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September 1977

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DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES

Environmental Monitoring and Support Laboratory
Office of Research and Development
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Las Vegas, Nevada 89114

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DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES

by

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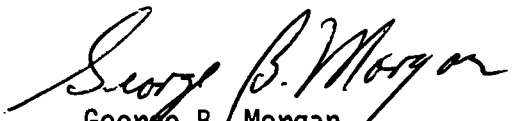
FOREWORD

Protection of the environment requires effective regulatory actions which are based on sound technical and scientific information. This information must include the quantitative description and linking of pollutant sources, transport mechanisms, interactions, and resulting effects on man and his environment. Because of the complexities involved, assessment of specific pollutants in the environment requires a total systems approach which transcends the media of air, water, and land. The Environmental Monitoring and Support Laboratory-Las Vegas contributes to the formation and enhancement of a sound integrated monitoring data base through multidisciplinary, multimedia programs designed to:

- develop and optimize systems and strategies for monitoring pollutants and their impact on the environment
- demonstrate new monitoring systems and technologies by applying them to fulfill special monitoring needs of the Agency's operating programs

This report presents the species and abundance of phytoplankton in the 8 lakes sampled by the National Eutrophication Survey in the State of Virginia, along with results from the calculation of several commonly used biological indices of water quality and community structure. These data can be used to biologically characterize the study lakes, and as baseline data for future investigations. This report was written for use by Federal, State, and local governmental agencies concerned with water quality analysis, monitoring, and/or regulation. Private industry and individuals similarly involved with the biological aspects of water quality will find the document useful. For further information contact the Water and Land Quality Branch, Monitoring Operations Division.



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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 1973, the Survey sampled 250 lakes in 17 States. Over 700 algal species and varieties were identified and enumerated from the 743 water samples examined.

This report presents the species and abundance of phytoplankton in the 8 lakes sampled in the State of Virginia (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 VIRGINIA

STORET No.	Lake Name	County
5103	Claytor Lake	Pulaski
5105	John W. Flannagan Dam	Dickenson
5106	John H. Kerr Reservoir (Buggs Island Lake)	Mecklenburg, Halifax (Granville, Vance, Warren in NC)
5108	Occoquan Reservoir	Fauquier
5110	Smith Mountain Lake	Bedford, Franklin
5111	Lake Chesdin	Dinwiddie
5112	Chickahominy Lake	New Kent, Charles City
5113	Rivanna (South Fork) Reservoir	Albemarle

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

Four milliliters (ml) of Acid-Lugol's sollution (Prescott 1970) were added to each 130-ml sample from each site at the time of collection for preservation. 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 drop of superconcentrate from the bottom of the test tube was placed in a ring of clear Karo® Corn Syrup with phenol (a few crystals of phenol were added to each 100 ml of syrup) on a glass slide, 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 U.S. Environmental Protection Agency's 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

Internal quality control checks on species identifications and counts were performed on a regular basis between project phycologists at the rate of 7 percent. 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

The Appendix summarizes all of the phytoplankton data collected from the State by the Survey. It is organized by lake, including 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 the Appendix. A question mark (?) was entered in these tables when the calculated 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 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.

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

Index	Calculation	Oligotrophic	Eutrophic
Myxophycean	$\frac{\text{Myxophyceae}}{\text{Desmideae}}$	0.0-0.4	0.1-3.0
Chlorophycean	$\frac{\text{Chlorococcales}}{}$	0.0-0.7	0.2-9.0
Diatom	$\frac{\text{Centric Diatoms}}{\text{Pennate Diatoms}}$	0.0-0.3	0.0-1.75
Euglenophyte	$\frac{\text{Euglenophyta}}{\text{Myxophyceae + Chlorococcales}}$	0.0-0.2	0.0-1.0
Compound	$\frac{\text{Myxophyceae + Chlorococcales + Centric Diatoms + Euglenophyta}}{\text{Desmideae}}$	0.0-1.0	1.2-25

TABLE 3. ALGAL GENUS POLLUTION INDEX (Palmer 1969)

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

TABLE 4. ALGAL SPECIES POLLUTION INDEX (Palmer 1969)

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

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 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 ith taxon in the sample, which is calculated from n_i/N; n_i is the number of individuals per milliliter of the ith 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, which 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 a 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 $\log_2 S$, the total diversity (D) was calculated from HN, and the evenness component of diversity (J) was estimated from H/MaxH (Pielou 1966). Also given in the Appendix 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).

