 19 liters/second
Temperature	- 5.0°C
Bottom Composition	- Gravel, sand, log debris

iv) Inflow #4

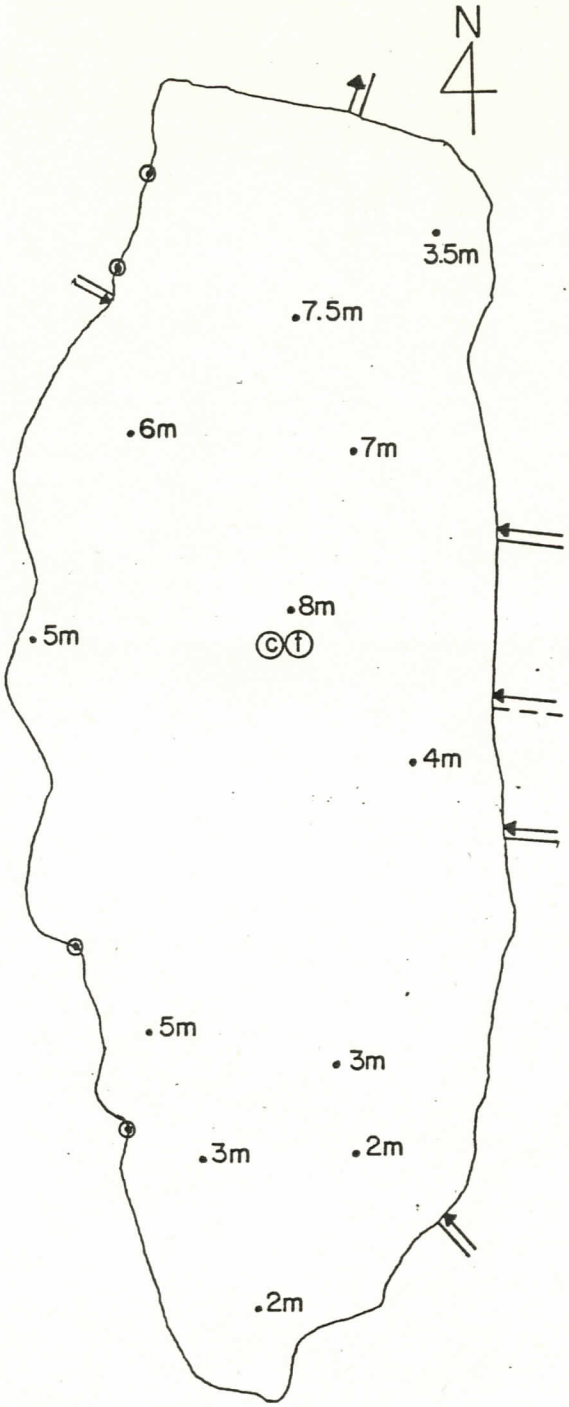
Average Width	- 130 centimeters
Average Depth	- 20 centimeters
Velocity	- 0.38 meters/second
Volume of Flow	- 98 litres/second
Temperature	- 7.0°C
Bottom Composition	- Gravel, pebbles, sand
Comments	- Rainbow trout spawning

C) OUTFLOW STREAM

Average Width	- 4 meters
Average Depth	- 50 centimeters
Velocity	- 1.0 meters/second
Volume of Flow	- 2000 liters/second
Temperature	- 8.0°C
Bottom Composition	- Boulders, some log debris

FIG. 4B

ELMO LAKE



ELEVATION 166lm.

AREA 14 ha.

LEGEND

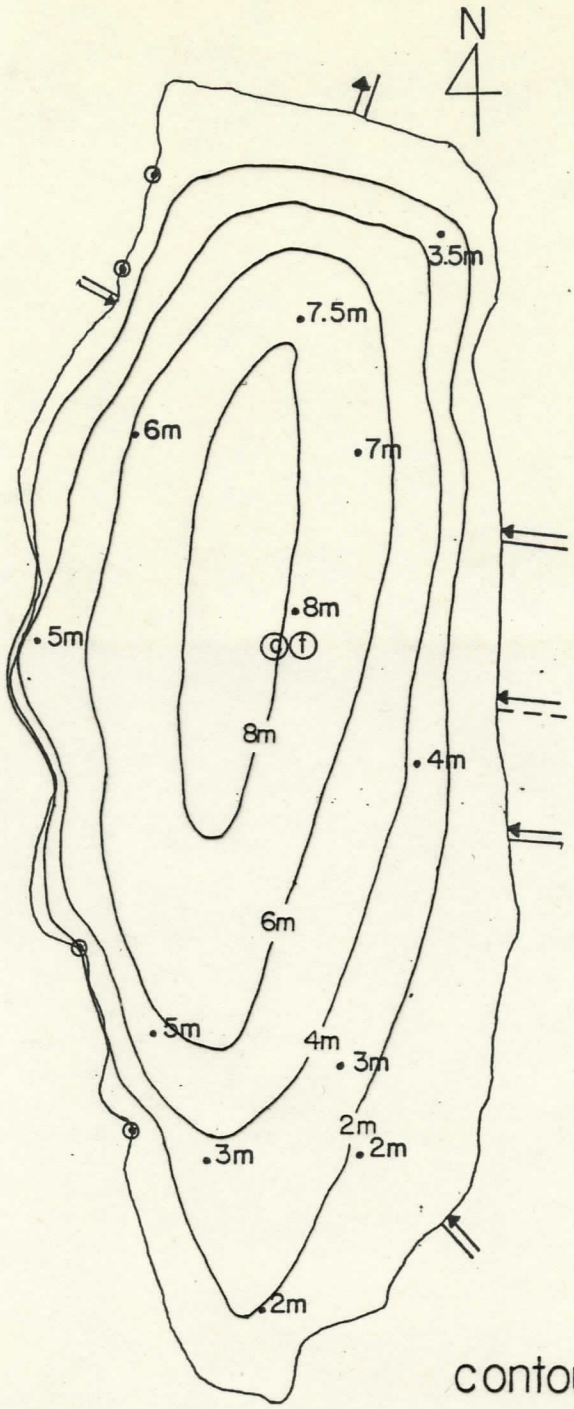
- plane table stations
- chemical record
- temperature record
- depth soundings
- inflow/outflow streams
- runoff stream

PLANE TABLE SURVEY.

scale = 1:2976

FIG. 4B

ELMO LAKE



ELEVATION 1661m.

AREA 14 ha.

· LEGEND

- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- · depth soundings
- ⟹ inflow/outflow streams
- ⟹ runoff stream

contours (meters)

PLANE TABLE SURVEY

scale = 1:2976

WALDIE LAKE (WULF LAKE)

DATE STUDIED: July 21st, 1981

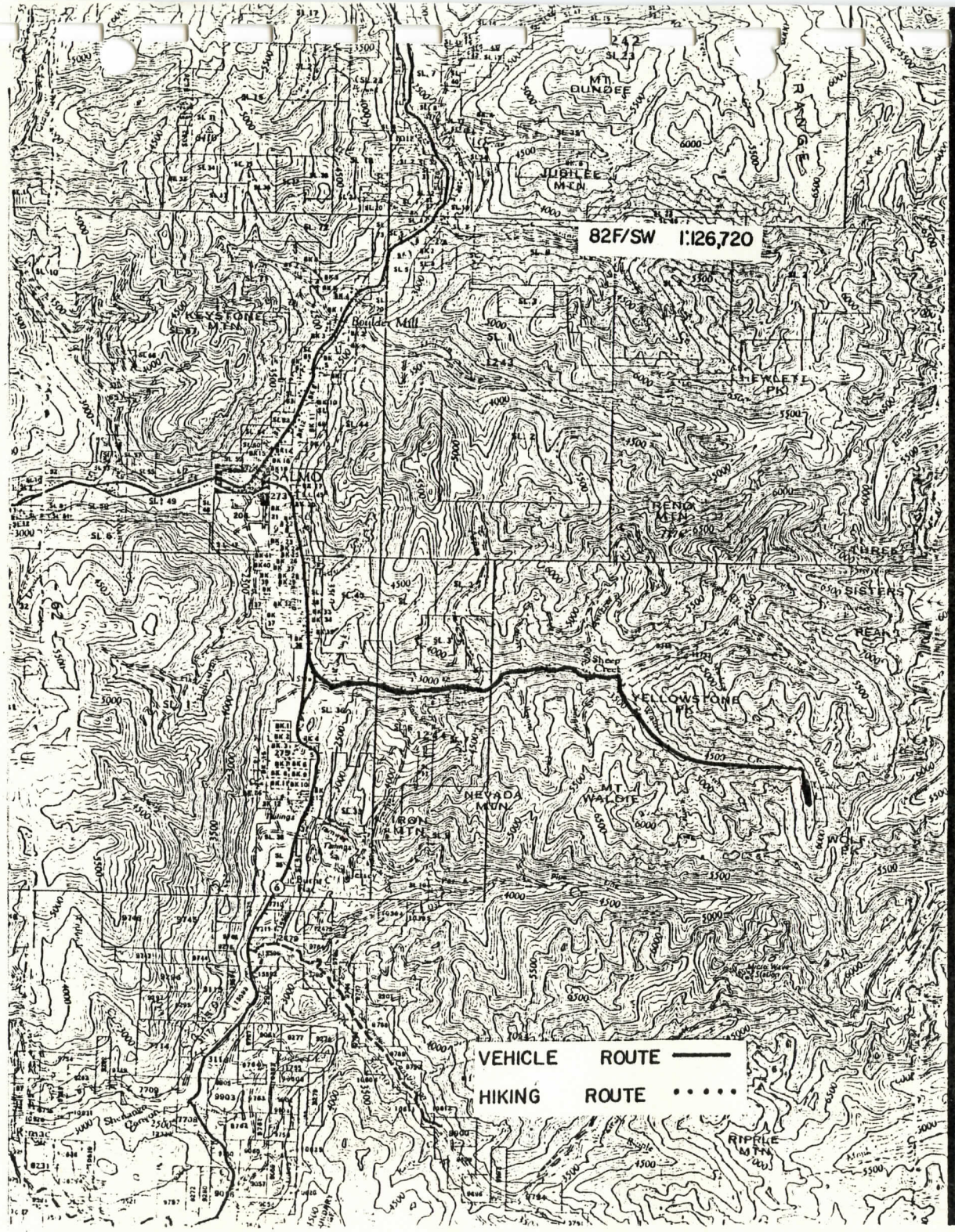
I. LOCATION:

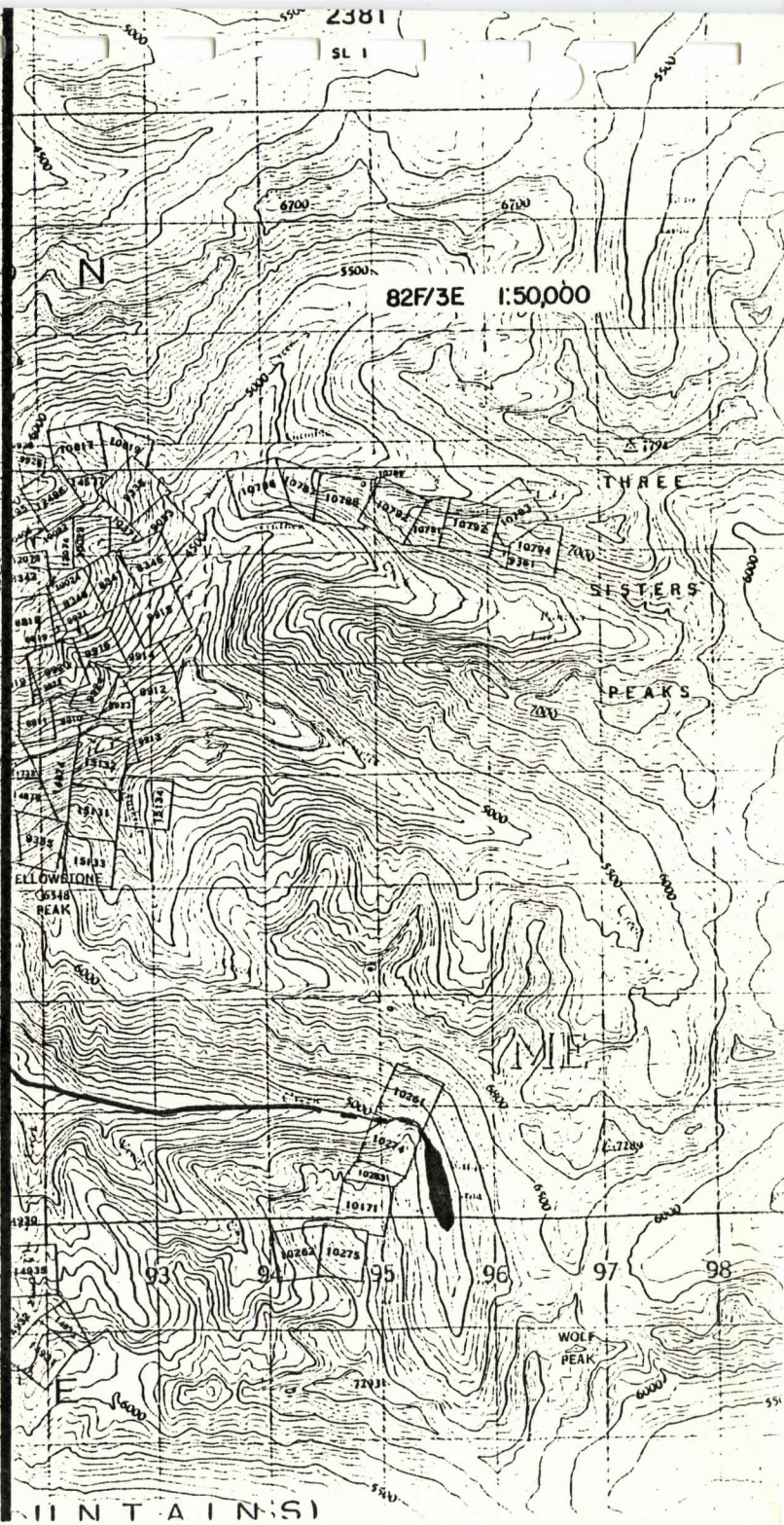
- 49° 07' N., 117° 3.5' W.
- Department of Mines and Technical Surveys Map: Salmo, B.C.; 82F/3E; 1:50,000; Grid Reference 955404
- Department of Lands and Forests Map: Trail, B.C.; 82F/SW; 1:126,720
- Aerial photographs #BC 5348-142, #BC 5348-143

II. ACCESS:

By Vehicle

Drive towards Salmo on Highway #3A and turn left at Salmo turnoff. 0.7 km past the turnoff turn right (at Salmo Sewing Basket). After 5.8 km past the Salmo Sewing Basket, turn left. Then proceed as follows:


82F/SW 1:126,720
MT. DUNDEE
JUBILEE MTN
RANGE
KEYSTONE MTN
Boulder Mill
HEWLETT PK
KILMO
IRENO MTN
THREE SISTERS PEAK
Sheep Creek
YELLOWSTONE PK
NEVADA MTN
MT. WALOLE
IRON MTNE
WOLF PK
RIPPLE MTN
VEHICLE ROUTE
HIKING ROUTE


82F/3E 1:50,000
THREE SISTERS PEAKS
YELLOWSTONE PEAK
WOLF PEAK
93
94
95
96
97
98

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
0.3	- Dirt road begins	
2.9	- Fork in road	R
5.9	- Fork in road	R
6.3	- Creek	
7.3	- Bridge	
8.0	- Fork in road	R
9.5	- Fork in road	R
9.6	- Creek	
10.4	- Fork in road	R
10.43	- Bridge	
10.48	- Fork in road	R
10.6	- Bridge	
11.2	- Fork in road	L
12.9	- Fork in road	L
13.4	- Fork in road	R
13.8	- Creek	
14.4	- Creek	
14.7	- Fork in road	R
15.0	- Fork in road	R
15.8	- Creek	
16.4	- STOP	

Hiking Route

Walk back down the road a short distance until flagging is seen on the right. Follow the path to Waldie Lake. Hiking time is approximately 1/2 hour.

III. GENERAL DESCRIPTION:

Waldie Lake (also known as Wulf Lake) is situated in a long, narrow valley with a northwestern exposure. It lies at an elevation of 1640 meters.

There are five major inflow streams into the lake, and Waldie Creek is the only outflow.

The trail and recreation site at Waldie Lake are maintained by the B.C. Forest Service. The lake has been stocked with rainbow trout.

This popular recreation site shows evidence of past mining and logging activity.

Noticeable talus slope on mountain south of the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was observed in the lake.

Sites

Waldie Lake is located in the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone.

Figure 6A illustrates the site areas.

Waldie Lake nests in a glacially scoured V-shaped valley. It is part of the Three Sisters Formation and a quartzite sample was taken from the talus slope on the west end of the lake.

Site 1

This site was located in the forest on the west side of the lake.

Slope:	28°
Exposure:	East
Moisture Regime:	Moist
Vegetation Classification:	Menziesia-Tiarella Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

- Picea glauca ssp. engelmannii (Engelmann Spruce)
- Tsuga heterophylla (Western Hemlock)
- Abies lasiocarpa (Alpine Fir)

Shrubs:

- Rubus pedatus (Trailing Rubus)
- Sorbus scopulina (Western Mountain Ash)
- Vaccinium membranaceum (Black Mountain Huckleberry)
- Menziesia ferruginea (False Azalea)
- Rhododendron albiflorum (White Rhododendron)
- Ribes hudsonianum (Hudson Bay Currant)

Flowers:

- Tiarella unifoliata (Foam Flower)
- Streptopus amplexifolius (Twisted Stalk)
- Viola glabella (Yellow Violet)
- Xerophyllum tenax (Bear-Grass)

Mosses:

- Sphagnum sp.
- Hygrohypnum luridum
- Dicranum fuscenscens

Lichens: Alectoria sp. (Old Man's Beard)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

This site was beside the inflow stream at the south end of the lake.

Slope: 0°

Exposure: Northeast

Moisture Regime: Very moist to wet

Vegetation Classification: Sphagnum Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Rubus pedatus (Trailing Rubus)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Streptopus amplexifolius (Twisted Stalk)

Alisma plantago-aquatica (Water Plantain)

Sium ssp. (Parsnip)

Senecio triangularis (Giant Ragwort)

Viola langsdorfii (Smooth Violet)

Xerophyllum tenax (Bear-Grass)

Mosses: Sphagnum sp.

Aulacomnium palustre

Lichens: Alectoria sp. (Old Man's Beard)

Sedges: Unidentified

Site 3

Site three was located on the east side of the lake.

Slope: 10°

Exposure: West

Moisture Regime: Very Moist

Vegetation Classification: Pachistima Association of the ESSFw Biogeoclimatic Zone*

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3 (cont'd)

Vegetation

Trees:

Tsuga heterophylla (Western Hemlock)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Rubus pedatus (Trailing Rubus)

Pachistima myrsinites (False Box)

Lonicera utahensis (Red Twinberry)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Tiarella unifoliata (Foam Flower)

Clintonia uniflora (Queen's Cup)

Xerophyllum tenax (Bear-Grass)

Mosses:

Aulacomnium palustre

Dicranum fuscescens

Lichens:

Alectoria sp. (Old Man's Beard)

Cladonia sp. (Trumpet Lichen)

Peltigera sp.

* The sites were classified according to Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw).

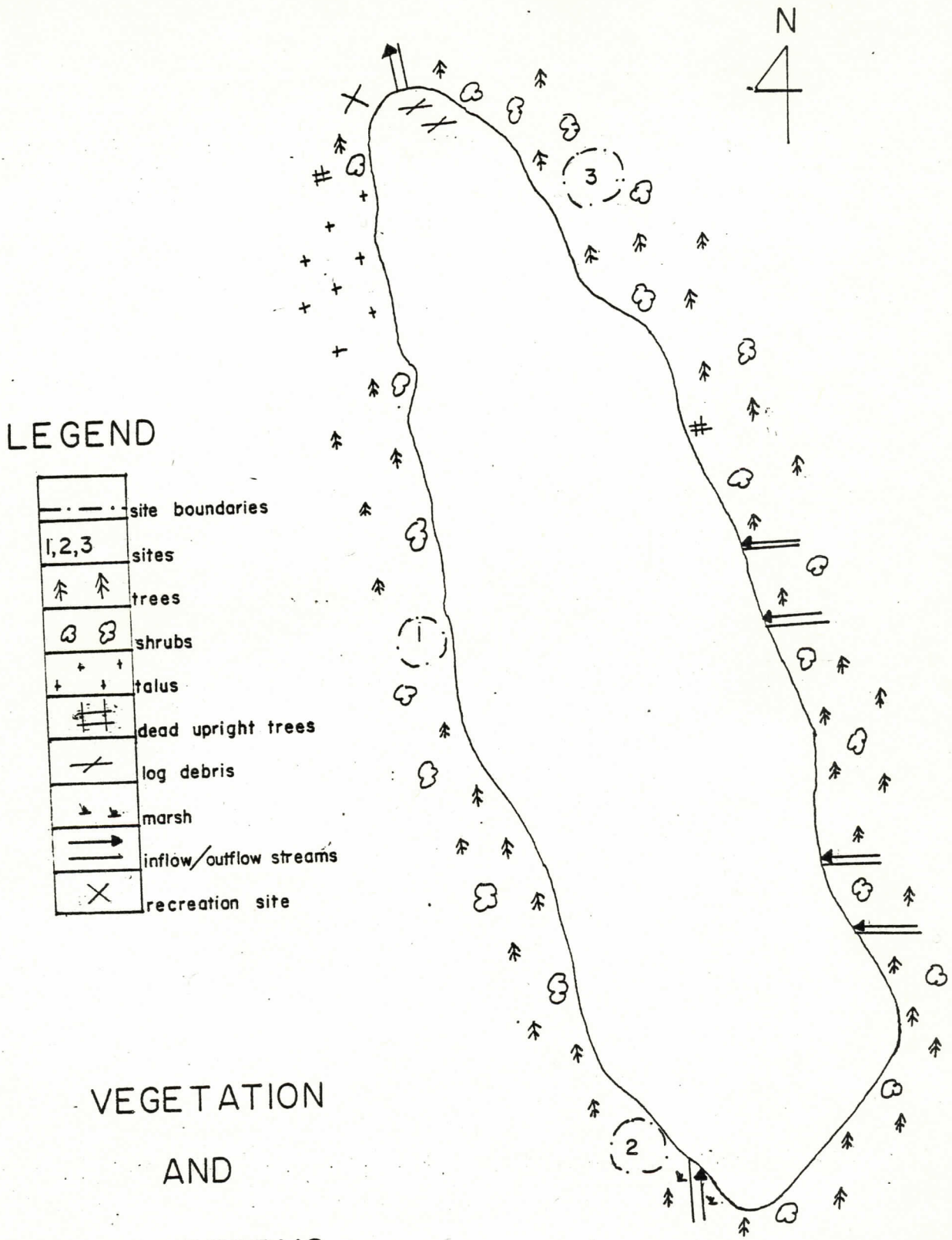
V. PHYSCIAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 9.0°C
	- Bottom 8.0°C
Secchi Disc	- Limit of visibility - 7.0 meters
	- Weather conditions - heavily overcast (3:00 p.m.)
	- Water condition - choppy
Bottom Composition	- Rocks, sand, muck

FIG. 6A

WALDIE LAKE (WULF LAKE)



VEGETATION AND LANDFORMS

scale = 1:2500

V. PHYSICAL AND CHEMICAL DATA: (cont'd)

A) LAKE

TEST	RESULT
pH	- 6.8
Total Alkalinity	- 6 ppm
Total Dissolved Solids	- 16 ppm
Lake Level	- at high water level
Littoral Area	- 1.0×10^4 m^2
Total Volume	- 7.0×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 2.5 meters
Average Depth	- 45 centimeters
Velocity	- 0.29 meters/second
Volume of Flow	- 320 liters/second
Temperature	- 6.0°C
Bottom Composition	- Gravel, sand, some log debris and moss

ii) Inflow #2

Average Width	- 40 centimeters
Average Depth	- 5 centimeters
Velocity	- 0.5 meters/second
Volume of Flow	- 10 liters/second
Temperature	- 4.0 C
Bottom Composition	- Gravel, rocks, pebbles, sand, some log debris

iii) Inflow #3

Average Width	- 85 centimeters
Average Depth	- 12 centimeters
Velocity	- 1.0 meters/second
Volume of Flow	- 100 liters/second
Temperature	- 4.5°C
Bottom Composition	- Gravel, pebbles, rocks, sand

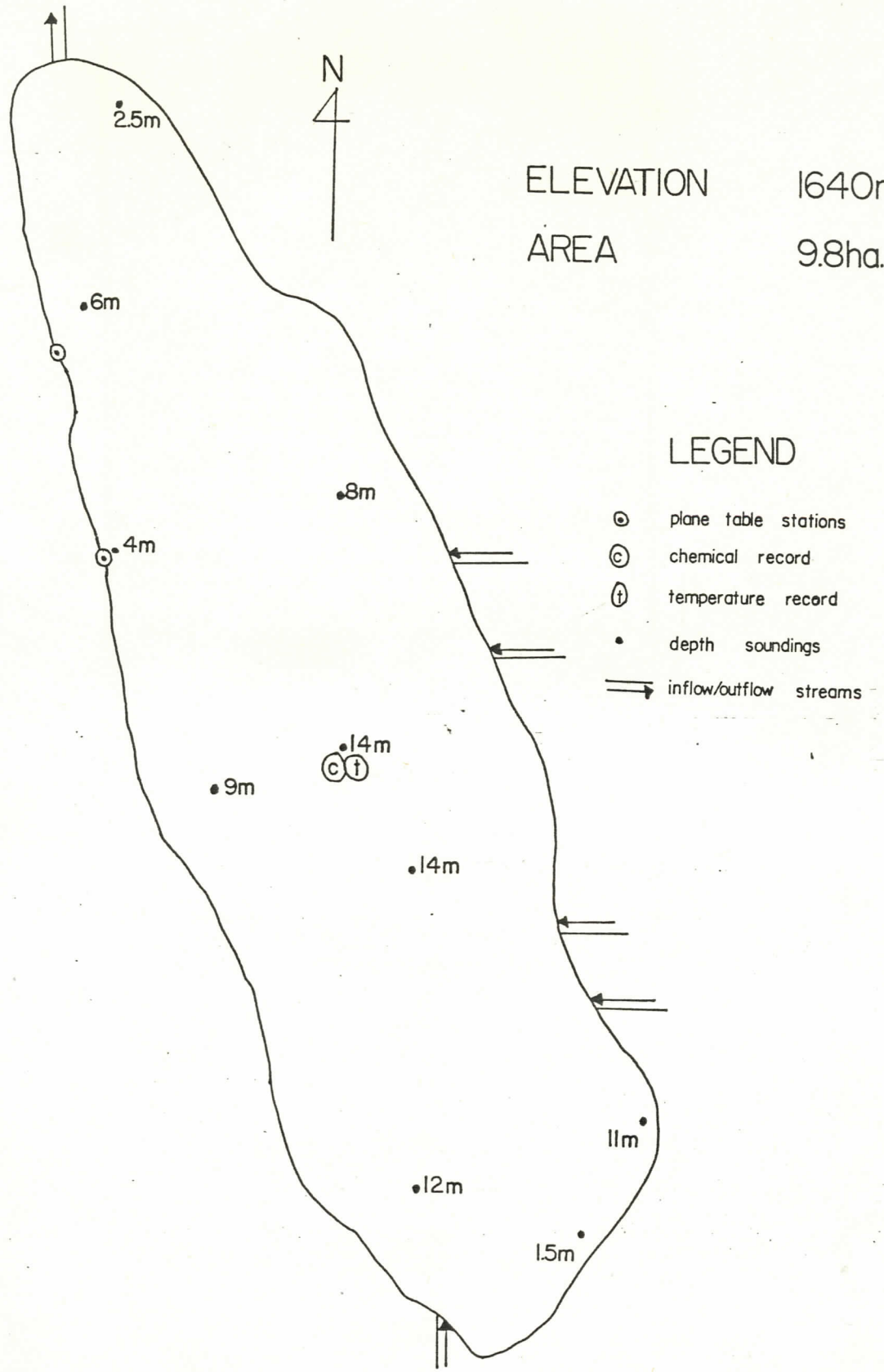
V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

TEST	RESULT
iv) Inflow #4	
Average Width	- 1.3 meters
Average Depth	- 8 centimeters
Velocity	- 0.33 meters/second
Volume of Flow	- 34 liters/second
Temperature	- 5.0°C
Bottom Composition	- Gravel, rocks, sand, log debris
v) Inflow #5	
Average Width	- 70 centimeters
Average Depth	- 8 centimeters
Velocity	- 0.47 meters/second
Volume of Flow	- 26 liters/second
Temperature	- 6.0°C
Bottom Composition	- Large rocks, boulders and gravel
C) OUTLFOW STREAM	
Average Width	- 3 meters
Average Depth	- 60 centimeters
Velocity	- 0.67 meters/second
Volume of Flow	- 1200 liters/second
Temperature	- 9.0°C
Bottom Composition	- Gravel, pebbles, rocks, sand, log debris

WALDIE LAKE (WULF LAKE)

FIG.6B

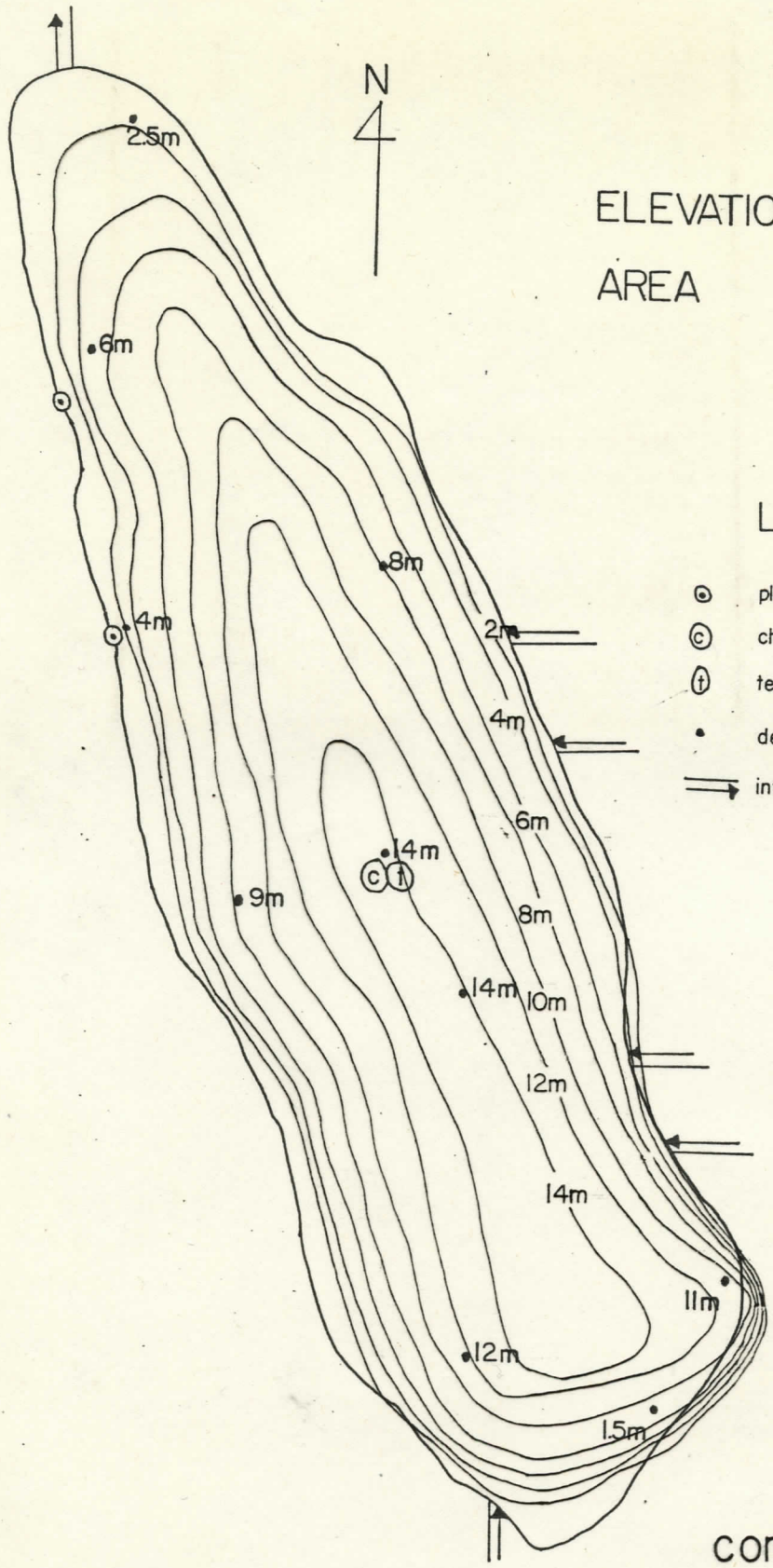


PLANE TABLE SURVEY

scale = 1:2330

WALDIE LAKE (WULF LAKE)

FIG.6B



ELEVATION 1640m.

