M E R R I L L L A K E S U R V E Y

Dates: July 25,26 & 27/1978

watershed code # 26-8-91
920-6279-357-051-000

Prepared by
Young Canada Works
Student Salmonid Program
c/o Campbell River Junior Secondary School

INDEX

L A K E : M E R R I L L

Distance from Campbell River: 28.8 km.

Road conditions: excellent

Coordinates: $125^{o}33'30"W, 50^{o}3'40"N$

Drainage area: 4.0 km^2

Drainage system: From Merrill Lake to Boot Lake at Lawson Lake to Fry Lake to Campbell Lake.

Surface area: 0.65625 km^2

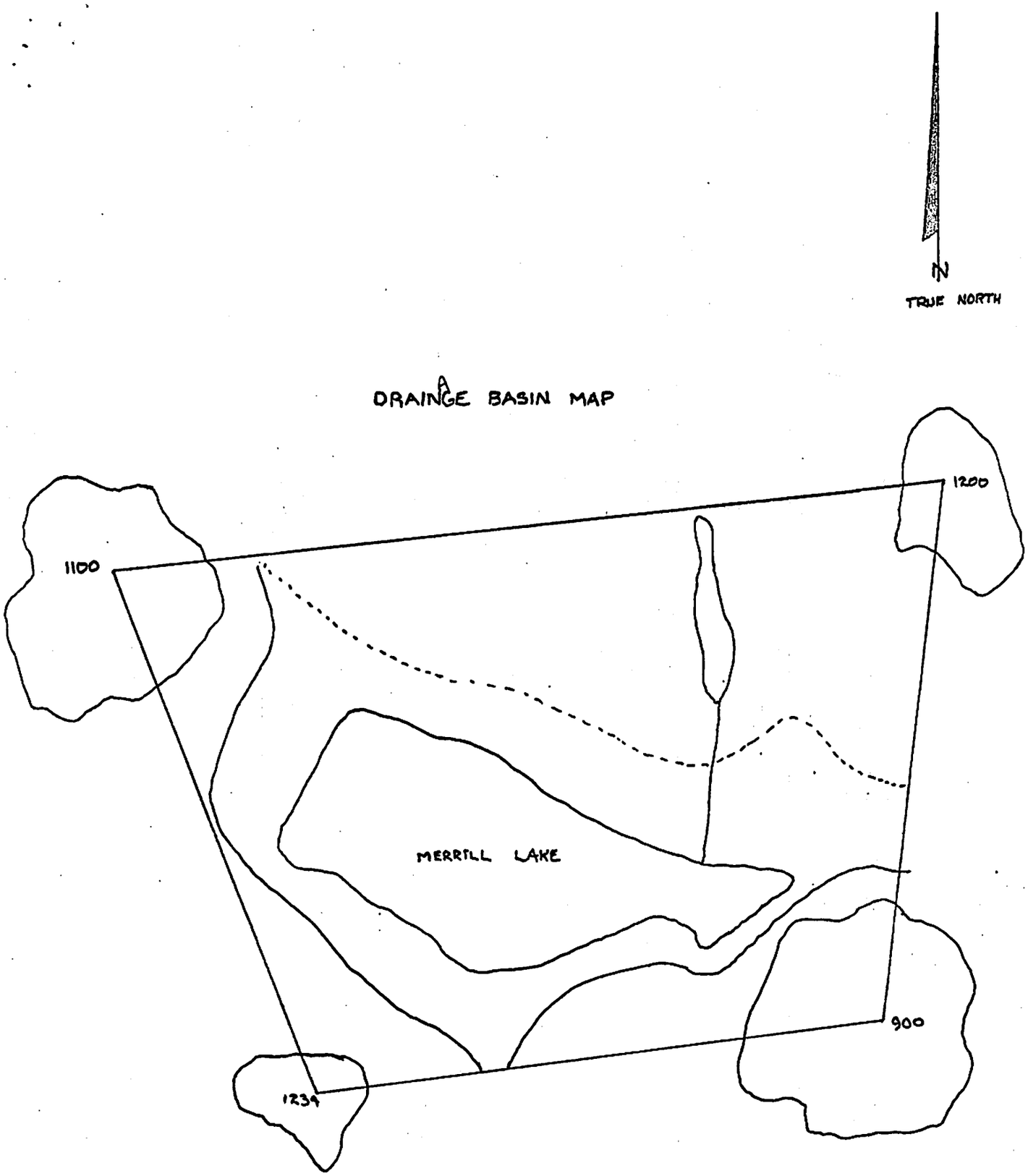
Perimeter: 3.6 km.

Elevation: 260 m.

