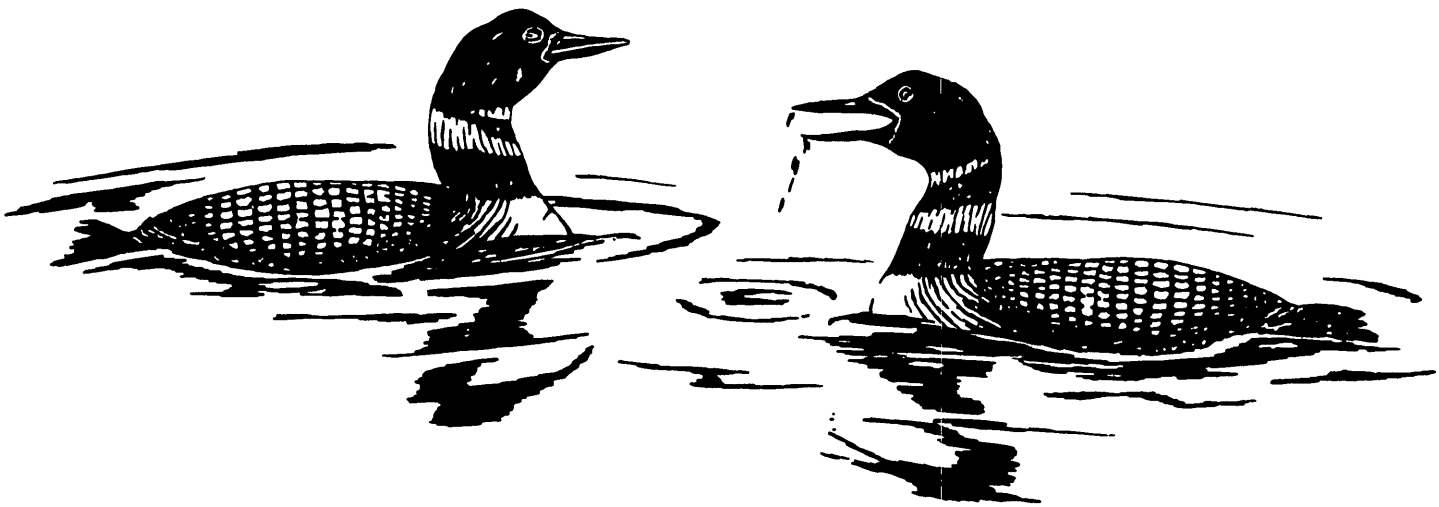
WATER-QUALITY RECONNAISSANCE OF LAKES IN VOYAGEURS NATIONAL PARK, MINNESOTA



U. S. GEOLOGICAL SURVEY
Open-File Report 79-556

Prepared in cooperation with
[illegible]ark Service,
[illegible] of the Interior

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WATER-QUALITY RECONNAISSANCE OF LAKES IN VOYAGEURS NATIONAL PARK, MINNESOTA

By G. A. Payne

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CONTENTS

ILLUSTRATIONS

TABLES

WATER-QUALITY RECONNAISSANCE OF LAKES IN VOYAGEURS NATIONAL PARK MINNESOTA

By Gregory A. Payne

ABSTRACT

Water samples were collected from three lakes in Voyageurs National Park to assess chemical and biological water quality in March and August 1977. Bottom material samples were also collected and analyzed for chemical quality. Results of the analyses show that the water system was dilute; specific conductance ranged from 32 to 111 micromhos. Blue-green algae, particularly Oscillatoria, were the most common phytoplankton in the samples. Differences in water quality, shown particularly by concentrations of nutrients and dissolved solids, were detected between samples collected in different areas of the park. The collected data were used to design a monitoring program to assess eutrophication that may occur during the development of the park.

INTRODUCTION

This report is a summary of work done in Voyageurs National Park (hereafter called "the park") by the U.S. Geological Survey in cooperation with the National Park Service. It includes a description of the sampling discussion of analytical results, and discussions of a monitoring/sampling program. A computer listing of data collected during the study accompanies this report.

DESCRIPTION OF SAMPLING

Eleven lake sites were sampled for water quality during March and August 1977. Samples were collected from two sites each at Black Bay, Meadwood Bay, Gappas Landing, Harrison Narrows, and Kettle Falls, and from one site at Brule Narrows (fig. 1). The paired sampling consisted of collecting one sample near shore and one near mid-bay.

Samples were collected and analyzed according to procedures described in Brown and others (1970), Goerlitz and Brown (1972), and Greeson and others (1977).

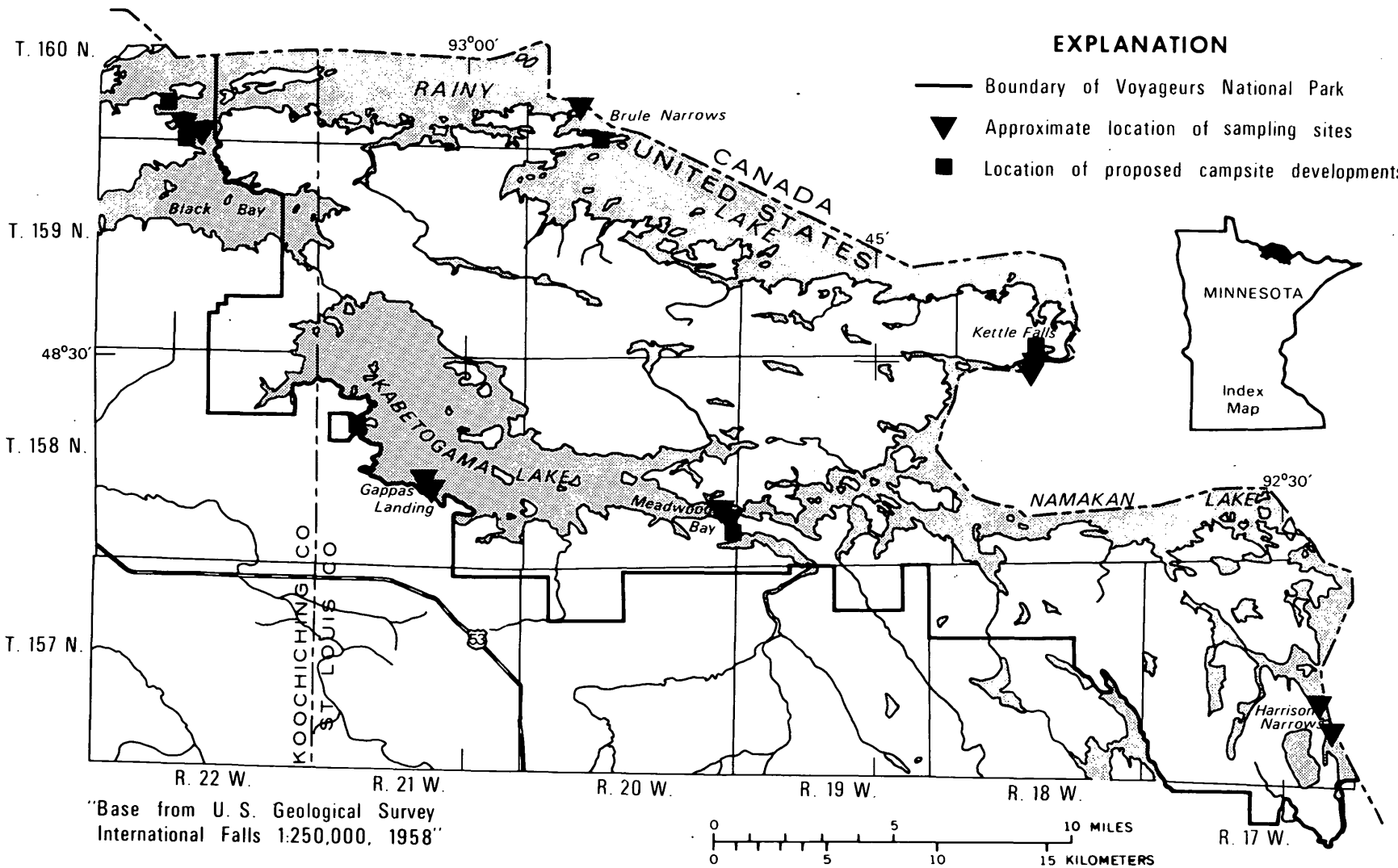

Figure 1.--Map showing location of sampling sites.

