THE LIMNOLOGY OF MORICE LAKE

VOLUME 5: CHAPTER 2

ENVIRONMENT CANADA
FISHERIES SERVICE
NORTHERN OPERATIONS
HABITAT PROTECTION

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SUMMARY

1. Dissolved oxygen saturation ranged from 90 - 100% during the survey.

2. Maximum temperature observed was 12.7^{o} C. in August, 1974. The north end of the lake had consistantly higher temperatures than the southern end of the lake. Very little stratification occurred during the survey (in the upper 200 feet).

3. Seventeen chemical - physical parameters were measured throughout the survey. With the exception of the four stations listed below, no spatial or temporal trends were observed. Station 1 had greater input values for Na, K, Mg, Si; Station 2 for K, Mg, TP; Station 11 for K, Ca, Mg; Station 13 for Mg.

   With the exception of silicon, nutrients appear to be limiting within the Morice watershed, the Nanika River contributed the major input of total phosphorus. Silicon was likely not a limiting element.

   Snow measurements indicate little chemical input to the system.

4. Phytoplankton biomass ranged 26 - 300 mg/m^3 throughout the survey.

   Chrysophyta were dominant throughout the survey; Chlorophyta occupied a large percentage in early spring.

Phytoplankton density was greater at the northern end of Morice Lake.

Morice Lake is classified as ulta-oligotrophic according to maximum plankton density.

The low phytoplankton productivity of Morice Lake is likely due to limiting nutrients and low temperatures.

5. Morice Lake is poor in amount of zooplankton, both in the number of species present and the total abundance of each species.

Greatest abundance of zooplankton occurs in the spring, after spring run-off.

Zooplankton abundance appears to decrease from the north to south end of Morice Lake.

6. Morice Lake according to zoobenthos typology is cold stenothermic and ulta oligotrophic.

Benthic invertebrate density is 1680 organisms/m^2 throughout Morice Lake. The greatest density (3366/m^2) of benthic invertebrates occurs in the upper 10 meters of the lake.

Approximately 50% of the benthic fauna are Chironomids, in most cases the dominant species is *Heterotrissocladius oliveri* Saether.

FORWARD

The impounding of a natural water regime causes environmental changes. The more evident effects occur at the land and water interface, usually due to flooding and or lake drawdown. The new ecosystem can either create or destroy habitat for the existing species of fish and other organisms. Shoreline and bank erosion, altered flow regime and other physical changes can have severe chemical and biological repercussions by altering the sensitive natural balance.

As part of the Kemano II Environmental Study, Environment Canada, Fisheries Service, initiated a program during 1974 - 75 to inventory the existing water chemistry, plankton and benthic fauna of Morice Lake. The main objectives of this study were to provide data to determine the present trophic state of the lake, the nutrient loading into the lake, phytoplankton and zooplankton biomass and lake benthic fauna population. These data are used to assess the total lake productivity and to predict responses to an altered environment.

The 1974 - 75 limnological study consisted of four parts as outlined below:

I Water Chemistry

Water chemistry influences the basic components of any natural waters thereby affecting the natural productivity. Recognition of this required that a limnological survey be undertaken as part of the Kemano II power development impact assessment. The report attempts to characterize the water chemistry of Morice Lake during May, 1974 to August, 1975, and on the basis of these short term observations, attempts to quantitatively estimate changes in chemical parameters consequential to impoundment and diversion.

The water chemical budget of a reservoir usually depends upon the inflowing streams. However, during the period of formation the flooded shoreline zone will leach chemical substances from the soil and the decayed vegetation. The water, due to these leachates, will modify the chemical composition of the water. These changes may be expressed in several methods but the most obvious is usually an increase in plankton biomass and lake productivity.

II Phytoplankton

Phytoplankton are the primary utilizers of nutrients and are the consequential primary food organisms. These primary producers, by utilizing light and nutrients, initiate and sustain the trophic level of the biological community. The algae production as well as influencing the quantity of secondary production, may also affect the quality of the water and the fishery. The critical role of algae in lake metabolism dictates a study to adequately characterize Morice Lake. The following components were examined: phytoplankton taxonomic composition, by season and region, standing crop or biomass of algae, and the identification of possible limiting factors. Nanika Lake was also sampled on July 31, 1974 for comparison and as a relative indication of production for the area.

III Zooplankton

Zooplankton information is essential for an understanding of biological conditions existing in the lake at present and the changes which may occur due to the possible hydro-electric development.

Nanika Lake, also part of the possible Kemano II hydro-electric project, was sampled on July 31, 1974 for comparison to Morice and as a relative indication of the productivity of the area.

IV Zoobenthos

Zoobenthos refers to those invertebrates that inhabit the bottom sediments of aquatic systems. This benthic community contributes an important role in the ecosystem and in Morice Lake a probable critical role in the food chain may exist.

The quantity and quality of zoobenthos are also good indicators of the general productivity of a water body. Consequently, differences in abundance and composition of the zoobenthos in different parts of a lake can often provide useful information on the regional factors influencing general productivity as well as indicate the capacity to support some species of fish.

The objectives of the survey on Morice Lake were to determine the abundance and composition of the zoobenthos in Morice Lake and to compare the results to those found in other regional lakes, relate abundance and distribution of zoobenthos to other biological components of the ecosystem and attempt to predict the impact of the hydro-electric development on the abundance and composition of zoobenthos within Morice Lake.

METHODS

Water Chemistry:

Three major chemistry stations were located on the major axis of the lake and on eleven of the streams that flow into Morice Lake, Figure 1. The stations were monitored monthly by boat in summer months and by helicopter in the winter months.

Samples were collected with a Nansen water sampler and shipped in dark coolers to the chemistry laboratory, Department of the Environment, Fisheries and Marine Service, Vancouver, B. C. Samples were generally analyzed within 24 hours of collection. For detailed methods see Laboratory Manual, Fisheries Service - Environmental Protection Service, Pacific Region, 1974.

Observations on dissolved oxygen were made four times during the survey, on 17 July 1975, 11 September 1975, 10 December 1975 and 28 May 1975. Measurements were made with an IBC (International Biophysics Corporation) dissolved oxygen field unit at 0.5, 7, 25 and 50 meter depths at stations 3, 4 and 5. The meter was calibrated by Winkler analysis.

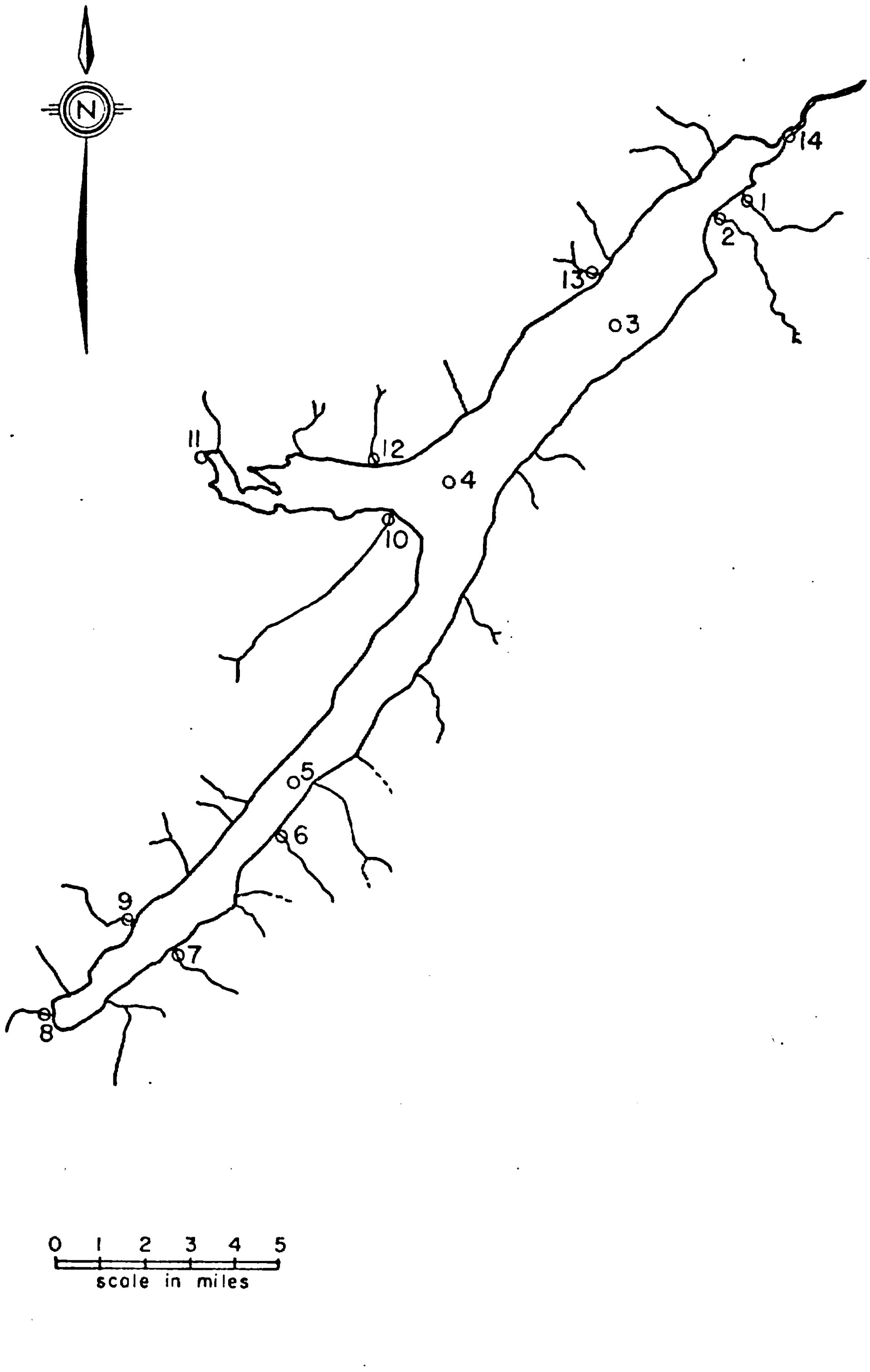

Figure 1 Morice Lake sampling stations.

Temperature was measured twelve times during the survey at three lake stations (four depths) and at eleven streams, see Figure 1. Measurements were taken with a YSI field temperature meter.

Transparency measurements were made with a standard black and white secchi disc five times during 1974.

<u>Phytoplankton</u>:

Samples were collected in a 250 ml. bottle and preserved in Lugol's solution. The algae were identified and enumerated using the Utermohl technique. Biomass was estimated by multiplying volume by number of cells per unit volume. This method is described in Vollenweider (1969). Deep water samples were collected using a Nansen bottle.

<u>Zooplankton</u>:

Data were collected between July, 1974 and August, 1975. Samples were taken from three stations on Morice Lake, see Figure 1. Ten meter vertical hauls were made at each station using a single net with a mouth diameter of 25 cm. and a pore opening of 77µ. The results are expressed as individuals per litre. Corresponding individuals per cm^2 values are identical, since hauls were taken from depths of 10 meters. The figure given for each species represents the accumulated total of various life stages, for example <u>Cyclops bicuspidatus</u> adults, copepodids and nauplii are added to give a final total.

TABLE 1 - OBSERVED TEMPERATURES BY STATION AND DATE, MORICE LAKE, B.C.