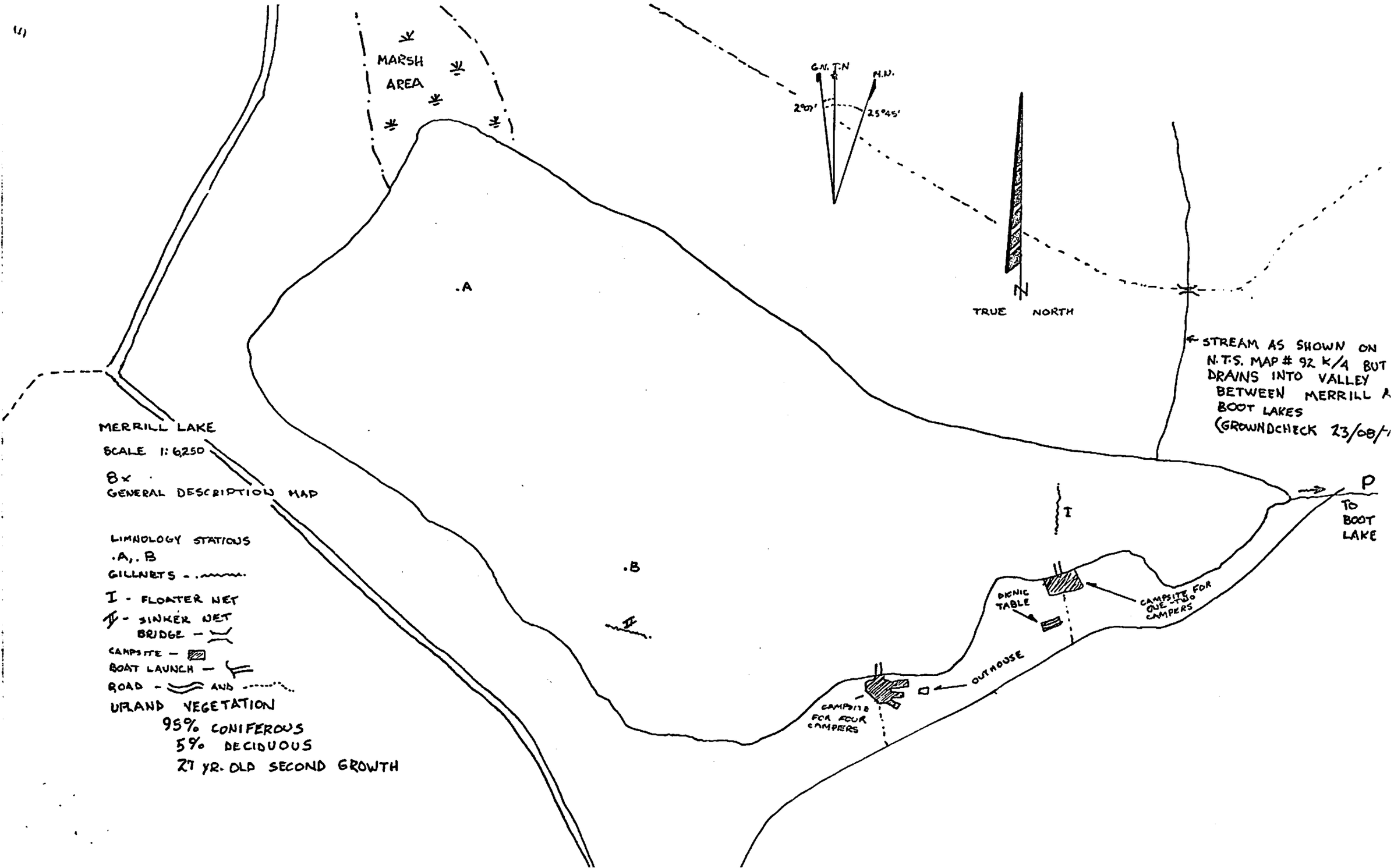
Volume: 5250 m^3

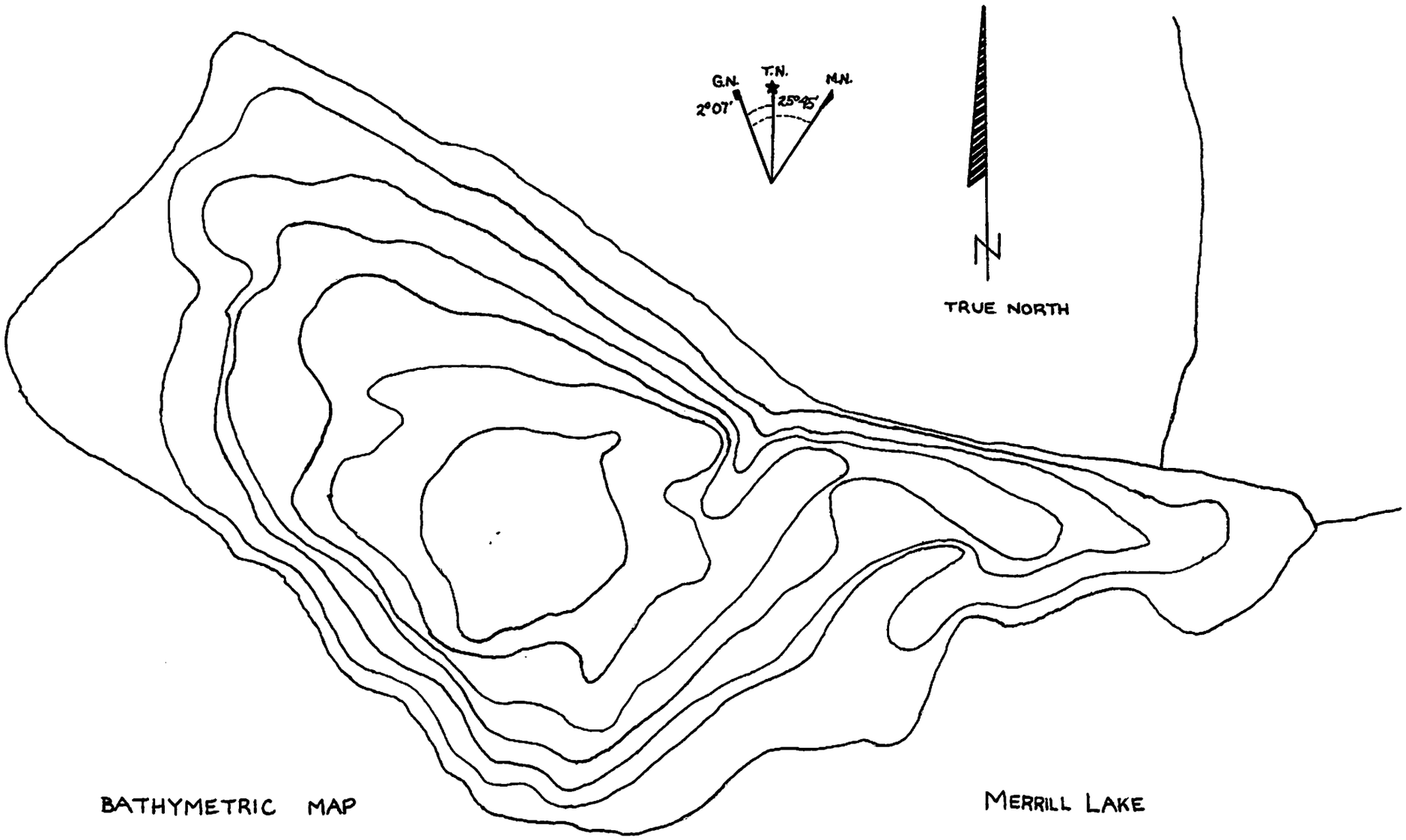
Area above 6 m. contour: 40%

Map #92K/4


N
TRUE NORTH
A
DRAINGE BASIN MAP
1200
1100
MERRILL LAKE
900
1234

(1)