Water samples were analyzed for the common cations and anions, physical properties, nutrients, and phytoplankton. Bottom material was collected at each site and analyzed for organic carbon and nutrients. The following is a list of the chemical constituents, physical characteristics and biological components determined from the samplings:

Physical characteristics	Chemical constituents of water samples
Air temperature	Dissolved calcium
Water temperature	Dissolved magnesium
Water depth	Dissolved sodium
Dissolved oxygen	Dissolved potassium
Dissolved oxygen percent saturation	Total and dissolved iron
pH	Dissolved manganese
Transparency	Bicarbonate
Specific conductance	Hardness
Turbidity	Total and dissolved phosphorus
	Total ammonia nitrogen
	Total and dissolved Kjeldahl nitrogen
	Total and dissolved nitrite plus nitrate nitrogen
	Total nitrogen
	Dissolved and suspended organic carbon

Chemical constituents of bottom material

Organic carbon
Total phosphorus
Total ammonia nitrogen
Total Kjeldahl nitrogen
Total nitrite plus nitrate nitrogen

Biological components

Phytoplankton cells per milliliter
Taxonomy of phytoplankton
Co-dominant phytoplankton genera

RESULTS OF ANALYSES

The scarcity of data collected during this reconnaissance allows only slight interpretation of results, but they are deemed sufficient for planning a monitoring program. Concentrations of most chemical constituents were low, which is typical of waters in this region of Minnesota. Specific conductance ranged from 32 to 111 micromhos per centimeter at 25° Celsius. Alkalinity varied at some sites, but, in general, water from the Harrison Narrows, Kettle Falls, and Brule Narrows areas was soft, and water from the Black Bay, Gappas Landing, and Meadwood Bay area was moderately hard, based on criteria described by Moyle (1971).

The six areas sampled can be divided into two groups based on several of their water-quality characteristics. Black Bay, Meadwood Bay, and Gappas Landing areas, in general, had higher values for conductance, bicarbonate, phosphorus, nitrite plus nitrate, and phytoplankton cell counts, than the Harrison Narrows, Kettle Falls, and Brule Narrows areas.

Seasonal variations in many of the characteristics were found, even in the small number of samples collected in March and August 1977. Seasonal variations may be greater than changes caused by development of the park facilities. Therefore, monitoring should take into account seasonal variability to allow comparison of results over an extended time.

pH ranged from 6.6 to 7.5 in March and 7.1 to 8.9 in August. The rise in pH in August is probably associated with increased photosynthetic activity.

Dissolved oxygen was near 100-percent saturation at all sites in August. In March, dissolved oxygen saturation ranged from 62 to 99 percent. The lowest dissolved oxygen concentration in March was 8.6 mg/L (milligrams per liter). This concentration is not extremely low, but it indicates that some oxygen depletion had occurred under an ice cover.

Dissolved phosphorus ranged from 0.00 to 0.02 mg/L, and total phosphorus ranged from 0.00 to 0.06 mg/L. The Meadwood Bay, Gappas Landing, and Black Bay sites had higher total phosphorus levels (0.02 to 0.06 mg/L), whereas the Brule Narrows, Harrison Narrows, and Kettle Falls sites had lower levels (0.00 to 0.03 mg/L).

The March sampling showed that nitrite plus nitrate concentrations ranged from 0.11 to 0.43 mg/L. Concentrations were lower in August, typically 0.01 mg/L, except at one site in Black Bay, which increased between the March and August samplings. Generally, more of the nitrogen was in the organic form, as shown by the Kjeldahl nitrogen measurements. The proportion of Kjeldahl nitrogen in the dissolved versus the suspended state was different between sites and may be associated with varying levels of biological activity, variable inputs from the watersheds, or other reasons.

Analyses of bottom material gave some indication of differences between areas. Some sites had soft bottom material that was easily sampled, whereas others, particularly Brule Narrows and Gappas Landing, had rock or very firm sand bottoms. Samples could not be obtained at Gappas Landing in March and at Brule Narrows in August because of the hard bottom. Concentrations of organic carbon, nitrogen, and phosphorus were variable between areas and between the paired sites at each area.

Phytoplankton respond to water-quality changes and therefore can be used as indicators of water quality and of changing conditions. Considerable variations in cell counts occurred between the six areas, which may indicate differences in available nutrients. However, phytoplankton populations naturally fluctuate rapidly, often weekly. More meaningful data could be obtained by making comparisons between samples collected at the same time of year, preferably during a period of maximum growth.

More than 80 percent of the phytoplankton samples were dominated by blue-green algae. Although these algae are not necessarily indicators of high nutrient enrichment, they often thrive under such conditions. Oscillatoria were common and may be significant because they belong to a common genus indicative of early stages of eutrophication. Excessive growth of blue-green algae can cause nuisance conditions. Therefore, continued monitoring of phytoplankton is advisable to detect changes in cell counts, species composition, and diversity, particularly trends toward increasing amounts of blue-green algae.

ANTICIPATED WATER-QUALITY CHANGES

Accelerated nutrient enrichment is the most likely change expected to result from development of the park facilities. The enrichment would be reflected in increased concentrations of nitrogen, phosphorus, and organic carbon. Phytoplankton and benthic invertebrate populationss,species composition, and diversity may also change in response to the enrichment. Because the water is dilute, small additions of dissolved material, particularly nutrients, are likely to result in large changes in algal production.

Bacterial contamination may become a problem. Therefore, sampling for bacteria could be begun when visitor use increases to determine whether contamination by fecal coliform is a problem near developed areas. Bacteria sampling would probably be necessary only during peak-use periods.

SUGGESTED MONITORING PROGRAM

Any well-designed water-quality study must start with clearly defined objectives. In this study, the problems are mostly potential. Accelerated enrichment has been mentioned as a potential problem. Other problems, such as contamination by coliform bacteria and by trace metals such as mercury, may exist or emerge as the park is developed.

Because nutrient enrichment could be detrimental to water quality in the park, future sampling would sensibly be focused primarily on nutrient enrichment initially and expanded or modified to include other problems when needed.

There is an apparent need for the Park Service to monitor the lakes for changes in water quality. Monitoring of nutrient enrichment requires selection of characteristics to be monitored and selection of proper frequency and timing of sampling. The timing of sampling is important because nutrients are affected by uptake and utilization by shoreline vegetation and algae and accumulation and release from bottom sediments. Because the main problem is expected to be excessive algal growth, it is important to consider the nutrients that are available for algal growth. The best time to sample for available nutrients would probably be shortly after the spring thaw and subsequent lake overturn. During that time, the available nutrients would probably be at maximum concentrations. Sampling over a period of years during the spring overturn may reveal long-term trends of increasing concentrations of available nutrients.

In addition to sampling for nutrient concentrations, it may be advisable to sample for effects of nutrient enrichment. Because phytoplankton respond to enrichment, determination of phytoplankton populations, species composition, and diversity can reveal changes over a period of time.

Benthic invertebrates also respond to changes in lake environment. Sampling for benthic invertebrates will determine whether that community is changing in numbers, species composition, and diversity.

The original sampling sites are probably adequate to detect local changes caused by development. Control sites could be located in mid-lake and in areas that are well mixed by wind. On Kabatogoma Lake, one control site may be sufficient for both Gappas Landing and Meadwood Bay.

The following is a possible monitoring program: Chemical and phytoplankton sampling to begin at the time of spring overturn. Temperature and dissolved oxygen profiles to be obtained at each site. Profiles will provide valuable information and, in combination with Secchi disc readings, will permit decisions for better phytoplankton sampling. The sampling to be repeated in August, when algal growth, particularly blue-green algae, would be expected to be highest. Benthic invertebrates also to be sampled in August. Finally, a November sampling for chemical constituents and phytoplankton would determine water quality at the time of autumn overturn.

The following is a list of physical, chemical, and biological characteristics for analysis:

Physical characteristics

Air temperature
Water temperature (profile)
Depth
Dissolved oxygen (profile)
pH
Transparency (Secchi disk)
Specific conductance

Biological components

Phytoplankton
Benthic invertebrates
Fecal coliform and fecal Streptococcus bacteria[1]

Chemical constituents

Total nitrite plus nitrate
Dissolved nitrite plus nitrate
Total Kjeldahl nitrogen
Total phosphorus
Dissolved phosphorus
Dissolved manganese
Organic carbon (bottom material)
Trace metals[1]

[1]Samples can be collected once to determine background levels.

SUMMARY

A water-quality reconnaissance in the Voyageurs National Park during 1977 reveals that (1) some differences in water quality exist between the six areas sampled, (2) the water in the areas is dilute and likely to be impacted by addition of dissolved material, (3) seasonal variation occurs in many of the constituents, requiring systematic sampling to allow comparability over a period of years, (4) phytoplankton populations are variable with site and were commonly dominated by blue-green algae, and (5) nutrient enrichment is a potential problem.

Evaluation of the data can be used as a basis for developing a monitoring program to assess anticipated changes. The proposed program rests on the hypothesis that the most likely impact of development of the park facilities would be nutrient enrichment, resulting in changes in the phytoplankton and benthic communities. The proposed analytical schedule and frequency of sampling is expected to provide the data to assess the expected impact adequately.

REFERENCES

Brown, Eugene, Skougstad, M. W., and Fishman, M. J., 1970, Methods for collection and anlysis of water samples for dissolved minerals and gases: U.S. Geological Survey Techniques Water-Resources Investigations, book 5, chap. A1, 160 p.