Year		1974							1975				
Day-Month		18/6	17/7	31/7	6/8	11/9	21/10	10/12	3/2	2/3	28/5	25/6	24/8
STATION	DEPTH meters												
1	0.5	8.9	10.1	11	-	12	3.9	1.0	-	1.0	9	-	12.1
2	0.5	7	8.5	9.8	-	9.9	6.8	0.5	0.5	1.8	7	-	-
3	0.5	7.8	9	10.6	12.7	12.3	7.1	4.8	1.8	1.9	6.0	7.2	12.0
3	7	-	-	9.4	11.6	11	-	4.8	2.05	2.05	5.0	6.0	11.1
3	25	5.5	6	7.8	11.0	8.9	6.4	4.8	2.05	3.0	4.0	5.8	7.2
3	50	4.8	5.1	6.3	9	8	5.0	4.8	3.0	3.7	-	4.8	6.2
4	0.5	6.8	7.8	10	12.3	12.1	7.1	4.8	-	-	-	-	10.8
4	7	-	-	8.2	11.0	11.0	-	4.8	-	-	-	-	9.8
4	25	5.5	6	-	11.0	8.8	6.4	4.8	-	-	-	-	6.5
4	50	4.8	5.1	6.2	8.9	7.5	5.0	4.8	-	-	-	-	6.1
5	0.5	6.5	7	9.8	11.5	11.0	7.1	4.8	-	1.0	5.0	6.2	10.5
5	7	-	-	8.0	11.0	9.6	-	4.8	-	-	-	-	-
5	25	5.2	5.8	7	10.0	7.9	6.3	4.8	-	-	-	4.8	-
5	50	4.8	5.1	6	8.6	7.0	5.0	4.8	-	-	-	-	-
6	0.5	5.1	7	7	-	7	-	-	-	-	-	5.2	7.5
7	0.5	4.8	5	5.5	-	6	3.3	0.5	-	-	4	5.0	-
8	0.5	5.5	5.1	4.5	-	4	2.0	0.2	-	-	4.5	5.2	-
9	0.5	5.0	6.2	5.5	-	-	2.5	1.2	-	-	5.8	4.5	-
10	0.5	5.1	6	4	-	4	2.2	0.1	-	-	5	5.5	-
11	0.5	7.0	8.8	10.2	-	8	3.5	1.5	0.5	-	7.5	7.0	-
12	0.5	4.6	4	4	-	5	2.8	1.5	-	-	-	4.6	-
13	0.5	4.6	4	4	-	-	3.0	1.5	-	-	-	-	-
14	0.5	7	-	-	-	-	7	4.8	-	1.5	5.5	7.0	-

Zoobenthos:

The survey was conducted from 30 May to 6 June 1975. Three sampling sites were located on the major axis of the lake at the water chemistry sampling stations. Within each sampling site a series of dedgings were collected from various depths within the lake profile, using a standard Ponar dedge. Sediments were field sieved using a Nitex nylon net (400μ mesh) and the residue preserved in 5 - 7% formalin. Laboratory samples were rinsed overnight to remove formalin and sorted with a stereomicroscope.

Organism identification was accomplished using a stereo and a compound microscope depending upon size of the specimen. Copepoda, Cladocera, Ostrocoda and other small (<400μ) species were not enumerated because they were not sampled quantitatively in the field sieved net.

RESULTS

Water Chemistry:

Observations on dissolved oxygen showed a 90 - 100% saturation at all stations and depths throughout the survey. At no time was oxygen super saturation observed or concentrations of less than 90.8%.

Temperature observations are recorded in Table 1. Examination of the temperature profiles shows that at any time throughout the survey the north end of the lake (station 3) is warmer than the south end of the lake (station 5). The inflowing streams have a cooler mean temperature than the lake, and the maximum temperatures at all stations occurred in mid-August, 1975. The maximum summer vertical temperature gradient occurred in the summers of both 1975 and 76. The maximum difference between 0.5 meters and 50 meters was only 5.8^{o} C. (28/8/75) at station three. A previous survey by Brett and Pritchard (1946) indicated a mid-summer temperature profile of 9^{o} C. (14^{o} C. at surface to 5^{o} C. at 200 feet). However, Brett and Pritchard did not indicate stream location or methods so that direct comparison is not possible. The relative uniform temperature during the present survey is attributed to lake circulation, likely due to the strong, south to north, prevailing winds throughout the survey.

Secchi depths were observed as below:

	station 3	station 5
18 June	3.25 m.	3.6 m.
17 July	3.25 m.	3.7 m.
31 July	3.5 m.	2.0 m.
6 Aug.	6.0 m.	6.5 m.
11 Sept.	9.0 m.	9.75 m.

Ice first appeared in the sheltered bays near the end of October, however, freeze-up did not occur until mid-February, 1975. Break up occurred approximately six weeks later, in late March to early May. Ice thickness at station three on 2 March 1975 was approximately 24 centimeters (9 inches). The short duration of ice on the lake is likely due to a large annual heat budget. The overwhelming source of heat income is through heat transfer on the lake surface, rather than by stream inflow.

Seventeen chemical parameters were measured during this survey. The complete results of the chemical water analysis are recorded in Appendix / . Mean values of selected chemical species are summarized in Table 2, and a summary of annual range for all chemical parameters at each station are recorded in Table 3. A comparison with other regional lakes is presented in Table 4. Locations of stations are indicated in Figure 1.

Four cations; sodium, potassium, calcium and magnesium, were measured throughout the survey at all stations. Station one, McBride Creek, had a statistically greater input of sodium than all other stations. Mean yearly values for potassium were greater at McBride Creek and Atna Creek (station 11), as well, Atna Creek also had a higher yearly mean for calcium. Magnesium input was higher at McBride, Nanika, Atna and station 13. However, other than these exceptions, little spatial or temporal variations occurred at the stations surveyed. Calcium and potassium had a yearly mean at the various stations of 4.18 - 5.79 mg/l and 0.14 - 0.38 mg/l respectively. Sodium had a yearly mean for all stations of 0.42 to 0.61 mg/l, except for station 1 which had a mean of 1.61 mg/l. Magnesium for stations 3 to 10, 12 and 14 had a yearly mean of from 0.30 - 0.47 mg/l; stations 1, 2, 11 and 13 had a yearly mean of 0.83, 0.57, 0.65, and 0.56 mg/l respectively.

Three anions were measured; chlorides, sulphates, and silicon. Two of the ions, chlorides and sulphates, showed less than the detectable sensitivity of analytical methods. Concentrations of <1 mg/l for chlorides and <5 mg/l for sulphates were consistent at all stations

TABLE 2 - MEAN OF SELECTED CHEMICAL PARAMETERS, MORICE LAKE, B. C., 1975

STATION	DEPTH M	TR mg/l	HARDNESS mg/l Ca CO_3	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Si mg/l	NH_3 mg/l	NO_3 mg/l
1	0.5	53	14	1.61	0.32	0.83	4.95	2.4	.012	.016
2	0.5	44	12	0.57	0.19	0.57	4.72	1.3	.011	.020
3	0.5	39	15	0.53	0.24	0.47	5.22	1.22	.008	.035
4	0.5	41	14	0.56	0.25	0.47	5.20	1.27	.009	.031
5	0.5	41	14	0.56	0.23	0.45	5.06	1.17	.010	.031
6	0.5	44	13	0.49	0.16	0.36	4.96	1.08	.006	.026
7	0.5	41	14	0.51	0.21	0.44	5.24	1.33	.01	.016
8	0.5	55	12	0.56	0.29	0.44	4.77	1.13	.01	.041
9	0.5	51	14	0.55	0.25	0.45	5.35	1.23	.009	.048
10	0.5	48	15	0.44	0.17	0.40	4.93	1.20	.010	.041
11	0.5	43	16	0.54	0.38	0.65	5.79	1.07	.010	.029
12	0.5	37	12	0.42	0.14	0.30	4.48	1.12	.015	.015
13	0.5	42	13	0.45	0.14	0.56	4.18	-	-	-
14	0.5	34	15	0.61	0.24	0.44	5.28	0.92	.001	.027

TABLE 3 - RANGE, MAXIMUM-MINIMUM, CHEMICAL PARAMETERS, MORICE LAKE, 1974-75

STATION	DEPTH M	TR mg/l	HARD. mg/l Ca CO_3	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l
1	0.5	31-89	10-20	1.2-2.3	0.21-0.50	0.27-1.10	3.0-9.0	<1	<5
2	0.5	24-57	10-19	0.2-1.2	0.02-0.40	0.50-1.00	3.2-6.5	<1	<5
3	0.5	17-64	12-20	0.1-1.5	0.22-0.31	0.26-0.50	4.3-5.9	<1	<5
4	0.5	31-55	11-19	0.2-1.3	0.25-0.31	0.29-0.53	3.7-6.1	<1	<5
5	0.5	29-56	13-19	0.2-1.4	0.18-0.31	0.40-0.53	3.9-6.2	<1	<5
6	0.5	31-64	10-20	0.2-0.9	0.10-0.33	0.26-0.70	2.5-7.6	<1	<5
7	0.5	16-62	10-20	0.2-0.9	0.10-0.90	0.21-0.58	2.5-9.6	<1	<5
8	0.5	24-83	10-20	0.3-1.9	0.10-0.53	0.24-0.70	2.3-8.0	<1	<5
9	0.5	30-78	10-20	0.2-1.4	0.10-0.46	0.24-0.70	2.7-8.6	<1	<5
10	0.5	24-73	10-20	0.1-1.6	0.08-0.60	0.16-0.50	2.2-7.3	<1	<5
11	0.5	13-78	10-20	0.2-1.3	0.20-0.52	0.24-1.10	3.3-8.0	<1	<5
12	0.5	19-52	10-20	0.2-0.8	0.14-0.30	0.20-0.40	3.6-5.2	<1	<5
13	0.5	32-54	10-20	0.2-0.8	0.16-0.40	0.40-0.70	3.0-6.2	<1	<5
14	0.5	<10-50	13-19	0.4-1.5	0.19-0.50	0.22-0.56	4.6-6.3	<1	<5

TABLE 3 (Cont'd) - RANGE, MAXIMUM-MINIMUM, CHEMICAL PARAMETERS, MORICE LAKE, 1974 - 75.

STATION	DEPTH M	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	1.1-3.96	<.005-0.04	<.005-0.006	<.01 -0.032	<.005-0.008	<.01-0.07
2	0.5	0.6-2.87	<.005-0.08	<.005-	<.005-0.038	<.005-0.01	<.01-0.09
3	0.5	0.7-1.8	<.005-0.07	<.005-0.007	.02 -0.055	<.005-0.011	<.01-0.045
4	0.5	0.8-1.65	<.005-0.03	<.005-0.007	<.005-0.06	<.005-	<.01-0.058
5	0.5	0.7-1.7	<.005-0.06	<.005-0.007	.018-0.05	<.005-	<.01-0.045
6	0.5	0.7-1.4	<.005-0.02	<.005-	.02 -0.03	<.005-	<.01-0.045
7	0.5	0.9-2.51	<.005-0.016	<.005-	<.01 -0.042	<.005-0.008	<.01-0.045
8	0.5	0.3-2.38	<.005-0.03	<.005-0.008	<.005-0.11	<.005-0.010	<.01-0.041
9	0.5	0.5-2.59	<.005-0.04	<.005-0.006	<.01 -0.14	<.005-0.010	<.01-0.055
10	0.5	0.5-2.38	<.005-0.03	<.005-0.01	<.01 -0.138	<.005-0.007	<.01-0.040
11	0.5	0.3-1.52	<.005-0.04	<.005-0.006	<.01 -0.050	<.005-0.011	<.01-0.043
12	0.5	0.7-1.4	<.005-0.02	<.005-	<.01 -0.030	<.005-0.007	<.01-0.061
13	0.5	<.2-1.1	<.005-0.02	<.005-	<.01 -	<.005-	<.01-
14	0.5	0.7-1.7	<.005-0.04	<.005-	<.01 -0.60	<.005-0.005	<.01-0.04

TABLE 4 - COMPARISON OF SELECTED CHEMICAL PARAMETERS FROM MORICE AND OTHER REGIONAL LAKES

	MORICE LAKE $\overline{X}$ Station 3	BABINE LAKE 3 Aug. 1972[1]	BABINE LAKE 20-26 Oct. 74[2]	BABINE LAKE 14 Aug. 75[3]	KATHLYN LAKE 13 Aug. 73[4]	NANIKA LAKE 22 Oct. 74	KIDPRICE L 22 Oct. 74
- Hardness mg/l $CaCO_3$	15	-	36.3	-	16.6	17	19
- K mg/l	0.24	0.52	-	-	-	0.20	0.33
- Mg mg/l	0.47	-	-	2.5	1.05	0.40	0.91
- Ca mg/l	5.22	8.1	-	10.3	4.9	7.7	5.6
- Cl mg/l	<1	-	-	0.5	-	<1	<1
- SO_4 mg/l	<5	-	-	<5	-	<5	6
- Si mg/l	1.22	-	-	4.3	-	1.4	1.48
- Na mg/l	0.53	1.37	-	1.9	-	0.54	0.68
- Cond. µmho/cm	30-50	-	57	78	44	-	-
- pH	7-7.6	6.8 -7.6	7.9	7.6	7.4	7.3	7.2

[1] Stockner and Shortreed, 1974

[2] Chan and Wing (Station 4)

[3] B.C. Water Resources Station 4 at 1 m.

[4] Baillie and Buchanan (2.5 m.)

throughout the survey. A significant input of silicon from station 1, McBride Creek, was observed throughout the survey. A mean yearly value of 2.4 mg/l was observed from station 1 as compared to a mean value of 0.92 - 1.33 mg/l for all other stations. No other spatial or temporal trends could be observed for silicon.