MARSH AREA
G.N. T.N
M.N.
29°0'
25°45'
TRUE NORTH
N
.A
.B
STREAM AS SHOWN ON N.T.S. MAP # 92 K/4 BUT DRAINS INTO VALLEY BETWEEN MERRILL & BOOT LAKES (GROUNDCHECK 23/08/
P
TO BOOT LAKE
I
II
PICNIC TABLE
CAMPSITE FOR ONE-TWO CAMPERS
OUTHOUSE
CAMPSITE FOR FOUR CAMPERS
MERRILL LAKE
SCALE 1: 6250
8x
GENERAL DESCRIPTION MAP
LIMNOLOGY STATIONS
.A, .B
GILLNETS
I - FLOATER NET
II - SINKER NET
BRIDGE
CAMPSITE
BOAT LAUNCH
ROAD AND
UPLAND VEGETATION
95% CONIFEROUS
5% DECIDUOUS
27 YR. OLD SECOND GROWTH



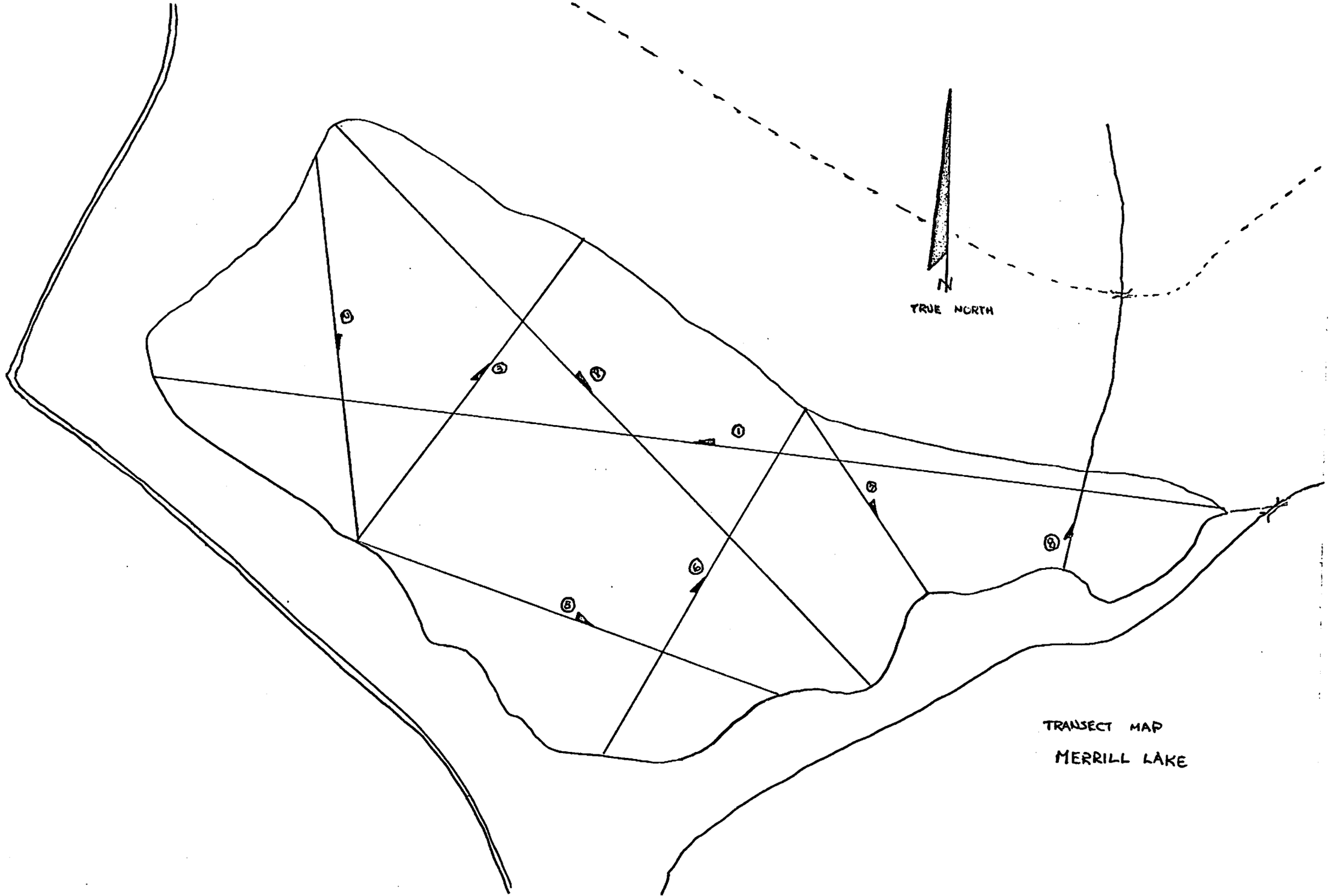
BATHYMETRIC MAP

MERRILL LAKE

SCALE 1: 6250

8 x

3 METER CONTOURS



TRANSECT MAP

MERRILL LAKE

LIMNOLOGY DATA - MERRILL LAKE

Limnology data for Merrill Lake was taken at 2 stations. They are marked A & B on Map II. and correspong to the deeper regions of the lake. At each station the following data was collected:

1) pertinent weather and lake surface conditions.
2) water transparency using a secchi disk, 20 cm. diameter, and divided into two black and two white quarters.
3) pH at 3 meters using a wide range pH comparator kit.
4) an oxygen - temperature profile was obtained by taking water samples from various depths and taking their temperatures with a thermometer and the dissolved oxygen content with a Hach Kit and Winkler titration methodology.

Station A.

