

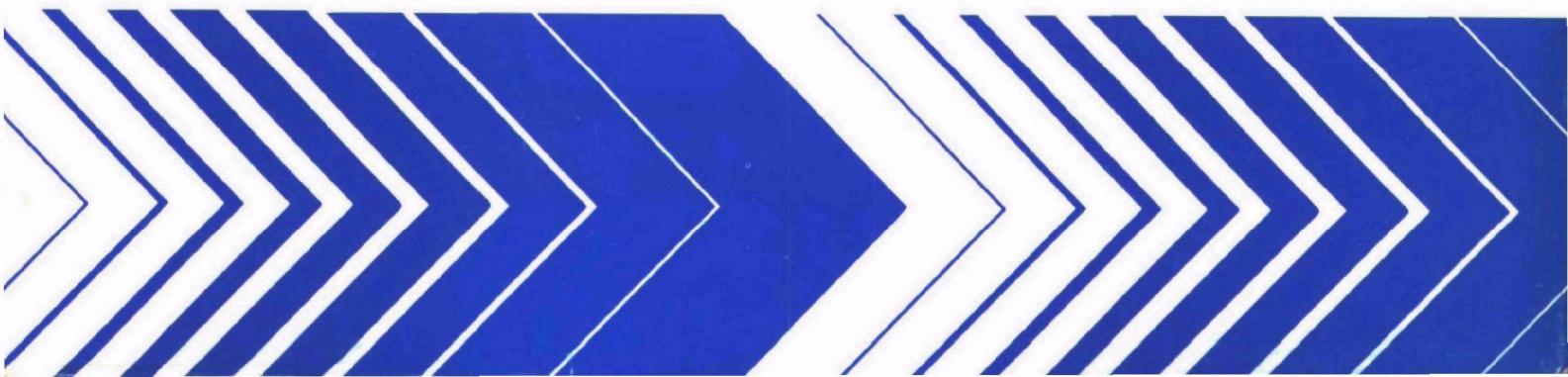
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# Distribution of Phytoplankton in North Dakota Lakes

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Paper 700



DISTRIBUTION OF PHYTOPLANKTON IN NORTH DAKOTA LAKES

by

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## FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs. The Survey was designed to develop, in conjunction with State environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and State management practices relating to point source discharge reduction and nonpoint source pollution abatement in lake watershed.

The Survey collected physical, chemical, and biological data from 815 lakes and reservoirs throughout the contiguous United States. To date, the Survey has yielded more than two million data points. In-depth analyses are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes.

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## INTRODUCTION

The collection and analysis of phytoplankton data were included in the National Eutrophication Survey in an effort to determine relationships between algal characteristics and trophic status of individual lakes.

During spring, summer, and fall of 1974, the Survey sampled 179 lakes in 10 States. Over 700 algal species and varieties were identified and enumerated from the 573 water samples examined.

This report presents the species and abundance of phytoplankton in the 14 lakes sampled in the State of North Dakota (Table 1). The Nygaard's Trophic State (Nygaard 1949), Palmer's Organic Pollution (Palmer 1969), and species diversity and abundance indices are also included.

TABLE 1. LAKES SAMPLED IN THE STATE OF NORTH DAKOTA

STORET No.	Lake Name	County
3801	Lake Ashtabula	Barnes, Griggs
3802	Lake Audubon	McLean
3803	Brush Lake	McLean
3804	Lake Darling	Renville
3805	Devils Lake	Benson, Ramsey
3806	Jamestown Reservoir	Stutsman, Foster
3807	Lake La Moure	Stutsman
3808	Matejcek Lake	Walsh
3809	Lake Metigoshe	Bottineau (part in Canada)
3811	Pelican Lake	Bottineau
3812	Lake Sakakawea (Garrison Reservoir)	Mercer, McLean, Mountrail Williams, McKenzie, Dunn

(Continued)

TABLE 1. LAKES SAMPLED IN THE STATE OF NORTH DAKOTA (Continued)

STORET No.	Lake Name	County
3813	Spirit Wood Lake	Stutsman
3814	Sweet Briar Reservoir	Morton
3815	Whitman Lake	Nelson, Walsh

## MATERIALS AND METHODS

### LAKE AND SITE SELECTION

Lakes and reservoirs included in the Survey were selected through discussions with State water pollution agency personnel and U.S. Environmental Protection Agency Regional Offices (U.S. Environmental Protection Agency 1975). Screening and selection strongly emphasized lakes with actual or potential accelerated eutrophication problems. As a result, the selection was limited to lakes:

- (1) impacted by one or more municipal sewage treatment plant outfalls either directly into the lake or by discharge to an inlet tributary within approximately 40 kilometers of the lake;
- (2) 40 hectares or larger in size; and
- (3) with a mean hydraulic retention time of at least 30 days.

Specific selection criteria were waived for some lakes of particular State interest.

Sampling sites for a lake were selected based on available information on lake morphometry, potential major sources of nutrient input, and on-site judgment of the field limnologist (U.S. Environmental Protection Agency 1975). Primary sampling sites were chosen to reflect the deepest portion of each major basin in a test lake. Where many basins were present, selection was guided by nutrient source information on hand. At each sampling site, a depth-integrated phytoplankton sample was taken. Depth-integrated samples were uniform mixtures of water from the surface to a depth of 15 feet (4.6 meters) or from the surface to the lower limit of the photic zone representing 1 percent of the incident light, whichever was greater. If the depth at the sampling site was less than 15 feet (4.6 meters), the sample was taken from just off the bottom to the surface. Normally, a lake was sampled three times in 1 year, providing information on spring, summer, and fall conditions.

### SAMPLE PREPARATION

To preserve the sample 4 milliliters (ml) of Acid-Lugol's solution (Prescott 1970) were added to each 130-ml sample from each site at the time of collection. The samples were shipped to the Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, where equal volumes from each site

were mixed to form two 130-ml composite samples for a given lake. One composite sample was put into storage and the other was used for the examination.

Prior to examination, the composite samples were concentrated by the settling method. Solids were allowed to settle for at least 24 hours prior to siphoning off the supernate. The volume of the removed supernate and the volume of the remaining concentrate were measured and concentrations determined. A small (8-ml) library subsample of the concentrate was then taken. The remaining concentrate was gently agitated to resuspend the plankton and poured into a capped, graduated test tube. If a preliminary examination of a sample indicated the need for a more concentrated sample, the contents of the test tube were further concentrated by repeating the settling method. Final concentrations varied from 15 to 40 times the original.

Permanent slides were prepared from concentrated samples after analysis was complete. A ring of clear Karo® corn syrup with phenol (a few crystals of phenol were added to each 100 ml of syrup) was placed on a glass slide. A drop of superconcentrate from the bottom of the test tube was placed in the ring. This solution was thoroughly mixed and topped with a coverglass. After the syrup at the edges of the coverglass had hardened, the excess was scraped away and the mount was sealed with clear fingernail polish. Permanent diatom slides were prepared by drying sample material on a coverglass, heating in a muffle furnace at 400° C for 45 minutes, and mounting in Hyrax®. Finally, the mounts were sealed with clear fingernail polish.

Backup samples, library samples, permanent sample slides, and Hyrax®-mounted diatom slides are being stored and maintained at the Environmental Monitoring and Support Laboratory-Las Vegas.

## EXAMINATION

The phytoplankton samples were examined with the aid of binocular compound microscopes. A preliminary examination was performed to precisely identify and list all forms encountered. The length of this examination varied depending on the complexity of the sample. An attempt was made to find and identify all of the forms present in each sample. Often forms were observed which could not be identified to species or to genus. Abbreviated descriptions were used to keep a record of these forms (e.g., lunate cell, blue-green filament, Navicula #1). Diatom slides were examined using a standard light microscope. If greater resolution was essential to accurately identify the diatoms, a phase-contrast microscope was used.

After the species list was compiled, phytoplankton were enumerated using a Neubauer Counting Chamber with a 40X objective lens and a 10X ocular lens. All forms within each field were counted. The count was continued until a minimum of 100 fields had been viewed, or until the dominant form had been observed a minimum of 100 times.

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## QUALITY CONTROL

Project phycologists performed internal quality control intercomparisons regularly on 7 percent of the species identification and counts. Although an individual had primary responsibility for analyzing a sample, taxonomic problems were discussed among the phycologists.

Additional quality control checks were performed on the Survey samples by Dr. G. W. Prescott of the University of Montana at the rate of 5 percent. Quality control checks were made on 75 percent of these samples to verify species identifications while checks were made on the remaining 25 percent of the samples to verify genus counts. Presently, the agreement between quality control checks for species identification and genus enumerations is satisfactory.

## RESULTS

A phytoplankton species list for the State is presented in Appendix A. Appendix B summarizes all of the phytoplankton data collected from the State by the Survey. The latter is organized by lake, and includes an alphabetical phytoplankton species list with concentrations for individual species given by sampling date. Results from the application of several indices are presented (Nygaard's Trophic State, Palmer's Organic Pollution, and species diversity and abundance). Each lake has been assigned a four-digit STORET number. (STORET (STOrage and RETrieval) is the U.S. Environmental Protection Agency's computer system which processes and maintains water quality data.) The first two digits of the STORET number identify the State; the last two digits identify the lake.

### NYGAARD'S TROPHIC STATE INDICES

Five indices devised by Nygaard (1949) were proposed under the assumption that certain algal groups are indicative of levels of nutrient enrichment. These indices were calculated in order to aid in determining the surveyed lakes' trophic status. As a general rule, Cyanophyta, Euglenophyta, centric diatoms, and members of the Chlorococcales are found in waters that are eutrophic (rich in nutrients), while desmids and many pennate diatoms generally cannot tolerate high nutrient levels and so are found in oligotrophic waters (poor in nutrients).

In applying the indices to the Survey data, the number of taxa in each major group was determined from the species list for each sample. The ratios of these groups give numerical values which can be used as a biological index of water richness. The five indices and the ranges of values established for Danish lakes by Nygaard for each trophic state are presented in Table 2. The appropriate symbol, (E) eutrophic and (O) oligotrophic, follows each calculated value in the tables in Appendix B. A question mark (?) following a calculated value in these tables was entered when that value was within the range of both classifications.