Zand (1976) suggests that diversity indices be expressed in units of "sits", 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 sits 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 species. Since MaxH equals log S, the expression in sits is equal to $\log_S S$, or 1. Therefore diversity in sits 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 the Appendix, 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 the presence of the species on that date in such a low concentration that it did not show up 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. 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, EUNOTIA ?, FLAGELLATE, FLAGELLATES, MICROSYSTIS 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: CLAYTOP LAKE
STORET NUMBER: 5103

NYGAARD TROPHIC STATE INDICES

DATE	07 16 73	09 27 73
MYXOPHYCEAN	0.80 E	3.00 E
CHLOROPHYCEAN	3.80 E	4.00 E
EUGLENOPHYTE	0.04 ?	0.07 ?
DIATOM	0.33 E	0.15 ?
COMPOUND	5.40 E	8.50 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 16 73	09 27 73
GENUS	14	02
SPECIES	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 16 73	09 27 73
AVERAGE DIVERSITY	H	3.44	3.06
NUMBER OF TAXA	S	43.00	37.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00
MAXIMUM DIVERSITY	MAXH	5.43	5.21
TOTAL DIVERSITY	D	6216.08	5829.30
TOTAL NUMBER OF INDIVIDUALS/ML	N	1807.00	1905.00
EVENESS COMPONENT	J	0.63	0.59
MEAN NUMBER OF INDIVIDUALS/TAXA	L	42.02	51.49
NUMBER/ML OF MOST ABUNDANT TAXON	K	490.00	545.00

LAKE NAME: CLAYTOR LAKE
STORET NUMBER: 5103

CONTINUED

TAXA	FORM	07 16 73 S	07 16 73 %C	07 16 73 ALGAL UNITS PER ML	09 27 73 S	09 27 73 %C	09 27 73 ALGAL UNITS PER ML
ACHNANTHES	CEL						X
ACHNANTHES LANCEOLATA V. DUBIA	CEL			X			
ACTINASTRUM GRACILIMUM	COL						X
ACTINASTRUM HANTZSCHII ?	COL			X			
ANABAENA #1	FIL						X
ANABAENA #2	FIL						X
ANKISTRODESMUS	CEL		5.1	92			
APHANIZOMENON ?	FIL	5	5.1	92	2	14.3	272
CENTRIC DIATOM	CEL					1.7	32
CLOSTERIUM	CEL			X			X
COCCONEIS	CEL						X
COCCONEIS PLACENTULA V. EUGLYPTA	CEL			X			
COELASTRUM RETICULATUM	COL		3.4	61			
COELASTRUM SPHAERICUM	COL			X		0.8	16
COSMARIUM	CEL			X			
CYMBELLA	CEL						X
CYMBELLA AFFINIS ?	CEL			X			X
DACTYLOCOCCOPSIS	CEL					5.0	96
DINOFLAGELLATE	CEL			X		0.8	16
EUDORINA ELEGANS	COL					0.8	16
EUGLENA	CEL			X		1.7	32
FLAGELLATE #1	CEL				5	28.6	545
FLAGELLATE #2	CEL				1	13.4	256
FLAGELLATES	CEL	1	27.1	490			
FRAGILARIA CROTONENSIS	CEL	2	16.9	306			
FRAGILARIA CROTONENSIS ?	CEL				4	13.4	256
GOMPHONEMA	CEL						X
GYROSIGMA	CEL						X
MALLOMONAS	CEL						X
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL		5.1	92			X