Goerlitz, D. F., and Brown, E., 1972, Methods for analysis of organic substances in water: U.S. Geological Survey Techniques Water-Resources Investigations, book 5, chap. A3, 40 p.

Greeson, P. E., and others, 1977, Methods for collection and analysis of aquatic biological and microbiological samples: U.S. Geological Survey Techniques Water-Resources Investigations, book 5, chap. A4, 165 p.

Moyle, J. B., 1971, Reviews, comments and notes No. 5: Minnesota Department Natural Resources Special Publication 88, 8 p.

TABLE 1.--WATER-QUALITY DATA FOR LAKES IN VOYAGEURS NATIONAL PARK

DATE	TIME	DEPTH OF RESERVOIR (FT)	SAMPLING DEPTH (FT)	AIR TEMPERATURE (DEG C)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)	PERCENT SATURATION	PH (UNITS)	TRANSPARENCY (SECCHI DISK) (M)	SPECIFIC CONDUCTANCE (MICROMHOS)	DISSOLVED CALCIUM (CA) (MG/L)	DISSOLVED MAGNESIUM (MG) (MG/L)
483511093092801 - RAINY LAKE AT BLACK BAY NR ISLAND VIEW MN (LAT 48 35 11 LONG 093 09 28,01)												
MAR , 1977												
14...	1400	4,3	2,2	--	1,5	12,4	92	7,1	--	50	5,3	1,9
AUG												
22...	1900	7,0	3,0	15,0	17,5	9,0	98	7,8	,60	111	15	5,0
483538093100001 - RAINY LAKE AT BLACK BAY NARROWS NR ISLANDVIEW MN (LAT 48 35 38 LONG 093 10 00,01)												
MAR , 1977												
14...	1630	4,5	2,2	--	1,0	9,2	67	7,5	--	83	8,4	2,9
AUG												
22...	1930	7,0	3,5	15,0	17,0	9,2	99	7,8	,60	109	14	4,8
483622092560701 - RAINY LAKE AT BRULE NARROWS NR INT FALLS MN (LAT 48 36 22 LONG 092 56 07,01)												
MAR , 1977												
15...	1225	15	7,2	--	,5	12,9	93	6,6	--	32	5,6	1,8
AUG												
23...	1200	18	9,0	14,5	16,5	9,5	101	7,3	2,60	50	6,2	1,7

DATE	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	BICAR-BONATE (HCO3) (MG/L)	HARD-NESS (CA,MG) (MG/L)	TUR-BID-ITY (JTU)	DIS-SOL-VED ORGANIC CARBON (C) (MG/L)	SUS-PENDED ORGANIC CARBON (C) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)
483511093092801 - RAINY LAKE AT BLACK BAY NR ISLAND VIEW MN (LAT 48 35 11 LONG 093 09 28,01)												
MAR , 1977												
14...	2,5	,5	210	550	30	16	21	6	6,4	,7	,01	,02
AUG												
22...	1,8	1,0	80	360	0	58	58	8	17	1,3	,02	,05
483538093100001 - RAINY LAKE AT BLACK BAY NARROWS NR ISLANDVIEW MN (LAT 48 35 38 LONG 093 10 00,01)												
MAR , 1977												
14...	1,5	,7	260	2700	90	33	33	10	12	1,8	,02	,06
AUG												
22...	1,8	1,0	60	400	0	58	55	8	29	1,3	,02	,06
483622092560701 - RAINY LAKE AT BRULE NARROWS NR INT FALLS MN (LAT 48 36 22 LONG 092 56 07,01)												
MAR , 1977												
15...	1,0	,6	30	110	10	6	21	1	8,0	,4	,00	,00
AUG												
23...	1,4	,6	20	90	0	22	22	1	11	,4	,01	,02

DATE	TOTAL AMMONIA NITROGEN (N) (MG/L)	DISSOLVED KJEL. NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITROGEN (N) (MG/L)	ORGANIC CARBON IN BOTTOM MATERIAL (C) (G/KG)	TOTAL PHOSPHORUS IN BOTTOM MATERIAL (MG/KG)	TOTAL AMMONIA NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL KJEL. NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL NITRITE PLUS NITRATE IN BOT. MAT. (MG/KG)	TOTAL PHYTOPLANKTON (CELLS PER ML)
483511093092801 - RAINY LAKE AT BLACK BAY NR ISLAND VIEW MN (LAT 48 35 11 LONG 093 09 28,01)												
MAR , 1977												
14...	,19	,52	,54	,24	,28	,82	43	160	59	4000	,0	2800
AUG												
22...	,07	,47	1,0	,01	,01	1,0	69	30	,0	490	26	170000
483538093100001 - RAINY LAKE AT BLACK BAY NARROWS NR ISLANDVIEW MN (LAT 48 35 38 LONG 093 10 00,01)												
MAR , 1977												
14...	,25	,70	,86	,11	,11	,97	82	130	110	1900	,0	500000
AUG												
22...	,04	,52	1,1	,30	,35	1,5	92	15	,0	570	21	210000
483622092560701 - RAINY LAKE AT BRULE NARROWS NR INT FALLS MN (LAT 48 36 22 LONG 092 56 07,01)												
MAR , 1977												
15...	,02	,35	,35	,11	,14	,49	2,2	140	4,2	250	,0	720
AUG												
23...	,01	,14	,35	,00	,03	,38	--	--	--	--	--	4400

DATE	TIME	DEPTH OF RESER-VOIR (FT)	SAMP-LING DEPTH (FT)	AIR TEMPER-ATURE (DEG C)	TEMPER-ATURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)	PER-CENT SATUR-ATION	PH (UNITS)	TRANS-PAR-ENCY (SECCHI DISK) (M)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)
482630093011701 - KABETOGAMA LK AT GAPPAS LANDING NR RAY MN (LAT 48 26 30 LONG 093 01 17.01)												
MAR , 1977												
16...	1330	2.3	1.0	--	.0	12.9	91	6.8	--	43	4.0	1.4
AUG												
24...	1330	8.0	4.0	16.0	17.5	9.9	108	8.6	1.70	88	11	4.0
482642093011901 - KABETOGAMA LK NR GAPPAS LANDING NR RAY MN (LAT 48 26 42 LONG 093 01 19.01)												
MAR , 1977												
16...	1415	16	8.2	--	1.0	11.3	82	7.1	--	100	13	4.7
AUG												
24...	1400	20	6.0	16.0	17.0	10.0	108	8.6	1.70	88	10	2.0
483003092380301 - KETTLE RV BEL KETTLE FALLS NR INT FALLS MN (LAT 48 30 03 LONG 092 08 03.01)												
MAR , 1977												
15...	0930	--	5.2	--	.5	12.4	89	6.6	--	46	5.5	1.8
AUG												
23...	0930	12	6.0	14.5	16.5	9.7	103	7.2	2.90	46	12	1.7
483015092380101 - KETTLE R BL KET. FALLS NR INTERNATIONAL FALLS MN (LAT 48 30 15 LONG 092 38 01.01)												
MAR , 1977												
15...	1045	--	2.0	--	1.0	11.0	80	6.7	--	46	4.9	1.6
AUG												
23...	1030	6.1	3.0	14.5	16.5	9.6	102	7.3	--	47	6.0	1.6

DATE	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	BICAR-BONATE (HCO3) (MG/L)	HARD-NESS (CA,MG) (MG/L)	TUR-BID-ITY (JTU)	DIS-SOL-VED ORGANIC CARBON (C) (MG/L)	SUS-PENDED ORGANIC CARBON (C) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)
482630093011701 - KABETOGAMA LK AT GAPPAS LANDING NR RAY MN (LAT 48 26 30 LONG 093 01 17,01)												
MAR , 1977												
16...	,8	,5	20	1200	10	15	16	4	3,0	1,6	,02	,05
AUG												
24...	1,2	,7	20	50	0	46	44	2	9,6	1,1	,02	,02
482642093011901 - KABETOGAMA LK NR GAPPAS LANDING NR RAY MN (LAT 48 26 42 LONG 093 01 19,01)												
MAR , 1977												
16...	1,3	,9	30	80	20	58	52	1	8,3	,4	,02	,03
AUG												
24...	1,2	,7	30	60	0	47	33	3	9,7	--	,02	,06
483003092380301 - KETTLE RV BEL KETTLE FALLS NR INT FALLS MN (LAT 48 30 03 LONG 092 08 03,01)												
MAR , 1977												
15...	1,0	,6	60	90	0	19	21	1	8,2	,5	,00	,00
AUG												
23...	1,4	,6	20	60	0	50	37	1	8,2	,5	,01	,02
483015092380101 - KETTLE R BL KET, FALLS NR INTERNATIONAL FALLS MN (LAT 48 30 15 LONG 092 38 01,01)												
MAR , 1977												
15...	,9	,6	50	280	0	15	19	9	7,7	,8	,00	,01
AUG												
23...	1,5	,7	20	120	0	20	22	1	8,1	,4	,01	,02