Date: July 27/78
Time: 10:30 A.M.
Depth: 12 m.
Weather and surface conditions: 100% cloud coverage,slight wind form south and the air temperature is 17°C.

Water transparency(secchi disk): 6 m.
pH at 3 m.: 7
Oxygen - temperature data:
b) oxygen - temperature profiles

(in m.) Depth	(°C) Temperature	(P.P.M.) Oxygen
s	21°	9.5
1	21°	10.2
2	21°	9.6
3	21°	9.5
4	21°	9
5	20°	10
6	20°	9
7	20°	9
8	20°	8.5
9	20°	9.5
10	16°	10
11	14°	10

Station B.

Date: July 27/78
Time: 12:00 P.M.
Depth: 17 m.
Weather and surface conditions: 100% cloud coverage
Secchi disk (Water transparency): 8.5 m.
pH at 3 meters: 7
Oxygen - temperature data: a)
Oxygen - temperature profiles: b)

(in M.) Depth	(°C) temperature	(P.P.M.) Oxygen
S		
1		

continued

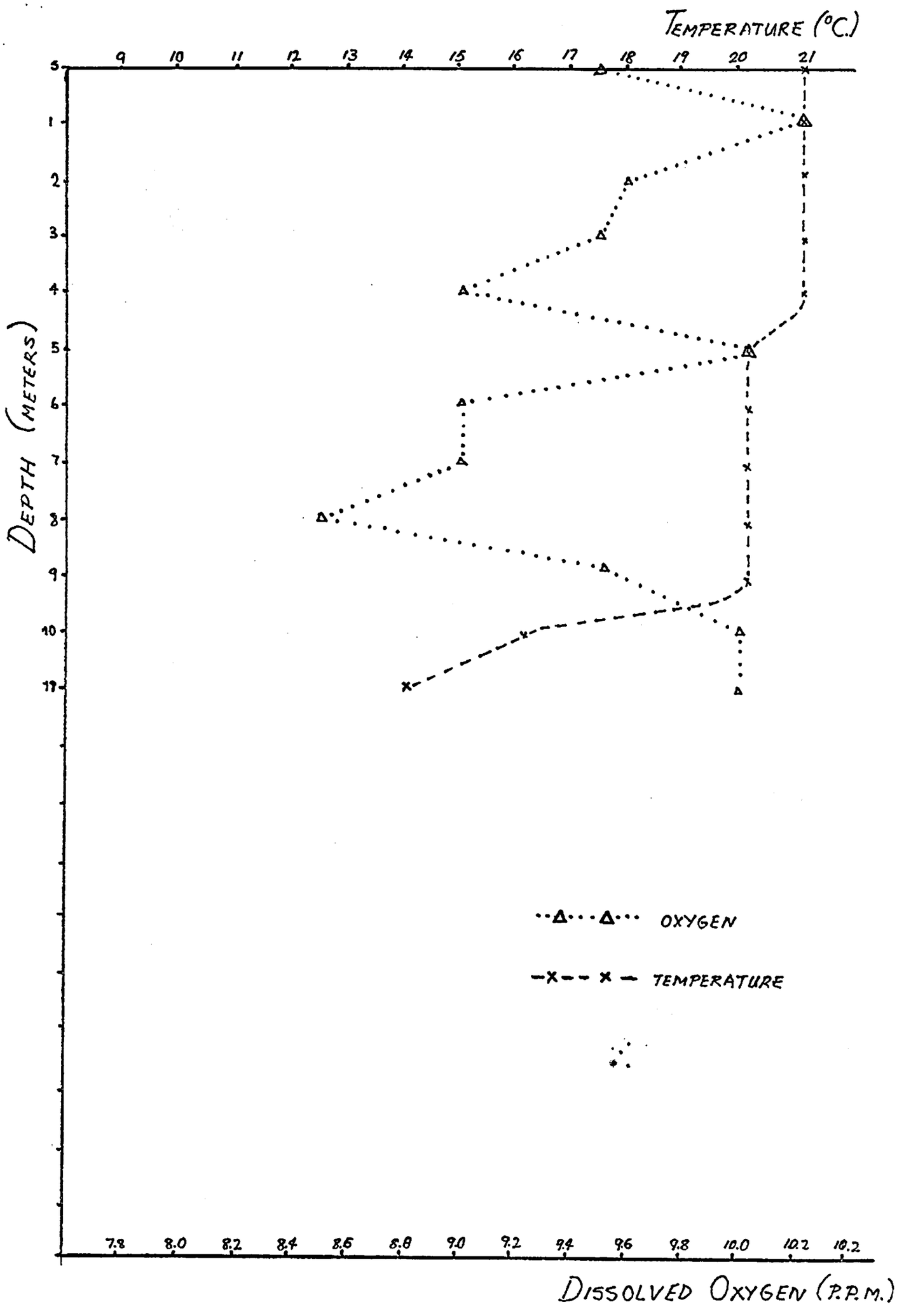
LIMNOLOGY DATA - MERRILL LAKE

CONTINUED

Station B.

(in m.) Depth	(^{o}C) Temperature	(P.P.M.) Oxygen
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12	12^{o}	9.5
13	12^{o}	
14		
15		
16		8
17		
18		
19		
20		
21	11^{o}	7.75

