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TITLE

THE MORPHOMETRY OF BABINE LAKE AND NILKITKWA LAKE

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by

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This manuscript report presents morphometric data on Babine Lake and adjacent Nilkitkwa Lake in north central British Columbia. Figure 1 presents a topographic map showing the drainage basin of these lakes.

Figure 2 shows the different lake basins or regions of these lakes which were designated as discrete sampling areas during the course of ecological studies carried out between 1956 and 1963. Morphometric data is presented for each of these lake basins or regions individually.

The morphometric parameters for Nilkitkwa Lake were calculated from a bathymetric map with a scale 1 inch equals 475 feet. The morphometric parameters for Babine Lake were calculated from a bathymetric map having a scale 1 inch equals 1 mile (except for length of shoreline, L, which was measured from a more recent outline map based on aerial photographs having a scale 1 inch equals 0.5 miles). Figures 3, 4, 5, and 6 present photographs of the bathymetric maps used. The symbols used to denote the morphometric parameters are those of Hutchinson (1957). Volumes were calculated by plotting area of depth contours against depth, and then measuring planimetrically the appropriate areas under the curve.

Table 1 presents the standard morphometric data. In addition Table 1 gives for each lake basin or region the % of total area of the drainage basin from which inflowing waters are received. This parameter was calculated planimetrically from the topographic map reproduced in Figure 1. This parameter was included to facilitate calculation of rates of flushing of the various lake basins or regions in the manner used by Johnson (1964).

Table 2 presents data on the volume and % of total volume in various depth intervals for each of the individual basins and lake regions.

In addition to this morphometric data, Figure 7 gives a diagrammatic presentation of the discharge of the Babine River at the outlet of Babine Lake for the years 1955 through 1963; and Figure 8 presents, in diagrammatic form, available information on the water level of Babine Lake measured at Topley Landing for the years 1955 to 1963.

References

Hutchinson, G. E. 1957. A Treatise on Limnology: Vol. 1 - Geography, Physics, and Chemistry. Wiley, New York.

Johnson, W. E. 1964. Quantitative aspects of the pelagic, entomostracan zooplankton of a multibasin lake system over a 6-year period. Verh. Internat. Verein. Limnol. XV, 727-734.