DATE	TOTAL AMMONIA NITROGEN (N) (MG/L)	DISSOLVED KJEL. NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITROGEN (N) (MG/L)	ORGANIC CARBON IN BOTTOM MATERIAL (C) (G/KG)	TOTAL PHOSPHORUS IN BOTTOM MATERIAL (MG/KG)	TOTAL AMMONIA NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL KJEL. NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL NITRITE PLUS NITRATE IN BOT. MAT. (MG/KG)	TOTAL PHYTOPLANKTON (CELLS PER ML)
482630093011701 - KABETOGAMA LK AT GAPPAS LANDING NR RAY MN (LAT 48 26 30 LONG 093 01 17,01)												
MAR , 1977												
16...	.32	.30	.53	.43	.43	.96	2.2	100	7.8	120	.0	12000
AUG												
24...	.06	.45	.45	.00	.03	.48	6.1	22	8.0	33	5.7	28000
482642093011901 - KABETOGAMA LK NR GAPPAS LANDING NR RAY MN (LAT 48 26 42 LONG 093 01 19,01)												
MAR , 1977												
16...	.00	.35	.39	.30	.31	.70	--	--	--	--	--	1800
AUG												
24...	.03	.74	.74	.02	.04	.78	14	21	9.9	86	5.6	14000
483003092380301 - KETTLE RV BEL KETTLE FALLS NR INT FALLS MN (LAT 48 30 03 LONG 092 08 03,01)												
MAR , 1977												
15...	.01	.36	.41	.11	.12	.53	5.5	130	14	350	.0	870
AUG												
23...	.01	.19	.46	.00	.01	.47	9.2	33	.0	65	5.9	4700
483015092380101 - KETTLE R BL KET. FALLS NR INTERNATIONAL FALLS MN (LAT 48 30 15 LONG 092 38 01,01)												
MAR , 1977												
15...	.04	.35	.48	.16	.16	.64	42	100	27	3500	.0	2200
AUG												
23...	.01	.14	.37	.02	.02	.39	25	41	.0	140	6.6	2100

DATE	TIME	DEPTH OF RESER-VOIR (FT)	SAMP-LING DEPTH (FT)	AIR TEMPER-ATURE (DEG C)	TEMPER-ATURE (DEG C)	DIS-SOLVED OXYGEN (MG/L)	PER-CENT SATUR-ATION	PH (UNITS)	TRANS-PAR-ENCY (SECCHI DISK) (M)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)
482056092282001 - SANDPOINT LK ABV HARRISON NARROWS NR CRANE LK MN (LAT 48 20 56 LONG 092 28 20.01)												
MAR , 1977												
16...	0900	52	26	--	2.5	13.1	99	6.9	--	53	5.8	2.0
AUG												
24...	1000	60	6.0	16.0	17.0	8.9	96	7.1	2.30	54	6.5	2.3
482226092283301 - SANDPOINT LK BL HARRISON NARROWS NR CRANE LK, MN (LAT 48 22 26 LONG 092 28 33.01)												
MAR , 1977												
16...	0945	24	12	--	2.0	12.3	91	6.9	--	55	5.8	2.0
AUG												
24...	0900	33	6.0	14.0	17.0	9.0	97	7.2	2.50	52	6.3	2.0
482603092511401 - KABETOGAMA LK IN MEADWOOD BAY NR RAY MN (LAT 48 26 03 LONG 092 51 14.01)												
MAR , 1977												
17...	0950	1.7	1.0	--	.5	8.6	62	6.8	--	100	6.8	2.7
AUG												
24...	1230	11	6.0	16.0	17.5	10.7	116	8.9	1.50	70	9.4	2.7
482607092511701 - KABETOGAMA LK AT MOUTHOF MEADWOOD BAY NR RAY MN (LAT 48 26 07 LONG 092 51 17.01)												
MAR , 1977												
17...	1100	7.8	4.0	--	1.0	11.1	81	7.1	--	108	12	4.5
AUG												
24...	1130	21	6.0	16.0	17.5	9.9	108	8.7	1.50	69	9.3	2.6

DATE	DIS-SOLVED SODIUM (NA) (MG/L)	DIS-SOLVED PO-TAS-SIUM (K) (MG/L)	DIS-SOLVED IRON (FE) (UG/L)	TOTAL IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	BICAR-BONATE (HCO3) (MG/L)	HARD-NESS (CA,MG) (MG/L)	TUR-BID-ITY (JTU)	DIS-SOL-VED ORGANIC CARBON (C) (MG/L)	SUS-PENDED ORGANIC CARBON (C) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)
482056092282601 - SANDPOINT LK ABV HARRISON NARROWS NR CRANE LK MN (LAT 48 20 56 LONG 092 28 20.01)												
MAR , 1977												
16...	1.4	.8	110	180	0	22	23	1	9.8	.4	.02	.03
AUG												
24...	1.4	.8	110	110	0	23	26	1	13	.4	.01	.02
482226092283301 - SANDPOINT LK BL HARRISON NARROWS NR CRANE LK, MN (LAT 48 22 26 LONG 092 28 33.01)												
MAR , 1977												
16...	1.5	.8	100	150	10	22	23	1	9.9	.4	.02	.02
AUG												
24...	1.3	.8	60	140	0	22	24	1	11	.5	.01	.02
482603092511401 - KABETOGAMA LK IN MEADWOOD BAY NR RAY MN (LAT 48 26 03 LONG 092 51 14.01)												
MAR , 1977												
17...	.8	.9	60	490	120	48	28	20	7.2	.4	.02	.06
AUG												
24...	1.7	.8	40	170	0	55	35	2	8.1	1.6	.01	.06
482607092511701 - KABETOGAMA LK AT MOUTHOF MEADWOOD BAY NR RAY MN (LAT 48 26 07 LONG 092 51 17.01)												
MAR , 1977												
17...	1.3	.9	40	40	0	56	49	1	5.8	--	.02	.02
AUG												
24...	1.5	.7	40	160	0	31	34	2	8.7	1.1	.01	.05

DATE	TOTAL AMMONIA NITROGEN (N) (MG/L)	DISSOLVED KJEL. NITROGEN (N) (MG/L)	TOTAL KJELDAHL NITROGEN (N) (MG/L)	DISSOLVED NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITRITE PLUS NITRATE (N) (MG/L)	TOTAL NITROGEN (N) (MG/L)	ORGANIC CARBON IN BOTTOM MATERIAL (C) (G/KG)	TOTAL PHOSPHORUS IN BOTTOM MATERIAL (MG/KG)	TOTAL AMMONIA NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL KJEL. NITROGEN IN BOTTOM MAT. (MG/KG)	TOTAL NITRITE PLUS NITRATE IN BOT. MAT. (MG/KG)	TOTAL PHYTOPLANKTON (CELLS PER ML)
482056092282001 - SANDPOINT LK ABV HARRISON NARROWS NR CRANE LK MN (LAT 48 20 56 LONG 092 28 20.01)												
MAR , 1977												
16...	.00	.45	.51	.19	.19	.70	62	280	210	6000	.0	110
AUG												
24...	.03	.63	1.3	.01	.01	1.3	63	44	250	392	36	9300
482226092283301 - SANDPOINT LK BL HARRISON NARROWS NR CRANE LK, MN (LAT 48 22 26 LONG 092 28 33.01)												
MAR , 1977												
16...	.00	.49	.52	.20	.20	.72	15	130	5.3	980	.0	1000
AUG												
24...	.01	.37	.37	.00	.01	.38	11	13	9.1	49	8.6	9100
482603092511401 - KABETOGAMA LK IN MEADWOOD BAY NR RAY MN (LAT 48 26 03 LONG 092 51 14.01)												
MAR , 1977												
17...	.38	.33	.79	.33	.37	1.2	6.1	84	11	330	.0	2900
AUG												
24...	.08	.70	.75	.01	.01	.76	6.3	33	.0	210	9.9	44000
482607092511701 - KABETOGAMA LK AT MOUTHOF MEADWOOD BAY NR RAY MN (LAT 48 26 07 LONG 092 51 17.01)												
MAR , 1977												
17...	.00	.32	.42	.18	.18	.60	3.1	120	6.1	300	.0	2300
AUG												
24...	.07	.41	.74	.01	.01	.75	3.1	47	1.3	32	4.1	43000