### PALMER'S ORGANIC POLLUTION INDICES

Palmer (1969) analyzed reports from 165 authors and developed algal pollution indices for use in rating water samples with high organic pollution. Two lists of organic-pollution-tolerant forms were prepared, one containing 20 genera, the other, 20 species (Tables 3 and 4). Each form was assigned a pollution index number ranging from 1 for moderately tolerant forms to 6 for

TABLE 2. NYGAARD'S TROPHIC STATE INDICES ADAPTED FROM HUTCHINSON (1967)

Index	Calculation	Oligotrophic	Eutrophic
Myxophycean	<u>Myxophyceae</u> Desmideae	0.0-0.4	0.1-3.0
Chlorophycean	<u>Chlorococcales</u> Desmideae	0.0-0.7	0.2-9.0
Diatom	<u>Centric Diatoms</u> Pennate Diatoms	0.0-0.3	0.0-1.75
Euglenophyte	<u>Euglenophyta</u> Myxophyceae + Chlorococcales	0.0-0.2	0.0-1.0
Compound	Myxophyceae + Chlorococcales + <u>Centric Diatoms + Euglenophyta</u> Desmideae	0.0-1.0	1.2-25

TABLE 3. ALGAL GENUS POLLUTION INDEX  
(Palmer 1969)

Genus	Pollution Index
<u>Anacystis</u>	1
<u>Ankistrodesmus</u>	2
<u>Chlamydomonas</u>	4
<u>Chlorella</u>	3
<u>Closterium</u>	1
<u>Cyclotella</u>	1
<u>Euglena</u>	5
<u>Gomphonema</u>	1
<u>Lepocinclis</u>	1
<u>Melosira</u>	1
<u>Micractinium</u>	1
<u>Navicula</u>	3
<u>Nitzschia</u>	3
<u>Oscillatoria</u>	5
<u>Pandorina</u>	1
<u>Phacus</u>	2
<u>Phormidium</u>	1
<u>Scenedesmus</u>	4
<u>Stigeoclonium</u>	2
<u>Synedra</u>	2

TABLE 4. ALGAL SPECIES POLLUTION INDEX (Palmer 1969)

Species	Pollution Index
<u>Ankistrodesmus falcatus</u>	3
<u>Arthrosphaera jenneri</u>	2
<u>Chlorella vulgaris</u>	2
<u>Cyclotella meneghiniana</u>	2
<u>Euglena gracilis</u>	1
<u>Euglena viridis</u>	6
<u>Gomphonema parvulum</u>	1
<u>Melosira varians</u>	2
<u>Navicula cryptocephala</u>	1
<u>Nitzschia acicularis</u>	1
<u>Nitzschia palea</u>	5
<u>Oscillatoria chlorina</u>	2
<u>Oscillatoria limosa</u>	4
<u>Oscillatoria princeps</u>	1
<u>Oscillatoria putrida</u>	1
<u>Oscillatoria tenuis</u>	4
<u>Pandorina morum</u>	3
<u>Scenedesmus quadricauda</u>	4
<u>Stigeoclonium tenue</u>	3
<u>Synedra ulna</u>	3

extremely tolerant forms. Palmer based the index numbers on occurrence records and/or where emphasized by the authors as being especially tolerant of organic pollution.

In analyzing a water sample, any of the 20 genera or species of algae present in concentrations of 50 per milliliter or more are recorded. The pollution index numbers of the algae present are totaled, providing a genus score and a species score. Palmer determined that a score of 20 or more for either index can be taken as evidence of high organic pollution, while a score of 15 to 19 is taken as probable evidence of high organic pollution. Lower figures suggest that the organic pollution of the sample is not high, that the sample is not representative, or that some substance or factor interfering with algal persistence is present and active.

#### SPECIES DIVERSITY AND ABUNDANCE INDICES

"Information content" of biological samples is being used commonly by biologists as a measure of diversity. Diversity in this connection means the degree of uncertainty attached to the specific identity of any randomly selected individual. The greater the number of taxa and the more equal their proportions, the greater the uncertainty, and hence, the diversity (Pielou 1966). There are several methods of measuring diversity, e.g., the formulas given by Brillouin (1962) and Shannon and Weaver (1963). The method which is appropriate depends on the type of biological sample on hand.

Pielou (1966) classifies the types of biological samples and gives the measure of diversity appropriate for each type. The Survey phytoplankton samples are what she classifies as larger samples (collections in Pielou's terminology) from which random subsamples can be drawn. According to Pielou, the average diversity per individual ( $H$ ) for these types of samples can be estimated from the Shannon-Wiener formula (Shannon and Weaver 1963):

$$H = -\sum_{i=1}^S p_i \log_x p_i$$

where  $P$  is the proportion of the  $i$ th taxon in the sample, which is calculated from  $n_i/N$ ;  $n_i$  is the number of individuals per milliliter of the  $i$ th taxon;  $N$  is the total number of individuals per ml; and  $S$  is the total number of taxa. However, Basharin (1959) and Pielou (1966) have pointed out that  $H$  calculated from the subsample is a biased estimator of the sample  $H$ , and if this bias is to be accounted for, we must know the total number of taxa present in the sample since the magnitude of this bias depends on it.

Pielou (1966) suggests that if the number of taxa in the subsample falls only slightly short of the number in the larger sample, no appreciable error will result in considering  $S$ , estimated from the subsample, as being equal to the sample value. Even though considerable effort was made to find and identify all taxa, the Survey samples undoubtedly contain a fair number of rare phytoplankton taxa which were not encountered.

In the Shannon-Wiener formula, an increase in the number of taxa and/or an increase in the evenness of the distribution of individuals among taxa will increase the average diversity per individual from its minimal value of zero. Sager and Hasler (1969) found that the richness of taxa was of minor importance in determination of average diversity per individual for phytoplankton and they concluded that phytoplankton taxa in excess of the 10 to 15 most abundant ones have little effect on H. This was verified by our own calculations. Our counts are in number per milliliter and since logarithms to the base 2 were used in our calculations, H is expressed in units of bits per individual. When individuals of a taxon were so rare that they were not counted, a value of 1/130 per milliliter or 0.008 per milliliter was used in the calculations since at least one individual of the taxon must have been present in the collection.

A Survey sample for a given lake represents a composite of all phytoplankton collected at different sampling sites on the lake during a given sampling period. Since the number of samples (M) making up a composite is a function of both the complexity of the lake sampled and its size, it should affect the richness-of-taxa component of the diversity of our phytoplankton collections. The maximum diversity (MaxH) (i.e., when the individuals are distributed among the taxa as evenly as possible) was estimated from  $\log_2 S$  (Pielou 1966), while the minimum diversity (MinH), was estimated from the formula:

$$\text{MinH} = - \frac{S-1}{N} \log_2 \frac{1}{N} - \left[ \frac{N - (S-1)}{N} \right] \log_2 \left[ \frac{N - (S-1)}{N} \right]$$

given by Zand (1976). The total diversity (D) was calculated from  $H_N$  (Pielou 1966). Also given in Appendix B are L (the mean number of individuals per taxa per milliliter) and K (the number of individuals per milliliter of the most abundant taxon in the sample).

The evenness component of diversity (J) was estimated from  $H/\text{MaxH}$  (Pielou 1966). Relative evenness (RJ) was calculated from the formula:

$$RJ = \frac{H-\text{MinH}}{\text{MaxH}-\text{MinH}}$$

given by Zand (1976). Zand suggests that RJ be used as a substitute for both J and the redundancy expression given by Wilhm and Dorris (1968). As pointed out by Zand, the redundancy expression given by Wilhm and Dorris does not properly express what it is intended to show, i.e., the position of H in the range between MaxH and MinH. RJ may range from 0 to 1; being 1 for the most even samples and 0 for the least even samples.

Zand (1976) suggests that diversity indices be expressed in units of "sites", i.e., in logarithms to base S (where S is the total number of taxa in the sample) instead of in "bits", i.e., in logarithms to base 2. Zand points out that the diversity index in sites per individual is a normalized number ranging from 1 for the most evenly distributed samples to 0 for the least evenly distributed samples. Also, it can be used to compare different samples, independent of the number of taxa in each. The diversity in bits per

individual should not be used in direct comparisons involving various samples which have different numbers of taxa. Since MaxH equals  $\log S$ , the expression in sites is equal to  $\log S$ , or 1. Therefore diversity in sites per individual is numerically equivalent to J, the evenness component for the Shannon-Wiener formula.

#### SPECIES OCCURRENCE AND ABUNDANCE

The alphabetic phytoplankton species list for each lake, presented in Appendix B, gives the concentrations of individual species by sampling date. Concentrations are in cells, colonies, or filaments (CEL, COL, FIL) per milliliter. An "X" after a species name indicates that the species identified in the preliminary examination was in such a low concentration that it did not appear in the count. A blank space indicates that the organism was not found in the sample collected on that date. Column S is used to designate the examiner's subjective opinion of the five dominant taxa in a sample, based upon relative size and concentration of the organism. The percent column (%C) presents, by abundance, the percentage composition of each taxon.

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**APPENDIX A**  
**PHYTOPLANKTON SPECIES FOR THE STATE OF NORTH DAKOTA**

<i>Actinastrum gracilimum</i>	<i>Dictyosphaerium ehrenbergianum</i>
<i>Amphora</i> sp.	<i>Dictyosphaerium pulchellum</i>
<i>Anabaena circinalis</i>	<i>Dinobryon divergens</i>
<i>Anabaena flos-aquae</i>	<i>Dinobryon sertularia</i>
<i>Ankistrodesmus falcatus</i>	<i>Dinobryon sociale</i>
<i>Ankistrodesmus falcatus</i> v. <i>acicularis</i>	<i>Dinobryon sociale</i> v. <i>americanum</i>
<i>Ankistrodesmus falcatus</i> v. <i>mirabilis</i>	<i>Diplopsalis acuta</i>
<i>Aphanizomenon flos-aquae</i>	<i>Elakatothrix gelatinosa</i>
<i>Aphanothece</i> sp.	<i>Entomoneis alata</i>
<i>Asterionella formosa</i>	<i>Entomoneis ornata</i>
<i>Asterionella formosa</i> v. <i>gracillima</i>	<i>Epithemia sorex</i>
<i>Carteria</i> sp.	<i>Eudorina elegans</i>
<i>Ceratium hirundinella</i>	<i>Euglena gracilis</i>
<i>Ceratium hirundinella</i> f. <i>furcoides</i>	<i>Euglena tripteris</i>
<i>Ceratium hirundinella</i> f. <i>robustum</i>	<i>Fragilaria crotonensis</i>
<i>Ceratium hirundinella</i> f. <i>scotticum</i>	<i>Frustulia rhomboides</i>
<i>Chaetoceros elmorei</i>	<i>Glenodinium gymmodinium</i>
<i>Chlamydomonas globosa</i>	<i>Glenodinium oculatum</i>
<i>Chlorogonium</i> sp.	<i>Glenodinium penardiiforme</i>
<i>Chroococcus dispersus</i>	<i>Gloeocystis gigas</i>
<i>Chroococcus limneticus</i>	<i>Gloeocystis major</i> ?
<i>Chroomonas acuta</i>	<i>Gloeotrichia echinulata</i>
<i>Chroomonas reflexa</i>	<i>Gomphonema</i> sp.
<i>Closterium</i> sp.	<i>Gomphosphaeria aponina</i> ?
<i>Coccconeis pediculus</i>	<i>Gomphosphaeria lacustris</i>
<i>Coccconeis placentula</i>	<i>Gymnodinium album</i>
<i>Coelastrum microporum</i>	<i>Gyrosigma wormleye</i>
<i>Coelastrum reticulatum</i>	<i>Hantzschia</i> sp.
<i>Coelosphaerium kuetzingianum</i>	<i>Kirchneriella contorta</i>
<i>Coelosphaerium naegelianum</i>	<i>Lepocinclis</i> sp.
<i>Coscinodiscus lacustris</i>	<i>Lyngbya birgei</i>
<i>Cosmarium</i> sp.	<i>Mallomonas acaroides</i>
<i>Crucigenia quadrata</i>	<i>Mallomonas caudata</i>
<i>Crucigenia tetrapedia</i>	<i>Mallomonas pseudocoronata</i>
<i>Cryptomonas erosa</i>	<i>Melosira distans</i>
<i>Cryptomonas marssonii</i>	<i>Melosira granulata</i>
<i>Cryptomonas reflexa</i>	<i>Melosira granulata</i> v. <i>angustissima</i>
<i>Cryptomonas rostrata</i>	<i>Melosira varians</i>
<i>Cyclotella meneghiniana</i>	<i>Merismopedia glauca</i>
<i>Cymatopleura elliptica</i>	<i>Merismopedia minima</i>
<i>Cymatopleura solea</i>	<i>Merismopedia tenuissima</i>
<i>Cymbella triangulum</i> ?	<i>Microcystis aeruginosa</i>
<i>Dactylococcopsis fascicularis</i>	<i>Microcystis incerta</i>
<i>Dactylococcopsis irregularis</i>	<i>Mougeotia</i> sp.
<i>Diatoma vulgare</i>	<i>Navicula viridula</i> v. <i>avenacea</i>
	<i>Nitzschia closterium</i>
	<i>Nitzschia filiformis</i>
	<i>Nitzschia sigmoidea</i>