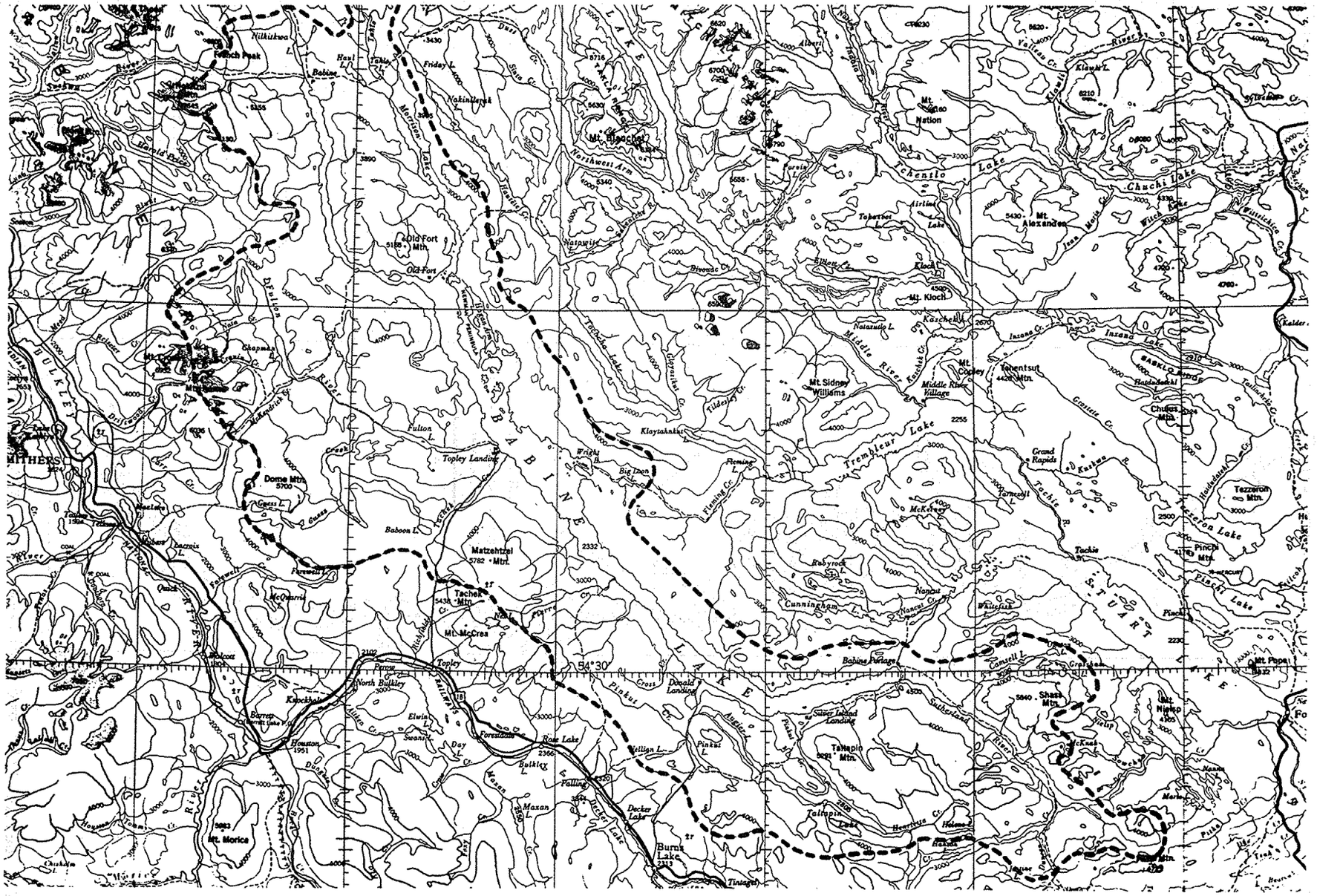

Fig. 1. The Babine Lake - Nilkitkwa Lake drainage area - enclosed by broken line.
(Elevations in feet)

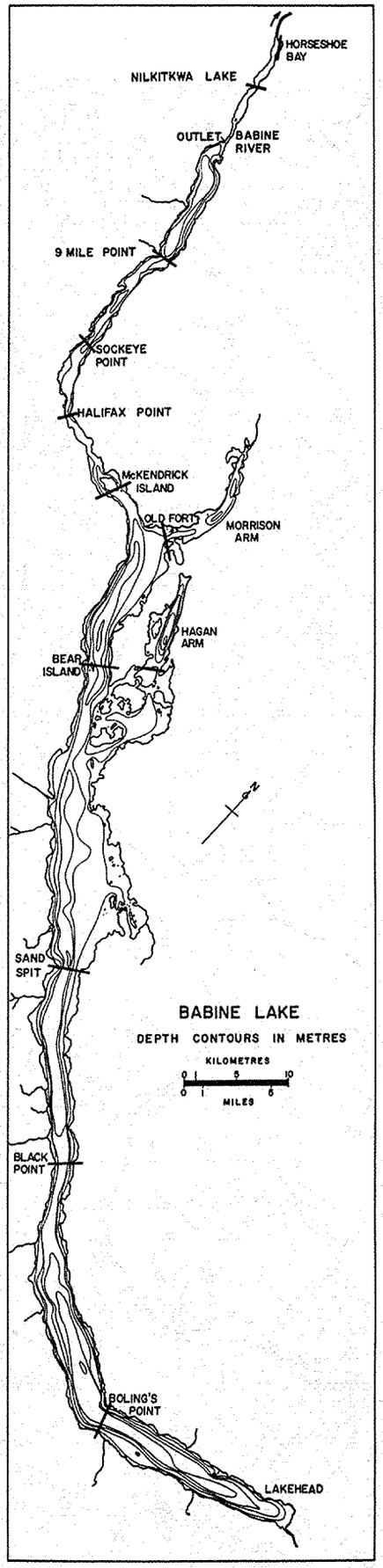

Fig. 2. Babine Lake and Nilkitkwa Lake, showing the different lake basins or regions.