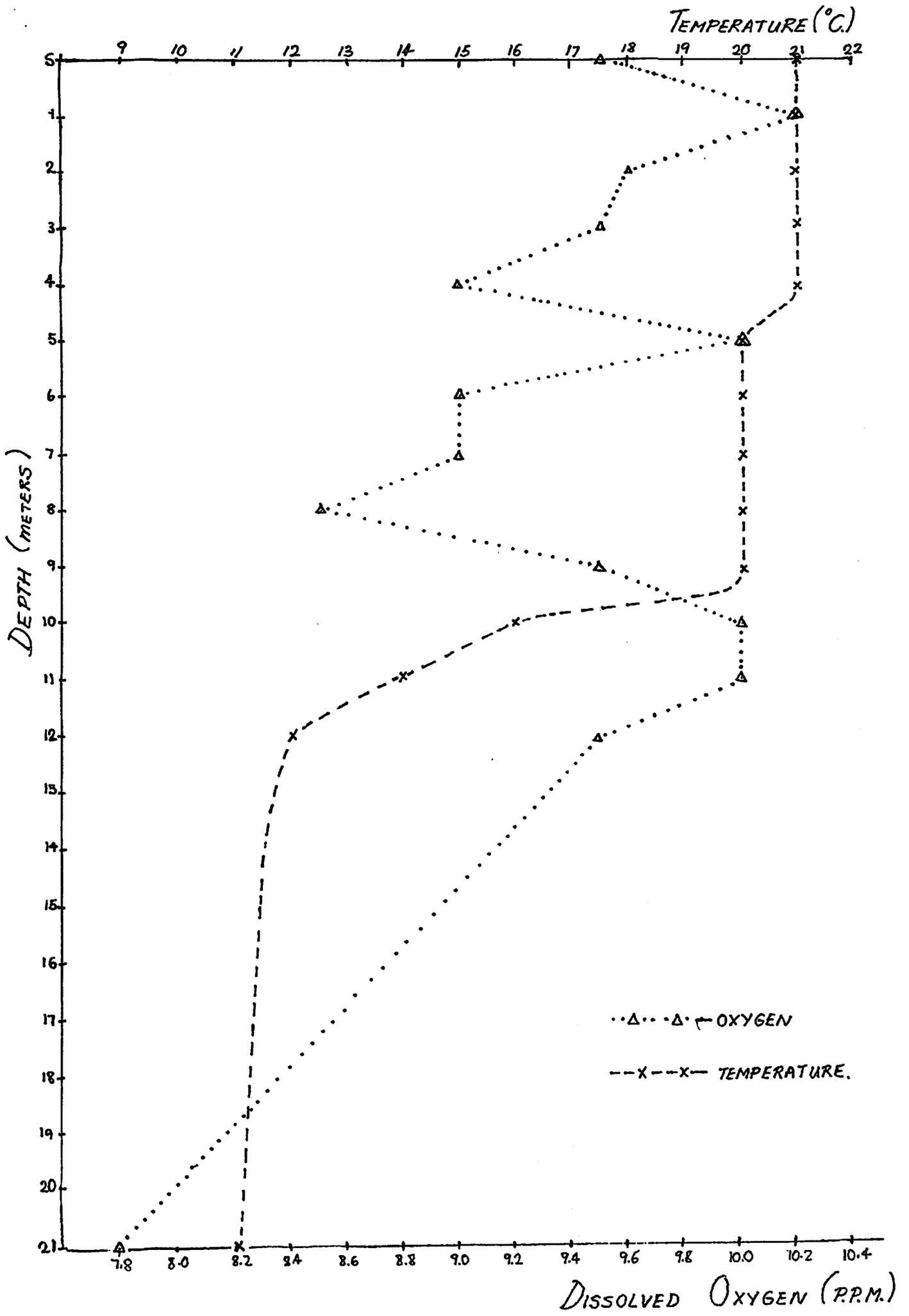
We were almost out of PAO Titrant so we only sampled the most important depths.



MERRILL LAKE

STATION A - 44M DEEP

JULY 27 1970



MERRILL LAKE
STATION B - 21M. DEEP
JULY 27, 1978

V.R.D.

FISH DATA - MERRILL LAKE

Sampling effort on Merrill Lake consisted of one overnight set of two gill nets, 300 feet long and 8 feet deep.

One floating net and one sinking net were used and each was made up of six 50 foot sections of mesh in the following size range: 3/4",1".1½",2",2½" & 3". Positions of the nets in the lake are shown on map II. Times of setting and retrieval are shown at the head of each column of data for a particular net. After retrieval the fish were measured (fork length,± 0.1 cm.),weighed on a triple beam balance (Ohaus 1650,± gm.), a scale sample was taken and the stomach contents were examined.

Set I.

Type of net: Floatee
Date net set out: July 25/78
Time net set out: 1:25 P.M.
Date net brought in: July 26/78
Time net brought in: 1:30 P.M.