Chlorophyll concentrations were measured at the three lake stations six times during the survey. The only detectable concentration of Chlorophyll was observed on 17-7-74, where values of 0.1 mg/l were obtained at stations three and four at 0.5 meter depth. All other analysis showed less than 0.1 mg/l Chlorophyll at all stations.

Nutrient values were generally lower than the sensitivity of our present analytical methods. Variations, spatial or temporal, were insignificant or undetected for NO_2, NO_3 and OP. During the survey NH_3 was consistently <0.02 mg/l except from 18 June to 11 September 1974 where an input from each station was evident. The analytical results for total phosphorus, with the exceptions of Nanika River (station 1), Delta Creek (station 8), and Pyrimid Creek (station 9) was generally less than a detectable amount. Delta and Pyrimid Creeks did indicate low input during part of the survey, however, since the volume of water inflow from these creeks is low, the enrichment to Morice Lake is also low. Nanika River, however, contributes the majority (approximately 50%) of water inflow to Morice Lake and the analytical results also indicate a substantial ($\overline{X}$ of 0.037 mg/l) input of total phosphorus. A substantial input was indicated during September to October which could be due to salmon carcasses (see Stockner and Shortreed, 1974).

Total hardness showed no spatial variations during the survey and ranged from 10 - 20 mg/l $CaCO_3$. Conductivity was measured four times during 1975; values ranged from 30 - 50 µmho/cm with no trends observed. Hydrogen ion activity was relatively similar between all stations throughout the survey and ranged from 7.0 to 7.6. Station variations in total residue (T.R.) were insignificant; the mean yearly range for all stations was 34 - 55 mg/l.

In order to fully appreciate the total input into Morice Lake, a chemical analysis of snow was undertaken twice during 1975. The results are reported below:

	February 3	March 2
Na mg/l	0.01	0.01
K mg/l	0.02	0.03
Ca mg/l	<.03	<.03
Mg mg/l	0.02	0.03
Hardness (mg/l $CaCO_3$)	<.2	<.2
pH	7.0	7.0
Cond. µmho/cm	3.9	3.1
Cl mg/l	1	1
SO_4 mg/l	5	5
Si mg/l	<.01	<.01
NH_3 mg/l	<.02	<.02
NO_2 mg/l	<.005	<.005
NO_3 mg/l	<.01	<.01
OP mg/l	<.005	<.005
TP mg/l	<.01	<.01

Although only two samplings were analyzed, the results indicate neutral acidity, low conductivity and a low input of all parameters measured. The snow on the lake would likely dilute the available chemical species in the natural run-off waters.

Phytoplankton:

A listing of the phytoplankton enumerated and a table of estimated biomass values by station and date appears in Table 6 and Appendix 2. The sampling was begun in July, 1974 and terminated in June, 1975. During the study period the chrysophyta were the dominant species. However, the chlorophyta occupied a fairly large percentage of the population during early spring. During the survey the biomass values reached 300 mg/m^3 only once, in September, 1974 and ranged to a low of 26 mg/m^3 during the winter at the most productive station (#3). Figure 4 shows the estimated seasonal biomass and succession pattern for this station. Data for Stations 4 and 5 are incomplete, however Table 8 and Figure 3 indicate lower phytoplankton productivity towards the south end of the lake. The relatively high phytoplankton biomass at Station 3 is likely due to the input of nutrients from the Nanika River, as compared to the nutrient-poor streams in the remainder of the lake (see chemical data).

Literature on phytoplankton biomass for this area is limited. Stockner and Shortreed (1974) however, have reported on Babine Lake phytoplankton successive and primary production. The lakes are not comparable since Babine is classified as being mixotrophic and Morice, according to Vollenweider's 1968 lake classification is ulta-oligotrophic (lower than 1000 mg/m^3 maximum plankton density). The lower phytoplankton productivity of Morice Lake could be due to the substantially lower temperatures. A previous study by Brett and Pritchard (1946) indicated that Morice Lake had a low productivity, however no biomass values were reported. Kling (1975) and Schindler et.al. (1974) reported on several lakes with similar biomass values, however these lakes are all located in the Northwest Territories and are likely not comparable due to the differences in amount of sunlight.

During most of the year, due to wind action, it was impossible to sample the water column, however, temperature data, and the phytoplankton sampling on July 17, 1974 (Appendix 2) would indicate that the top 200 meters are relatively mixed. The apparent predominance of the negatively buoyant diatoms throughout the water column on July 17, 1974 would tend to confirm that wind mixing is a major factor within the lake.

Nanika Lake was also sampled once during the survey, on July 31, 1974. The results show it is similar in biomass to Morice Lake, Table 7. A list of algae species present is given in Table 6.

Since measurable quantities of NH_3, NO_2, NO_3, OP and TP were generally close to or below analytical detection limits, it is reasonable to assume that nutrients (except silicon) are a major limiting factor to phytoplankton production within Morice Lake. During the survey only Nanika River contributed any significant supply of TP.

TABLE 5 - CHEMICAL ANALYSIS, NANIKA AND KIDPRICE LAKES, 1974

STATION NUMBER	DEPTH M	TEMP °C	pH ~~ppm~~	Cu mg/l	Zn mg/l	Pb mg/l	TR mg/l	HARD. $CaCO_3$ mg/l	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Mn mg/l	Fe mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
OCTOBER 22																						
KIDPRICE LK.	0.5	7	7.2	0.01	<.01	<.02	41	19	0.68	0.33	0.91	5.6	0.04	1.3	<1	6	1.48	-	<.005	<.01	-	0.065
BERGELAND CR.	0.5	2.3	7.3	0.01	<.01	<.02	55	-	0.70	-	0.96	11.	<.03	0.25	<1	13	2.25	<.01	<.005	.014	-	0.016
NANIKA A*	0.5	3.2	7.3	<.01	<.01	<.02	46	-	0.29	-	0.25	4.4	<.03	0.5	<1	<5	0.9	<.01	<.005	.018	-	0.02
NANIKA C*	0.5	7	7.3	<.01	<.01	<.02	37	17	0.54	0.20	0.40	7.7	<.03	0.5	<1	<5	1.4	<.01	<.005	0.029	-	0.049
DECEMBER 11																						
KIDPRICE LK.	0.5	3.0	-	-	-	-	19	18	0.46	0.46	0.93	5.8	<.03	-	<1	<5	1.38	<.01	<.005	<.01	<.005	<.01
NANIKA C*	0.5	3.0	-	-	-	-	15	15	0.33	0.12	0.33	5.5	<.03	-	<1	<5	1.21	<.01	<.005	<.01	<.005	<.01

* See Figure 2 for station location.

TABLE 6 ALGAL SPECIES LIST, MORICE AND NANIKA LAKES

	MORICE LAKE	NANIKA LAKE
CYANOPHYTA		
Synechococcus sp.	+	+
Anabaena sp.	+	+
Anabaena flos-aquae	+	+
Anabaena circinalis	+	+
Aphanizomenon flos-aquae	+	+
CHLOROPHYTA		
Oocystis lacustris	+	
Oocystis submarina var. variablis	+	
Gloeocystis planctonicus	+	
Elakatothrix gelatinosa	+	+
Tetraedron minimum	+	+
Lagerheimia quadriseta	+	
Lagerheimia subsalsus	+	
Monoraphidium sp.	+	
Scenedesmus denticulatus var. linearis	+	
Scenedesmus sp.	+	
Nephrocytium aqardhianum	+	
Coelastrum microporum	+	
Chlamydomonas sp.	+	
Cosmarium depressum	+	
Pachycladon sp.	+	
EUGLENOPHYTA		
None		
CHRYSOPHYCEAE		
Chrysococcus rufescens	+	
Chrysococcus sp.	+	+

TABLE 6 (CONT'D)

	MORICE LAKE	NANIKA LAKE
Erkenia subaequiciliata	+	
Erkenia sp.	+	+
Chromulina sp.	+	+
Ochromonas sp.	+	+
Heterochromonas sp.	+	+
Rhizochrysis sp.	+	
Kephyrion sp.	+	+
Kephyrion bonale	+	+
Pseudokephyrion spirale	+	+
Mallomonas spp.	+	+
Synura sp.	+	+
Chrysoikos skujai	+	+
Dinobryon sertularia var. protrub	+	+
Dinobryon acuminatum	+	
Dinobryon njakjaurensis	+	
Dinobryon sociale var. americanum	+	
Dinobryon suecicum	+	
Dinobryon sp.	+	+
Botryococcus braunii	+	
DIATOMAEAE		
Synedia acus	+	+
Synedia acus var. radians	+	
Synedia acus var. angustissima	+	
Synedia sp.	+	+
Cyclotelea comta	+	+
Cyclotelea stelligera	+	+
Cyclotella keutzingiana	+	+
Cyclotella sp.	+	+
Cymbella sp.	+	+

TABLE 6 (CONT'D)

	MORICE LAKE	NANIKA LAKE
Stauroneis sp.	+	+
Naircula sp.	+	+
Achnanthes sp.	+	+
Nitzschia acicularis	+	+
Stephanodiscus astreae	+	+
Eunotia sp.	+	
Epithemia sp.	+	
Eucocconeis sp.	+	
Melosira granulata	+	
Melosira distens	+	
Tabellaria finestrata	+	
Tabellaria flosculosa	+	
Asterionella formosa	+	
Rhizosolenia eriensis	+	
Rhizosolenia sp.	+	
CRYPTOPHYCEAE		
Cryptomonas erosa	+	
Cryptomonas rostratiformes	+	
Cryptomonas pusilla	+	
Rhodonomas minuta	+	+
Katablepharis ovalis	+	+
Cryptaulax sp.	+	
PERIDINEAE		
Gymnodinium helveticium	+	
Gymnodinium spp.	+	
Glenodinium poscheri	+	
Peridinium pusillum	+	

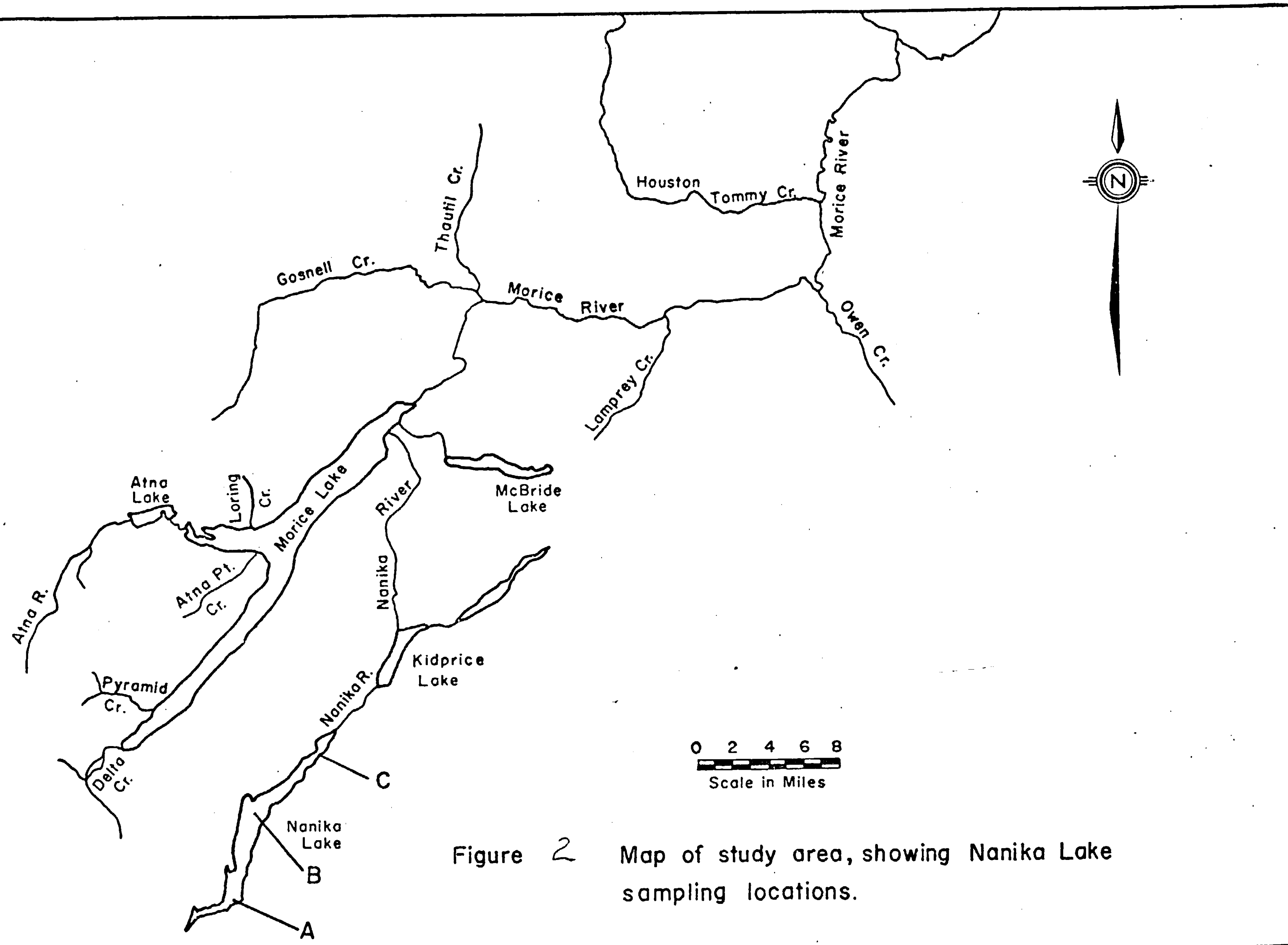

Figure 2 Map of study area, showing Nanika Lake sampling locations.

