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LAKE SUPERIOR COOLING SEASON TEMPERATURE CLIMATOLOGY

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LAKE SUPERIOR COOLING SEASON TEMPERATURE CLIMATOLOGY[1]

Raymond A. Assel

ABSTRACT. A temperature climatology has been developed for the surface and ten 10-m layers along the normal ship route between the eastern and western ends of Lake Superior and for discrete areas along the ship route. Base period for the climatology includes winters 1973-76 and falls 1976-79. Daily average temperatures and extreme temperatures for the base period were calculated, and a six-wave Fourier equation fitted to the average temperature time series to define the temperature climatology.

1. INTRODUCTION

Bathythermograph surveys were made across an east-to-west section of Lake Superior during portions of the 1973-76 winters and the 1976-79 falls (Assel, 1983). A climatology of daily average surface temperatures and daily average vertically averaged temperatures for ten 10-m layers, from the surface to 100 m, was developed from that data. The climatology was derived for the entire survey route and for discrete areas along that route. The methods used in the analysis are similar to those described by Feit and Goldenburg (1976), who developed a surface temperature climatology for the Great Lakes. They stated

> "Few observations were taken between November and March on all the lakes. This problem was greatest at Lake Superior where almost no observations were taken between October and April; hence, on this lake, the temperatures in this time frame are dubious."

The work described in this report should help to solve this problem by providing an improved temperature climatology of the surface temperatures and temperatures at depth for Lake Superior during the fall and winter cooling periods of the annual temperature cycle. The surface temperature climatology described here, however, is not a skin temperature but rather a surface layer temperature, down to about 5 m, because of the instrument system depth measurement accuracy. Products of the analysis include tabulations and graphical summaries of the temperature climatology.

2. PROCEDURES

A portable bathythermograph recorder using expendable bathythermograph probes was used to measure temperature profiles to a depth of 200 m along the normal shipping route between the eastern and western ends of Lake Superior.

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[1] GLERL Contribution No. 452.

Survey date, number of profiles per survey, and average distance between profiles are given in table 1. Temperature is accurate to plus or minus 0.2°C and depth is accurate to within 2% of actual depth or 4.57 m, whichever is greater. Over 1,000 temperature profile measurements were made during 46 surveys across the lake.

Mean survey thermal profiles (fig. la-lh) were calculated by horizontally averaging the temperatures for a given survey for each meter down to 200 m, eq. (1), (table 2; all equations referenced in the text are in table 2). Next the vertically averaged temperature (vat) for each 10-m layer of the mean profile down to 100 m, eq. (2) was calculated. Interpolation between observation dates produced a daily time series of water temperature for each of the fall and winter seasons. The average daily temperatures were averaged for the fall and winter from these data. That time series was irregular because of discontinuities in observation density and the small number of observations. A six-wave Fourier curve, eq. (3) was fitted to the temperature data at each depth and it filtered out most of the irregularities. The Fourier equation was used to define the temperature climatology. It was applied to data with a minimum density of three observations per day for the fall season (August to December) and two observations per day for the winter season (January to March), where observation density was lower. The period of the climatology extends from late August to early March. Mid-March and April is not included in the Fourier analysis because of insufficient data. The number of observations per day over the eight seasons ranged from 0 to 4; August to January usually had three or four observations per day, February and early March primarily two or three observations per day, and most of March and all of April zero or one observation per day.

The survey route was partitioned into 15 areas (fig. 2 and table 3) and a temperature climatology was calculated for each area in the same way the climatology was developed for the entire survey route. Mean survey profiles for a given day and season were calculated, eq. (4), then the vat's for each 10-m layer were calculated, eq. (2), and daily temperatures interpolated between survey dates for each season. The average daily temperature over the eight seasons was then calculated and Fourier curves fitted to those data to produce the climatology. The number of observations used in the Fourier analysis for each area and depth is summarized in table 4. No climatology was defined for areas 1 and 15 because a preliminary analysis indicated there was insufficient data; and the climatologies for areas 2 and 13 were limited to the upper 30 m and 50 m of the water column for the same reason.

3. RESULTS

Tabulations of the climatology for the first day of each month, and the 5th through the 25th day at 5-day intervals, are given for September-March in table 5a for the lake as a whole and in tables 5b-5p for areas 1-15, respectively. Observed temperatures on survey dates given in table 1 were analyzed for the maximum and minimum temperatures over the period of record. These temperatures define the variation of temperature for each area and depth over the base period. These extreme temperatures and the dates of there occurrence are listed for comparison with the temperature climatology. Fourier equation coefficients, tables 6a-6n, define the climatology over the period of their

Table I.--Temperature surveys *across Lake Superior: winter 1973, 1974, 1975, and 1976, and autumn 1976, 1977, 1976, and 1979*

Winter survey dates	Number of stations	Average distance between stations (km)	Autumn survey dates	Number of stations	Average distance between stations (km)
1973			1976		
Dec. 20-21, 1972	43	13.7	Aug. 18-20, 1976	24	24.0
Dec. 27-28, 1972	43	13.2	Sept. 7-9, 1976	24	22.8
Jan. 15-16, 1973	30	18.0	Sept. 28-29, 1976	24	23.1
Jan. 31-Feb. 1, 1973	28	19.3	Oct. 20-22, 1976	24	23.9
			Nov. 14-16, 1976	24	23.4
1974			Dec. 5-7, 1976	24	22.9
Dec. 19-20, 1973	27	20.6	1977		
Jan. 10-12, 1974	31	17.5			
Jan. 22-23, 1974	24	25.1	Oct. 30-31, 1977	27	20.8
			Nov. l-2, 1977	28	20.5
1975			Nov. 17-22, 1977	31	22.6
			Dec. 16-17, 1977	25	22.2
Dec. 19, 1974	22	25.3	Dec. 19-20, 1977	16	31.1
Dec. 27-28, 1974	33	17.3			
Jan. 7-8, 1975	32	17.7	1978		
Jan. 21-24, 1975	38	16.8			
Feb. 5-7, 1975	25	21.0	Aug. 22-23, 1978	19	26.1
Feb. 18-20, 1975	27	19.5	Sept. 11, 1978	21	26.9
Mar. 11-12, 1975	26	19.9	Sept. 28-29, 1978	21	26.9
			Oct. 17-18, 1978	27	19.0
1976			Nov. 16-17, 1978	26	20.4
			Nov. 30-Dec. 1, 1978	31	18.3
Dec. 17-19, 1975	22	31.5	Dec. 15-17, 1978	29	20.5
Jan. 6-8, 1976	16	41.6			
Jan. 8-9, 1976	9	56.1	1979		
Jan. 27-29, 1976	24	34.9			
Feb. 21-22, 1976	22	23.7	Aug. 23-24, 1979	23	23.0
Mar. 25-27, 1976	16	30.8	Sept. 11, 1979	24	23.7
Apr. 27-29, 1976	22	24.6	Sept. 25-26, 1979	26	21.0
			Oct. 16-18, 1979	26	21.4
			Oct. 30-31, 1979	22	25.8
			Nov. 16-18, 1979	26	21.6
			Dec. 13-15, 1979	23	22.8

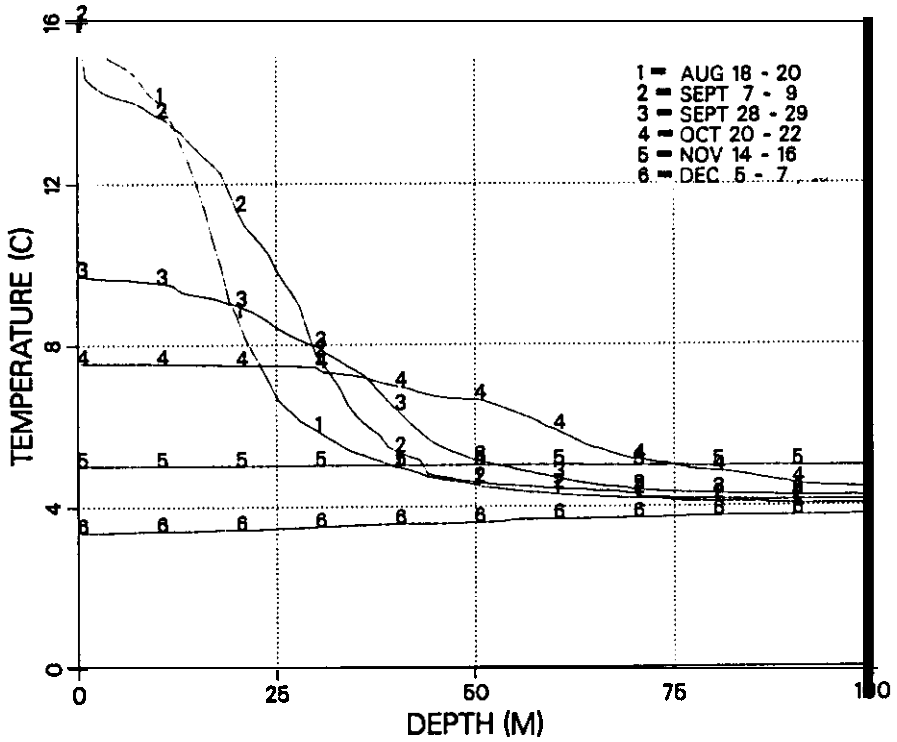

Figure la.--*Fall 1976 mean* survey *profile.*

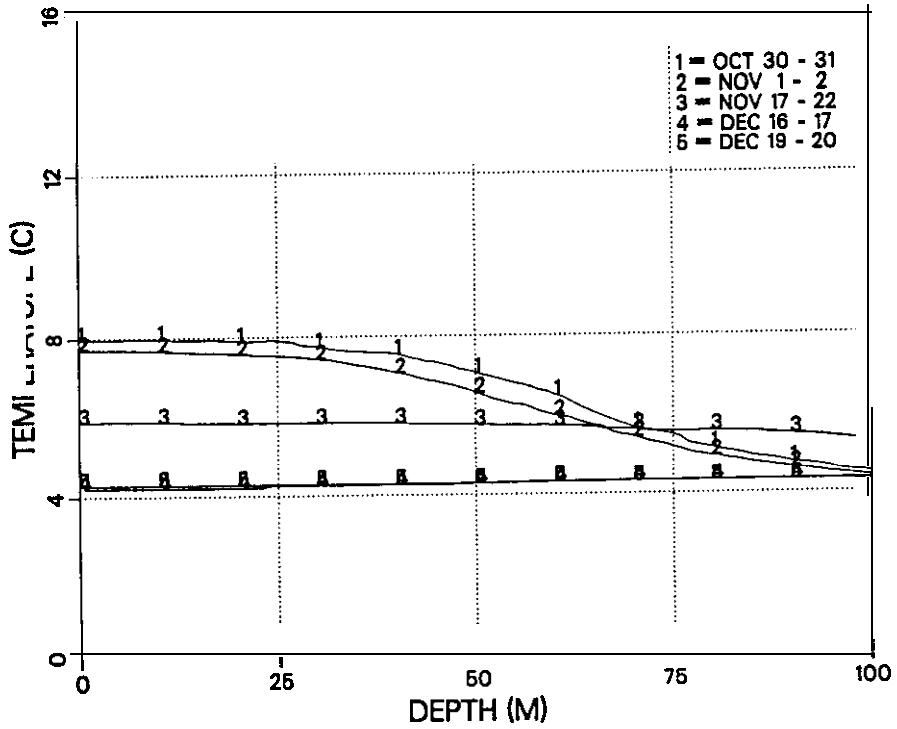

Figure lb.--Fall 1977 mean survey *profile.*

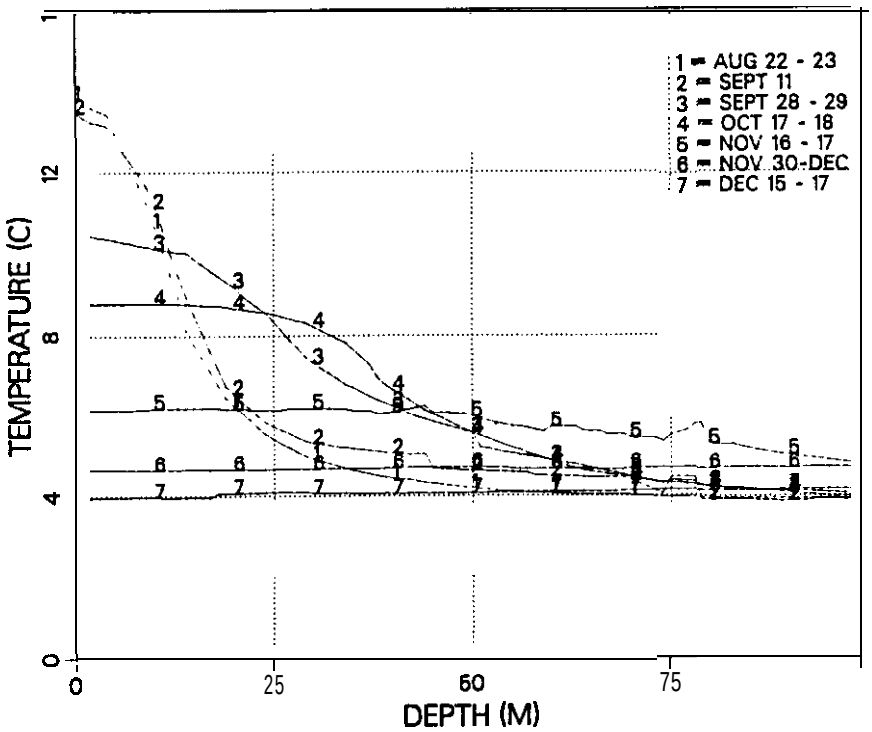

Figure 1c.--*Fall* 1978 mean *survey profile.*

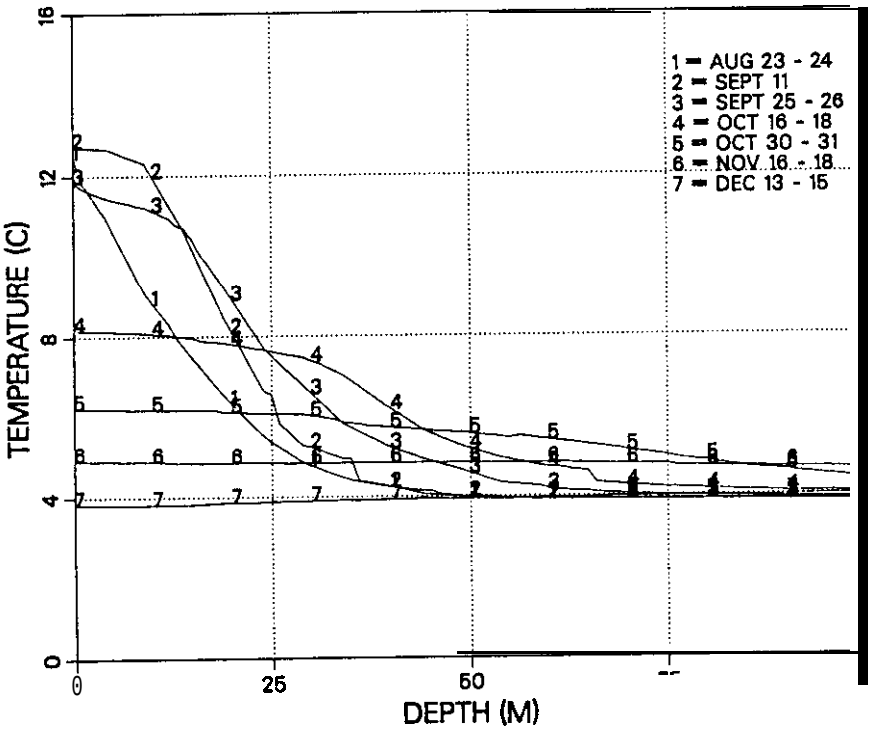

Figure 1d.--*Fall* 1979 mean survey **profile.**

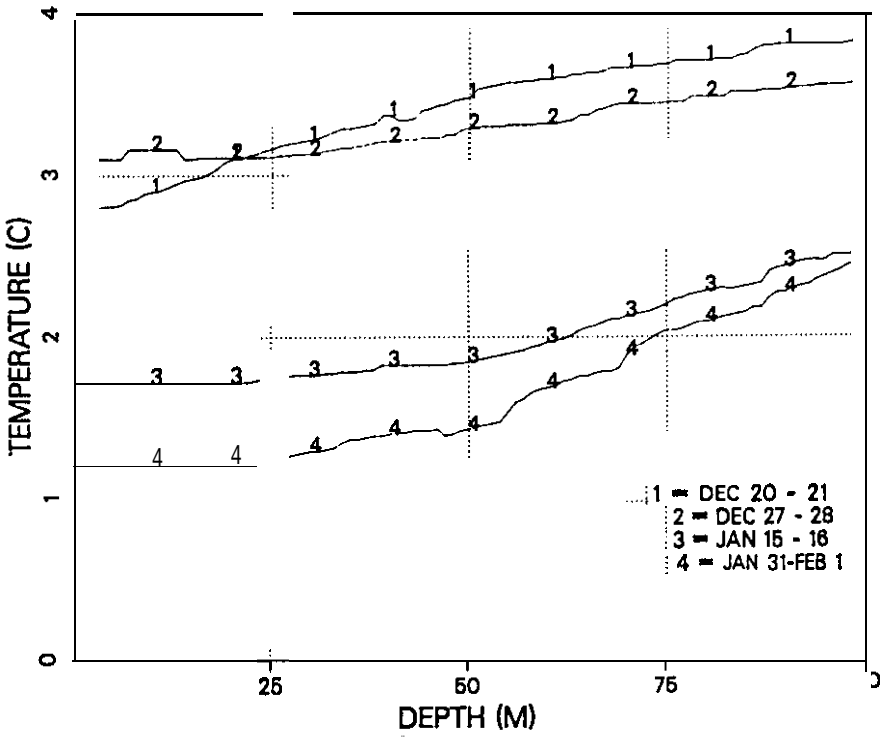

Figure le.--Winter 1973 mean survey profile.

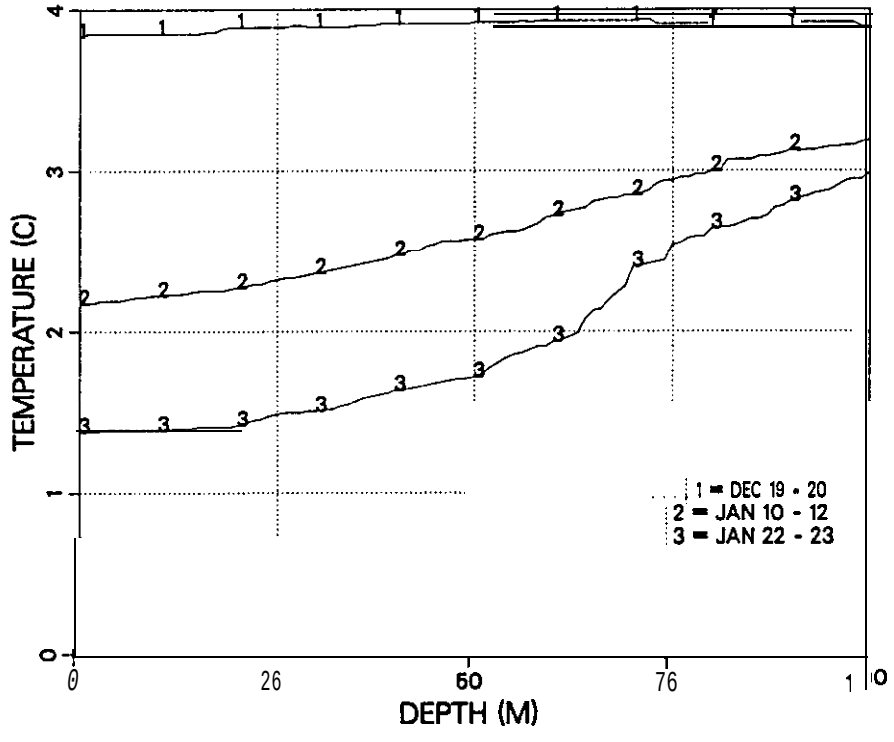

Figure 1f .--Winter 1974 mean survey profile.