AREA 9.8ha.

LEGEND

- plane table stations
- chemical record
- temperature record
- depth soundings
- inflow/outflow streams

contours

PLANE TABLE SURVEY

(meters)

scale. = 1:2330

PANTHER LAKE

DATE STUDIED: July 22nd, 1981

I. LOCATION:

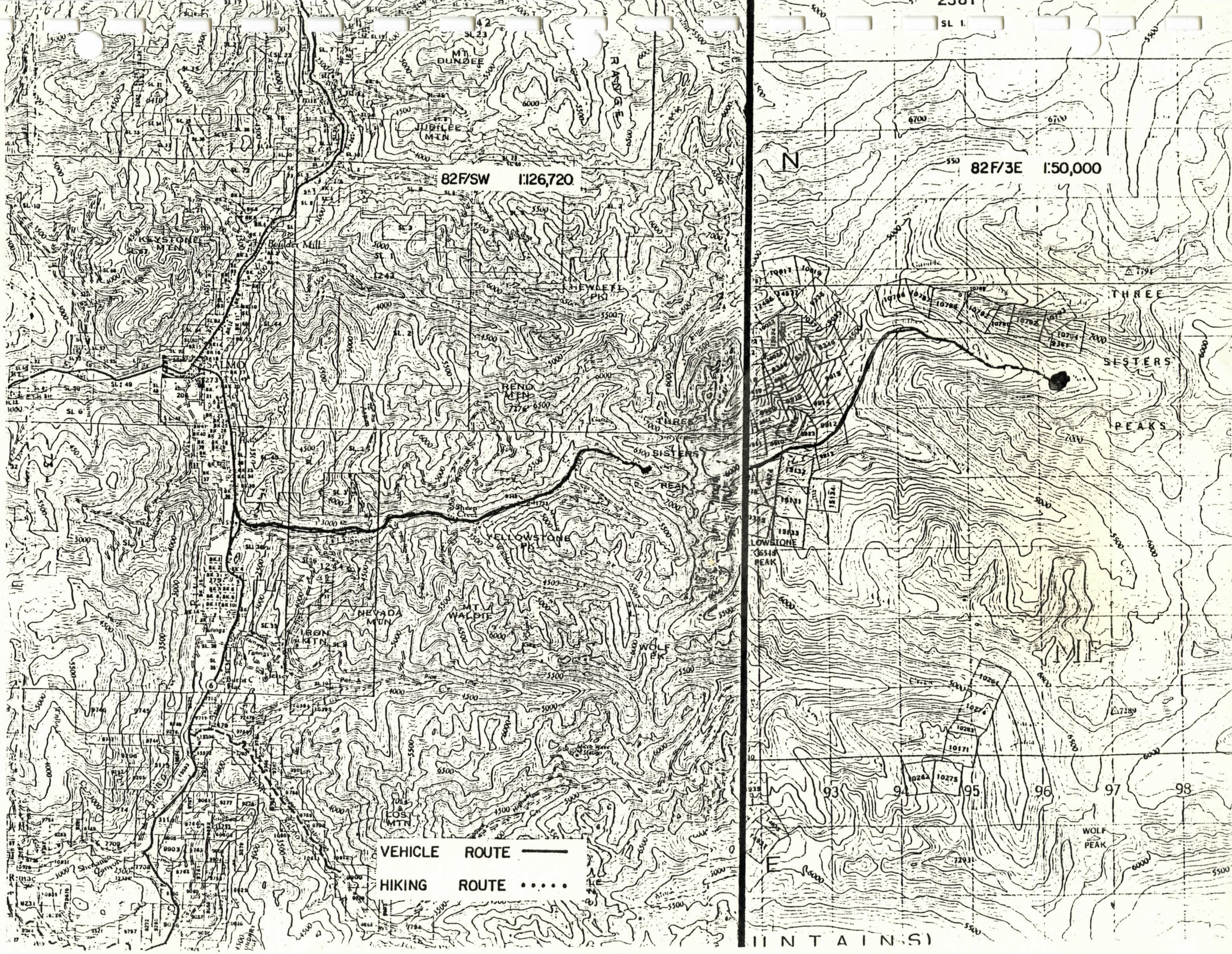
- 49° 9.6' N., 117° 3' W.
- Department of Mines and Technical Surveys Map: Salmo, B.C.; 82F/3E; 1:50,000; Grid Reference 963454
- Department of Lands and Forests Map: Trail, B.C.; 82F/SW; 1:126,720
- Aerial photographs #BC 5348-140, #BC 5348-141

II. ACCESS:

By Vehicle

Drive towards Salmo on Highway #3A and turn left at Salmo turnoff. 0.7 km past the turnoff, turn right (at Salmo Sewing Basket). After 5.8 km past the Salmo Sewing Basket, turn left. Then proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
0.3	- Dirt road begins	
2.9	- Fork in road	R
5.9	- Fork in road	R
6.3	- Creek	
7.3	- Bridge	



82F/SW 1:126,720
82F/3E 1:50,000
MT DUNDEE
JUBILEE MTN
KEYSTONE MTN
Boulder Mill
HEWLETT PK
REND MTN
THREE SISTERS PEAK
YELLOWSTONE PK
NEVADA MTN
IRON MTN
MT WALDIE
WOLF PK
LOST MTN
THREE SISTERS PEAKS
WOLF PEAK
VEHICLE ROUTE
HIKING ROUTE

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)		FEATURE	ROUTE
8.0	-	Fork in road	R
9.5	-	Fork in road	R
9.6	-	Creek	
10.4	-	Fork in road	L
10.5	-	Creek	
10.8	-	Recreation Site	
11.7	-	Fork in road	R
13.5	-	Fork in road	L
14.0	-	Fork in road	L
14.5	-	Creek	
15.0	-	Fork in road	R
15.1	-	Bridge	
15.3	-	Fork in road	R
15.6	-	Fork in road	R
15.7	-	Fork in road	R
16.0	-	Fork in road	L
16.3	-	STOP	

Hiking Route

Follow Panther Lake Trail directly to the lake. Hiking time is approximately 50 minutes.

III. GENERAL DESCRIPTION:

Panther Lake is situated at an elevation of 1740 meters and has a western exposure. Talus slope surrounds the entire eastern half of the lake and, on the southeastern shore, the talus extends out into the water to form a small island.

Panther Lake is fairly small and shallow. Rainbow Trout were observed in the lake and in the largest inflow stream at the east end. Altogether, there are two major inflow streams, one major outflow stream, and many small runoff streams.

The B.C. Forest Service maintains a recreation site with a picnic table and tent space at the lake. Some large boulders at the east end could also provide shelter.

B.C. Forest Service campsite.

Talus slope boardering lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No aquatic vegetation was noted.

Sites

Panther Lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic zone. The sites are illustrated in Figure 7A.

Quartzite and conglomerate rock samples were taken from the talus slopes at Panther Lake. The area is geologically classified as part of the Three Sisters Formation as well as the Quartzite Range Formation. The colorful pink and green quartzite talus slopes provide a scenic backdrop for this glacially scoured basin.

Site 1

This site was above the rock shore on the north side of the lake.

Slope: 13°

Exposure: East

Moisture Regime: Slightly Damp

Vegetation Classification: Engelmann Spruce-Alpine Fir-Black Huckleberry Association of the ESAF Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Sorbus sitchensis (Sitka Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Xerophyllum tenax (Bear-Grass)

Saxifraga ferruginea (Rusty Saxifrage)

Mosses: Aulacomnium palustre

Polytrichum juniperinum

Polytrichum commune

Lichens:

Alectoria sp. (Old Man's Beard)

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Site 2

This site was between the inflow stream and the large boulders of the talus slope at the end of the lake.

Slope: 3°

Exposure: Northwest

Moisture Regime: Moist

Vegetation Classification: Engelmann Spruce-Alpine Fir-Black Huckleberry Association of the ESAF Biogeoclimatic Zone*

Vegetation

Trees:

Pinus contorta latifolia (Lodgepole Pine)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Kalmia polifolia (Swamp Laurel)

Tiarella unifoliata (Foam Flower)

Sium spp. (Parsnip)

Listera cordata (Heart-Leaved Twayblade)

Viola langsdorfii (Smooth Violet)

Veratrum eschocholtzii (Indian Hellebore)

Mosses: Sphagnum sp.

Mnium glabrescens

Aulacomnium palustre

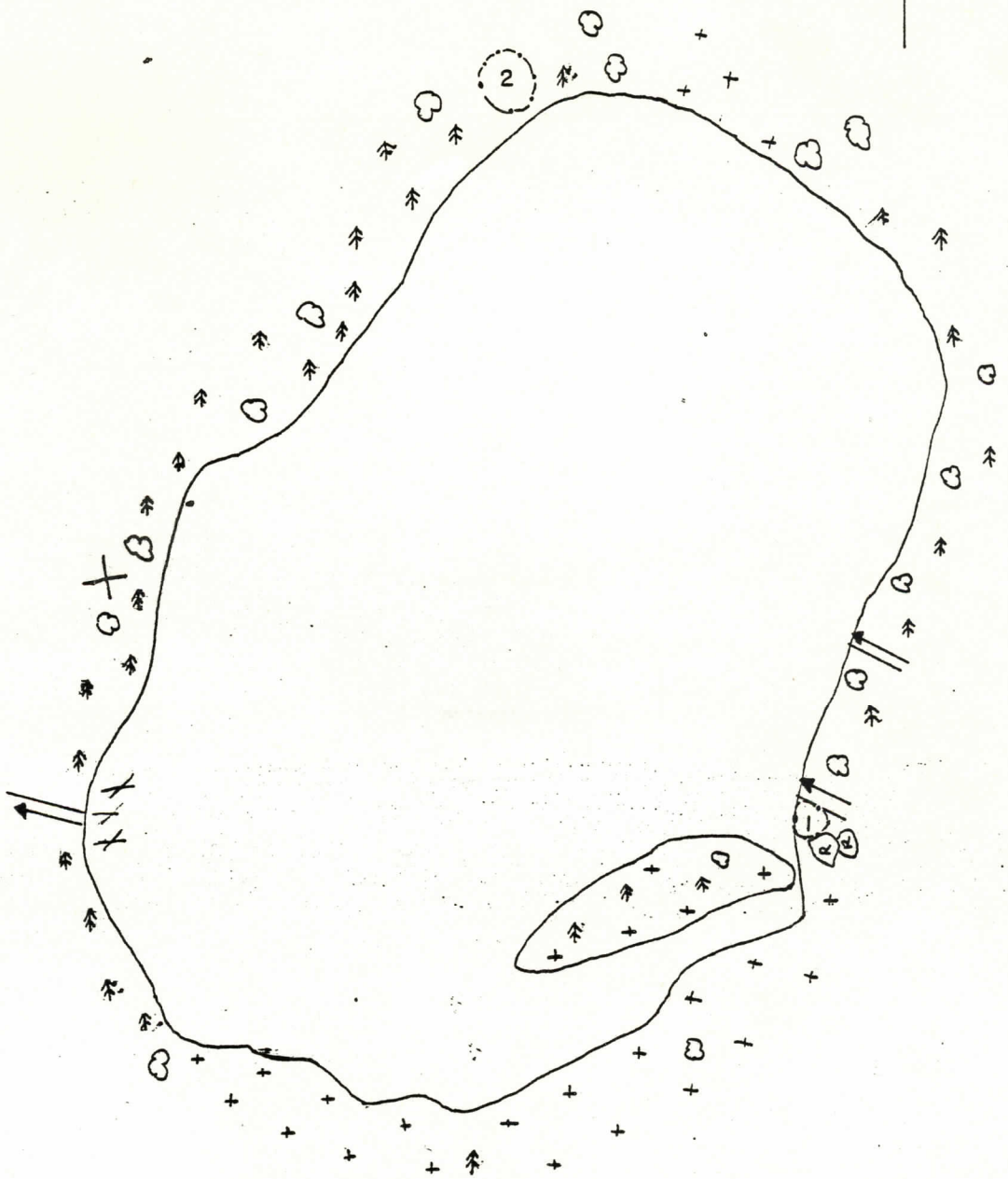
Lichens: Cladonia sp. (Trumpet Lichen)

Note: Cassiope mertensiana (White Moss Heather), Phyllodoce glanduliflora (Yellow Heather) and Juniperus communis var. saxatilis (Dwarf Juniper) were found on the talus slope.

* The associations for both sites were classified within the associations given by the Forestry Handbook for British Columbia under the biogeoclimatic zone Engelmann Spruce-Alpine Fir Zone (ESAF).

PANTHER LAKE

N



LEGEND

- site
- boundaries
- 1,2 sites
- trees
- shrubs
- talus
- log debris
- large boulders
- inflow/outflow streams
- recreation site

VEGETATION AND LANDFORMS

scale= 1: 1540

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 9.0°C
	- Bottom 9.5°C
Secchi Disc	- Limit of visibility-4.0 meters (lake bottom)
	- Weather conditions - sunny with some clouds (11:20 a.m.)
	- Water conditions - slight ripples
Bottom Composition	- Rocks, sand, gravel, log debris
pH	- 6.9
Total Alkalinity	- 10 ppm
Total Dissolved Solids	- 9 ppm
Lake Level	- At high water level
Littoral Area	- $7.0 \times 10^3 m^2$
Total Volume	- 1.0×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 1.5 meters
Average Depth	- 40 centimeters
Velocity	- 1.0 meters/second
Volume of Flow	- 560 liters/second
Temperature	- 4.0°C
Bottom Composition	- Rocks, gravel, log debris, fine to coarse sand

ii) Inflow #2

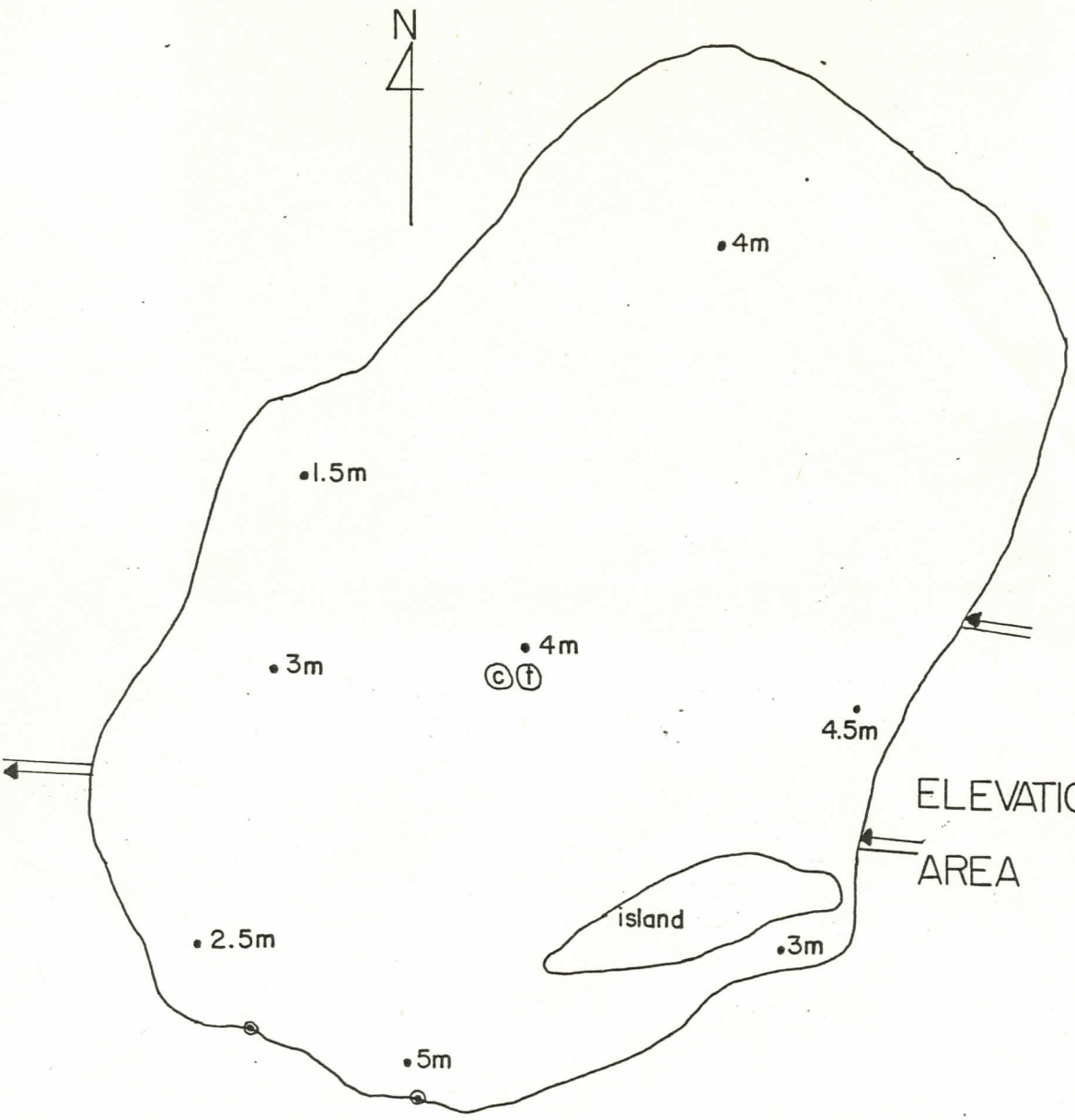
Average Width	- 1 meter
Average Depth	- 16 centimeters
Velocity	- 0.25 meters/second
Volume of Flow	- 40 liters/second
Temperature	- 4.0°C
Bottom Composition	- Gravel, rocks, log debris

C) OUTFLOW STREAM

Average Width	- 4 meters
Average Depth	- 30 centimeters
Velocity	- 0.33 meters/second
Volume of Flow	- 400 liters/second
Temperature	- 8.5°C
Bottom Composition	- Large rocks, sand, muck

PANTHER LAKE

FIG.7B



ELEVATION 1740m.

AREA 5.3ha.

LEGEND

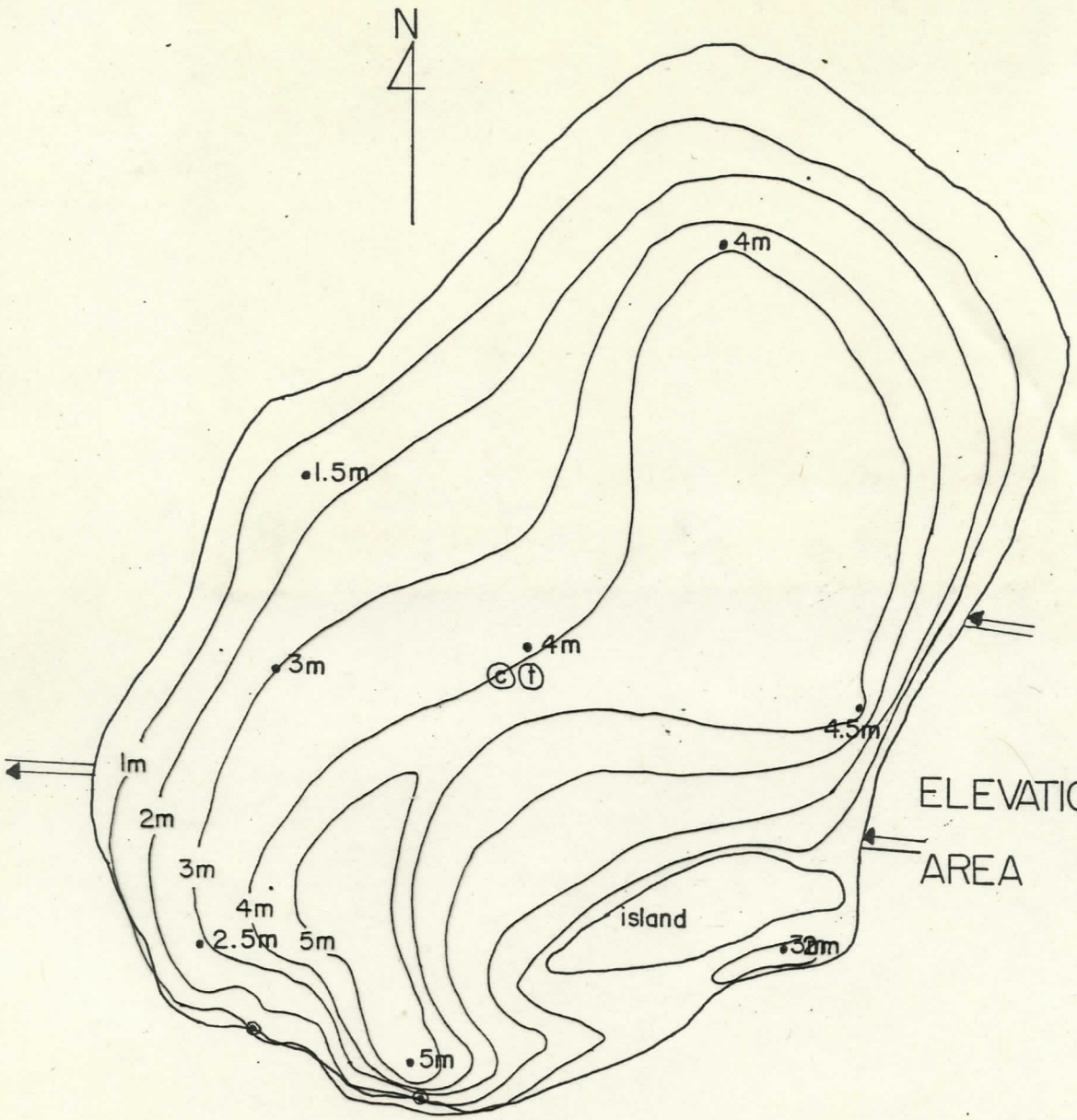
- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:1450

PANTHER LAKE

FIG. 7B



ELEVATION 1740m

AREA 5.3ha

LEGEND

- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

contours (meters)

PLANE TABLE SURVEY

scale = 1:1450

CURTIS LAKE

DATE STUDIED: July 22nd, 1981

I. LOCATION:

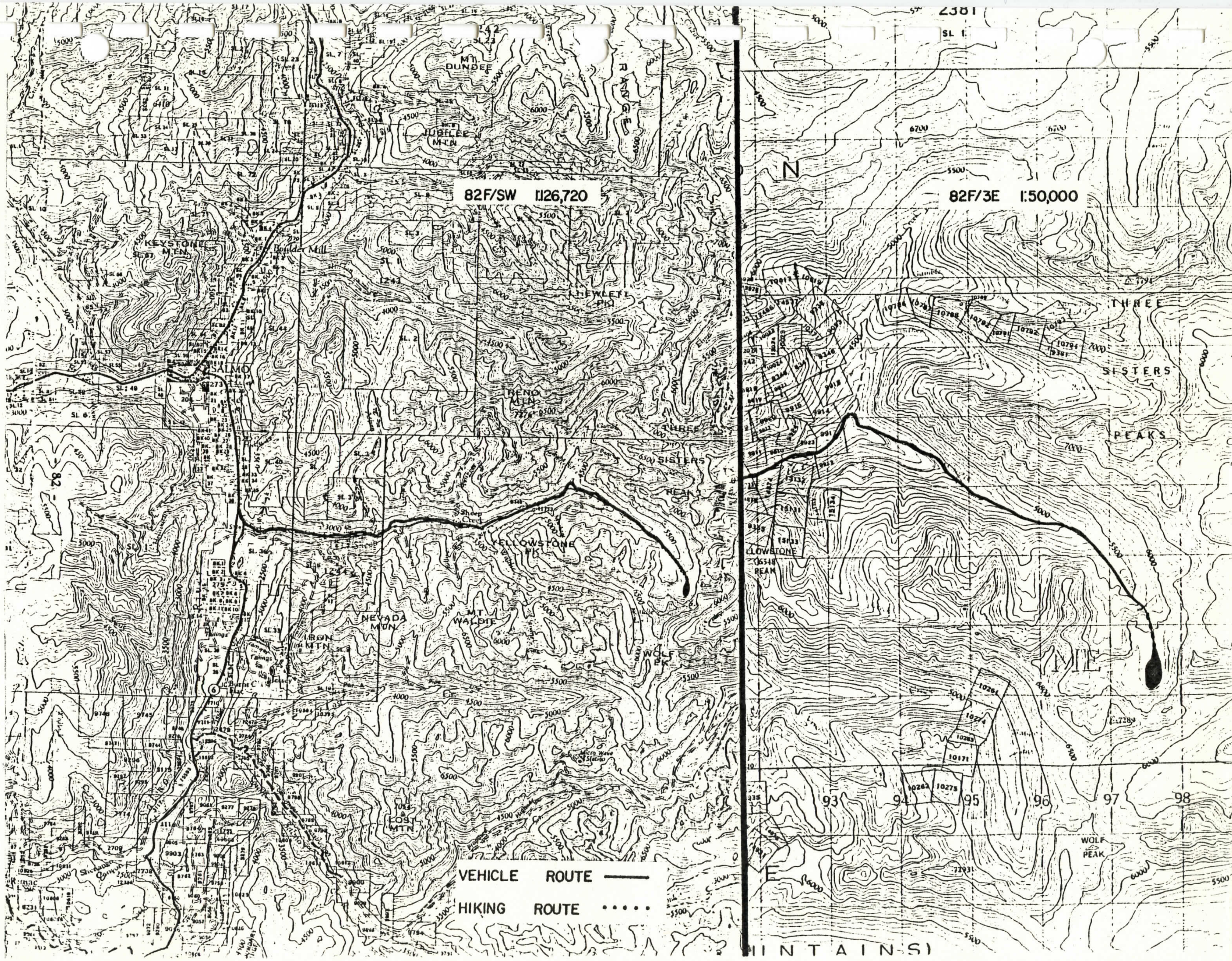
- 49° 7.6' N., 117° 2.2' W.
- Department of Mines and Technical Surveys Map: Salmo, B.C.; 82F/3E; 1:50,000; Grid Reference 976413
- Department of Lands and Forests Map: Trail, B.C.; 82F/SW; 1:126,720
- Aerial photographs #BC 5348-142, #BC 5348-143

II. ACCESS:

By Vehicle

Drive towards Salmo on Highway #3A and turn left at the Salmo turnoff. 0.7 km past the turnoff, turn right (at Salmo Sewing Basket) after 5.8 km past the Salmo Sewing Basket, turn left and proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
0.3	- Dirt road begins	
2.9	- Fork in road	R
5.9	- Fork in road	R
6.3	- Creek	


82F/SW 1:126,720
82F/3E 1:50,000
MT. DUNDEE
JUBILEE MTN
KEYSTONE MTN
Boulder Mill
SALMO
HEWLETT PK
RENO MTN
THREE SISTERS PEAKS
YELLOWSTONE PK
NEVADA MTN
MT. WALDIE
IRON MTN
WOLF PK
LOST MTN
THREE
SISTERS
PEAKS
WOLF PEAK
93
94
95
96
97
98
VEHICLE ROUTE
HIKING ROUTE

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
7.3	- Bridge	
8.0	- Fork in road	R
9.5	- Fork in road	R
9.6	- Creek	
10.4	- Fork in road	L
10.5	- Creek	
10.8	- Recreation site	
11.7	- Fork in road	R
13.5	- Fork in road	L
14.0	- Fork in road	R
14.1	- Bridge	
15.3	- Fork in road	L
16.1	- Fork in road	L
16.3	- Fork in road	R
16.8	- Fork in road	R
18.0	- Fork in road	L
18.2	- Slight washout - 4 wheel drive recommended	
18.5	- Fork in road	L
18.6	- STOP	

Hiking Route

Follow Curtis Lake Trail directly to lake. Hiking time is about 40 minutes.

III. GENERAL DESCRIPTION:

Curtis Lake is located in a high mountain valley at an elevation of 1840 meters. It has a northern exposure, and therefore, can still be frozen until the middle of July.

The B.C. Forest Service maintains a recreation site at the lake, but, at the time of this survey, the site was extremely wet due to recent thawing, runoff, and seepage. However, other areas around the lake are suitable for camping.

There are four major inflow streams, and Curtis Creek is the only outflow for this lake. Rainbow Trout were observed in the streams and the lake. An abundance of frogs was most noticeable.

Log debris at outflow.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

Minimal algal growth was observed at the mouth of the outflow stream.

Sites

Curtis Lake lies in the Engelmann Spruce-Alpine Fir Biogeoclimatic zone. The two sties are illustrated in Figure 8A.