48355809510000I RAINY LAKE AT BLACK BAY NARROWS NR ISLANDVIEW MN
LAT 48-35-36 LONG 093-10-00 SEQ 01

MAR, 14, 1977
1630 HOURS

IDENTIFICATION OF PHYTOPLANKTON

500,000 CELLS/ML

	ORGANISM NAME	COMMON NAME		CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE				
	.CHLOROPHYCEAE					
	..CHLOROCOCCALES					
	...OOCYSTACEAE					
	....ANKISTRODESMUS			870	0	
	...SCENEDESMACEAE					
	....SCENEDESMUS			3,500	1	
	..VOLVOCALES					
	...CHLAMYDOMONADACEAE					
	....CHLAMYDOMONAS			2,600	1	
			TOTALS	6,900	2	1,4=DIVERSITY
	CHRYSOPHYTA					
	.BACILLARIOPHYCEAE	DIATOMS				
	..CENTRALES	CENTRIC				
	...COSCINODISCACEAE					
	....CYCLOTELLA			4,300	1	
#	....MELOSIRA			140,000	28	
	....STEPHANODISCUS			870	0	
	..PENNALES	PENNATE				
	...ACHNANTHACEAE					
	....COCCONEIS			870	0	
	...FRAGILARIACEAE					
	....FRAGILARIA			2,600	1	
	...NAVICULACEAE	NAVICULOID				
	....AMPHIPRORA			870	0	
	....CALONEIS			1,700	0	
	....DIPLONEIS			870	0	
	....GYROSIGMA			870	0	
	....NAVICULA			5,200	1	
	....PINNULARIA			870	0	
*	....STAURONEIS				0	
	...NITZSCHIACEAE					
	....NITZSCHIA			2,600	1	
	...SURIRELLACEAE					
	....SURIRELLA			1,700	0	
	...TABELLARIACEAE					
	....TABELLARIA			1,700	0	
			TOTALS	160,000	32	1,1=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE				
	.MYXOPHYCEAE					
	..CHROOCOCCALES	COCCOID				
	...CHROOCOCCACEAE					
#	....ANACYSTIS			240,000	48	
	..OSCILLATORIALES	FILAMENTOUS				
	...OSCILLATORIACEAE					
	....OSCILLATORIA			16,000	3	
	....SPIRULINA			6,100	1	
	...RIVULARIACEAE					
	....RAPHIDIOPSIS			65,000	13	
			TOTALS	330,000	65	1,1=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS				
	.EUGLENOPHYCEAE					
	..EUGLENALES					
	...EUGLENACEAE					
	....TRACHELOMONAS			2,600	1	
			TOTALS	2,600	1	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD; GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	1,1
CLASS	1,1
ORDER	1,8
FAMILY	2,0
GENERA	2,2

483538093100001 RAINY LAKE AT BLACK BAY NARROWS ON ISLANDVIEW MN
LAT 48-35-38 LONG 093-10-00 SEC 01

AUG. 22, 1977
1930 HOURS

IDENTIFICATION OF PHYTOPLANKTON

210,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...COELASTRACEAE				
	....COELASTRUM		1,200	1	
	...MICRACTINIACEAE				
	....GOLENKINIA		290	0	
	..OOCYSTACEAE				
	....ANKISTRODESMUS		730	0	
	....DICTYOSPHAERIUM		2,500	1	
	....FRANCEIA		580	0	
	....KIRCHNERIELLA		1,000	0	
	....OOCYSTIS		1,200	1	
	....TETRAEDRON		440	0	
	...SCENEDESMACEAE				
	....SCENEDESMUS		4,600	2	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....ARTHRODESMUS		150	0	
		TOTALS	13,000	6	2.7=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	..COSCINODISCACEAE				
	....CYCLOTELLA		730	0	
	...MELOSTRA		3,300	2	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
*	....COCCONEIS			0	
	...FRAGILARIACEAE				
	....SYNEDRA		290	0	
	...GOMPHONEMATACEAE				
*	....GOMPHONEMA			0	
	...NITZSCHIACEAE				
	....NITZSCHIA		1,300	1	
		TOTALS	5,700	3	1.5=DIVERSITY
	.CHRYSOPHYCEAE	YELLOW-BROWN ALGAE			
	..CHRYSOMONADALES				
	...OCHROMONADACEAE				
	....DINOBRYON		1,900	1	
		TOTALS	1,900	1	0.0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.CYANOPHYCEAE				
	..CHROCOCCALES	COCCOID BLUE-GREENS			
	...CHROCOCCACEAE				
#	....ANACYSTIS		71,000	34	
	..HORMOGONALES	FILAMENTOUS BL-GREEN			
	...NOSTOCACEAE				
	....APHANIZOMENON		1,200	1	
	...OSCILLATORIACEAE				
#	....LYNGBYA		58,000	28	
	....PHORMIDIUM		9,300	4	
	..CHROCOCCALES	COCCOID BLUE-GREENS			
	...CHROCOCCACEAE				
#	....GOMPHOSPHAERIA		48,000	23	
		TOTALS	190,000	90	1.8=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....TRACHELOMONAS		290	0	
		TOTALS	290	0	0.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.6
CLASS	0.6
ORDER	1.5
FAMILY	1.6
GENERA	2.4

483511093092801 RAINY LAKE AT BLACK BAY NR ISLAND VIEW MN
LAT 48-35-11 LONG 093-09-28 SEQ 01

MAR, 14, 1977
1400 HOURS

IDENTIFICATION OF PHYTOPLANKTON

2,800 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		11	0	
		TOTALS	11	0	0.0=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		23	1	
#	....MELOSIRA		2,100	75	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
	....ACHNANTHES		23	1	
	....COCCONEIS		23	1	
	...CYMBELLACEAE				
	....AMPHORA		34	1	
	...FRAGILARIACEAE				
	....ASTERIONELLA		57	2	
	....FRAGILARIA		250	9	
	...GOMPHONEMATACEAE				
	....GOMPHONEMA		11	0	
	...NAVICULACEAE	NAVICULOID			
	....DIPLONEIS		11	0	
	....NAVICULA		150	5	
	....PINNULARIA		23	1	
	...NITZSCHIACEAE				
	....HANTZSCHIA		11	0	
	....NITZSCHIA		57	2	
	...TABELLARIACEAE				
	....TABELLARIA		11	0	
		TOTALS	2,800	98	1.5=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM: GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.0
CLASS	0.0
ORDER	0.8
FAMILY	1.3
GENERA	1.5

483511093092801 RAINY LAKE AT BLACK BAY NR ISLAND VIEW MN
LAT 48-35-11 LONG 093-09-28 SEQ 01

AUG. 22, 1977
1900 HOURS

IDENTIFICATION OF PHYTOPLANKTON

170,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		1,300	1	
	....DICTYOSPHAERIUM		2,000	1	
	....KIRCHNERIELLA		810	0	
	....OOCYSTIS		3,600	2	
	...SCENEDESMACEAE				
	....SCENEDESMUS		3,700	2	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....ARTHRODESMUS		650	0	
		TOTALS	12,000	7	2,3=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		810	0	
	....MELOSIRA		6,200	4	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....SYNEDRA		160	0	
	...NAVICULACEAE	NAVICULOID			
*	....NAVICULA			0	
	...NITZSCHIACEAE				
	....NITZSCHIA		1,300	1	
		TOTALS	8,500	5	1,2=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.CYANOPHYCEAE				
	..CHROCOCCALES	COCCOID BLUE-GREENS			
	...CHROCOCCACEAE				
#	....ANACYSTIS		130,000	79	
	..HORMOGONALES	FILAMENTOUS BL-GREEN			
	...OSCILLATORIACEAE				
	....LYNGBYA		1,600	1	
	....PHORMIDIUM		12,000	7	
		TOTALS	150,000	87	0,5=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....EUGLENA		160	0	
	....TRACHELOMONAS		330	0	
		TOTALS	490	0	0,9=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,7
CLASS	0,7
ORDER	1,1
FAMILY	1,2
GENERA	1,4

08260709251170I KAHETOGAMA LK AT MOUTHOF MEADOWOOD BAY NR RAY MN
LAT 48-26-07 LONG 092-51-17 SEQ 01

MAR, 17, 1977
1100 HOURS

IDENTIFICATION OF PHYTOPLANKTON

2,300 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...CHARACIACEAE				
	....SCHROEDERIA		4	0	
	...OOCYSTACEAE				
	....DICTYOSPHAERIUM		11	0	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		36	2	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
*	....COSMARIUM			8	
		TOTALS	50	10	1,1=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....MELOSIRA		86	4	
	....STEPHANODISCUS		14	1	
	..PENNALES	PENNATE			
	...CYMBELLACEAE				
	....AMPHORA		39	2	
	...FRAGILARIACEAE				
	....FRAGILARIA		21	1	
	...GOMPHONEMATACEAE				
	....GOMPHONEMA		4	0	
	...NAVICULACEAE	NAVICULOID			
	....DIPLONEIS		7	0	
*	....GYROSIGMA			8	
	....NAVICULA		39	2	
		TOTALS	210	18	2,3=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
#	....GOMPHOSPHAERIA		1,500	67	
	..OSCILLATORIALES	FILAMENTOUS			
	...OSCILLATORIACEAE				
#	....OSCILLATORIA		500	22	
		TOTALS	2,000	89	0,8=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%

* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,6
CLASS	0,6
ORDER	1,4
FAMILY	1,5
GENERA	1,5