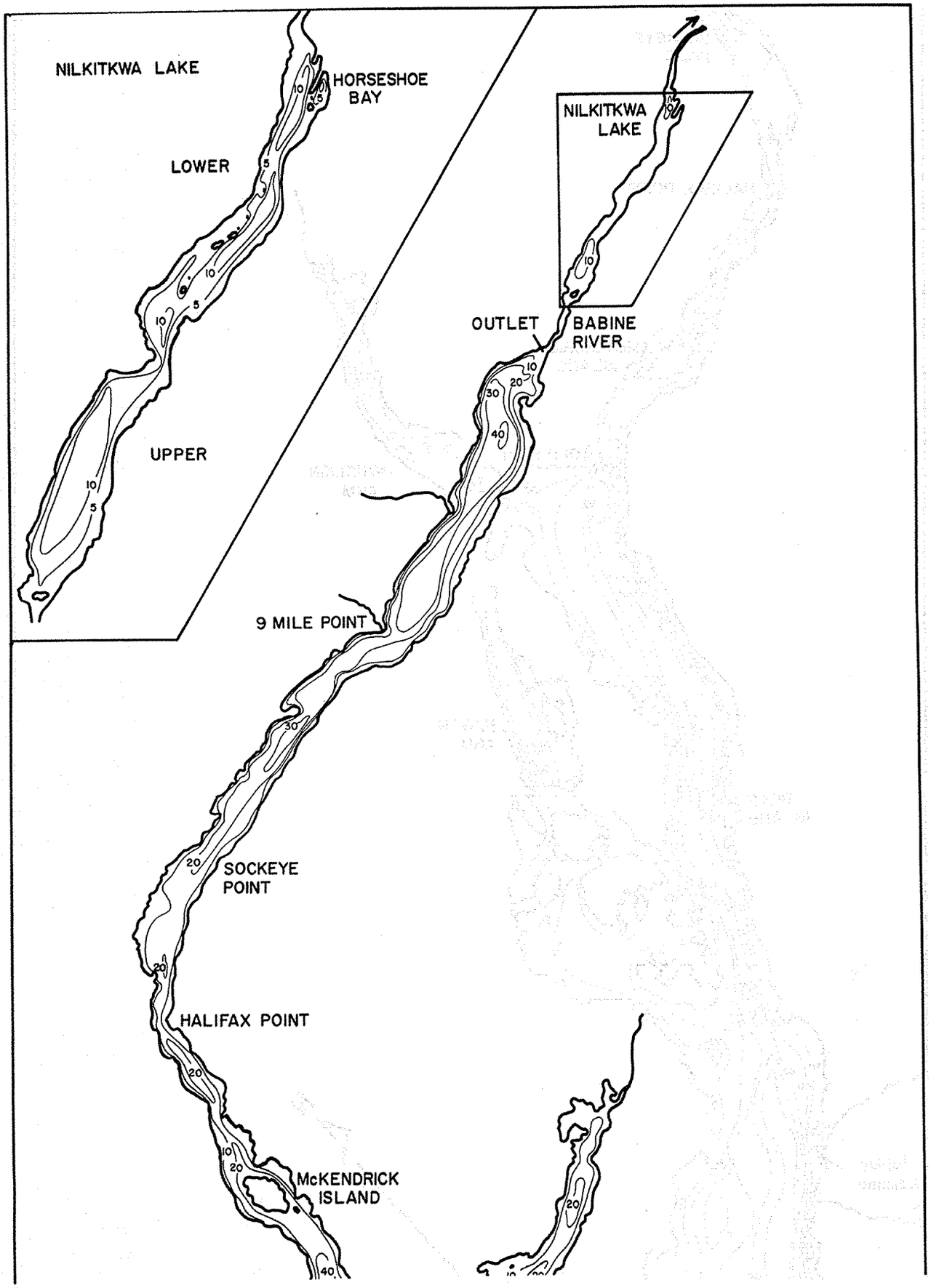

Fig. 3. Nilkitkwa Lake and the northern regions of Babine Lake.