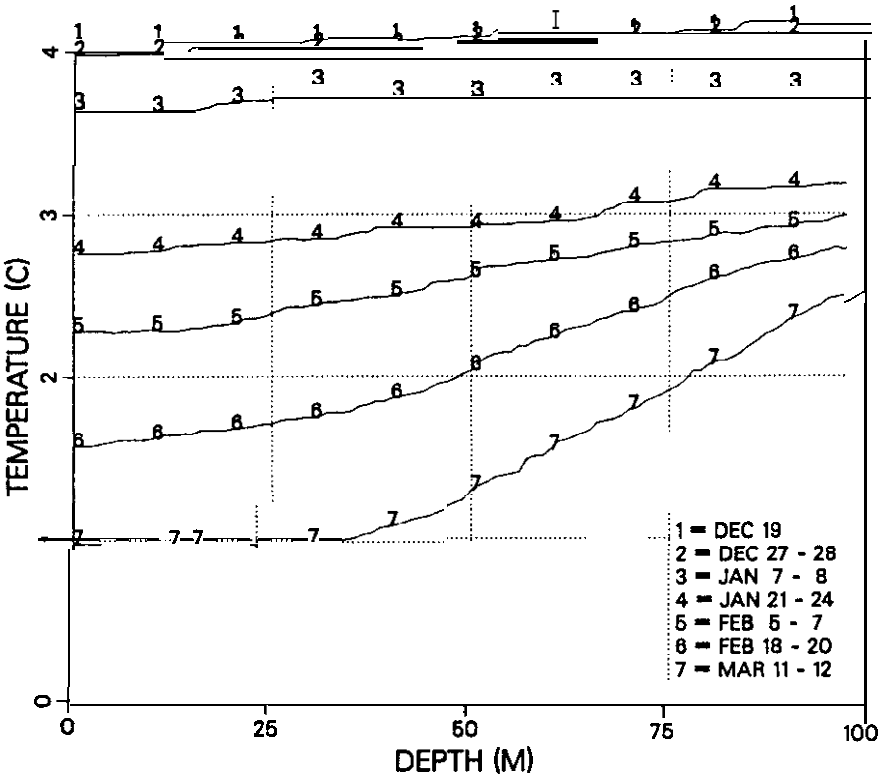

Figure lg.--Winter 1975 mean survey profile.

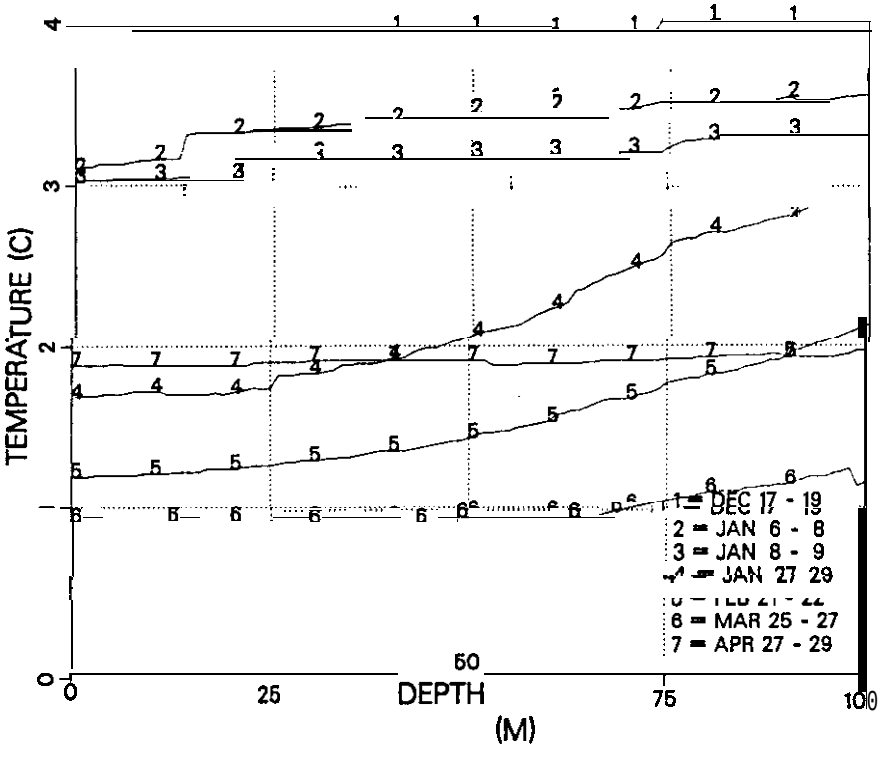

Figure lh.--Winter 1976 mean survey profile.

Table 2.--*Summary* of *equations*

Equation 1.

$$T(z) = 1/S_z \int_0^{S_z} T(s)_z ds,$$

where S_z = ship track length at depth z,

$T(s)_z$ = temperature as a function of distance along the ship track for depth z, and

$T(z)$ = horizontally averaged temperature for depth z.

Equation 2.

$$T_v = 1/(z_2 - z_1) \int_{z_1}^{z_2} T(z)dz,$$

where T_v = vertically averaged temperature for layer $(z_2 - z_1)$, and

$T(z)$ = horizontally averaged temperature for depth z.

Equation 3.

$$\begin{aligned} T = A0 &+ A1 \sin 2\pi t + B1 \cos 2\pi t \\ &A2 \sin 4nt + B2 \cos 4nt \\ &A3 \sin 6nt + B3 \cos 6nt \\ &A4 \sin 8\pi t + B4 \cos 8\pi t \\ &A5 \sin 10\pi t + B5 \cos 10\pi t \\ &A6 \sin 12\pi t + B6 \cos 12\pi t, \end{aligned}$$

where the A's and B's are the coefficients of regression, t is time in days, and T is temperature.

Equation 4.

$$T_a(z) = 1/n \sum_{i=1}^{n} T_{ai}(z),$$

where $T_a(z)$ = horizontally averaged temperature for area "a" at depth z, and

$T_{ai}(z)$ = ith temperature observation for area "a" at depth z for a given day and year.

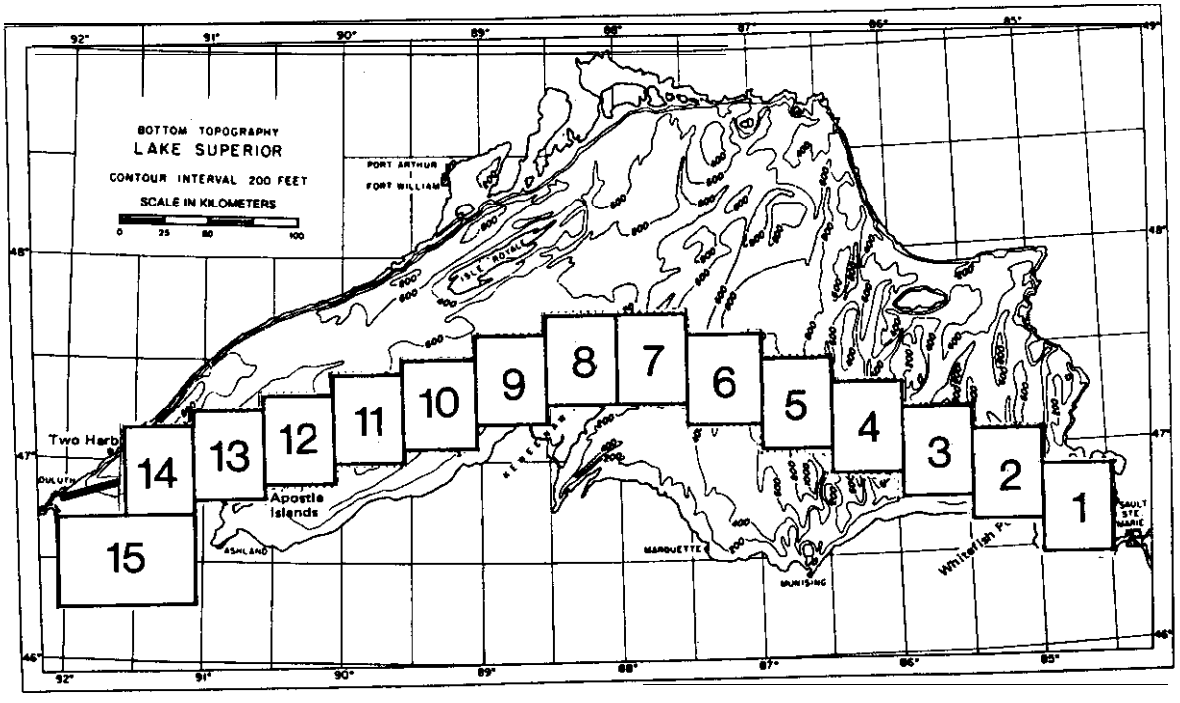

Figure 2.--Survey **route and take area** *locations.*

Table 3.--*Location and* **depth** *statistics for each lake area*

Areas	Latitude* from	Latitude* to	Longitude* from	Longitude* to	Profile depth statistics ave†	sd†	cv#
1	46.36	46.85	84.50	84.99	53	26	48
2	46.75	46.95	85.00	85.49	61	47	76
3	46.92	47.08	85.50	85.99	151	31	21
4	47.01	47.25	86.00	86.49	195	46	24
5	47.15	*47.40*	*86.50*	*86.99*	253	40	16
6	47.25	47.60	87.00	87.49	221	53	24
7	47.43	*47.63*	*87.50*	*87.99*	142	33	24
8	47.40	47.66	88.00	88.49	224	30	13
9	47.36	47.56	88.50	88.99	190	42	22
10	47.31	*47.50*	*89.00*	*89.49*	177	14	8
11	*47.26*	*47.41*	*89.50*	*89.99*	*177*	*20*	11
12	47.15	47.36	90.00	90.49	110	23	21
13	*47.05*	*47.26*	*90.50*	*90.99*	*79*	*37*	*46*
14	47.00	47.16	91.00	91.49	171	33	20
15	46.98	46.98	91.00	91.99	105	43	41

* Latitude north and Longitude west in degrees and hundreds.
† Average depth (ave) and standard deviation (sd) in meters for temperature profiles in each area.
\# Depth coefficent of variation (cv) in percent.

Table 4.--Summary of number of day8 meeting observation density criteria* for Fourier analysis for each area by depth

Areas	Layer depth in meters										
	0	10	20	30	40	50	60	70	80	90	100
1	45	45	44	37	37	37	28	2	1	0	0
2	196	196	196	175	165	121	113	74	22	11	11
3	196	196	196	196	196	196	196	196	196	196	196
4	197	197	197	197	197	197	197	197	197	197	197
5	197	197	197	197	197	197	197	197	197	197	197
6	197	197	197	197	197	197	197	197	197	197	197
7	197	197	197	197	197	197	197	197	197	197	158
8	179	179	179	179	179	179	179	179	179	179	179
9	145	145	145	145	145	145	145	145	145	145	145
10	145	145	145	145	145	145	145	145	145	145	145
11	137	137	137	137	137	137	137	137	137	137	137
12	177	177	177	177	177	177	177	177	177	177	144
13	177	177	177	177	177	141	68	45	22	21	21
14	142	142	142	142	142	142	142	142	142	142	42
15	20	20	20	20	20	20	20	20	20	20	20

* Minumum of 3 years of data for days in the months of August through December and minumum observation density of 2 years of data for days in January through March.

derivation, but using these coefficients outside the range of Julian days given may result in erroneous temperatures. The temperature climatology for the mean survey thermal profile is shown in fig. 3 for six layers; it illustrates some of the seasonal characteristics and the thermal structure of the lake along the survey route. Isothermal contour charts illustrate the spatial variation of the temperature climatology over areas 2-14 at end-of-month dates from August to February (fig. 4a-4g).

4. DISCUSSION AND CONCLUDING REMARKS

The annual temperature cycle of Lake Superior has been described by Bennett (1978); in the present study the climatology of the three stages of the cooling period are described. These are (1) loss of summer stratification due to atmospheric cooling and convective mixing, leading to isothermal conditions; (2) isothermal cooling of the entire water column due to full convective mixing; and (3) winter restratification due to reduction of the depth of convective mixing caused by cooling of the water column past the temperature of maximum density and subsequent formation of a stable water density gradient with respect to depth. These stages are shown for Lake Superior in figure 3

Table 5a.--*Summary* **of** *Lake Superior temperature climatology and extreme temperatures* **over** *period* **of record**

TEMPERATURE CC) CLIMATOLOGY FORLAKE

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	14.2	13.0	10.1	6.9	5.2	4.5	4.3	4.2	4.1	4.0	4.0
5	14.1	13.0	10.3	7.1	5.3	4.6	4.3	4.2	4.1	4.0	4.3
10	13.7	12.8	10.4	7.4	5.6	4.7	4.3	4.2	4.1	4.0	4.0
15	13.1	12.3	10.4	7.7	5.8	4.9	4.5	4.3	4.2	4.0	4.0
20	12.2	11.7	10.2	7.9	4.2	5.1	4.6	4.4	4.2	4.1	4.0
25	11.3	11.0	10.0	8.1	6.5	5.4	4.8	4.5	4.3	4.2	4.1
OCT 1	10.3	10.1	9.5	8.2	6.8	5.7	4.9	4.5	4.3	4.2	4.1
5	9.7	9.5	9.2	8.2	7.0	5.8	5.1	4.6	4.3	4.2	4.1
10	9.0	8.9	8.7	8.1	7.1	5.9	5.2	4.7	4.4	4.2	4.1
15	8.5	8.4	8.3	7.9	7.1	6.1	5.4	4.8	4.5	4.3	4.2
20	8.0	8.0	7.9	7.7	7.1	6.1	5.5	5.0	4.6	4.4	4.3
25	7.6	7.6	7.5	7.3	6.9	6.2	5.7	5.2	4.8	4.6	4.1.
NOV 1	6.9	6.9	6.9	6.8	6.6	6.1	5.7	5.3	5.1	4.9	4.6
5	6.6	6.6	4.6	6.5	6.3	6.0	5.7	5.4	5.1	4.9	4.7
10	6.1	6.1	6.1	6.1	6.0	5.8	5.6	5.4	5.2	5.3	4.3
15	5.7	5.7	5.7	5.6	5.6	5.5	5.4	5.3	5.1	5.0	4.8
20	5.3	5.3	5.3	5.3	5.2	5.2	5.1	5.1	5.0	4.9	4.8
25	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.3	4.8	4.8	4.1
OEC 1	4.5	4.6	4.6	4.6	4.6	4.6	4.5	4.6	4.6	4.5	4.6
5	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5
10	4.2	4.2	4.2	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.3
15	4.0	4.0	4.0	4.1	4.1	4.1	4.1	4.2	4.2	4.2	4.2
20	3.8	3.8	3.8	3.9	3.9	4.0	4.0	4.0	4.5	4.0	4.0
25	3.6	3.6	3.6	3.7	3.7	3.8	3.8	3.8	3.8	3.9	3.9
JAN 1	3.2	3.2	3.3	3.3	3.3	3.4	3.4	3.5	3.5	3.6	3.6
5	2.9	3.0	3.0	3.0	3.1	3.1	3.2	3.3	3.3	3.4	3.5
10	2.6	2.7	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3
15	2.4	2.4	2.4	2.5	2.5	2.6	2.6	2.8	2.9	3.0	3.1
20	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.6	2.7	2.8	3.0
25	2:0	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.6	2.7	2.9
FEB 1	1.9	1.9	1.9	2.0	2.0	2.1	2.2	2.4	2.5	2.7	2.8
5	1.8	1.8	1.8	1.9	2.0	2.1	2.2	2.3	2.5	2.6	2.7
10	1.7	1.7	1.8	1.8	1.9	2:0	2.1	2.3	2.4	2.5	2.7
15	1.6	1.6	1.6	1.7	1.8	1.9	2.0	2.2	2.3	2.5	2.6
20	1.5	1.5	1.5	1.5	1.6	1.7	1.9	2.0	2.2	2.3	2.4
25	1.3	1.3	1.3	1.4	1.4	1.5	1.7	1.8	2.0	2.1	2.3
MAR 1	1.2	1.2	1.2	1.2	1.3	1.4	1.5	1.7	1.9	2.0	2.2
5	1.1	1.1	1.1	1.2	1.2	1.3	1.5	1.6	1.8	2.0	2.1
10	1.1	1.1	1.1	1.1	1.1	1.2	1.4	1.5	1.7	1.9	2.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99:o	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	15.9	15.0	12.1	8.2	7.3	6.4	6.0	5.5	5.2	5.1	4.9
DATE	Aug22	Aug20	Aug22	Sep28	Oct17	Oct30	Oct30	Oct30	Nov16	Nov16	Nov16
MIN	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.2
DATE	Mar26	Mar26	Mar26	Mar24	Mar26	Mar26	Mar26	Mar25	Mar26	Mar26	Mar26

99 = insufficent data **for climatic** analysis

Table 5b.--*Summary* of *Lake Superior, area 1, temperature climatology* and *extreme temperatures over period of record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 1

	LAYERS IN METERS										
	0	10	20	30	40	50	60	70	80	90	100
SEP 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0
15	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99:o	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
OCT 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99:o
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	9r:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99:o	99.0	99:o	99.0	99.0	93:o	99.0
NOV 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99:o	99.0	99:o	99.0	99:o	99:o	99.0	99.0	99.0	99.0	99:o
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93:o	99.0	99.0	99.0
25	99:o	99: 0	99.0	99.0	99.0	99.0	99.0	93.0	99.0	99:o	99:o
DEC 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0
20	99:o	99:o	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
JAN 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0
25	99:o	99:o	99.0	99.0	99:o	99.0	99:o	99.0	99.0	99:o	99.0
FEB 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99:o
15	99:o	99.0	99.0	99:o	99.0	93.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99:o	99:o	99.0
25	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
MAR 1	99.0	99.0	99.0	93.0	99.0	99.0	99.0	99.0	99.0	93.0	99.0
5	99.0	93.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99:o
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99:o	99.0	99:o	99:o	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99:o	99:o
Extreme Temperatures For The Base Period											
MAX	18.1	17.6	17.3	lb.3	14.0	10.6	99.0	99.0	99.0	99.0	99.0
DATE	Aug20	Aug20	Aug20	Aug20	Aug20	Oct20	....	....	....	....	....
MIN	0.3	0.3	0.3 Feb 1	0.3	0.4 Feb 1	0.5 Jan27	99.0	99.0	99.0	99.0	99.0
DATE	Feb 1	Feb 1		Feb 1			....	....	....	....	....