LAKE NAME: CLAYTOR LAKE
STORET NUMBER: 5103

CONTINUED

TAXA	FORM	07 16 73 S	07 16 73 %C	07 16 73 ALGAL UNITS PER ML	09 27 73 S	09 27 73 %C	09 27 73 ALGAL UNITS PER ML
MELOSIRA VARIANS	CEL			X			
MERISMOPEDIA	COL			X			
MICROCYSTIS	COL						X
MICROCYSTIS INCERTA	COL			X			
NAVICULA	CEL			X			
NAVICULA #1	CEL					0.8	16
NAVICULA #2	CEL					0.8	16
NITZSCHIA	CEL			X			X
OSCILLATORIA LIMNETICA	FIL		3.4	61		1.7	32
PEDIASTRUM DUPLEX V. RETICULATUM	COL			X			
PEDIASTRUM SIMPLEX V. DUODENARIUM	COL						X
PEDIASTRUM TETRAS V. TETRAODON	COL			X			X
SCENEDESMUS #1	COL			X			
SCENEDESMUS #2	COL			X			
SCENEDESMUS ABUNDANS	COL		3.4	61			
SCENEDESMUS ARMATUS ? V. BICAUDATUS	COL			X			
SCENEDESMUS BIJUGA	COL			X			
SCENEDESMUS BIJUGA V. ALTERNANS	COL		1.7	31			
SCENEDESMUS DENTICULATUS	COL					0.8	16
SCENEDESMUS DENTICULATUS V. LINEARIS	COL			X			
SCENEDESMUS DIMORPHUS	COL		1.7	31			
SCENEDESMUS INTERMEDIUS	COL			X			
SCENEDESMUS INTERMEDIUS V. BICAUDATUS	COL			X			
SCENEDESMUS OPOLIENSIS	COL		5.1	92		0.8	16
SCENEDESMUS PROTUBERANS	COL						X

LAKE NAME: CLAYTOR LAKE CONTINUED
STORET NUMBER: 5103

TAXA	FORM	07 16 73 S	07 16 73 %C	07 16 73 ALGAL UNITS PER ML	09 27 73 S	09 27 73 %C	09 27 73 ALGAL UNITS PER ML
STAURASTRUM #1	CEL			X			
STAURASTRUM #2	CEL			X			
STAURASTRUM #3	CEL			X			
STAURASTRUM #4	CEL						X
STEPHANODISCUS	CEL		5.1	92			
SYNEDRA ?	CEL						X
SYNEDRA #2	CEL						X
SYNEDRA DELICATISSIMA	CEL	4	5.1	92			
SYNEDRA RADIANS	CEL		5.1	92			
SYNEDRA RADIANS ?	CEL				3	13.4	256
SYNEDRA ULNA							
V. OXYRHYNCHUS F. MEDIOCONTRACTA	CEL			X			
TETRAEDRON MINIMUM	CEL					0.8	16
TETRAEDRON MINIMUM							
V. SCROBICULATUM	CEL	3	6.8	122			
TETRAEDRON REGULARE							
V. INCUS	CEL			X			
TOTAL				1807			1905

LAKE NAME: JOHN W. FLANNAGAN DAM
STORET NUMBER: 5105

NYGAARD TROPHIC STATE INDICES

DATE	04 05 73	07 18 73	09 27 73
MYXOPHYCEAN	01/0 E	0/01 O	0/02 O
CHLOROPHYCEAN	0/0 O	1.00 E	1.50 E
EUGLENOPHYTE	1.00 E	0/01 ?	0.33 E
DIATOM	0/04 ?	0.50 E	1.00 E
COMPOUND	02/0 E	2.00 E	4.00 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 05 73	07 18 73	09 27 73
GENUS	00	00	03
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICE