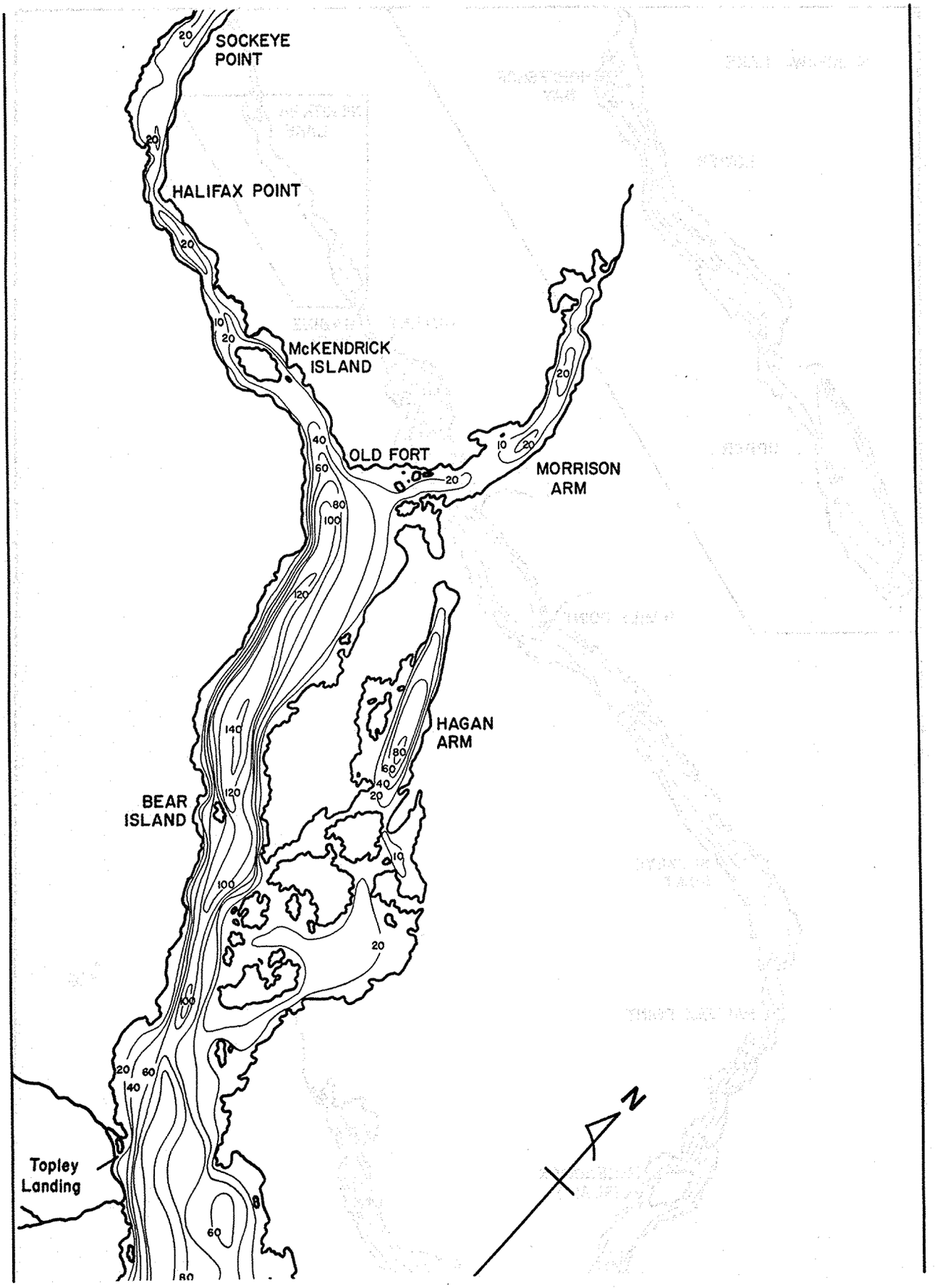

Fig. 4. The north central regions of Babine Lake.

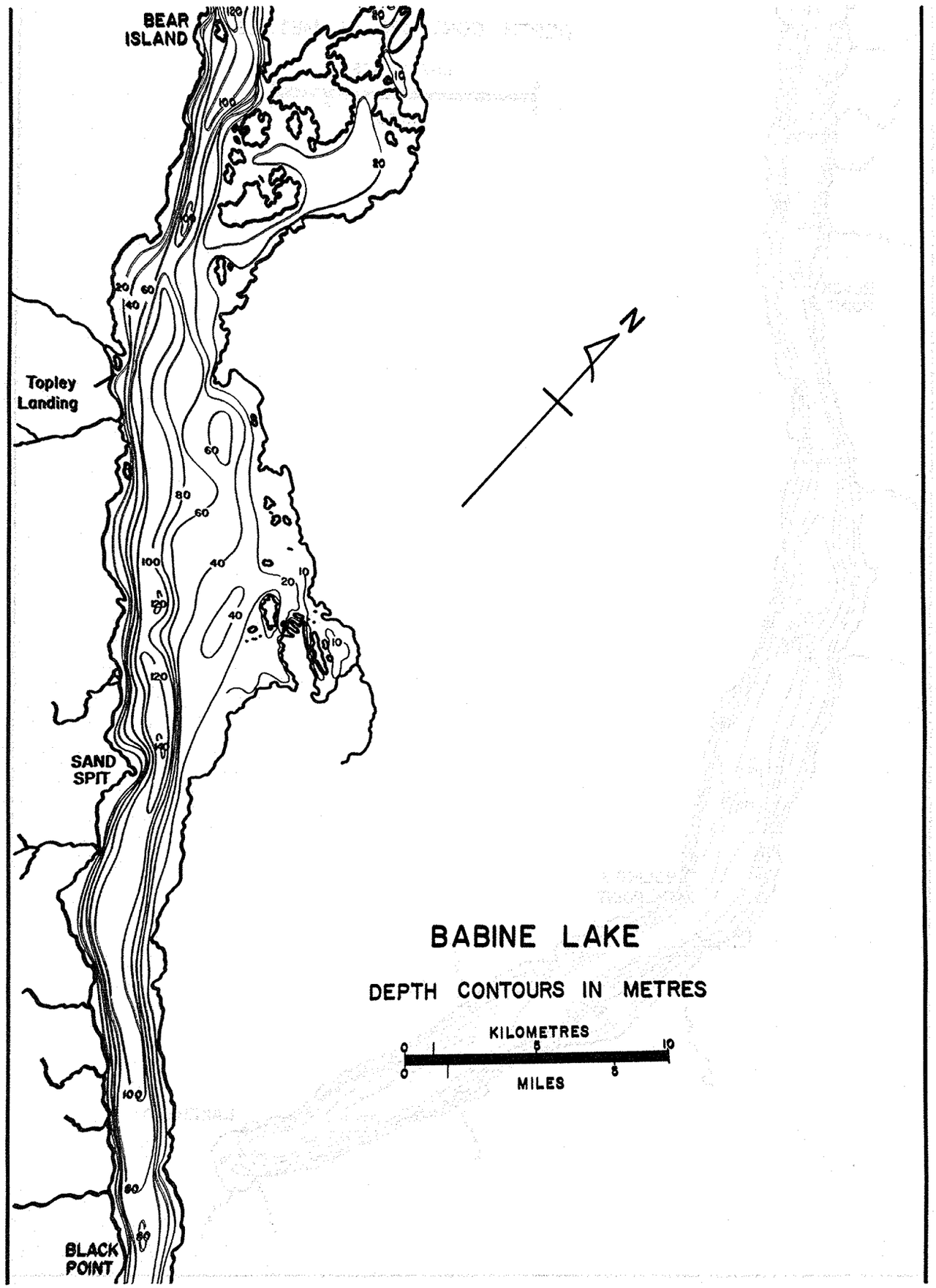

Fig. 5. The central regions of Babine Lake.