482607092511701 KABETOGAMA LK AT MOUTHOF MEADWOOD BAY NR RAY MN
LAT 48=26=07 LONG 092=51=17 SEQ 01

AUG, 24, 1977
1130 HOURS

IDENTIFICATION OF PHYTOPLANKTON

43,000 CELLS/ML

	ORGANISM NAME	COMMON NAME		CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE				
	.CHLOROPHYCEAE					
	..CHLOROCOCCALES					
	...COELASTRACEAE					
	....COELASTRUM			210	1	
	...OOCYSTACEAE					
	....NEPHROCYTIUM			130	0	
	...SCENEDESMACEAE					
	....SCENEDESMUS			140	0	
	....TETRASTRUM			18	0	
			TOTALS	500	1	1,7=DIVERSITY
	CHRYSOPHYTA					
	.BACILLARIOPHYCEAE	DIATOMS				
	..CENTRALES	CENTRIC				
	...COSCINODISCACEAE					
	....CYCLOTELLA			18	0	
	....MELOSIRA			1,400	3	
	....STEPHANODISCUS			230	1	
	..PENNALES	PENNATE				
	...FRAGILARIACEAE					
	....SYNEDRA			54	0	
			TOTALS	1,700	4	0,8=DIVERSITY
	.XANTHOPHYCEAE	YELLOW=GREEN ALGAE				
	..HETEROCOCCALES					
	...CHLOROTHECIACEAE					
	....OPHIOCYTIUM			18	0	
			TOTALS	18	0	0,0=DIVERSITY
	CYANOPHYTA	BLUE=GREEN ALGAE				
	.MYXOPHYCEAE					
	..CHROOCOCCALES	COCCOID				
	...CHROOCOCCACEAE					
#	....ANACYSTIS			7,800	18	
#	....GOMPHOSPHAERIA			19,000	44	
	..OSCILLATORIALES	FILAMENTOUS				
	...NOSTOCACEAE					
#	....ANABAENA			8,300	20	
	...OSCILLATORIACEAE					
	....LYNGBYA			770	2	
	....OSCILLATORIA			4,500	11	
			TOTALS	40,000	95	1,9=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS				
	.EUGLENOPHYCEAE					
	..EUGLENALES					
	...EUGLENACEAE					
	....EUGLENA			18	0	
	....TRACHELOMONAS			18	0	
			TOTALS	36	0	1,0=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE				
	.DINOPHYCEAE	DINOFLAGELLATES				
	..PERIDINIALES					
	...CERATIACEAE					
	....CERATIUM			36	0	
			TOTALS	36	0	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,4
CLASS	0,4
ORDER	1,2
FAMILY	1,6
GENERA	2,2

48260309251401 KABETOGAMA LK IN MEADWOOD BAY NR RAY MN
LAT 48-26-03 LONG 092-51-14 SEQ 01

MAR, 17, 1977
0950 HOURS

IDENTIFICATION OF PHYTOPLANKTON

2,900 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		39	1	
#	....MELOSIRA		1,500	52	
	....STEPHANODISCUS		140	5	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
	....ACHNANTHES		13	0	
	...FRAGILARIACEAE				
	....ASTERIONELLA		26	1	
#	....FRAGILARIA		490	17	
	...NAVICULACEAE	NAVICULOID			
#	....NAVICULA		450	16	
	...NITZSCHIACEAE				
	....NITZSCHIA		230	8	
		TOTALS	2,900	100	2.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:
ORDER 1.0
FAMILY 1.6
GENERA 2.0

482603092511401 KABETOGAMA LK IN MEADWOOD BAY NR RAY MN
LAT 48-26-03 LONG 092-51-14 SEQ 01

AUG, 24, 1977
1230 HOURS

IDENTIFICATION OF PHYTOPLANKTON

44,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....KIRCHNERIELLA		940	2	
	....OOCYSTIS		54	0	
	...SCENEDESMACEAE				
	....SCENEDESMUS		220	0	
	..TETRASPORALES				
	...PALMELLACEAE				
	....SPHAEROCYSTIS		1,200	3	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....COSMARIUM		380	1	
	....COSMOCLADIUM		670	2	
		TOTALS	3,500	8	2,2=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
*	....CYCLOTELLA			0	
	....MELOSIRA		1,100	3	
	....STEPHANODISCUS		350	1	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		160	0	
	....FRAGILARIA		3,300	7	
	....SYNEDRA		81	0	
		TOTALS	5,000	11	1,4=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....ANACYSTIS		2,200	5	
#	....GOMPHOSPHAERIA		15,000	35	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
#	....ANABAENA		11,000	24	
	....APHANIZOMENON		4,200	9	
	...OSCILLATORIACEAE				
	....OSCILLATORIA		270	1	
	....PHORMIDIUM		3,200	7	
		TOTALS	36,000	81	2,0=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....TRACHELOMONAS		81	0	
		TOTALS	81	0	0,0=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...CERATIACEAE				
	....CERATIUM		54	0	
		TOTALS	54	0	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(12MM DIAM), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,9
CLASS	0,9
ORDER	1,9
FAMILY	2,3
GENERA	2,9

482630093011701 KABETOGAMA LK AT GAPPAS LANDING NR RAY MN
LAT 48=26=30 LONG 093=01=17 SLG 01

MAR, 16, 1977
1330 HOURS

IDENTIFICATION OF PHYTOPLANKTON

12,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
*	....ANKISTRODESMUS			13	
*	....DICTYOSPHAERIUM			13	
	...SCENEDESMACEAE				
	....SCENEDESMUS		43	0	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		720	6	
		TOTALS	770	32	0,3=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
*	....CYCLOTELLA			13	
	....MELOSIRA		43	0	
	....STEPHANODISCUS		230	2	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
	....ACHNANTHES		11	0	
	...CYMBELLACEAE				
	....AMPHORA		11	0	
*	....CYMBELLA			13	
	...FRAGILARIACEAE				
*	....FRAGILARIA			13	
*	....SYNEDRA			13	
	...NAVICULACEAE	NAVICULOID			
	....AMPHIPRORA		11	0	
*	....GYROSIGMA			13	
	....NAVICULA		76	1	
	...NITZSCHIACEAE				
	....NITZSCHIA		97	1	
	...SURIRELLACEAE				
*	....SURIRELLA			13	
		TOTALS	480	82	2,1=DIVERSITY
	.XANTHOPHYCEAE	YELLOW=GREEN ALGAE			
	..HETEROCOCCALES				
	...CHLOROTHECIACEAE				
	....OPHIOCYTIUM		22	0	
		TOTALS	22	0	0,0=DIVERSITY
	CYANOPHYTA	BLUE=GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
#	....GOMPHOSPHAERIA		11,000	90	
		TOTALS	11,000	90	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(1/2DM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,6
CLASS	0,6
ORDER	0,7
FAMILY	0,7
GENERA	0,7

482630093011701 KABETOGAMA LK AT GAPPAS LANDING NR RAY MN
LAT 48-26-30 LONG 093-01-17 SEQ 01

AUG, 24, 1977
1330 HOURS

IDENTIFICATION OF PHYTOPLANKTON

28,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....OOCYSTIS		39	0	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....COSMARIUM		78	0	
		TOTALS	120	0	0,9=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		39	0	
	....MELOSIRA		91	0	
	....STEPHANODISCUS		91	0	
		TOTALS	220	1	1,5=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....ANACYSTIS		1,500	5	
#	....GOMPHOSPHAERIA		14,000	49	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
#	....ANABAENA		5,100	18	
	...OSCILLATORIACEAE				
#	....PHORMIDIUM		7,400	26	
		TOTALS	28,000	99	1,7=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...CERATIACEAE				
	....CERATIUM		26	0	
		TOTALS	26	0	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:
PHYL/DIV 0,1
CLASS 0,1
ORDER 1,1

FAMILY 1,5
GENERA 1,8

482642093011901 KABETOGAMA LK NR GAPPAS LANDING NR RAY MN
LAT 48=26=42 LONG 093=01=19 SEQ 01

MAR, 16, 1977
1415 HOURS

IDENTIFICATION OF PHYTOPLANKTON

1,800 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...CHARACIACEAE				
	....SCHROEDERIA		37	2	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
*	....CLOSTERIUM			90	
		TOTALS	37	92	0,0=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		7	0	
		TOTALS	7	0	0,0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
*	....AGMENELLUM			90	
#	....GOMPHOSPHAERIA		1,700	98	
		TOTALS	1,700	188	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD; GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,2
CLASS	0,2
ORDER	0,2
FAMILY	0,2
GENERA	0,2