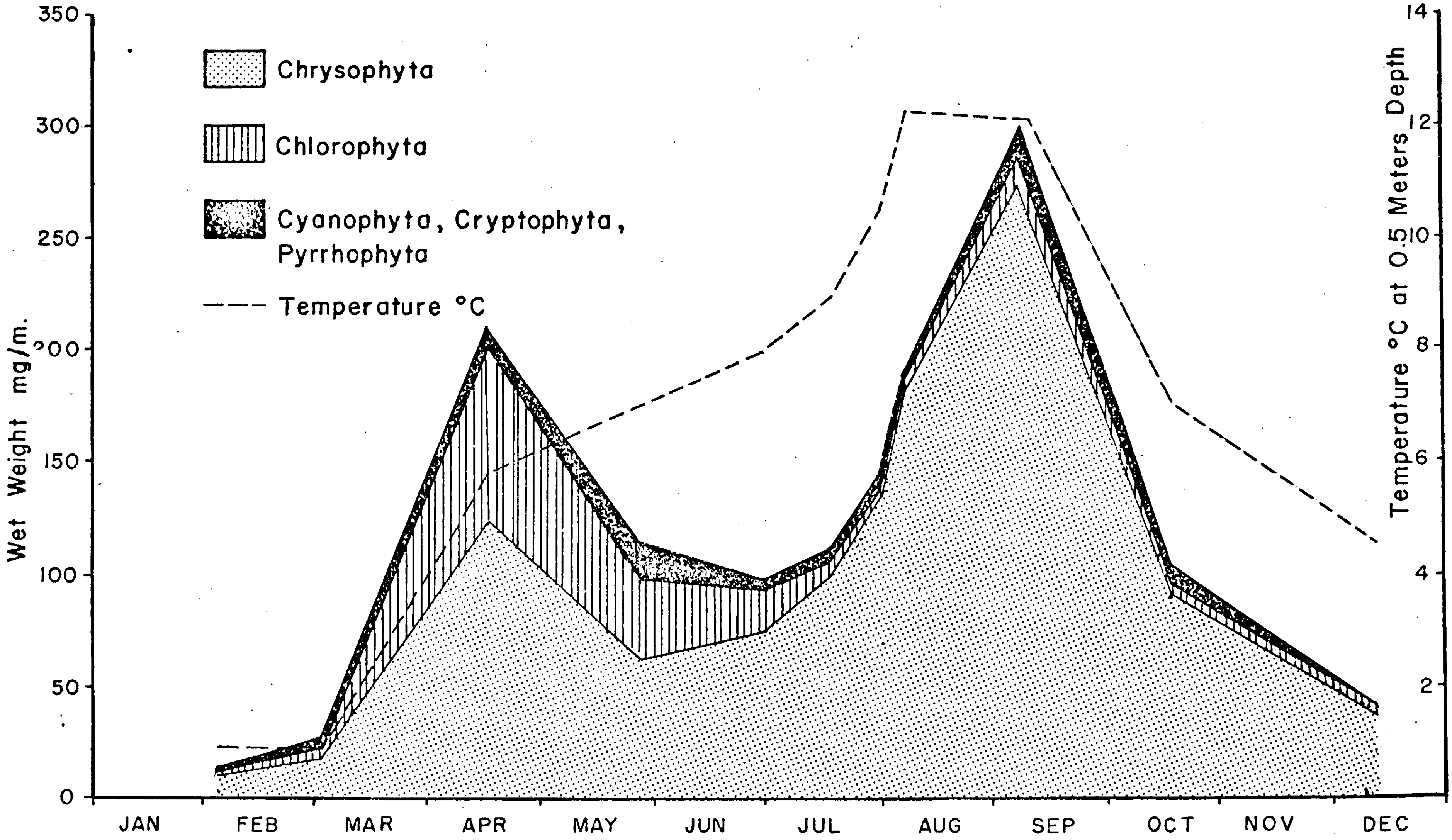

Figure 3 Phytoplankton Biomass Values and Temperature, Station 3 (0.5 Meters), Morice Lake, B.C.

TABLE 7 NANIKA LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	JULY 31, 1974			
STATION*	A		B	
DEPTH M	0.5		0.5	
	mg/m^3	%	mg/m^3	%
CYANOPHYTA	9.5	16.6	28.8	15.4
CHLOROPHYTA	4.3	7.5	10.1	5.4
EUGLENOPHYTA	-	-	-	-
CHRYSOPHYCEAE	28.2	49.4	110.2	58.8
DIATOMEAE	15.1	26.4	36.1	19.2
CRYPTOPHYCEAE	-	-	2.1	1.1
PERIDINEAE	-	-	-	-
TOTAL	57.1	-	187.3	-

* See map of study area

TABLE 8 COMPARISON OF MORICE LAKE PHYTO-PLANKTON BIOMASS VALUES BETWEEN JULY, 1974 TO JUNE, 1975.

	STATION 3	STATION 4	STATION 5
Jul. 17, 1974	119.1	102.9	53.8
Jul. 31	146.0	136.2	44.3
Aug. 6	190.1	171.0	69.8
Sep. 9	300.6	-	111.1
Oct. 21	100.1	-	39.0
Dec. 10	50.5	-	20.1
Feb. 3, 1975	26.1	-	-
Mar. 2	49.8	-	-
Apr. 18	212.0	-	-
May 28	120.1	-	-
Jun. 25	99.1	90.0	39.8

Silicon is an important nutrient to Morice Lake since diatoms are the dominant phytoplankton group. According to Lund (1950, 54), silicon is limiting (to Asterionella formosa and Melosira italica) if the supply is lower than 0.5 mg/l. However, since the measurable quantity was never observed at this low level it is likely that silicon is not limiting in Morice Lake during the 1974 - 75 survey. Other chemical parameters measured do not appear (Lund, 1950) to be present in sufficiently low levels to reduce or limit production of phytoplankton.

Zooplankton:

Based on data analyzed during this survey, the low number of zooplankton species (Table 9) is typical of alpine and montane lakes and is believed to be a result of factors primarily connected with altitude such as low water temperature, and reduced probability of distribution owing to isolation (Patalas, 1964).

Quantitatively, the planktonic abundance found in this lake is low, typical of alpine lakes. The decreased amount of plankton is generally associated with increased altitude and decreased total dissolved solids (TR). A comparison with other Canadian lakes is given below, (Patalas, 1973).

Lake	Total Crustacean Zooplanktonic Abundance, Ind/cm^2
Great Slave	15
Superior	43
Winnipeg	100

Lake	Total Crustacean Zooplanktonic Abundance, Ind/cm^2
Okanagan	101 - 188
Huron	167
Ontario	306
Erie	400

In comparison, on data presented to date, Morice Lake is poor in amount of zooplankton, both in the number of species present and the total amount of each species.

A probable pattern is exhibited in a decreasing trend in total abundance from spring to fall at all three stations, see below:

Total Individuals Per Litre, Morice Lake, 1974 - 75

DATE	STATIONS		
	3	4	5
17 July	8.96	3.26	2.66
31 July	3.45	1.23	0.75
11 Sept.	1.58	0.82	0.69
3 Feb.	1.45	-	-
28 May	5.31	-	1.48
25 June	8.16	0.37	1.10
24 Aug.	1.05	0.70	0.76

This may reflect a deteriorating nutritional situation related to decreasing allochthonic input following initial spring run-off.

TABLE 9 - LIST OF ZOOPLANKTON SPECIES FOUND IN NET PLANKTON OF MORICE LAKE, B.C. 1974

SPECIES	STATION 3			STATION 4			STATION 5		
	17.VII.74	31.VII.74	11.IX.74	17.VII.74	31.VII.74	11.IX.74	17.VII.74	31.VII.74	11.IX.74
Epischura nevadensis Lilljeborg	1.48	0.62	-	0.04	0.05	<0.01	-	0.21	0.01
Cyclops bicuspidatus thomasi S. A. Forbes	-	-	-	-	-	-	-	-	-
Cyclops scutifer Sars.	6.40	1.92	0.04	2.31	0.56	0.06	2.46	0.11	0.03
Daphnia longiremus Sars.	0.13	0.04	<0.01	0.11	0.03	0.04	0.04	0.05	0.09
Bosmina coregoni longespina Leudig	0.04	0.04	0.07	-	-	0.13	-	<0.01	0.18
Holopedium gibberum Zaddach	0.91	0.83	1.27	0.80	0.59	0.53	0.16	0.38	0.38
TOTAL IND/1	8.96	3.45	1.38	3.26	1.23	0.82	2.66	0.75	0.69

TABLE 9 - LIST OF ZOOPLANKTON SPECIES FOUND IN NET PLANKTON OF MORICE LAKE, B. C.

SPECIES	STATION 3				STATION 4		STATION 5		
	3.II.75	28.V.75	25.VI.75	24.VIII.75	25.VI.75	24.VIII.75	28.V.75	25.VI.75	24.VIII.75
:pischura nevadensis Lilljeborg	-	-	-	0.03	-	<0.01	-	-	0.03
Diaptomidae nauplii	-	-	0.31	-	0.06	-	-	0.04	-
:yclops bicuspidatus thomasi S. A. Forbes	-	-	-	0.06	-	-	-	-	-
:yclops scutifer Sars	1.43	5.31	7.59	0.44	0.31	0.53	1.48	1.00	0.57
3osmina coregoni longispina Leydig	<0.01	<0.01	0.05	0.18	-	0.10	-	-	0.03
Iolopedium gibberum Zaddach	0.02	-	0.21	0.34	<0.01	0.07	-	0.06	0.13
:otal Ind/L.	1.45	5.31	8.16	1.05	0.37	0.70	1.48	1.10	0.76

Ihe Diaptomidae nauplii are likely those of Epischura nevadensis as no other diaptomid species was encountered.