<i>Oocystis borgei</i>	<i>Scenedesmus dimorphus</i>
<i>Oocystis eremosphaeria</i>	<i>Scenedesmus intermedius</i>
<i>Oocystis parva</i>	<i>Scenedesmus obliquus</i>
<i>Ophiocytium ? sp.</i>	<i>Scenedesmus quadricauda</i>
<i>Oscillatoria agardhii</i>	<i>Scenedesmus setigera</i>
<i>Oscillatoria amphibia</i>	<i>Selenastrum sp.</i>
<i>Pandorina morum</i>	<i>Spermatozoopsis sp.</i>
<i>Pascherina tetras</i>	<i>Sphaerocystis schroeteri</i>
<i>Pediastrum boryanum</i>	<i>Spirogyra sp.</i>
<i>Pediastrum duplex</i>	<i>Staurastrum tetracerum</i>
<i>Pediastrum duplex</i>	<i>Stephanodiscus astraea</i>
v. <i>clathratum</i>	<i>Stephanodiscus niagarae</i>
<i>Pediastrum kawraiskyi</i>	<i>Surirella angusta</i>
<i>Pediastrum tetras</i>	<i>Surirella ovalis</i>
<i>Peridinium inconspicuum</i>	<i>Surirella ovata</i>
<i>Peridinium quadrident</i>	<i>Synedra acus</i>
<i>Peridinium willei ?</i>	<i>Synedra delicatissima</i>
<i>Phacus acuminatus</i>	<i>Synedra ulna</i>
v. <i>drezepolskii</i>	<i>Synura ? sp.</i>
<i>Phacus caudatus</i>	<i>Tetraedron minimum</i>
<i>Phacus megalopsis</i>	<i>Tetraedron minimum</i>
<i>Phacus pleuronectes</i>	v. <i>scrobiculatum</i>
<i>Phacus pseudonordstedtii</i>	<i>Tetraedron regulare</i>
<i>Phacus pyrum</i>	<i>Tetraedron regulare</i>
<i>Phormidium mucicola</i>	v. <i>granulata</i>
<i>Pinnularia brevicostata</i>	<i>Tetraedron regulare</i>
<i>Quadrigula chodatii</i>	v. <i>incus</i>
<i>Raphidiopsis sp.</i>	<i>Tetraedron trigonum</i>
<i>Rhodomonas minuta ?</i>	<i>Tetrastrum staurogeniaeforme</i>
<i>Rhoicosphenia curvata</i>	<i>Trachelomonas intermedia</i>
<i>Rhopalodia gibba</i>	<i>Trachelomonas planctonica</i>
<i>Scenedesmus abundans</i>	<i>Trachelomonas volvocina</i>
<i>Scenedesmus acuminatus</i>	<i>Volvox sp.</i>
<i>Scenedesmus bijuga</i>	

## APPENDIX B. SUMMARY OF PHYTOPLANKTON DATA

This appendix was generated by computer. Because it was only possible to use upper case letters in the printout, all scientific names are printed in upper case and are not italicized.

The alphabetic phytoplankton lists include taxa without species names (e.g., EUNOTIA, EUNOTIA #1, FLAGELLATE, FLAGELLATES, MICROCYSTIS INCERTA ?, CHLOROPHYTAN COCCOID CELLED COLONY). When species determinations were not possible, symbols or descriptive phrases were used to separate taxa for enumeration purposes. Each name on a list, however, represents a unique species different from any other name on the same list, unless otherwise noted, for counting purposes.

Numbers were used to separate unidentified species of the same genus. A generic name listed alone is also a unique species. A question mark (?) is placed immediately after the portion of a name which was assigned with uncertainty. Numbered, questioned, or otherwise designated taxa were established on a lake-by-lake basis; therefore NAVICULA #2 from lake A cannot be compared to NAVICULA #2 from lake B. Pluralized categories (e.g., FLAGELLATES, CENTRIC DIATOMS, SPP.) were used for counting purposes when taxa could not be properly differentiated on the counting chamber.

LAKE NAME: LAKE ASHTABULA  
STORET NUMBER: 3841

NYGAARD TROPHIC STATE INDICES

DATE	04 30 74	07 16 74	09 17 74
MYXOPHYCEAN	0.370 E	0.570 E	0.570 E
CHLOROPHYCEAN	0.470 E	0.470 E	0.370 E
EUGLENOPHYTE	0.43 E	0.44 E	0.66 ?
DIATOM	0.44 E	0.50 E	2.00 E
COMPOUND	1.70 E	1.67 E	1.70 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 30 74	07 16 74	09 17 74
GENUS	07	16	32
SPECIES	05	11	30

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 30 74	07 16 74	09 17 74	
AVERAGE DIVERSITY	H	0.28	1.95	1.63
NUMBER OF TAXA	S	35.00	29. J	14. JO
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00	4. JO
MAXIMUM DIVERSITY	MAXH	5.13	6.66	3.81
MINIMUM DIVERSITY	MINH	0.02	0.09	0.01
TOTAL DIVERSITY	D	7110.32	7766.55	23359.54
TOTAL NUMBER OF INDIVIDUALS/ML	N	25394.00	3949.00	15558.20
EVENNESS COMPONENT	J	0.35	0.40	0.43
RELATIVE EVENNESS	KJ	0.00	0.39	0.43
MEAN NUMBER OF INDIVIDUALS/TAXA	L	725.54	136.17	1111.29
NUMBER/ML OF MOST ABUNDANT TAXON	K	24617.00	2400.00	4136.00

TAXA	TYP	14 30 74			17 18 74			09 17 74		
		IS	SC	PER ML	IS	SC	PER ML	IS	SC	PER ML
ACTINASTIUM GRACILINUM	CEL	1	1	1	1	1	1	1	1	1
ANABAENA #1	FIL	1	1	1	1	1	1	141	2.01	446
ANABAENA CIRCINALIS	FIL			2114.01		577				x
ANASTRODESmus TALCATUS										
V. ACICULARIS	CEL	141	0.41	111						
APHANTIZUMENAS FLOS-AQUAE	FIL			x	311	7.71	304	1156.71	9136	
ASTERIONELLA FURROSA										
V. GRACILLIMA	CEL	1	0.11	37						
CENTRIC DIATOM	CEL						x			
CEPIDIUM HIRUNDINELLA	CEL					x				
CEPIDIUM HIRUNDINELLA										x
F. AUGUSTUM	CEL									
CEPIDIUM HIRUNDINELLA										
F. SECTICUM	CEL					x				
CHLAMYDOMONAS GLACIOSA	CEL		0.31	74						
CHLOROPHYTAN CELL	CCL			x						
CHLOROPHYTAN COLONY	CCL			x						
CHLOECOCCUS	CCL							0.0		137
CHLOROPUNAS	CCL	31	0.91	422						
CHLOROPUNAS ACUTA	CEL	1	1	x		1.51	61	1.11		172
CHLOROPHYTAN CELL	CEL			x			x			
CHLOROPHYTAN COLONY	CCL			x						
CILIUM	CCL			x						
CRYPTOMUNAS ERGOSA	CEL	121	0.61	148		5.1	121			
CRYPTOMUNAS REFLEXA	CEL			x						
CYCLIDELLA PENEGRINIANA ?	CEL	11190.91	24017							
CYBELLA	CEL					x				
CYST	CEL			x			x			
DACTYLLOCUCOPSIS	CEL					x				
DIATOMA ?	CEL			x			x			
DINGBYUM SOCIALE	CEL	1	0.11	37			x			
EUGLENA	CIL									
EUGLENA #1	CEL			x						
EUGLENA GRACILIS	CEL			x		1.51	61		2.21	343
FLAGELLATE #2	CEL			x						
FRAGILARIAM	CEL			x			x			
FRAGILARIAM CHOTONENSIS	CEL			x						
GLENODINIUM CYANOLIUM	CEL			x						
GLENODINIUM OCULATOR	CEL			x			x			
GLENODINIUM PENARIFORME	CEL			x		51	4.01	182		
LYNGBYA	FIL			x						
MELISIRA GRANULATA	CEL			x		1160.01	2400	12129.81	4637	
MELISIRA VARIANS	CEL			x						
MICROCYSTIS	CCL									x
MICROCYSTIS AFRIGINUSA	CCL					x				
MICROCYSTIS INCENTA	CCL					x				
NAVICULA	CEL			x			x			
NETZSCHEA	CEL			x			x			
OCYSTIS BORGELI	CEL			x						
OCYSTIS EREOSPHERIA	CEL			x			x			
OCYSTIS PARVA	CEL			x			x			
OSCILLATORIA	FIL	1	0.11	37						
PANDURINA "KUMUP"	CCL					x				
MEDIASTRUM COMPLEX	CCL					x				
PINULARIA	CEL					x				
SCENELESmus DIMORPHUS	CCL			x						
SCENELESmus GUARICALUA	COL			x						
SCHMIDELIA SETIGERA	CEL			x					1.71	103
STEPHANOISCUS	CEL			x					1.11	172
STEPHANOISCUS NIAGARAE	CEL			x				30		
SURIRELLA	CEL			x						
SURIRELLA GUATA	CEL	191	0.31	74						
SYNIGRA ULMIA	CEL	1	0.11	37						
TETRAEDRUM REGULARE	CFL									x
V. GRANULATA	CFL									
TETRAEDRUM STAUROGENIAEFFLUME	CCL			x						
TRACHELOMONAS	CFL			x			x			
TRACHELOMONAS INTERMEDIA	CFL			x			x			
TRACHELOMONAS VOLVICINA	CFL			x			x			
TOTAL				69394		3944		15558		

LAKE NAME: LAKE AUDUBON  
STORE NUMBER: 3802

NYGAARD TROPHIC STATE INDICES

DATE	04 26 74	07 18 74	09 13 74
MIXEDPHYCEAN	02/C L	03/C E	03/C E
CHLOROPHYCEAN	01/O E	02/O E	01/O E
EUGLENOPHYTE	C/C3 ?	D/D5 ?	C/C4 ?
DIATOM	0.33 E	1.00 E	01/D E
COMPOUND	06/0 E	06/0 E	05/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 26 74	07 18 74	09 13 74
GENUS	04	05	00
SPECIES	30	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 26 74	07 18 74	09 13 74
AVERAGE DIVERSITY H	2.02	2.55	2.10
NUMBER OF TAXA S	25.00	7.00	7.00
NUMBER OF SAMPLES COMPOSITED M	3.00	3.00	3.00
MAXIMUM DIVERSITY MAXH	4.32	2.81	2.41
MINIMUM DIVERSITY MINH	1.00	0.10	0.02
TOTAL DIVERSITY D	9231.41	364.16	877.12
TOTAL NUMBER OF INDIVIDUALS/PL N	4570.00	662.00	5482.00
EVENNESS COMPLEMENT J	0.47	0.20	0.30
RELATIVE EVENNESS KJ	0.47	0.17	0.30
MEAN NUMBER OF INDIVIDUALS/TAXA L	226.50	94.57	783.14
NUMBER/ML OF MOST ABUNDANT TAXON K	2039.00	579.00	5350.00