This lake lies in a moraine-dammed, glacially scoured basin. The headwall and talus slope at the south end of the lake are formed from quartzite and conglomerate. This area belongs to the Three Sisters Formation geological division.

Site 1

This site was in close proximity to the B.C. Forest Service recreation site at the north end of the lake. The ground was very wet due to active runoff streams and the high water level of the lake.

Slope: 2°

Exposure: West

Moisture Regime: Very wet

Vegetation Classification: Sphagnum Association for the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Pinus contorta latifolia (Lodgepole Pine)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Rubus pedatus (Trailing Rubus)

Sorbus sitchensis (Sitka Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Kalmia polifolia (Swamp Laurel)

Trollius laxus (Foam Flower)

Senecio triangularis (Giant Ragwort)

Erythronium grandiflorum (Snow Lily)

Xerophyllum tenax (Bear-Grass)

Veratrum eschocholtzii (Indian Hellebore)

Sium spp. (Parsnip)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Mosses: Sphagnum sp.

Aulacomnium palustre

Pohlia wahlenbergii

Grasses: Unidentified

Sedges: Unidentified

Site 2

Site 2 was located on the west side of the talus slope at the south end of the lake. The site was situated on a steep bank beside the lake.

Slope: 28°

Exposure: East

Moisture Regime: Moist

Vegetation Classification: Menziesia-Tiarella Association for the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Lycopodium lucidulum (Club Moss)

Flowers:

Saxifraga integrifolia (Saxifrage)

Streptopus amplexifolius (Twisted Stalk)

Tiarella unifoliata (Foam Flower)

Valeriana sitchensis (Mountain Valerian)

Erythronium grandiflorum (Snow Lily)

Geum macrophyllum (Large-Leaved Avens)

Pedicularis groenlandica (Elephant Head)

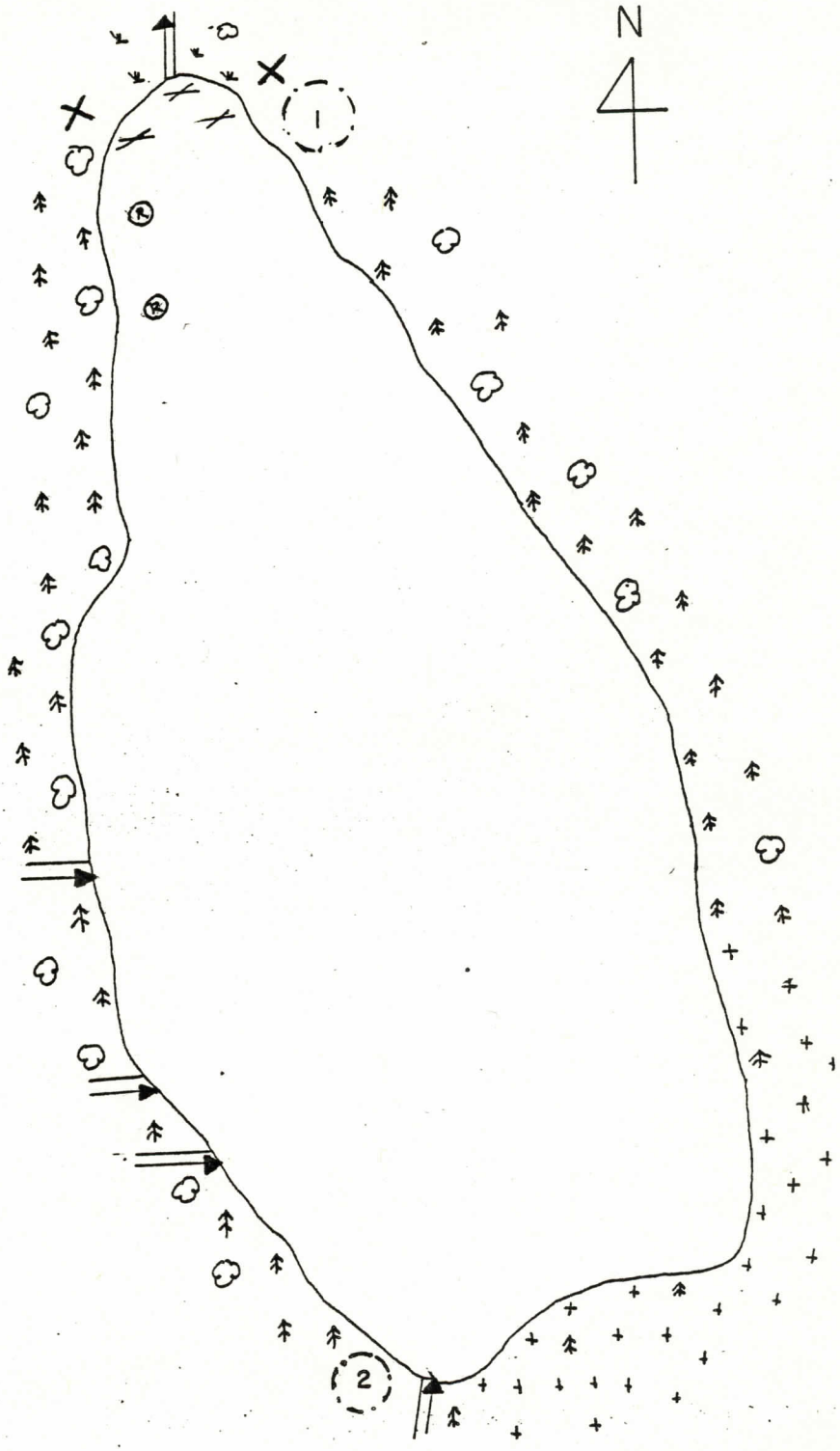
Listera spp. (Twayblade)

Listera cordata (Heart-Leaved Twayblade)

Sium spp. (Parsnip)

Veratrum eschocholtzii (Indian Hellebore)

CURTIS LAKE



LEGEND

- site boundaries
- 1,2 sites
- trees
- shrubs
- talus
- log debris
- boulders
- marsh
- recreation site
- inflow outflow streams

VEGETATION AND LANDFORMS

scale = 1: 2630

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Mosses: Sphagnum sp.
Aulacomnium palustre
Hygrohypnum luridum
Pohlia wahlenbergii

Lichens: Alectoria sp.

* The association classifications for the sites were developed from Utzig's Guide for Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 11.0°C
	- Bottom 10.0°C
Secchi Disc	- Limit of visibility 7.0 meters
	- Weather conditions - mainly cloudy with sunny spots
	- Water conditions - slight ripples
Bottom Composition	- Boulders, rocks, muck, sand
pH	- 7.0
Total Alkalinity	- 8 ppm
Total Dissolved Solids	- 13 ppm
Lake Level	- At high water mark
Littoral Area	- $9.6 \times 10^3 m^2$
Total Volume	- 5.2×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 50 cm
Average Depth	- 5 cm
Velocity	- 0.35 meters/second
Volume of Flow	- 9 liters/second
Temperature	- 4.5°C
Bottom Composition	- Gravel, coarse sand, log debris

V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

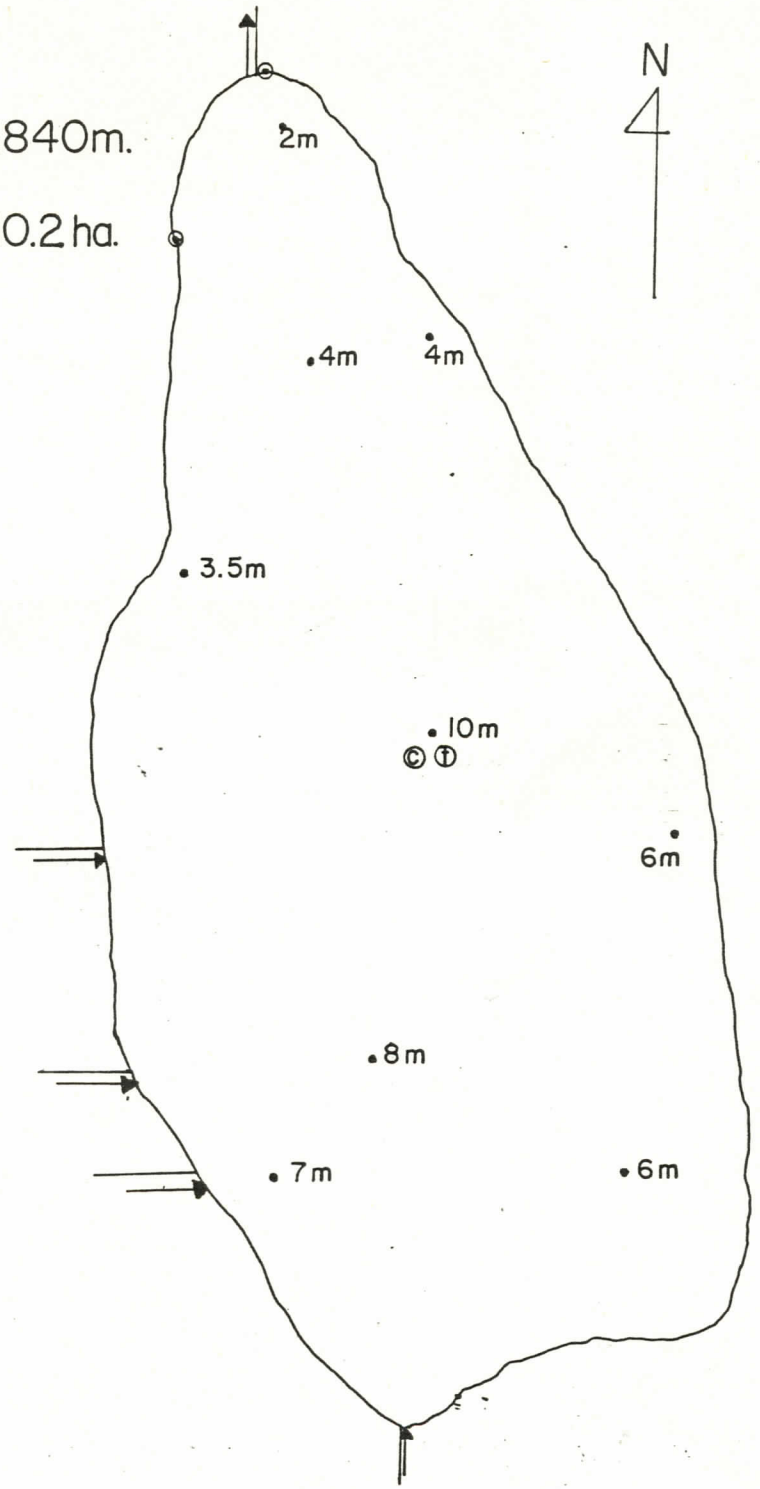
TEST	RESULT
ii) Inflow #2	
Average Width	- 50 cm
Average Depth	- 20 cm
Velocity	- 0.35 meters/second
Volume of Flow	- 35 liters/second
Temperature	- 5.0°C
Bottom Composition	- Gravel, sand, muck, pebbles
iii) Inflow #3	
Average Width	- 70 cm
Average Depth	- 10 cm
Velocity	- 0.33 meters/second
Volume of Flow	- 23 liters/second
Temperature	- 6.0°C
Bottom Composition	- Rocks, log debris, gravel, coarse sand
iv) Inflow #4	
Average Width	- 13 meters
Average Depth	- 24 cm
Velocity	- 0.53 meters/second
Volume of Flow	- 21 liters/second
Temperature	- 6.0°C
Bottom Composition	- Rocks, gravel, coarse sand, log debris
C) OUTLFOW STREAM	
Average width	- 4 meters
Average Depth	- 30 cm
Velocity	- 0.5 meters/second
Volume of Flow	- 600 liters/second
Temperature	- 10.5°C
Bottom Composition	- Boulders, rocks, gravel, muck

FIG. 8B

CURTIS LAKE

ELEVATION 1840m.

AREA 10.2 ha.



LEGEND

- ⊙ plane table stations
- © chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

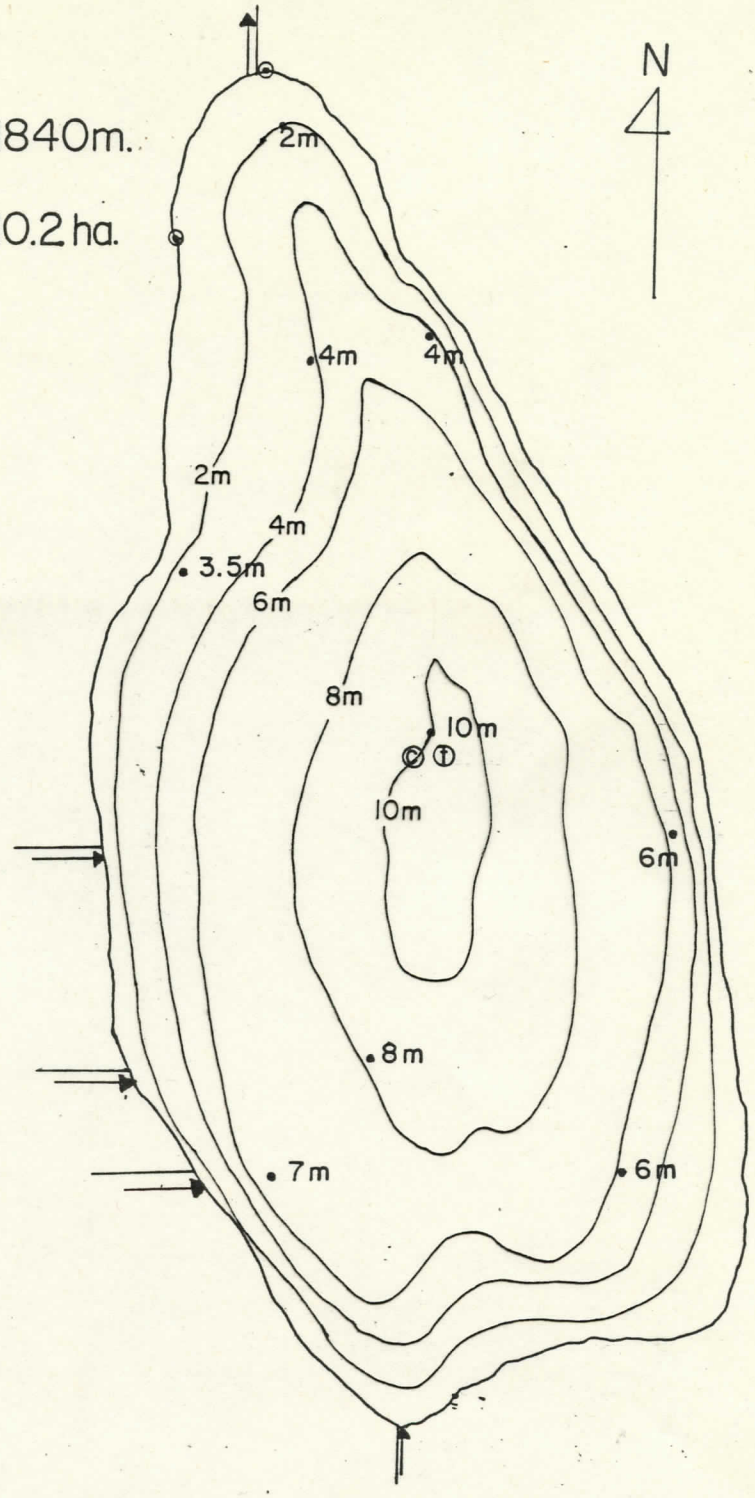
scale = 1:2630

FIG. 8B

CURTIS LAKE

ELEVATION 1840m.

AREA 10.2 ha.



LEGEND

- ⊙ plane table stations
- © chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

contours (meters)

PLANE TABLE SURVEY

scale = 1:2630

UPPER PLACER LAKE

DATE STUDIED: August 6th, 1981

I. LOCATION:

- 49° 08' N., 116° 54' W.
- Department of Mines and Technical Surveys Map: Creston, B.C.; 82F/2W; 1:50,000; Grid Reference 428068
- Department of Lands and Forests Map: Creston, B.C.; 82F/SE; 1:125,000
- Aerial photographs #BC 5348-107, #BC 5348-108

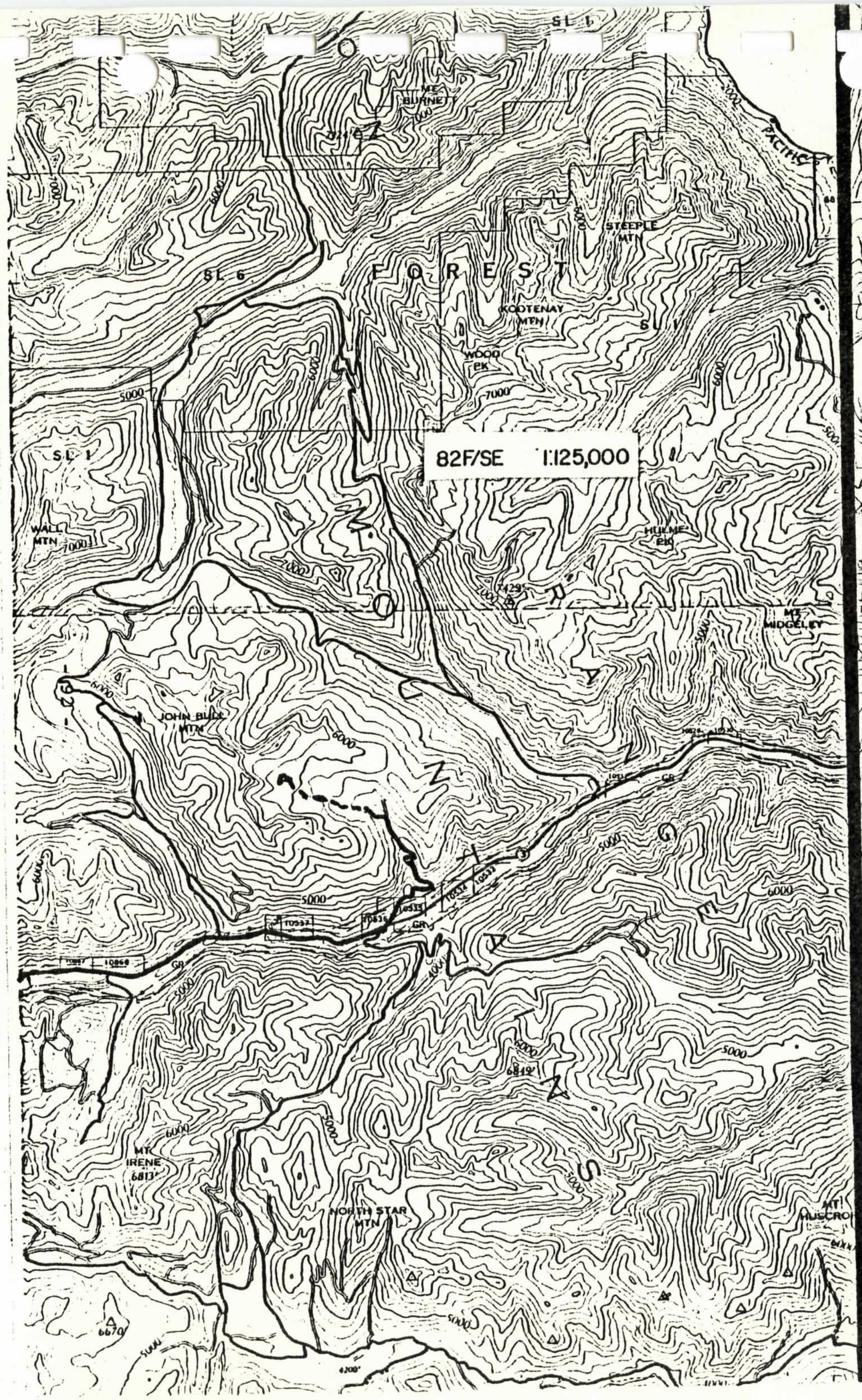
II. ACCESS:

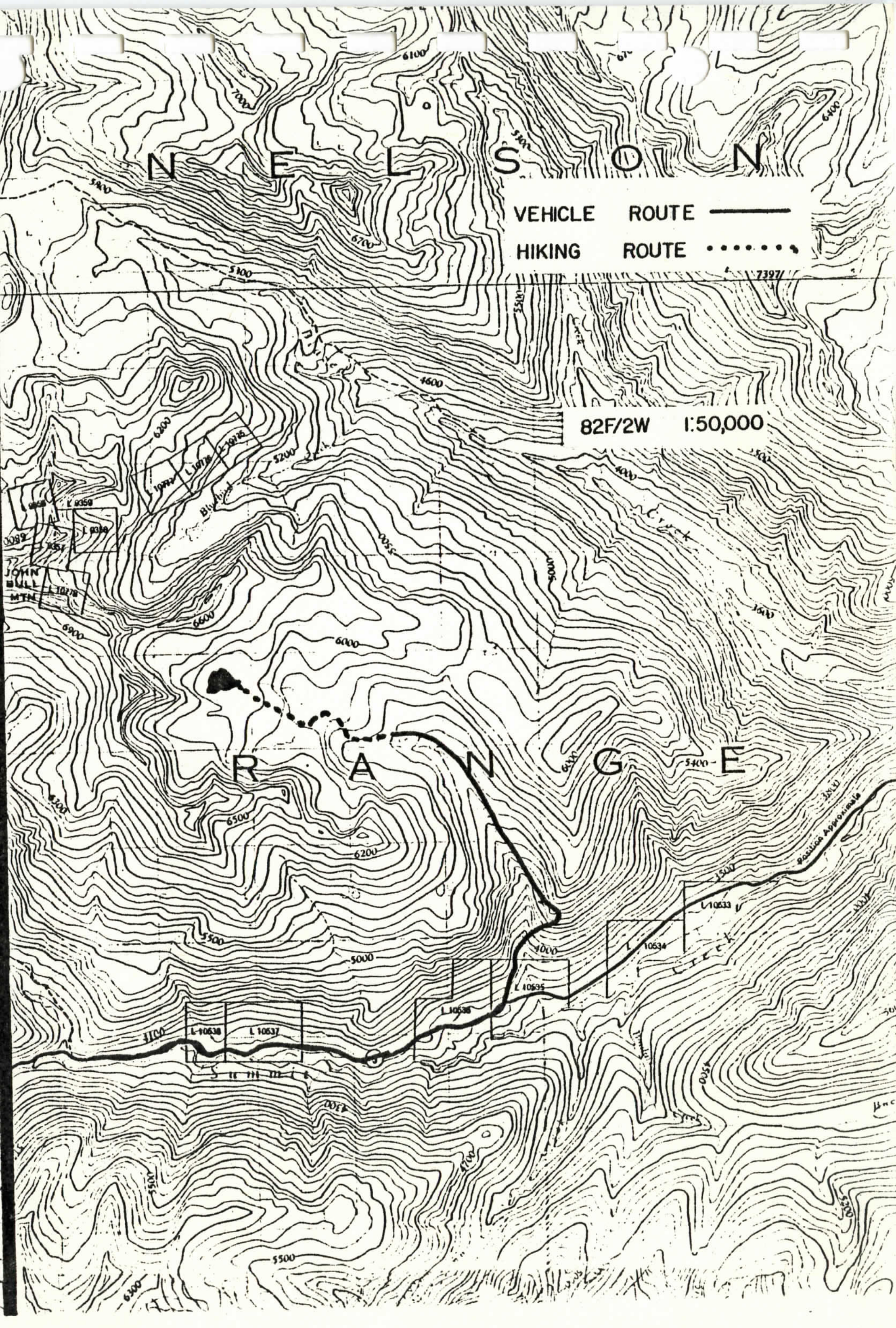
By Vehicle

From the Salmo turnoff on Highway #3 drive towards Creston 52.5 km. Turn left on a gravel road and proceed as follows:

DISTANCE (Km)		FEATURE	ROUTE
0.1	-	Fork in road	L
0.9	-	Bridge	
3.3	-	Creek	
4.2	-	Fork in road	R
5.3	-	Fork in road	L
5.7	-	Creek	
5.9	-	STOP	

NOTE: Instead of culverts across the road, there are ditches cut into the road. Therefore high clearance is recommended.


MT BURNETT
STEEPLE MTN
FOREST
KOOTENAY MTN
WOOD PK
SL 6
SL 1
82F/SE 1:125,000
WALL MTN
HULME PK
MT MIDGELEY
JOHN BULL MTN
MT IRENE 6813'
NORTH STAR MTN


N E L S O N
VEHICLE ROUTE
HIKING ROUTE
82F/2W 1:50,000
JOHN BULL MTN
R A N G E

II. ACCESS: (cont'd)

Hiking Route

Follow Placer Lake trail provided by B.C. Forest Service. Hiking time to Lower Placer Lake is 30 minutes and another 30 minutes to Upper Placer Lake.

III. GENERAL DESCRIPTION:

Upper Placer Lake is situated in the Selkirk Mountains at an elevation of 1840 meters. It is surrounded by morrainal talus and subalpine forest. There is evidence of an old burn in the area.

This easterly exposed lake has four inflow streams and Placer Creek is its only outflow. It is a relatively shallow lake that has been well stocked with Rocky Mountain Cutthroat Trout.

The B.C. Forest Service maintains a trail to the Placer Lakes, and good camping spots are easily found around the lake.

A Great Blue Heron was sighted during the hike to Placer Lake, and cat tracks were observed around the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was observed in the lake.

Sites

This lake is located in the Engelmann Spruce-Alpine Fir Biogeoclimatic zone. The sites are illustrated in Figure 10A.

Upper Placer Lake lies in a glacially scoured, morainal dammed basin. Granite rock forms the talus slope on the north side of the lake.

Site 1

Site 1 was situated on the north side of Upper Placer Lake where the talus slope almost reaches the shoreline. However, the talus gives way to bog type vegetation near the water where the soil becomes increasingly damp.

Slope: 0° - 30°

Exposure: South

Moisture Regime: Wet to slightly dry

Vegetation Classification: Equisetum-Senecio Association of the ESSFw Biogeoclimatic Zone*

Vegetation

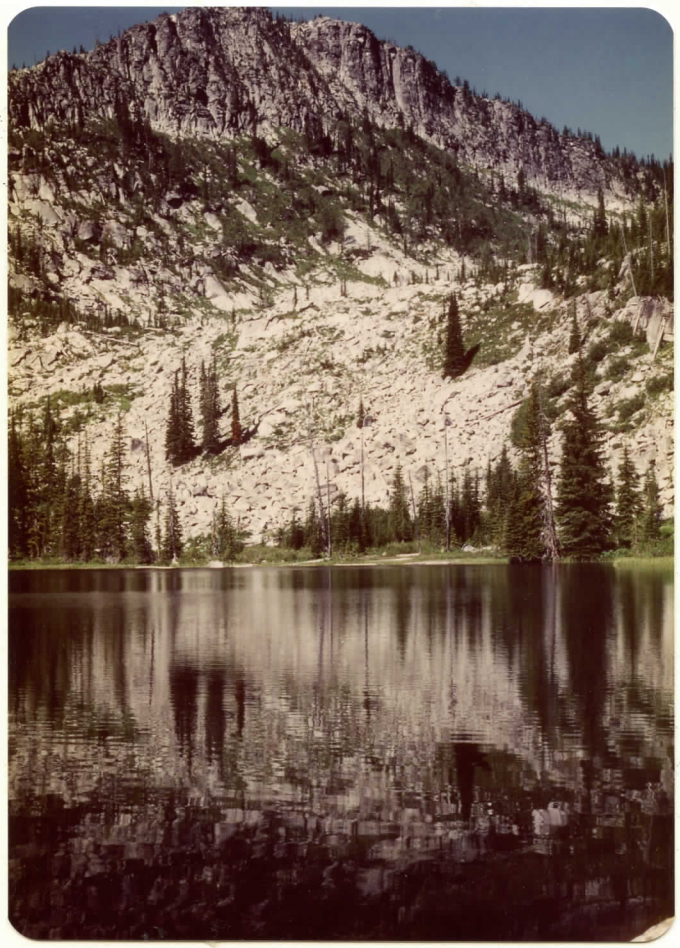
Trees:

Pinus albicaulis (whitebark Pine)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Sedge vegetation at north-east corner.



Northern mountains in background.

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Rubus idaeus (Red Raspberry)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Leptarrhena pyrolifolia (Leptarrhena)

Eriophorum chamissonis (Cotton Grass)

Anaphalis margaritacea (Pearly Everlasting)

Achillea millefolium (Yarrow)

Valeriana sitchensis (Mountain Valerian)

Senecio triangularis (Giant Ragwort)

Aquilegia flavescens (Yellow Columbine)

Veronica wormskjoldii (Veronica)

Castilleja spp. (Indian Paintbrush)

Mitella pentandra (Alpine Mitrewort)

Hypericum formosum (St. John's Wort)

Xerophyllum tenax (Bear-Grass)

Kalmia polifolia (Swamp Laurel)

Penstemon fruticosis var. scouleri (Scoulers Penstemon)

Pedicularis groenlandica (Elephant Head)

Epilobium angustifolium (Fireweed)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

Equisetum hyemale (Scouring Rush)

Mosses: Aulacomnium palustre

Barbula cylindrica

Site 2

This site was situated in the forest at the west end of the lake.

Slope: 13°C

Exposure: East

Moisture Regime: Wet to slightly moist

Vegetation Classification: Equisetum-Senecio Association of the ESSFw Biogeoclimatic Zone*

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2 (cont'd)

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Cassiope mertensiana (White Moss Heather)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Valeriana sitchensis (Mountain Valerian)

Phlox spp. (Phlox)

Viola glabella (Yellow Violet)

Senecio triangularis (Giant Ragwort)

Arnica latifolia (Broad-Leaf Arnica)

Veronica wormskjoldii (Veronica)

Castilleja spp. (Indian Paintbrush)

Leptarrhena pyrolifolia (Leptarrhena)

Kalmia polifolia (Swamp Laurel)

Ligusticum canbyi (Canby's Lovage)

Habenaria dilatata (White Rein Orchid)

Streptopus amplexifolius (Twisted Stalk)

Eriophorum chamissonis (Cotton Grass)

Aconitum columbianum (Monkshood)

Pedicularis groenlandica (Elephant Head)

Aster spp. (Aster)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

Mosses:

Aulacomnium palustre

Dicranella heteromalla

Hygrohypnum luridum

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Site 3

This site was situated near the outflow stream at the end of the lake.