TABLE 10 - LIST OF ZOOPLANKTON SPECIES FOUND IN NET PLANKTON OF NANIKA LAKE, B.C. 1974

SPECIES	STATION A	STATION B	STATION C
	31.VII.74	31.VII.74	31.VII.74
Epischura nevadensis Lilljeborg	0.07	0.04	0.04
Diaptomus arcticus Marsh	0.04	0.02	-
Diaptomus kenai M. S. Wilson	0.37	0.14	0.05
Cyclops bicuspidatus thomasi S. R. Forbes	1.90	1.19	0.09
Daphnia longispina hyalina Leydig var miscrocephala Sars.	0.09	0.09	0.03
Bosmina coregoni longespina Leydig	0.02	<0.01	<0.01
TOTAL IND/l	2.49	1.49	0.21

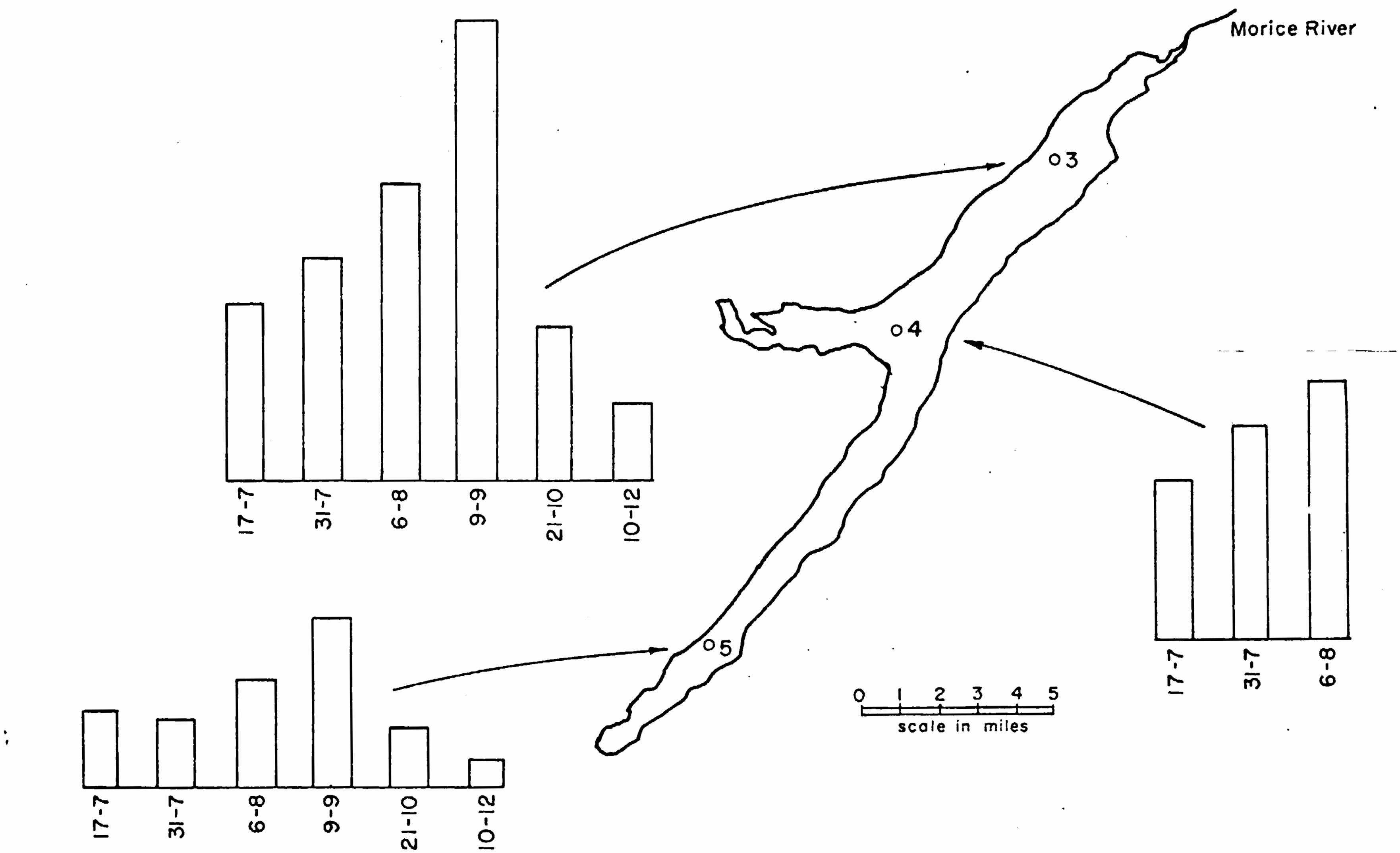

Figure 4 Relative Plankton Biomass, 1974, Morice Lake B.C. at 0.5 Meters Depth.

Zooplankton abundance also appears to decrease from the north to the south end of the lake. Winter abundance also appears to increase (at station three) over the fall values, which could be due to increase in nutrients from the natural run-off or precipitation. The greatest zooplankton abundance occurs between May and July which probably occurs as a direct result of spring run-off.

However, there is a possibility of another diaptomid being present below the 10 meter layer. The absence of Daphnia longiremis from the 1975 samples may be due to a lack of sampling of deeper water, especially in daytime sampling. In the Okanagan Lakes and the Great Lakes for example, 90% of the plankton are located between 0 - 50 meters (Patalas). Therefore, there is a possibility that a large proportion of the zooplankton may have been missed in the 10 meter haul.

Nanika Lake was also sampled on 31-7-74 as a comparison to Morice Lake. The results are reported in Table 10.

Zoobenthos:

The average density of benthic invertebrates in samples from Morice Lake was 1680 per square meter. If the upper 100 meters of water is considered the density increased to $1992/m^2$, $2812/m^2$ for the upper 25 meters and $3366/m^2$ for the upper most 10 meters of littoral shore area. The density ranged from $6006/m^2$ at stations three at two meters depth to $42/m^2$ at station five at 231 meters depth.

Table 11 indicates that the Chironomids constitute approximately 50% of the fauna of Morice Lake and that 66% occur in the top 25 meters. In most cases, the dominant species is Heterotissocladius cf oliveri Saether. Saether (1975) indicates this species as strongly cold-stenothermic and Ultra-oligotrophic.

No previous benthic invertebrate data for Morice Lake or other regional lakes could be located in the literature. Zoobenthic literature for southern British Columbia is published but are also incomparable in species composition and abundance, which is likely due to difference in altitude and climate.

Rawson (1957, 1960 a, 1960 b) and Koshinsky (1971) surveyed several Churchill River lakes in Saskatchewan with similar climate and reported equal or lower densities. The larger mesh for sample seining as used by Rawson and Koshinsky would result in reporting relatively lower population densities. Sampling techniques used on 15 small lakes in the Canadian Shield near Kenora, Ontario (Hamilton, 1971) were identical to those used on thise study. Hamilton reported an average of 1552 benthic organisms/m^2 with a range from 104 to 3556 organisms/m^2. These densities are similar to Morice Lake, however both the latitude and altitude are lower.

Morphometry of Morice Lake:

Other factors, especially lake morphometry, may also have profound influence on lake production (Rawson, 1957). The Morice Lake basin lies in S.W. to N.E. axis, with the outflow to the north into the Morice River. The

TABLE 11 - DISTRIBUTION OF BENTHIC INVERTIBRATES IN MORICE LAKE, BY STATION AND DEPTH
(S = Sand, C = Gray clay, O = Organic material, M = Brown mud)

STATION	THREE									FOUR				FIVE										
DEPTH (M)	2	8	16	23	35	55	75	115	162	12	35	100	234	2	5	7	9	14	25	37	66	81	231	Total
Chironomidae	109	40	73	54	14	26	22	5	4	200	6	37	21	10	6	10	32	39	32	36	68	70	2	916
Empididae	55	10	-	1	-	-	-	-	-	3	-	-	-	-	5	-	2	-	2	-	-	-	-	78
Oligochaeta	122	99	-	2	-	-	-	-	2	9	-	-	7	115	169	18	41	10	-	-	-	-	-	594
Gastropoda	-	2	1	-	-	-	-	-	-	3	-	-	-	-	-	-	5	-	-	-	-	-	-	11
Pelecypoda	-	6	16	8	2	-	-	-	-	7	2	-	-	-	-	4	15	3	28	9	-	-	-	100
Nematoda	-	25	-	24	5	7	16	6	16	-	1	-	2	-	-	-	-	49	9	8	-	-	-	168
Total	286	182	90	89	21	33	38	11	22	222	9	37	30	125	180	32	95	101	71	53	68	70	2	1867
Substrate Type	M	M	M	M	S	S-M	M	C	M	M	S	C	C	S-M	O-M	S	M-O	M	M	C-M	C	C	C	
Organisms per square meter	6006	3822	1890	1869	441	693	798	231	462	4662	189	777	630	2625	3780	672	1995	2121	1491	1113	1428	1470	42	$\overline{X}$=1680

TABLE 12 - DISTRIBUTION OF CHIRONOMIDAE IN MORICE LAKE

STATION	THREE									FOUR				FIVE									
DEPTH (M)	2	8	16	23	35	55	75	115	162	12	35	100	234	2	5	7	9	14	25	37	66	81	231
Procladius sp.	2	2	7	10	5	1	-	-	-	-	-	-	-	-	-	-	2	3	3	1	-	1	2
Thienemannimyia group	7	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Paracladopelma sp.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Stictochironomus sp.	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-
Micropsectra sp.	-	4	4	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	-	-	-	-
Tanytarsus sp.	78	4	-	-	-	-	-	-	-	-	-	-	-	4	3	-	-	-	-	-	-	-	-
Heterotrissocladius cf. oliveri saeth.	-	6	24	26	7	25	22	5	4	68	6	34	18	1	3	-	21	27	19	27	68	69	-
Paracladius sp.	10	10	20	3	-	-	-	-	-	52	-	1	2	-	-	-	5	2	-	-	-	-	-
Parakiefferiella sp.	-	-	8	14	1	-	-	-	-	48	-	2	1	-	-	-	4	2	6	8	-	-	-
Psectrocladius sp.	11	2	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	5	4	-	-	-	-
Monodiamesa cf. prolilabata saeth.	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Protanypus cf. namiltani saeth.	-	-	-	-	1	-	-	-	-	4	-	-	-	3	-	-	-	-	-	-	-	-	-
Potthastia longimanus (Kieff.)	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Sympotthastia sp.	3	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	109	40	73	54	14	26	22	5	4	200	6	37	21	10	6	10	32	39	32	36	68	70	2

TABLE 13 - THE CHIRONOMIDAE FROM MORICE LAKE, B.C.

Subfamily Tanypodinae

Procladius sp.
Thienemannimyia group cf. Conchapelopia sp.

Subfamily Chironominae

Tribe Chironomini

Paracladopelma sp.
Stictochironomus sp.

Tribe Tanytarsini

Micropsectra sp.
Tanytarsus sp.

Subfamily Orthocladiinae

Heterotrissocladius cf. oliveri Saeth.
Paracladius sp.
Parakiefferiella sp.
Psectrocladius sp.

Subfamily Diamesinae

Monodiamesa cf. prolilobata Saeth.
Protanypus cf. hamiltani Saeth.
Potthastia longimanus (Kieff.)
Sympotthastia sp.

surrounding glaciated mountains are a conspicuous feature of the lake basin. The prevailing winds from the high (6555 ft.) Cascade Mountains follow the long axis of the lake and proceed down the Morice River. The glacial streams and the prevalence of strong winds down Morice undoubtedly have effected the transparency of Morice Lake from increased turbidity.

Morice Lake is 41.7 km. long by 4.5 km. wide, and has an area of 10,360 hectares (shoreline development factor is 3.2). The lake has a maximum and mean depths of 236.2 and 99.7 meters respectively with a total volume of 10,327.5 X 10^6 cubic meters (Godfrey, 1955). The Morice River, outflow, had a mean monthly flow (for 1968 - 1973) of 2,655 cfs (Water Resources, Inland Waters). Assuming that the inflow equals the outflow, the theoretical exchange time for Morice Lake is then calculated at 4.36 years.

Trophic Level:

No attempt has been made to relate the available data on phosphorus input to the trophic level of Morice Lake. The present data observed was to a large degree below the measurable limit of the analytical facilities. The major tributary, the Nanika River, contributed by surface streamflow, the only significant loading of measured total phosphorus to the lake.

Table 14, however, (after Rawson, 1958; Gray, 1970) characterizes factors affecting the trophic level and compares them to Morice Lake. The conditions indicate clearly that Morice Lake is of an oligotrophic type.

TABLE 14 - CHARACTERISTICS OF MORICE LAKE TROPHIC LEVEL

PARAMETER	OLIGOTROPHIC	EUTROPHIC	MORICE LAKE
Potential nutrients in water	low	high	low
Shore development	low	high	3.2 (low)
Area	large	low	10360 hectares (relatively large)
# Islands	low	high	5 (low)
Transparency	high	low	9.7 m. (high)
Stratification	low	high	low
Depth Mean	deep	shallow	99.7 m. (deep)
Depth Max.	deep	shallow	236.2 m. (deep)
Oxygen % saturation	high	low	90 - 100% (high)
Temperature	low	high	Max. = 12.7^{o} C. (low)
Quantity of plankton	poor	rich	poor
Fish	salmonids	coarse - percids type	salmonids
Bottom fauna	stenoxybiont	euryoxybiont	stenoxybiont

IMPACT OF IMPOUNDMENT

Morice Lake will be affected by water chemistry changes due to inundation. The initial effect of impoundment will be an increase in nutrients from the new littoral zone because of leaching from the new shoreline soils. Since the majority of the shoreline of Morice Lake is rock and some gravel, the leaching effect will be minimum except at Delta and Atna Creeks and from Nanika River and McBride Creek areas. The minimal nutrient leaching from these new flooded zones may result in a proportionally small increase in primary production. However, flooding (shoreline erosion) will also increase the turbidity which will have a corresponding decrease in the lake production by decreasing the photosynthetic zone.