TAXA	FORM	4 26 74			4 27 18 74			4 29 13 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
AMARAENA	FIL	1	1	1	X					
APHAENIZOMENUM FLUSS-AQUAE	FIL	1	1			1187.5	579	1197.6	5350	
ASTERIOSELLA FORMOSA	CEL	1	1	1.1	52					
CENTRIC DIATOMS	CEL	12144.6	2039							
CHLAMYDOMONAS	CEL	11132.8	1497							
CHLOREPHYTUM COLONIA	COL	151	2.8	129						
CHODRYPHYES	CEL	1	1					161	2.4	132
CHODRYPHYES ACUTA	CEL	13111.9	542							
COELASTRUM RETICULATUM	CGE	1	1				X			
CRYPTOCERAS ERCSA	CEL	141	4.0	181						
CRYPTOPHYAS RAFFSONII	CEL	1	1							X
DACTYLCYCOPSIS	CEL	1	1	0.6	26					
FRAGILARIA	CEL	1	1				X			
FRAGILARIA #1	CEL	1	1		X					
FRAGILARIA #2	CEL	1	1		X					
GIGRUMENEA #1	CEL	1	1	0.0	26					
GIGRUMENEA #2	CEL	1	1		X					
MELOSIRA DISTANS	CEL	1	1		X					
MICROCYSTIS AERUGINOSA	CGE	1	1				X			X
MAYICULA #1	CEL	1	1		X					
SPHINCTIUM ?	CEL	1	1		X					
OSCILLATORIA	FIL	1	1			12112.5	63			X
PETRASTRUM LUPLEX	COL	1	1							
SPICICOSPHEMIA CURVATA	CEL	1	1		X					
SCHMIDTERIA SETIGERA	CEL	1	1				X			
SELENASTRUM	CEL	1	1	1.1	52					
SILPHAMONDISCUS NIAGAREAE	CEL	1	1	0.6	26		X			X
SURIRELLA CVALIS	CEL	1	1		X					
SURIRELLA GVATA	CEL	1	1		X					
TOTAL				4370		662		5482		

LAKE NAME: BRUSH LAKE  
STORET NUMBER: 3673

NYGAARD TROPHIC STATE INDICES

	DATE	04 26 74	07 16 74	09 13 74
MYXOPHYCEAN	C/U	1	4.00 E	2.67 E
CHLOROPHYCEAN	05/0 E	5.00 E	2.67 E	
EUGLENOPHYTE	0.20 ?	0.06 ?	0.12 ?	
DIATOM	0.43 E	0.25 ?	0.33 E	
COMPOUND	09/0 E	10.5 E	6.67 E	

PALMER'S ORGANIC POLLUTION INDICES

	DATE	04 26 74	07 16 74	09 13 74
GENUS	00	07	00	
SPECIES	00	00	00	

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	04 26 74	07 16 74	09 13 74
AVERAGE DIVERSITY	H	1.61	1.51	2.12
NUMBER OF TAXA	S	21.00	39.00	36.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	3.00	2.00
MAXIMUM DIVERSITY MAXH	G.39	5.29	5.17	
MINIMUM DIVERSITY MINH	0.16	0.06	0.07	
TOTAL DIVERSITY	D	2348.99	13819.52	15291.56
TOTAL NUMBER OF INDIVIDUALS/ML	N	1459.00	9152.00	7213.00
EVENNESS COMPONENT	J	0.37	0.29	0.41
RELATIVE EVENNESS	RJ	0.35	0.26	0.41
MEAN NUMBER OF INDIVIDUALS/TAXA	L	69.48	234.67	200.30
NUMBER/ML OF MOST ABUNDANT TAXON	K	711.00	6944.00	3660.00

TAXA	FORM	JULY 20 1974			JULY 15 1974			OCTOBER 13 1974			
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	
ARPHICRA	CEL			x						x	
ANABAENA	FIL										
ANABAENA #1	FIL										
ANABAENA #2	FIL				13	4.71	431			1.01	73
APHAENIZOMENON PLUS-AQUAT	FIL										
APHANTHICE	CCL										
ASTERIONELLA FORMUSA	CEL	13	5.1	75							
CERATIUM MIRUNDINELLA	CEL										
CERATIUM MIRUNDINELLA F. FURCOIDES	CEL										
CHLOROPHYTAN CELL	CEL										
CHLOROPHYTAN COLCHY	COL										
CHACUCUCCUS LINNETICUS	CCL										
CHEDDORUM ACUTA	CEL	12	38.5	561		3.51	323		3.51	295	
CLOSTERIUM #1	CEL										
CLOSTERIUM #2	CEL										
COELASTRUM MICROPURUM	CCL										
COELOSPHELIUM KUETZELIANUM	COL										
COSMARIA	CEL										
CRYPTOMONAS	CEL	11	48.7	711							
CRYPTOMONAS ERUSA	CEL										
CRYPTOMONAS MARSSUNII	CFL										
CRYPTOMONAS PEPLERA	CEL										
CRYPTOMONAS LUSTRIATA	CEL										
CYCLOTELLA	CEL			x							
CYPAEOPLEURA ELLIPTICA	CEL										
CYPAEOPLEURA SGLEA	CEL										
CYMSELLA	CEL			x							
MICROSphaerium EHRENSBERGIANUM	COL										
DINOBRYUM SERTULARIA	CEL			x							
ELANODIOMIX GELATINGIA	CEL	13	5.1	75							
EPITHEMIA	FIL										
EPITHEMIA SEREA	CEL			x							
EUGLENA	CEL										
EUGLENA GHACILIS	CEL			x							
FRAGILARIA	FIL										
FRAGILARIA CHATHAMENSIS	CEL			x	1.01	2.01	269				
FRUSIULIA RHOMBULUS	CEL			x	1.01	5.01	538		127.3	1068	
GENUINUM OCULATUM	CEL										
GUMPHOSPHAERIA APUNINA ?	CFL										
HELOSIRA GRANULATA	CEL										
HELOSIRA GRANULATA V. ANGUSTISSIMA	CEL										
HERISPORUM GLAUCUM	COL										
MICROCYSTIS AERUGINOSA	CFL										
MICROCYSTIS INCERTA	CCL										
MOURETTIA	FIL										
MITZSCHEA SIGMOIDEA	CFL										
OCCYSTIS	COL			x							
OSCILLATORIA	FIL										
PEDIASTRUM BOTYANUM	CCL										
PEDIASTRUM DUPLEX	COL										
PEUDIASTRUM KAWAIKIYI	COL			x							
PERIDIUM QUADRISENS	CEL			x							
PHAGMIDIUM MUCICELLA	FIL			x							
PINNULARIA BREVICUSTATA	CFL										
QUADRIGULA CHODATII	CFL										
ANGIOCYSTIS CURVATA	CFL			x							
RHCPALUJIA GIBBA	CFL										
SCENELESMUS BIJUGA	COL										
SCENELESMUS GUARDICAUDA	COL			x							
SCHEGOECKIA SETIGERA	CEL										
STAURASTRUM	CEL										
STEPHANOGLISCUS	CFL			x							
STEPHANOGLISCUS ASTREA	CFL										
SUPERELLA #9	CEL										
SUPERELLA OVALIS	CEL			x							
STMURA ?	CEL	10	2.5	37							
TETRAEDRON MINIMUM	CEL			x							
TETRAEDRON MINIMUM V. SCHOBICULATUM	CEL										
TETRAEDRON REGULARE	CEL										
TRACHELOMONAS VOLVUCINA	CEL										
TOTAL					1459		9152		7213		

LAKE NAME: LAKE DARLING  
STORE NUMBER: 3864

NYGAARD TROPHIC STATE INDICES

DATE	04 30 74	07 17 74	09 13 74
MICROPHYCEAN	2.00 E	5.00 E	04/0 E
CHLOROPHYCEAN	15.0 E	1.00 E	J1/0 E
EUGLENOPHYTE	0.12 ?	0/06 ?	0/05 ?
DIATOM	0.50 E	01/0 E	01/0 E
COMPOUND	22.0 E	7.00 E	G0/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 30 74	07 17 74	09 13 74
GENUS	05	02	01
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 30 74	07 17 74	09 13 74
AVERAGE DIVERSITY	H	1.15	1.73
NUMBER OF TAXA	S	36.00	16.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	3.00
MAXIMUM DIVERSITY MAXH		5.17	3.81
MINIMUM DIVERSITY MINH		0.05	0.02
TOTAL DIVERSITY	D	12751.20	13805.95
TOTAL NUMBER OF INDIVIDUALS/ML	N	11088.00	8015.00
EVENESS COMPONENT	J	0.22	0.45
RELATIVE EVENESS	RJ	0.22	0.46
MEAN NUMBER OF INDIVIDUALS/TAXA	L	306.00	572.50
NUMBER/ML OF MOST ABUNDANT TAXON	K	9068.00	3959.00
			1934.38