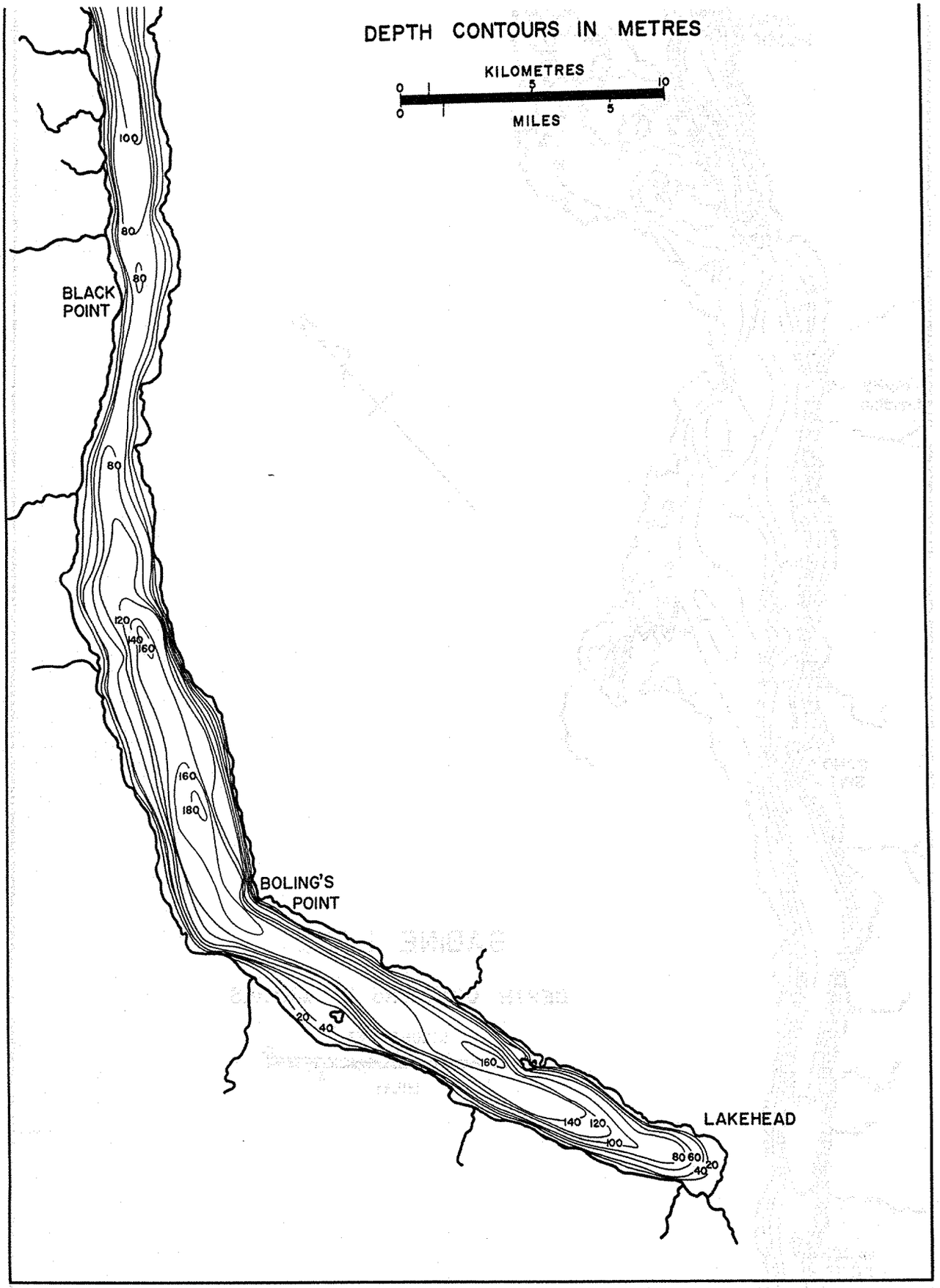

Fig. 6. The southern regions of Babine Lake.