Slope: 3° - 4°

Exposure: Northwest

Moisture Regime: Moist

Vegetation Classification: Menziesia Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Pinus albicaulis (Whitebark Pine)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Rubus pedatus (Trailing Rubus)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Leptarrhena pyrolifolia (Leptarrhena)

Streptopus amplexifolius (Twisted Stalk)

Valeriana sitchensis (Mountain Valerian)

Arnica latifolia (Broad-Leaf Arnica)

Aster spp. (Aster)

Kalmia polifolia (Swamp Laurel)

Ligusticum canbyi (Canby's Lovage)

Xerophyllum tenax (Bear-Grass)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum hyemale (Scouring Rush)

Mosses: Aulacomnium palustre

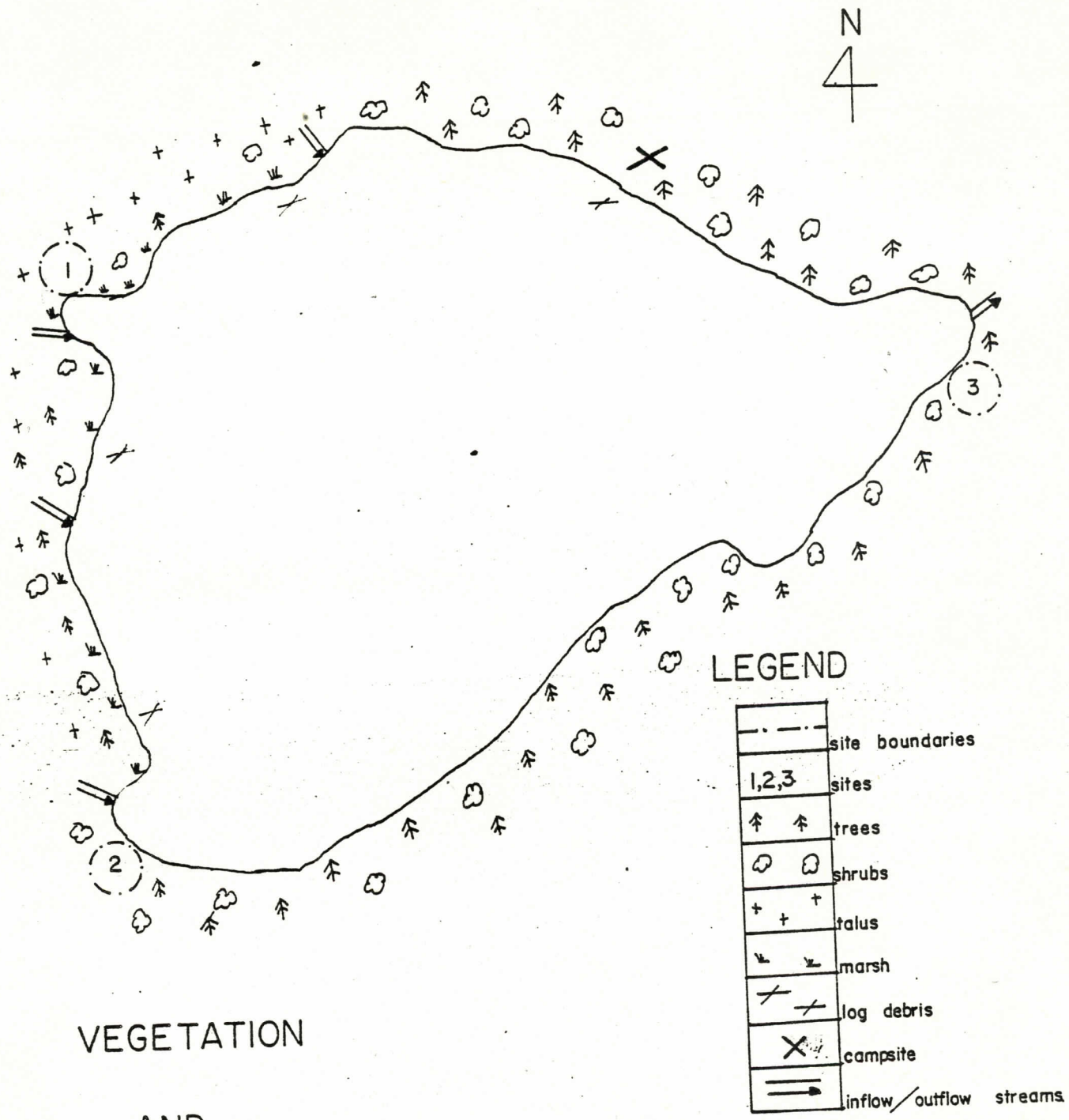
Pohlia nutans

Sphagnum sp.

Lichens: Cladonia sp. (Trumpet Lichen)

* The association for each site was classified according to Utzig's Guide for Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw).

UPPER PLACER LAKE



VEGETATION AND LANDFORMS

scale = 1:1666

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 16.0°C
	- Bottom 15.0°C
Secchi Disc	- Limit of visibility - to the bottom
	- Weather conditions - clear and sunny (2:15 p.m.)
	- Water conditions - very slight ripples
Bottom Composition	- Muck
pH	- 6.8
Total Alkalinity	- 9 ppm
Total Dissolved Solids	- 5 ppm
Lake Level	- At high level mark
Littoral Area	- $5.7 \times 10^3 m^2$
Total Volume	- 1.6×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 85 centimeters
Average Depth	- 10 centimeters
Veolocity	- 0.3 meters/second
Volume of Flow	- 26 liters/second
Temperature	- 8.5°C
Bottom Composition	- Sand, log debris

ii) Inflow #2

Average Width	- 20 centimeters
Average Depth	- 5 centimeters
Velocity	- 0.08 meters/second
Volume of Flow	- 1 liter/second
Temperature	- 8.0°C
Bottom Composition	- Sand, muck

iii) Inflow #3

Average Width	- 45 centimeters
Average Depth	- 5 centimeters
Velocity	- 0.36 meters/second
Volume of Flow	- 8 liters/second
Temperature	- 8.5°C
Bottom Composition	- Sand

V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

TEST	RESULT
iv) Inflow #4	
Average Width	- 1.5 meters
Average Depth	- 10 centimeters
Velocity	- 0.3 meters/second
Volume of Flow	- 45 liters/second
Temperature	- 7.0°C
Bottom Composition	- Sand, log debris

C) OUTFLOW STREAM

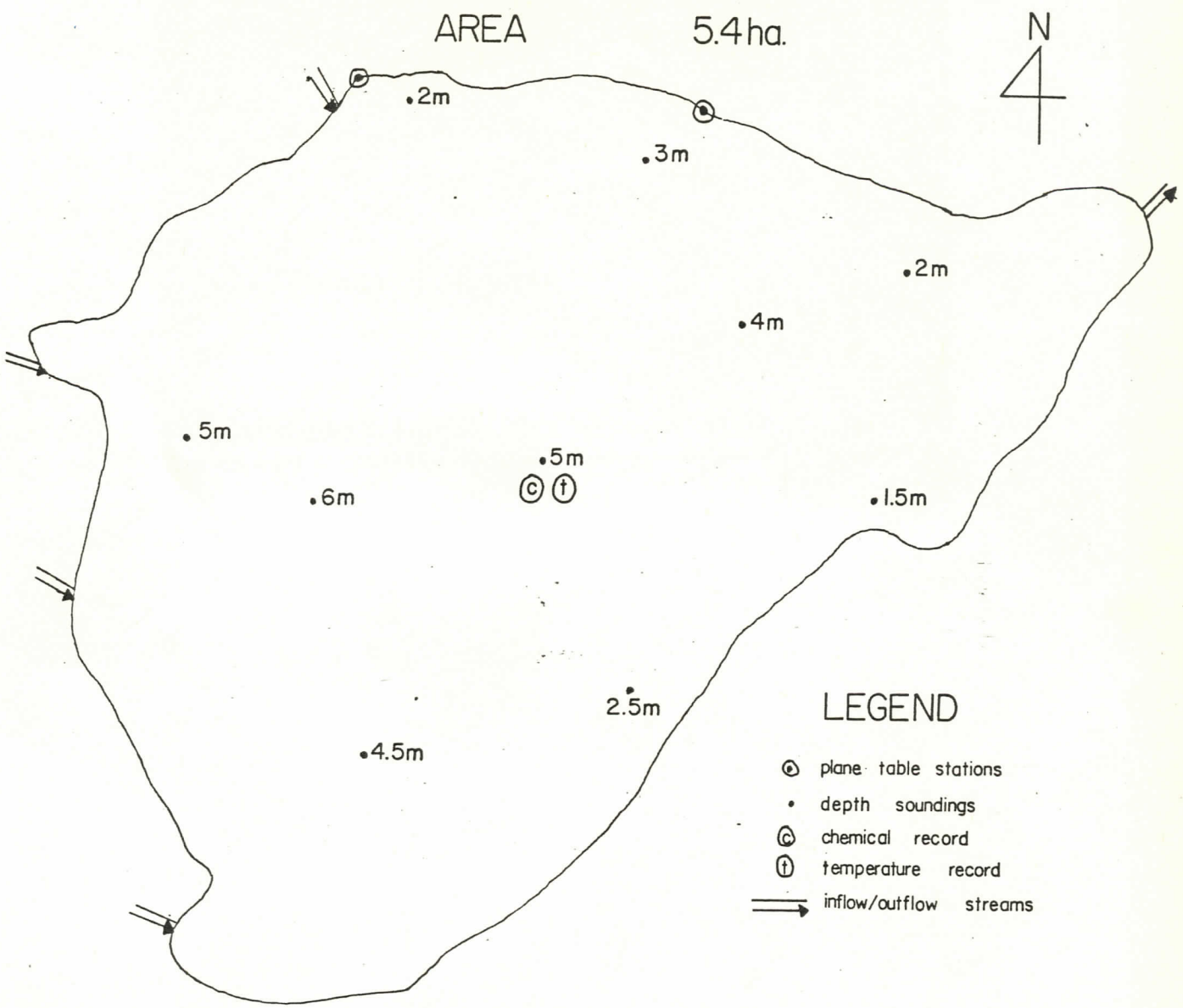
Average Width	- 5 meters
Average Depth	- 13 centimeters
Velocity	- 0.25 meters/second
Volume of Flow	- 160 liters/second
Temperature	- 17.0°C
Bottom Composition	- Rocks, muck, gravel, sand

FIG.10B

UPPER PLACER LAKE

ELEVATION 1840m.

AREA 5.4ha.



PLANE TABLE SURVEY

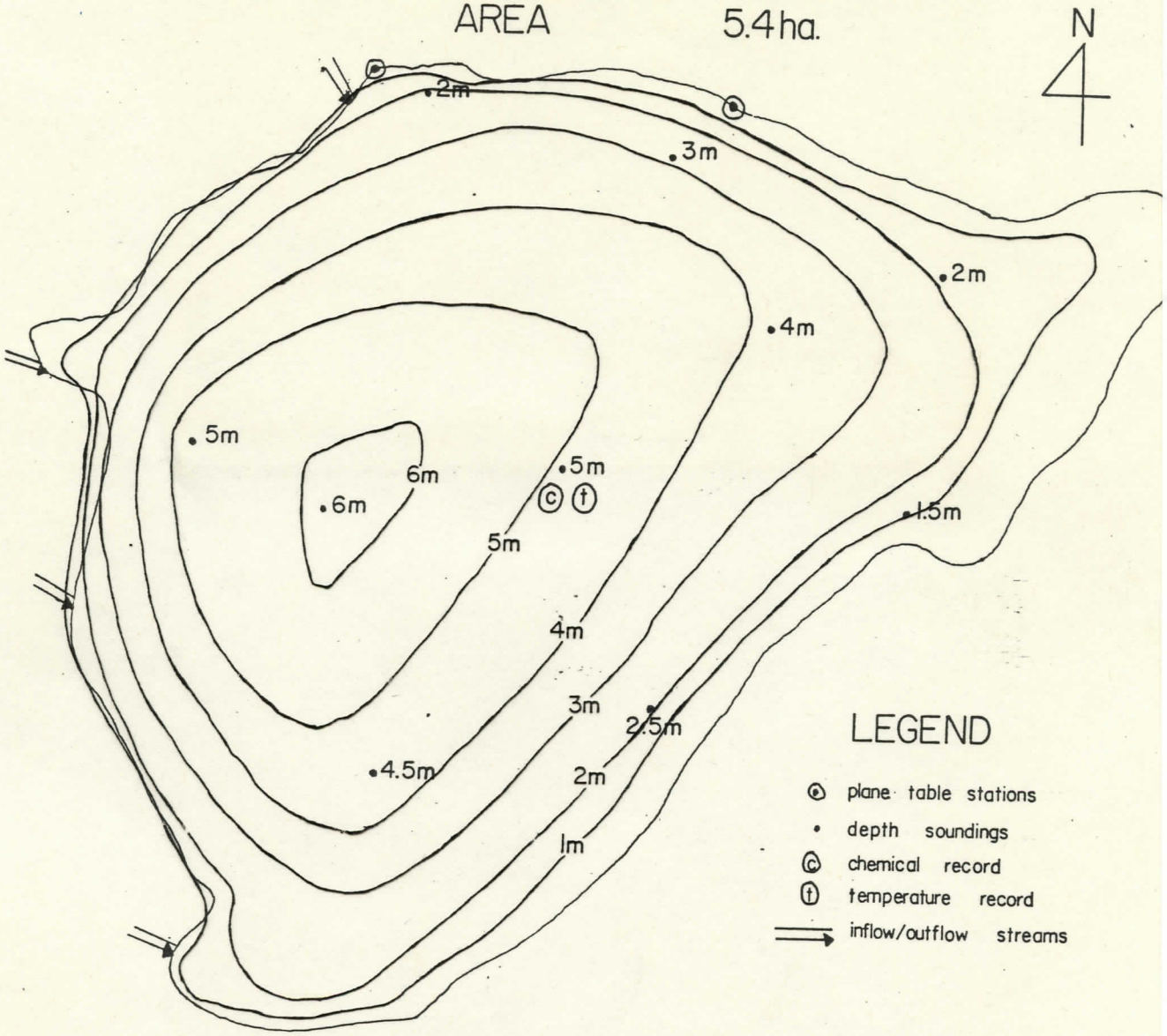
scale = 1:1428

FIG.10B

UPPER PLACER LAKE

ELEVATION 1840m.

AREA 5.4ha.



contours
(meters)

PLANE TABLE SURVEY

scale = 1:1428

LOWER PLACER LAKE

DATE STUDIED: August 7th, 1981

I. LOCATION:

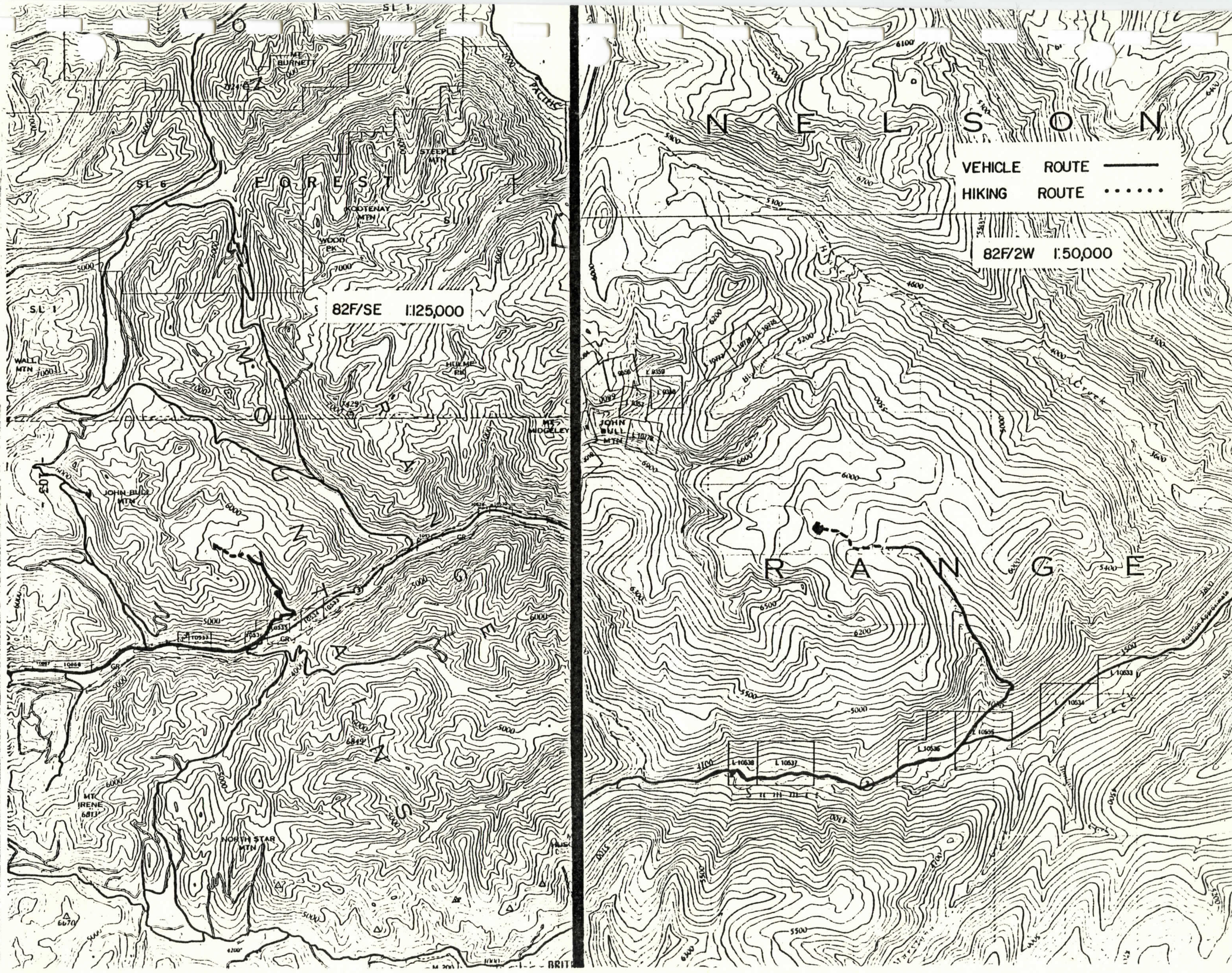
- 49° 08' N., 116° 53' W.
- Department of Mines and Technical Surveys Map: Creston, B.C.; 82F/2W; 1:50,000; Grid Reference 424076
- Department of Lands and Forests Map: Creston, B.C.; 82F/SE; 1:125,000
- Aerial photographs #BC 5348-107, #BC 5348-108

II. ACCESS:

By Vehicle

From the Salmo turnoff on Highway #3 drive towards Creston 52.5 km. Turn left on a gravel road and proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
0.1	- Fork in road	L
0.9	- Bridge	
3.3	- Creek	
4.2	- Fork in road	R
5.3	- Fork in road	L
5.7	- Creek	
5.9	- STOP	



82F/SE 1:125,000
82F/2W 1:50,000
VEHICLE ROUTE
HIKING ROUTE
N E L S O N
F O R E S T
R A N G E
MT BURNETT
STEEPLE MTN
KOOTENAY MTN
WOOD PK
WALL MTN
JOHN BULL MTN
MT MIDGELEY
HULME PK
MT IRENE 6811
NORTH STAR MTN
PACIFIC

II. ACCESS: (cont'd)

Hiking Route

Follow Placer Lake trail provided by B.C. Forest Service. Hiking time is approximately 30 minutes.

III. GENERAL DESCRIPTION:

Lower Placer Lake is a very shallow lake lying at an elevation of 1760 meters. It is surrounded by marsh grasses and sedges, giving it quite an irregular shoreline. Large morrainal boulders and subalpine forest verge on the edge of the marshlands.

The lake is northeasterly exposed, has one inflow stream, and one outflow stream. Both the inflow and outflow are a continuation of Placer Creek, which eventually drains into Summit Creek alongside Highway #3.

Lower Placer Lake has been stocked with Rocky Mountain Cutthroat Trout that are now approximately 18 cm in length.

The land around the lake is too wet to provide a good camping spot.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No aquatic vegetation was noted.

Sites

Lower Placer Lake is situated in the Engelmann Spruce-Alpine Fir Zone. The site areas are illustrated in Figure IIA.

This lake is essentially a marsh that is morainal dammed. Morainal debris on the surrounding mountainside give evidence to previous glacial activity in the valley.

Site 1

This was situated on the west side of the lake near the inflow stream.

Slope: 3°

Exposure: East

Moisture Regime: Moist to wet

Vegetation Classification: Sphagnum Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Pinus albicaulus (Whitebark Pine)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Sedges surround

Southern view.

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Menziesia ferruginea (False Azalea)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Anaphalis margaritacea (Pearly Everlasting)

Valeriana sitchensis (Mountain Valerian)

Eriophorum chamissonis (Cotton Grass)

Alisma plantago-aquatica (Water Plantain)

Veronica spp. (Veronica)

Aquilegia spp. (Columbine)

Erythronium spp. (Lily)

Kalmia polifolia (Swamp Laurel)

Aster spp. (Aster)

Ligusticum canbyi (Canby's Lovage)

Pedicularis groenlandica (Elephant Head)

Epilobium angustifolium (Fireweed)

Veratrum eschocholtzii (Indian Hellebore)

Mosses: Sphagnum sp.

Grasses: Unidentified

Sedges: Unidentified

Site 2

This site was located on the south end of the lake where the forest was quite near the shore.

Slope: 10°

Exposure: North

Moisture Regime: Moist

Vegetation Classification: Equisetum-Senecio Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Shrubs:

Salix sitchensis (Sitka Willow)

Salix barclayi (Barclay Willow)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Eriophorum chamissonis (Cotton Grass)

Valeriana sitchensis (Mountain Valerian)

Alisma plantago-aquatica (Water Plantain)

Castilleja spp. (Indian Paintbrush)

Leptarrhena pyrolifolia (Leptarrhena)

Senecio triangularis (Giant Ragwort)

Veronica spp. (Veronica)

Ligusticum canbyi (Canby's Lovage)

Aquilegia spp. (Columbine)

Pedicularis groenlandica (Elephant Head)

Epilobium angustifolium (Fireweed)

Veratrum eschocholtzii (Indian Hellebore)

Aster spp. (Aster)

Equisetum arvense (Common Horsetail)

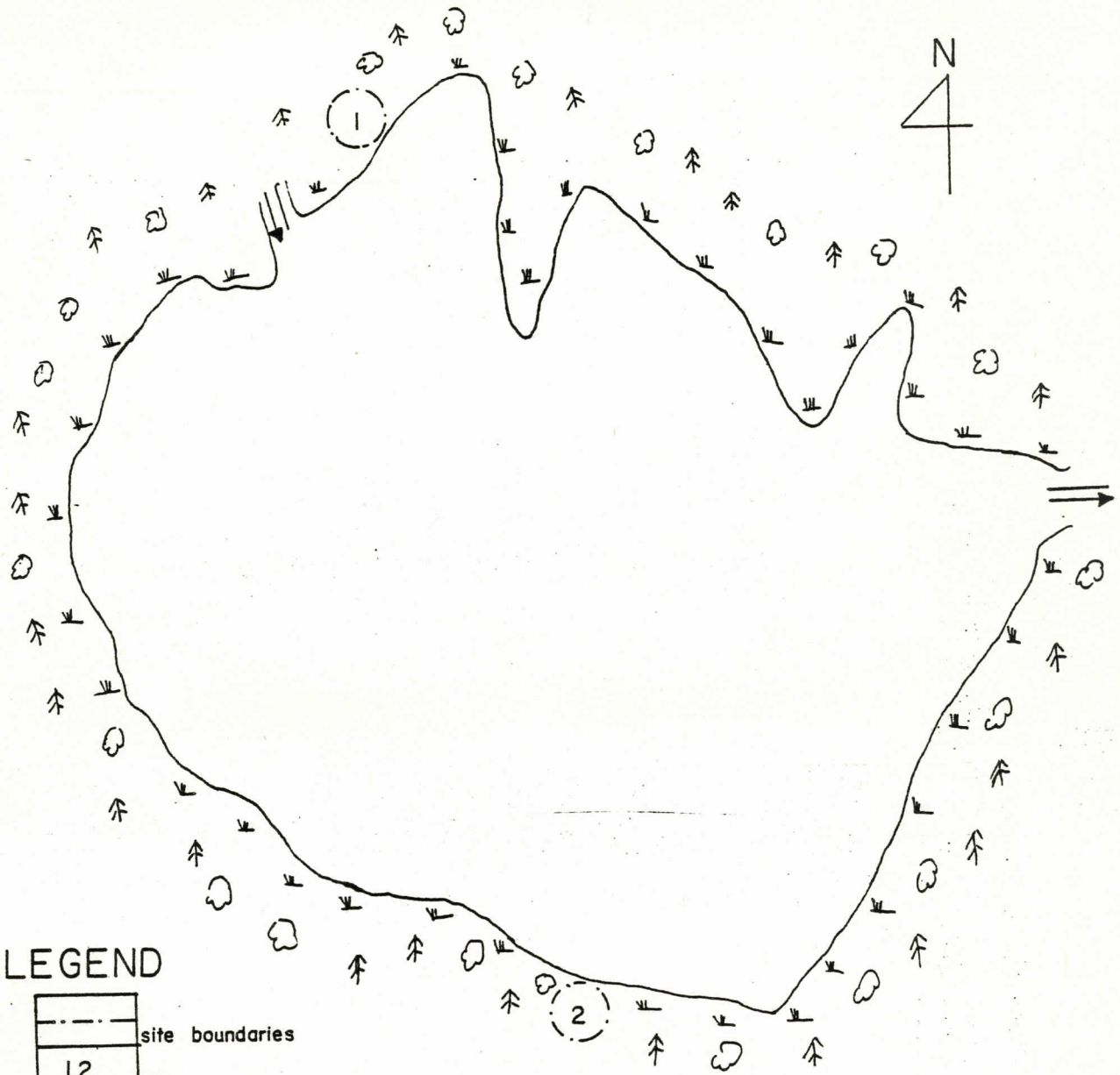
* The associations for the sites were developed from Utzig's Guide for Tree Species Selection in the Nelson Forest District under the Engelmann Spruce-Subalpine Fir Biogeoclimatic Zone (ESSFw).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 15.0°C
	- Bottom 14.5°C
Secchi Disc	- Limit of visibility - bottom
	- Weather conditions - clear and sunny (10:30 a.m.)
	- Water conditions - calm
Bottom Composition	- Muck

LOWER PLACER LAKE



LEGEND

- site boundaries
- 1,2 sites
- trees
- shrubs
- marsh
- inflow/outflow streams

VEGETATION AND LANDFORMS

scale = 1:847

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE (cont'd)

TEST	RESULT
pH	- 7.1
Total Alkalinity	- 7 ppm
Total Dissolved Solids	- 7 ppm
Lake Level	- At high level mark
Littoral Area	- $3.5 \times 10^3 m^2$
Total Volume	- 1.6×10^7 liters

B) INFLOW STREAM

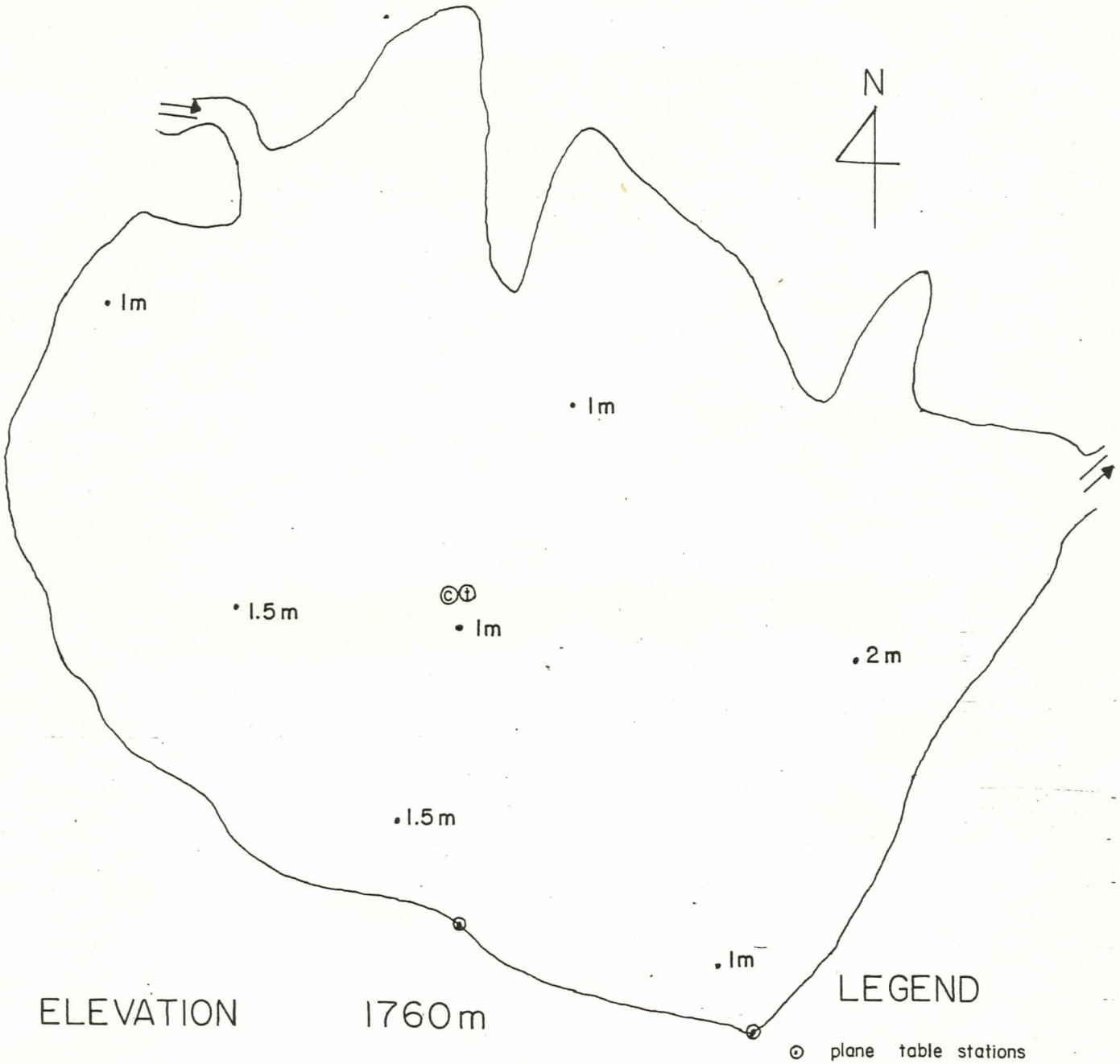
Average Width	- 4 meters
Average Depth	- 20 centimeters
Velocity	- 0.27 meters/second
Volume of Flow	- 210 liters/second
Temperature	- 10.5°C
Bottom Composition	- Fine to coarse sand, pebbles, log debris

C) OUTFLOW STREAM

Average Width	- 4 meters
Average Depth	- 15 centimeters
Velocity	- 0.3 meters/second
Volume of Flow	- 180 liters/second
Temperature	- 15.0°C
Bottom Composition	- Rocks, muck, sand

FIG. IIB

LOWER PLACER LAKE



ELEVATION 1760m

AREA 1.6 ha.