LAKE NAME: LAKE DAPLING  
STATION NUMBER: 3864

CONTINUED

TAXA	FORM	04 36 74			07 17 74			09 13 74			
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	
ACTINOSTRUM GRACILIMUM	CEL	1	1	X	1	1					
ARABIAEA	FIL	1	1				X	141	4.51	651	
ANASTRODESMUS FALCATUS	CEL	1	0.31	33							
V. ACICULATIS	CEL	1	1	X	1	1					
ANASTRODESMUS FALCATUS	CEL	1	0.31	33							
V. RIBABILIS	CEL	1	1	X	1	1					
APHAENIZMNON FLDS-AQUAE	FIL	1	1	X	1	1	1140.41	3999	11190.01	13933	
ASTERIONELLA FORNSA	CEL	1	1	X	1	1					
CHLAMYDOMAS	CEL	141	6.41	488	1	1	0.61	49			
CHLOROGONIUM	CEL	1	1	X	1	1					
CHLOROCUCUS DISPERCUS	COL	1	1		2811.11	891					
CHLOROPORAS	CEL	131	5.31	589	1	1					
CHLOROPORAS ACUTA	CEL	1	1	X	1	1	141	3.11	247	1.71	266
CLUSTELIUM	CEL	1	1	X	1	1					
COELOSPHAERIUM NAEGLERIUM	COL	1	1	X	1	1					
CRYPTOPORAS	CEL	1	1	X	1	1					
CYPTOPORAS EPOSA	CEL	121	5.01	553	1	1	0.61	49			
CYPTOPORAS PARSENII	CEL	1	1	X	1	1					
CYPTOPORAS REPLEXA	CEL	1	1	X	1	1					
CYCLOTELLA	CEL	11181.81	9188								
CYMATOFLEURA SOLEA	CEL	1	1	X	1	1					
CYST	CEL	1	1	X	1	1					
DACTYLOCOPYSIS IRREGULARIS	CEL	1	1	33	1	1					
DICTYOSPHAERIUM PULCHELLUM	COL	1	1	X	1	1					
EUGLEMA GRACILIS	CEL	1	1	X	1	1					
FLAGELLATE ZC	CEL	1	1	X	1	1	1.61	148			
GLUEGCRYPTIS MAJOR ?	COL	1	1	X	1	1					
GYNOCINIUM ALBULUM	CEL	1	1	33	1	1					
GYROSIGMA ?	CEL	1	1	X	1	1					
HELGSIKA	CEL	1	1	X	1	1					
MICROCYTUS AERUGINOSA	COL	1	1	X	1	1					
NAVICILLA	CEL	1	1	33	1	1					
NIZZENIA	CEL	1	1	X	1	1					
NUCTSTIS	COL	1	1	33	1	1					
PEUASTRUM CURVANUM	COL	1	1	1	1	1					
PEUASTRUM DUPLEX	COL	1	1		1	1					
PEUASTRUM DUPLEX	COL	1	1		1	1					
V. CLAVIRAZUR	COL	1	1	X	1	1					
PERIDINIUM QUADRIDENTS	CEL	1	1	X	1	1					
PHAEOMIDIUM	FIL	1	1		1	1	3133.31	2672			
PHORMIDIUM MUCICOLA	FIL	1	1		1	1					
SCENEDESMIUS ACURINATUS	COL	1	1	X	1	1					
SCENEDESMIUS BIJUGA	COL	1	1	X	1	1					
SEMEDESMIUS TIRORPHUS	COL	1	1	X	1	1					
SEMEDESMIUS QUADRICAUDA	COL	1	1	33	1	1					
SCHNOLDERIA SETIGERA ?	CEL	1	1	X	1	1					
SPHAEROPHYTIS SCHROETERI	COL	1	1	X	1	1					
STEPHANODISCUS	CEL	151	1.21	130	1	1					
STEPHANODISCUS NIAGARAE	CEL	1	1	X	1	1					
SPIRELLA ZC	CEL	1	1	X	1	1					
TETRAEDRON TRIGONUM	CEL	1	1	33	1	1					
TETRASTRUM STAURUGENIAEFOERME	COL	1	1	33	1	1					
TRACHELLOMONAS PLANTUNICA	CEL	1	1	X	1	1					
TOTAL				11088			6619		15475		

LAKE NAME: DEVILS LAKE  
STORET NUMBER: 3805

NYGAARD TROPHIC STATE INDICES

DATE	04 29 74	07 16 74	09 16 74
MYXOPHYCEAN	C1/C E	06/C E	33/C E
CHLOROPHYCEAN	C2/0 E	03/0 E	03/0 E
EUGLENOPHYTE	0.67 E	0.11 ?	0.06 ?
DIATOM	0.25 ?	1.00 E	0.50 E
COMPOUND	06/0 E	12/0 E	37/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 29 74	07 16 74	09 16 74
GENUS	C3	C1	C1
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 29 74	07 16 74	09 16 74
AVERAGE DIVERSITY	H	2.06	2.07
NUMBER OF TAXA	S	26.00	14.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00
MAXIMUM DIVERSITY MAXH	M	4.32	3.81
MINIMUM DIVERSITY MINH	M	0.09	0.08
TOTAL DIVERSITY	D	7123.48	4313.48
TOTAL NUMBER OF INDIVIDUALS/ML	N	2678.00	2084.00
EVENNESS COMPONENT	J	0.62	0.54
RELATIVE EVENNESS	RJ	0.61	0.54
MEAN NUMBER OF INDIVIDUALS/TAXA	L	133.90	148.86
NUMBER/ML OF MOST ABUNDANT TAXON	K	1004.00	748.00
			5330.00

TAXA	FORM	69 29 74			7 16 74			09 16 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ANABENA	FIL						4			
ANALISTODESMUS FALCATUS	CEL	1	1	X						
APHAENIZOMENON FLUSS-AQUAC	FIL	1	1		2134.61		721	1194.31		6330
CHAETOCERUS ELIMOREI	CEL	1	1		151 1.21		27			
CHLOROPHYTAN FLAGELLATE	CEL	15137.51	1006							
CHLOROPHYTAN LUMATE CELL	CFL	1	15.31	609						
CHROMONAS ACUTA	CEL	141	6.91	186						
COCCEID CELLED COLONY	COL	1	1	6.91	186					
COCCEONIS	CEL	1	1							X
CRYPTOMONAS	CEL	130	4.21	112						
DACTYLOCOPCOPSIS IRREGULARIS	CEL	12119.51	521							
DINOFAGELLATE	CEL	1	1	X						
ENTOMONIS	CFL	1	1							
EUDORINA ELEGANS	COL	131	4.21	112						
EUGLENA	CFL			X						
GIGPHOSPHARIA	COL									
MICROCYSTIS AERUGINOSA	COL	1	1		141 2.51		53	121 3.61		245
MICROCYSTIS INCERTA	COL	1	1		3120.51		427			
MIVICULA	CFL			X						
MITZCHIA	CFL	1	1	1.41	37					
MITZCHIA CLOSTERIUM	CFL	1	1	1.41	37					
OCYSTIS	CFL	1	1							
OCYSTIS ERENUSPHARIA	CFL									
PACHERINA TETRAS	COL									
PECTASTIUM DUPLEX	COL	1	1	1.41	37					
V. CLATHRATUM	COL	1	1							
PHACUS	CFL									
PHAGIDIUM MUCICILLA	CFL	1	1							
RHOICOSPHERIA CURVATA	CFL	1	1		1.31		27			
SCHEDEDESmus INTERREDIUS	COL	1	1		1.31		27			
SCHEDEDERIA SETIGERA	CFL	1	1		X					
SPIRATULODOPSIS	CEL	1	1	1.41	37					
SPHAEROCYSTIS SCHNOETELII	COL	1	1							
STEPHANOBLISCUS ASTRAEA	CEL	1	1	X	1135.91		748	13 6.51		35
SURIRELLA	CEL	1	1	X			X			
SURIRELLA SVATA	CFL	1	1							
TRACHELCHUNAS VOLVOCINA	CFL	1	1	X						
TOTAL					2678		2184		6715	

LAKE NAME: JAMESTOWN RES.  
STORET NUMBER: 3806

NYGAARD TROPICNIC STATE INDICES

	DATE	04 26 74	07 17 74	09 17 74
MYXOPHYCEAN		1.50 E	07/0 E	1.67 E
CHLOROPHYCEAN		3.50 E	05/0 E	4.67 E
EUGLENOPHYTE		0.20 ?	0.17 ?	0.21 E
DIATOM		0.50 E	0.07 E	2.50 E
COMPOUND		7.50 E	16/0 E	9.33 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	04 26 74	07 17 74	09 17 74
GENUS		09	07	02
SPECIES		07	06	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	04 26 74	07 17 74	09 17 74
AVERAGE DIVERSITY	H	2.34	1.82	3.65
NUMBER OF TAXA	S	35.00	29.00	42.00
NUMBER OF SAMPLES	M	3.00	3.00	3.00
COMPOSITION	M	5.13	4.64	5.39
MAXIMUM DIVERSITY	MAX	0.04	0.05	0.18
MINIMUM DIVERSITY	MIN	0.04	0.05	0.18
TOTAL DIVERSITY	G	29540.16	11360.44	11001.10
TOTAL NUMBER OF INDIVIDUALS/ML	N	12624.00	6242.00	3014.00
EVENNESS COMPONENT	J	0.46	0.39	0.68
RELATIVE EVENNESS	RJ	0.46	0.39	0.67
MEAN NUMBER OF INDIVIDUALS/TAXA	L	360.69	249.66	71.76
NUMBER/ML OF MOST ABUNDANT TAXON	K	7179.00	4335.00	680.00

TAXA	FCRN	64 26 74			57 17 74			39 17 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ACTINASTHUM GRACILINUM	CEL			x						
ANABAENA	FIL							3.21	97	
ANKISTRIDIUM SNUSS FALCATUS	CEL							1.61	49	
V. ACICULARIS	CEL	151	5.0	631						
ANKISTRIDIUM SNUSS FALCATUS	CEL	141	5.0	631	141	0.5	33	211.31	340	
V. MIRABILIS	CEL	141	5.0	631						
APHAMIZUMON FLOWS-AQUAE	FIL									
CARTERIA	CEL									x
CERATIUM HIRUNDINELLA	CEL									
CHLAMYDOMONAS	CEL									
CHLOROPHYTAN COCCOID CELL	CEL									x
CHLOROPHYTAN CELLED COLONY	COL									x
CHLOROPHYTAN COLONY	COL									x
CHLOROCYCEUS	COL									x
CHLORONAS	CEL									
CHLORONAS ACUTA	CEL									x
CLISTERIUM 01	CEL			x						x
CLISTERIUM 02	CEL			x						x
CCELASTIUM MICROPORUM	CCL									x
CRUCIGENIA QUADRATA	CGL									x
CRUCIGENIA TETRAPELIA	CGL									x
CRYPTONAS	CEL									
CRYPTONAS IPOMA	CEL	21	7.5	947		2.1	133	116.11	486	
CRYPTONAS REFLEXA	CEL			x						
CYCLOCTELLA	CEL	1156.91	7179					3.21	97	
CYRATOPLEURA SOLEA	CEL			x						
CYST	CEL			x						x
DACTYLUCOCCOPSIS IRREGULARIS	CEL			x						x
DINGBATON SICIALE	CEL			x						x
DIPLOPSALIS ACUTA	CFL									
ENTOMONEIS URNATA	CEL									
EUDOMINA ELEGANS	CEL			x						
EUGLENA	CEL									
EUGLENA TRIPTERIS	CEL									x
FLAGELLATE 02	CEL									x
FRAGILARIA	CEL									x
GLENDODIUM OCULATUM	CEL	1.9		437						
GROMPHOSPHARIA LACUSIRIS	COL							3.21	97	
KIRCHNERIELLA	CEL									
KIRCHNERIELLA CONTORTA	CEL						x	3.21	97	
MALLCONAS ACAROIDES	CEL			x						x
MALLCONAS PSEUDOGROMATA	CEL			x						x
MELUSIRA GRANULATA	CEL			x	1169.41	4335				x
MELUSIRA GRANULATA	CEL			x						x
V. ANGSTISSIMA	CEL							1.61	49	
MELOSIRA VARIANS	CEL									x
PERISOPEDIA MINIMA	CGL									
PERISOPEDIA TENUISSIMA	CGL	0.6		79	1.1	67				
MICROCYSTIS	CCL									
MICROCYSTIS INCERTA	CCL							4.61	146	
MAVICULA	CEL									
MITZSCHIA	CEL			x						
OCYSTIS	CCL						x			
OSCILLATORIA	FIL			x						x
PANOGAMA RICIN	CGL			x						
PASCHERINA TETRAS	COL	3.0		79						x
PEDIASIUM BERYANUM	COL			x						x
PEDIASIUM DUPLEX	COL			x						x
PEDIASIUM DUPLEX	COL			x						x
V. CLATHRATOR	COL			x						
PERIDIUM ?	CEL			x						
PHACUS ACURINATUS	CEL			x						
V. ORZEPOLSKII	CEL			x				1.61	49	
PHACUS NEGALOPSIS	CEL			x						
PHACUS PSEUDOMORDREDIS	CEL			x						
PHAGIDIUM MUCICOLA	FIL					1.61	100			
RAPHIDIOPSIS	FIL			x	0.5	33				
RHYPALODIA GIBBA	CEL			x						x
SCENEDESmus BIJUGA	CGL			x						
SCENEDESmus CIRURPHUS	CGL	1.91		437	1.1	37		1.61	49	
SCENEDESmus INFERMIUS	COL			x				1.61	49	
SCENEDESmus QUADRICALDA	COL	3.61		79	1			1.61	49	
SCHROEDERIA SETIGERA	CEL			x	8.31	500		1.61	49	
STAUNASTRUM	CEL			x						x
STEPHANOGLISCUS NIAGAKAE	CEL			x	151	1.11	67			x
SURIRELLA 09	CEL			x						
SURIRELLA ANGUSTA	CEL			x						
SYNEDRA	CEL	1.3		158						x
TETRAEDEUM REGULARE	CEL			x						x
V. INCUS	CEL									
TETRASTRUM STAURUGENIALFORKE	COL									
TRACHELOMONAS	CEL									
TRACHELOMONAS INTERPEDIA ?	CEL							4.81	146	
TRACHELOMONAS VOLVOCIA	CEL			x						