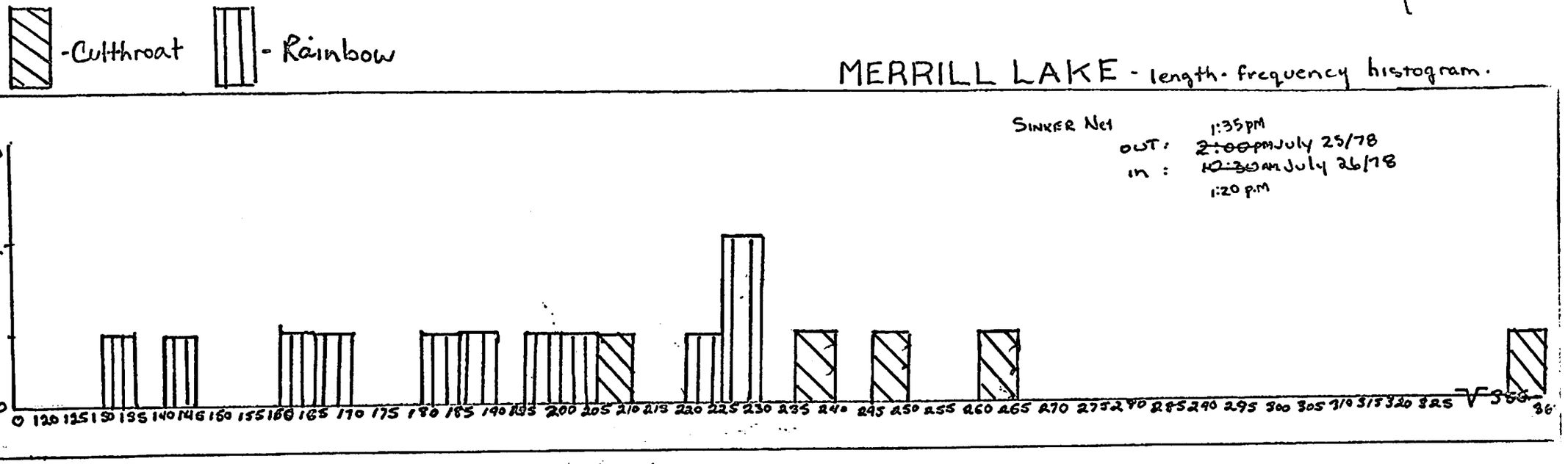
Speices	(in cm.) Length	(in g.) Weight	Sex	scale sample	mesh size	Remarks
Rainbow	14.8	49	M	x	3/4"	flys in stomach
Rainbow	12.5	28	F	x	3/4"	flys in stomach
Rainbow	15.0	49	F	x	3/4"	flys in stomach
Rainbow	12.0	25.8	M	x	3/4"	flysiin stomach
Rainbow	14.8	37.5	M	x	1"	flys in stomach
Rainbow	22.0	108.1	F	x	1"	nymphs in stomach
Rainbow	16.0	53.2	M	x	1"	nymphs in stomach
Rainbow	17.2	65	M	x	1"	nymphs in stomach
Rainbow	16.6	55.0	M	x	1"	flys in stomach
Rainbow	20.0	96.0	M	x	1"	flys in stomach
Rainbow	18.5	78	F	x	1"	flys in stomach
Rainbow	19.7	90.0	M	x	1"	flying bugs in stomach
Rainbow	20.2	92.8	F	x	1"	flys in stomach
Rainbow	20.0	92	M	x	1"	flys in stomach
Rainbow	19.6	85.7	M	x	1"	flys in stomach
Rainbow	20.9	90.7	F	x	1"	stickleback in stomach
Rainbow	17.7	60.4	M	x	1"	stickleback in stomach
Rainbow	17.8	66.0	M	x	1"	stickleback in stomach
Rainbow	17.5	69.0	M	x	1"	stickleback in stomach
Rainbow	19.0	81.1	F	x	1"	flying bugs in stomach
Rainbow	17.7	68.0	F	x	1"	flying bugs in stomach
Rainbow	15.3	43.1	M	x	1"	flying bugs in stomach
Rainbow	18.5	76.8	M	x	1"	flying insects in stomach

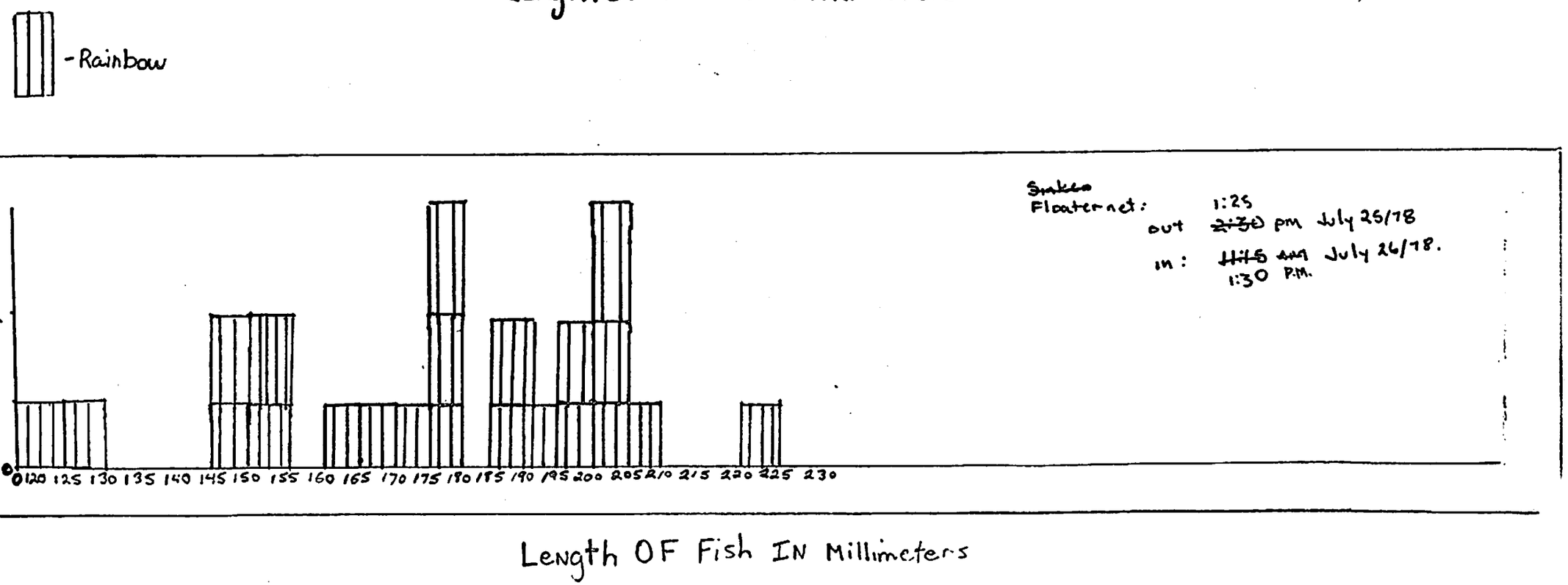
FISH DATA - MERRILL LAKE

Set II.

Type of net: Sinker
Date net set out: July 25/78
Time net set out: 1:35 P.M.
Date net brought in: July 26/78
Time net brought in: 1:20 P.M.