LEGEND

⊙ plane table stations

© chemical record

ⓣ temperature record

• depth soundings

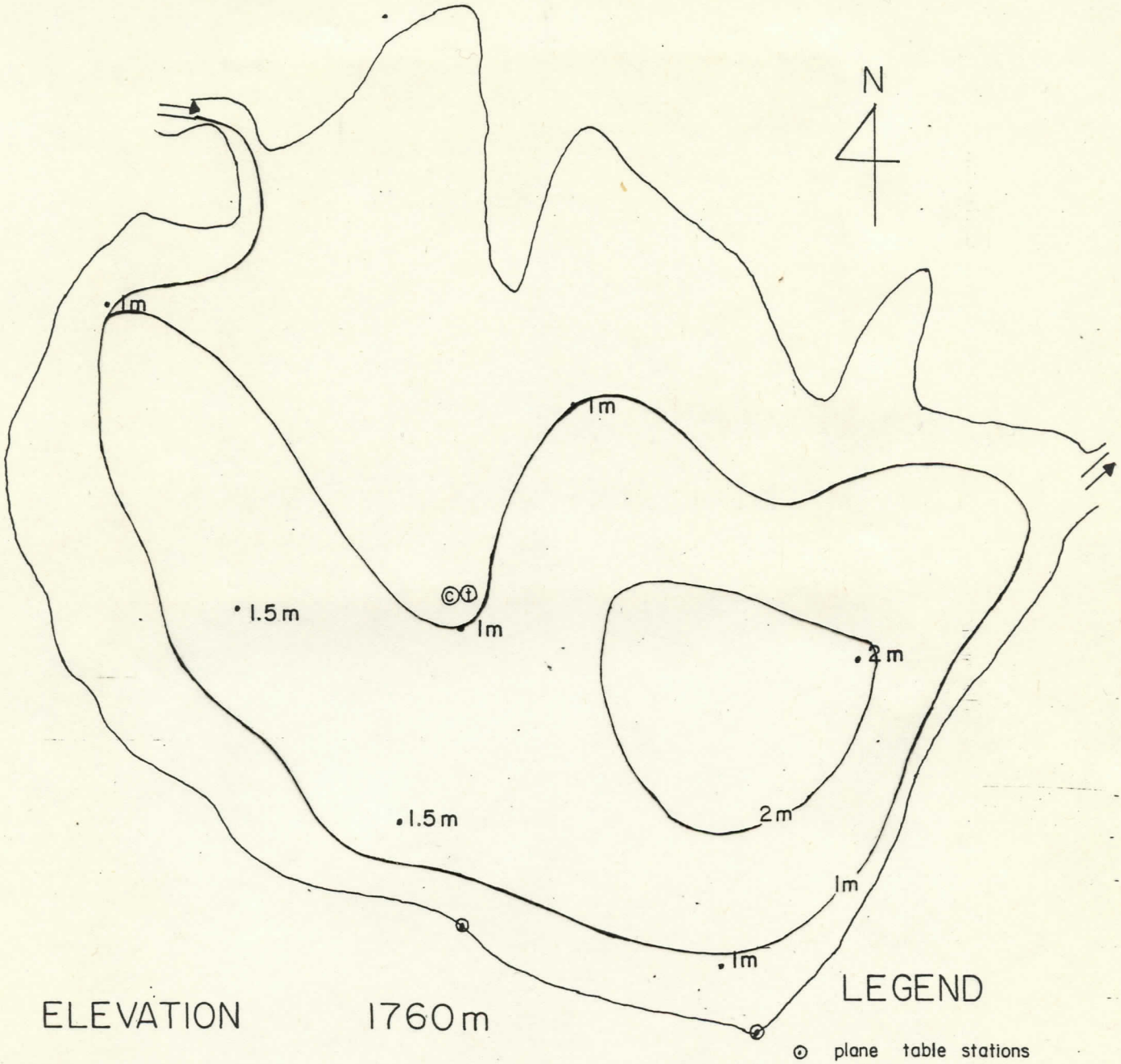
⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:714

FIG. IIB

LOWER PLACER LAKE



ELEVATION 1760m

AREA 1.6 ha.

contours (meters)

LEGEND

- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:714

OBARA LAKE

DATE STUDIED: August 3rd, 1981

I. LOCATION:

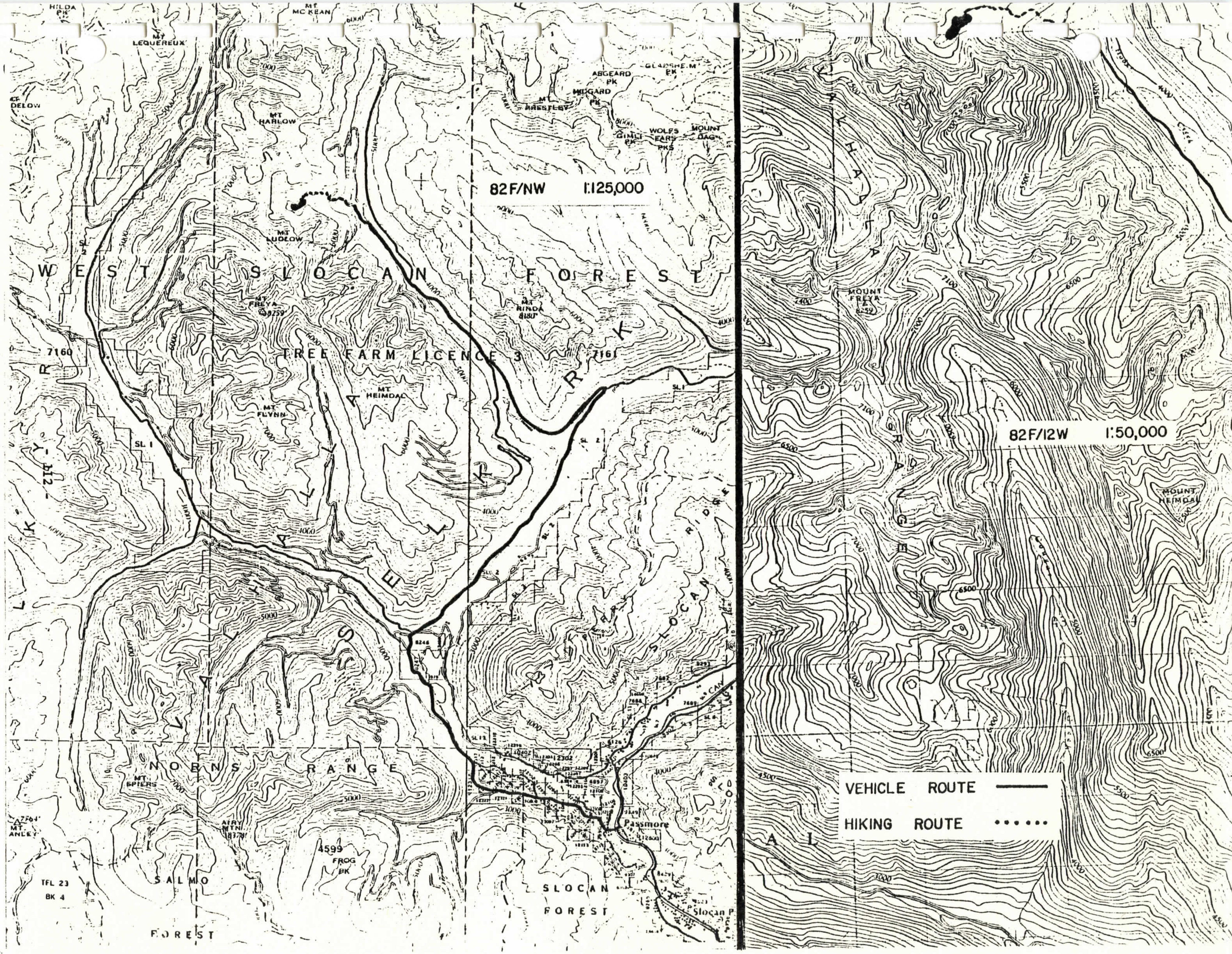
- 49° 44' N., 117° 48' W.
- Department of Mines and Technical Surveys Map: Passmore, B.C.; 82F/12W; 1:50,000; Grid Reference 418101
- Department of Lands and Forests Map: Slocan, B.C.; 82F/NW; 1:125,000
- Aerial photograhs #BC 5352-014, #BC 5352-015

II. ACCESS:

By Vehicle

Drive to the Playmor Junction (junction of Highway #6 and Highway #3A) and turn onto Highway #6. Proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
15.6	- Passmore Junction (little Slocan Road, paved)	L
15.7	- Railway	
15.9	- Bridge	
16.0	- Fork in road	L
16.7	- Fork in road	L
18.6	- Pavement ends	
19.2	- Fork in road	L


82F/NW 1:125,000
82F/12W 1:50,000
WEST SLOCAN FOREST
TREE FARM LICENCE 3
NORNS RANGE
SLOCAN RIDGE
MT LUDLOW
MT FREYA
MT HEIMDAL
MT FLYNN
MT HARLOW
MT RINDA
MT SPIERS
MT ANLEY
FROG PK
Passmore
SLOCAN FOREST
SALMO FOREST
MOUNT FREYA
MOUNT HEIMDAL
VEHICLE ROUTE
HIKING ROUTE

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
19.89	- Fork in road	R
19.9	- Fork in road	L
20.9	- Fork in road	R
21.7	- Bridge (Airy Creek)	
22.6	- Fork in road	L
23.1	- Fork in road	R
26.4	- Bridge (Boulder Creek)	
28.0	- Fork in road	R
28.3	- Bridge (Koch Creek)	
28.9	- Fork in road	R
29.0	- Fork in road	R
33.9	- Fork in road	L
34.1	- Bridge	
38.6	- Bridge	
40.7	- Fork in road	L
47.2	- Fork in road	R
50.3	- Bridge (Hoder Creek)	
51.2	- Creek	
51.3	- Fork in road	L
53.6	- Creek	
53.9	- Washout (4-Wheel Drive)	
54.0	- Fork in road	L
55.1	- Fork in road	R
55.5	- STOP	

Hiking Route

Follow the old logging road until it ends (sometimes it becomes a path). Keeping right of the falls, head up towards the talus slope and follow it to the top. At the top, angle down to the left until the lake is reached. Hiking time is 90 minutes.

III. GENERAL DESCRIPTION:

Obara Lake is a relatively shallow subalpine lake. It lies at an elevation of 1790 meters, and has an eastern exposure.

The hike up to Obara Lake commences at the base of a sheer granite cliff over which the outflow stream cascades into a beautiful waterfall. Only the one outflow drains from Obara Lake. There are two major inflow streams, and the one at the south-west end of the lake is ideal for spawning. Trout up to 25 cm in length were observed in the lake.

Obara Lake does not provide a good camping area. The northern and southern shore-lines are steep with some avalanche areas. The east and west ends are very damp. However, remnants of a campfire pit can be found at the east end of the lake by the outflow stream.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was observed in the lake.

Sites

Obara Lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic zone. The sites are illustrated in Figure 9A.

This lake is part of the Valhalla Plutonic Rocks geological classification. At the west end of the lake there is a backdrop of granite pecks and colluvial aprons for this glacially scoured basin.

Site 1

The southwestern shore of Obara Lake is very damp and boggy. Site 1 was located here beside the major inflow stream.

Slope:	0° - 1°
Exposure:	East
Moisture Regime:	Wet
Vegetation Classification:	Equisetum-Senecio Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation (cont'd)

Shrubs:

Cassiope mertensiana (White Moss Heather)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Menyanthes trifoliata (Buckbean)

Trollius laxus (Globe Flower)

Senecio triangularis (Giant Ragwort)

Viola spp. (Violet)

Mitella breweri (Mitrewort)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

Mosses: Aulacomnium palustre

Brachythecium asperrimum

Polytrichum commune

Sphagnum sp.

Lichens: Cladonia sp. (Trumpet Lichen)

Grasses: Unidentified

Site 2

A small vegetated talus slope is found on the northeastern shore of Obara Lake. Site 2 was next to the water's edge on this inactive talus.

Slope: 25°

Exposure: South

Moisture Regime: Slightly moist

Vegetation Classification: Engelmann Spruce-Alpine Fir-Black Huckleberry Association of the ESAF Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Alnus sinuata (Sitka Alder)

Rain AGAIN!

View toward outflow.

Spectacular waterfall formed by Obara Creek.

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation (cont'd)

Shrubs:

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Streptopus amplexifolius (Twisted Stalk)

Smilacina amplexicaulis (False Solomon's Seal)

Valeriana sitchensis (Mountain Valerian)

Senecio triangularis (Giant Ragwort)

Lilium spp. (Lily)

Arnica latifolia (Broad-Leaf Arnica)

Viola glabella (Yellow Violet)

Thalictrum occidentale (Meadow Rue)

Aster spp. (Aster)

Ligusticum canbyi (Canby's Lovage)

Myosotis sylvatica var. alpestris (Mountain Forget-Me-Not)

Veratrum eschocholtzii (Indian Hellebore)

Ferns: Athyrium filix-femina (Lady-Fern)

Mosses: Ceratodon purpureus

Pohlia nutans

Polytrichum juniperinum

Site 3

This site was located on the steep forested slope at the eastern shore of the lake.

Slope: 30°

Exposure: North

Moisture Regime: Slightly Moist

Vegetation Classification: Menziesia-Tiarella Association of the ESSFw Biogeoclimatic Zone*

Vegetation

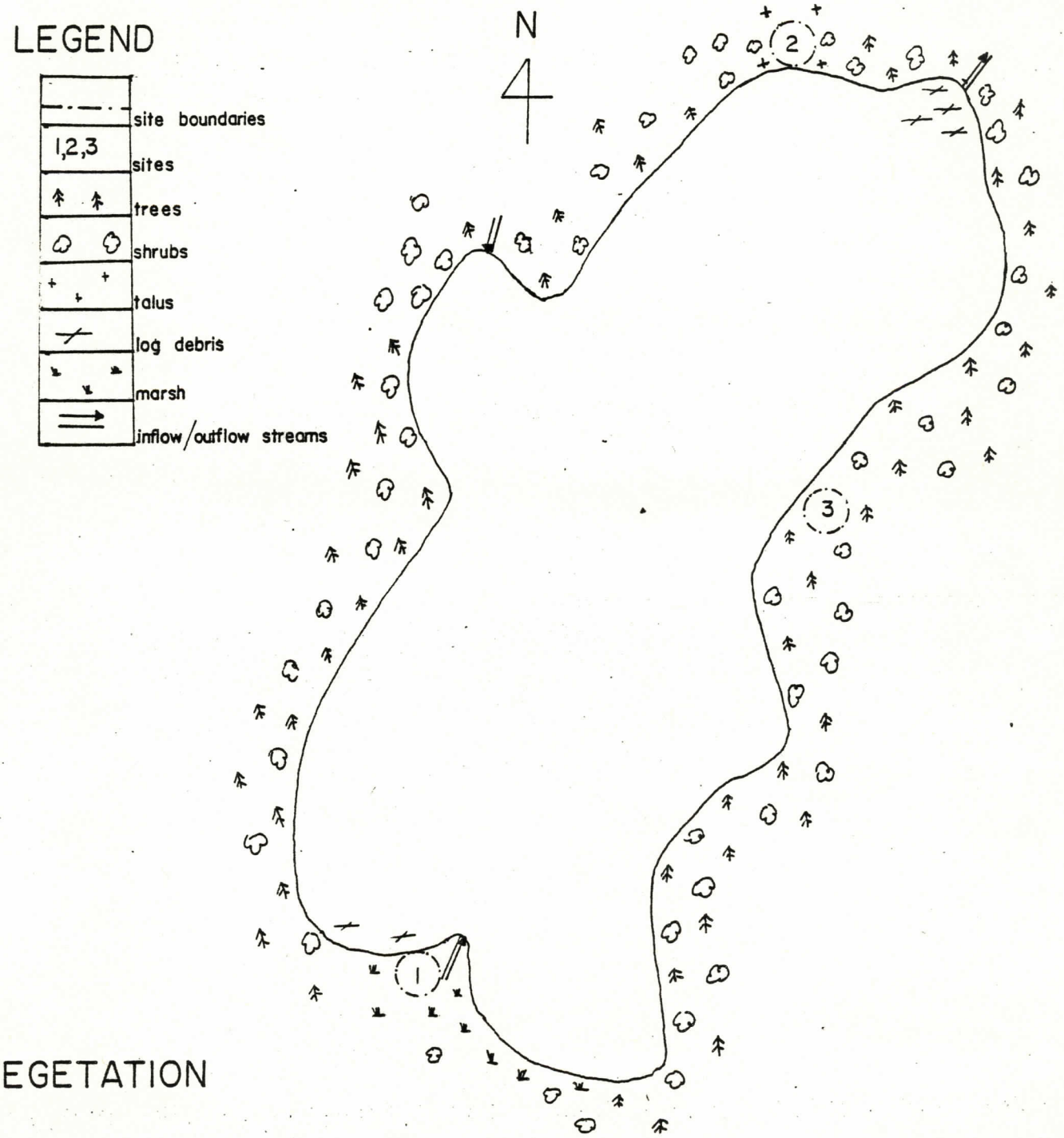
Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

FIG. 9A

OBARA LAKE



VEGETATION AND LANDFORMS

scale = 1: 2080

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Vegetation (cont'd)

Shrubs:

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Tiarella unifoliata (Foam Flower)

Trollius laxus (Globe Flower)

Arnica cordifolia (Heart-Leaf Arnica)

Tofieldia intermedia (False Asphodel)

Mitella breweri (Mitrewort)

Veratrum eschocholtzii (Indian Hellebore)

Mosses: Dicranum fuscescens

Hygrohypnum luridum

Mnium glabrescens

* Sites 1 and 3 were classified according to Utzig's Guide for Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw). The association for site 2 was classified within the association given by the Forestry Handbook for British Columbia under the biogeoclimatic zone Engelmann Spruce-Alpine Fir Zone (ESAF).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 9.0°C
	- Bottom 8.5°C
Secchi Disc	- Limit of visibility - 5 meters (bottom)
	- Weather conditions - completely overcast, raining (3:45 p.m.)
	- Water condition - fairly calm
Bottom Composition	- Boulders, rocks, sand, muck
pH	- 6.6
Total Alkalinity	- 5 ppm

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE (cont'd)

TEST	RESULT
Total Dissolved Solids	- 10 ppm
Lake Level	- At high level mark
Littoral Area	- $8.8 \times 10^3 m^2$
Total Volume	- 3.1×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 3 meters
Average Depth	- 30 centimeters
Velocity	- 0.27 meters/second
Volume of Flow	- 245 liters/second
Temperature	- 5.0°C
Bottom Composition	- Rocks, sand, some log debris

ii) Inflow #2

Average Width	- 1.3 meters
Average Depth	- 20 centimeters
Velocity	- 0.5 meters/second
Volume of Flow	- 130 liters/second
Temperature	- 5.5°C
Bottom Composition	- Rocks, sand, gravel, log debris
Comment	- Inflow #2 and Inflow #1 join together before lake

iii) Inflow #3

Average Width	- 20 centimeters
Average Depth	- 4 centimeters
Velocity	- 1.0 meters/second
Volume of Flow	- 8 liters/second
Temperature	- 9.0°C
Bottom Composition	- Rocks, gravel

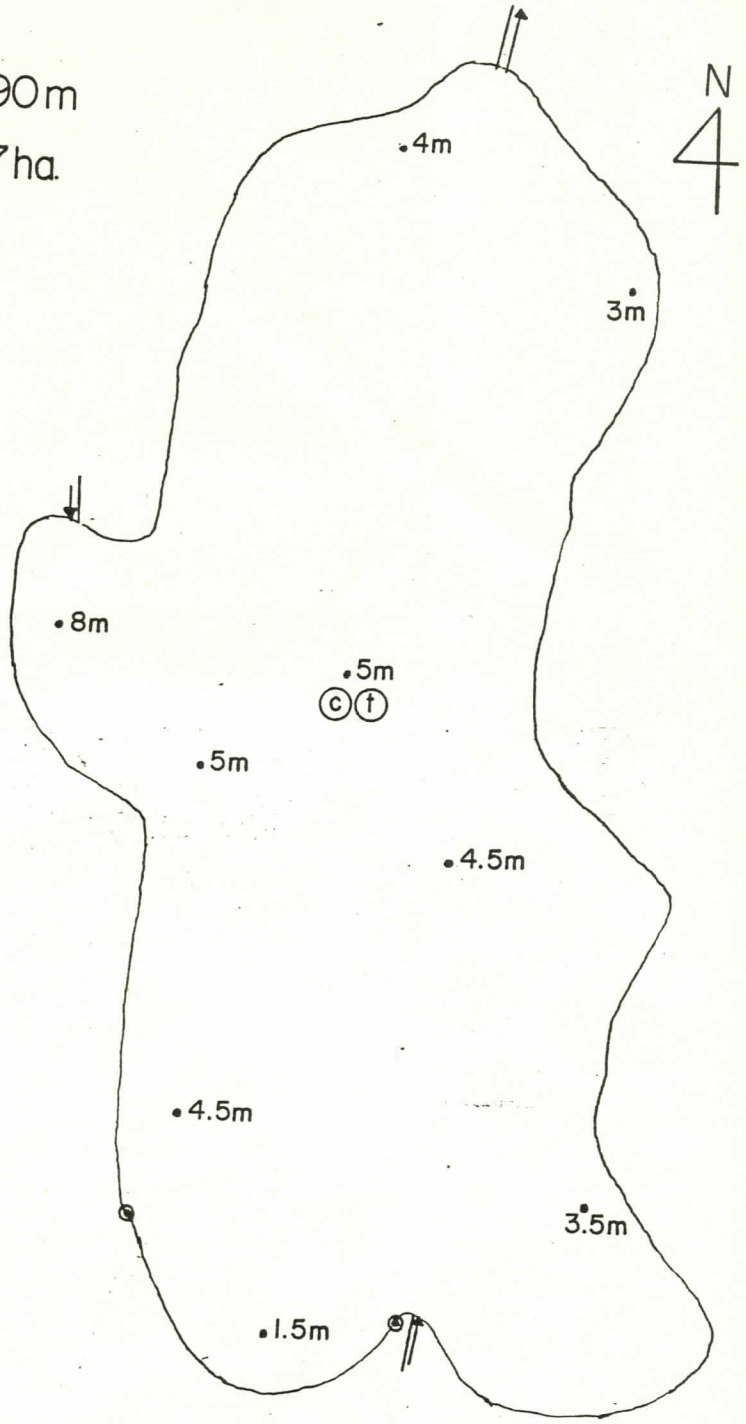
C) OUTFLOW STREAM

Average Width	- 5 meters
Average Depth	- 25 centimeters
Velocity	- 1.0 meters/second
Volume of Flow	- 1300 liters/second
Temperature	- 8.0°C
Bottom Composition	- Rocks, gravel, log debris

OBARA LAKE

FIG. 9B

ELEVATION 1790m
AREA 7.7ha.



LEGEND

- plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

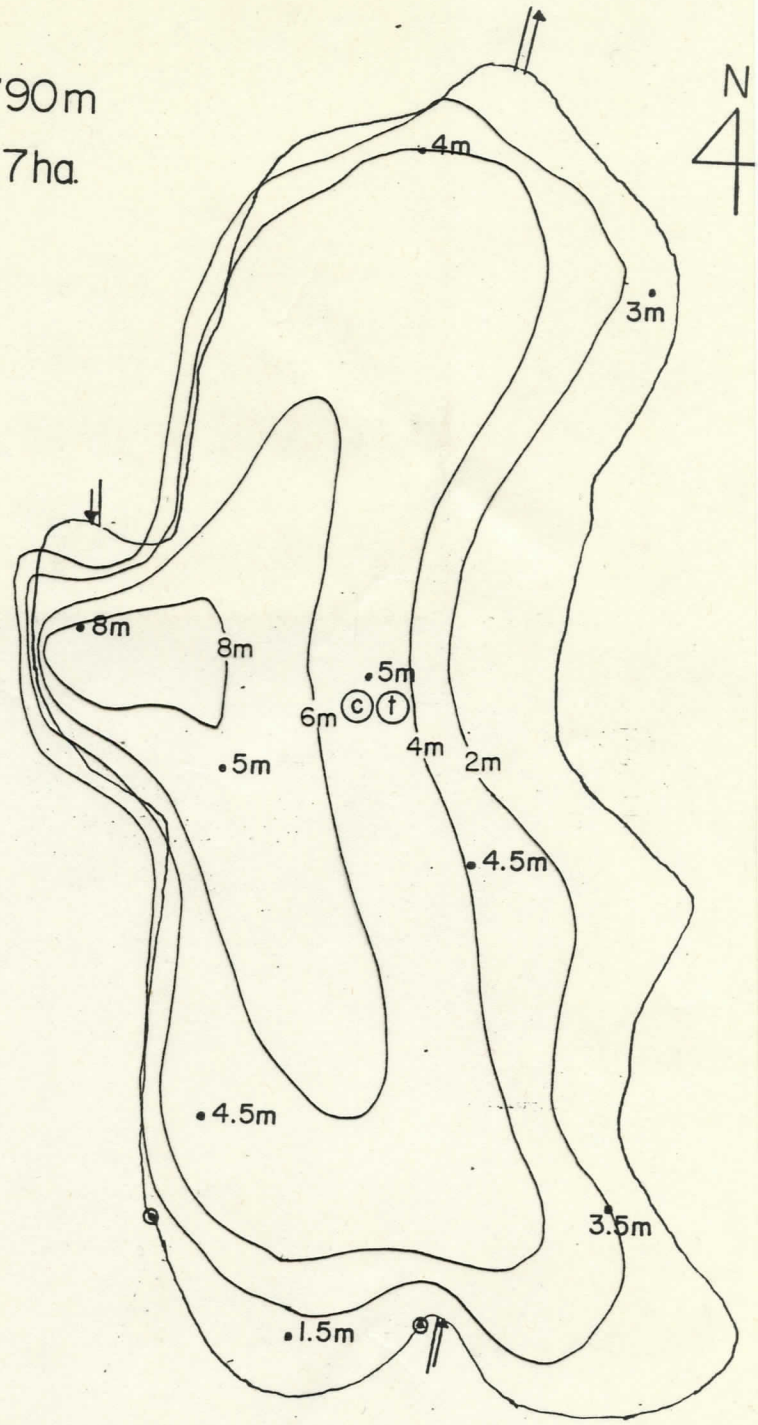
scale = 1:1920

OBARA LAKE

FIG. 9B

ELEVATION 1790m

AREA 7.7ha.