The Nanika River presently contributes approximately 50% of the water inflow into Morice Lake. The chemical water quality of Morice Lake, therefore, is substantially influenced by this river. This is evident from the relative greater photoplankton production in this area (station 3) which is likely due to nutrient input from the Nanika River. Reduction of this water flow will likely cause a decrease in the primary productors (photoplankton) with eventual lowering of the upper food chain. Zooplankton, feeding on littoral phytoplankton, will follow a similar pattern of production with a short time lag.

Similar surveys by Sinclair (1965) and especially Grimas (1961) in British Columbia and Swedish impounded lakes show some post impoundment changes to the benthos. Comparing these reports with the present survey enables some predictions of impoundment to the benthic invertebrate community. The water level fluctuations in both past surveys caused reductions of bottom fauna. This will be especially critical in Morice Lake since the maximum abundance of the benthic invertebrates inhabit this top littoral lake environment. At high and low water levels, wave action and ice scouring also will effectively limit benthos and plant development in this region. Changes may also occur in species type and abundance. Some species (e.g., Gastropoda) could become extremely reduced or eliminated, while other new species (perhaps not desireable to present fish community) may colonize this new territory.

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APPENDIX 1 - CHEMICAL ANALYSIS MORICE LAKE, B. C.

DATE - 31-5-74

STATION NUMBER	DEPTH M	TR mg/1	HARD. mg/1 $CaCO_3$	Na mg/1	K mg/1	Mg mg/1	Ca mg/1	Cl mg/1	SO_4 mg/1	Si mg/1	NH_3 mg/1	NO_2 mg/1	NO_3 mg/1	OP mg/1	TP mg/1
1	0.5	-	-	2.0	-	-	4.0	<1	<5	-	<.02	<.005	-	<.005	<.01
2	0.5	-	19	1.2	-	-	-	<1	<5	-	<.02	<.005	-	<.005	0.01
3	0.5	64	15	1.5	0.12	0.56	5.2	<1	<5	-	<.02	<.005	0.05	<.005	<.01
4	0.5	55	19	1.3	0.20	0.41	6.1	<1	<5	-	-	<.005	0.06	<.005	<.01
5	0.5	56	19	1.4	0.21	0.42	6.2	<1	<5	-	<.02	<.005	0.05	<.005	<.01
5	5.0	56	16	1.5	0.18	0.50	5.8	<1	<5	-	<.02	<.005	0.05	<.005	<.01
6	0.5	-	-	-	-	-	-	<1	<5	-	<.02	<.005	0.03	<.005	<.01
8	0.5	59	15	1.9	0.35	0.32	6.5	-	<5	-	<.02	<.005	0.11	<.005	<.01
9	0.5	63	18	1.4	0.33	0.35	6.5	<1	<5	-	<.02	<.005	0.14	<.005	<.01
10	0.5	47	15	1.6	0.15	0.39	5.4	<1	<5	-	<.02	<.005	0.03	<.005	<.01
11	0.5	65	20	1.3	0.44	0.62	7.8	<1	<5	-	<.02	<.005	0.05	<.005	<.01
12	0.5	-	-	-	-	-	-	<1	<5	-	<.02	<.005	0.03	<.005	<.01
14	0.5	50	19	1.5	0.12	0.40	5.2	<1	<5	-	<.02	<.005	-	<.005	<.01

DATE - 18-6-74

STATION NUMBER	DEPTH M	TR mg/1	HARD. mg/1 $CaCO_3$	Na mg/1	K mg/1	Mg mg/1	Ca mg/1	Cl mg/1	SO_4 mg/1	Si mg/1	NH_3 mg/1	NO_2 mg/1	NO_3 mg/1	OP mg/1	TP mg/1
1	0.5	67	10	1.5	0.33	1.0	3.0	<1	<5	-	0.04	<.005	-	<.005	<.01
2	0.5	49	10	0.5	0.24	0.6	3.2	<1	<5	-	0.08	<.005	-	<.005	<.01
3	0.5	46	13	0.4	0.28	0.4	4.6	<1	<5	-	0.07	<.005	-	<.005	<.01
4	0.5	41	13	0.4	0.27	0.5	4.7	<1	<5	-	0.03	0.007	-	<.005	<.01
5	0.5	40	13	0.4	0.22	0.4	4.6	<1	<5	-	0.06	<.005	-	<.005	<.01
6	0.5	46	13	0.4	0.15	0.4	4.7	<1	<5	-	0.02	<.005	-	<.005	<.01
7	0.5	45	10	0.3	-	0.3	2.5	<1	<5	-	0.11	<.005	-	<.005	<.01
8	0.5	77	10	0.3	0.32	0.4	2.3	<1	<5	-	0.03	0.005	-	<.005	<.01
9	0.5	63	10	0.4	0.19	0.5	2.7	<1	<5	-	0.04	<.005	-	<.005	<.01
10	0.5	45	13	0.3	0.13	0.4	4.6	<1	<5	-	0.03	-	-	<.005	<.01
11	0.5	51	16	0.4	0.45	0.6	5.3	<1	<5	-	0.04	<.005	-	<.005	<.01
12	0.5	40	10	0.4	0.16	0.4	3.6	<1	<5	-	0.02	<.005	-	<.005	<.01
13	0.5	40	10	0.4	0.16	0.4	3.6	<1	<5	-	0.02	<.005	-	<.005	<.01
14	0.5	40	13	0.4	0.20	0.4	4.6	<1	<5	-	0.04	<.005	-	<.005	<.01

DATE - 17-7-74

STATION NUMBER	DEPTH M	Chla mg/l	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	-	63	11	1.8	0.40	0.93	3.0	<1	<5	2.15	0.02	<.005	-	0.008	0.07
2	0.5	-	57	11	0.6	0.06	0.44	4.0	<1	<5	1.36	0.02	0.005	-	0.005	0.09
3	0.5	0.1	55	13	0.6	0.25	0.42	4.8	<1	<5	1.3	0.01	<.005	-	0.005	0.045
3	100	<0.1	55	13	0.2	0.26	0.42	4.7	<1	<5	1.3	0.01	<.005	-	<.005	0.048
3	200	<0.1	55	13	0.6	0.26	0.44	5.0	<1	<5	1.3	0.01	<.005	-	<.005	0.048
4	0.5	0.1	-	14	0.7	0.27	0.44	5.0	<1	<5	1.3	0.01	<.005	-	<.005	0.058
4	75	<0.1	67	14	0.7	0.24	0.42	4.9	<1	<5	1.3	0.01	<.005	-	<.005	0.043
4	150	<0.1	70	14	0.6	0.27	0.44	5.0	<1	<5	1.1	0.01	<.005	-	<.005	0.048
5	0.5	<0.1	-	14	0.6	0.26	0.42	4.7	<1	<5	1.2	0.02	<.005	-	<.005	0.045
5	175	<0.1	70	14	0.9	0.34	0.49	4.9	<1	<5	1.1	0.02	<.005	-	<.005	0.039
5	200	<0.1	-	14	0.8	0.27	0.44	4.9	<1	<5	1.2	0.01	<.005	-	0.005	0.039
6	0.5	-	64	14	0.9	0.19	0.44	5.1	<1	<5	1.1	<.01	<.005	-	0.008	0.045
7	0.5	-	62	11	0.5	0.09	0.36	3.7	<1	<5	1.1	0.02	<.005	-	0.007	0.045
8	0.5	-	71	10	0.4	0.33	0.36	3.2	<1	<5	0.9	0.02	<.005	-	0.010	0.041
9	0.5	-	66	10	0.5	0.23	0.31	3.2	<1	<5	1.2	<.01	<.005	-	0.008	0.055
10	0.5	-	73	14	0.1	0.16	0.30	3.2	<1	<5	1.1	0.02	<.005	-	0.007	0.040
11	0.5	-	78	14	0.5	0.44	0.50	5.0	<1	<5	1.1	0.02	<.005	-	0.006	<.01
12	0.5	-	52	10	0.5	0.09	0.30	4.7	<1	<5	1.22	0.02	<.005	-	0.007	0.061
13	0.5	-	-	-	0.8	-	-	3.0	<1	<5	-	-	<.005	-	-	<.01
14	0.5	-	-	14	0.6	0.27	0.40	-	<1	<5	-	-	<.005	-	<.005	0.04

DATE - 31-7-74

STATION NUMBER	DEPTH M	Chl mg/l	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	-	50	10	1.5	0.4	1.1	-	<1	<5	2.45	0.019	<.005	<.01	<.005	0.01
2	0.5	-	33	10	0.4	0.1	0.4	3.0	<1	<5	1.4	0.014	<.005	<.01	0.005	0.01
3	0.5	-	46	13	0.5	0.3	0.5	4.4	<1	<5	1.4	0.005	<.005	.028	<.005	<.01
3	25	<0.1	-	12	0.5	0.3	0.5	3.9	<1	<5	1.4	0.007	<.005	.015	<.005	<.01
3	175	-	<2.5	11	0.5	0.3	0.4	3.8	<1	<5	1.4	<.005	<.005	.03	<.005	<.01
4	0.5	<0.1	46	11	0.4	0.3	0.5	3.7	<1	<5	1.4	<.005	<.005	.018	<.005	<.01
4	25	-	<2.5	13	0.4	0.3	0.4	4.5	<1	<5	1.4	<.005	<.005	.028	<.005	<.01
4	175	-	<2.5	12	0.6	0.3	0.6	3.9	<1	<5	1.4	<.005	<.005	.035	<.005	<.01
5	0.5	<0.1	29	12	0.5	0.3	0.5	3.9	<1	<5	1.4	<.005	<.005	.018	<.005	<.01
5	10	-	<2.5	13	0.4	0.3	0.5	4.2	<1	<5	1.4	<.005	<.005	.015	<.005	<.01
5	75	-	<2.5	12	0.4	0.3	0.4	4.0	<1	<5	1.4	<.005	<.005	.015	<.005	<.01
5	175	-	<2.5	13	0.5	0.3	0.4	4.2	<1	<5	1.4	<.005	<.005	.029	<.005	<.01
6	0.5	-	37	11	0.6	0.1	0.3	4.0	<1	<5	1.4	<.005	<.005	.029	<.005	<.01
7	0.5	-	55	10	0.4	0.3	0.5	3.0	<1	<5	1.4	<.005	<.005	<.01	<.005	<.01
8	0.5	-	55	10	0.4	0.1	0.4	-	<1	<5	1.2	0.009	<.005	<.01	<.005	<.01
9	0.5	-	40	10	0.2	0.2	0.4	-	<1	<5	0.6	<.005	<.005	<.01	<.005	<.01
10	0.5	-	57	10	0.4	0.1	0.3	3.8	<1	<5	1.2	<.005	<.005	<.01	<.005	<.01
11	0.5	-	30	13	0.2	0.4	0.7	3.9	<1	<5	1.0	<.005	<.005	<.01	<.005	<.01
12	0.5	-	19	10	0.5	0.1	0.2	-	<1	<5	1.2	<.005	<.005	<.01	<.005	<.01
13	0.5	-	32	13	0.2	0.2	0.7	3.9	<1	<5	1.1	<.005	<.005	<.01	<.005	<.01
14	0.5	-	-	-	0.6	0.3	0.4	4.0	<1	<5	-	<.005	<.005	<.01	<.005	<.01