Species	(in cm.) Length	(in g.) Weight	Sex	scale Sample	mesh size	Remarks
Rainbow	16.7	61	M	x	1"	flying bugs in stomach
Rainbow	18.6	74.9	F	x	1"	flying bugs in stomach
Rainbow	13.2	32	M	x	1½"	flys in stomach
Rainbow	14.2	39.8	M	x	1½"	flys in stomach
Rainbow	15.2	44.2	M	x	1½"	flys in stomach
Rainbow	18.0	68.0	M	x	1½"	flys in stomach
Rainbow	22.9	128.8	F	x	1½"	flys in stomach
Rainbow	22.9	138.0	F	x	1½"	flys in stomach
Rainbow	22.o	119.5	F	x	1½"	flys in stomach
Rainbow	19.5	84.5	M	x	2½"	flys in stomach
Cutthroat	26	155.2	F	x	1"	nymphs in stomach
Cutthroat	24..6	145.3	M	x	1"	empty stomach
Cutthroat	20.7	93.0	M	x	1"	empty stomach
Rainbow	20.0	85	F	x	1½"	empty stomach
Cutthroat	23.6	145.9	F	x	1½"	empty stomach
Cutthroat	35.5	486.3	M	x	2½"	empty stomach


-Cutthroat
- Rainbow
MERRILL LAKE - length-frequency histogram.
NUMBER OF FISH CAUGHT IN EACH LENGTH RANGE
Sinker Net
out: 1:35 pm
in: 1:20 p.m
0 1 2 3
0 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 336
Length OF Fish In Millimeters


-Rainbow
NUMBER OF FISH CAUGHT IN EACH LENGTH RANGE
Sinker
Floater net:
out 1:25 pm July 25/78
in: 1:30 P.M. July 26/78.
0 1 2 3
0 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230
Length OF Fish IN Millimeters

STREAM SURVEY METHODS

Field Data

Reaches were measured with an appropriate number of length of a 25 meter rope that was marked off at 1 meter intervals. A reach description and rough reach map were prepared as the crew travelled each reach.

A station for data collection was located at the end of each reach and the following parameters measured:

(a) width - wetted width and high water width were measured with a meter stick or stream rope.

(b) depth - depths were taken with a meter stick at 1/4, 1/2 and 3/4 of stream width and an average calculated.

(c) water velocity was calculated by recording the time required for an object to float down stream over a measured distance. Three trials were done and an average calculated.

(d) Volume flow was calculated from the above data and the following formula.

$$\text{volume flow}(m^3/\text{sec}) = \frac{(\text{float distance, meters})(\text{wetted width, meters})(\text{average depth, meters})}{\text{average time for float, (sec.)}}$$

(e) water temperature was recorded from a thermometer reading.

(f) clinometer readings were taken by sighting to a point of equal height some distance away and readings from either a homemade or a Silva Type 15CL clinometer were recorded.

(g) Stream substrate type was classified under the following criteria:

1) organic (needles, leaves, decaying material)
2) clay
3) silt
4) sand
5) gravel, pebbles (2-7.5 mm.)
6) cobble (8-30 cm.)
7) boulders (<30 cm.)
8) bedrock

(h) Channel types were classified under the following headings:

1) braided
2) branched
3) straight

(i) Bank stability was classified as either:

1) stable - no evidence of erosion
2) unstable - eroding

(j) Upland vegetation was classified as to the composition of deciduous and coniferous vegetation in order of prominence.

CONTINUATION OF

STREAM SURVEY METHODS

Map Data

The following items were calculated from standard N.T.S. 1:50,000 topographic maps.

1) drainage system and area.
2) coordinates of stream at a point halfway down its length.
3) average gradient.

STREAM FLOWING FROM
MERRILL LAKE TO BOOT LAKE.

SHOWN AS STREAM P
ON MAP II.

STREAM INVENTORY DATA

A. General Information

Lake stream drains into: Boot
Length of stream: .5 km.
Coordinates of stream: 125°32'40"W,50°31'45"N
Drainage area: 0.5 km^2
Map number: 92K/4
Gradient:

B. Field data

Date of survey: July 18/78
Station intervals: 25 m.

	Distance from mouth of stream at Boot Lake (Stations)				
	mouth of stream	2	3	4	5
Width a. high water	2 m.	2 m.	1.6m.	3.6m.	2.8 m.
b. wetted	1.2 m.	1.2 m.	1.3 m.	2.[illegible] m.	1.5 m.
Depth a. 1/4 across	4 cm.	5.5 cm.	10 cm.	14.5 cm.	10 cm.
b. 1/2 across	4.5 cm.	11 cm.	10 cm.	8.2 cm.	12 cm.
c. 3/4 across	3 cm.	10.5 cm	9 cm.	12.2 cm.	10 cm.
d. avg. depth	3.8 cm.	9 cm.	9.6 cm.	11.6 cm.	10.6 cm.
Water velocity a.	25 sec.	10 sec.	10 sec.	12 sec.	10 sec.
(taken over b.	23 sec.	10 sec.	10 sec.	10 sec.	10 sec.
one meter) c.	27 sec.	10 sec.	11 sec.	15 sec.	11 sec.
avg.	25 sec.	10 sec.	10.3 sec.	12.3 sec.	10.3 sec.
Temperature (°C)	19°	18°	19°	19.5°	19°
Volume Flow (m^3/sec.)	0.0018	0.0998	0.012	0.16	0.243
Substrate type	pebble	pebble silt	pebble silt	cobble gravel	pebble silt cobble
Channel type	straight unconfined	straight " "	branched " "	straight " "	straight confined
Bank stability	stable	stable	stable	stable	stable
Upland vegetation	Included in reach description				

STREAM INVENTORY DATA

Continued
STREAM FROM MERRILL TO BOOT

B. Field data

Date of survey: July 18/78
Station intervals: 25 m.

Distance from mouth of stream at Boot Lake (Stations)

	6	7	8	9	10
Width a. high water	3 m.	3.5 m.	2.5 m.	3.7 m.	2.1 m.
b. wetted	2.6 m.	3 m.	1.4 m.	3.3 m.	1 m.
Depth a. 1/4 across	7.5 cm.	4.5 cm.	10.6 cm.	9.5 cm.	5 cm.
b. 1/2 across	10 cm.	5.5 cm.	13.5 cm.	10.5 cm.	5 cm.
c. 3/4 across	9.5 cm.	8.5 cm.	7.1 cm.	14.3 cm.	5 cm.
d. avg. depth	8.6 cm.	6.1 cm.	14 cm.	11.4 cm.	5 cm.
Water velocity a.	10 sec.	unable	21 sec.	too	10 sec.
(taken over b.	10 sec.	to do	20 sec.	blocked	10 sec.
one meter) c.	15 sec.	because	22 sec.	up	12 sec.
avg.	11.6 sec.	log jam	21 sec.		10.6 sec.
Temperature (^{o}C)	21^{o}	19^{o}	20^{o}	23^{o}	22^{o}
Volume Flow	0.0197		0.0096		0.0047
Substrate type	pebble cobble gravel	pebble silt	pebble silt	pebble silt	pebble silt
Bank stability	stable	stable	stable	stable	stable
Channel type	straight	straight	straight	straight	straight
	confined	unconfined	" "	" "	" "
Upland vegetation		Included in reach description			

B. Field data

Date of survey: July 18/78
Station intervals: 25 m.