99 = insufficent data for climatic analysis

Table 5c.--*Summary of Lake* **Superior**, *area 2, temperature climatology and extreme temperatures over period* **of** *record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 2

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	15.2	14.2	11.4	8.3	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	15.1	14.0	11.2	8.3	99.0	99.0	99.0	93.0	99.0	99.0	99.0
10	14.8	13.7	10.9	8.2	99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	14.2	13.3	10.6	8.2	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	13.5	12.8	10.3	8.3	99.0	99.0	99:o	99:o	99.0	99.0	99.0
25	12.6	12.2	10.1	8.4	99.0	99.0	99.0	99.0	99.0	99.0	99.0
OCT 1	11.6	11.4	9.9	8.6	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	11.0	10.9	9.7	8.7	99.0	99.0	99.0	99.0	99.0	99.0	39.0
10	10.3	10.3	9.6	8.8	99.0	99.0	99.0	99.0	99:o	99.0	93.0
15	9.8	9.7	9.4	8.7	99.0	99.0	99.0	99.0	99.0	99.0	39.0
20	9.3	9.2	9.1	8.6	99.0	99.0	99:o	99:o	99.0	93.0	99.0
25	8.8	8.8	8.7	8.3	99.0	99.0	99.0	99.0	99.0	99.0	99.0
NOV 1	8.1	9.1	8.1	7.8	99.0	99.0	99.0	99.0	99.0	99.0	99.3
5	7.6	7.7	7.7	7.4	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	7.1	7.1	7.1	6.9	99.0	99.0	99.0	99.0	99.3	99.0	99.0
15	6.5	6.5	6.5	6.5	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	5.9	5.9	5.9	6.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	5.4	5.4	5.4	5.6	99.0	99.0	99:o	99.0	99.0	99.0	99.0
OEC 1	4.8	4.8	4.9	5.1	99.0	99.0	99.0	99.0	99.0		99.3
5	4.5	4.5	4.6	4.8	99.0	99.0	99.0	99.0	99.0	[illegible]	99.0
10	4.2	4.2	4.4		99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	3.9	3.9	4.1	a::	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	3.6	3.7	3.8	3.9	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	3.3	3.3	3.5	3.6	99.0	99:o	99.0	99.0	99.0	99.0	99.0
JAN 1	2.8	2.8	3.0	3.1	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	2.4	2.5	2.7	2.8	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	2.0	2.0	2.2	2.4	99:o	99.0	99.0	99.0	99.0	99.0	99.0
15	1.6	1.6	1.8	2.1	99.0	99.0	99.0	99:o	99.0	99.0	99.0
20	1.3	1.3	1.5	1.7	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	l:o	1.1	1.2	1.5	99:o	99.0	99.0	99.0	99.0	99.0	99.0
FEB 1	0.9	0.9	0.9	1.2	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	0.8	0.9	0.9	1.1	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	0.8	0.8	0.8	1.0	99:o	99.0	99.0	99.0	99.0	99.0	99:o
15	0.7	0.7	0.7	0.9	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	0.6	0.6	0.5	0.8	99.0	99:o	99.0	99.0	99.0	99.0	99.0
25	0.5	0.5	0.4	0.6	99.0	99.0	99.0	99.0	99.0	99.0	99.0
MAR 1	0.4	0.4	0.3	0.4	99.0	99.0	99.0	99.3	99.0	99.0	99.0
5	0.4	0.4	0.3	0.4	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	0.6	0.6	0.5	0.6	99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0

Extreme Temperatures For The Base Period

MAX	16.1	15.7	13.3	9.1	8.5	7.9	7.3	5.3	6.3	6.0	5.7
DATE	Aug21	Aug20	Aug21	Octlb	Oct16	Oct16	Oct16	Nov14	Nov14	Nov14	Nov14
MIN	0.4	0.4	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
OATE	Mar26	Mar26	Feb18	Feb18	Mar25	Mar26	Mar26	Mar25	Mar26	Mar26	Mar26

99 = inrufficent data for climatic analysis

Table 5d.--*Summary of Lake Superior, area 3, temperature climatology and extreme temperatures over period of record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 3

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	13.1	11.6	9.2	6.7	5.0	4.3	4.2	4.1	4.0	4.0	4.0
5	13.0	11.6	9.4	6.7	5.0	4.4	4.2	4.1	4.0	4.0	3.9
10	12.6	11.3	9.3	6.7	5.0	4.4	4.2	4.1	4.1	4.0	3.9
15	12.0	10.7	9.1	6.6	5.0	4.4	4.2	4.2	4.1	4.1	4.0
20	11.3	10.0	8.8	6.6	5.0	4.5	4.3	4.2	4.2	4.1	4.1
25	10.4	9.3	8.4	6.7	5.2	4.6	4.3	4.2	4.2	4.2	4.1
OCT 1	9.5	8.6	8.1	6.8	5.6	4.9	4.4		4.2	4.1	4.1
5	9.0	8.3	7.9	6.9	5.9	5.1	4.5		4.2	4.1	4.1
10	8.3	7.9	7.7	7.1	6.3	5.4	4.8	4.4	4.2	4.1	4.1
15	7.8	7.7	7.5	7.1	6.6	5.8	5.0	4.6	4.3	4.2	4.2
20	7.4	7.4	7.3	7.1	6.7	6.0	5.3	4.9	4.5	4.4	4.4
25	7.0	7.1	7.0	6.9	6.7	6.2	5.5	5.1	4.9	4.6	4.6
NOV 1	6.6	6.6	6.6	6.6	6.5	6.2	5.7	5.3	5.1	4.9	4.9
5	6.3	6.3	6.3	6.3	6.3	6.1	5.7	5.4	5.2	5.0	5.0
10	6.0	6.0	6.0	6.0	5.9	5.8	5.6	5.4	5.3	5.1	5.1
15	5.7	5.7	5.7	5.7	5.6	5.6	5.5	5.3	5.3	5.1	5.0
20	5.4	5.4	5.4	5.4	5.3	5.3	5.3	5.1	5.1	5.0	4.9
25	5.2	5.1	5.1	5.2	5.1	5.1	5.1	5.0	4.9	4.8	4.8
DEC 1	4.9	4.9	4.9	4.9	4.9	4.9	4.8	4.3	4.7	4.7	4.7
5	4.8	4.8	4.7	4.8	4.8	4.8	4.7	4.7	4.6	4.6	4.6
10	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.5	4.5	4.5
15	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.4	4.4	4.5
20	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4	4.3	4.4	4.4
25	4.1	4.1	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2	4.3
JAN 1	3.8	3.8	3.8	3.9	3.9	3.9	4.0	4.0	4.0	4.0	4.0
5	3.6	3.6	3.6	3.7	3.7	3.7	3.8	3.8	3.8	3.3	3.8
10	3.3	3.4	3.4	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5
15	3.0	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.3	3.3
20	2.8	2.8	2.8	2.9	3.0	2.9	3.0	3.0	3.0	3.1	3.1
25	2.5	2.5	2.5	2.6	2.7	2.7	2.7	2.8	2.8	2.9	3.0
FEB 1	2.3	2.2	2.2	2.3	2.5	2.5	2.5	2.6	2.6	2.3	2.9
5	2.1	2.0	2.1	2.1	2.3	2.3	2.4	2.5	2.6	2.8	2.8
10	2.0	1.9	1.9	2.0	2.2	2.2	2.3	2.3	2.5	2.6	2.7
15	1.8	1.8	1.8	1.8	2.0	2.0	2.1	2.2	2.3	2.5	2.5
20	1.6	1.6	1.6	1.7	1.8	1.8	1.9	2.0	2.1	2.2	2.2
25	1.4	1.4	1.4	1.5	1.6	1.6	1.7	1.8	1.9	2.0	2.0
MAR 1	1.2	1.2	1.2	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9
5	1.0	1.0	1.1	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
10	1.1	1.1	1.1	1.1	1.1	1.2	1.3	1.4	1.4	1.6	1.7
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20		99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	13.5	13.3	9.9	7.6	6.9	6.4	5.9	5.5	5.3	5.1	5.1
DATE	Aug21	Aug20	Aug21	Oct16	Oct17	Oct30	Oct30	Oct30	Nov14	Nov14	Nov14
MIN	0.7	0.7	0.7	0.7	0.7	0.7	3.7	0.7	0.7	1.0	1.2
DATE	Mar26	Mar26	Mar26	Mar26	Mar24	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26

99 = insufficent data for climatic analysis

Table 5e.--*Summary* of *Lake Superior, area 4, temperature climatology and extreme temperatures over period* of *record*

TEMPERATURE (C) CLIMATOLOGY FOR 4RCA 4

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	13.4	12.3	10.4	7.6	5.5	4.6	4.3	4.2	4.2	4.1	4.1
5	13.5	12.3	10.5	7.9	5.6	4.6	4.3	4.2	4.1	4.0	4.0
10	13.2	12.2	10.6	8.3	5.7	4.5	4.3	4.2	4.1	4.0	4.0
15	12.7	11.9	10.6	8.6	5.8	4.5	4.2	4.1	4.1	4.0	4.0
20	11.9	11.4	10.6	8.8	5.9	4.5	4.2	4.1	4.1	4.C	4.0
25	11.0	10.8	10.4	9.0	6.2	4.7	4.3	4.2	4.1	4.1	4.1
OCT 1	10.1	10.0	9.9	8.9	6.6	5.1	4.6	4.4	4.2	4.1	4.1
5	9.5	9.5	9.4	8.7	6.8	5.3	4.8	4.6	4.2	4.2	4.1
10	8.9	8.9	8.9	8.4	7.1	5.7	5.2	4.9	4.3	4.2	4.1
15	8.3	8.3	8.3	8.0	7.2	6.1	5.5	5.1	4.4	4.3	4.1
20	7.8	7.7	7.7	7.6	7.2	6.2	5.7	5.3	4.6	4.4	4.3
25	7.3	7.2	7.1	7.1	6.9	6.3	5.8	5.4	4.7	4.6	4.4
NOV 1	6.6	6.5	6.5	6.4	6.4	6.0	5.7	5.4	4.9	4.8	4.6
5	6.2	6.2	6.1	6.1	6.0	5.8	5.6	5.3	5.0	4.9	4.7
10	5.7	5.7	5.7	5.7	5.6	5.5	5.3	5.2	5.0	4.9	4.8
15	5.3	5.3	5.4	5.3	5.2	5.2	5.1	5.1	5.0	4.9	4.9
20	5.0	5.0	5.1	5.1	5.0	5.0	4.9	4.9	4.9	4.9	4.8
25	4.8	4.8	4.8	4.a	4.8	4.8	4.8	4.8	4.8	4.8	4.d
DEC 1	4.6	4.6	4.6	4.6	4.7	4.7	4.7	4.7	4.7	4.7	4.7
5	4.5	4.5	4.5	4.5	4.6	4.6	4.7	4.7	4.6	4.6	4.6
10	4.5	4.5	4.4	4.5	4.5	4.6	4:b	4.6	4:s	4.5	4.5
15	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.4	4.5	4.4
20	4.3	4.3	4.3	4.3		4.3	4.4	4.3	4.3	4.4	4.3
25	4.2	4.2	4.1	4.1	a::	4.2	4.2	4.2	4.2	4.2	4.2
JAN 1	3.8	3.9	3.9	3.9	3.8	3.9	3.9	3.9	3.9	4.0	3.9
5	3.7	3.7	3.7	3.7	3.6	3.7	3.7	3.7	3.7	3.8	3.8
10	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.5
15	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.2	3.3	3.3
20	2.9	2.9	2.9	2.9	3.0	3.0	3.0	3.0	3.0	3.0	3.0
25	2.7	2.7	2.7	2.7	2.8	2.7	2.8	2.8	2.8	2.8	2.9
FEB 1		2.4	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.7	2.7
5	t-4	2.3	2.3	2.4	2.3	2.4	2.4	2.5	2.5	2.6	2.6
10	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.4	2.5	2.5
15	2.0	2.0	2:o	2.1	2.0	2.1	2.1	2.2	2.3	2.3	2.4
20	1.9	1.9	1.9	1.9	1.9	2.0	2.0	2.0	2.1	2.2	2.2
25	1.8	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	2.0	2:o
MAR 1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.9	2.0
5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.8	1.9
10	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.7	1.8
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	93.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99:o	99:o	99.0	99.0	99.0	99.0	99.0	99:o

Extreme Temperatures For The Base Period

MAX	13.8	13.6	13.2	9.3	7.6	6.4	5.3	5.5	5.1	5.1	5.1
DATE	Aug21	Aug20	Aug20	Aug21	Oct17	Oct20	Oct20	Oct20	Nov17	Nov17	Nov17
MIN	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1
DATE	Mar26	Mar26	Mat-26	Mar26	Mar26	Mar25	Mar26	Mar25	Mar26	Mar26	Mar26

99 = insufficent data for climatic analysis

Table 5f.--*Summary of Lake Superior, area 5, temperature climatology and extreme temperatures over period of record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 5

LAYERS IN METERS

	0	10	20	30	40	50	60	70	50	90	100
SEP 1	12.8	11.7	9.0	6.4	4.8	4.4	4.2	4.1	4.0	4.0	4.0
5	12.9	11.9	9.4	6.5	4.8	4.4	4.2	4.0	4.0	4.0	4.0
10	12.8	11.9	9.8	6.9	5.0	4.5	4.2	4.1	4.0	4.0	4.0
15	12.3	11.6	9.9	7.3	5.4	4.7	4.3	4.1	4.0	4:o	4.0
20	11.6	11.1	9.9	7.7	6.0	4.9	4.4	4.2	4.1	4.1	4.0
25	10.8	10.5	9.6	8.1	6.5	5.2	4.5	4.2	4.1	4.1	4.1
OCT 1	9.8	9.7	9.2	8.2	6.9	5.5	4.7	4.3	4.1	4.1	4.3
5	9.2	9.1	8.8	8.2	7.0	5.7	4.8	4.3	4.1	4.1	4.0
10	8.5	8.5	8.4	8.0	7.0	5.8	5.0	4.4	4.2	4.1	4.0
15	8.0	8.0	7.9	7.7	6.9	5.9	5.1	4.5	4.2	4.1	4.7
20	7.5	7.5	7.4	7.3	6.8	5.9	5.3	4.7	4.4	4.2	4.1
25	7.1	7.1	7:o	6.9	6.5	5.9	5.4	4.9	4.6	4.3	4.2
NOV 1	6.5	6.5	6.5	6.4	6.2	5.8	5.5	5.1	4.8	4.5	4.4
5	6.2	6.2	6.2	6.2	6.0	5.7	5.5	5.2	5.0	4.7	4.5
10	5.8	5.8	5.8	5.8	5.7	5.6	5.4	5.2	5.0	4.8	4.6
15	5.4	5.4	5.5	5.5	5.4	5.3	5.3	5.2	5.0	4.8	4.7
20	5.1	5.1	5.1	5.2	5.1	5.1	5.1	5.1	5.0	4.8	4.7
25	4.8	4.8	4:s	4.9	4.9	4.9	4.8	4.9	4.8	4.7	4.6
DEC 1	4.6	4.6	4.6	4.6	4.6	4.5	4.6	4.7	4.6	4.6	4.5
5	4.4	4.4	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.5	4.5
10	4.3			4.3	4.3	4.3	4.3	4.3	4.3	4.4	4.3
15	4.2	4::	9::	4.1	4.1	4.2	4.2	4.2	4.2	4.2	4.2
20	4.0	4.0	4.0	4.0	4.0	4.0	4.1	4.1	4.1	4.1	4.1
25	3.8	3.8	3.8	3.9	3.9	3.9	3.9	3.9	4.0	4.0	4.0
JAN 1	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7
5	3.4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.6	3.6
10	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.4	3.4	3.4	3.4
15	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2	3.3
20	3.0	3.0	3.0	2.9	3.0	3.0	3.0	3:o	3.1	3.1	3.1
25	2.8	2.8	2.8	2.8	2.8	2.8	2.9	2.9	2:9	3.0	3:o
FE6 1	2.7		2.7	2.7	2.7	2.7	2.7	2.7	2.0	2.8	2.9
5	2.5	5::	2.6	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.8
10	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.6
15	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.5
20	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.3
25	2.0	2.0	2.0	1.9	1.9	2.0	2.0	2.0	2.0	2:o	2.1
MAR 1	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0	2.0
5	1.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	2.0
10	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:0
25	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	13.1	12.2	9.9	8.4	7.0	6.0	5.7	5.3	5.2	4.9	4.8
OATE	Sep 7	Aug19	Sep11	Sep28	Oct17	Oct17	Oct30	Nov17	Nov17	Nov18	Nov18
MIN	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
DATE	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26

99 = insufficent deta for climatic analysis

Table 5g.--*Summary* **of** *Lake* Superior, *area 6, temperature climatology and extreme temperatures over period* **of** *record*

TEMPERATURE CC) CLIMATOLOGY FOR AREA 6

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	14.4	12.9	10.3	7.2	5.6	4.7	4.2	4.1	4.1	4.1	4.1
5	14.2	13.0	10.8	7.3	5.7	4.7	4.3	4.1	4.1	4.0	4.1
10	13:b	12.7	11.1	7.6	5.8	4.8	4.3	4.2	4.1	4.1	4.1
15	12.7	12.1	11.0	8.0	6.1	5.0	4.5	4.3	4.2	4.1	4.1
20	11.7	11.4	10.6	8.5	6.4	5.3	4.7	4.3	4.3	4.2	4.1
25	10.7	10.5	10.1	8.8	6.8	5.5	4.8	4.4	4.3	4.2	4.1
OCT 1	9.6	9.6	9.4	8.3	7.0	5.8		4.5	4.3	4.2	4.1
5	9.1	9.0	8.9	8.6	7.1	6.0	5.2	4.5	4.3	4.2	4.1
10	8.5	8.4	8.4	8.3	7.1	6.1	5.1	4.6	4.3	4.2	4.0
15	8.0	7.9	7.9	7.8	7.0	6.1	5.3	4.8	4.4	4.2	4.1
20		7.5	7.5	7.3	6.7	6.1	5.4	4.9	4.5	4.3	4.1
25	3::	7.1	7.0	6.8	6.5	6.0	5.5	5.1	4.7	4.4	4.3
NOV 1	6.4	6.4	6.3	6.2	6.0	5.8	5.5	5.2	4.9	4.7	4.5
5	6.0	6.0	6.0	5.9	5.8	5.6	5.5	5.2	5.0	4.8	4.6
10	5.6	5.6	5.6	5.6	5.4	5.3	5.3	5.2	5.0	4.9	4.7
15	5.2	5.2	5.2	5.3	5.1	5.1	5.1	5.1	4.9	4.9	4.7
20	4.9	4.9	4.9	4.9	4.9	4.8	4.9	4.9	4.8	4.8	4.7
25	4.6	4.6	4.6	4.7	4.6	4.6	4.7	4.7	4.1	4.7	4.6
DEC 1	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.5	4.4
5	4.3	4.3	4.3	4.2	4.3	4.3	4.2	4.3	4.3	4.3	4.3
10	4.2	4.2	4.2	4.1	4.1	4.2	4.1	4.1	4.2	4.2	4.2
15	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4:c
20	3.8	3.8	3.8	3.8	3.8	3.9	3.9	3.9	3.9	3.9	3.9
25	3.7	3.6	3.7	3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.8
JAN 1	3.4	3.4	3.4	3.4	3.4	3.4	3.5	3.5	3.5	3.5	3.6
5	3.2	3.2	3.2	3.3	3.3	3.3	3.4	3.4	3.4	3.4	3.5
10	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.3	3.3
15	2.9	2.9	2.9	2.9	2.9	2.9	3.0	3.0	3.1	3.1	3.2
20	2.8	2.8	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.0	3.1
25	2.7	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.9	3.0	3.1
FEB 1	2.6	2.6	2.6	2.7	2.6	2.6	2.7	2.8	2.8	2.9	3.0
5	2.5	2.5	2.5	2.6	2.6	2.5	2.7	2.7	2.8	2.8	3.0
10	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.7	2.8	2.8	2.9
15	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.6	2.6	2.6	2.7
20	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.5
25	2.0	2.0	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.3
MAR 1	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.2
5	1.7	1.7	1.7	1.9	1.8	1.8	1.9	2.0	2.1	2.1	2.2
10	1.7	1.7	1.7	1.7	1.7	1.7	1.8	1.8	1.9	1.9	2.1
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20			99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	
25	99.0	99.0	99:0	99.0	99:0	99:0	99.0	99.0	99.0	99.0	99.0 99.0