TOTAL

12626

6242

3014

LAKE NAME: LAKE LAMOUR  
STOCKET NUMBER: 3807

NYGAARD TRIPHIC STATE INDICES

DATE 04 29 74 07 10 74 09 17 74

MYXOPHYCEAN	02/0 E	03/0 E	2.00 E
CHLOROPHYCEAN	07/0 E	02/0 E	1.00 E
EUGLENOPHYTE	0.11 ?	0.05 ?	0/03 ?
DIATOM	0.25 ?	0/0 ?	0/0 ?
COMPUND	11/0 E	05/0 E	3.00 E

PALMER'S ORGANIC POLLUTION INDICES

DATE 04 29 74 07 10 74 09 17 74

GENUS	10	07	00
SPECIES	05	03	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 04 29 74 07 10 74 09 17 74

AVERAGE DIVERSITY	H	2.38	1.79	0.41
NUMBER OF TAXA	S	20.00	9.00	8.00
NUMBER OF SAMPLES COMPOSITED	M	1.00	2.00	2.00
MAXIMUM DIVERSITY	MAXH	4.32	3.17	3.00
MINIMUM DIVERSITY	MINH	1.02	0.04	0.03
TOTAL DIVERSITY	D	28100.00	5076.44	1055.34
TOTAL NUMBER OF INDIVIDUALS/ML	N	11807.00	2836.00	2574.00
EVENNESS COMPONENT	J	0.55	0.56	0.14
RELATIVE EVENNESS	RJ	0.55	0.56	0.13
MEAN NUMBER OF INDIVIDUALS/TAXA	L	590.35	315.11	321.75
NUMBER/ML OF MOST ABUNDANT TAXON	K	5208.00	1772.00	2402.00

TAXA	FCGR	04 29 74			07 10 74			09 17 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ACTINASTHUM GRACILIMUM	COL	1	1	0.21	22	1	1	1	1	1
ANABAENA FLOS-AQUAE	FIL	1	1		141	3.08	121	1	1	1
ANISTRUDERUS FALCATUS	CEL	1	1			1.81	51	1	1	1
ANISTRUDERUS FALCATUS	CEL	1	1	12121.7	2559	1	1	1	1	1
V. ACICULARIS	CEL	1	1					1	1	1
ANISTRUDERUS FALCATUS	CEL	1	1					1	1	1
V. MIRABILIS	CEL	1	1					1	1	1
APHAENIZIUM NON FLOS-AQUAE	FIL	1	1		12112.51	354	1193.31	2402	1	1
ASTERIONELLA FORMOSA	CEL	1	1	3.0	359	1	1	1	1	1
V. GRALLIPPA	CEL	1	1	7.21	853	1	1	131	9.01	129
CHACONIAS ACUTA	CEL	1	1					1	1	1
CHACONIAS REFLEXA	CEL	1	1					1	1	1
CLADSTERIUM	CEL	1	1					1	1	1
CRYPTOMONAS BI	CEL	1	1					121	1.71	43
CRYPTOMONAS EROSA	CEL	1	1	4.61	539	1	1	1	1	1
CRYPTOMONAS PARSSUNII	CEL	1	1					1	1	1
CRYPTOMONAS REFLEXA	CEL	1	1	0.21	22	1	1	141	14.51	465
CYCLOSTELLA RENEGHINIAYA	CFL	1	1	1144.11	5608	1	1	1	1	1
DICTYOSPHELIUM PULCHELLUM	COL	1	1	0.61	67	1	1	1	1	1
JINDERTON SCOCIALE	CEL	1	1	0.41	45	1	1	1	1	1
GLECHMIUM ECULAIOR	CEL	1	1			1	1	1	1	1
LYNGBYA	FIL	1	1	3.41	404	1	1	1	1	1
MALLEPPIAS	CEL	1	1			1.81	51	1	1	1
MICROCYSTIS AERUGINOSA	CEL	1	1					1	1	1
MITZSCHIA	CEL	1	1					1	1	1
OCELLATUMIA	FIL	1	1	0.81	90	1	1	51	1	1
PHODOMYIAS MINUTA ?	CEL	1	1		13162.51	1772	1	1	1	1
SCENEDESMUS LINOPHUS	CEL	1	1		1	1	1	1	1	1
SCENEDESMUS GLADICAUJA	COL	1	1		1	1	1	1	1	1
SCHREUERIA SETIGERA	CEL	1	1				1	1	1	1
SYNECHIA ACUS	CEL	1	1	3813.51	1594	1	1	1	1	1
SYNECHIA ULNA	CIL	1	1		1	1	1	1	1	1
TETRASTRUM STAUROGENTAEFORME	COL	1	1	0.41	45	1	1	1	1	1
TRACHELUMONAS VOLVOCINA	CEL	1	1		1	1	1	1	1	1
VULVOX ANIMERICIAL PACKET	COL	1	1	1	191	1.81	51	1	1	1
TOTAL					11807		2836		2974	

LAKE NAME: MATEJICK LAKE  
STORET NUMBER: 3868

NYGAARD TROPHIC STATE INDICES

DATE	04 29 74	07 16 74	09 16 74
MYXOPHYCEAN	01/0 E	03/0 E	02/0 E
CHLOROPHYCEAN	32/0 E	04/0 E	3/0 O
EUGLENOPHYTE	0.67 E	0.29 L	0.50 E
DIATOM	0.33 E	0.25 ?	0.50 E
COMPOUND	66/0 E	19/0 E	04/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 29 74	07 16 74	09 16 74
GENUS	04	00	00
SPECIES	30	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 29 74	07 16 74	09 16 74
AVERAGE DIVERSITY	H	1.79	1.61
NUMBER OF TAXA	S	13.00	16.00
NUMBER OF SAMPLES COMPOSITED	M	2.30	2.00
MAXIMUM DIVERSITY MAXM	MAXM	3.70	4.00
MINIMUM DIVERSITY MINM	MINM	0.41	1.92
TOTAL DIVERSITY	D	449.41	86.94
TOTAL NUMBER OF INDIVIDUALS/ML	N	279.00	54.00
EVENNESS COMPONENT	J	0.48	0.40
RELATIVE EVENNESS	RJ	0.42	-0.14
MEAN NUMBER OF INDIVIDUALS/TAXA	L	21.46	3.38
NUMBER/ML OF MOST ABUNDANT TAXON	K	116.00	18.00
			135.00

TAXA	FORM	04 29 74			07 16 74			09 16 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ANGEALINA	FIL	1	1				X	1	1	X
ANKISTRODESMUS	CEL	141	8.71	23						
APHANIZOMENON FLAG-AQUAE	FIL	1	1		12133.31		18	11125.11		68
CHLAMYDOMONAS GLUBOSA	CFL	12133.31		93						
CRYPTOMONAS	CFL	11141.61		116				12125.11		68
CRYPTOMONAS ROSA	CEL						X			
CYCLOTELLA PENEGRINIANA	CFL									
CYTOGLPLEURA SOLLA	CEL						X			
CYTBELLA TRIANGULUM ?	CEL						X			
EUDORINA ELEGANS	CEL						X			
EUGLENA	CEL									
EUGLENA TRIPTERIS ?	CEL						X			
FLAGELLATE	CEL									
GYMNOCIUM	CEL	13116.81		47				13149.81		135
GYMNOCIUM ALBULUM	CEL						X			
GYROSIGRA ?	CEL						X			
NAVICULA	CEL						X			
NAVICULA #1	CEL						X			
NAVICULA #2	CEL						X			
NITZSCHIA #1	CEL						X			
NITZSCHIA #2	CEL						X			
OSCILLATORIA #1	FIL						X			
OSCILLATORIA #2	FIL						X			
PHACUS LAUDATIS	CEL						X			
SCENEDESmus BIJUGA	CUL			13133.31			18			
SCENEDESmus DELICIOSUS	CGL			X						
SCHROEDERIA SETIFERA	CEL						X			
SPHAEROCYSTIS SCHREUTERI	COL			11133.31			18			
STEPHANODISCUS NIAGARAE	CEL						X			
TETRAEDRUM ?	CEL						X			
TRACHELLOMONAS	CEL						X			
TRACHELLOMONAS INTERMEDIA	CEL			X						
TOTAL				279			54			271

LAKE NAME: LAKE METIGOSHE  
STORET NUMBER: 3809

NYGAARD TROPHIC STATE INDICES

DATE 07 17 74 09 13 74

MYXOPHYCEAN	03/0 E	04/0 E
CHLOROPHYCEAN	08/0 E	04/0 E
EUGLENOPHYTE	0.27 E	0/08 ?
DIATOM	0.25 ?	0.50 E
COMPOUND	16/0 E	16/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE 07 17 74 09 13 74

GENUS	64	67
SPECIES	00	04

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 07 17 74 09 13 74

AVERAGE DIVERSITY	M	3.44	3.42
NUMBER OF TAXA	S	34.00	17.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00
MAXIMUM DIVERSITY MAXH	H	5.09	4.09
MINIMUM DIVERSITY MINH	H	0.22	0.10
TOTAL DIVERSITY	D	5709.12	7117.02
TOTAL NUMBER OF INDIVIDUALS/ML	N	1878.00	2081.00
EVENNESS COMPONENT	J	0.64	0.84
RELATIVE EVENNESS	RJ	0.58	0.84
MEAN NUMBER OF INDIVIDUALS/TAXA	L	55.24	122.41
NUMBER/ML OF MOST ABUNDANT TAXON	K	797.00	489.00