LEGEND

- plane table stations
- C chemical record
- T temperature record
- depth soundings
- inflow/outflow streams

contours (meters)

PLANE TABLE SURVEY

scale = 1:1920

LOWER GWILLIM LAKE

DATE STUDIED: August 10th, 1981

I. LOCATION:

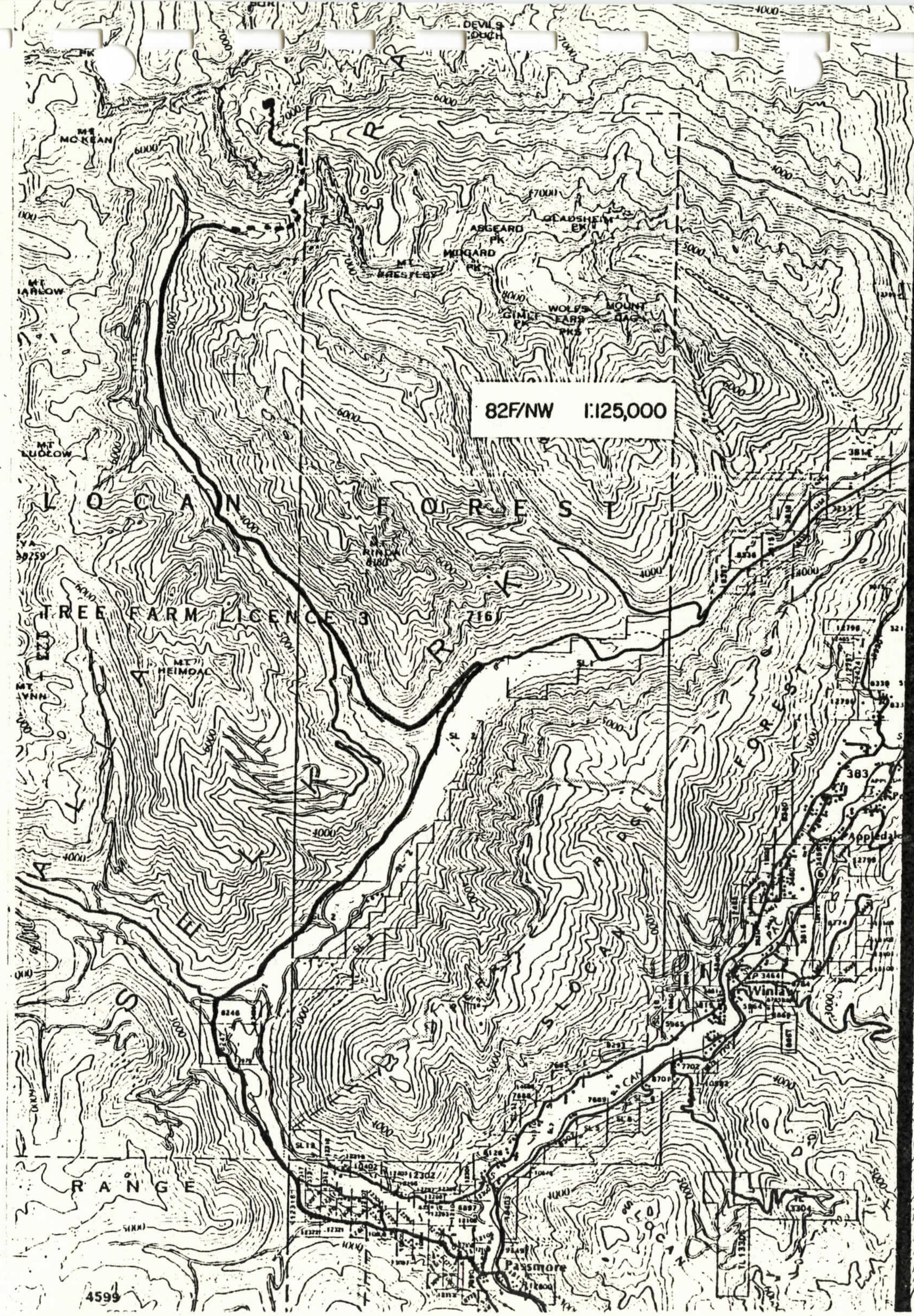
- 49° 52' N., 117° 46' W.
- Department of Mines and Technical Surveys Map: Burton, B.C.; 82F/13; 1:50,000; Grid Reference 468179
- Department of Lands and Forests Map: Slocan, B.C.; 82F/NW; 1:125,000
- Aerial photographs #BC 5352-063, #BC 5352-064

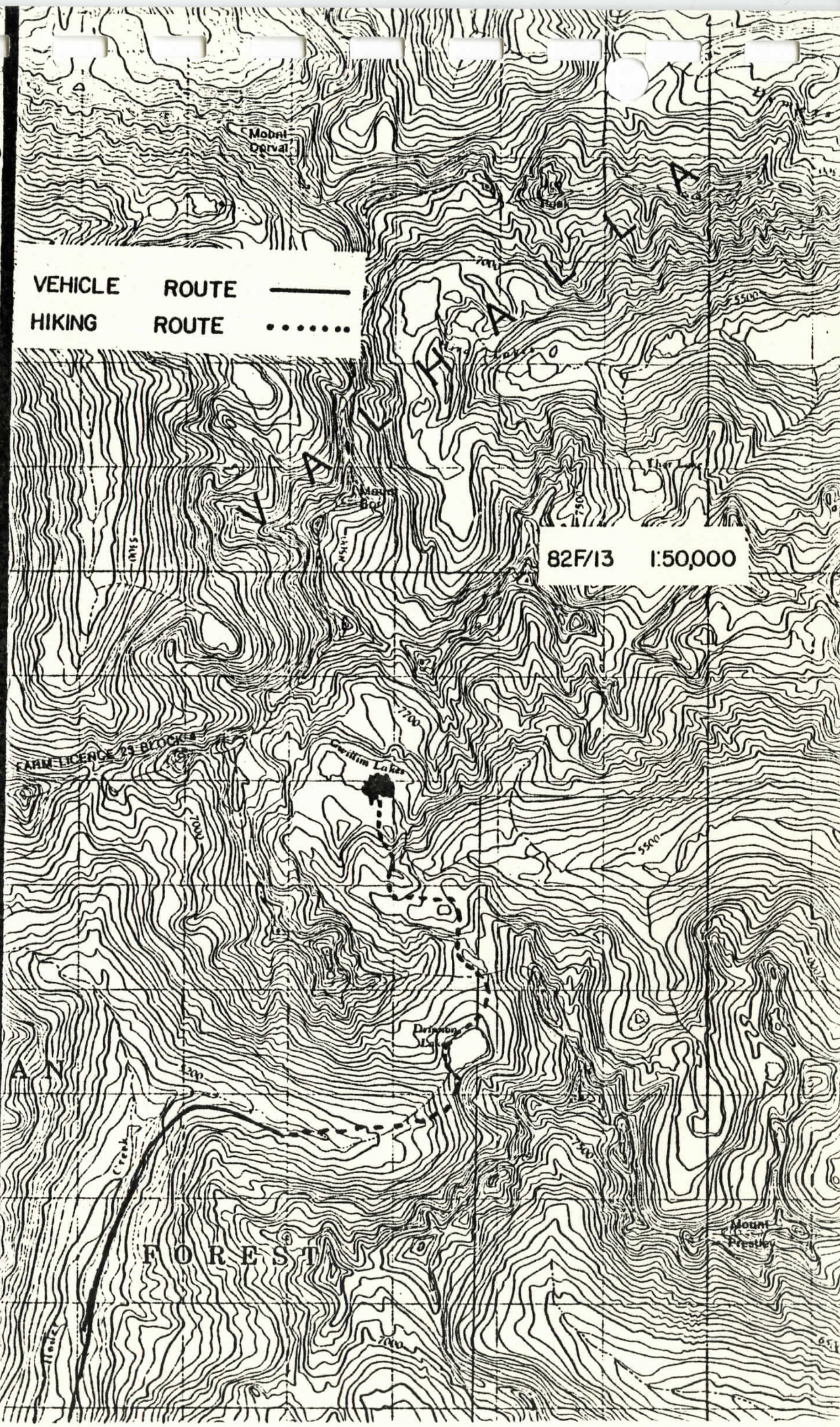
II. ACCESS:

By Vehicle

From the Playmor Junction turn onto Highway #6 and 15.4 km past Playmor Junction fork left onto a paved road then proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
0.2	- Railway	
0.3	- Bridge	
0.4	- Fork in road	L
1.2	- Fork in road	L
3.0	- Pavement ends	
3.7	- Fork in road	L
4.3	- Fork in road	R


82F/NW 1:125,000
LOCAN FOREST
TREE FARM LICENCE 3
RANGE
Appledale
Passmore


VEHICLE ROUTE
HIKING ROUTE
82F/13 1:50,000
FOREST

II. ACCESS:

- By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
5.3	- Fork in road	R
6.1	- Bridge (Airy Creek)	
7.0	- Fork in road	L
7.5	- Fork in road	R
10.9	- Bridge (Boulder Creek)	
12.4	- Fork in road	R
12.8	- Bridge (Koch Creek)	
13.3	- Fork in road	R
13.5	- Fork in road	R
18.4	- Fork in road	L
18.6	- Bridge	
23.1	- Bridge	
24.4	- Texas Gate	
25.1	- Fork in road	L
31.6	- Fork in road	R
34.7	- Bridge (Hoder Creek)	
35.7	- Fork in road	R
36.0	- Bridge (Hoder Creek)	
42.5	- Creek (Slight washout)	
43.3	- Creek	
43.6	- Fork in road	L
43.9	- Fork in road (road is rough in places)	R
46.2	- STOP	

Hiking Route

From the end of the vehicle route, a talus slope is visible to the north. Head for the talus slope following the creek. (There is no trail so bushwacking must be done). Keep to the right of the talus slope until the top is reached. Then, angle left until Drinnon Lake is reached. Cross the outflow and hike around the left of the lake hiking at about a 30° angle along the slope. When the plateau is reached, hike down it keeping to the left around the small lakes. At the end of the plateau head down the slope keeping to the left.

II. ACCESS:

Hiking Route (cont'd)

At the base a small lake will be reached. Go around the right of the lake. (A trail should be noticed by now.) In the northwest direction a pass is visible between a high ridge and a talus slope. Head for the pass and hike to the top. On that plateau are Gwillim Lakes - hiking time is 5 hours.

III. GENERAL DESCRIPTION:

Lower Gwillim Lake is situated at an alpine elevation of 2160 meters and has a south-eastern exposure. To the north and west rise towering mountain peaks, and across the meadows to the southeast unfolds a majestic view of the southern Valhallas.

There are six inflow streams, one of which is a beautiful waterfall from the hanging valley on the north side of the lake. Two outflow streams drain from the lake.

A number of islands and rocky peninsulas are found at Lower Gwillim Lake. Large boulders also lie in and around the water.

Camping space is plentiful, but campfires are not recommended. There are no fish in the lake.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No aquatic vegetation was observed.

Sites

This lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic zone. The site areas were all uniform and near the water's edge. These sites are illustrated in Figure 12A.

Hornblende-biotite-feldspar gneiss is the major rock type at Lower Gwillim Lake. However, an igneous intrusion borders on the edge of the Gwillim Lake area. Therefore, some granite rock may also be found.

Although the basin for Gwillim Lakes is somewhat irregularly shaped, it once held a cirque glacier. Large morainal boulders are prevalent around the lake.

Site 1

Slope:	5°
Exposure:	Southeast
Moisture Regime:	Dry
Vegetation Classification:	*Vaccinium scoparium* Association of the ESSFe Biogeoclimatic Zone*

Evidence of past glacial activity.

A major inflow stream forms a waterfall.

IV. VEGETATION AND GEOMORPHOLOGY:

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Ranunculus eschscholtzii (Snow Buttercup)

Viola adunca (Blue Violet)

Kalmia polifolia (Swamp Laurel)

Mitella pentandra (Alpine Mitrewort)

Lichens: Lecanora sp.

Grasses: Unidentified

Sedges: Unidentified

Rushes: Luzula sp. (Wood Rush)

Site 2

Slope: 6°

Exposure: North

Moisture Regime: Moist to dry

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Shrubs:

Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Ranunculus eschscholtzii (Snow Buttercup)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation

Flowers (cont'd)

Veronica spp. (Veronica)

Mitella pentandra (Alpine Mitrewort)

Mosses:

Rhytidiadelphus squarrosus

Hygrohypnum luridum

Polytrichum juniperinum

Lichens: Lecanora sp.

Grasses: Unidentified

Sedges: Unidentified

Rushes: Luzula sp. (Wood Rush)

Site 3

Slope: 6°

Exposure: Northwest

Moisture Regime: Moist to Dry

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Leptarrhena amplexifolia (Leptarrhena)

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Senecio triangularis (Giant Ragwort)

Mitella pentandra (Alpine Mitrewort)

Veratrum eschocholtzii (Indian Hellebore)

Caltha biflora (Marsh Marigold)

Viola spp. (Violet)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Vegetation (cont'd)

Mosses:

Hygrohypnum luridum

Rhacomitrium lanuginosum

Ceratodon purpureus

Lichens:

Cladonia sp. (Trumpet Lichen)

Lecanora sp.

Grasses: Unidentified

Sedges: Unidentified

Rushes: Luzula sp. (Wood Rush)

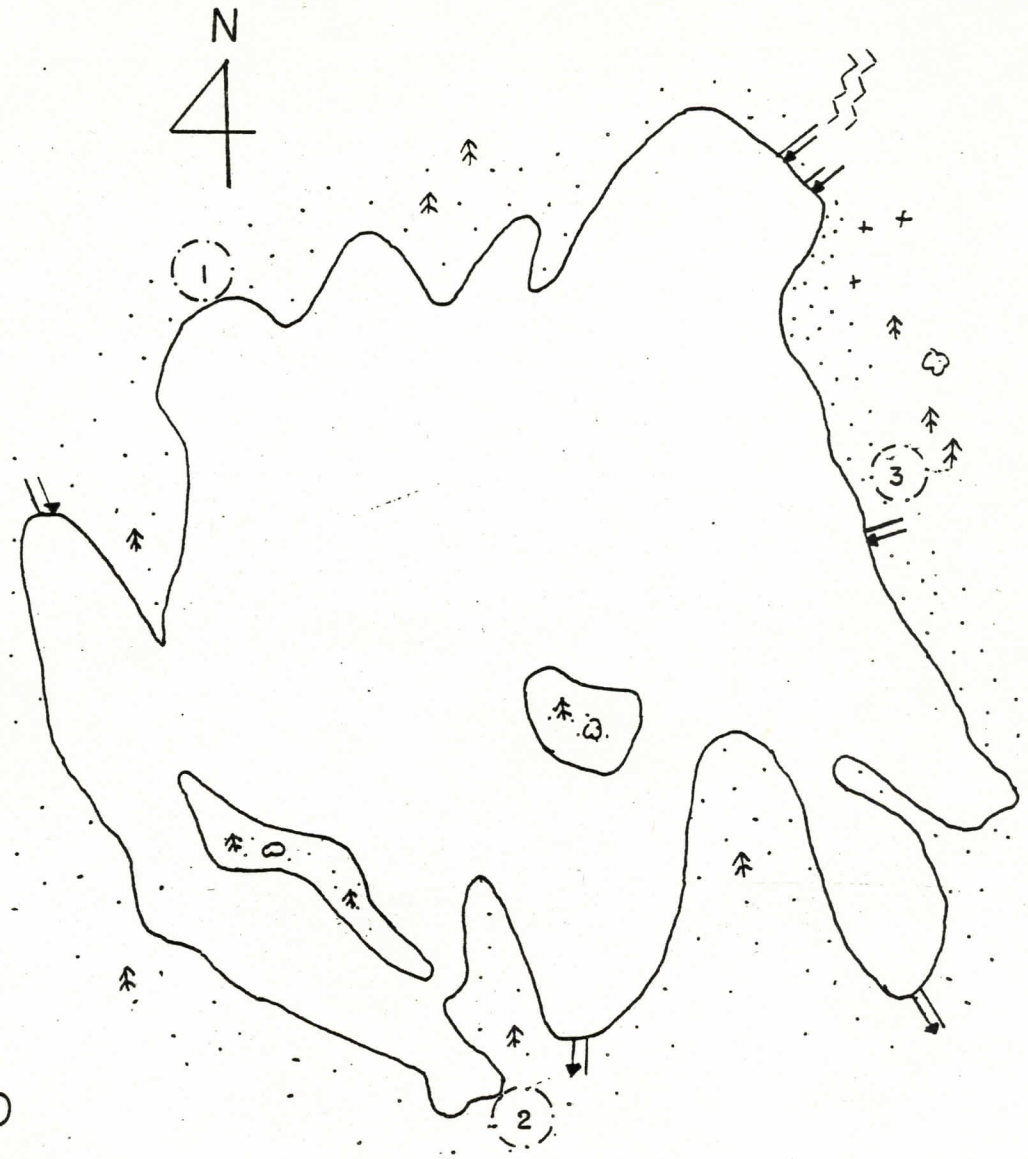
* The associations for the sites were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFe).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 13.5°C
	- Bottom 13.0°C
Secchi Disc	- Limit of visibility - bottom of lake
	- Weather conditions - clear, sunny (7:20 P.M.)
	- Water conditions - fairly calm
Bottom Composition	- Boulders, sand, muck, silt
pH	- 7.2
Total Alkalinity	- 6 ppm
Total Dissolved Solids	- 4 ppm
Lake Level	- At high water level
Littoral Area	- $1.1 \times 10^4 m^2$
Total Volume	- 3.4×10^8 liters

LOWER GWILLIM LAKE



LEGEND

- site boundaries
- 1,2,3 sites
- trees
- shrubs
- talus
- alpine vegetation
- waterfall
- inflow outflow streams

VEGETATION AND LANDFORMS

scale = 1:2380

V. PHYSICAL AND CHEMICAL DATA: (cont'd)

B) INFLOW STREAMS

TEST	RESULT
i) Inflow #1	
Average Width	- 1.1 meters
Average Depth	- 8 centimeters
Velocity	- 0.34 meters/second
Volume of Flow	- 30 liters/second
Temperature	- 6.0°C
Bottom Composition	- Rocks, pebbles
ii) Inflow #2	
Average Width	- 1.3 meters
Average Depth	- 18 centimeters
Velocity	- 0.52 meters/second
Volume of Flow	- 120 liters/second
Temperature	- 9.5°C
Bottom Composition	- Rocks, pebbles
iii) Inflow #3	
Average Width	- 0.7 meters
Average Depth	- 8 centimeters
Velocity	- 0.6 meters/second
Volume of Flow	- 34 liters/second
Temperature	- 8.0°C
Bottom Composition	- Rocks, gravel, sand
iv) Inflow #4	
Average Width	- 0.7 meters
Average Depth	- 5 centimeters
Velocity	- 0.8 meters/second
Volume of Flow	- 28 liters/second
Temperature	- 6.0°C
Bottom Composition	- Rocks, pebbles
v) Inflow #5	
Average Width	- 0.6 meters
Average Depth	- 12 centimeters
Velocity	- 0.6 meters/second
Volume of Flow	- 43 liters/second
Temperature	- 10.0°C
Bottom Composition	- Sand, pebbles, rocks

V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

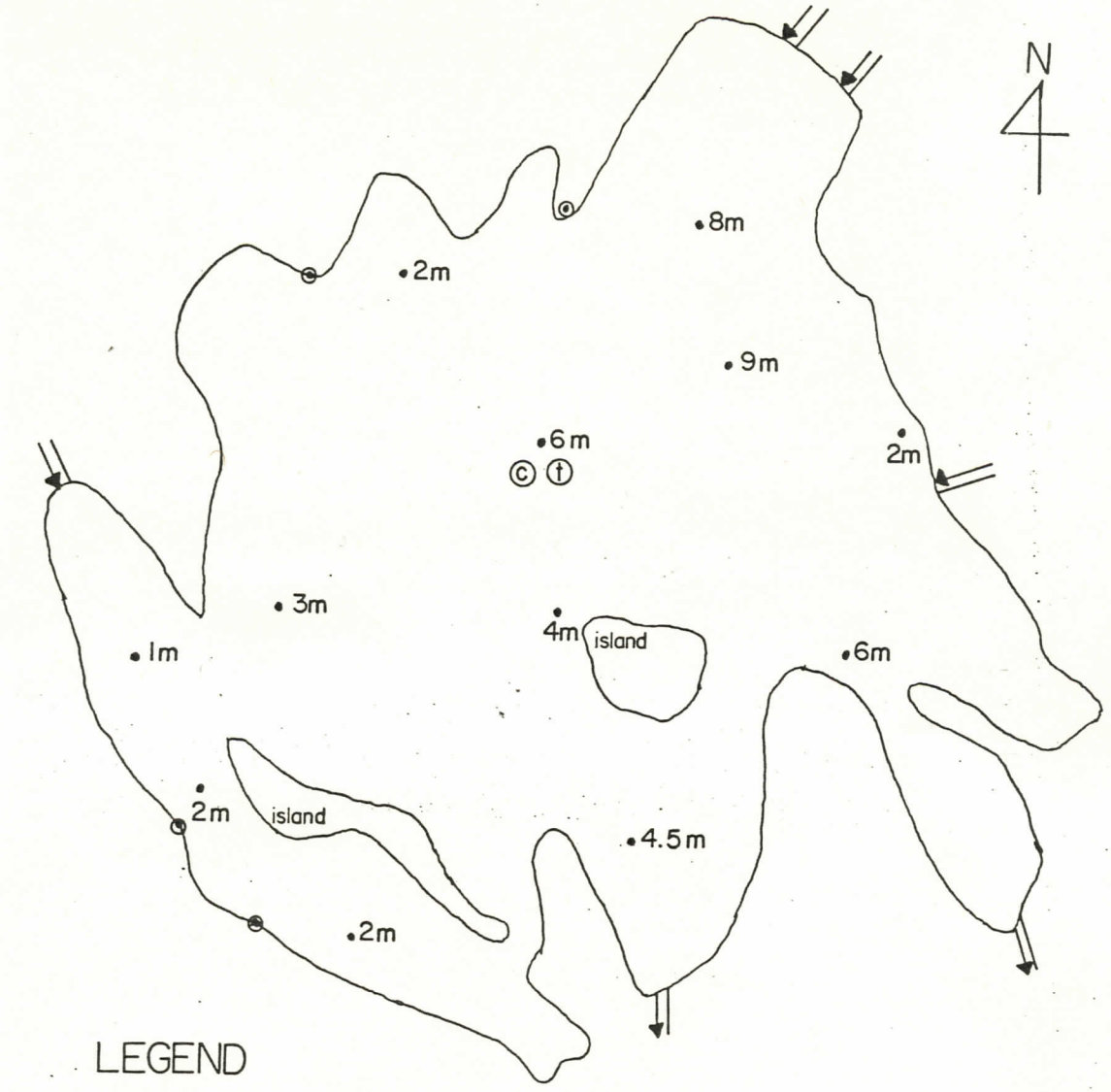
TEST	RESULT
vi) Inflow #6	
Average Width	- 0.9 meters
Average Depth	- 45 centimeters
Velocity	- 0.86 meters/second
Volume of Flow	- 350 liters/second
Temperature	- 10.0°C
Bottom Composition	- Rocks, sand

C) OUTFLOW STREAMS

i) Outflow #1	
Average Width	- 1 meter
Average Depth	- 12 centimeters
Velocity	- 0.4 meters/second
Volume of Flow	- 48 liters/second
Temperature	- 17.0°C
Bottom Composition	- Rocks
ii) Outflow #2	
Average Width	- 2.5 meters
Average Depth	- 30 centimeters
Velocity	- 0.4 meters/second
Volume of Flow	- 300 liters/second
Temperature	- 16.0°C
Bottom Composition	- Rocks, gravel

LOWER GWILLIM LAKE

FIG. 12B



LEGEND

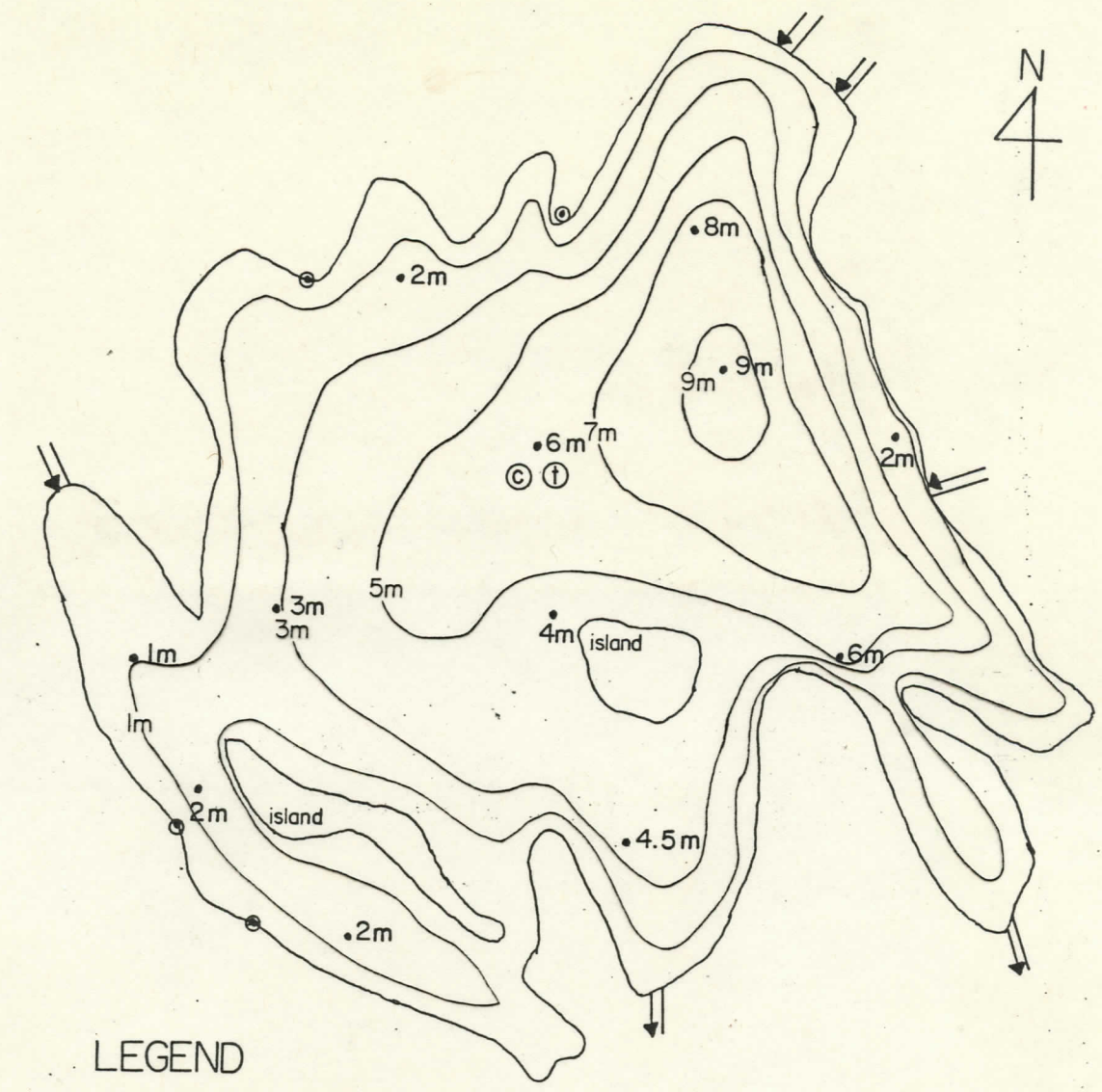
- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1: 2173

LOWER GWILLIM LAKE

FIG. 12B



LEGEND

- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- contours (meters)
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1: 2173

UPPER GWILLIM LAKE

DATE STUDIED: August 11th, 1981

I. LOCATION:

- 49° 52' N., 117° 46' W.
- Department of Mines and Technical Surveys Map: Burton, B.C.; 82F/13;
- 1:50,000; Grid Reference 464182
- Department of Lands and Forests Map: Slocan, B.C.; 82F/NW; 1:125,000
- Aerial photographs #BC 5352-063; #BC 5352-064

II. ACCESS:

See ACCESS to Lower Gwillim Lake. Upper Gwillim Lake is approximately 100 meters from the northwestern shore of Lower Gwillim Lake.

III. GENERAL DESCRIPTION:

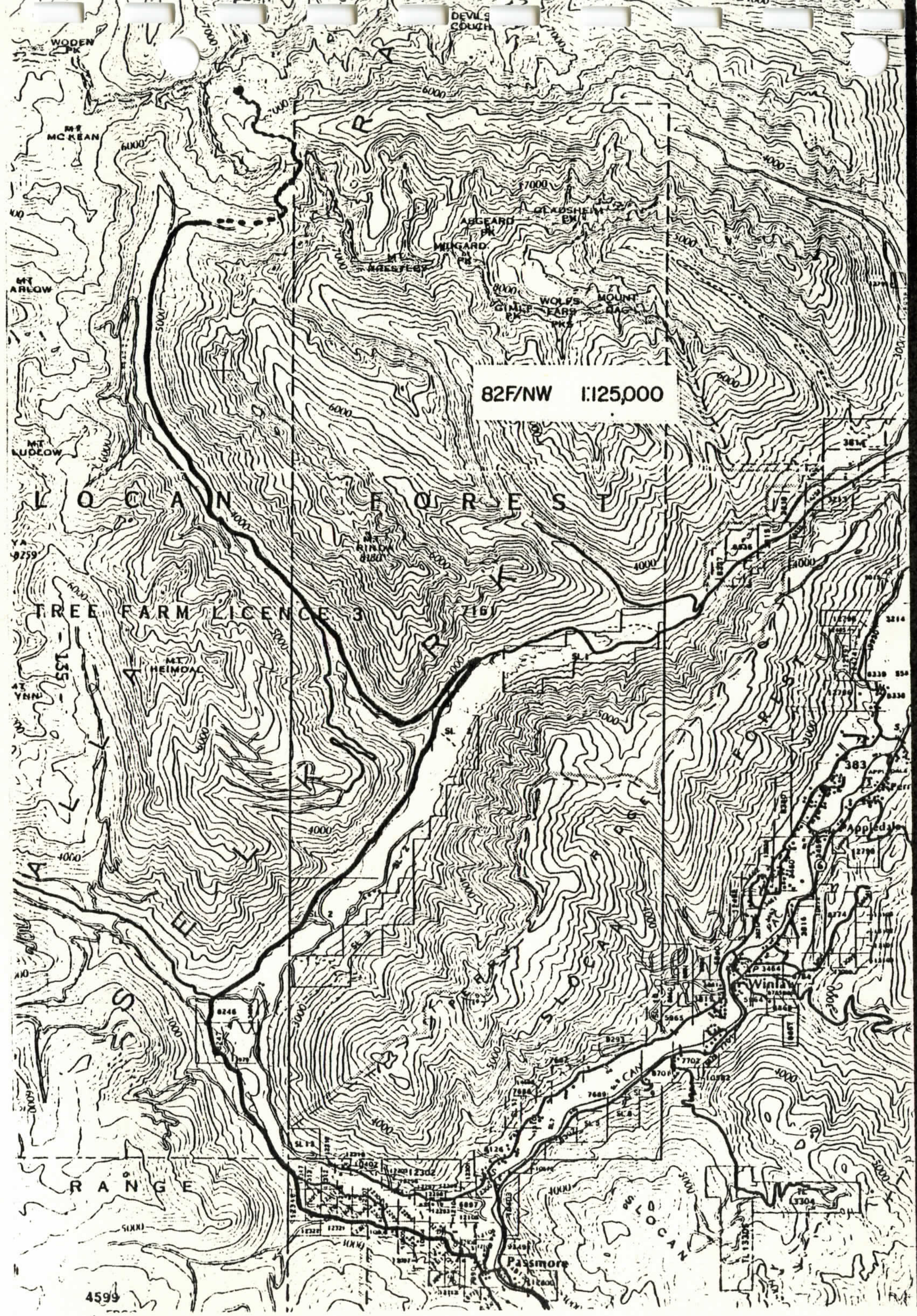
Upper Gwillim Lake lies approximately 100 meters north and west of Lower Gwillim Lake. It too has a southeastern exposure and an elevation of 2160 meters.

There are four inflow streams into the lake and the two outflow streams drain into Lower Gwillim Lake.

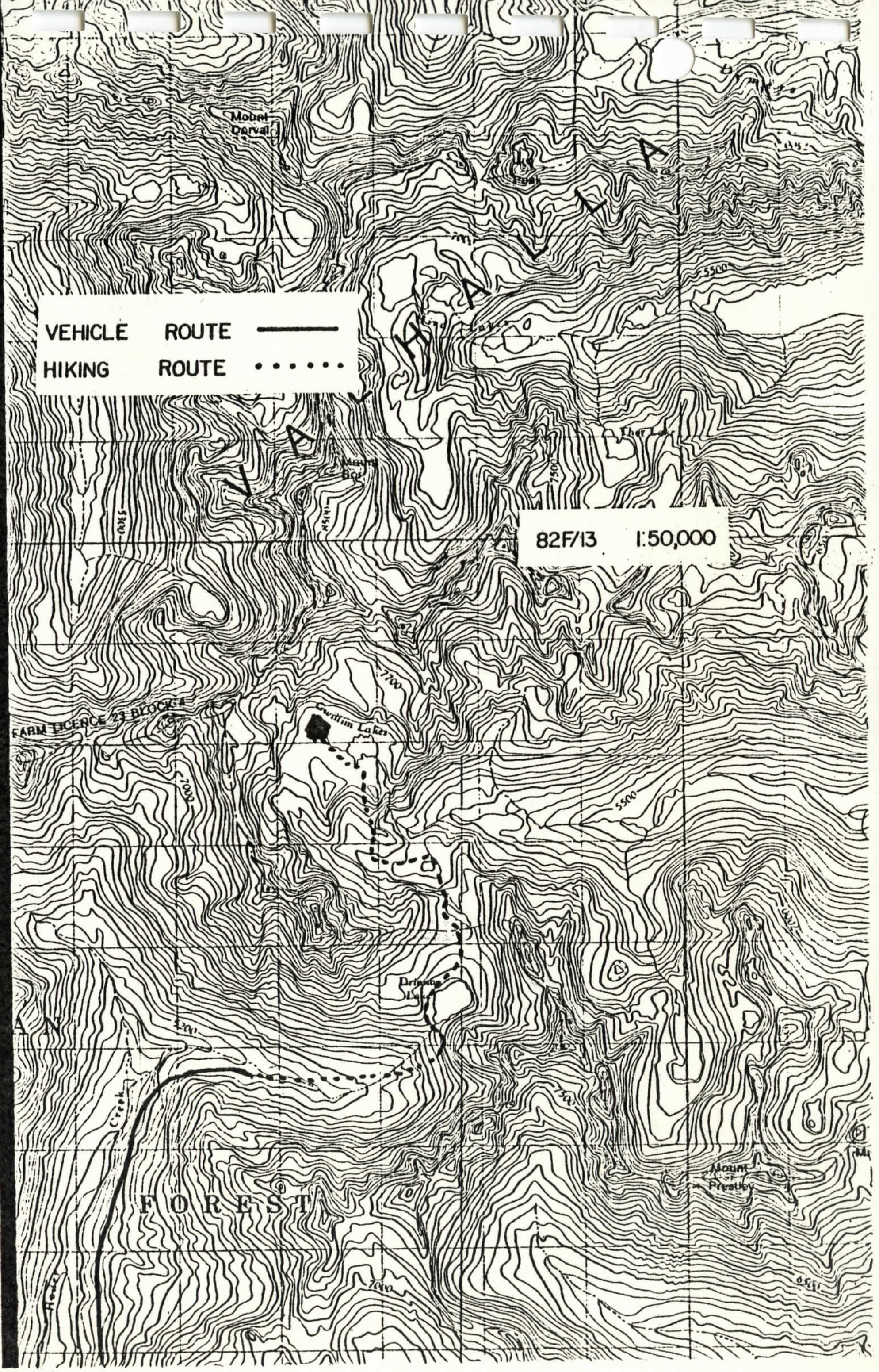
A rock cliff drops into the water from the edge of the talus slope on the north side of the lake. Alpine meadow and forest surround the remaining water's edge. Large boulders are also found in and around the lake.