Extreme Temperatures For The Base Period

MAX	15.6	14.2	11.4	3.1	7.1	6.3	5.8	5.4	5.0	4.9	4.9
DATE	Aug19	Aug19	Sepll	Sep26	Oct16	Oct17	Oct30	Oct30	Nov11	Nov17	Nov17
MIN	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
DATE	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26	Mar26

99 = insufficent data for climatic analysis

Table 5h.--*Summary* **of** *Lake* **Superior,** *area 7, temperature climatology and extreme temperatures over period* **of record**

TEMPERATURE (C) CLIMATOLOGY FOR AREA 7

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	14.3	13.3	10.7	7.3	5.5	4.6	4.3	4.2	4.1	4.1	4.1
5	14.1	13.1		7.3	5.4	4.6	4.3	4.1	4.1	4.0	4.0
10	13.7	12.6	9.i	7.5	5.7	4.8	4.4	4.2	4.1	4.0	4.1
15	13.0	12.1	9.9	7.9	6.3	5.3	4.3	4.5	4.3	4.2	4.2
20	12.1	11.5	10.0	8.5	7.1	6.0	5.3	4.9	4.5	4.3	4.2
25	11.3	11.0	10.1	9.0	7.8	6.5	5.7	5.3	4.7	4.5	4.7
OCT 1	10.6	10.4	10.1	9.3	8.3	7.0	6.2	5.7	5.0	4.6	4.0
5	10.1	10.1	10.0	9.4	8.4	7.1	6.3	5.8	5.2	4.6	3.9
10	9.7	9.7	9.6	9.2	8.3	7.1	6.5	6.0		4.7	3.7
15	9.2	9.2	9.2	8.8	8.0	7.0	6.5	6.1	5::	4.8	3.7
20	8.8	8.8	8.6	8.3	7.7	6.8	6.5	6.1	5.6	4.9	3.9
25	8.3	8.2	8.1	7.a	7.3	6.7	4.4	6.2	5.7	5.1	4.3
NUV 1	7.5	7.4	7.3	7.2	6.9	6.5	6.3	6.2	5.8	5.4	4.9
5	7.0	7.0	6.9	6.8	6.7	6.3	6.3	6.1	5.8	5.5	5.2
10	6.5	6.5	6.5	6.4	6.4	6.2	6.1	6.0	5.8	5.6	5.5
15	6.0	6.0	6.1	6.1	6.1	5.9	5.8	5.8	5.7	5.6	5.6
20	5.6	5.6	5.7	5.7	5.7	5.6	5.6	5.6	5.5	5.5	5.5
25	5.2	5.2	5.2	5.3	5.3	5.3	5.3	5.3	5.3	5.3	5.3
DEC 1	4.8	4.8	4.8	4.8	4.8	4.8	4.9	4.9	4.9	4.9	4.3
5	4.6	4.5	4.5	4.5	4.6	4.6	4.6	4.6	4.7	4.7	4.6
10	4.3	4.2	4.2	4.2	4.2	4.3	4.3	4.3	4.4	4.3	4.2
15	3.9	3.9	3.9	4.0	4.0	4.0	4.1	4.1	4.1	4.1	4.0
20	3.6	3.6	3.6	3.7	3.7	3.8	3.8	3.8	3.8	3.8	3.8
25	3.3	3.3	3.3	3.5	3:s	3.5	3.5	3.5	3.5	3.6	3:b
JAN 1	2.9	2.9	3.0	3.1	3.1	3.1	3.1	3.1	3.1	3.2	3.3
5	2.7	2.7	2.7	2.8	2.9	2.9	2.9	2.9	2.9	3.0	3.1
10	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.8	2.9
15	2.1	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6	2.7
20	1.8	1.8	1.8	1.9	1.9	2.0	2.1	2.2	2.4	2.5	2.5
25	1.5	1.5	1.5	1.6	1.7	1.8	1.9	2.1	2.3	2.4	2.4
FEB 1	1.1	1.1	1.2	1.3	1.5	1.7	1.8	2.0	2.2	2.3	2.3
5	0.9	1.0	1.1	1.2	1.4	1.6	1.7	1.9	2.1	2.2	2.3
10	0.8	0.9	1.0	1.1	1.2	1.4	1.5	1.8	2.0	2.1	2.3
15	0.8	0.8	0.9	1.0	1.1	1.3	1.4	1.6	1.8	2.0	2.2
20	0.9	0.8	0.8	0.9	0.9	1.1	1.2	1.4	1.7	1.8	2.0
25	0.9	0.8	0.8	0.9	0.9	1.0	1.1	1.3	1.5	1.6	1.8
HAR 1	0.8	0.8	0.8	0.9	0.9	1.0	...	1.3	1.5	1.5	1.7
5	0.7	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.4	1.5	1.6
10	0.8				0.9	1.0	1.1	1.2	1.3	1.3	1.5
15	99.0	99.0	0.8	0.9	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0			99.0	99.0
25	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures **For The Base Period**

MAX	16.4	15.8	13.7	9.4	R.3	7.1	6.7	6.3	5.8	5.8	5.8
DATE	Aug22	Aug19	Aug19	Sep26	Sep28	Oct20	Oct20	Oct20	Nov14	Nov16	Nov16
MIN	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
DATE	Mar13	Mar13	Mar13	Mar13	Mar13	Mar13	Mar24	Mar25	Mar25	Mar25	Mar25

99 = **insufficent date for** climatic analysis

Table 51.--*Summary* of *Lake Superior, area 8, temperature climatology and extreme temperatures over period* of record

TEMPERATURE (C) CLIMATOLOGY FOR AREA 8

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	15.5	14.1	10.5	7.4	5.3	4.2	4.1	4.0	4.0	4.0	4.0
5	15.4	14.0	10.3	7.5	5.3	4.3	4.1	4.0	4.0	4.0	4.0
10	14.9	13.5	10.2	7.9	5.9	4.6	4.2	4.1	4.0	4.0	4.0
15	14.0	12.9	10.2	8.6	6.8	5.1	4.4	4.2	4.1	4.1	4.0
20	12.9	12.1	10.3	9.2	7.8	5.8	4.6	4.3	4.2	4.2	4.1
25	11.9	11.3	10.4	9.7	8.6	6.3	4.9	4.4	4.3	4.2	4.1
GCT 1	10.8	10.6	10.3	9.9	9.1	6.8	5.2	4.5	4.3	4.2	4.1
5	10.3	10.2	10.1	9.9	9.1	6.9	5.4	4.5	4.2	4.2	4.1
10	9.8	9.8	9.8	9.5	8.9	7.1	5.7	4.5	4.2	4.1	4.1
15	9.4	9.3	9.3	9.1	8.5	7.1	5.9	4.6	4.3	4.2	4.1
20	8.9	8.9	8.8	8.6	8.1	7.1	6.1	4.8	4.4	4.3	4.2
25	8.3	8.3	8.2	8.0	7.7	7.0	6.2	5.0	4.7	4.s	4.4
NOV 1	7.4	7.4	7.4	7.3	7.1	6.7	6.2	5.3	5.1	4.9	4.8
5	6.9	6.9	6.9	6.9	6.8	6.5	6.1	5.4	5.3	5.1	4.9
10	6.3	6.3	6.3	6.3	6.3	6.1	5.9	5.5	5.4	5.3	5.1
15	5.8	5.8	5.8	5.8	5.9	5.7	5.6	5.5	5.4	5.3	5.2
20	5.3	5.3	5.3	5.4	5.4	5.3	5.3	5.3	5.2	5.2	5.1
25	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
DEC 1	4.7	4.6	4.6	4.6	4.6	4.6	4.6	4.7	4.7	4.1	4.7
5	4.5	4.4	4.4	4.4	4.4	4.5	4.5	4.5	4.4	4.5	4.5
10	4.2	4.2	4.3	4.3	4.3	4.3	4.3	4.3	4.2	4.2	4.3
15	4.0	4.0	4.1	4.1	4.2	4.2	4.1	4.1	4.1	4.1	4.1
20	3.8	3.8	3.9	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
25	3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.Y	3.9	3.8	3.3
JAN 1	3.4	3.4	3.4	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.3
5	3.2	3.2	3.2	3.2	3.3	3.3	3.4	3.4	3.4	3.4	3.4
10	3.0	3.0	2.9	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.2
15	2.7	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.9	3.0
20	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.7	2.8
25	2.0	2:o	2.1	2.2	2.3	2.3	2.3	2.4	2.5	2.6	2.6
FEB 1	1.6	1.6	1.7	1.8	1.9	2.0	2.1	2.3	2.4	2.5	2.5
5	1.4	1.5	1.5	1.6	1.7	1.8	2.0	2.2	2.3	2.4	2.4
10	1.3	1.3	1.3	1.5	1.5	1.7	1.9	2.1	2.2	2.3	2.3
15	1.1	1.1	1.2	1.4	1.5	1.8	1.8	1.9	2.0	2.1	2.2
20	1.0	1.0		1.3	1.4	1.6	1.7	1.8	1.9	2.0	2.2
25	99.0	99.0	9:::	99.0	99.0	99.0	93.0	99.0	99.0	99.0	99.0
MAR 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.3
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0	99.0
10	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	93.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99:o
20	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	9'9.0	99.0

Extreme Temperatures For The Base Period

MAX	16.2	15.5	11.6	10.1	9.2	7.3	6.2	5.7	5.6	5.6	5.3
OATE	Aug22	Aug22	Aug22	Sep26	Sep27	Oct20	Oct20	Nov14	Nov14	Nov14	Nov14
MIN	1.0	1.0	1.0	1.1	1.1	1.3	1.3	1.5	1.5	1.8	2.0
DATE	Feb19	Feb19	Feb19	Mar12	Mar12	Mar12	Mar12	Mar12	Mar12	Mar12	Feb19

99 = insufficent data for climatic analysis

Table 5j .--Summary of Lake Superior, area 9, temperature climatology and extreme temperatures over period of record

TEMPERATURE (C) CLIMATOLOGY FOR AREA 9

LAYERS IN METERS

	0	10	20	30	40	50	60	70	30	90	100
SEP 1	14.5	13-b	10.1	6.8	4.9	4.1	4.0	4.0	4.0	3.9	4.0
5	14.6	13.7	10.5	7.2	4.9	4.1	4.0	3.9	3.9	3.9	3.3
10	14.2	13.4	10:b	7.4	5.0	4.1	4.0	4.0	4.0	3.9	3.9
15	13.3	12.6	10.3	7.4	5.1	4.3	4.2	4.1	4:o	4.0	4.0
20	12.0	11.5	9.8	7.1		4.6	4.5	4.3	4.1	4.0	4.0
25	10:b	10.3	9.1	6.8	5.4	4.9	4.7	4.4	4.1	4.0	4.0
OCT 1	9.2	9.1	8.5	6.7	5.1	5.2	4.8	4.4	4.1	3.9	3.9
5	8.5	8.5	8.2	6.7	5.9	5.3	4.8	4.4	4.0	3.8	3.8
10	8.0	8.1	7.9	6.8	6.2	5.5	4.9	4.3	3.9	3.8	3.8
15	7.8	7.8	7.9	7.0	6.4	5.6	4.9	4.3	3.9	3.8	3.8
20	7.7	7.7	7.8	7.2	6.6	5.7	5.0	4.5	4.1	3.9	3.9
25	7.6	7.6	7.6	7.2	6.7	5.8	5.2	4.7	4.7	4.1	4.1
NOV 1	7.2	7.2	7.2	7.0	6.5	5.8	5.4	5.0	4.7	4.5	4.i
5	6.8	6.8	6.8	6.7	6.3	5.8	5.4	5.2	4.9	4.1	4.6
10	6.3	6.2	6.2	6.2	5.9	5.6	5.4	5.2	5.0	4.8	4.7
15	5.7	5.7	5.6	5.6	5.5	5.3	5.2	5.1	5.0	4.8	4.7
20	5.1	5.1	5.1	5.1	5.1	5.1	5.0	5.0	4.9	4.8	4.7
25	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.7	4.6	4.6
DEC 1	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
5	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
10	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
15	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
20	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.1	4.1	4.0
25	3.8	3.8	3.8	3.8	3.9	3.9	3.9	3.9	4.0	3.9	3.9
JAN 1	3.4	3.4	3.5	3.5	3.6	3.6	3.7	3.7	3.7	3.7	3.7
5	3.2	3.2	3.2	3.3	3.3	3.4	3.4	3.4	3.5	3.5	3.5
10	2.9	2.9	3.0	3.0	3.0	3.1	3.1	3.1	3.2	3.2	3.3
15	2.7	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.9	3.0	3.1
20	2.5		2.5	2.5	2.5	2.6	2.6	2.6	2.7	2.8	2.9
25	2.4	f-2	2.4	2.4	2.4	2.4	2.4	2.5	2.6	2.7	2.8
FEB 1	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.5	2.6	2.6	2.8
5	2.2	2.2	2.2	2.2	2.3	2.3	2.3	2.5	2.6	2.6	2.8
10	2.0	2.0	2.0	2.1	2.2	2.2	2.2	2.4	2.5	2.5	2.7
15	1.9	1.9	1.9	1.9	2.0	2.0	2.1	2.2	2.4	2.4	2.5
20	1.7	1.7	1.7	1.7	1.8	1.8	1.8	2.0	2.1	2.2	2.3
25	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.9	2.0	2.2
MAR 1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.6	1.8	1.9	2.0
5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.6	1.7	1.9	2.0
10	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.6	1.8	1.9
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99:o	99:o	99.0	99.0	99:o	99.0	99.0	99.0

Extreme Temperatures For The Ease Period

MAX	15.8	15.0	12.6	8.0	7.3	6.2	5.4	5.2	5.0	4.B	4.8
DATE	Aug22	Aug22	Aug22	Oct18	Oct17	Oct17	Nov 2	Nov13	Nov13	Nov14	Nov14
MIN	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8
DATE	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25

99 = insufficent data for climatic analysis

Table 5k.--*Summary* of *Lake Superior, area 10, temperature climatology and* extreme *temperatures over period* of *record*

TEMPERATURE (C) CLIHATOLDGY FOR AREA 10

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	14.5	13.5	10.2	6.8	4.6	4.1	4.1	4.0	4.0	4.0	4.3
5	14.6	13.6	10.6	6.8	4.6	4.1	4.0	4.0	4.0	4.3	3.9
10	14.2	13.3	10.8	7.0	4.6	4.1	4.0	4:o	4.0	4.0	4.0
15	13.3	12.7	10.7	7.1	4.8	4.3	4.1	4.1	4.0	4.0	4.0
20	12.1	11.7	10.2	7.3	5.0	4.5	4.2	4.1	4.0	4.0	4.0
25	10.8	10.6	9.7	7.4	5.3	4.7	4.2	4.1	4.0	4.0	4.0
OCT 1	9.5	9.5	9.1	7.7	5.8	4.9	4.3	4.0	3.9	3.9	3.9
5	8.8	8.9	8.8	7.8	6.1	5.0	4.3	4.0	3.8	3.8	3.8
10	8.3	8.4	3.5	7.9	6.4	5.1	4.4	4.0	3.8	3.8	3.8
15	7.9	8.1	8.3	8.0	6.7	5.3	4.5	4.1	3.9	3.8	3.8
20	7.7	7.8	8.0	7.9	6.9	5.4	4.7	4.3	4.0	4.0	3.9
25	7.5	7.5	7.7	7.6	6.8	5.5	4.9	4.6	4.3	4.2	4.3
NO" 1	7.0	7.0	7.1	7.0	6.6	5.6	5.2	4.9	4.6	4.5	4.3
5	6.6	6.6	6.6	6.6	6.3	5.5	5.3	5.0	4.3	4.7	4.5
10	6.0	6.0	6.0	6.0	5.8	5.4	5.2	5.1	4.9	4.8	4.6
15	5.4	5.5	5.4	5.4	5.4	5.2	5.1	5.0	4.9	4.8	4.7
20	5.0	5:o	5.0	5.0	5.0	4.9	4.9	4.3	4.8	4.8	4.7
25	4.6	4.7	4.6	4.6	4.6	4.7	4.7	4.1	4.7	4.6	4.6
DEC 1	4.3	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
5	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3
10	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
15	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.0	4.0	4.1
20	3.9	3.9	3.9	3.9	3.9	3.9	4.0	3.9	3.9	3.9	3.9
25	3.7	3.7	3.7	3.7	3.7	3.8	3.8	3.8	3.8	3.8	3.8
JAN 1	3.3	3.3	3.3	3.3	3.4	3.5	3.5	3.5	3.5	3.6	3.b
5	3.1	3.1	3.1	3.1	3.2	3.2	3.3	3.3	3.4	3.4	3.4
10	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.1	3.2	3.2	3.2
15	2.6	2.6	2.6	2.6	2.7	2.7	2.3	2.8	2.9	3.0	3.1
20	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.7	2.8	2.8	2.9
25	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.6	2.7	2.9
FEB 1	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.5	2.6	2.8
5	1.9	1.9	2.0	2.1	2.1	2.2	2.3	2.4	2.5	2.6	2.8
10	1.7	1.7	1.8	1.9	2.0	2.1	2.3	2.4	2.4	2.5	2.8
15	1.5	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.7
20	1.4	1.4	1.5	1.5	1.6	1.6	1.9	2.0	2.1	2.3	2.3
25	1.3	1.3	1.4	1.4	1.4	1.4	1.7	1.9	2.0	2.2	2.4
MAR 1	1.3	1.3	1.3	1.3	1.3	1.4	1.6	1.7	1.9	2.0	2.3
5	1.3	1.3	1.3	1.3	1.3	1.3	1.5	1.6	1.8	1.9	2.2
10	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.5	1.7	1.8	2.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures for The Base Period