DATE		04 05 73	07 18 73	09 27 73
AVERAGE DIVERSITY	H	1.61	1.80	2.17
NUMBER OF TAXA	S	9.00	10.00	18.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	3.00	4.00
MAXIMUM DIVERSITY	MAXH	3.17	3.32	4.17
TOTAL DIVERSITY	D	1051.33	3718.80	5108.18
TOTAL NUMBER OF INDIVIDUALS/ML	N	653.00	2066.00	2354.00
EVENESS COMPONENT	J	0.51	0.54	0.52
MEAN NUMBER OF INDIVIDUALS/TAXA	L	72.56	206.60	130.78
NUMBER/ML OF MOST ABUNDANT TAXON	K	348.00	1287.00	1224.00

LAKE NAME: JOHN W. FLANNAGAN DAM CONTINUED
STORET NUMBER: 5105

TAXA	FORM	04 05 73 S	04 05 73 %C	04 05 73 ALGAL UNITS PER ML	07 18 73 S	07 18 73 %C	07 18 73 ALGAL UNITS PER ML	09 27 73 S	09 27 73 %C	09 27 73 ALGAL UNITS PER ML
ACHNANTHES MICROCEPHALA ?	CEL								1.0	23
ASTERIONELLA FORMOSA	CEL								2.9	69
CENTRIC DIATOM	CEL								1.0	23
CLOSTERIUM	CEL					0.9	18		1.0	23
COELASTRUM RETICULATUM	COL								1.0	23
CYCLOTELLA	CEL							1	52.0	1224
DINOBRYON DIVERGENS	CEL	2	33.4	218	5	5.3	109			
DINOFLAGELLATE	CEL	3	8.0	52			X			X
DINOFLAGELLATE #1	CEL							5	2.9	69
EUGLENA	CEL			X						X
FLAGELLATES	CEL	1	53.3	348	2	62.3	1287	2	24.5	577
MALLOMONAS	CEL					1.7	36			
MELOSIRA	CEL									X
NITZSCHIA	CEL						X			
OOCYSTIS	CEL								2.9	69
OSCILLATORIA LIMNETICA	FIL			X						
PENNATE DIATOM	CEL		1.4	9					0.5	11
PERIDINIUM WISCONSINENSE	CEL				1	14.9	308	4	3.4	81
SCENEDESMUS DIMORPHUS	COL									X
STAURASTRUM	CEL									X
STEPHANODISCUS	CEL				3	10.6	218			X
SYNEDRA	CEL							3	6.9	162
SYNEDRA #1	CEL	4	2.6	17		1.7	36			
SYNEDRA #2	CEL			X						
SYNEDRA #3	CEL	5	1.4	9						
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL				4	2.6	54			
TOTAL				653			2066			2354

LAKE NAME: JOHN H. KERR RES.
STORET NUMBER: 5106

NYGAARD TROPHIC STATE INDICES

DATE	03 23 73	07 13 73	09 26 73
MYXOPHYCEAN	02/0 E	2.50 E	3.50 E
CHLOROPHYCEAN	0/0 D	4.25 E	5.50 E
EUGLENOPHYTE	0.50 E	0.11 ?	0.22 E
DIATOM	0.42 E	0.55 E	0.71 E
COMPOUND	08/0 E	9.00 E	13.5 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	03 23 73	07 13 73	09 26 73
GENUS	01	14	15
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		03 23 73	07 13 73	09 26 73
AVERAGE DIVERSITY	H	2.20	3.71	3.49
NUMBER OF TAXA	S	22.00	56.00	40.00
NUMBER OF SAMPLES COMPOSITED	M	9.00	6.00	6.00
MAXIMUM DIVERSITY	MAXH	4.46	5.81	5.32
TOTAL DIVERSITY	D	3036.00	14294.63	24503.29
TOTAL NUMBER OF INDIVIDUALS/ML	N	1380.00	3853.00	7021.00
EVENESS COMPONENT	J	0.49	0.64	0.66
MEAN NUMBER OF INDIVIDUALS/TAXA	L	62.73	68.80	175.53
NUMBER/ML OF MOST ABUNDANT TAXON	K	790.00	931.00	1523.00