Distance from mouth of stream at Boot Lake (Stations)

	11	12	13	14	15
Width a. high water	24.3 m.	Understory was too dense			
b. wetted	20.5 m.				
Depth a. 1/4 across	60.6 cm.	WE COULDN'T DO ST'S			
b. 1/2 across	90.3 cm.	12. 13, 14, & 15			
c. 3/4 across	90.2 cm.	BECAUSE THE UNDERSTORY WAS			
d. avg. depth	80.3 cm.	TOO THICK			
Water velocity a.	21 sec.				
(taken over b.	20 sec.				
one meter) c.	20 sec.				
avg.d.	20.3 sec.				
Temperature (^{o}C)	25^{o}				
Volume Flow	0.18118				
Substrate type	silt	Channel type straight			
Bank stability	stable				

STREAM INVENTORY DATA

B. Field data

Date of survey: July 19/78
Station intervals: 50 m.

Distance from mouth of stream at Boot Lake (Stations)

	16	17	18	19	20
Width a. high water	1.4 m.	5 m.	8 m.	5 m.	3.5 m.
b. wetted	.8 m.	3 m.	2.4 m.	1.1 m.	2.0 m.
Depth a. 1/4 across	2 cm.	30 cm.	30 cm.	7 cm.	10 cm.
b. 1/2 across	4 cm.	17 cm.	35 cm.	9 cm.	8 cm.
c. 3/4 across	1.4 cm.	17 cm.	31 cm.	17 cm.	6.5 cm.
d. avg. depth	2.4 cm.	18 cm.	32 cm.	11 cm.	15 cm..
Water velocity a.	unable	25 sec.	30 sec.	20 sec.	20 sec.
(taken over b.	too	30 sec.	35 sec.	15 sec.	19 sec.
one meter) c.	ditto	29 sec.	32 sec.	9 sec.	18 sec.
avg.		28 sec.	32.3 sec.	14.6 sec.	19 sec.
Temperature (^{o}C)	18.5^{o}	18^{o}	18^{o}	18^{o}	18^{o}
Volume Flow		0.0193	0.021	0.0125	0.0091
Substrate type	silt pebble	silt sand	silt pebble	silt pebble	silt cobble pebble
Channel type	straight unconfined	straight " "	straight " "	straight " "	branched confined
Bank stabilty	stable	stable	stable	unstable	stable
Upland vegetation	Included in reach description				

REACH DESCRIPTIONS

Mouth of stream (St's 1 & 2)

10% deciduous,90% coniferous.
Skunk cabbage,ferns,grass,Swamp grass,Salal & Sweet gail.

This area has been logged off and there are logs everywhere,in and around the stream.
There are many young alder along the stream banks.

Reach 2 (St's 3 & 4)

10% deciduous, 90% coniferous.
Skunk cabbage,ferns,grass,Swamp grass,Salal & Sweet gail.

This area has been logged off and there are logs everywhere,in the stream and around it.
There are many young alder growing on the stream banks.

Reach 3 (St's 5 & 6

10% decidous, 90% coniferous.
Skunk cabbage,ferns,Grass,Swamp grass,Salal & Sweet gail.

REACH DESCRIPTIONS

CONTINUED

Stream Into Boot from Merrill

Reach 4 (St's 6 & 7)	10% deciduous,90% coniferous. Sweet gail,Skunk cabbage,Grass,Ferns,Swamp grass & Salal. This area has been logged off and there is logs littering the stream and the stream banks.Heavy bush in places.
Reach 5 (St's 8 & 9)	10% deciduous, 90% coniferous. Sweet gail,Skunk cabbage,Grass,Ferns,Swamp grass & Salal. This area has been logged off and there is logs littering the stream banks and the stream. There is very heavy bush in places and there is young alder growing on the stream banks.
Reach 6 (10 & 11)	10% deciduous, 90% coniferous. Sweet gail,Skunk cabbage,Grass,Ferns,Swamp grass & Salal. This area has been logged off and there is logs all over the place. In some places the under story is very thick.
Reach 7 (St's 12 & 13)	10% deciduous,90% coniferous. Sweet gail,Skunk cabbage,Grass,Ferns,Swamp grass & Salal. This area has been logged off and there are a lot of logs around. There are more young deciduous trees in this area.
Reach 8 St's (14 & 15)	10% deciduous, 90% coniferous. Skunk cabbage,ferns,Grass,Swamp grass,Sweet gail,Bullrushes & Salal This area is logged off but the second growth is well on it's way.. The stream bottom is littered with logs & Organic material.
Reach 9 (St's 16)	10% deciduous,90% coniferous. Ferns,Skunk cabbage,Sweet gail, & many young alder trees. The area is still logged off but it is very much overgrown with alder trees.
REach 10 (St. 17)	50% deciduous,50% coniferous. Ferns,Skunk cabbage,Sweet gail,Salal & many young alder. Logged off area with young alders as a second growth.
Reach 11 (st. 18)	50% deciduous, 50% coniferous. Ferns,Skunk cabbage, Sweet gail & Youn alder. Very heavy understory.
Reach 12 *St. 19	50% coniferous , 50% deciduous. Sweet gail,ferns,grass,Swamp grass & young alders. Logged off area. Very thick understory.
Reach 13 (St. 20)	50% deciduous , 50% coniferous. Sweet gail,ferns,Swamp grass & young alder.