MAX	18.0	17.1	16.0	10.3	6.9	5.6	5.2	5.1		4.9	4.8
DATE	Aug18	Aug18	Aug18	Aug22	Dct18	Nov 2	Nov 2	Nov14	No%	Nov17	Nov17
MIN	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
DATE	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25

99 = insufficent data for climatic analysis

Table 51.--*Summary of Lake Superior, area 11, temperature climatology and extreme temperatures over period of record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 11

	LAYERS IN METERS										
	0	10	20	30	40	50	60	70	80	30	100
SEP 1	14.7	14.1	9.8	5.8	4.5	4.1	4.0	4.0	4.0	4.0	3.9
5	14.6	14.1	10.0	6.0	4.5	4.1	4.0	4.0	4.0	4.0	4.0
10	14.3	13.9	10.2	6.4	4.7	4.1	4.0	4.0	4:o	4.0	4.0
15	13.7	13.5	10.4	6.8	5.0	4.2	4.1	4.0	4.0	4.0	4.0
20	12.9	12.7	10.4	7.3	5.3	4.4	4.1	4.0	4.0	4.0	4.0
25	12.0	11.8	10.4	7.7	5.7	4.5	4.2	4.0	4.0	4.0	3.3
OCT 1	10.8	10.7	10.2	8.0	6.1	4.7	4.2	4.1	4.1	4.0	3.9
5	10.1	10.0	9.9	8.2	6.3	4.8	4.3	4.2	4.1	4.0	3.9
10	9.3	9.2	9.5	8.2	6.5	4.9	4.5	4.3	4.3	4.0	4.0
15	8.7	8.6	9.0	8.1	6.6	5.2	4.7	4.5	4.4	4.1	4.0
20	8.2	8.1	8.4	7.9	6.7	5.4	5.0	4.8	4.6	4.2	4.0
2s	7.7	7.7	7.9	7.6	6.7	5.6	5.3	5.1	4.8	4.2	4.1
NOV 1	7.1	7.1	7.1	7.0	6.4	5.8	5.6	5.4	5.0	4.4	4.2
5	6.7	6.7	6.7	6.6	6.2	5.8	5.7	5.5	5.1	4.5	4.3
10	6.1	6.1	6.1	6.0	5.9	5.6	5.6	5.4	5.1	4.5	4.4
15	5.6	5.6	5.6	5.5	5.5	5.3	5.3	5.3	5.0	4.6	4.5
20	5.1	5.1	5.1	5.1	5.1	5.0	5.0	5.0	4.8	4.5	4.5
25	4.7	4.6	4.7	4.7	4.7	4.7	4.7	4.7	4.6	4.5	4.5
DEC 1	4.3	4.3	4.4	4.4	4.3	4.4	4.4	4.4	4.4	4.4	4.4
5	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3
10	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
15	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4:o	4.0	4.0
20	3.8	3.8	3.9	3.9	3.9	3.9	3.9	3.8	3.8	3.8	3.8
25	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7	3.7
JAN 1	3.2	3.2	3.2	3.3	3.3	3.3	3.3	3.4	3.5	3.5	3.6
5	2.9	2.9	3.0	3.0	3.0	3.0	3.1	3.2	3.3	3.4	3.5
10	2.6	2.6	2.6	2.7	2.7	2.7	2.8	2.9	3.1	3.3	3.4
15	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.7	2.9	3.1	3.2
20	2.1	2.1	2.2	2.2	2.2	2.2	2.3	2.5	2.8	2.9	3.1
25	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.5	2.6	2.8	2.9
FEB 1	2.0	2.0	2.1	2.1	2.1	2.2	2.2	2.4	2.5	2.6	2.7
5	2.0	2.0	2.1	2.1	2.1	2.1	2.2	2.3	2.4	2.5	2.6
10	1.9	2.0	2.0	2.0	2:o	2.1	2.2	2.3	2.3	2.4	2.6
15	1.8	1.8	1.8	1.8	1.9	1.9	2.0	2.1	2.2	2.4	2.6
20	1.5	1.6	1.6	1.6	1.6	1.7	1.8	1.9	2.1	2.3	2.6
25	1.3	1.4	1.4	1.4	1.4	1.5	1.6	1.7	2.0	2.2	2.5
MAR 1	1.2	1.2	1.2	1.2	1.3	1.3	1.4	1.6	1.9	2.1	2.S
5	1.1	1.1	1.1	1.1	1.2	1.3	1.4	1.5	1.7	2.0	2.3
10	1.0	1.0	1.0	1.0	1.1	1.2	1.3	1.4	1.6	1.8	2.2
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.3	99.0	99.0
25	99:o	99.0	99.0	99.0	99.0	99.0	93.0	99.0	99.0	99.0	99.0
Extreme Temperatures For The Base Period											
MAX	17.0	16.3	13.5	7.9	6.4	[illegible]	[illegible]	[illegible]	5.1	[illegible]	4.6
DATE	Aug18	Aug18	dug22	Sep29	Oct18	Nov 2	Nov 2	Nov 2	Nov14	Nov17	Nov17
MIN	0.8	0.8	0.8	0.3	0.8	0.8	0.8	0.8	3.8	0.8	1.0
DATE	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25	Mar25

99 = inrufficent data for climatic analysis

Table Sm.--Summary of Lake Superior, area 12, temperature climatology and extreme temperatures over period of record

TEMPERATURE CC) CLIMATOLOGY FOR AREA 12

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	15.1	14.1	9.6	5.2	4.2	4.1	4.1	4.0	4.0	4.3	3.9
5	14.7	13.9	3.6	5.2	4.1	4.1	4.0	4.0	4.0	4.3	4.0
10	14.1	13.5	9.7	5.4	4.4	4.2	4.1	4.0	4.0	4.0	4.0
15	13.4	13.0	9.9	6.1	5.1	4.4	4.1	4.1	4.0	4.0	4.0
20	12.6	12.4	10.0	6.9	5.9	4.5	4.2	4.1	4.1	4.0	4.0
25	11.8	11.6	10.0	7.6	6.6	4.8	4.3	4.1	4.1	4.0	4.0
OCT 1	10.7	10.5	9.7	8.0	7.0	4.9	4.4	4.1	4.1	4.0	4.0
5	9.9	9.8	9.3	8.1	7.0	5.0	4.4	4.1	4.1	4.1	4.1
10	9.1	9.0	8.8	7.9	6.8	5.0	4.5	4.2	4.1	4.1	4.1
15	8.3	8.3	8.1	7.6	6.6	5.1	4.7	4.2	4.2	4.2	4.2
20	7.7	7.6	7.6	7.2	6.3	5.3	4.9	4.4	4.3	4.3	4.2
25	7.1	7.1	7.1	6.8	6.1	5.4	5.1	4.6	4.5	4.3	4.2
NOV 1	6.5	6.5	6.4	6.3	5.9	5.6	5.3	4.8	4.7	4.5	4.3
5	6.2	6.2	6.1	6.1	5.8	5.6	5.3	5.0	4.9	4.6	4.4
10	5.8	5.8	5.7	5.7	5.7	5.5	5.2	5.0	4.9	4.6	4.5
15	5.3	5.4	5.3	5.4	5.4	5.3	5.1	5.0	4.9	4.7	4.5
20	5:il	5.0	5:o	5.0	5.0	5.0	4.9	4.9	4.8		4.6
25	4.7	4.7	4.7	4.7	4.7	4.7	4.6	4.7	4.7	1::	4.5
DEC 1	4.3	4.4	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4	4.4
5	4.2	4.2	4.2	4.1	4.1	4.1	4.2	4.2	4.2	4.3	4.3
10	4.0	4.0	4.0	4.0	3.9	4.0	4:o	4.3	4.0	4.1	4.1
15	3.8	3.8	3.8	3.8	3.8	3.8	3.9	3.8	3.8	3.8	3.9
20	3.5	3.5	3.6	3.6	3.7	3.7	3.7	3.7	3.7	3.7	3.7
25	3.2	3.2	3.3	3.4	3.4	3.4	3.5	3.5	3.5	3.6	3.6
JAN 1	2.7	2.7	2.8	2.9	3.0	3.0	3.0	3.2	3.3	3.5	3.5
5	2.4	2.4	2.5	2.6	2.6	2.7	2.8	3.0	3.2	3.4	3.4
10	2.0	2.1	2.1	2.2	2.2	2.3	2.5	2.7	3.0	3.3	3.3
15	1.8	1.8	1.9	1.9	1.9	2.1	2.2	2.5	2.9	3.2	3.2
20	1.7	1.7	1.7	1.8	1.8	1.9	2.0	2.3	2.7	3.0	3.1
25	1.7	1.7	1.7	1.7	1.8	1.9	2.0	2.3	2.6	2.8	3.0
FEB 1	1.8	1.8	1.8	1.9	2.0	1.8	2.0	2.3	2.5	2.7	2.9
5	1.8	1.8	1.8	1.9	2.1	1.9	2.0	2.3	2.6	2.7	2.9
10	1.7	1.7	1.7	1.9	2.0	1.9	2.0	2.4	2.7	2.7	3.0
15	1.5	1.5	1.6	1.7	1.8	1.7	2.0	2.4	2.8	2.9	3.1
20	1.3	1.3	1.3	1.4	1.5	1.5	1.8	2.4		3.0	3.3
25	1.1	1.2	1.1	1.2	1.2	1.4	1.7	2.2	5::	3.1	3.3
MAR 1	1.1	1.1	1.1	1.1	1.2		1.6	2.1	2.6	3.0	3.3
5	1.1	1.1	1.1	1.2	1.2	1.3	1.5	2.0	2.5	2.9	3.1
10	1.1	1.1	1.1	1.1	1.2	1.2	1.4	1.8	2.3	2.7	3.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0
25	99.0	99.0	99.0	99.0	99.0	93.0	93.0	99.0	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	19.5	19.1	15.4	8.3	7.3	5.9	Nov 5.4 2	Nov 5.0 2	4.9	4.8	4.6
DATE	Aug18	Aug18	Aug18	Sep29	Sep29	Oct31			Nov15	Nov17	Nov14
MIN	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.9	2.5	2.6
DATE	Mar13	Mar13	Mar13	Mar24	Mar25	Mar25	Mar25	Mar25	Mar25	Mar31	Mar31

99 = insufficent data for climatic analysis

Table 5n.--*Summary of Lake Superior, area 13, temperature climatology and extreme temperatures over period of record*

TEMPERATURE (C) CLIMATOLOGY FOR AREA 13

LAYERS IN METERS

	0	10	20	30	40	so	60	70	80	30	100
SEP 1	14.3	12.5	8.9	5.9	5.0	99.0	99.0	99.0	99.0	99.0	99.0
5	14.1	12.9	9.9	6.4	5.3	99.0	99.0	99.0	99.0	99.3	91.0
10	13.7	13.2	10.9	7.1	5.7	99:o	99.0	99.0	99.0	99.0	99.0
15	13.2	13.0	11.4	7.6	6.2	99.0	99.0	99.0	99.0	99.0	99.0
20	12.6	12.4	11.4	8.0	6.5	99.0	99.0	99.0	99.3	99:o	99.0
25	11.8	11.7	11.0	8.3	6.9	99.0	99.0	99.0	99.0	99.0	99.0
OCT 1	10.8	10.6	10.3	8.4	7.1	6.8	99.0	99.0	99.0	99.0	99.0
5	10.1	10.0	9.8	8.3	7.2	6.6	99.0	99.0	93.0	99.0	99.0
10	9.4	9.3	9.1	8.2	7.2	6.1	99.0	99.0	99.0	99.0	99.0
15	8.7	8.6	8.5	8.0	7.1	5.7	99.0	99.0	99.0	99.0	99:o
20	8.1	8.1	8.0	7.7	7.0	5.6	99.0	99.0	99.0	99.0	99.0
2s	7.6	7.6	7.5	7.4	6.8	5.6	93.0	99.0	99.0	99.0	99.0
NOV 1	7.0	7.0	7.0	6.9	6.6	5.7	99.0	93.0	99.0	99.0	99.0
5	6.7	6.7	6.7	6.7	6.4	5.8	99.0	99.0	99.0	99.0	99.0
10	6.3	6.3	6.3	6.3	6.1	5.8	99.0	99.0	99.0	99.0	99:0
15	5.9	5.8	5.9	5.8	5.7	5.7	99.0	99.0	99.0	99.0	99.0
20	5.4	5.4	5.4	5.4	5.3	5.4	99.0	99.0	99.0	99.0	99.0
2s	5.0	5.0	5.0	5.0	5.0	5.1	99.0	99.0	99:0	99.0	99.0
DEC 1		4.5	4.5	4.5	4.6	4.6	99.0	99.0	99.0	97.0	99.0
5	1::	4.2	4.2	4.3	4.3	4.3	99.0	99.0	99.0	99.0	99.0
10	3.9	3.9	3.9	3.9	4.0	4.0	99.0	99.0	99.0	99.0	99.0
15	3.5	3.5	3.5	3.6	3.7	3.8	93:o	99.0	99.0	99.0	99.0
20	3.2	3.2	3.3	3.3	3.4	3.5	99.0	99.0	99.0	99.0	99.0
25	2.9	2.9	3.0	3.0	3.1	3.2	99.0	99.0	99.0	99.0	99.0
JAN 1	2.5	2.5	2.6	2.6	2.6	2.7	99.0	99.0	99.0	99.0	99.0
5	2.3	2.3	2.3	2.3	2.3	2.5	99.0	99.0	99.0	99.0	99.0
10	2.0	2.0	2.1	2.1	2.1	2.2	99.0	99.0	99.0	99:o	99.0
15	1.7	1.7	1.8	1.8	1.9	2.0	99:0	99.0	99.0	99.0	99.0
20	1.4	1.4	1.5	1.6	1.9	2.0	99.0	99.0	99.0	99.0	99.0
25	1.2	1.2	1.3	1.5	1.9	2.1	99.0	99.0	99.0	99:o	99.0
FEB 1	1.0	1.0	1.0	1.4	2.0	2.4	99.0	99.0	99.0	99.0	93.0
5	0.9	0.9	1.0	1.3	2.0	2.5	99.0	99.0	99.0	99.0	99.0
10	0.9	0.8	0.9	1.3	1.9	2.4	99.0	99.0	99.0	99.0	99.0
15	0.8	0.8	0.9	1.2	1.6	2.1	99.0	99.0	99.0	99.0	99.0
20	0.8	0.9	0.9	1.1	1.3	1.6	99.0	99:o	99.0	99.0	99.0
25	0.8	0.9	0.9	1.0	1.0	1.2	99.0	99.0	99.0	99.0	99.0
MAR 1	0.8	0.8	0.8	0.9	0.9	1.0	99.0	97.0	99.0	99.0	99.0
5	0.8	0.8	0.8	0.9	0.9	1.0	9'3.0	99.0	99.0	99.0	99.0
10	0.7	0.7	0.7	0.8	0.8	0.9	97.0	99.0	99.0	99:o	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	93.3	99.0	99:o	99.0	99.0
20	99.0	99.0	99.0	99.0	99.(99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99:o	99:o	99.(99.0	99.0	99.0	99.0	99:o	99.0

Extreme Temperatures For The Bass Period

MAX	20.0	15.8	11.3	8.5	7.2	7.0	6.0	5.5	4.8	4.8	4.8
DATE	Aug18	Aug18	Sep11	Sep29	Sep29	Sep29	Oct31	Nov14	Nov14	Nov14	Nov14
MIN	0.7	0.7	0.7	0.7	0.8	0.8	0.9	1.1	1.1	1.1	1.1
DATE	Feb20	Mar12	Mar12	Mar12	Mar12	Mar12	Mar12	Mar25	Mar25	Hat-25	Mar25

99 = insufficent date for climatic analysis

Table 5o.--*Summary of Lake Superior, area 14, temperature climatology and extreme temperatures* **over period of record**

TEMPERATURE (C) CLIMATOLOGY FOR AREA 14

LAYERS IN METERS

	0	10	20	30	CO	50	60	70	80	90	100
SEP 1	99.0	99.0	99.0	99.0	99.0	93.0	99.0	99.0	93.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99:o	99.0	99.0	99.0
OCT 1	10.3	10.2	3.7	7.0	5.5	4.6	4.3	4.2	4.1	4.0	4.0
5	9.9	9.9	9.3	7.2	5.9	5.2	4.8	4.5	4.3	4.2	4.1
10	9.4	9.3	8.9	7.5	6.5	5.8	5.3	4.9	4.6	4.3	4.2
15	a.7	8.7	8.3	7.6	6.7	6.2	5.5	4.9	4.6	4.3	4.2
20	8.1	8.1	7.8	7:s	6.7	6.2	5.6	4.9	4.6	4: 3	4.2
25	7.6	7.5	7.4	7.3	6.5	6.1	5.5	4.9	4.5	4.3	4.2
NOV 1	6.9	6.9	6.8	6.7	6.2	5.8	5.4	5.0	4.1	4.5	4.3
5	6.4	6.4	6.4	6.3	5.9	5.6	5.3	5.0	4.8	4.6	4.4
10	5.9	5.9	5.9	5.8	5.6	5.3	5.1	5.0	4.8	4.7	4.6
15	5.3	5.3	5.3	5.3	5.2	5.1	5.0	4.9	4.8	4.7	4.6
20	4.9	4.9	4.8	4.8	4.8	4.8	4.8	4.8	4.7	4.1	4.6
25	4.5	4.5	4.5	4.5	4.5	4.6	4:h	4.6	4.6	4.6	4.5
DEC 1	4.3	4.3	4.3	4.3	4.3	4.4	4.4	4.4	4.4	4.4	4.4
5	4.2	4.2	4.2	4.2	4.2	4.3	4.3	4.3	4.3	4.3	4.3
10	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.2	4.2	4.2
15	3.9	3.9	3.9	3.9	3.9	4.0	4.0	4.0	4:o	4.0	4.1
20	3.7	3.7	3.7	3.7	3.7	3.8	3.5	3.8	3.9	3.9	4.0
25	3.4	3. 4	3.4	3.5	3.5	3.6	3.6	3.7	3.7	3.7	3.3
JAN 1	2.3	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.5	3.6	3.6
5	2.7	2.7	2.8	2.8	3.0	3.1	3.2	3.3	3.4	3.5	3.5
10	2.4	2.4	2.5	2.6	2.7	2.9	3.0	3.2	3.3	3.3	3.4
15	2.2	2.2	2.2	2.3	2.5	2.7	2.7	2.9	3.1	3.1	3.2
20	2.0	2.0	2.0	2.1	2.3	2.4	2.5	2.7	2.8	2.9	3.0
25	2.0	2.0	2.0	2.1	2.2	2.3	2.3	2.5	2:b	2.8	2.9
FEE 1	2.0	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.5	2.7	2.9
5	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.7	2.9
10	1.7	1.8	1.8	2.0	2.2	2.2	2.3	2.4	2.6	2.8	3.0
15	1.3	1.5	1.5	1.6	1.8	1.9	2.0	2.3	2.6	2.8	3.1
20	1.2	1.4	1.3	1.5	1.7	1.9	2.0	2.2	2.7	2.9	3.1
25	99:o	99:o	99:o	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0
WAR 1	99.0	93.0	93.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:a	99.0	99.0
20	99.0	93.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0
25	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	15.0	13.3	13.0	7777	6-8.9	6-56.55.8		5.1	4.9	4.8	4.7
DATE	Aug22	Au322	Sep29	Oct18	Oct13	Oct18	Oct18	Oct18	Nov11	Nov16	Dec17
MIN	0.8	0.8	0.8	0.8	1.0	1.3	1.9	2.2	2.4	2.7	2.8
DATE	Mar12	Mar12	Mar12	Mar12	Mar12	Mar12	Feb21	Feb21	Jan31	Jan31	Jan30