DATE - 11-9-74

STATION NUMBER	DEPTH M	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	40	17	1.20	0.24	0.50	6.2	<1	<5	1.8	0.027	<.005	-	<.005	0.01
2	0.5	48	14	0.40	0.12	0.50	4.8	<1	<5	0.6	0.029	<.005	-	<.005	0.04
3	0.5	28	16	0.40	0.24	0.50	5.6	<1	<5	0.7	0.012	<.005	-	<.005	<.01
4	0.5	35	15	0.50	0.25	0.53	5.5	<1	<5	0.8	0.016	<.005	<.005	< -	0.01
5	0.5	45	15	0.40	0.26	0.53	5.3	<1	<5	0.8	0.015	<.005	-	<.005	<.01
5	25	40	15	0.40	0.26	0.56	5.0	<1	<5	0.9	0.014	<.005	-	<.005	<.01
5	175	-	15	0.40	0.25	0.52	5.3	<1	<5	1.1	0.015	<.005	-	<.005	<.01
6	0.5	41	20	0.50	0.17	0.45	7.6	<1	<5	1.0	0.013	<.005	-	<.005	<.01
7	0.5	41	18	0.60	0.12	0.58	6.4	<1	<5	0.8	0.016	<.005	-	<.005	<.01
8	0.5	57	11	0.50	0.43	0.53	3.6	<1	<5	0.3	0.024	<.005	-	<.005	0.01
9	0.5	47	13	0.40	0.26	0.53	4.7	<1	<5	0.5	0.019	<.005	-	<.005	0.01
10	0.5	38	16	0.20	0.08	0.40	5.9	<1	<5	0.5	0.015	<.005	-	<.005	<.01
11	0.5	37	12	0.25	0.37	0.45	4.0	<1	<5	0.3	0.019	<.005	-	<.005	<.01
12	0.5	37	13	0.40	0.07	0.38	4.6	<1	<5	0.7	0.016	<.005	-	<.005	<.01
13	0.5	54	17	0.40	0.07	0.57	6.2	<1	<5	<.2	.02	<.005	-	<.005	<.01
14	0.5	43	17	0.50	0.24	0.50	6.2	<1	<5	0.8	0.018	<.005	-	<.005	<.01

DATE - 21-10-74

STATION NUMBER	DEPTH M	Chla mg/l	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	-	89	19	1.7	-	1.1	4.5	<1	<5	3.2	<.01	<.005	<.01	-	0.01
2	0.5	-	38	14	0.6	-	0.8	5.2	<1	<5	1.5	0.01	<.005	<.01	-	0.22
3	0.5	<.01	38	14	0.4	-	0.5	5.9	<1	<5	1.4	<.01	<.005	0.026	-	<.01
4	0.5	<.01	32	14	0.6	-	0.52	5.8	<1	<5	1.4	<.01	<.005	0.028	-	<.01
5	0.5	<.01	-	14	-	-	-	-	-	-	1.4	<.01	<.005	0.027	-	<.01
7	0.5	-	44	20	0.6	-	0.5	7.5	<1	<5	1.8	<.01	<.005	<.01	-	<.01
8	0.5	-	39	15	0.5	-	0.8	6.3	<1	<5	1.6	<.01	<.005	0.03	-	0.01
9	0.5	-	41	15	0.7	-	0.7	7.1	<1	<5	1.8	<.01	<.005	0.03	-	0.02
10	0.5	-	48	15	0.4	-	0.5	-	<1	<5	1.6	<.01	<.005	0.06	-	<.01
11	0.5	-	42	16	0.6	-	1.1	-	<1	<5	1.4	<.01	<.005	0.02	-	0.04
14	0.5	-	33	13	0.5	-	0.56	6.2	<1	<5	1.4	<.01	<.005	0.03	-	<.01

DATE - 10-12-74

STATION NUMBER	DEPTH M	Chl mg/l	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	-	45	20	1.60	0.31	0.8	9.0	<.4	<5	3.96	0.01	0.006	<.01	<.005	0.01
2	0.5	-	53	14	0.60	0.40	1.0	4.0	<.4	<5	2.87	0.01	<.005	0.01	<.005	0.01
3	0.5	<.01	28	14	0.50	0.31	0.5	4.9	<.4	<5	1.8	0.01	0.007	0.02	<.005	<.01
4	0.5	<.01	31	14	0.50	0.25	0.5	4.9	<.4	<5	1.65	<.01	0.007	0.02	<.005	<.01
5	0.5	<.01	-	14	0.50	0.30	0.5	4.9	<.4	<5	1.7	<.01	0.007	0.02	<.005	<.01
5	50	<.01	-	14	0.50	0.27	0.5	4.9	<.4	<5	1.8	<.01	0.007	0.02	<.005	<.01
7	0.5	-	16	20	0.80	0.17	0.7	9.8	<.4	<5	2.51	<.01	<.005	<.01	<.005	<.01
8	0.5	-	24	20	0.60	0.53	0.4	8.0	<.4	<5	2.38	<.01	0.008	0.03	<.005	0.01
9	0.5	-	32	20	0.70	0.46	0.5	8.6	<.4	<5	2.58	<.01	0.006	0.02	<.005	<.01
10	0.5	-	24	15	0.60	0.11	0.6	-	<.4	<5	2.38	<.01	0.01	0.03	<.005	<.01
11	0.5	-	21	20	0.80	-	0.9	6.6	<.4	<5	1.52	<.01	0.006	<.01	.006	<.01
14	0.5	-	-	14	0.50	0.30	0.5	5.0	<.4	<5	1.7	<.01	0.007	.02	<.005	<.01

DATE - 4-2-75

STATION NUMBER	DEPTH M	Chla mg/l	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
2	0.5	<.01	-	18	0.5	0.28	0.64	6.1	<.04	<5	1.6	<.01	<.005	0.03	0.01	0.02
3	0.5	<.01	17	16	0.4	0.24	0.44	5.8	<.04	<5	1.3	<.01	<.005	0.005	-	<0.01
11	0.5	-	33	22	0.7	-	0.74	7.7	<.04	<5	1.5	<.01	<.005	0.06	0.011	0.01

DATE - 2-3-75

STATION NUMBER	DEPTH M	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	30	18	1.7	0.4	0.92	5.8	-	<5	3.1	<.01	<.005	0.01	0.005	<0.01
2	0.5	31	19	0.6	0.2	0.6	6.5	-	<5	1.7	<.01	<.005	0.03	0.005	<0.01
14	0.5	<10	18	0.6	0.3	0.5	6.3	<1	<5	1.4	<.01	<.005	0.04	0.005	<0.01

DATE - 28-5-75

STATION NUMBER	DEPTH M	TR mg/1	HARD. mg/1 $CaCO_3$	Na mg/1	K mg/1	Mg mg/1	Ca mg/1	Cl mg/1	SO_4 mg/1	Si mg/1	NH_3 mg/1	NO_2 mg/1	NO_3 mg/1	OP mg/1	TP mg/1
1	0.5	65	12	1.2	0.21	0.58	3.9	<1	<5	2.2	<.01	<.005	0.013	<.005	<.01
2	0.5	56	14	0.7	0.13	0.50	4.9	<1	<5	1.5	<.01	<.005	0.028	0.009	0.03
3	0.5	48	15	0.5	0.22	0.45	5.4	<1	<5	0.9	<.01	<.005	0.042	0.011	<.01
5	0.5	42	15	0.5	0.18	0.43	5.2	<1	<5	0.8	<.01	<.005	0.042	<.005	<.01
7	0.5	42	13	0.6	0.10	0.37	4.6	<1	<5	1.1	<.01	<.005	<.01	<.005	<.01
8	0.5	83	11	0.4	0.23	0.24	4.0	<1	<5	0.9	<.01	<.005	0.070	<.005	0.03
9	0.5	78	16	0.6	0.31	0.50	5.7	<1	<5	1.3	<.01	<.005	0.078	<.005	0.03
10	0.5	55	18	0.4	0.08	0.39	6.7	<1	<5	1.0	<.01	<.005	0.138	<.005	<.01
11	0.5	57	20	0.6	0.52	0.70	8.0	<1	<5	0.8	<.01	<.005	0.050	<.005	<.01
14	0.5	35	16	0.6	0.19	0.47	5.7	<1	<5	0.1	<.01	<.005	0.047	<.005	<.01

DATE - 25-6-75

STATION NUMBER	DEPTH M	TR mg/l	HARD. mg/l $CaCO_3$	Na mg/l	K mg/l	Mg mg/l	Ca mg/l	Cl mg/l	SO_4 mg/l	Si mg/l	NH_3 mg/l	NO_2 mg/l	NO_3 mg/l	OP mg/l	TP mg/l
1	0.5	-	-	2.3	0.5	1.1	4.4	<1	<5	2.1	<.005	<.005	0.01	<.005	0.01
2	0.5	-	-	0.6	0.2	0.5	4.7	<1	<5	1.2	<.005	<.005	<.005	<.005	0.01
3	0.5	-	-	0.5	0.3	0.5	5.7	<1	<5	1.2	<.005	<.005	0.02	<.005	<.01
4	0.5	-	-	0.5	0.3	0.5	5.7	<1	<5	1.3	<.005	<.005	<.005	<.005	<.01
5	0.5	-	-	0.5	0.2	0.4	5.7	<1	<5	1.2	<.005	<.005	0.03	<.005	<.01
6	0.5	-	-	0.4	0.1	0.3	5.6	<1	<5	1.2	<.005	<.005	0.02	<.005	<.01
7	0.5	-	-	0.4	0.6	0.4	3.2	<1	<5	0.9	<.005	<.005	0.01	<.005	<.01
8	0.5	-	-	0.4	0.3	0.7	3.1	<1	<5	0.6	<.005	<.005	<.005	<.005	0.02
9	0.5	-	-	0.5	0.1	0.5	5.3	<1	<5	1.2	0.009	<.005	0.03	<.005	0.01
10	0.5	-	-	0.3	0.6	0.6	6.5	<1	<5	1.0	<.005	<.005	0.01	<.005	<.01
11	0.5	-	-	0.5	0.2	0.6	5.8	<1	<5	1.1	<.005	<.005	0.01	<.005	<.01
12	0.5	-	-	0.4	0.3	0.3	4.3	<1	<5	1.1	0.005	<.005	0.01	<.005	<.01

DATE - 24-8-75

STATION NUMBER	DEPTH M	HARD. mg/1 $CaCO_3$	Na mg/1	K mg/1	Mg mg/1	Ca mg/1	Cl mg/1	SO_4 mg/1	Si mg/1	NH_3 mg/1	NO_2 mg/1	NO_3 mg/1	OP mg/1	TP mg/1
1	0.5	11	0.5	0.26	-	7.1	<1	<5	1.4	<.005	<.005	0.02	<.005	<.01
2	0.5	10	0.5	0.22	-	6.0	<1	<5	1.3	<.005	<.005	0.02	<.005	0.01
3	0.5	20	0.5	0.26	-	6.0	<1	<5	1.3	<.005	<.005	0.02	<.005	<.01
4	0.5	15	0.5	0.31	-	6.0	<1	<5	1.3	<.005	<.005	0.03	<.005	<.01
4	10	17	0.6	0.31	-	6.0	<1	<5	1.2	<.005	<.005	0.03	<.005	<.01
4	30	17	0.6	0.31	-	6.0	<1	<5	1.3	0.007	<.005	0.04	<.005	<.01
5	0.5	10	0.6	0.31	-	6.0	<1	<5	1.3	<.005	<.005	0.03	<.005	<.01
6	0.5	12	0.4	0.33	-	5.2	<1	<5	1.1	<.005	<.005	0.02	<.005	<.01
7	0.5	18	0.7	0.22	-	8.0	<1	<5	1.4	<.005	<.005	0.02	<.005	<.01
8	0.5	-	0.5	0.25	-	7.1	<1	<5	1.2	<.005	<.005	0.02	<.005	<.01
9	0.5	20	0.5	0.32	-	6.1	<1	<5	1.2	<.005	<.005	0.02	0.01	0.01
10	0.5	20	0.4	0.22	-	7.3	<1	<5	1.1	0.009	<.005	0.01	0.005	<.01
11	0.5	20	0.4	0.52	-	6.3	<1	<5	0.9	0.006	<.005	<.01	<.005	<.01
12	0.5	20	0.5	0.14	-	5.2	<1	<5	1.4	<.005	<.005	<.01	<.005	<.01
14	0.5	-	0.5	0.31	-	5.0	<1	<5	1.3	<.005	<.005	<.01	<.005	<.01

APPENDIX 2

MORICE LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	JULY 17, 1974																		
STATION	3					4							5						
DEPTH M	0.5		100		-	0.5		75		100		-	0.5		175		200		INT
	mg/m³	%	mg/m³	%	INT*	mg/m³	%	mg/m³	%	mg/m³	%	INT	mg/m³	%	mg/m³	%	mg/m³	%	
CYANOPHYTA	5.7	5.3	-	-	2.8	2.9	2.5	7.3	7.6	6.8	6.3	6.1	1.4	2.1	-	-	-	-	0.6
CHLOROPHYTA	11.0	10.2	5.3	4.0	8.1	8.4	7.4	2.5	2.6	6.6	6.1	5.0	2.0	3.1	1.4	3.0	5.7	14.6	1.9
EUGLENOPHYTA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHRYSOPHYTA																			
CHRYSOPHYCEAE	55.2	51.0	86.9	66.2	70.7	81.2	71.7	50.3	52.7	24.4	22.7	51.3	34.5	53.5	22.3	48.0	10.1	25.9	26.8
DIATOMEAE	33.7	31.1	23.6	18.0	28.5	21.1	18.5	27.4	28.7	63.8	59.2	34.8	26.6	41.2	12.6	27.1	17.2	44.1	19.0
CRYPTOPHYTA																			
CRYPTOPHYCEAE	0.7	0.6	2.5	1.9	1.5	-	-	0.2	0.2	6.1	5.7	1.6	-	-	9.6	20.6	4.3	11.0	5.1
PYRRHOPHYTA																			
PERIDINIACEAE	1.9	1.8	12.9	9.8	7.4	0.6	0.5	7.8	8.2	-	-	4.0	-	-	0.6	1.3	1.7	4.4	0.4
TOTAL	108.2		131.2		119.1	114.2		95.5		107.7		102.9	64.5		46.5		39.0		53.8