Table 1. Morphometric data for Nilkitkwa Lake and Babine Lake

Lake or Lake Region	A = Area		V = Volume	$\bar{Z}$ (mean depth)	Z_m (max. depth)	$\bar{Z}/Z_m$	L[1]	D_L[2]	l[3]	% of total drainage area from which inflow enters
	km^2	$miles^2$	km^3	m	m		km		km	
NILKITKWA LAKE	4.87	1.88	0.038031	7.81	21.0	0.37	22.7	2.91	8.8	
Horseshoe Bay	0.0829	0.032	0.000511	6.16	16.0	0.38	1.16	1.11	0.6	.002[4]
Lower basin	2.3386	0.903	0.016103	6.89	20.0	0.34	12.44	2.30	5.1	100.0
Upper basin	2.4500	0.946	0.021417	8.74	21.0	0.42	9.10	1.65	3.7	99.2
BABINE LAKE	490.60	189.42	27.010	55.10	186.0	0.30	564.7	7.19	150.2	
Outlet to 9-Mile Pt.	21.94	8.47	0.534	24.34	46.0	0.53	31.5	1.90	12.7	95.4
9-Mile Pt. to Sockeye Pt.	13.39	5.17	0.262	19.57	36.0	0.54	25.9	1.99	10.9	92.8
Sockeye Pt. to Halifax Pt.	9.06	3.50	0.115	12.69	25.0	0.51	17.0	1.59	7.2	90.9
Halifax Pt. to McKendrick Is.	9.01	3.48	0.165	18.31	33.0	0.56	27.5	2.59	9.0	89.0
Morrison Arm	17.72	6.84	0.202	11.40	31.0	0.37	49.5	3.32	13.4	10.2
Hagan Arm	14.25	5.50	0.405	28.42	83.0	0.34	33.4	2.49	9.0	0.9
McKendrick Is. to Bear Is.	52.32	20.20	3.290	62.88	144.0	0.44	43.2	1.68	17.5	87.1
Bear Is. to Sandspit	169.72	65.53	7.326	43.17	141.0	0.31	184.1	4.00	28.8	73.1
Sandspit to Black Pt.	50.43	19.47	3.065	60.78	120.0	0.51	41.8	1.66	18.7	40.6
Black Pt. to Boling's Pt.	74.75	28.86	6.659	89.08	186.0	0.48	57.8	1.89	25.1	33.2
Boling's Pt. to Lakehead	58.01	22.40	4.987	85.97	167.0	0.51	53.0	1.96	20.3	28.7

[1] L = length of shoreline, including islands.

[2] D_L = development of shoreline = $\frac{L}{2\sqrt{\pi A}}$

[3] l = length of lake or basin.

[4] = assuming no entry of water from the Lower basin of Nilkitkwa Lake.

Table 2. Volume and per cent of total volume in various depth intervals for the basins of Nilkitkwa Lake and Babine Lake.

Nilkitkwa Lake: Horseshoe Bay

Depth Interval m	Volume km^3	%
0-5	.000325385	63.6
5-10	.000145128	28.4
10-15	.000039744	7.8
15-16	.000001026	0.2
Total:	.000511283	

Nilkitkwa Lake: Lower Basin

Depth Interval m	Volume km^3	%
0-5	.008997	55.9
5-10	.004614	28.7
10-15	.001938	12.0
15-20	.000554	3.4
Total:	.016103	

Nilkitkwa Lake: Upper Basin

Depth Interval m	Volume km^3	%
0-5	.009889	46.2
5-10	.006683	31.2
10-15	.003653	17.1
15-20	.001154	5.4
20-21	.000038	0.1
Total:	.021417	

Table 2. (continued) - a

Babine Lake: Outlet to 9 Mile Pt.

Depth Interval m	Volume km^3	%
0-5	0.104	19.5
5-10	0.094	17.6
10-20	0.157	29.4
20-30	0.120	22.5
30-40	0.056	10.5
40-45	0.003	0.5
Total:	0.534	

Babine Lake: 9 Mile Pt. to Sockeye Pt.

Depth Interval m	Volume km^3	%
0-5	0.063	24.0
5-10	0.061	23.3
10-20	0.091	34.7
20-30	0.044	16.8
30-35	0.003	1.2
Total:	0.262	

Babine Lake: Sockeye Pt. to Halifax Pt.

Depth Interval m	Volume km^3	%
0-5	0.042	36.5
5-10	0.035	30.4
10-20	0.035	30.4
20-25	0.003	2.7
Total	0.115	

Table 2. (continued) - b

Babine Lake: Halifax Pt. to McKendrick Is.

Depth Interval m	Volume km^3	%
0-5	0.043	26.1
5-10	0.042	25.5
10-20	0.060	36.4
20-30	0.020	12.0
Total:	0.165	

Babine Lake: Morrison Arm

Depth Interval m	Volume km^3	%
0-5	0.083	41.1
5-10	0.054	26.7
10-20	0.057	28.2
20-30	0.008	4.0
Total:	0.202	

Babine Lake: Hagan Arm

Depth Interval m	Volume km^3	%
0-5	0.067	16.5
5-10	0.058	14.3
10-20	0.088	21.7
20-30	0.063	15.6
30-40	0.052	12.8
40-50	0.039	9.6
50-60	0.022	5.4
60-70	0.010	2.5
70-80	0.006	1.6
Total	0.405	

Table 2. (continued) - c

Babine Lake: McKendrick Is. to Bear Is.

Depth Interval m	Volume km³	%
0-5	0.250	7.6
5-10	0.236	7.2
10-20	0.455	13.8
20-30	0.412	12.5
30-40	0.363	11.0
40-50	0.320	9.7
50-60	0.259	7.9
60-70	0.213	6.5
70-80	0.192	5.8
80-90	0.168	5.1
90-100	0.148	4.5
100-110	0.117	3.6
110-120	0.081	2.5
120-130	0.051	1.6
130-140	0.025	0.7
Total:	3.290	

Babine Lake: Bear Is. to Sandspit

Depth Interval m	Volume km³	%
0-5	0.827	11.3
5-10	0.710	9.7
10-20	1.236	16.9
20-30	1.011	13.8
30-40	0.781	10.7
40-50	0.668	9.1
50-60	0.550	7.5
60-70	0.441	6.0
70-80	0.349	4.8
80-90	0.286	3.9
90-100	0.226	3.1
100-110	0.141	1.9
110-120	0.070	0.9
120-130	0.022	0.3
130-140	0.008	0.1
Total:	7.326	

Table 2. (continued) - d

Babine Lake: Sandspit to Black Pt.