93 = insufficent data for climatic analysis

Table 5p.--*Summary* of *Lake Superior,* **area 15, temperature** *climatology and extreme temperatures* **over** *period* **of record**

TEMPERATURE (C) CLIMATOLOGY FOR AREA 15

LAYERS IN METERS

	0	10	20	30	40	50	60	70	80	90	100
SEP 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	93:o	99.0	99:o	99.0	99.0	99.0	59.0	99:0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0	93.0
20	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0
OCT 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	9 . 0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99:o	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99:o	93.0	99.0	99.0	99.0	99.0	93.0
20	99.0	99.0	99.0	93:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99:o	93.0	99.0	93.0	99.0	99.0	93:o	99.0	99.0	99.0	93.0
NOV 1	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99:o	99.0	99:o	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
20	99.0	99:o	99.0	99.0	99.0	99:o	99.0	99.0	93:o	99.0	99.0
25	99:o	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0
DEC 1	99.0	99.0	93.0	99.0	99.0	99.0	99.0	99.3	93.0	99.0	99.0
5	99.0	99. 0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	99.0	99.0	93.0	99:o	99:o	93:o	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	93:o
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99.0	99.0	99.0	99.0	99:o	99:o	99:o	99.0	93:o	99.0	99.0
JAN 1	99.0	93.0	99.0	99.0	99.0	09.0	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.3	99.0
10	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
15	99:o	99.0	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99:o
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	'33.0
25	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99.0	93.0
FEB 1	99.0	99.0	93.0	99.0	99.0	99.3	99.0	99.0	99.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	93.0
10	99:o	99.0	99.0	99:o	93:o	99.0	99.0	99:o	99.0	99.0	99.0
15	99.0	99.0	99.0	99.0	99.0	99:o	99.0	99.0	99:o	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
25	99:b	99:o	99.0	93:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0
MAR 1	99.0	99.0	99.0	93.0	99.0	99.0	99.0	99.0	93.0	99.0	99.0
5	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
10	99.0	93:o	99.0	99.0	99:o	99.0	99:o	99.0	99.0	99.0	99.0
15	99.0	99.0	99.0	99:o	99.0	99.0	99.0	99.0	93.0	99.0	99.0
20	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99:o	99.0
25	99.0	99:o	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0

Extreme Temperatures For The Base Period

MAX	16.8	15.5	12.1	8.1	8.1	7.9	7.7	7.4	7.0	6.2	5.5
DATE	Sep 8	Sep 8	Sep a	Oct31	Oct31	Oct31	Oct31	Oct31	Oct31	Nov 1	Nov18
MIN	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
DATE	....	....	....	....	....	....	....	....	....	....	....

93 = **insufficent** data for climatic analysis

Table ba.--Fourier **coefficients for** *Lake Superior.*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	236	435
1	236	435
2	236	435
3	236	435
4	236	435
5	236	435
6	236	435
7	236	435
8	236	435
9	236	435
10	236	435

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	24.76658630	18.51961517	-21.77382088	-39.38548279	-41.84466553	A0
A1						
A2	-33.81136322 15.84580653	-23.84144020 11.29031944	-21.16004131 41.55287552	-36.44079634 70.50527454	-37.50537109 74.09924316	A1A2
43	-3.44150066			6.43415689	6.08348456	A3
A4	-0.76299965	0.31889820	4.85657787	5.38559580	5.88643340	A4
A5	0.51081250	-0.08588907	-3.62040973	-4.42294148	-4.48620539	A5
A6						
B1	10.05313969 0.52123177	0.19124340 5.11932707	-26.73670197 1.09123218	-38.59841156 1.29590881	-40.19434357 1.35421881	A6B1
B2	-18.35'393631	-11.69046525	31.30505888	47.97017470	50.58193588	B2
B3	14.44582157	9.41329224	-22.52450104	-34.18615723	-33.42763901	03
B4						
B5	-7.29336647 2.39165187	-4.92941284 1.74015706	-2.47022436 10.37827396	-4.60707235 17.25377044	-4.85963345 18.33134270	04 B5
B6	-0.56918430	-0.49505359	0.00100810	3.29922984	0.31577113	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-54.56447054	-45.18490601	-47.77088165	-43.45783615	-44.81117630	-35.78425598	A0
A1	93.78585760	78.49959564	82.85614777	84.02552032	78.71434200	64.28973389	Al
A2	-45.28336633	-37.60743168	-40.10247421	-40.74255753	-39.39791107	-32.40534851	A2
A3	5.22540283	4.05519104	5.03084758	5.40364313	6.83352339	4.36838531	A3
A4	3.06329727	7.88213968	7.30784845	7.40897589	5.89328623	4.26435075	A4
A5							
A6	-6.65152025 1.86520565	-5.83599901 1.67734981	-6.32571058 1.74273855	-5.93786526 1.43467233	-5.09306574 1.48324203	-3.94883440 1.16917586	A5A6
81	-51.84462738	-43.60382197	-45.17461777	-45.40019224	-41.09190369	-33.01361465	B1
	66.37519836	55.77169800	58.36450958	59.92199324	53.73557443	43.14246414	B2
B4							
B2							
B3	-40.34945413 -5.75580910 23.03519050 0.33315272	-42.05352020 -4.75898238 19.34920120 0.22389054	-44.20987756 -5.17071048 20.47100449 0.35481750	-44.57690811 -5.28280880 20.61339569 0.41723079	-41.23927744 -5.32943305 19.59024700 0.55480449	-33.40497071 -4.49275975 16.00014455 0.58046855	03945586

********** = insufficient data for climatic analysis

Table 6b.--*Fourier coefficients* for *Lake Superior, area 2*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	235	435
1	235	435
2	235	435
3	235	435
4	0	0
5	0	0
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	8.91962624	-23.84006310	-14.65899086	-16.07092094	**********	A0
A1	-7.29423809	45.29205322	32.72492981	37.48781967	**********	A1
A2	0.53015012	-24.21367073	-23.13047218	-30.83953857	**********	A2
A3	0.61345053	3.11301637	9.70458984	17.96404839	**********	A3
A4	0.43370863	5.47637987	-1.08145523	-6.49356890	**********	A4
A5	-0.94342202	-4.34022903	-1.19640374	0.77891725	**********	A5
A6	0.58307409	1.39622056	0.73329473	0.35530525	**********	A6
B1	-2.95283175	-31.17180824	-16.76707758	-11.00874233	**********	B1
B2	-1.36186337	36.34962082	18.88589668	13.26663494	**********	B2
B3	0.56296760	-27.36673164	-16.94207573	-15.44185352	**********	B3
B4	0.06262697	12.91835747	10.03368197	11.66404915	**********	B4
B5	0.10429153	-3.16382647	-3.37727427	-5.13648653	**********	B5
B6	-0.25844908	0.06855557	0.31500378	0.95467436	**********	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	**********	**********	**********	**********	**********	**********	A0
A1	**********	**********	**********	**********	**********	**********	A1
A2	**********	**********	**********	**********	**********	**********	A2
A3	**********	**********	**********	**********	**********	**********	A3
A4	**********	**********	**********	**********	**********	**********	A4
A5	**********	**********	**********	**********	**********	**********	A5
A6	**********	**********	**********	**********	**********	**********	A6
B1	**********	**********	**********	**********	**********	**********	B1
B2	**********	**********	**********	**********	**********	**********	B2
B3	**********	**********	**********	**********	**********	**********	B3
B4	**********	**********	**********	**********	**********	**********	B4
B5	**********	**********	**********	**********	**********	**********	B5
B6	**********	**********	**********	**********	**********	**********	B6

********** = insufficient data for climatic analysis

Table 6c.- *Fourier coefficients for Lake Superior, area 3*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	235	435
1	235	435
2	235	435
3	235	435
4	235	435
5	235	435
6	235	435
7	235	435
8	235	435
9	235	435
10	235	435

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	18.83084488	73.31911469	34.24210739	27.04144478	46.34558868	A0
A1	-21.22363853	-109.47563171	-46.17294693	-33.48530579	-66.68305969	A1
A2	3.97830057	47.15623474	16.02353859	7.33915472	27.92657661	A2
A3	5.89631987	-0.17739248	4.68410015	9.51554298	1.50970674	A3
A4	-5.38392019	-12.97866154	-8.19599724	-10.44098091	-9.51884747	A4
A5	1.82824349	7.51802540	3.91073823	4.69454432	5.42002821	A5
A6	-0.06097636	-1.51340902	-0.61314213	-0.76128042	-1.08339691	A6
B1	11.13013268	57.94110870	26.55831718	24.41495895	37.85163498	B1
B2	-17.55762482	-79.96739197	-37.65958405	-33.77935791	-52.41913986	B2
B3	11.16983128	57.21664429	25.43269920	21.16366005	36.32711029	B3
B4	-3.28198171	-24.14724159	-9.33885384	-6.20766973	-14.41432190	B4
B5	0.01117906	5.31874371	1.38613927	-0.04693112	2.85655975	B5
B6	0.13934945	-0.36559889	0.04970869	0.38421050	-0.18435699	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	29.99214745	-1.15658236	-20.57158279	-49.31543350	-59.80339432	-64.01114655	A0
A1	-42.37430954	7.52982378	38.73179626	85.50222778	101.93798065	108.23337555	A1
A2	20.70767593	-2.71242356	-17.61960220	-41.09194183	-47.87172318	-49.70256042	A2
A3	-3.02075481	-0.76462036	0.99798000	5.16657972	4.63046265	3.39052820	A3
A4	-3.15027618	2.01323592	4.98648500	8.29945946	10.79832935	12.41801739	A4
A5	2.13918757	-1.55433214	-3.69625044	-6.50128269	-7.87132645	-8.56086254	A5
A6	-0.33522576	0.63847315	1.17862940	1.95392847	2.20378757	2.27433467	A6
B1	20.48757935	-6.44516277	-23.00908661	-46.68775177	-56.44785690	-60.93557358	B1
B2	-30.01675224	6.31018496	28.67255020	60.77796555	73.65187073	79.33882904	B2
B3	21.32727814	-5.55957985	-22.10729027	-46.30586243	-55.19340240	-58.75737762	B3
B4	-9.21343327	2.85110092	10.32250535	21.73131371	25.20651627	26.20872688	B4
B5	2.44743037	-0.59193379	-2.49762535	-5.68938971	-6.21996498	-6.09158993	B5
B6	-0.41979495	-0.10126462	0.08860753	0.50811470	0.41436347	0.26818803	B6

********** = insufficient data for climatic analysis

Table 6d.--*Fourier coefficients for Lake Superior, area 4*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	235	434
1	235	436
2	235	436
3	235	436
4	235	436
5	235	436
6	235	436
7	235	436
8	235	436
9	235	436
10	235	436

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	40.36167526	8.47301464	-36.31089020	-37.04338120	39.26227951	A0
A1	-58.94603012	-6.64305305	64.69580078	46.63764479	-54.39180374	A1
A2	28.91857910	4.69330502	-30.57697868	-33.29916000	25.31809425	A2
A3	-5.47183139	-3.73650551	1.83059692	4.79529047	-0.97382176	A3
A4	-3.32319078	2.73473406	8.23290348	6.00016022	-6.95379440	A4
A5	2.48614345	-1.13517155	-5.36117953	-4.28761673	4.79394531	A5
A6	-0.60010505	0.32912330	1.40337494	1.12099230	-1.19690524	A6
B1	23.79023552	-5.00930071	-41.00474548	-37.97965422	29.83947182	B1
B2	-36.80114345	1.74692915	50.31920242	46.97104525	-43.05344391	B2
B3	2v.28652131	0.58739811	-34.04549799	-34.28676224	31.58146667	B3
B4	-14.52523422	-1.34019446	15.96969174	15.79754029	-13.82809258	84
B5	4.40966749	0.95723152	-3.83810353	-4.10102558	3.39165711	85
B6	-0.77503198	-0.39991045	0.19721693	0.30078867	-0.44229520	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	41.63473614	25.74055039	14.20420456	-29.65330505	-34.01308060	-41.84402737	A0
A1	-61.45373535	-43.94132614	-17.31585388	53.90924835	41.26049042	74.07479858	A1
A2	30.28154853	20.90600204	8.23780823	-26.42181778	-30.54711388	-37.18545914	A2
A3	-4.38422394	-3.73085451	-0.71115404	4.29425097	5.50281342	4.90652466	A3
A4	-5.33353142	-2.97693396	-1.77129626	4.32170296	4.57333755	5.31900358	A4
A5	4.18398333	2.51084518	1.18111670	-3.57021141	-3.95623970	-4.44510666	A5
A6	-1.01722550	-0.58821660	-0.21224897	1.07374632	1.19349042	1.37816811	A6
B1	30.52006912	19.36146355	8.02803707	-28.98334122	-32.16590981	-38.43380356	81
B2	-43.94836426	-28.90393982	-13.07734203	36.14853256	41.41302237	30.26140976	02
B3	32.70022583	21.47519438	9.21015358	-28.32345417	-32.12363815	-38.71434021	83
B4	-15.08920097	-10.13277245	-4.07464314	13.30109978	15.28492055	18.43908691	B4
B5	4.18193434	2.99339461	1.14485977	-3.50840378	-4.15432439	-5.07611561	85
B6	-0.66124847	-0.55334621	-0.28419736	0.29669404	0.40395334	0.54578733	B6

********** = insufficient data for climatic analysis

Table 6e.- *Fourier coefficients for Lake Superior, area 5*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	235	436
1	235	436
2	235	436
3	235	436
4	235	436
5	235	436
6	235	436
7	235	436
8	235	436
9	235	436
10	235	436

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	21.44282722	13.32893467	-20.56180191	-80.42938995	-72.85961914	A0
A1	-29.15867043	-16.46318054	38.84122086	136.25251770	123.53651428	A1
A2	16.14832306	10.93860149	-17.21207047	-66.20088196	-59.19280624	A2
A3	-6.02284145	-6.54979038	-0.94638729	8.18828869	6.50807858	A3
A4	1.16082275	3.24284291	6.41874075	12.40507317	11.74309826	A4
A5	0.11610146	-1.08482802	-3.81443906	-8.68650627	-8.04395580	A5
A6	-0.05949771	0.21845199	0.91944653	2.13765836	1.96996212	A6
B1	6.61463070	-0.80357665	-26.78362656	-74.83641052	-68.31589508	B1
B2	-13.98452663	-4.10028458	31.12686920	96.27419281	88.05634308	B2
B3	13.01325417	5.73084307	-21.10178947	-70.70397186	-65.04000854	B3
B4	-7.74065971	-4.44289732	8.40795326	32.15217590	29.71861267	B4
B5	3.07458973	2.24265313	-1.38507807	-8.05819035	-7.46840429	B5
B6	-0.70278114	-0.62092483	-0.16693756	0.65876305	0.61387146	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-41.23606873	-29.05302620	-39.16365433	46.35275650	-34.08199692	-32.85204315	A0
A1	72.45747375	52.27677536	68.28990936	80.41081238	60.93349457	58.81739807	A1
A2	-34.73572159	-24.00303459	-31.17831421	-38.25432968	-29.74088860	-28.47373962	A2
A3	3.97909880	1.60280824	1.96877229	4.43720341	4.60214472	4.13673115	A3
A4	-6.73466873	5.71564627	7.67812490	7.70268345	4.97907972	5.04892111	A4
A5	4.72627497	-3.83953905	-5.23002911	-5.71013021	-4.01537943	-3.96008182	A5
A6	1.21236277	1.00644898	1.36122513	1.52275109	1.07485807	1.03461051	A6
B1	-40.19775391	30.11646271	-39.03384781	-43.99231339	-32.60940170	-31.69030571	B1
B2	51.02529144	37.64253998	49.77157593	56.98682022	42.09063721	40.90365219	B2
B3	-37.93565369	-27.78266335	-36.76356125	-42.71241760	-31.94296265	-30.89431953	B3
B4	17.31324005	12.29181576	16.23620415	19.42412949	14.81389523	14.20080185	B4
B5	-4.20864344	-2.69339657	-3.66185927	-4.75416660	-3.84947109	-3.60980320	B5
B6	0.27722701	0.07117999	0.18907164	0.37386891	0.37467450	0.29771551	B6

********** = insufficient tic analysis

Table 6f. *-Fourier coefficients for Lake Superior area 6*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last		LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
0	235	436	A0	61.57213593	61.18663025	50.91439056	-95.70881653	-37.41773605	A0
1	235	436	A1	-93.37320709	-93.07879639	-76.15796661	161.65780640	67.97135925	A1
2	235	436	A2	45.38118744	45.00040054	37.09918213	-80.47640991	-36.43484116	A2
3	235	436	A3	-7.51679945	-8.63572025	-6.63675451	12.18170643	8.49648571	A3
4	235	436	A4	-6.39551258	-5.46839571	-4.55208540	13.31065369	3.20731974	A4
5	235	436	A5	5.00524139	4.56507874	3.63538432	-10.09485340	-3.29834604	A5
6	235	436	A6	-1.26156437	-1.15763700	-0.88441944	2.61135530	0.94573045	A6
7	235	436	B1	41.63692474	41.32966995	34.76831055	-86.98863220	-34.63690948	B1
8	235	436	B2	-60.36487579	-60.00096833	-50.89748001	113.20840454	44.11440277	B2
9	235	436	B3	46.80982590	46.62586594	39.42051697	-84.14442444	-33.88244629	B3
10	235	436	B4	-22.57386780	-22.55921173	-18.85072136	39.23463821	16.87303925	B4
			B5	6.55276060	6.58498287	5.37768412	-10.50653553	-4.99459076	B5
			B6	-1.00573902	-1.01559103	-0.82144994	1.04749012	0.54822689	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-14.49202919	-36.17302322	-33.36683655	-37.31308365	-37.71138382	-38.29011917	A0
A1	30.07748604	63.19944763	58.81093216	65.79827118	66.90396118	67.89110565	A1
A2	-16.37618446	-28.19568443	-26.49170876	-31.24922371	-32.89091110	-33.38322067	A2
A3	4.01451015	0.49807474	0.94978744	3.30884218	5.04507160	5.08483744	A3
A4	1.22774422	8.09536552	7.21393394	6.59653616	5.50027990	5.70534658	A4
A5	-1.46701288	-5.30017471	-4.90829039	-4.96514368	-4.57254076	-4.69977522	A5
A6	0.48282382	1.43263316	1.35918701	1.39700496	1.29889405	1.28543973	A6
B1	-15.80298710	-37.56353378	-34.53254700	-36.51223373	-35.73176193	-36.07121277	B1
B2	18.98660660	47.47815323	43.82957840	47.14064026	46.49088669	47.16881180	B2
B3	-14.96527767	-34.74901581	-32.33948898	-35.42460632	-35.38689041	-35.87187576	B3
B4	7.74243116	15.36119652	14.41554832	16.28108406	16.66967010	16.79016685	B4
B5	-2.33470654	-3.43669128	-3.31243920	-4.08444548	-4.47252750	-4.39223671	B5
B6	0.19043222	0.07440158	0.12235256	0.30746415	0.47308198	0.40576714	B6