LAKE NAME: JOHN H. KERR RES.
STORET NUMBER: 5106

CONTINUED

TAXA	FORM	03 23 73 S	03 23 73 %C	03 23 73 ALGAL UNITS PER ML	07 13 73 S	07 13 73 %C	07 13 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
ACHNANTHES LANCEOLATA V. DUBIA	CEL			X						
ACHNANTHES MICROCEPHALA ?	CEL					5.2	202		2.8	197
ANABAENA	FIL									X
ANABAENA #1	FIL					3.7	142			
ANABAENA #2	FIL						X			
APHANIZOMENON ?	FIL						X	3	8.0	564
ASTERIONELLA FORMOSA	CEL		2.1	29						
CENTRIC DIATOM	CEL		2.1	29	5	5.8	223			
CERATIUM HIRUNDINELLA	CEL									X
CLOSTERIOPSIS	CEL								0.4	28
COCCONEIS	CEL			X			X			
COCCONEIS PLACENTULA V. EUGLYPTA	CEL									X
COELASTRUM SPHAERICUM	COL					1.0	40			
COSCINODISCUS	CEL					1.0	40			
COSMARIUM	CEL					0.5	20			X
CYCLOTELLA STELLIGERA	CEL			X			X			
CYMBELLA #1	CEL			X						
CYMBELLA #2	CEL			X						
DACTYLOCOCCOPSIS	CEL	5	8.3	115		3.7	142		3.6	254
DIATOMA	CEL			X						
DINOBRYON	CEL						X			
DINOFLAGELLATE	CEL						X			
DINOFLAGELLATES	CEL						X		1.2	85
EUASTRUM	CEL						X		0.4	28
EUGLENA	CEL			X						
EUGLENA #1	CEL						X		0.4	28
EUGLENA #2	CEL									X
EUGLENA #3	CEL									X
EUNOTIA	CEL			X						
FLAGELLATE #1	CEL	2	12.5	172						

LAKE NAME: JOHN H. KERR RES. CONTINUED
STORET NUMBER: 5106

TAXA	FORM	03 23 73 S	03 23 73 %C	03 23 73 ALGAL UNITS PER ML	07 13 73 S	07 13 73 %C	07 13 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
FLAGELLATE #2	CEL	3	5.2	72						
FLAGELLATES	CEL				2	12.4	479	1	21.7	1523
FRAGILARIA CROTONENSIS	CEL						X			
FRANCEIA	CEL						X		0.4	28
GOMPHONEMA	CEL			X						
GYROSIGMA ?	CEL									X
HANTZSCHIA	CEL						X			
LAGERHEIMIA WRATISLAVIENSIS	CEL									X
LYNGBYA	FIL								4.0	282
LYNGBYA LIMNETICA	FIL				1	24.2	931			
MELOSIRA	CEL								2.4	169
MELOSIRA DISTANS	CEL					1.0	40	5	4.4	310
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL						X			X
MELOSIRA ITALICA V. TENUISSIMA	CEL	1	57.2	790						
MELOSIRA VARIANS	CEL			X						X
MERISMOPEDIA TENUISSIMA	COL						X		0.8	56
MICROCYSTIS INCERTA	COL					1.0	40			
NAVICULA	CEL			X						
NAVICULA #1	CEL									X
NAVICULA #2	CEL								0.4	28
NITZSCHIA	CEL		2.1	29					2.0	141
NITZSCHIA #1	CEL					2.1	81			
NITZSCHIA ACICULARIS	CEL					0.5	20			
OSCILLATORIA	FIL					2.6	101			
OSCILLATORIA GEMINATA	FIL						X			
OSCILLATORIA LIMNETICA	FIL		2.1	29		1.0	40		3.6	254
PANDORINA MORUM	COL						X			X
PEDIASTRUM BIRADIATUM V. LONGECORNUTUM	COL								0.4	28
PEDIASTRUM DUPLEX V. RETICULATUM	COL						X			