Depth Interval m	Volume km^3	%
0-5	0.252	8.2
5-10	0.208	6.8
10-20	0.412	13.4
20-30	0.372	12.1
30-40	0.329	10.7
40-50	0.303	9.9
50-60	0.290	9.5
60-70	0.258	8.4
70-80	0.220	7.2
80-90	0.173	5.6
90-100	0.128	4.2
100-110	0.088	2.9
110-120	0.032	1.1
Total:	3.065	

Babine Lake: Black Pt. to Boling's Pt.

Depth Interval m	Volume km^3	%
0-5	0.381	5.7
5-10	0.328	4.9
10-20	0.680	10.2
20-30	0.639	9.6
30-40	0.603	9.1
40-50	0.578	8.7
50-60	0.562	8.4
60-70	0.455	6.8
70-80	0.448	6.7
80-90	0.396	5.9
90-100	0.348	5.2
100-110	0.307	4.6
110-120	0.259	3.9
120-130	0.215	3.2
130-140	0.179	2.7
140-150	0.135	2.0
150-160	0.084	1.3
160-170	0.047	0.8
170-180	0.015	0.3
Total:	6.659	

Table 2. (continued) - e

Babine Lake: Boling's Pt. to Lakehead

Depth Interval m	Volume km^3	%
0-5	0.299	6.0
5-10	0.251	5.0
10-20	0.505	10.1
20-30	0.480	9.6
30-40	0.462	9.3
40-50	0.430	8.6
50-60	0.398	8.0
60-70	0.367	7.4
70-80	0.344	6.9
80-90	0.310	6.2
90-100	0.274	5.5
100-110	0.248	5.0
110-120	0.214	4.3
120-130	0.168	3.4
130-140	0.128	2.6
140-150	0.078	1.6
150-160	0.031	0.5
Total	4.987	