482642093011901 KABETOGAMA LK NR GAPPAS LANDING NR RAY MN
LAT 48-26-42 LONG 093-01-19 SEQ 01

AUG, 24, 1977
1400 HOURS

IDENTIFICATION OF PHYTOPLANKTON

14,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....OOCYSTIS		16	0	
	..TETRASPORALES				
	...PALMELLACEAE				
	....SPHAEROCYSTIS		330	2	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....COSMARIUM		33	0	
	....STAURASTRUM		8	0	
		TOTALS	390	3	0.8=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		82	1	
	....MELOSIRA		41	0	
	....STEPHANODISCUS		130	1	
		TOTALS	250	2	1.4=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....ANACYSTIS		290	2	
#	....GOMPHOSPHAERIA		8,200	60	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
	....ANABAENA		1,400	10	
	...OSCILLATORIACEAE				
#	....PHORMIDIUM		3,200	23	
		TOTALS	13,000	95	1.4=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....TRACHELOMONAS		8	0	
		TOTALS	8	0	0.0=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...CERATIACEAE				
	....CERATIUM		8	0	
	...PERIDINIACEAE				
	....PERIDINIUM		8	0	
		TOTALS	16	0	1.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.3
CLASS	0.3
ORDER	1.2
FAMILY	1.5
GENERA	1.7

482056092282001 SANDPOINT LK ABV HARRISON NARROWS NR CRANE LK MN
LAT 48-20-56 LONG 092-28-20 SLO 01

MAR, 16, 1977
0900 HOURS

IDENTIFICATION OF PHYTOPLANKTON

110 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		3	3	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		7	6	
		TOTALS	10	9	0,9=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
#	....CYCLOTELLA		23	22	
	..PENNALES	PENNATE			
	...NITZSCHIACEAE				
	....NITZSCHIA		3	3	
		TOTALS	27	25	0,5=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....ANACYSTIS		13	13	
#	....GOMPHOSPHAERIA		23	22	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
#	....APHANIZOMENON		30	28	
		TOTALS	66	63	1,5=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....TRACHELOMONAS		3	3	
		TOTALS	3	3	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISMS GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV 1,4
CLASS 1,4
ORDER 2,2
FAMILY 2,2

GENERA 2,6

482056092282001 SANDPOINT LK ABV HARRISON NARROWS NR CRANE LK MN
LAT 48-20-56 LONG 092-28-20 SEQ 01

AUG, 24, 1977
1000 HOURS

IDENTIFICATION OF PHYTOPLANKTON

9,300 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		12	0	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		600	7	
	....FRAGILARIA		160	2	
	....SYNEDRA		12	0	
	...GOMPHONEMATACEAE				
	....GOMPHONEMA		6	0	
		TOTALS	790	9	1,0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
#	....ANACYSTIS		4,300	46	
#	....GOMPHOSPHAERIA		3,000	32	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
	....ANABAENA		470	5	
	...OSCILLATORIACEAE				
	....OSCILLATORIA		730	8	
		TOTALS	8,400	91	1,6=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...CERATIACEAE				
	....CERATIUM		18	0	
		TOTALS	18	0	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,4
CLASS	0,4
ORDER	1,0
FAMILY	1,1
GENERA	2,0

482226092283301 SANDPOINT LK BL HARRISON NARROWS NR CRANE LK, MN
LAT 48-22-26 LONG 092-28-33 SEQ 01

MAR, 16, 1977
0945 HOURS

IDENTIFICATION OF PHYTOPLANKTON

1,000 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		38	4	
	...SCENEDESMACEAE				
	....SCENEDESMUS		7	1	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		3	0	
		TOTALS	48	5	0,9=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		24	2	
	....MELOSIRA		65	6	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....FRAGILARIA		7	1	
	...NITZSCHIACEAE				
	....NITZSCHIA		7	1	
	...TABELLARIACEAE				
	....TABELLARIA		3	0	
		TOTALS	110	10	1,6=DIVERSITY
	.CHRYSOPHYCEAE	YELLOW-BROWN ALGAE			
	..CHRYSOMONADALES				
	...OCHROMONADACEAE				
	....DINOBRYON		7	1	
		TOTALS	7	1	0,0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....ANACYSTIS		96	9	
#	....GOMPHOSPHAERIA		640	62	
	..OSCILLATORIALES	FILAMENTOUS			
	...OSCILLATORIACEAE				
	....OSCILLATORIA		140	13	
		TOTALS	880	84	1,1=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%

ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,8
CLASS	0,8
ORDER	1,4
FAMILY	1,5
GENERA	1,9

482226092283301 SANDPOINT LK BL HARRISON NARROWS NR CRANE LK, MN
LAT 48-22-26 LONG 092-28-33 SEQ 01

AUG. 24, 1977
0900 HOURS

IDENTIFICATION OF PHYTOPLANKTON

9,100 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...COELASTRACEAE				
	....COELASTRUM		250	3	
	...OOCYSTACEAE				
	....DICTYOSPHAERIUM		18	0	
	....OOCYSTIS		110	1	
	...SCENEDESMACEAE				
	....SCENEDESMUS		37	0	
		TOTALS	410	5	1.4=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		14	0	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		780	9	
	....FRAGILARIA		28	0	
	....SYNEDRA		41	0	
		TOTALS	870	10	0.6=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.CYANOPHYCEAE				
	..CHROCOCCALES	COCCOID BLUE-GREENS			
	...CHROCOCCACEAE				
	....AGMENELLUM		180	2	
#	....ANACYSTIS		5,500	61	
	..HORMOGONALES	FILAMENTOUS BL-GREEN			
	...NOSTOCACEAE				
	....ANABAENA		170	2	
	..CHROCOCCALES	COCCOID BLUE-GREENS			
	...CHROCOCCACEAE				
#	....GOMPHOSPHAERIA		1,900	21	
		TOTALS	7,800	86	1.1=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...PERIDINIACEAE				
	....PERIDINIUM		9	0	
		TOTALS	9	0	0.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES

= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.7
CLASS	0.7
ORDER	0.9
FAMILY	0.9
GENERA	1.8

483622092560701 RAINY LAKE AT BRULE NARROWS NR INT FALLS MN
LAT 48-36-22 LONG 092-56-07 SEQ 01

MAR, 15, 1971
1225 HOURS

IDENTIFICATION OF PHYTOPLANKTON

720 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		40	6	
#	....DICTYOSPHAERIUM		270	37	
	....KIRCHNERIELLA		3	0	
	...SCENEDESMACEAE				
	....SCENEDESMUS		6	1	
	..TETRASPORALES				
	...PALMELLACEAE				
	....GLOEOCYSTIS		11	2	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		6	1	
		TOTALS	330	47	1,0=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		51	7	
	....MELOSIRA		97	14	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		9	1	
	...NAVICULACEAE	NAVICULOID			
	....NAVICULA		6	1	
	...NITZSCHIACEAE				
	....NITZSCHIA		3	0	
		TOTALS	170	23	1,5=DIVERSITY
	.CHRYSOPHYCEAE	YELLOW-BROWN ALGAE			
	..CHRYSOMONADALES				
	...OCHROMONADACEAE				
	....DINOBRYON		6	1	
		TOTALS	6	1	0,0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
#	....ANACYSTIS		210	29	
		TOTALS	210	29	0,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES

= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	1,5
CLASS	1,6
ORDER	1,8
FAMILY	1,9
GENERA	2,4

483622092560701 RAINY LAKE AT BRULE NARROWS NR INT FALLS MN
LAT 48-36-22 LONG 092-56-07 SEQ 01

AUG, 23, 1977
1200 HOURS

IDENTIFICATION OF PHYTOPLANKTON

4,400 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		28	1	
	....OOCYSTIS		21	0	
		TOTALS	48	1	1.0=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....MELOSIRA		100	2	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		35	1	
	....FRAGILARIA		350	8	
	....SYNEDRA		7	0	
	...GOMPHONEMATACEAE				
	....GOMPHONEMA		7	0	
	...TABELLARIACEAE				
	....TABELLARIA		470	11	
		TOTALS	970	22	1.7=DIVERSITY
	.CHRYSOPHYCEAE	YELLOW-BROWN ALGAE			
	..CHRYSOMONADALES				
	...OCHROMONADACEAE				
	....DINOBRYON		7	0	
		TOTALS	7	0	0.0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
	....AGMENELLUM		170	4	
#	....ANACYSTIS		2,000	46	
	....GOMPHOSPHAERIA		620	14	
	..OSCILLATORIALES	FILAMENTOUS			
	...NOSTOCACEAE				
	....ANABAENA		83	2	
	....APHANIZOMENON		410	9	
	...OSCILLATORIACEAE				
	....PHORMIDIUM		48	1	
		TOTALS	3,300	76	1.7=DIVERSITY
	PYRRHOPHYTA	FIRE ALGAE			
	.DINOPHYCEAE	DINOFLAGELLATES			
	..PERIDINIALES				
	...PERIDINIACEAE				
	....PERIDINIUM		14	0	
		TOTALS	14	0	0.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.9
CLASS	0.9
ORDER	1.5
FAMILY	1.8
GENERA	2.6