LAKE NAME: JOHN H. KERR RES. CONTINUED
STORET NUMBER: 5106

TAXA	FORM	03 23 73 S	%C	ALGAL UNITS PER ML	07 13 73 S	%C	ALGAL UNITS PER ML	09 26 73 S	%C	ALGAL UNITS PER ML
PEDIASTRUM SIMPLEX V. DUODENARIUM	COL								0.4	28
PENNATE DIATOMS	CEL		3.1	43	4	9.4	364			
PHACUS ACUMINATUS	CEL									X
RAPHIDIOPSIS	FIL							2	21.7	1523
RHIZOSOLENIA LONGISETA	CEL					0.5	20			
SCENEDESMUS	COL					1.0	40			
SCENEDESMUS #1	COL						X			X
SCENEDESMUS #2	COL					0.5	20			
SCENEDESMUS #3	COL						X			
SCENEDESMUS #4	COL						X			
SCENEDESMUS #5	COL						X			
SCENEDESMUS #6	COL						X			
SCENEDESMUS ABUNDANS	COL					0.5	20		0.4	28
SCENEDESMUS ACUTUS	COL								0.4	28
SCENEDESMUS DENTICULATUS	COL								0.8	56
SCENEDESMUS OPOLIENSIS	COL								1.2	85
SCENEDESMUS OPOLIENSIS ?	COL					0.5	20			
SCENEDESMUS PROTUBERANS ?	COL						X			
SCENEDESMUS QUADRICAUDA	COL						X			
SCHROEDERIA	CEL					1.0	40			
STAURASTRUM #1	CEL					0.5	20			
STAURASTRUM #2	CEL						X			
STEPHANODISCUS	CEL	4	5.2	72					3.2	226
SURIRELLA	CEL						X			
SYNEDRA #1	CEL				3	15.8	607	4	14.9	1044
SYNEDRA #2	CEL					1.6	61			
SYNEDRA ACUS ?	CEL			X						
TABELLARIA	CEL						X			
TETRAEDRON	CEL					0.5	20			
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL					1.0	40			X

LAKE NAME: JOHN H. KERR RES. CONTINUED
STORET NUMBER: 5106

TAXA	FORM	03 23 73 S	%C	ALGAL UNITS PER ML	07 13 73 S	%C	ALGAL UNITS PER ML	09 26 73 S	%C	ALGAL UNITS PER ML
TRACHELOMONAS #1	CEL					0.5	20			
TRACHELOMONAS #2	CEL					0.5	20			
TOTAL				1380			3853			7021

LAKE NAME: OCCOQUAN RES.
STORET NUMBER: 5108

NYGAARD TROPHIC STATE INDICES

DATE	04 10 73	07 19 73	09 29 73
MYXOPHYCEAN	0/0 O	1.00 E	1.50 E
CHLOROPHYCEAN	01/0 E	5.50 E	2.50 E
EUGLENOPHYTE	0/01 ?	0.38 E	0.25 E
DIATOM	0.29 ?	0.43 E	4.00 E
COMPOUND	03/0 E	10.5 E	6.00 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 10 73	07 19 73	09 29 73
GENUS	03	09	07
SPECIES	00	03	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 10 73	07 19 73	09 29 73
AVERAGE DIVERSITY	H	1.56	2.93	1.62
NUMBER OF TAXA	S	12.00	33.00	33.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	3.58	5.04	5.04
TOTAL DIVERSITY	D	3485.04	10852.72	7695.00
TOTAL NUMBER OF INDIVIDUALS/ML	N	2234.00	3704.00	4750.00
EVENESS COMPONENT	J	0.44	0.58	0.32
MEAN NUMBER OF INDIVIDUALS/TAXA	L	186.17	112.24	143.94
NUMBER/ML OF MOST ABUNDANT TAXON	K	1529.00	1541.00	3301.00