07 17 74      54 13 /4

TAXA	FORM	ALGAL UNITS			ALGAL UNITS		
		IS	SC	PER AL	IS	SC	PER AL
ANABAENA	FIL	151	3.51	69	131	4.41	92
ANKistrodesmus FALCATUS	CEL	1	1	1	1	1	1
APHAENIDIACE	COL	1	1	1	1	1	1
CENTRIC DIATOM	CEL	1	4.61	86			X
CHROOPOMAS ACUTA	CEL	131	6.91	129	111	3	214
COCconeis PLACENTULA	CEL	1	1	1	1	1	1
COCconeis PLACENTULA V. ?	CEL	1	1	1	1	1	1
CRUCIGENIA	COL	1	1.21	22			
CRYPTOMONAS EROSA	CEL	111	13.71	258	111	11.81	265
DINUBRYON DIVEPGEMIS	CEL	1	1	1	1	1	1
DINUBRYON SUCIALE	CEL	1	1	1	1	1	1
DINUBRYON SUCIALE V. AMERICANUM	CEL	1	1	1	1	1	1
DINUBRYON SPP.	CEL	1	4.61	86			
LUGLENA	CEL	1	1.21	22			
EUGLENA #1	CEL	1	1	1	1	1	1
FLAGELLATE #2	CEL	141	5.81	108			
FRAGILARIA	CEL	1	1	1	1	1	1
FRAGILARIA CRATONENSIS	CEL	121	42.41	797	151	5.91	122
GOMPHUNERA	CEL	1	1	1	1	1	1
MALLORUMAS #2	CEL	1	1	1	1	1	1
MALLORUMAS CAUDATA	CEL	1	1	1	1	1	1
MALLOMONAS SPP.	CEL	1	1.21	22			
MELOSINA	CEL	1	1	1	1	1	1
MELOSIRA GRANULATA	CEL	1	1	1	1	1	1
PERISPUPELIA MINIMA	CEL	1	1	1	1	1	1
PERIOPEDIA TENUISSIMA	COL	1	1.21	22			
NICHOYSTIS #3	COL	1	1	1	121	43.41	489
NAVICULA	CEL	1	1	1	1	1	1
NAVICULA #2	CEL	1	1.21	22			
NETZSCHIA	CEL	1	1	1	1	1	1
OXYSTIS #1	CEL	1	1	1	1	1	1
OXYSTIS BORGII	CEL	1	1.21	22			
PERIDINUM INCUNSPICUM	CEL	1	1	1	1	1	1
PHACUS PEGALOPSIS	CEL	1	1.21	22			
PHALARIOILIA	FIL	1	1	1	1	1	1
SCENECESMUS ABUNDANS	COL	1	1	1	1	1	1
SCENECESMUS BIJUGA	COL	1	5.81	106	1	5.91	122
SCENECESMUS QUADRICAUVA	COL	1	1	1	1	1	1
SYNECRA	CEL	1	2.31	43	1	1.51	31
TETRAEDRUM MINIMUM	CEL	1	1.21	22			
TETRAEDRUM MINIMUM V. SCRUGGICULATUM	CEL	1	1	1	111	11.81	265
TETRAEDRUM TRIGONUM	CEL	1	1.21	22	1	1	1

TOTAL

1678

2681

LAKE NAME: PELICAN LAKE  
STORED NUMBER: 3811

NYGAARD TROPHIC STATE INDICES

DATE 07 17 74 09 13 74

MYXOPHYCEAN	2.00 E	9.00 E
CHLOROPHYCEAN	2.50 E	5.00 E
EUGLENOPHYTE	0.22 E	0.07 ?
DIATOM	0.33 E	0.29 ?
COMPOUND	6.00 E	17.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE 07 17 74 09 13 74

GENUS	56	CZ
SPECIES	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 07 17 74 09 13 74

AVERAGE DIVERSITY	H	1.80	1.77
NUMBER OF TAXA	S	21.00	32.00
NUMBER OF SAMPLES COMPOSITED	M	1.00	1.00
MAXIMUM DIVERSITY MAXH		4.39	5.00
MINIMUM DIVERSITY MINH		0.14	0.11
TOTAL DIVERSITY	D	3033.00	6495.90
TOTAL NUMBER OF INDIVIDUALS/ML	N	1665.00	3670.00
EVENNESS COMPONENT	J	0.41	0.35
RELATIVE EVENNESS	RJ	0.40	0.34
MEAN NUMBER OF INDIVIDUALS/TAXA	L	60.24	114.69
NUMBER/ML OF MOST ABUNDANT TAXON	K	883.00	2526.00

67 17 74      69 13 74

TAXA	FORM	ALGAL			ALGAL		
		IS	ZC	PER ML	IS	ZC	PER ML
ANABAENA	FIL			X		2.81	104
APHAENIZIUM NON FLAG-AQUAE	FIL			X	121	4.71	173
ASTERIONELLA FURNUSA	CEL			X			X
CERATIUM MIKUNIDINELLA	CEL			X			X
CHROOCOCCUS DISPESSUS	COL						X
CHROOMONAS	CEL					1.11	35
CLADOSTRUM	CEL			X			
COCCONEIS	CEL						X
CYLLOSPHAERIUM KUETZINGIANUM	COL				141	2.61	104
CRYPTOMONAS MARSGNI	CEL	3119.11	321		1	2.61	104
DACTYLOCYCOPSIS IRREGULARIS	CEL						X
FRAGILARIA	CEL						X
FRAGILARIA CHOTONIENSIS	CEL	1152.41	603	1166.41	2526		
GLOEOSTRYSIS	CEL			X			
GLOEOSTRYSIS GIGAS	COL						X
GOMPHOSPHAERIA APENNINA ?	COL						X
GYROSIGMA ?	CEL						X
MALLOPUNAS ACAROIDES	CEL						X
MALLOPUNAS PSALUGOCORUMATA ?	CEL						X
PELUSIA GRANULATA	CEL				131	2.81	104
PICOCTYSIS AERUGINOSA	CCL					1.11	35
PICOCTYSIS INCERTA	COL	141	7.11	120	15111.31	415	
NITZSCHIA	CIL	191	2.41	40			
OCYSTIS	COL			X		1.11	35
OSCILLATORIA	FIL	12119.11	321		1.11		35
PEDIASTRUM ECTYANUM	COL			X			X
PEDIASTRUM DUPLEX	COL			X			X
PEDIASTRUM TEIRAS	COL						X
PENNATE DIATOM	CEL						X
PERIDINIUM VILLEI ?	CEL			X			
PHACUS PLEURONECTES	CEL			X			
SCENEDESMUS BIJUGA	COL			X			
SCENEDESMUS QUADRICAUDA	COL			X			X
SCHROEDERIA SETIGERA	CEL			X			
SPIKOGYRA	CEL						X
STAURASTRUM	CEL			X			X
STEPHANODISCUS ASTRAEA	CEL			X			X
SYNEDRA ULNA	CEL			X			X
TETRAEDRUM MINIMUM	CEL			X			
V. SCRUBICULATUM	CEL			X			X
TRACHELUMONAS VOLVOCINA	CEL			X			X
TOTAL					1069		3670

LAKE NAME: SAMAKAWEA  
STURET NUMBER: 3812

NYGAARD TROPHIC STATE INDICES

	DATE	04 30 74	07 18 74	09 17 74
MIXOPHYCEAN		01/0 E	04/0 E	02/0 E
CHLOROPHYCEAN		04/0 E	02/0 E	03/0 E
EUGLENOPHYTE		0.60 E	0.33 E	0.20 ?
DIATOM		0.33 E	0.43 E	0.80 E
COMPOUND		12/0 E	11/0 E	10/0 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	04 30 74	07 18 74	09 17 74
GENUS		13	18	36
SPECIES		04	55	30

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	04 30 74	07 18 74	09 17 74
AVERAGE DIVERSITY	H	3.36	2.77	2.56
NUMBER OF TAXA	S	29.00	21.00	18.00
NUMBER OF SAMPLES COMPOSITED	M	9.00	11.00	10.00
MAXIMUM DIVERSITY MAXH		4.86	4.39	4.17
MINIMUM DIVERSITY MINH		0.12	0.17	0.11
TOTAL DIVERSITY	D	9173.88	3963.87	4851.92
TOTAL NUMBER OF INDIVIDUALS/ML	N	2998.00	1431.00	1907.00
EVENNESS COMPONENT	J	0.63	0.63	0.61
RELATIVE EVENNESS	RJ	0.63	0.64	0.61
MEAN NUMBER OF INDIVIDUALS/TAXA	L	103.38	68.14	105.94
NUMBER/ML OF MOST ABUNDANT TAXON	K	785.00	376.00	786.00

LAKE NAME: SAKAKAVA  
STREET NUMBER: 3812

CONTINUED

TAXA	FORM	4 30 74			5 7 74			5 9 17 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ACTINASIRUR	CEL									X
ANABAENA	FIL									
ASTERIONELLA FORMOSA	CEL	0.3		250		2.7	38			X
CENTRIC DIATOM	CEL				139.21	...	301			
CENTRIC DIATORS	CEL	4.6		143						
CHAMOECUCUS	COL									
COCCOMEIS PEUICULUS	CEL			X						
COSCIMODISCUS LACUSTRIS	COL					2.7	38			X
CRUCIGENIA TETRAPEDIA	COL									
CRYPTODOMAS	CEL									
CRYPTODOMAS EADSA	CEL		5.91	178						
CRYPTODOMAS PEFLEA	CEL			X		141	2.7	38		
CYCLOTELLA PENICILLINIANA	CEL			X						
CYRATOPLEURA ? SOLEA	CEL						X			
CYBELLIA	CEL			X						
DACTYLOCUCOPSIS IRREGULARIS	CEL			X		2.7	38			
DIATOMA VULGARE	CEL			X						
EUDORINA ELEGANS	CEL			X						
EUGLENA	CEL			X						
EUGLENA #1	CEL	121	3.6	107						
FLAGELLATE	CEL	141	26.2	785						
FLAGELLATE #1	CEL					5.2	75			
FLAGELLATES	CEL									
GLENODIUM GYMNOLINIUM	CEL			1						
GLENOCINIUM OCULATUM	CEL		1.4	36						
GONPMONEMA	COL		2.4	71						
GYROSIGMA ?	CEL			X						
GYROSIGMA HERNLEYE	CEL						X			
HARTZSCHIA	CEL			X						
LUMATE CELL	CEL									
MELOSIRA #4	CEL				121	26.38	376			1.91
MELOSIRA DISTANS	CEL									X
MELOSIRA GRANULATA										
V. ANGUSTISSIMA	CEL									
NAVICILLA	CEL			X		2.7	38			
NAVICULA VIRIDULA										
V. AVENACEA	CEL	131	4.8	143						
NITZSCHIA	CEL			X						
NITZSCHIA #1	CEL						X			
NITZSCHIA #2	CEL						X			
OOCYSTIS BORGII	CEL						X			
OSCILLATORIA ?	FIL			X						
OSCILLATORIA AGARDHII	FIL									
OSCILLATORIA AMPHIBIA	FIL				191	5.2	75			1117.71
PEDIASTRUM KORTANUM	COL			1						
PENNATE DIATORS	CEL	10.7		321						9.9
PHACUS	CEL	1.2		36						1.91
PHACUS PSEUDONORDSTEDTII	CEL									
PHACUS PYRUM	CEL					2.7	38			
SCENEDESmus BIJUGA	COL			X						
SCENEDESmus DIPORPHUS	COL			X						
SCENEDESmus QUADRICAUDA	COL	2.4		71						
SCHROEDERIA SETIGERA	CEL									
STEPHANOIDSUS	CEL									
STEPHANOIDSUS #1	CEL	1	29.0	750						
STEPHANOIDSUS #2	CEL	151	3.6	107						
STEPHANOIDSUS ASIRAEA	CEL						X			
SUBIRELLA	CEL			X						
SYNEURA	CEL				11126.31		376			
SYNEURA ACUS	CEL									X
SYNEURA DELICAFISSIMA	CEL									X
TOTAL					2998		1431			1907