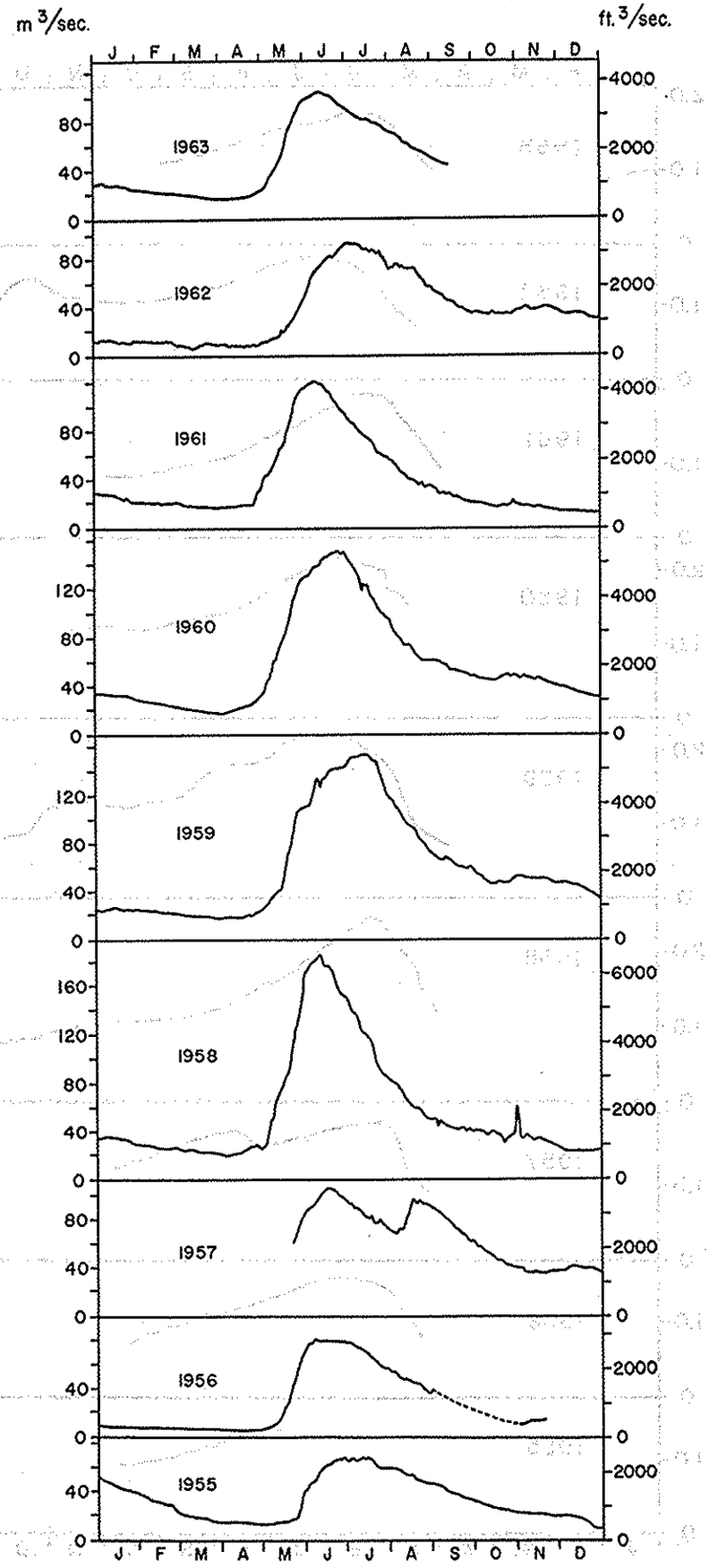

Fig. 7. The discharge of the Babine River at Fort Babine (approximately 200 meters downstream from the outlet of Babine Lake).

Data from Department of Northern Affairs and National Resources - Water Resources Branch.

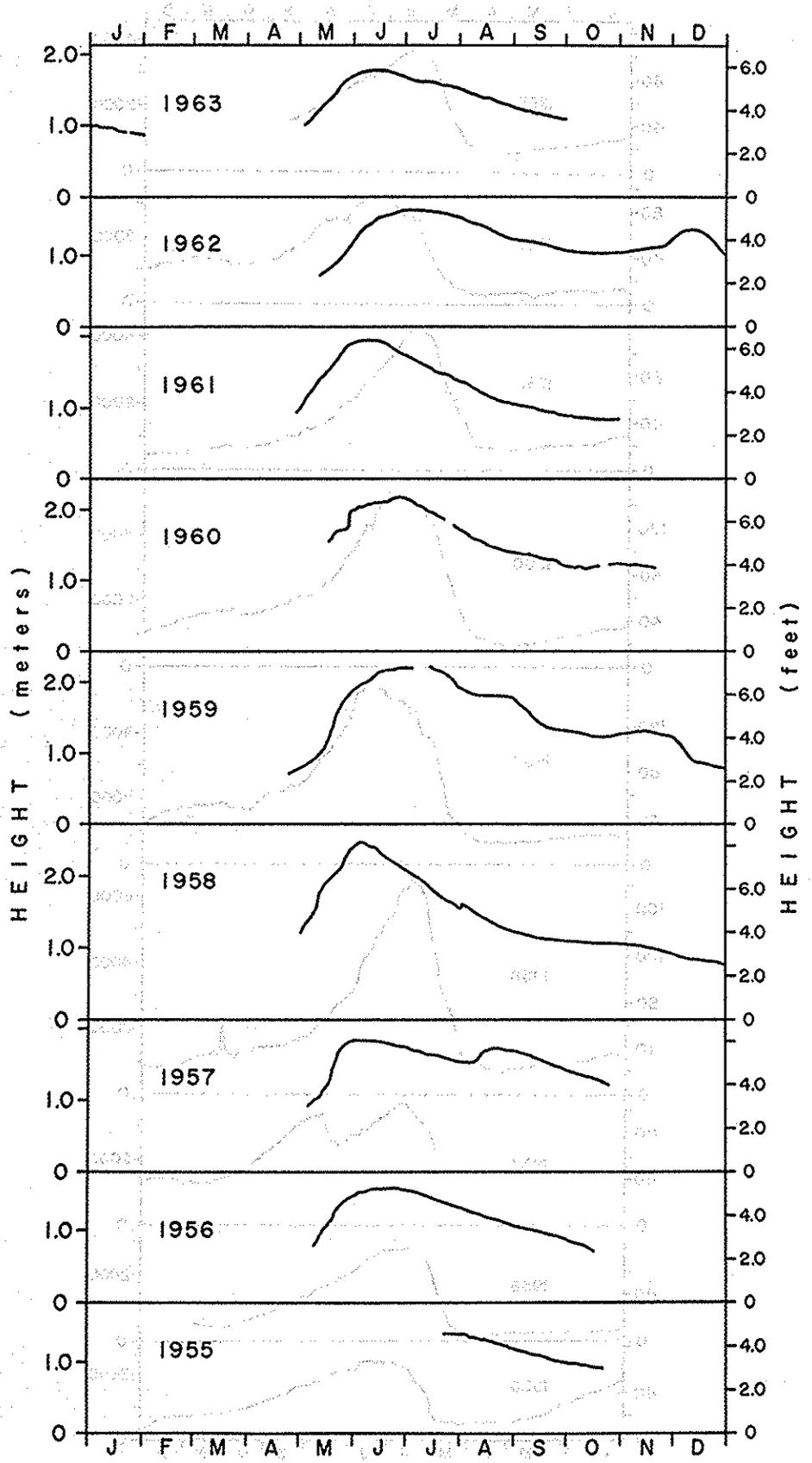

Fig. 8. Babine Lake lake levles measured at Topley Landing (see Fig. 5). Data from Department of Northern Affairs and National Resources - Water Resources Branch.