The meadow provides good camping spots, but firewood is scarce.

No fish are present in the lake.



82F/NW 1:125,000
TREE FARM LICENCE 3
RANGE
Winlaw
Appledale
Passmore
4599



VEHICLE ROUTE
HIKING ROUTE
82F/13 1:50,000
FOREST

View of inflow stream.

Lower Gwillim Lake can be seen in background.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was noted in the lake.

Sites

Upper Gwillim Lake is located in the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone. Sites 1 and 2 were uniform and located near the edge of the lake. The sites are illustrated in Figure 13A.

Upper Gwillim Lake is located in the same cirque basin as Lower Gwillim Lake.

Site 1

Slope: 5°

Exposure: Southwest

Moisture Regime: Dry to Moist

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Trees:

Abies lasiocarpa (Alpine Fir)

Shrubs:

Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Ranunculus eschscholtzii (Snow Buttercup)

Veronica spp. (Veronica)

Viola adunca (Blue Violet)

Mitella pentandra (Alpine Mitrewort)

Kalmia polifolia (Swamp Laurel)

Mosses:

Polytrichum juniperinum

Leptobryum pyriforme

Lichens: Lecanora sp.

Sedges: Unidentified

Rushes: Luzula sp. (Wood Rush)

IV. VEGETATION AND GEOMORPHOLOGY: (cont'd)

Site 2

Slope: 2°

Exposure: Southeast

Moisture Regime: Dry

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Shrubs:

Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Veronica spp. (Veronica)

Mitella pentandra (Alpine Mitrewort)

Kalmis polifolia (Swamp Laurel)

Veratrum eschocholtzii (Indian Hellebore)

Lichens:

Cladonia sp. (Trumpet Lichen)

Lecanora sp.

Rushes: Luzula sp. (Wood Rush)

Site 3

This site was above the rock cliff on the north side of the lake.

Slope: 30°

Exposure: East

Moisture Regime: Dry

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Shrubs:

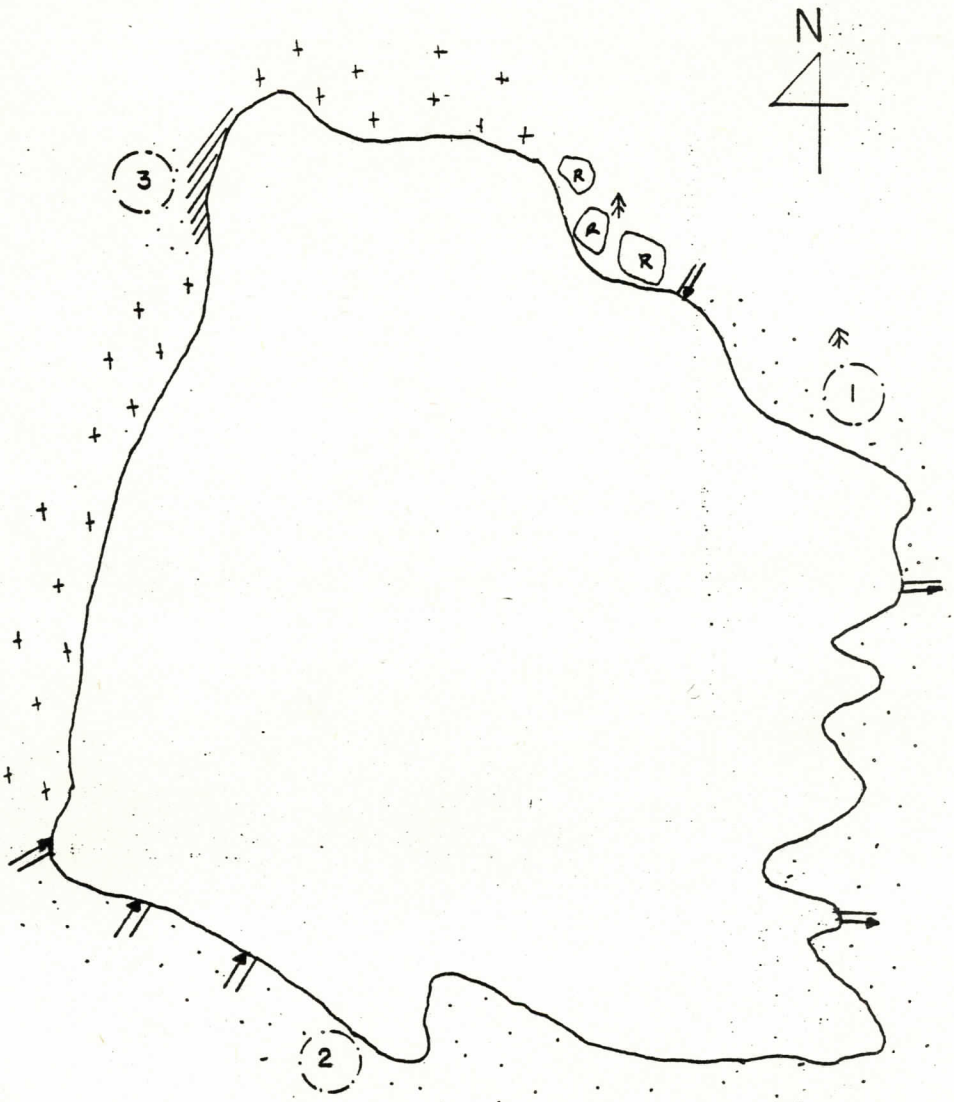
Cassiope mertensiana (White Moss Heather)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Vaccinium membranaceum (Black Mountain Huckleberry)

UPPER GWILLIM LAKE



LEGEND

- site boundaries
- 1,2,3 sites
- trees
- talus
- R boulders
- alpine vegetation
- rock cliff
- inflow outflow streams

VEGETATION AND LANDFORMS

scale = 1:1612

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Vegetation (cont'd)

Flowers:

Antennaria spp. (White Pussytoes)

Anemone occidentalis (Western Anemone)

Agoseris spp. (Agoseris)

Viola adunca (Blue Violet)

Aster spp. (Aster)

Kalmia polifolia (Swamp Laurel)

Veratrum eschocholtzii (Indian Hellebore)

Mosses:

Polytrichum juniperinum

Leptobryum pyriforme

Lichens: Lecanora sp.

Sedges: Unidentified

Rushes: Luzula sp. (Wood Rush)

* The associations for the sites were developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District under the Engelmann Spruce-Subalpine Fir Biogeoclimatic Zone (ESSFe).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 12.5°C
	- Bottom 11.0°C
Secchi Disc	- Limit of visibility - bottom of lake
	- Weather conditions - sunny, clear (12:30 noon)
	- Water conditions - slight ripples
Bottom Composition	- Boulders, sand, muck
pH	- 7.1
Total Alkalinity	- 4 ppm
Total Dissolved Solids	- 10 ppm
Lake Level	- High water level mark
Littoral Area	- $5.8 \times 10^3 m^2$
Total Volume	- 1.8×10^8 liters

V. PHYSICAL AND CHEMICAL DATA: (cont'd)

B) INFLOW STREAMS

TEST		RESULT
i)	Inflow #1	
	Average Width	- 1.4 meters
	Average Depth	- 18 centimeters
	Velocity	- 0.53 meters/second
	Volume of Flow	- 135 liters/second
	Temperature	- 10.0°C
	Bottom Composition	- Rocks, pebbles
ii)	Inflow #2	
	Average Width	- 1.6 meters
	Average Depth	- 8 centimeters
	Velocity	- 0.13 meters/second
	Volume of Flow	- 16 liters/second
	Temperature	- 15.0°C
	Bottom Composition	- Rocks, silt
iii)	Inflow #3	
	Average Width	- 60 centimeters
	Average Depth	- 10 centimeters
	Velocity	- 0.3 meters/second
	Volume of Flow	- 20 liters/second
	Temperature	- 13.0°C
	Bottom Composition	- Rocks, gravel, silt
iv)	Inflow #4	
	Average Width	- 25 centimeters
	Average Depth	- 8 centimeters
	Velocity	- 0.4 meters/second
	Volume of Flow	- 8 liters/second
	Temperature	- 14.0°C
	Bottom Composition	- Rocks, sand, gravel, muck

C) OUTFLOW STREAMS

i)	Outflow #1	
	Average Width	- 2.5 meters
	Average Depth	- 15 centimeters
	Velocity	- 0.5 meters/second
	Volume of Flow	- 190 liters/second
	Temperature	- 12.0°C
	Bottom Composition	- Rocks

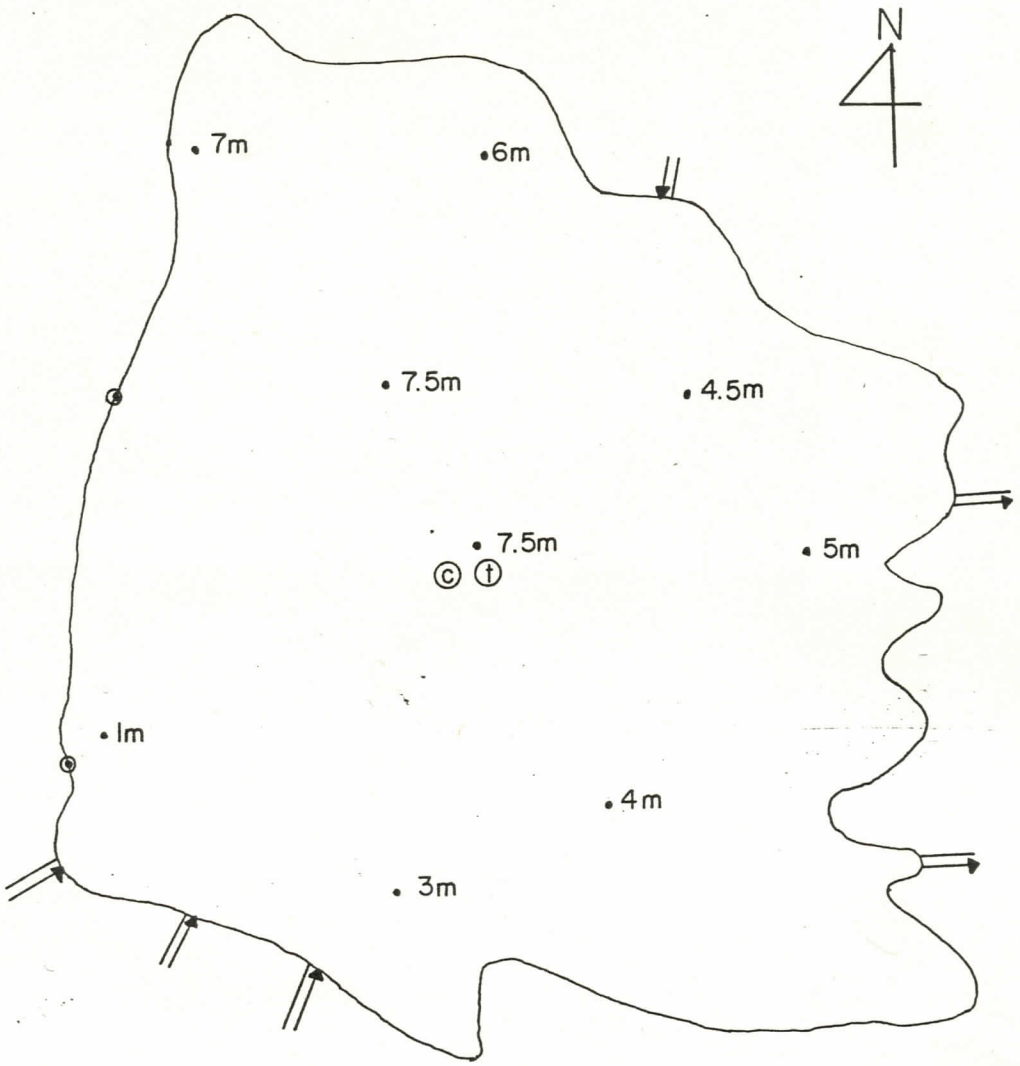
V. PHYSICAL AND CHEMICAL DATA:

C) OUTFLOW STREAMS (cont'd)

TEST		RESULT
ii)	Outflow #2	
	Average Width	- 1.3 meters
	Average Depth	- 10 centimeters
	Velocity	- 0.3 meters/second
	Volume of Flow	- 35 liters/second
	Temperature	- 11.0°C
	Bottom Composition	- Rocks, gravel

UPPER GWILLIM LAKE

FIG.13B



LEGEND

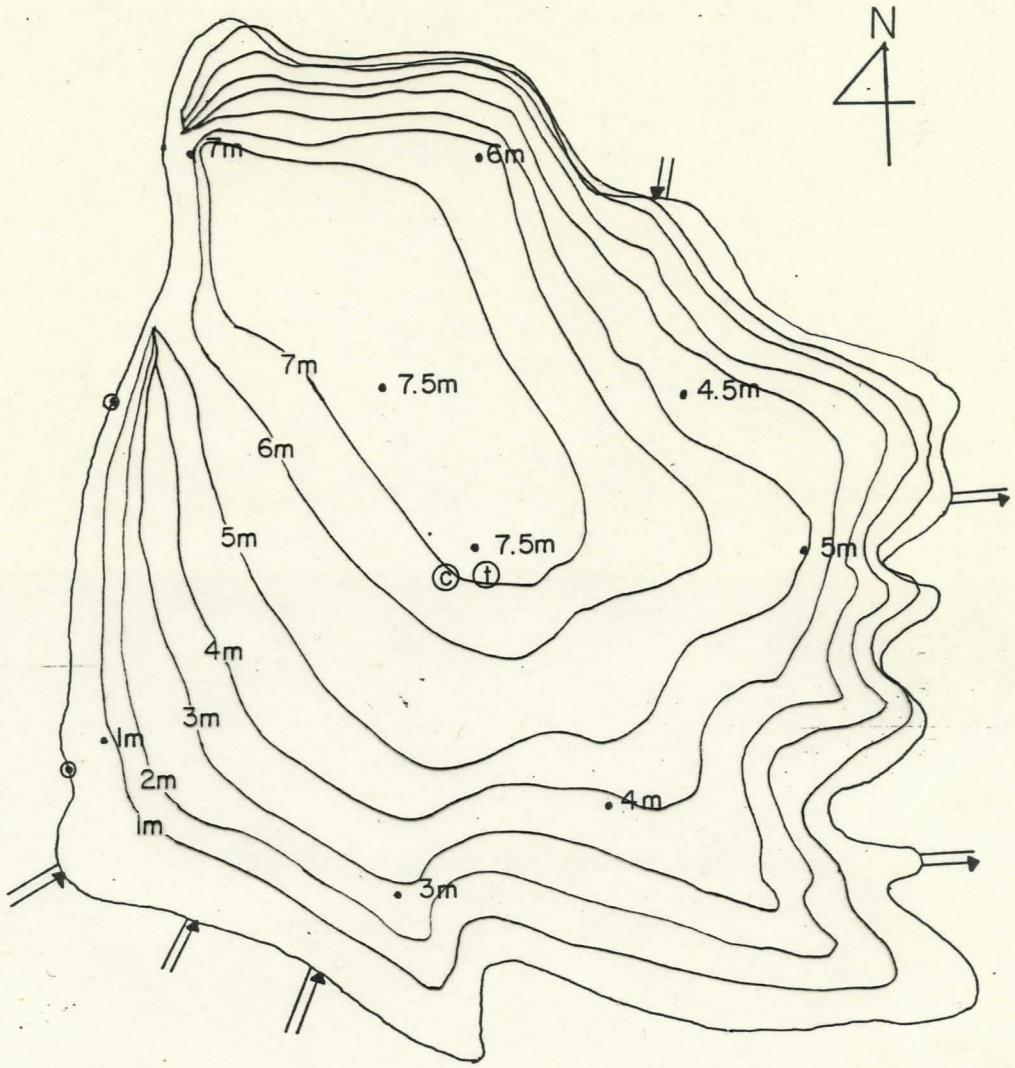
- ⊙ plane table stations
- Ⓒ chemical record
- Ⓣ temperature record
- • depth soundings
- ⟹ inflow/outflow streams

PLANE TABLE SURVEY

scale = 1:1490

FIG.13B

UPPER GWILLIM LAKE



LEGEND

- plane table stations
- chemical record
- temperature record
- depth soundings
- inflow/outflow streams

contours (meters)

PLANE TABLE SURVEY

scale = 1:1490

KRAO LAKE

DATE STUDIED: August 18th, 1981

I. LOCATION:

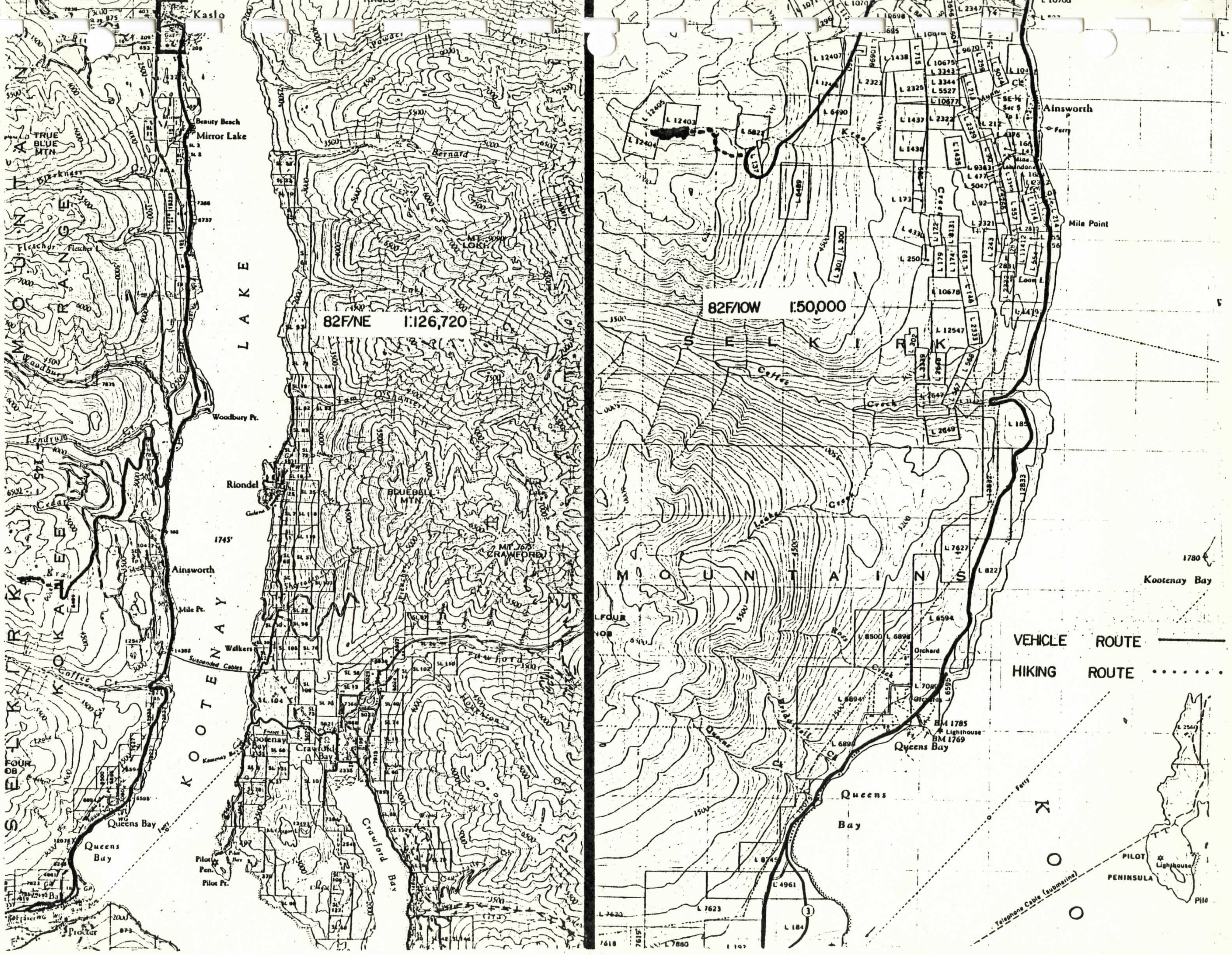
- 49° 43.9' N., 116° 59' W.
- Department of Mines and Technical Surveys Map: Crawford Bay, B.C.; 82F/10W; 1:50,000; Grid Reference 014085
- Department of Lands and Forests Map: Kaslo, B.C.; 82F/NE; 1:126,720
- Aerial photographs #BC 5348-046; #BC 5348-047

II. ACCESS:

By Vehicle

From Nelson drive towards Ainsworth 3.8 km past Ainsworth turn left onto a dirt road and proceed as follows:

DISTANCE (Km)	FEATURE	ROUTE
0.3	- Fork in road	L
1.4	- Fork in road	L
1.6	- Fork in road	Middle Road
2.8	- Fork in road	L
3.1	- Fork in road	L
4.0	- Fork in road	R
4.8	- Fork in road	R



Kaslo
Beauty Beach
Mirror Lake
TRUE BLUE MTN
Woodbury Pt.
Riondel
Ainsworth
Mile Pt.
Walkers
Suspended Cables
KOOTENAY LAKE
Kootenay Bay
Crawford Bay
Queens Bay
Pilot Pen.
Pilot Pt.
Procter
SELKIRK MOUNTAINS
KOKANEE RANGE
MT. LOKI
BLUEBELL MTN
MT. CRAWFORD
82F/NE 1:126,720
82F/10W 1:50,000
Ainsworth
Mile Point
SELKIRK
MOUNTAINS
Kootenay Bay
Queens Bay
Lighthouse
PILOT PENINSULA
Telephone Cable (submarine)
VEHICLE ROUTE
HIKING ROUTE

II. ACCESS:

By Vehicle (cont'd)

DISTANCE (Km)	FEATURE	ROUTE
4.9	- Direction indicator for Cody Caves	L
6.0	- Direction indicator for Cody Caves	L
7.8	- Fork in road	L
7.9	- Bridge	
8.0	- Fork in road	L
8.7	- Direction indicator for Cody Caves	L
9.6	- Fork in road	R
10.5	- Creek	
11.1	- Sign: Cody Caves - Hiking Time 25 Minutes	
11.6	- Fork in road	R
14.4	- Fork in road	L
15.4	- STOP	

Hiking Route

Back track about 100 yards and an old road forking to the right (up the side of the mountain) will be noticed. Follow this old road (more like a path now) for about 5 minutes, then there is a path forking off to the right. Take this path and very close there will be a fork in the path. Take the lower path which eventually crosses the talus slope and crosses a small creek until a meadow is reached. Head up at about a 30° angle to the left up the hill (following the outflow) until the lake is reached. Hiking time is approximately 40 minutes.

III. GENERAL DESCRIPTION:

In the late 1800's Cominco dammed Krao Creek to make Krao Lake. The dam is approximately eight feet high, and constructed from logs, boulders, and dirt. The town of Ainsworth receives its water supply from Krao Lake.

The lake was subsequently stocked, and Rocky Mountain Cutthroat Trout from 30 to 35 centimeters in length are an average catch.

Krao Lake has two inflow streams at the west end, and two outflow streams at the east end. It is an easterly exposed lake, situated at an elevation of 1900 meters.

III. GENERAL DESCRIPTION: (cont'd)

Camping spots and firewood are plentiful on the north shore of the lake. About halfway along this shore, someone has built a rustic campsite with a firepit, and a make shift counter.

IV. VEGETATION AND GEOMORPHOLOGY:

Aquatic Vegetation

No vegetation was observed in the lake.

Sites

Krao Lake is situated in the Engelmann Spruce-Alpine Fir Biogeoclimatic Zone. The sites are illustrated in Figure 14A.

The entire southern shore of Krao Lake is formed of porphyritic granite talus slope and rock cliffs. This shore is relatively steep and sparsely vegetated.

Site 1

This site was located on the north shore of the lake toward the west end. It was a bog-like site on the edge of the forest.

Slope	3°
Exposure:	Southeast
Moisture Regime:	Moist
Vegetation Classification:	Engelmann Spruce-Alpine Fir-Black Huckleberry Association for the ESAF Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Phyllodoce empetriformis (Red Heather)

Sorbus scopulina (Western Mountain Ash)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Flowers:

Leptarrhena amplexifolia (Leptarrhena)

Trollius laxus (Globe Flower)

Senecio triangularis (Giant Ragwort)

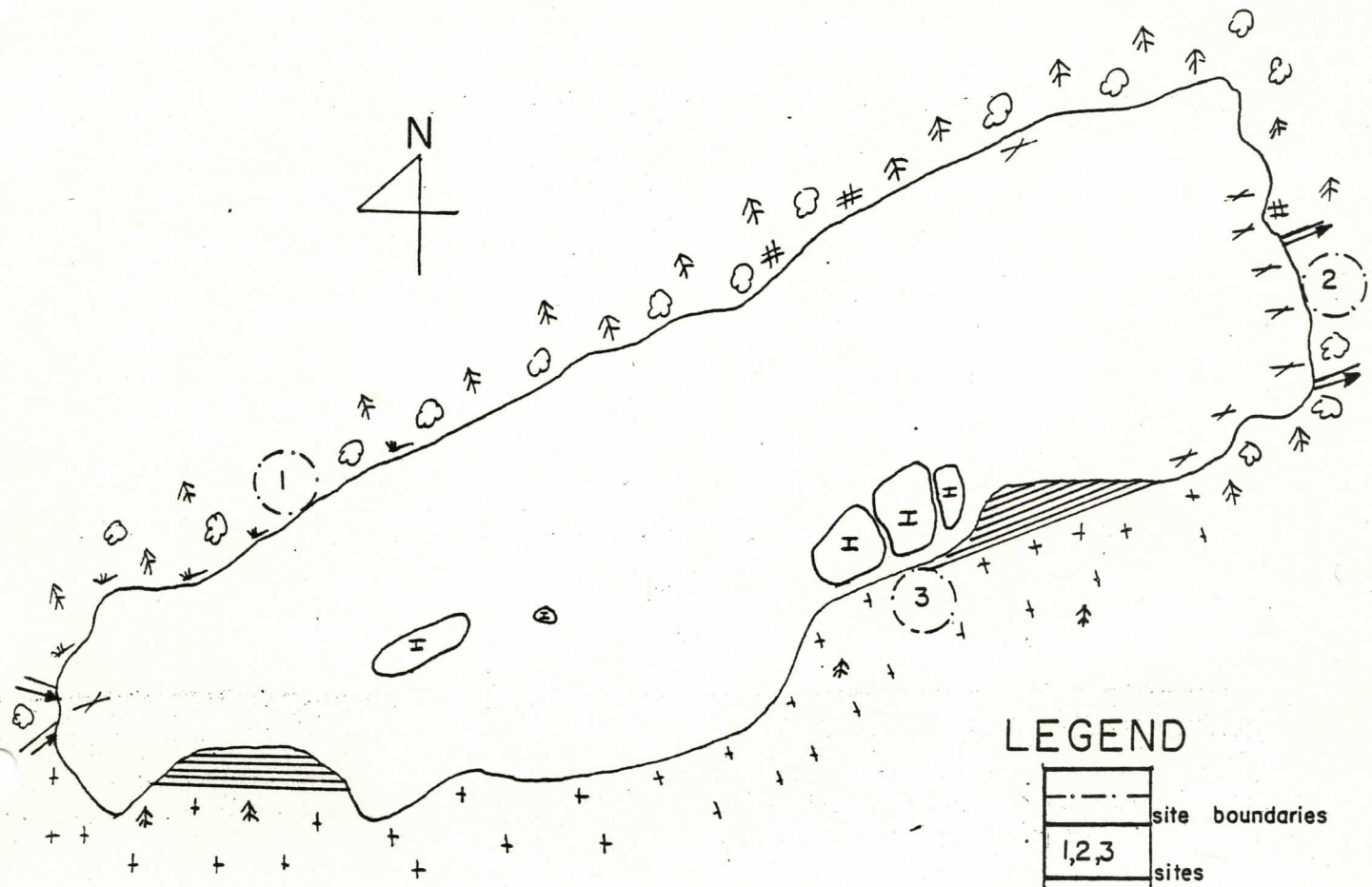
Arnica latifolia (Broad-Leaf Arnica)

Pedicularis groenlandica (Elephant Head)

Ligusticum canbyi (Canby's Lovage)

FIG.14A

KRAO LAKE



LEGEND

- site boundaries
- 1,2,3 sites
- trees
- shrubs
- dead upright trees
- talus
- log debris
- marsh
- rock cliffs
- rock islands
- inflow/outflow streams

VEGETATION AND LANDFORMS

scale = 1: 2325

IV. VEGETATION AND GEOMORPHOLOGY:

Site 1

Vegetation

Flowers (cont'd)

Eriophorum chamissonis (Cotton Grass)

Aster spp. (Aster)

Mitella spp. (Mitrewort)

Viola spp. (Violet)

Kalmia polifolia (Swamp Laurel)

Veratrum eschocholtzii (Indian Hellebore)

Equisetum arvense (Common Horsetail)

Habenana hyperborea (Green-Flowered Rein-Orchid)

Arnica mollis (Arnica)

Mosses: Sphagnum sp.