LAKE NAME: SPIRIT WOOD LAKE  
STORE NUMBER: 3813

NYGAARD TROPHIC STATE INDICES

DATE 04 26 74 07 17 74 09 17 74

MYXOPHYCEAN	02/0 E	04/0 E	03/0 E
CHLOROPHYCEAN	0/0 0	0/0 0	0/0 0
EUGLENOPHYTE	0/L2 ?	0/04 ?	0/03 ?
DIATOM	0.50 E	0/0 ?	1.00 E
COMPGUND	04/0 E	04/0 E	04/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE 04 26 74 07 17 74 09 17 74

GENUS	13	01	01
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 04 26 74 07 17 74 09 17 74

AVERAGE DIVERSITY	H	2.05	0.15	2.16
NUMBER OF TAXA	S	14.00	4.00	7.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00	2.00
MAXIMUM DIVERSITY MAXM		3.81	2.00	2.81
MINIMUM DIVERSITY MINM		0.03	0.00	0.07
TOTAL DIVERSITY	D	14313.10	1967.05	1974.00
TOTAL NUMBER OF INDIVIDUALS/ML	N	6982.00	10447.00	940.00
EVENNESS COMPONENT	J	0.54	0.08	0.75
RELATIVE EVENNESS	RJ	0.54	0.08	0.75
MEAN NUMBER OF INDIVIDUALS/TAXA	L	496.71	2611.75	134.29
NUMBER/ML OF MOST ABUNDANT TAXON	K	3738.00	10245.00	376.00

LAKE NAME: SPIRITWOOD LAKE  
STORE NUMBER: 3813

CONTINUED

TAXA	FURN	04 26 74			07 17 74			09 17 74		
		IS	ZC	PER ML	IS	ZC	PER ML	IS	ZC	PER ML
APHANIZOMENON FLOS-AQUAE	FIL	1	1		11198.11	10245	12112.01	113		
CHLANTOMUNAS	CEL	11153.51	3736							
CHLOROGONIUM	CEL	1	1	0.51	35					
CHLOROPHYTAN COLONY	COL	1	1	1.01	71					
CHRODORNAS ACUTA	CEL	131	5.11	393				19190.01	376	
COCCONEIS	CEL	1	1						x	
CRYPTOMONAS	CEL	121	2.01	141				14116.01	150	
DACTYLUOCCOPSIS	CEL	1	1	2.51	176					
FLAGELLATE #2	CEL	151	2.51	176						
FRAGILARIA	CEL	1	1	2.01	141					
LYNGBYA	FIL	1	1		131	0.41	40			
LYNGBYA BIRGEI	FIL	1	1						x	
MELOSIRA DISTANS	CEL	14126.81	1869							
MICROCYSTIS AERUGINOSA	COL	1	1		121	1.61	162	131	8.01	75
NAVICULA	CEL	1	1	0.51	35					
NETZSCHIA	CEL	1	1	1.51	106					
OSCILLATORIA	FIL	1	1	2.01	141					
PHORMIDIUM MUCICOLA	FIL	1	1					x		
STEPHANODISCUS ASTRAEA	CEL	1	1		x					
STEPHANODISCUS NIAGARAE ?	CEL	1	1					11124.01	226	
SURIRELLA	CEL	1	1		x					
TOTAL				6482			1,447		940	

LAKE NAME: SWEET BRIAR RES.  
STORET NUMBER: 3814

NYGAARD TROPHIC STATE INDICES

DATE	04 30 74	07 16 74	09 17 74
MYXOPHYCEAN	02/0 E	04/0 E	05/0 E
CHLOROPHYCEAN	0/0 0	0/0 E	0/0 E
EUGLENOPHYTE	0/02 ?	0/05 ?	0/06 ?
DIATOM	0/03 ?	0/01 ?	0/0 ?
COMPOUND	02/0 E	05/0 E	06/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 30 74	07 16 74	09 17 74
GENUS	00	02	00
SPECIES	00	C3	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 30 74	07 16 74	09 17 74
AVERAGE DIVERSITY	H	2.81	1.12
NUMBER OF TAXA	S	7.00	9.00
NUMBER OF SAMPLES COMPOSITED	R	1.00	2.00
MAXIMUM DIVERSITY	MAXH	2.81	3.17
MINIMUM DIVERSITY	MINH	0.03	0.02
TOTAL DIVERSITY	D	0.03	4935.84
TOTAL NUMBER OF INDIVIDUALS/ML	N	0.00	4407.00
EVENNESS COMPONENT	J	1.00	0.35
RELATIVE EVENNESS	RJ	0.54	0.35
MEAN NUMBER OF INDIVIDUALS/TAXA	L	0.00	614.50
NUMBER/ML OF MOST ABUNDANT TAXON	K	0.01	3415.00

LAKE NAME: SWEET BRIAR RES.  
STONET NUMBER: 3814

CONTINUED

TAXA	FORM	64 30 74			07 16 74			09 17 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ANABAENA	FIL	1	1		1	1	4	1	1	
ANKistrodesmus falcatus	CEL	1	1	151 1.01	79	1				
APHAENIDOMENUM FLOS-AQUAE	FIL	1	1	1177.51	3415	12181.31	3997			
ASPERIONELLA FORMUSA										
V. GRACILLIMA	CEL	1	1	x	1	1		1	1	
CHNUOCOCCUS	COL	1	1	x	1	1		1	1	
CHNUOPHORAS ACUTA	CEL	1	1	x	1312.61	596	14115.01	735		
COLLOSPHAERIUM MAEGElianum	COL	1	1		1	1		131 0.91	40	
CRYPTOGRANAS EROSA	CEL	1	1		141 1.81	29				
CRYPTOGRANAS PARSSUNII	CEL	1	1	x	121 0.31	278				
DACTYLOCOCCOPSIS	CEL	1	1	x						
GLOEDTRICHIA ECHINULATA	COL	1	1					111 1.41	92	
GOMPSOPHAEIRIA	COL	1	1					x		
MICROCYSTIS AERUGINOSA	COL	1	1					x		
NAVICULA	CEL	1	1	x				x		
NITZSCHIA FILIFORMIS	CEL	1	1	x				x		
PENNATE DIATOM	CEL	1	1					x		
PHENIDIUM PUCICOLA	FIL	1	1							
SCHLIEPERIA SETIGERA	CEL	1	1					151 0.91	46	
TOTAL					6		4407		4916	

LAKE NAME: WHITMAN LAKE  
STORET NUMBER: 3815

NYGAARD TROPHIC STATE INDICES

DATE	04 27 74	J7 16 74	19 16 74
MICROPHYCEAN	4.00 E	4.00 E	7.00 E
CHLOROPHYCEAN	3.00 E	6.00 E	5.00 E
EUGLENOPHYTE	0.43 E	0.30 E	0/12 ?
DIATOM	1.00 E	0.75 E	2.00 E
COMPOUND	12.0 E	16.0 E	14.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 27 74	07 16 74	09 16 74
GENUS	13	01	02
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04 27 74	07 16 74	19 16 74
AVERAGE DIVERSITY	H	3.02	3.03
NUMBER OF TAXA	S	21.00	28.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00
MAXIMUM DIVERSITY	MAXH	4.39	4.81
MINIMUM DIVERSITY	MINH	0.30	0.02
TOTAL DIVERSITY	D	2222.72	12960.00
TOTAL NUMBER OF INDIVIDUALS/ML	N	736.00	4320.00
EVENNESS COMPONENT	J	0.69	0.62
RELATIVE EVENNESS	RJ	0.67	0.62
MEAN NUMBER OF INDIVIDUALS/TAXA	L	35.05	154.29
NUMBER/ML OF MOST ABUNDANT TAXON	K	163.00	1006.00
			9542.00

TAXA	FORM	'6 27 74			'7 16 74			'0 16 74		
		IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML	IS	ZC	ALGAL UNITS PER ML
ACTINASTRUM	CEL									
ACTINASTRUM GRACILIRUM	COL		5.61	41						
ANABAENA #1	FIL				1123.31		1006			
ANABAENA #2	FIL							121	5.21	585
ANASTRODESMUS FALCATUS	CEL									
V. MIRABILIS	CEL			x						
APHAENONEON FLOS-AQUAE	FIL			x	12121.41		931		11104.01	9542
CHLAMYDOMONAS GLOBOSA	CEL	12122.11	163							
CHLOROPHYTAN FLAGELLATE	CEL				1516.91		298			
CHLOROPUNAS ACUTA	CEL				1512.11		522		1.51	176
CLOSTERIUM	CEL			x						
CUELA STRUM	COL				1510.91		37			
COELOSPHAERIUM NAEGELIANUM	COL				13118.11		782		131	1.01
CRYPTOMONAS	CEL									x
CRYPTOMONAS MARSSONII	CEL	13116.61	122							
DACTYLOCUCOPSIS FASCICULARIS	CEL								1.51	176
SCHIZOSPHELIUM PULCHELLUM	COL						x			x
DIPLOPSALIS ACUTA	CEL				1510.91		37			
ENTOMONEIS	CEL			x			x			
ENTOMONEIS ALATA	CEL									
EUGRINA ELEGANS	CEL			x						
EUGLENA	CEL		5.61	41						
EUGLENA GRACILIS	CEL			x						
GLENOGYTTRUM UCLULATUM	CEL			x						
LEPCCINCLIS	CEL				1510.91		37			
MALLUNOMAS	CEL				1510.91		37			
MELOSIRA GRANULATA	CEL				1510.91		37			
MELOSIRA GRANULATA	COL				1510.91		37			
V. ANGSTISSIMA	CEL						x			x
PERISAPEDIA MINIMA	COL							0.51		59
PERISAPEDIA TENUISSIMA	COL		5.61	41						
MICROCYTIS AEPUGINOSA	COL			x						
MICROCYTIS INCERTA	COL			x						
NAVICULA #1	CEL				1510.91		37			
NAVICULA #2	CEL				1510.91		37			
NITZSCHIA	CEL				1510.91		37			
NITZSCHIA #1	CEL				1510.91		37			
NITZSCHIA #2	CEL				1510.91		37			
OOCYSTIS	CEL				1510.91		37		3.61	410
OSCILLATORIA	FIL				1510.91		37			
PANDORINA MORUM	COL			x						
PEDIASTRUM DUPLEX	CEL				1510.91		37			
V. CLATHRATUM	CEL				1510.91		37			
PHORMIUM MUCICOLA	CUL				1510.91		37		0.51	59
PHODICSPHENIA CURVATA	CEL				1510.91		37			
SCHROEDERIA SETIGERA	CEL			x						
STAURASTRUM TETRACIRUM	CEL			x						
STEPHANO DISCUS	CEL				1510.91		37		1.51	176
STEPHANO DISCUS ASTREA	CEL				1510.91		37			
STEPHANO DISCUS NIAGARAE	CEL				1510.91		37			
SURIRELLA #9	CEL				1510.91		37			
TETRAEDRUM ?	CEL				1510.91		37			
TETRASTRUM STAUROGENTIALESCENS	COL				1510.91		37			
TRACHELOMONAS	CEL				1510.91		37			
TRACHELOMONAS INTERRMEDIA	CEL			x						
TRACHELOMONAS SPP.	CEL			x						
TRACHELOMONAS VOLVOCINA	CEL			x						
TOTAL					736		4320		11350	