483015092380101 KETTLE R BL KET, FALLS NR INTERNATIONAL FALLS MN
LAT 48-30-15 LONG 092-38-01 SEQ 01

MAR, 15, 1977
1045 HOURS

IDENTIFICATION OF PHYTOPLANKTON

2,200 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...SCENEDESMACEAE				
	....SCENEDESMUS		58	3	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		29	1	
		TOTALS	87	4	0,9=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		220	10	
#	....MELOSIRA		360	17	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
	....ACHNANTHES		58	3	
	....COCCONEIS		58	3	
	....RHOICOSPHENIA		14	1	
	...CYMBELLACEAE				
	....AMPHORA		14	1	
	....CYMBELLA		14	1	
	...EUNOTIACEAE				
	....EUNOTIA		14	1	
	...FRAGILARIACEAE				
	....ASTERIONELLA		43	2	
#	....FRAGILARIA		520	24	
	...GOMPHONEMATACEAE				
	....GOMPHONEMA		29	1	
	...NAVICULACEAE	NAVICULOID			
	....GYROSIGMA		14	1	
	....NAVICULA		200	9	
	....PINNULARIA		29	1	
	....STAURONEIS		29	1	
	...NITZSCHIACEAE				
#	....NITZSCHIA		480	22	
		TOTALS	2,100	98	3,0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:
PHYL/DIV 0,2
CLASS 0,2

ORDER 1,1
FAMILY 2,5
GENERA 3,2

483015092580101 KETTLE R BL KET. FALLS NR INTERNATIONAL FALLS MN
LAT 48-30-15 LONG 092-38-01 SEQ 01

AUG. 23, 1977
1030 HOURS

IDENTIFICATION OF PHYTOPLANKTON

2,100 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		16	1	
	....DICTYOSPHAERIUM		86	4	
	....OOCYSTIS		230	11	
	...SCENEDESMACEAE				
#	....CRUCIGENIA		320	16	
	..TETRASPORALES				
	...COCCOMYXACEAE				
	....ELAKATOTHRIX		11	1	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		11	1	
		TOTALS	670	33	1.7=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		16	1	
	....STEPHANODISCUS		5	0	
	..PENNALES	PENNATE			
	...FRAGILARIACEAE				
	....ASTERIONELLA		43	2	
	....SYNEDRA		21	1	
	...TABELLARIACEAE				
	....TABELLARIA		86	4	
		TOTALS	170	8	1.9=DIVERSITY
	.CHRYSOPHYCEAE	YELLOW-BROWN ALGAE			
	..CHRYSOMONADALES				
	...OCHROMONADACEAE				
	....DINOBRYON		5	0	
		TOTALS	5	0	0.0=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.CYANOPHYCEAE				
	..CHROCCOCCALES	COCCOID BLUE-GREENS			
	...CHROCCOCCACEAE				
#	....ANACYSTIS		670	33	
	..NOSTOCALES	FILAMENTOUS BL-GREEN			
	...NOSTOCACEAE				
	....ANABAENA		260	13	
	..CHROCCOCCALES	COCCOID BLUE-GREENS			
	...CHROCCOCCACEAE				
	....GOMPHOSPHAERIA		270	13	
		TOTALS	1,200	59	1.4=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	1.3
CLASS	1.3
ORDER	1.9
FAMILY	2.3
GENERA	2.9

483003092360301 KETTLE RV REL KETTLE FALLS NR INT FALLS MN
LAT 48-30-03 LONG 092-08-03 SEQ 01

MAR, 15, 1977
0930 HOURS

IDENTIFICATION OF PHYTOPLANKTON

870 CELLS/ML

	ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
	CHLOROPHYTA	GREEN ALGAE			
	.CHLOROPHYCEAE				
	..CHLOROCOCCALES				
	...OOCYSTACEAE				
	....ANKISTRODESMUS		3	0	
	..VOLVOCALES				
	...CHLAMYDOMONADACEAE				
	....CHLAMYDOMONAS		9	1	
	..ZYGNEMATALES				
	...DESMIDIACEAE	PLACODERM DESMIDS			
	....CLOSTERIUM		3	0	
		TOTALS	15	1	1.4=DIVERSITY
	CHRYSOPHYTA				
	.BACILLARIOPHYCEAE	DIATOMS			
	..CENTRALES	CENTRIC			
	...COSCINODISCACEAE				
	....CYCLOTELLA		23	3	
	....MELOSIRA		9	1	
	..PENNALES	PENNATE			
	...ACHNANTHACEAE				
	....ACHNANTHES		3	0	
	...CYMBELLACEAE				
	....CYMBELLA		6	1	
	...FRAGILARIACEAE				
	....FRAGILARIA		93	11	
	....SYNEDRA		6	1	
	...GOMPHONEMATACEAE				
*	....GOMPHONEMA			1	
	...NAVICULACEAE	NAVICULOID			
	....CALONEIS		3	0	
	....NAVICULA		26	3	
	....PINNULARIA		3	0	
	...NITZSCHIACEAE				
	....NITZSCHIA		6	1	
	...SURIRELLACEAE				
*	....SURIRELLA			1	
	...TABELLARIACEAE				
	....TABELLARIA		3	0	
		TOTALS	180	23	2.4=DIVERSITY
	CYANOPHYTA	BLUE-GREEN ALGAE			
	.MYXOPHYCEAE				
	..CHROOCOCCALES	COCCOID			
	...CHROOCOCCACEAE				
#	....GOMPHOSPHAERIA		640	74	
	..OSCILLATORIALES	FILAMENTOUS			
	...OSCILLATORIACEAE				
	....OSCILLATORIA		23	3	
		TOTALS	660	77	0.2=DIVERSITY
	EUGLENOPHYTA	EUGLENOIDS			
	.EUGLENOPHYCEAE				
	..EUGLENALES				
	...EUGLENACEAE				
	....TRACHELOMONAS		6	1	
		TOTALS	6	1	0.0=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
* = OBSERVED ORGANISM; NOT ACTUALLY COUNTED
ANALYSIS METHOD: GLASS CHAMBER(12MM CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0.9
CLASS	0.9
ORDER	1.2
FAMILY	1.5
GENERA	1.6

483003092380301 KETTLE RV BEL KETTLE FALLS NR INT FALLS MN
LAT 48-30-03 LONG 092-06-05 SEQ 01

AUG, 23, 1977
0930 HOURS

IDENTIFICATION OF PHYTOPLANKTON

4,700 CELLS/ML

ORGANISM NAME	COMMON NAME	CELLS/ML	PER CENT	
CHLOROPHYTA	GREEN ALGAE			
.CHLOROPHYCEAE				
..CHLOROCOCCALES				
...HYDRODICTYACEAE				
....PEDIASTRUM		15	0	
...OOCYSTACEAE				
....ANKISTRODESMUS		30	1	
....OOCYSTIS		10	0	
....QUADRIGULA		160	3	
....TETRAEDRON		5	0	
...SCENEDESMACEAE				
....CRUCIGENIA		99	2	
....SCENEDESMUS		30	1	
..TETRASPORALES				
...PALMELLACEAE				
....SPHAEROCYSTIS		120	3	
..VOLVOCALES				
...VOLVOCACEAE				
....EUDORINA		79	2	
..ZYGNEMATALES				
...DESMIDIACEAE	PLACODERM DESMIDS			
....CLOSTERIUM		5	0	
	TOTALS	550	12	2,7=DIVERSITY
CHRYSOPHYTA				
.BACILLARIOPHYCEAE	DIATOMS			
..CENTRALES	CENTRIC			
...COSCINODISCACEAE				
....CYCLOTELLA		20	0	
....MELOSIRA		79	2	
..PENNALES	PENNATE			
...FRAGILARIACEAE				
....ASTERIONELLA		40	1	
...NAVICULACEAE	NAVICULOID			
....NAVICULA		5	0	
...NITZSCHIACEAE				
....NITZSCHIA		54	1	
...TABELLARIACEAE				
....TABELLARIA		89	2	
	TOTALS	290	6	2,3=DIVERSITY
CYANOPHYTA	BLUE-GREEN ALGAE			
.CYANOPHYCEAE				
..CHROOCOCCALES	COCCOID BLUE-GREENS			
...CHROOCOCCACEAE				
....ANACYSTIS				
.....A.INCERTA		620	13	
....AGMENELLUM		570	12	
# ....ANACYSTIS		2,400	50	
..NOSTOCALES	FILAMENTOUS BL-GREEN			
...NOSTOCACEAE				
....ANABAENA		200	4	
....APHANIZOMENON		74	2	
...OSCILLATORIACEAE				
....PHORMIDIUM		59	1	
	TOTALS	3,900	82	1,7=DIVERSITY

NOTE: CELL/ML VALUES ARE BASED ON ACTUAL COUNTS AND REPORTED TO TWO(2) SIGNIFICANT FIGURES
= DOMINANT ORGANISM; GREATER OR EQUAL TO 15%
ANALYSIS METHOD: GLASS CHAMBER(12ML CIRC), INVERTED MICROSCOPE
DIVERSITY INDICES, BASED ON ACTUAL COUNTS:

PHYL/DIV	0,8
CLASS	0,8
ORDER	1,4
FAMILY	1,6
GENERA	2,2