********** = insufficient data for climatic analysis

Table 6g. -*Fourier coefficients for Lake Superior, area 7*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last		LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
0	235	436	A0	100.39714813	60.50227356	-57.14565659	-67.84038544	-121.41586304	A0
1	235	436	A1	-154.37451172	-89.92011261	100.51877594	118.27193451	203.26441956	A1
2	235	436	A2	69.82702637	38.54816437	-54.63709641	-64.16326141	-101.93442535	A2
3	235	436	A3	-4.69241095	-0.42991433	13.20384026	15.78884315	16.77886963	A3
4	235	436	A4	-16.60964203	-11.15048504	4.29059076	4.82330942	15.25169277	A4
5	235	436	A5	10.99820709	7.03800726	-4.46067429	-5.25886202	-11.82091141	A5
6	235	436	A6	-2.52020993	-1.63024533	1.26248562	1.52202213	3.06269884	A6
7	235	436	B1	73.23544257	44.50422287	-54.05119705	-60.03020477	-107.65267181	B1
8	235	436	B2	-109.59480236	-64.24996948	68.33593750	76.97245026	140.40484619	B2
9	235	436	B3	80.89699554	46.90915680	-52.53153610	-59.64099503	-105.87646484	B3
10	235	436	B4	-36.11031723	-20.24524879	26.16054916	29.93280411	50.04941177	B4
			B5	8.66285038	4.39162016	-8.09173107	-9.31210899	-13.83926582	B5
			B6	-0.63111162	-0.14157337	1.26208174	1.43670654	1.68863451	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-109.99922180	-72.72015381	-57.36291504	-33.13101959	-58.18912125	-97.16348267	A0
A1	183.70642090	123.29698944	98.41690826	59.39190674	100.28882599	162.31211853	A1
A2	-90.09184265	-60.39563370	-48.10767365	-29.44707108	-50.19961166	-78.22624207	A2
A3	12.48430061	8.24808121	6.57493019	4.68264914	8.67936897	9.76856232	A3
A4	15.71111679	10.52567959	8.22486687	4.28545475	7.13363600	14.98598099	A4
A5	-11.61765480	-7.79341602	-6.13707399	-3.51516128	-6.14791918	-11.54392529	A5
A6	2.97726703	2.00771499	1.56104350	0.91403604	1.71391404	3.18384576	A6
B1	-98.97986658	-66.94519806	-53.55826950	-32.18755341	-52.59075546	-87.54386139	B1
B2	128.88414001	86.18097687	68.41365814	40.25298691	68.31951141	115.32896423	B2
B3	-96.72408295	-64.99991760	-51.51275635	-30.68908310	-52.21390533	-86.79326630	B3
B4	44.99790192	30.19110489	23.87241936	14.37731171	24.71876144	39.99835968	B4
B5	-11.90398121	-7.91255569	-6.18752813	-3.79920578	-6.77449465	-10.41459846	B5
B6	1.23359215	0.76290256	0.58043190	0.39233920	0.82255578	1.13889480	B6

********** = data for climatic analysis

Table 6h.--*Fourier coefficients for Lake Superior, area 8*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	235	418
1	235	418
2	235	418
3	235	418
4	235	418
5	235	418
6	235	418
7	235	418
8	235	418
9	235	418
10	235	418

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	270.54858398	162.24453735	-152.34400940	-303.38424683	-491.64642334	A0
A1	-405.27297974	-242.29341125	231.97117615	457.00283813	733.95599365	A1
A2	146.28187561	90.41709137	-73.89193726	-146.40457153	-227.99266052	A2
A3	27.87801361	13.06004524	-23.15517807	-53.38080597	-93.49417114	A3
A4	-58.28315735	-33.13022232	33.10591507	75.71360779	125.65817261	A4
A5	27.04101617	16.06649209	-15.53050137	-30.81321144	-50.74519730	A5
A6	-4.75452232	-2.92662597	2.29550140	4.76932192	7.81735611	A6
B1	253.52729797	145.62475586	-166.40031433	-319.79696655	-515.55731201	B1
B2	-313.13119507	-135.29315186	195.35699463	379.17739868	614.50689697	B2
B3	204.37995911	121.87226868	-117.27451324	-229.11944580	-369.39227295	B3
B4	-72.14266205	-44.38205338	36.09642029	71.47567749	113.21215820	B4
B5	10.71487045					
B6	0.39170834	7.24564362 0.04510447	-2.79363238 -0.95103284	-1.61319697 -6.28008223	-0.75237274 -2.91235018	B5 B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-311.27780151	-22.94997679	-4.38949347	48.70906067	85.64144135	95.84266663	A0
A1	457.65875244	41.04496364	30.12511635	-44.76440811	-95.38720703	-115.74978630	A1
A2	-123.78290558	-16.53890300	-47.18801498	-31.89124298	-26.15242004	-7.14817381	A2
A3	-77.61375427	-1.06524706	36.04315567	54.29747772	71.07567596	60.15987396	A3
A4	86.00009155	5.13280964	-10.43527031	-27.08200455	-39.57563782	-37.87441254	A4
A5	-31.83303070	-2.84378016	-2.57789135	2.88952661	6.27885246	7.99856663	A5
A6	4.40931416	0.32914490	2.05054426	1.49359465	1.27153063	0.40859386	A6
B1	-339.65945435	-26.77874374	14.32981014	74.51873016	120.11267853	121.73282623	B1
B2	396.03918457	33.90594864	-1.96053755	-70.70082092	-120.38538361	-128.13905334	B2
B3	-227.79022217	-21.36824608	-22.37701939	14.46064281	38.15139389	50.76342773	B3
B4	62.01952744	3.36537933	24.45203731	16.76028824	13.92738438	3.96782398	B4
B5	-0.77958262	-1.39400339	-10.86460475	-12.29132366	-14.22187710	-10.38628292	B5
B6	-2.67579572	0.08352570	1.78628314	2.57937152	3.20840645	2.68611383	B6

********** = insufficient data for climatic analysis

Table 61.--*Fourier coefficients for Luke Superior, area 3*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	236	436
1	236	436
2	236	436
3	236	436
4	236	436
5	236	436
6	236	436
7	236	436
8	236	436
9	236	436
10	236	436

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	86.36181641	73.38608551	48.25781631	31.05276299	-39.95487976	A0
A1	-140.28582764	-118.57376532	-76.16941833	-47.99109268	69.51395416	A1
A2	83.57275391	71.36315155	46.65000153	31.92997131	-31.55961037	A2
A3	-32.14319717	-23.37742805	-19.71061707	-15.82475471	0.83900404	A3
A4	4.90332031	5.06795821	4.37109947	5.04612827	8.95796585	A4
A5	1.76629041	1.11427546	0.30759673	-0.68607670	-5.81319046	A5
A6	-0.67346799	-0.47796899	-0.18883257	0.12288930	1.64115953	A6
B1	43.73468781	39.67417145	24.18556023	12.83245136	-41.26199341	01
B2	-74.27088165	-61.64235637	-39.64269638	-23.43648720	51.63403320	B2
B3	63.02529526	52.87699509	34.63129425	21.43686867	-37.93911743	83
B4	-35.61400223	-30.26556396	-20.22676277	-13.46018791	16.78244591	B4
B5	13.43233204	11.65107346	8.13071346	6.08773899	-3.45945716	B5
B6	-2.87720990	-2.58046259	-1.96267807	-1.68283439	-0.19001186	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-82.46100616	-96.24395752	-109.46560669	-93.97708893	-76.05541992	-68.32305908	A0
A1	133.69236755	161.95130310	183.16476440	157.90261841	128.91642761	114.20433807	Al
A2	-69.21003723	-79.84907532	-90.06740570	-77.30246735	-63.23421478	-56.51210403	A2
A3	10.52363777	11.83693600	13.05041122	10.88474083	9.12853336	7.68725109	A3
A4	11.73511927	14.00128555	16.13821993	14.26082993	11.51176071	10.65921171	A4
A5	-9.26784932	-11.05741024	-12.73386288	-11.27277374	-9.18270779	-8.33466816	A5
A6	2.67298436	3.16964483	3.62391400	3.23344254	2.63537979	2.34377670	A6
B1	-73.91564178	-85.51503754	-96.71839905	-83.69300079	-68.23723602	-61.98508072	B1
B2	97.05820465	112.98857117	128.45419312	111.11408997	90.50542395	81.98898315	82
B3	-73.75885010	-85.78172302	-97.42957306	-84.30104065	-68.83110809	-62.03621292	B3
B4	34.87580109	40.37382889	45.68578720	39.43140411	32.21903610	28.81750107	B4
B5	-9.19276333	-10.64558933	-12.00253827	-10.30779552	-8.46802807	-7.47586012	B5
B6	0.77748799	0.96699482	1.10130322	0.92589110	0.77585649	0.67054027	B6

********** = insufficient data for climatic analysis

Table 6j.- *Fourier coefficients for Lake Superior, area 10*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last
0	236	436
1	236	436
2	236	436
3	236	436
4	236	436
5	236	436
6	236	436
7	236	436
8	236	436
9	236	436
10	236	436

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A_0	79.96036530	68.77119446	54.26699829	-19.59624481	-32.87990189	A0
A_1	-130.06440735	-110.95011902	-86.44329071	35.30549622	56.62179184	A1
A_2	78.36523438	66.78221893	52.50311661	-12.14565563	-22.47407341	A2
A_3	-31.02628136	-26.55663300	-21.52089310	-5.48355436	-3.66544533	A3
A_4	5.28259563	4.60132027	4.06760740	3.47582150	9.86497879	A4
A_5	1.64184797	1.41716051	1.09371281	-3.94060135	-5.21261024	A5
A_6	-0.79186660	-0.70016414	-0.59318012	0.78513116	1.17798913	A6
B_1	43.45811452	36.51489258	28.37259102	-27.62209892	-37.35258484	B1
B_2	-67.43399048	-57.53153569	-45.93946457	31.16843796	45.14764404	B2
B_3	59.10928345	49.75661469	40.07208252	-20.23812103	-31.44594002	B3
B_4	-33.43978882	-28.67600632	-23.22117615	6.93005705	12.40118217	B4
B_5	12.78207111	10.99057865	9.03275490	-0.04390672	-1.55853152	B5
B_6	-2.72471495	-2.36949182	-2.03690314	-0.79966474	-0.60811156	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-75.23722076	-63.47315488	-53.51045990	-51.17103195	-43.70614624	-38.01122284	A0
A1	126.11865997	107.66809082	91.46237946	88.02621460	75.19435883	67.59935760	A1
A2	-58.85200832	-51.12213516	-43.07300949	-42.21822357	-36.89447784	-33.85968399	A2
A3	4.63943434	5.20818806	4.09661722	5.16918421	5.05334282	6.00091887	A3
A4	13.79122353	11.17241287	9.70598888	8.37326336	6.81596565	5.07965899	A4
A5	-9.41179371	-3.22457409	-7.15356054	-6.44182444	-5.45216084	-4.60620165	A5
A6	2.45615244	2.34358597	2.04524732	1.84623132	1.59142160	1.41249990	A6
B1	-70.66631317	-59.42169189	-50.35466003	-47.98872757	-41.18404770	-35.32668304	B1
B2	91.53223419	77.44828033	65.10601807	62.61097717	53.71723938	46.47992325	B2
B3	-67.75711060	-58.20012283	-49.62747574	-47.27108002	-40.75246429	-35.86497116	B3
B4	30.33199310	25.67822075	22.64175415	21.80930710	18.99093056	17.23424149	B4
B5	-7.02527189	-6.57867718	-5.56369019	-5.61921692	-5.04395914	-4.90959263	B5
B6	0.27394116	0.41010758	0.36243680	0.54626948	0.53265613	0.58872306	B6

********** = insufficient data for climatic analysis

Table 6k.--*Fourier coefficients for Lake Superior, area 11*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Julian date Last		LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
0	236	436	A0	-20.42956543	-16.31489944	-65.56854248	-70.16085052	-78.09090424	A0
1	236	436	A1	35.70817566	28.96017265	111.70602417	119.33567810	131.05107117	A1
2	236	436	A2	-9.36376953	-6.37812185	-53.64048386	-58.16753006	-61.74583054	A2
3	236	436	A3	-10.30346298	-11.01592255	4.54327154	6.81656790	5.02952909	A3
4	236	436	A4	13.46955109	13.06325912	12.51235523	11.46360397	14.25319481	A4
5	236	436	A5	-7.09022713	-6.75357533	-9.60295296	-8.10100651	-9.74001408	A5
6	236	436	A6	1.77898324	1.71008694	2.25279236	2.13762546	2.59140277	A6
7	236	436	B1	-36.15538798	-32.46916199	-65.57946014	-65.94713593	-73.44210052	B1
8	236	436	B2	41.36280823	36.43383408	82.72893865	84.11335754	94.64907074	B2
9	236	436	B3	-26.35911942	-22.66151619	-60.18962097	-62.19648743	-70.04521942	B3
10	236	436	B4	3.59273434	6.36709785	26.97175739	28.48082924	31.57731819	B4
			B5	0.05039164	0.51313132	-6.36161327	-6.94257307	-7.34808350	B5
			B6	-1.01119089	-1.06393206	0.12731287	0.22468413	0.17559408	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-83.97551672	-78.98601532	-50.44094849	-11.71189308	12.06719589	25.35112953	A0
A1	139.83517456	131.34239197	85.37285614	23.55629158	-13.68124580	-34.43147278	A1
A2	-64.69300842	-59.55927658	-37.51486053	-9.44703579	5.82293940	14.53596783	A2
A3	4.05290508	2.19171616	3.10547972	-0.92971677	0.83532947	1.33175123	A3
A4	16.28009605	16.46374428	11.49705491	3.64903307	-2.59995580	-5.70607981	A4
A5	-11.13019848	-11.03776073	-7.52657843	-2.31746263	1.31260002	3.15937901	A5
A6	3.01132917	2.98711777	2.05331707	0.48361936	-0.22069442	-0.64481232	A6
B1	-78.96875763	-75.35471344	-50.49302399	-15.67362690	7.23545933	19.77722549	B1
B2	102.60076904	97.77947998	64.56465912	18.40789223	-11.20831013	-27.34776497	B2
B3	-76.01464031	-72.12376404	-47.33779144	-13.42162323	7.56971455	19.00986099	B3
B4	33.93830109	31.77199219	20.56517792	5.67989397	-2.86763144	-7.58357763	B4
B5	-7.73534870	-4.95381451	-4.29552317	-1.10313964	0.23014593	1.05338764	B5
B6	0.18534315	0.06579127	-0.01501746	-0.00657436	0.20185192	0.29110572	B6

********** = insufficient date for climatic analysis

Table 61.--Fourier *coefficients for Lake Superior, area 12*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Last
1	236	436
2	236	436
3	236	436
4	236 236	436
5		436
6	236 236	436
7	236	436
8	236	436
		436
9	236	436
10	236	436

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	-72.32482147	-57.87466431	-123.73545837	-181.72717285	-216.61305237	A0
A1	120.68346838	97.24563702	205.16777039	299.97952271	354.80303955	A1
A2	-54.59426727	-43.11513519	-98.89711761	-147.46965027	-170.66763306	A2
A3	0.24018149	-1.53497136	10.38854122	20.49979973	19.51809502	A3
A4	17.04725838	15.16275537	20.92352867	26.07387543	34.14797974	A4
A5	-10.80462551	-3.36362223	-14.68169689	-19.37418747	-24.40247536	A5
A6	2.62182212	2.25400257	3.69381547	4.99447632	5.25003624	A6
B1	-77.26779938	-64.42183685	-114.87590027	-159.69279480	-191.58084106	B1
B2	97.34992931	80.07592773	149.02062988	210.62153625	253.10441589	B2
B3	-69.29466248	-56.35791775	-109.58493805	-157.47061157	-188.16175842	B3
B4	29.20761871	23.18147278	49.28445435	72.92961884	85.87761688	B4
B5	-5.96933937	-4.36566925	-12.00630569	-18.97831154	-21.58792114	B5
B6	-0.17376384	-0.34359869	0.66103417	1.59570088	1.62274921	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-104.77614594	-56.31225204	-34.09001160	5.27546501	50.58797455	54.53197861	A0
A1	172.51494446	95.41072083	61.50674438	-0.31783664	-73.87197876	-79.89978027	A1
A2	-79.42502594	-44.40990829	-32.13422394	-4.26564741	30.99690628	33.39186478	A2
A3	4.51217127	3.05804276	5.34108448	6.26557493	2.12105276	2.40282893	A3
A4	20.11131237	10.87991428	3.67391157	-4.37078047	-11.54379940	-12.51296616	A4
A5	-13.44323830	-7.56456505	-3.97861576	1.15325751	6.54481602	7.10589170	A5
A6	3.47255397	2.13544774	1.38386832	0.13583018	-1.35228693	-1.52582586	A6
B1	-97.72909546	-54.09100723	-31.40156119	4.28436041	43.26029968	47.18525314	B1
B2	127.13935152	69.32102203	41.11219215	-5.72754860	-57.83340454	-62.68960190	B2
B3	-53.51273449	-52.09135818	-32.56885529	1.37554693	40.39702606	43.84976196	B3
B4	41.27989197	23.37658119	16.24775314	1.71866202	-16.23009300	-17.67926407	B4
B5	-9.40008831	-5.51559019	-4.94722891	-1.95963395	2.50998735	2.77975941	B5
B6	0.30533311	0.18292397	0.65293837	0.72125715	0.46333870	0.42723379	B6

********** = insufficient data for climatic analysis

Table 6m.--*Fourier coefficients for Lake Superior, area 13*

VALID DATES FOR COEFFICIENTS Layer	Julian First	Last
0	236	436
1	236	436
2	236	436
3	236	436
4	236	436
5	272	436
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	-5.64573799	51.36445398	20.44045639	-29.17255020	-84.65943909	A0
A1	14.28782368	-78.10037994	-28.04931641	52.51653290	141.64976501	A1
A2	-6.30235529	38.58830643	14.29902935	-25.658290'36	-67.43663738	A2
A3	-1.31364202	-8.08401775	-4.96847973	2.12550950	6.01947308	A3
A4	3.61016774	-3.83231735	0.67355907	5.80250883	14.95557690	A4
A5	-2.20214272	3.36361110	0.01434068	-4.02988529	-10.44451912	A5
A6	0.62371743	-0.75282633	0.12465157	1.01591617	2.59647810	A6
B1	-17.14575958	32.43373215	8.36543901	-31.40810204	-78.94638062	B1
B2	17.01085472	-49.65798569	-17.20580482	37.19706726	101.36238098	B2
B3	-11.25421047	38.74382019	-14.39447784	27.27191353	-74.74452912	B3
B4	4.31744671	.....	-7.6-18.92137500	12.34815598	3.50990611	B4
B5	-0.30576205	5.31295586	2.35085058	-3.02188969	-7.79401350	B5
B6	0.01635179	-0.59939092	-0.29274940	0.15635866	0.22729883	B6