LAKE NAME: OCCOQUAN RES.
STORET NUMBER: 5108

CONTINUED

TAXA	FORM	04 10 73 S	%C	ALGAL UNITS PER ML	07 19 73 S	%C	ALGAL UNITS PER ML	09 29 73 S	%C	ALGAL UNITS PER ML
ANABAENA	FIL					0.9	33			X
ANKISTRODESMUS	CEL		0.6	14						
ANKISTRODESMUS FALCATUS	CEL					3.5	131			
APHANIZOMENON	FIL									X
ASTERIONELLA FORMOSA	CEL	1	68.4	1529						
CENTRIC DIATOM	CEL					1.8	66			
CERATIUM HIRUNDINELLA	CEL						X			
CHRYSOCOCCUS	COL									X
CLOSTERIUM #1	CEL									X
CLOSTERIUM #2	CEL									X
COELASTRUM RETICULATUM	COL				1	41.6	1541	5	1.8	87
COELASTRUM SPHAERICUM	COL									X
COELOSPHAERIUM NAEGELIANUM	COL									X
COSMARIUM	CEL									X
CRUCIGENIA APICULATA	COL					1.8	66			X
DICTYOSPHAERIUM PULCHELLUM	COL						X		0.6	29
DINOBRYON DIVERGENS	CEL			X						X
EUDORINA	COL									X
EUGLENA	CEL						X		0.6	29
EUGLENA #1	CEL					0.9	33			X
FLAGELLATES	CEL	3	11.5	257	3	13.3	492	2	16.5	782
FRAGILARIA ?	CEL						X			
FRAGILARIA CROTONENSIS	CEL				2	11.5	426			
GYROSIGMA	CEL		0.6	14			X			
KIRCHNERIELLA	CEL					4.4	164			X
MELOSIRA #2	CEL	5	3.6	81						
MELOSIRA DISTANS	CEL	4	1.8	41			X	4	4.3	203
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL						X	1	69.5	3301
MELOSIRA VARIANS	CEL									X
MICROCYSTIS AERUGINOSA	COL									X
MICROCYSTIS INCERTA	COL						X			

LAKE NAME: OCCOQUAN RES.
STORET NUMBER: 5108

CONTINUED

TAXA	FORM	04 10 73 S	04 10 73 %C	04 10 73 ALGAL UNITS PER ML	07 19 73 S	07 19 73 %C	07 19 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
NAVICULA	CEL		0.6	14			X			
NAVICULA #1	CEL					2.6	98			
NITZSCHIA	CEL			X		0.9	33			
OSCILLATORIA #1	FIL									X
OSCILLATORIA #2	FIL									X
PANDORINA MORUM	COL						X			
PEDIASTRUM SIMPLEX										
V. ?	COL						X			
PEDIASTRUM TETRAS										
V. TETRAODON	COL					0.9	33			
PHACUS ACUMINATUS	CEL						X	3	2.4	116
PHACUS TORTUS	CEL						X			
SCENEDESMUS #2	COL					1.8	66			X
SCENEDESMUS #3	COL				4	8.0	295			
SCENEDESMUS #4	COL						X			
SCENEDESMUS ABUNDANS	COL								0.6	29
SCENEDESMUS INTERMEDIUS										
V. BICAUDATUS	COL				5	4.3	161		0.6	29
STAURASTRUM #1	CEL						X		0.6	29
STAURASTRUM #2	CEL						X			
STEPHANODISCUS	CEL								1.2	58
SURIRELLA	CEL			X						
SYNEDRA #1	CEL		0.6	14						
SYNEDRA DELICATISSIMA	CEL	2	12.1	270			X			X
TETRAEDRON	CEL									X
TRACHELOMONAS	CEL					1.8	66		0.6	29
TREUBARIA	CEL								0.6	29
TOTAL				2234			3704			4750