*INTEGRATED

App. 2

~~TABLE 9~~

MORICE LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	JULY 31, 1974						AUGUST 6, 1974						SEPTEMBER 9, 1974			
STATION	3		4		5		3		4		5		3		5	
DEPTH M	0.5		0.5		0.5		0.5		0.5		0.5		0.5		0.5	
	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%
CYANOPHYTA	5.7	3.9	0.7	0.5	-	-	2.8	1.4	0.6	0.4	0.5	0.7	0.7	0.2	16.1	14.5
CHLOROPHYTA	6.1	4.2	12.4	9.1	7.8	17.6	7.0	3.7	9.0	5.2	17.8	25.5	13.9	4.6	61.0	54.9
EUGLENOPHYTA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CHRYSOPHYTA																
CHRYSOPHYCEAE	108.4	74.2	95.0	69.8	33.2	74.9	158.2	83.3	140.0	81.9	47.4	67.9	271.1	90.2	23.3	21.0
DIATOMEAE	25.8	17.7	21.8	16.0	2.5	6.0	22.1	11.6	20.0	11.7	3.0	4.2	7.6	2.6	10.5	9.5
CRYPTOPHYTA																
CRYPTOPHYCEAE	-	-	-	-	-	-	-	-	-	-	-	-	6.8	2.3	0.2	0.2
PYRRHOPHYTA																
PERIDINIACEAE	-	-	6.3	4.6	0.6	1.3	-	-	1.4	0.8	1.1	1.7	0.2	0.1	-	-
TOTAL	146.0	-	136.2	-	44.3	-	190.1	-	171.0	-	69.8	-	300.6	-	111.1	-

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~~TABLE 9~~

MORICE LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	OCTOBER 21, 1974				DECEMBER 10, 1974			
STATION	3		5		3		5	
DEPTH M	0.5		0.5		0.5		0.5	
	mg/m^3	%	mg/m^3	%	mg/m^3	%	mg/m^3	%
CYANOPHYTA	0.2	0.2	5.1	13.1	-	-	4.1	20.4
CHLOROPHYTA	5.1	5.1	15.1	38.7	4.0	7.9	5.9	29.4
EUGLENOPHYTA	-	-	-	-	-	-	-	-
CHRYSOPHYTA								
CHRYSOPHYCEAE	86.6	86.5	12.0	30.8	41.0	81.2	6.5	32.3
DIATOMACEAE	5.0	5.0	6.8	17.4	5.5	10.9	3.6	17.9
CRYPTOPHYTA								
CRYPTOPHYCEAE	3.0	3.0	-	-	-	-	-	-
PYRRHOPHYTA								
PERIDINIACEAE	0.2	0.2	-	-	-	-	-	-
TOTAL	105.1	-	39.0	-	50.5	-	20.1	-

App. 2

~~TABLE 9~~ MORICE LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	FEB 3, 1975		MAR 2, 1975		APR 18, 1975		MAY 28, 1975	
STATION	3		3		3		3	
DEPTH M	0.5		0.5		0.5		0.5	
	mg/m³	%	mg/m³	%	mg/m³	%	mg/m³	%
CYANOPHYTA	0.7	2.7	5.7	11.3	8.1	3.7	7.3	6.1
CHLOROPHYTA	2.0	7.6	5.1	10.2	65.0	31.0	29.1	24.2
EUGLENOPHYTA	-	-	-	-	-	-	-	-
CHRYSOPHYTA								
CHRYSOPHYCEAE	13.1	50.2	23.0	46.2	92.1	43.0	47.2	39.3
DIATOMACEAE	10.1	38.7	15.5	31.1	45.9	22.0	22.0	18.3
CRYPTOPHYTA								
CRYPTOPHYCEAE	-	-	0.4	0.8	0.3	0.2	4.7	3.9
PYRRHOPHYTA								
PERIDINIACEAE	0.2	0.8	0.2	0.4	0.6	0.3	9.8	8.2
TOTAL	26.1	-	49.8	-	212.0	-	120.1	-

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~~TABLE 9~~ MORICE LAKE PHYTOPLANKTON BIOMASS VALUES

DATE	JUNE 25, 1975					
STATION	3		4		5	
DEPTH M	0.5		0.5		0.5	
	mg/m^3	%	mg/m^3	%	mg/m^3	%
CYANOPHYTA	5.1	5.1	3.2	3.6	1.1	2.8
CHLOROPHYTA	19.1	19.3	6.9	7.7	1.8	4.5
EUGLENOPHYTA	-	-	-	-	-	-
CHRYSOPHYTA						
CHRYSOPHYCEAE	45.0	45.4	51.0	56.7	26.1	65.6
DIATOMACEAE	28.9	29.2	28.5	31.6	10.8	27.1
CRYPTOPHYTA						
CRYPTOPHYCEAE	-	-	-	-	-	-
PYRRHOPHYTA						
PERIDINIACEAE	1.0	1.0	0.4	0.4	-	-
TOTAL	99.1	-	90.0	-	39.8	-

APPENDIX 3 - IDENTIFICATION OF ZOOBENTHOS, BY STATION AND DEPTH, MORICE LAKE, B. C., 1975

(L = Larvae, P = Pupae, Niponic = Specimen in postembryonic stage)

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 3 - 2 m.	Chironomidae	
	Paracladius sp.	10L
	Procladius sp.	2L
	Psectrocladius sp.	9L
	Psectrocladius sp.	2P
	Sympotthastia sp.	3L
	Tanytarsus sp.	78L
	Thienemannimyia group cf. Conchapelopia	7L
	Empididae	
	Hemerodromia sp.	38L
	Hemerodromia sp.	17P
	Oligochaeta	
	Tubificidae	
	Rhyacodrilus prob. montana	49
	Aulodrilus americanus	
	Enchytraeidae	5
St. 3 - 8 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	6L
	Monodiamesa cf. prolilobata	5L
	Micropsectra sp.	4L
	Paracladius sp.	10L
	Procladius sp.	2L

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 3 - 8 m. (cont'd)	Psectrocladius sp.	2P
	Stictochironomus sp.	5L
	Tanytarsus sp.	4L
	Thienemannimy group cf. Conchapelopia	2L
	Empididae	
	Hemerodromia sp.	6L
	Hemerodromia sp.	4P
	Gastropoda	
	Valrata sincere	2
	Pelecypoda	
	Pisidium casertanum	4
	Niponic	2
	Oligochaeta	
	Tubificidae	
	Rhyacodrilus prob. montana	31
	Aulodrilus americanus	61
	Potamothrix hammoniensis	1
	Enchytraeidae	6
St. 3 - 16 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	24L
	Micropsectra sp.	4L
	Paracladius sp.	9L
	Paracladius sp.	11P
	Parakiefferiella sp.	8L
	Procladius sp.	7L
	Sympotthastia sp.	9L
	Thienemannimyia group cf. Conchapelopia	1L

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 3 - 16 m. (cont'd)	Gastropoda	
	Valvata sincera	1
	Pelecypoda	
	Pisidium casertanum	14
	Niponic	2
	Nematoda	25
St. 3 - 23 m.	Chironomidae	
	Heterotrissocladius cf. oliver	26L
	Paracladius sp.	3L
	Parakiefferiella sp.	14L
	Procladius sp.	10L
	Thienemannimyia group cf. Conchapelopia	1L
	Empididae	
	Hemerodromia sp.	1L
	Pelecypoda	
	Pisidium casertanum	4
	Niponic	4
	Oligochaeta	
	Aulodrilus americanus	2
	Nematoda	24
St. 3 - 35 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	7L
	Parakiefferiella sp.	1L
	Procladius sp.	5L
	Protanypus cf. hamiltani	1L
	Pelecypoda	
	Pisidium casertanum	1
	Niponic	1
	Nematoda	5

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 3 - 55 m.	Chironomidae	
	Heterotrissocladius cf. oliver	25L
	Procladius sp.	1L
	Nematoda	7
St. 3 - 75 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	22L
	Nematoda	16
St. 3 - 115 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	5L
	Nematoda	6
St. 3 - 162 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	4L
	Oligochaeta	
	Rhyacodrilus prob. montana	2
	Nematoda	16
St. 4 - 12 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	68L
	Micropsectra sp.	12L
	Paracladius sp.	52L
	Parakiefferiella sp.	48L
	Protanypus cf. hamiltani	4L
	Psectrocladius sp.	16P
	Empididae	
	Hemerodromia sp.	3L
	Gastropoda	
	Valvata sincera	3

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 4 - 12 m. (cont'd)	Pelecypoda	
	Pisidium casertanum	1
	Niponic	6
	Oligochaeta	
	Rhyacodrilus prob. montana	5
	Aulodrilus americanus	4
St. 4 - 35 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	6L
	Pelecypoda	
	Niponic	2
	Nematoda	1
St. 4 - 100 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	34L
	Paracladius sp.	1L
	Parakiefferiella sp.	2L
St. 4 - 234 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	18L
	Paracladius sp.	2L
	Parakiefferiella sp.	1L
	Oligochaeta	
	Aulodrilus americanus	6
	Enchytraeids	1
	Nematoda	2

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 5 - 2 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	1L
	Paracladopelma sp.	1L
	Protanypus cf. hamiltani	3L
	Potthastia longimanus	1L
	Tanytarsus sp.	4L
	Oligochaeta	
	Aulodrilus americanus	29
	Rhyacodrilus prob. montana	82
	Enchytraeids	4
St. 5 - 5 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	3L
	Tanytarsus sp.	3L
	Empididae	
	Hemerodromia sp.	5L
	Oligochaeta	
	Aulodrilus americanus	46
	Rhyacodrilus prob. montana	97
	Enchytraeids	26
St. 5 - 7 m.	Chironomidae	
	Monodiamesa cf. prolilobata	1L
	Stictochironomus sp.	9L
	Pelecypoda	
	Niponic	4
	Oligochaeta	
	Rhyacodrilus prob. montana	16
	Aulodrilus americanus	2

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 5 - 9 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	21L
	Paracladius sp.	5L
	Procladius sp.	2L
	Parakiefferiella sp.	4L
	Empididae	
	Hemerodromia sp.	2L
	Gastropoda	
	Valvata sincera	5
	Pelecypoda	
	Pisidium casertanum	3
	Niponic	12
	Oligochaeta	
	Aulodrilus americanus	6
	Rhyacodrilus prob. montana	33
	Enchytraeids	2
St. 5 - 14 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	27L
	Paracladius sp.	2L
	Parakiefferiella sp.	2L
	Procladius sp.	3L
	Psectrocladius sp.	5L
	Pelecypoda	
	Pisidium casertanum	2
	Niponic	1
	Oligochaeta	
	Rhyacodrilus prob. montana	8
	Enchytraeids	2

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 5 - 14 m. (cont'd)	Nematoda	49
St. 5 - 25 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	19L
	Parakiefferiella sp.	6L
	Procladius sp.	3L
	Psectrocladius sp.	4P
	Empididae	
	Hemerodromia sp.	2L
	Pelecypoda	
	Pisidium casertanum	9
	Niponic	19
	Nematoda	
St. 5 - 37 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	27L
	Parakiefferiella sp.	8L
	Procladius sp.	1L
	Pelecypoda	
	Pisidium casertanum	4
	Niponic	5
	Nematoda	8
St. 5 - 66 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	68L
St. 5 - 81 m.	Chironomidae	
	Heterotrissocladius cf. oliveri	69L

STATION AND DEPTH	IDENTIFICATION	NO. OF SPECIMENS
St. 5 - 81 m. (cont'd)	Procladius sp.	1L
St. 5 - 231 m.	Chironomidae	
	Procladius sp.	2L