	LAYER 5	LAYER 6	LAYER 7	LAYER 8	LAYER 9	LAYER 10	
A0	-454.04553931	**********	**********	**********	**********	**********	A0
A1	775.52429199	**********	**********	**********	**********	**********	A1
A2	-460.96838379	**********	**********	**********	**********	**********	A2
A3	171.38327515	**********	**********	**********	**********	**********	A3
A4	-23.50112915	**********	**********	**********	**********	**********	A4
A5	-10.75553322	**********	**********	**********	**********	**********	A5
A6	4.66344452	**********	**********	**********	**********	**********	A6
B1	-256.00408936	**********	**********	**********	**********	**********	B1
B2	344.15360633	**********	**********	**********	**********	**********	B2
B3	-262.60550635	**********	**********	**********	**********	**********	B3
B4	125.57344818	**********	**********	**********	**********	**********	B4
B5	-34.69790268	**********	**********	**********	**********	**********	B5
B6	3.75302996	**********	**********	**********	**********	**********	B6

********** = insufficient data for climatic analysis

Table 6n.--*Fourier coefficients for Lake Superior, area 14*

VALID DATES FOR COEFFICIENTS Layer	Julian date First	Last
0	272	417
1	272	417
2	272	417
3	272	417
4	272	417
5	272	417
6	272	417
7	272	417
8	272	417
9	272	417
10	272	417

	LAYER 0	LAYER 1	LAYER 2	LAYER 3	LAYER 4	
A0	4416.03363141	4348.02783203	4530.43096404	4987.06103516	4971.88232422	A0
A2	-7332.45751953	-7216.28369141	-7490.49609375	-8240.81542969	-8249.39257813	A1
A3	-1391.71557617 4101.57275391	-1358.76538086 4029.27148430	-1330.84667969 4121.95458984	-1450.61230469 4524.22509766	-1543.60473633 4599.39013672	A3 A2
A4						
A5	180.07678223 44.94103622	168.69912720 48.02075958	123.17966451 68.22824060	127.49493408 77.28053284	186.51557922 56.69567325	A4 A5
A6						
B1	2696.84350586 -15 37316990	2672.47307695 -15.99442348	2870.95947266 -19.34890366	3150.43286133 -21.46257401	3032.31250000 -18.22164345	A6 81
B2	-3491.99218750	-3461.93579102	-3708.65478516	-4059.43798828	-3915.40105541	B2
B3						
B4	-1858.69299316 2460.06298828 262.68304443	-1851.57409668 2448.76928711 261.2617421	-1118.61840820 2601.2116992 271.48834229	-1198.93322754 2833.55004883287.98284912	-1168.18481445 2743.68188477283.17059326	B3 B4 B5
B6	-29.27297211	-29.14341164	-29.31764984	-29.94803619	-29.74471855	B6

| | LAYER | | | | | |

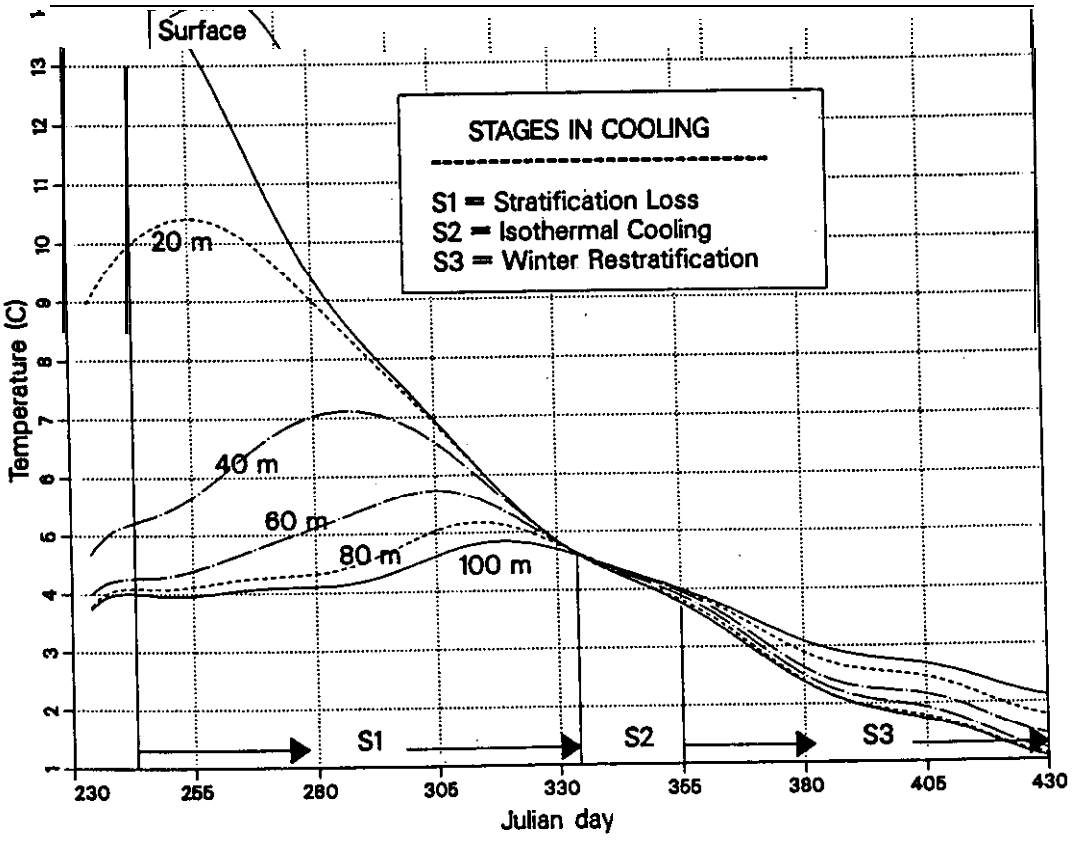

Figure 3.--*Mean survey temperature climatology and stages in cooling season.*

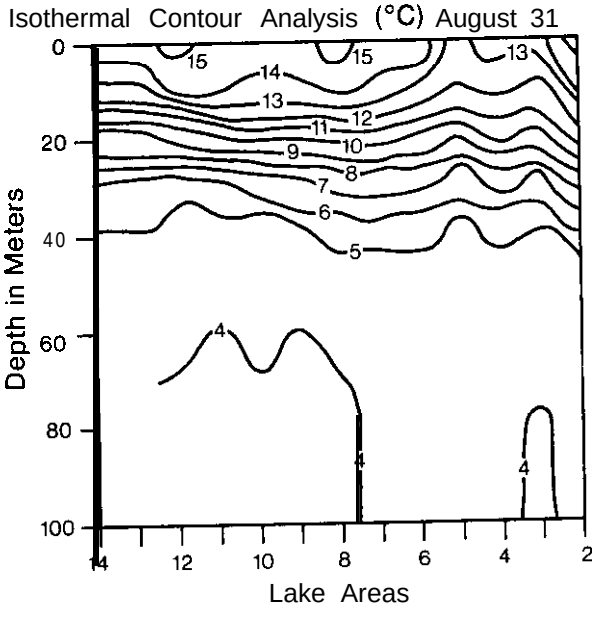

Figure 4a.--*August 31 isothermal contour analysis.*

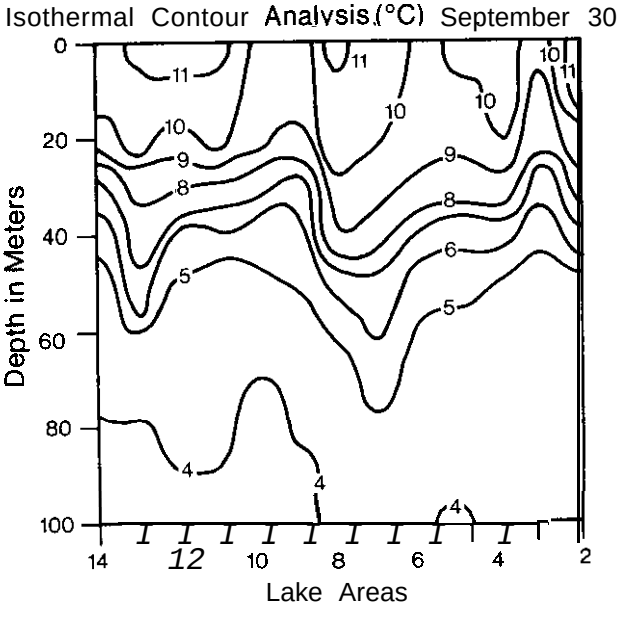

Figure 4b.--*September 30 isothermal contour analysis.*

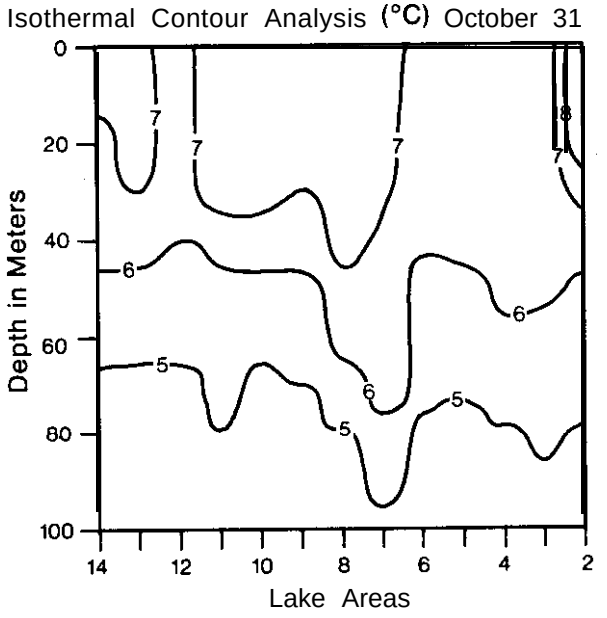

Figure 4c.--*October 31 isothermal* contour analysis.

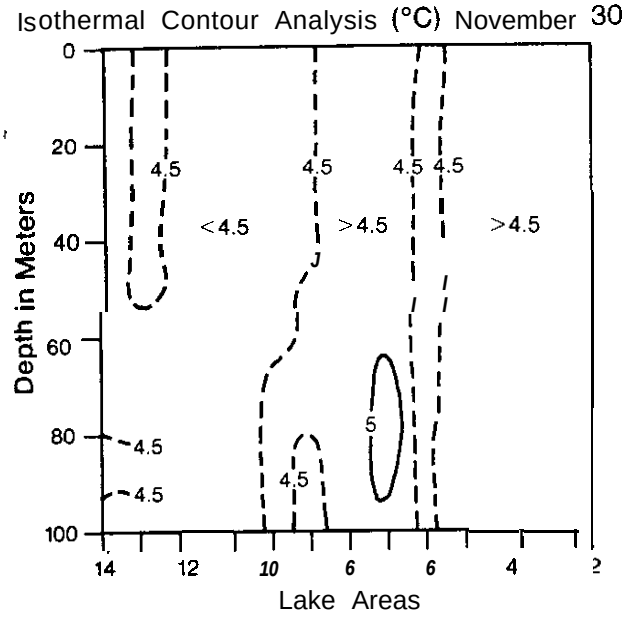

Figure 4d.--*November 30 isothermal contour analysis.*

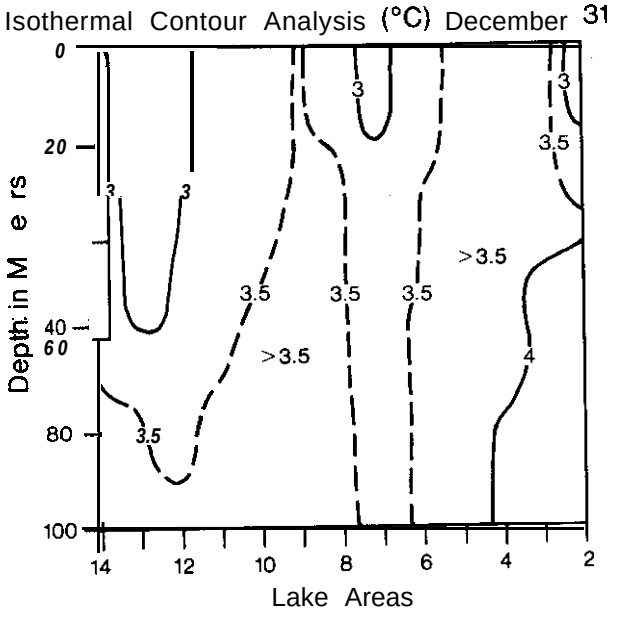

Figure 4e.--*December 31 isotherm1 contour analysis.*

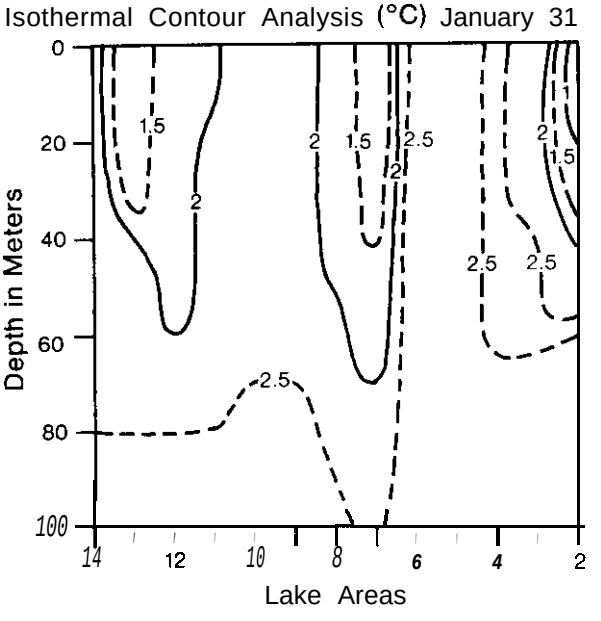

Figure 4f.--*January* 31 *isothermal* contour *analysis.*

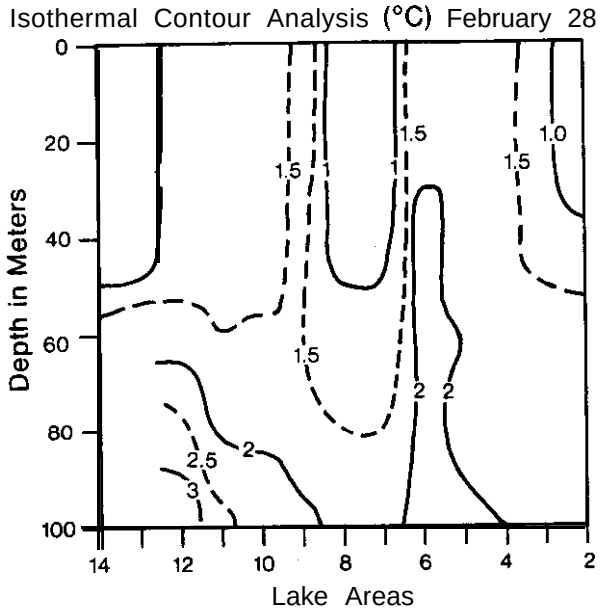

Figure 4g.--*February 28 isothermal contour analysis.*

for the mean survey climatology. Surface temperature is near its maximum at the end of August (Julian date 243) (fig. 3). Stage 1 starts when the epilimnion begins to cool during the last half of September, and it lasts about 80 days. The thermocline in Lake Superior extends down to the 20-m to 25-m depth in summer (Smith, 1972). Maximum temperature in the 20-m and 30-m layers usually occurs during the last half of September (Julian dates 258 to 273) and the entire water column is virtually isothermal near the end of November (Julian day 334) (fig. 3). The isothermal water column cools to the temperature of maximum density, 3.98°C, the last half of December; however the end of stage 2 is difficult to identify because, after the temperature of maximum density is attained, the development of winter stratification is dependent upon wind conditions as well as air temperature. Stage 3 can start any time between the last half of December and the last half of January. Frequent high winds in December and January can cause continued deep convective mixing and thus maintain isothermal conditions, as occurred in winter 1975 and to a lesser degree in winter 1976 (fig. lg-lh). Another possibility is a long period of calm wind conditions that would result in rapid cooling, stratification, and early ice formation, assuming normal or below-normal air temperatures. A more likely condition is alternating periods of relative calm and episodic high winds associated with storm passage. This condition results in alternating periods of stratification formation and stratification loss. This is illustrated by the mean thermal profiles shown in figure le for the two December surveys. Stratification formation is evident on December 20, but by December 27 there is a loss of the initial winter stratification probably caused by high winds during the week ending December 27. The climatology in figure 3 illustrates a gradual formation of winter stratification and in this respect is representative of a smoothed winter restratification. Winter stratification lasts until March, which is a period of transition, but because there are so few surveys in March and April, it is not possible to define the normal end of the winter stratification stage. In the one winter with

surveys through April, winter 1976, the upper 100 m of the water column was isothermal by the end of March, but there was still weak stratification below the 100-m level. Over the next month, the upper 100-m layer remained virtually isothermal, but the temperature in this layer increased nearly 1°C, indicating that spring overturn had started.

The variation in temperature over the survey route corresponds to depth and wind fetch variations. During stage 1 cooling, the fetch-limited and shallower western lake basin, areas 9 to 15, generally has higher surface and epilimnion temperatures (fig. 4b). Sharp differences in isotherm depth between adjacent areas are observed between areas 14 and 13, areas 9 and 8, and areas 4, 3, and 2 at the end of September. Ragotzkie (1974) noted that upwelling along the northwestern shore of Lake Superior occurs frequently. This, in combination with the deep trough in that area and relatively shallow waters In area 13, helps to explain the rise in isotherms from area 13 to 14. The convex shape of isotherms from areas 4 to 3 to 2 indicates that upwelling is also part of the temperature climatology of area 3. Bennett (1978) attributes this midlake upwelling to the divergence of wind-induced water motion or to the shoreward drift of surface waters associated with the general counterclockwise shore circulation pattern. While the large downward trend in isotherms between areas 9 and 8 likely marks the boundary between the water masses of the midlake areas of the eastern and western basins of Lake Superior, this spatial pattern is considerably weaker by the end of October (fig. 4c) and it is reversed by the end of November when full convective mixing results in warmer waters in the midlake areas of the eastern lake basin than in the western lake basin. This new spatial pattern persists in stage 2 and stage 3 cooling. Fall overturn is completed first in the shallow shore areas, that is, In areas 13, 7, and 2 (and In areas 1 and 15), next in the midlake western lake basin, and last in the midlake eastern lake basin. By the end of December (fig. 4e), temperature in shore areas in both eastern and western lake basins are less then 3°C, the midlake areas of the eastern basin are still isothermal and near the temperature of maximum density, and midlake areas of the western lake basin have begun to stratify. Winter stratification is stronger in the western lake basin In January and February (fig. 4f-4g) owing to the smaller wind fetch and also earlier and more extensive ice cover that normally forms in the western lake basin (Assel et al.. 1983).

5. REFERENCES

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