Site 2

Site 2 was situated between the two outflow streams at the east end of the lake.

Slope: 5°

Exposure: West

Moisture Regime: Slightly dry

Vegetation Classification: Menziesia Association of the ESSFw Biogeoclimatic Zone*

Vegetation

Trees:

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Salix scouleriana (Scouler Willow)

Salix argophylla (Silverleaf Willow)

Vaccinium scoparium (Grouseberry)

Vaccinium membranaceum (Black Mountain Huckleberry)

Rhododendron albiflorum (White Rhododendron)

Ribes lacustre (Swamp Gooseberry)

Flowers:

Leptarrhena amplexifolia (Leptarrhena)

Antennaria spp. (White Pussytoes)

Senecio triangularis (Giant Ragwort)

IV. VEGETATION AND GEOMORPHOLOGY:

Site 2

Vegetation

Flowers: (cont'd)

Arnica latifolia (Broad-Leaf Arnica)

Epilobium angustifolium (Fireweed)

Hieracium albiflorum (White Hawkweed)

Veratrum eschocholtzii (Indian Hellebore)

Ferns: Athyrium filix-femina (Lady-Fern)

Site 3

Site 3 was situated on the rock cliff bordering the talus slope on the southern side of the lake.

Slope: 35°

Exposure: Northwest

Moisture Regime: Slightly dry

Vegetation Classification: Vaccinium scoparium Association of the ESSFe Biogeoclimatic Zone*

Vegetation

Trees:

Larix occidentalis (Western Larch)

Picea glauca ssp. engelmannii (Engelmann Spruce)

Abies lasiocarpa (Alpine Fir)

Shrubs:

Vaccinium scoparium (Grouseberry)

Phyllodoce empetriformis (Red Heather)

Phyllodoce glanduliflora (Yellow Heather)

Flowers:

Saxifraga spp. (Saxifrage)

Antennaria spp. (White Pussytoes)

Arnica latifolia (Broad-Leaf Arnica)

Mosses:

Distichium capillaceum

Rhytidiadelphus loreus

Dicranum fuscescens

Lichens: Cladonia sp. (Trumpet Lichen)

Lecanora sp.

One of the few islands in the lake.

Outflow control valve.

IV. VEGETATION AND GEOMORPHOLOGY:

Site 3

Vegetation (cont'd)

NOTE: Pinus albicaulis (Whitebark Pine), Saxifraga spp. (Saxifrage), Anemone occidentalis (Western Anemone), Castilleja spp. (Indian Paintbrush), Veronica spp. (Veronica), and Hypericum perforatum (St. John's Wort) were also observed at other points around the lake.

* Site 1 was classified within the associations given by the Forestry Handbook for British Columbia under the biogeoclimatic zone Engelmann Spruce-Alpine Fir Zone (ESAF). Because the lake is in a transition zone, secondary biogeoclimatic zone classifications overlap as shown in sites 2 and 3. Both sites 2 and 3 were classified according to the associations given in Utzig's Guide for Tree Species Selection in the Nelson Forest District under the biogeoclimatic zone Engelmann Spruce-Subalpine Fir Zone (ESSFw for site 2 and ESSFe for site 3).

V. PHYSICAL AND CHEMICAL DATA:

A) LAKE

TEST	RESULT
Temperature	- Top 18.0°C
	- Bottom 17.0°C
Secchi Disc	- Limit of visibility - to the bottom
	- Weather conditions - sunny, clear (3:15 p.m.)
	- Water conditions - fairly calm
Bottom Composition	- Muck
pH	- 6.6
Total Alkalinity	- 12 ppm
Total Dissolved Solids	- 8 ppm
Lake Level	- 1.5 meters below high water level
Littoral Area	- $7.7 \times 10^3 m^2$
Total Volume	- 1.7×10^8 liters

B) INFLOW STREAMS

i) Inflow #1

Average Width	- 20 centimeters
Average Depth	- 10 centimeters
Velocity	- 0.25 meters/second
Volume of Flow	- 5 liters/second
Temperature	- 5.0°C
Bottom Composition	- Rocks, sand, moss

V. PHYSICAL AND CHEMICAL DATA:

B) INFLOW STREAMS (cont'd)

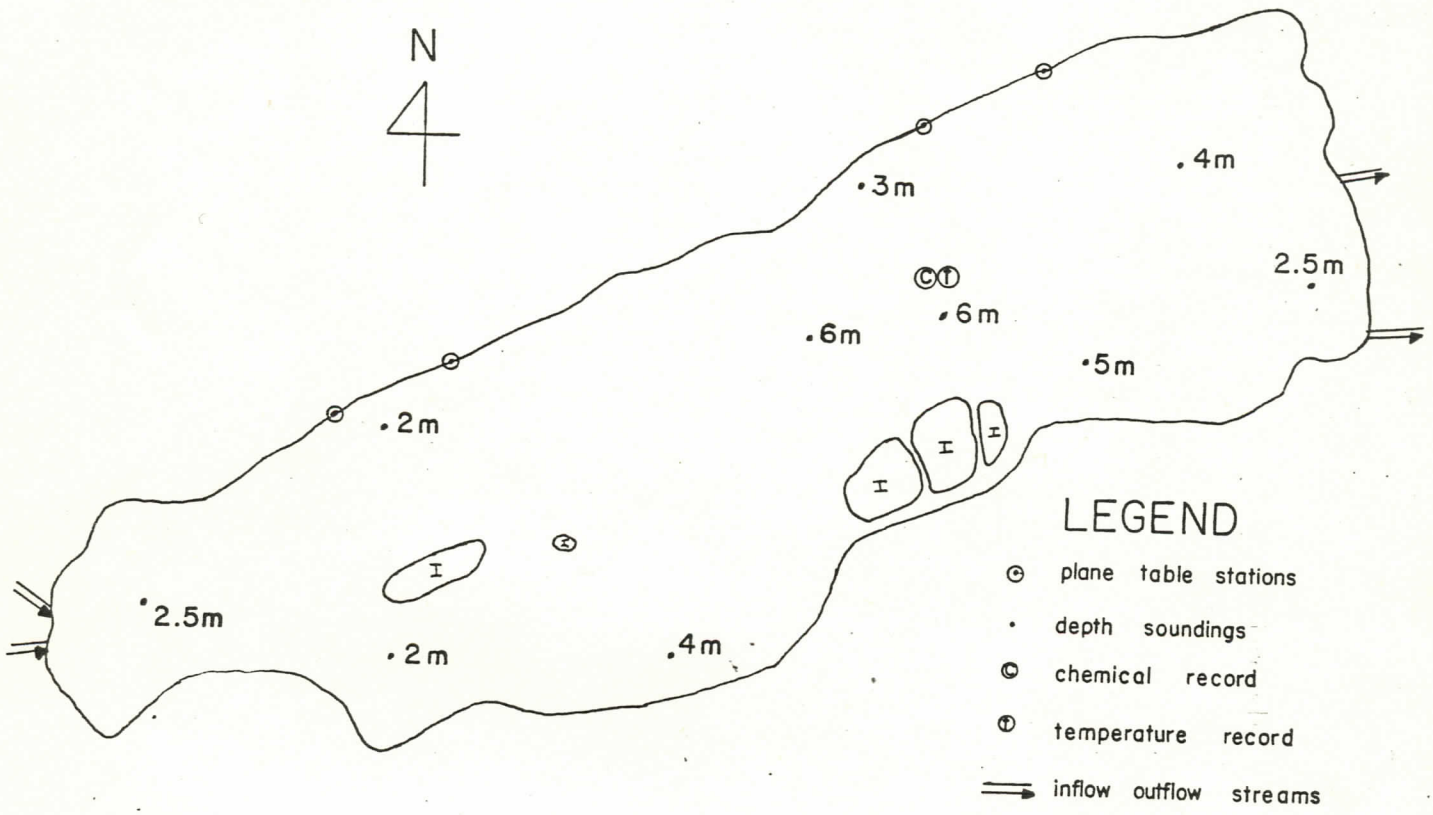
TEST		RESULT
ii)	Inflow #2	
	Average Width	- 1.3 meters
	Average Depth	- 12 centimeters
	Velocity	- 0.35 meters/second
	Volume of Flow	- 55 liters/second
	Temperature	- 15.0°C
	Bottom Composition	- Rocks, sand, moss, log debris

C) OUTFLOW STREAMS

i)	Outflow #1	
	Average Width	- 1.0 meter
	Average Depth	- 22 centimeters
	Velocity	- 0.23 meters/second
	Volume of Flow	- 51 liters/second
	Temperature	- 18.0°C
	Bottom Composition	- Fine to coarse sand, rocks, some log debris
ii)	Outflow #2	
	Average Width	- 54 centimeters
	Average Depth	- 16 centimeters
	Velocity	- 0.17 meters/second
	Volume of Flow	- 15 liters/second
	Temperature	- 19.0°C
	Bottom Composition	- Large rocks, coarse sand, moss

KRAO LAKE

FIG. 14B



ELEVATION 1900 m.

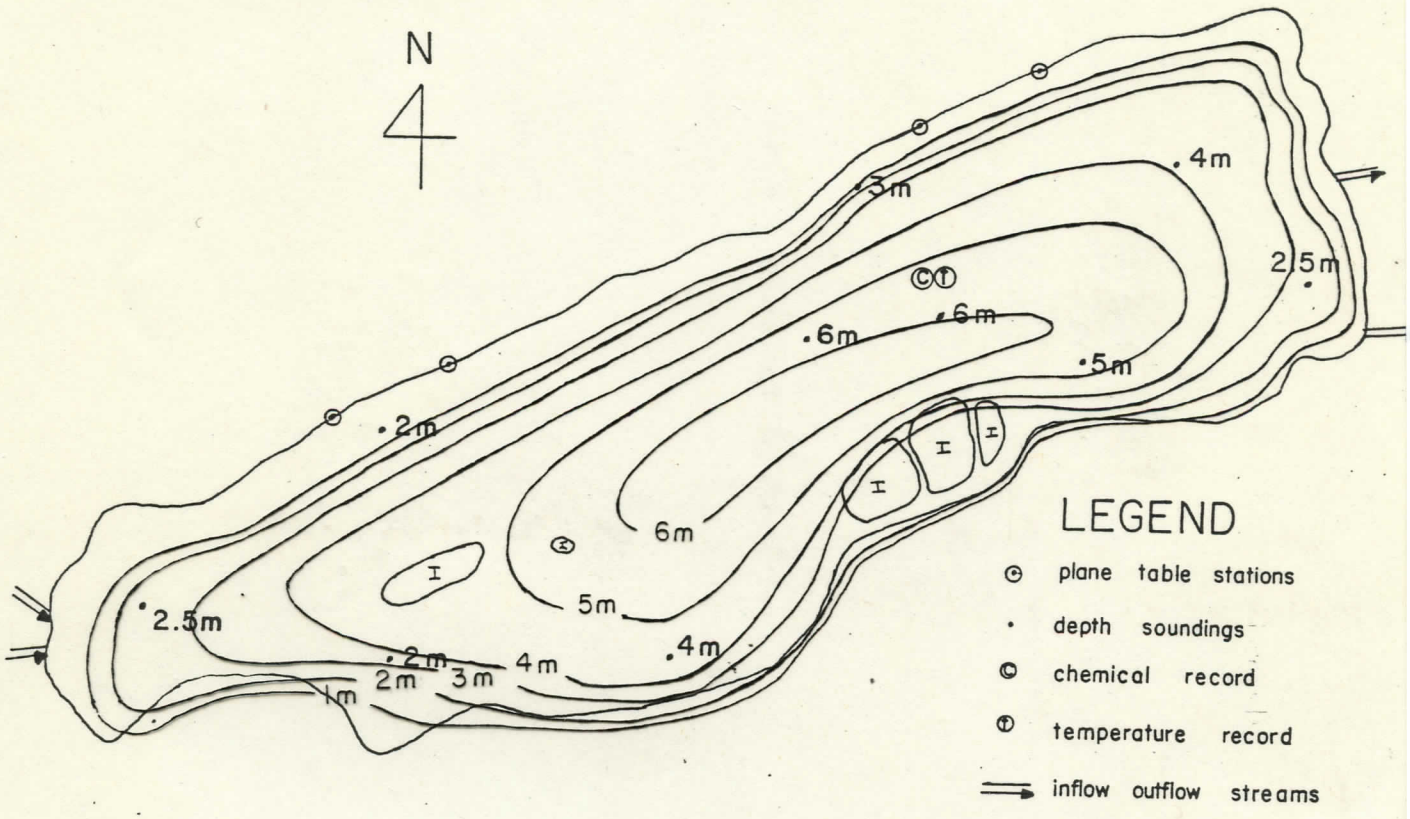
AREA 5.8 ha.

PLANE TABLE SURVEY

scale = 1:2325

KRAO LAKE

FIG. 14B



ELEVATION 1900m. contours (meters)

AREA 5.8 ha.

PLANE TABLE SURVEY

scale = 1:2325

APPENDIX A

CHEMICAL METHODS:

HYDROGEN ION CONCENTRATION (pH)

The results of this test were determined using Corning Digital 112 pH meter which was standardized with a buffer solution (pH - 6.86).

TOTAL ALKALINITY

This measurement indicates the capacity of the water to neutralize a strong acid. 5 drops of the indicator, methyl orange, were added to a 100 ml sample of water, producing a yellow solution. This solution was titrated with 0.01 M sulfuric acid until an orange color persisted. The volume of acid (in ml) required to reach this end point multiplied by 10 gives the total alkalinity in parts per million.

TOTAL DISSOLVED SOLIDS (T.D.S.)

3 clean, dry 250 ml beakers were weighed to the nearest 0.0001 grams 100 ml of water were added to each beaker which was placed in a Fisher Econotemp Laboratory Oven at a temperature of 78° - 85°C. The beakers were kept in the oven for approximately 24 hours. They were then removed, cooled and reweighed. The difference in mass multiplied by 10,000 gives the amount of dissolved sediments in parts per million.

The two preceeding tests, total alkalinity and T.D.S., are both useful indicators of biological productivity. The amount of material dissolved in the water may control the the number of plankton the lake can support.

PHYSICAL METHODS:

LIMIT OF VISIBILITY

This measurement indicates the degree to which light is able to penetrate the water. In addition, this measurement can serve as an indication of the amount of suspended matter in the water. The Secchi disc is lowered until it cannot be seen and the depth noted. The disc is then raised until it reappears and the depth again noted. The average of these two depths is the limit of visibility. The weather and water conditions were also recorded.

SURVEY METHODS

The lakes were surveyed using a plane table. Depth soundings were taken using the Secchi disc on a line with meter calibrations. The positions of these depth soundings were determined by using a range finder. The surface area was calculated using a planimeter. The total volume of the lake was calculated using mathematical approximations. Littoral area is the area of the lake between the shoreline and 7 meters outward. This was also calculated by mathematical approximations.

PHYSICAL METHODS: (cont'd)

STREAM CHARACTERISTICS

Measurements were conducted to determine the average width and depth of each stream. The surface velocity was determined using the chip-flow method. The volume of flow (litres per second) is the product of the width, depth and velocity.

Stream bed particles were classified by size using the "Modified Wentworth Particle Size Scale" in the Instream Flow Information Paper: No. 3.

METHOD OF VEGETATION ANALYSIS:

Vegetation, like any other aspect of nature, forms a continuum and this tends to complicate classification into biogeoclimatic zones and related associations. The vegetation continuum is more irregular in mountainous areas than it is in flatter areas because environments may change abruptly over short distances in these areas whereas, in flatter areas, environmental change is spread over a greater distance.

The manner in which plant populations rise and fall along environmental gradients supports the hypothesis that competition usually does not generate sharp boundaries between species, and that evolution of species in relation to one another does not result in well-defined groups of species that have similar distributions. The centers and boundaries of the species are scattered along the environmental gradient.

This is in accordance with the principle of community continuity developed by Ramensky and Gleason, which states that, rather than forming distinclty separated zones, most communities intergrade continuously along environmental gradients, as implied by the broad overlap and scattered centers of species groups along a gradient.

An attempt was made to classify areas of uniform vegetation around each lake and to provide data on the slope, exposure, moisture regime and landform of each area studied.

Site areas were chosen on the basis of uniform vegetation and differing moisture regime. The abundant flora was listed.

The biogeoclimatic zone of each lake was classified using the techniques and categories in pages 200 to 287 of the Forestry Handbook for British Columbia. The association classifications for the sites were mainly developed from Utzig's Guide For Tree Species Selection in the Nelson Forest District. Since Utzig's plant associations were developed from data collected in the general area of most of the lakes surveyed, they are more accurate than those in the Forestry Handbook.

APPENDIX A (cont'd)

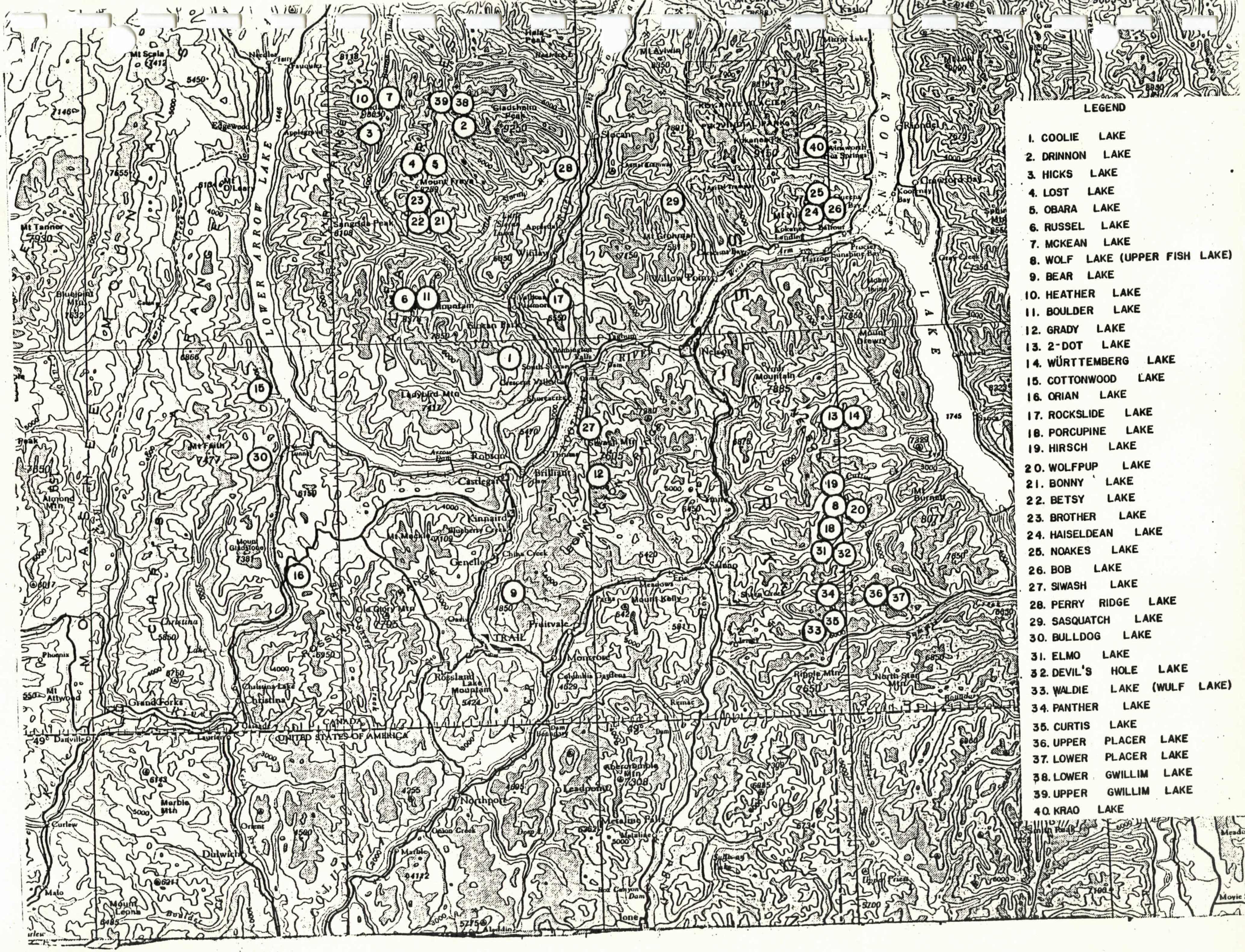
METHOD OF VEGETATION ANALYSIS:

Most of the vascular plants were primarily identified from Trees, Shrubs and Flowers to Know in British Columbia (Lyons, C.P., 1952). Mosses were identified from Some Common Mosses of British Columbia (Schofield, W.B., 1969). Lichens were identified using How to Know the Lichens (Hale, Mason E., 1979). Ferns were classified using The Ferns and Fern-Allies of British Columbia (Taylor, T.M.C., 1963).

GEOLOGICAL AREAS

The geological areas were classified according to the Geology Map (82FW, Nelson) drawn by the Geological Survey of Canada in 1960 using the results of field work done by H.W. Little in 1948 to 1952.

APPENDIX B



LEGEND

1. COOLIE LAKE
2. DRINNON LAKE
3. HICKS LAKE
4. LOST LAKE
5. OBARA LAKE
6. RUSSEL LAKE
7. MCKEAN LAKE
8. WOLF LAKE (UPPER FISH LAKE)
9. BEAR LAKE
10. HEATHER LAKE
11. BOULDER LAKE
12. GRADY LAKE
13. 2-DOT LAKE
14. WÜRTTEMBERG LAKE
15. COTTONWOOD LAKE
16. ORIAN LAKE
17. ROCKSLIDE LAKE
18. PORCUPINE LAKE
19. HIRSCH LAKE
20. WOLFPUP LAKE
21. BONNY LAKE
22. BETSY LAKE
23. BROTHER LAKE
24. HAISELDEAN LAKE
25. NOAKES LAKE
26. BOB LAKE
27. SIWASH LAKE
28. PERRY RIDGE LAKE
29. SASQUATCH LAKE
30. BULLDOG LAKE
31. ELMO LAKE
32. DEVIL'S HOLE LAKE
33. WALDIE LAKE (WULF LAKE)
34. PANTHER LAKE
35. CURTIS LAKE
36. UPPER PLACER LAKE
37. LOWER PLACER LAKE
38. LOWER GWILLIM LAKE
39. UPPER GWILLIM LAKE
40. KRAO LAKE

NAME OF LAKE	YEAR SURVEYED	LOCATION	ACCESS	ELEVATION	EXPOSURE	AREA	DEPTH	FISH	CAMPING
Coolie Lake	1977	49° 29.4' N., 117° 38.6' W.	2 - W.D. 5 minute hike	1524 m	North	4.88 ha.	13.0 m	Yes 10-15 cm length	Poor
Drinnon Lake	1977	49° 47' N., 117' 43.5' W.	2 - W.D. 75 minute hike	1951 m	Southwest	11.4 ha.	29.0 m	None	Fair
Hicks Lake	1977	49° 47' N., 117° 54.6' W.	2 - W.D. 2 hour hike	1890 m	South	8.4 ha.	19.0 m	None	Fair
Lost Lake	1977	49° 44.5' N., 117° 50.3' W.	2 - W.D. 3 hour hike	2103 m	West	8.0 ha.	27.0 m	Yes 15-20 cm length	Good
Obara Lake	1977	49° 44.6' N., 117° 48.5' W.	4 - W.D. recommended 1 hour hike	1798 m	East	7.7 ha.	4.0 m	None	Fair
Russell Lake	1977	49° 33' N., 117° 51' W.	4 - W.D. recommended 6 hour hike	1951 m	North	12.0 ha.	23.0 m	None	Good
McKean Lake	1977	49° 49' N., 117° 51' W.	2 - W.D. 4 hour hike	2103 m	West	16.0 ha.	47.0 m	Yes 15-20 cm length	Poor
Upper Fish Lake (Wolf Lake)	1977	49° 15.9' N., 117° 01' W.	2 - W.D. 15 minute hike	1920 m	Northwest	9.1 ha.	10.0 m	None	Fair to Poor
Bear Lake	1978	49° 10.2' N., 117° 01' W.	2 - W.D. 90 minute hike	1128 m	South	6.71 ha.	4.0 m	None	Fair to Poor
Heather Lake	1978	49° 48.9' N., 117° 52.5' W.	2 - W.D. 70 minute hike	1800 m	Northeast	3.6 ha.	4.5 m	None	Good
Boulder Lake	1978	49° 33.9' N., 117° 47.8' W.	4 - W.D. needed 2 hour hike	1750 m	Northeast	4.5 ha.	3.0 m	None	Fair
Grady Lake	1978	49° 18.3' N., 117° 28.5' W.	4 - W.D. needed 4 hour hike	1900 m	Northeast	2.7 ha.	6.0 m	None	Good
2-Dot Lake	1978	49° 23' N., 117° 00.5' W.	2 - W.D. 3 hour hike	1800 m	Northeast	5.4 ha.	4.0 m	None	Good
Württemberg Lake	1978	49° 22.8' N., 117° 01' W.	2 - W.D. 3.5 hour hike	1870 m	North	14.0 ha.	59.0 m	None	Fair
Cottonwood Lake	1980	49° 28' N., 118° 12' W.	motor boat 2 hour hike	820 m	South	5.8 ha.	3.5 m	Rainbow Trout 30 cm length	Good

NAME OF LAKE	YEAR SURVEYED	LOCATION	ACCESS	ELEVATION	EXPOSURE	AREA	DEPTH	FISH	CAMPING
Orian Lake	1980	49° 12' N., 118° 5' W.	2 - W.D. 5 minute hike	1450 m	Southwest	11.9 ha.	8.5 m	None	Fair
Rockslide Lake	1980	49° 33' N., 117° 31' W.	2 - W.D. 15 minute hike	1550 m	South	2.1 ha.	14.0 m	Eastern Brook 25 cm length	Poor
Porcupine Lake	1980	49° 15.5' N., 117° 1.5' W.	4 - W.D. needed no hike	1860 m	West	7.8 ha.	6.0 m	Rainbow Trout 20 cm length	Good
Hirsch Lake	1980	49° 15.5' N., 117° 1.5' W.	4 - W.D. recommended 5 minute hike	1730 m	West	4.2 ha.	8.0 m	Rainbow Trout 18 cm length	Poor
Wolf pup Lake	1980	49° 16' N., 117° 0.5' W.	4 - W.D. recommended 90 minute hike	2080 m	East	2.4 ha.	6.0 m	None	Good
Bonny Lake	1980	49° 41' N., 117° 49' W.	2 - W.D. 1 hour hike	2000 m	Southeast	1.7 ha.	17.0 m	None	Good
Betsy Lake	1980	49° 41' N., 117° 49' W.	2 - W.D. 1 hour hike	2000 m	East	6.7 ha.	27.0 m	None	Good
Brother Lake	1980	49° 41.5' N., 117° 49' W.	2 - W.D. 2 hour hike	2090 m	South	5.2 ha.	16.0 m	None	Good
Haiseldean Lake	1980	49° 40.5' N., 117° 2' W.	2 - W.D. 2 hour hike	2000 m	Southeast	4.4 ha.	16.0 m	Rainbow Trout 28 cm length	Good
Noakes Lake	1980	49° 41' N., 117° 1.5' W.	2 - W.D., 2 hour 45 minute hike	2100 m	Southeast	11.2 ha.	25.0 m	None	Good
Bob Lake	1980	49° 41' N., 117° 1.5' W.	2 - W.D. 3 hour hike	2050 m	Southeast	2.7 ha.	4.0 m	Rainbow Trout 20 cm length	Fair
Siwash Lake	1980	49° 22' N., 117° 28' W.	2 - W.D. 4 hour hike	1810 m	Northwest	6.8 ha.	8.0 m	None	Fair
Perry Ridge Lake	1981	49° 42.8' N., 117° 31.8' W.	2 - W.D. 1.5 hour hike	1112 m	Southeast	1.8 ha.	7.5 m	None	Poor
Sasquatch Lake	1981	49° 41.7' N., 117° 8.5' W.	2 - W.D. No Hike	1052 m	Northwest	1.8 ha.	4.5 m	Rainbow Trout 10 cm length	Good
Bulldog Lake	1981	49° 22' N., 118° 0.8' W.	4 - W.D. 4 hour hike	1143 m	South	10.7 ha.	18.0 m	None	Poor

NAME OF LAKE	YEAR SURVEYED	LOCATION	ACCESS	ELEVATION	EXPOSURE	AREA	DEPTH	FISH	CAMPING
Elmo Lake	1981	49° 12' N., 117° 02' W.	4 - W.D. needed 20 minute hike	1661 m	North	14.0 ha.	8.0 m	Rainbow Trout 28 cm length	Fair
Devil's Hole Lake	1981	49° 11.5' N., 117° 00.5' W.	4 - W.D. 30 minute hike	1783 m	North	14.3 ha.	22.0 m	Cutthroat Trout 28 cm length	Fair
Waldie Lake (Wulf Lake)	1981	49° 0.7' N., 117° 3.5' W.	2 - W.D. 30 minute hike	1640 m	Northwest	9.8 ha.	14.0 m	Rainbow Trout	Good
Panther Lake	1981	49° 9.6' N., 117° 3' W.	2 - W.D. 15 minute hike	1740 m	West	5.3 ha.	4.5 m	Rainbow Trout 18 cm length	Good
Curtis Lake	1981	49° 7.6' N., 117° 2.2' W.	4 - W.D. recommended 40 minute hike	1840 m	North	10.2 ha.	10.0 m	Rainbow Trout 25 cm length	Good
Obara Lake	1981	49° 44.6' N., 117° 48.5' W.	4 - W.D. recommended 90 minute hike	1790 m	East	7.7 ha.	8.0 m	Dolly Varden Char 25 cm length	Poor
Upper Placer Lake	1981	49° 08' N., 116° 54' W.	4 - W.D. recommended 1 hour hike	1840 m	East	5.4 ha.	6.0 m	Cutthroat Trout 28 cm length	Good
Lower Placer Lake	1981	49° 08' N., 116° 53' W.	4 - W.D. recommended 30 minute hike	1760 m	Northeast	1.6 ha.	2.0 m	Cutthroat Trout 18 cm length	Poor
Lower Gwillim Lake	1981	49° 52' N., 117° 46' W.	2 - W.D. 4 - 5 hour hike	2160 m	Southeast	8.4 ha.	9.0 m	None	Good
Upper Gwillim Lake	1981	49° 52' N., 117° 46' W.	2 - W.D. 4 - 5 hour hike	2160 m	Southeast	4.6 ha.	7.5 m	None	Good
Krao Lake	1981	49° 43.9' N., 116° 59' W.	4 - W.D. recommended 40 minute hike	1900 m	East	5.8 ha.	6.0 m	Cutthroat Trout 30-35 cm length	Good

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