LAKE NAME: SMITH MT. LAKE
STORET NUMBER: 5110

NYGAARD TROPHIC STATE INDICES

DATE	04 04 73	07 16 73	09 26 73
MYXOPHYCEAN	01/0 E	3.50 E	3.00 E
CHLOROPHYCEAN	02/0 E	4.00 E	4.50 E
EUGLENOPHYTE	0.33 E	0.07 ?	0.20 ?
DIATOM	0.33 E	0.50 E	0.33 E
COMPOUND	06/0 E	9.00 E	10.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 04 73	07 16 73	09 26 73
GENUS	08	13	07
SPECIES	03	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 04 73	07 16 73	09 26 73
AVERAGE DIVERSITY	H	1.71	2.63	3.07
NUMBER OF TAXA	S	15.00	27.00	34.00
NUMBER OF SAMPLES COMPOSITED	M	5.00	5.00	5.00
MAXIMUM DIVERSITY	MAXH	3.91	4.75	5.09
TOTAL DIVERSITY	D	12814.74	49451.89	12454.99
TOTAL NUMBER OF INDIVIDUALS/ML	N	7494.00	18803.00	4057.00
EVENESS COMPONENT	J	0.44	0.55	0.60
MEAN NUMBER OF INDIVIDUALS/TAXA	L	499.60	696.41	119.32
NUMBER/ML OF MOST ABUNDANT TAXON	K	4329.00	7994.00	1325.00

LAKE NAME: SMITH MT. LAKE
STORET NUMBER: 5110

CONTINUED

TAXA	FORM	04 04 73 S	04 04 73 %C	04 04 73 ALGAL UNITS PER ML	07 16 73 S	07 16 73 %C	07 16 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
ACHNANTHES #4	CEL						X			
ACHNANTHES LANCEOLATA V. DUBIA	CEL						X			
ACHNANTHES MICROCEPHALA ?	CEL								3.5	141
ANKISTRODESMUS FALCATUS	CEL	5	4.7	352						
APHANOTHECE ?	COL					5.7	1072			
ASTERIONELLA FORMOSA	CEL			X						
CERATIUM HIRUNDINELLA	CEL									X
CHROCCOCCUS	COL				2	15.2	2858			
CLOSTERIUM	CEL									X
COELASTRUM PROBOSCIDEUM	COL									X
COELASTRUM RETICULATUM	COL						X		0.7	28
COELASTRUM SPHAERICUM	COL					0.2	45			
COSMARIUM	CEL						X			
CRUCIGENIA APICULATA	COL			X						
CRUCIGENIA TETRAPEDIA	COL								0.7	28
CYCLOTELLA STELLIGERA	CEL				5	3.8	714			
DACTYLOCOCCOPSIS	CEL							5	11.8	479
DINOBRYON	CEL								0.7	28
DINOFLAGELLATE #1	CEL			X					0.7	28
DINOFLAGELLATE #2	CEL						X		0.7	28
EUGLENA	CEL						X		0.7	28
FLAGELLATES	CEL	2	27.1	2029	4	7.8	1474	1	32.7	1325
FRAGILARIA	CEL									X
FRAGILARIA CROTONENSIS	CEL					1.7	313			
GOLENKINIA	CEL								0.7	28
GOLENKINIA ?	CEL					0.2	45			
GOMPHONEMA	CEL		0.4	27						
LYNGBYA LIMNETICA	FIL				1	42.5	7994			
MALLOMONAS	CEL									X
MELOSIRA #2	CEL	3	5.8	433			X			
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL									X

LAKE NAME: SMITH MT. LAKE
STORET NUMBER: 5110

CONTINUED

TAXA	FORM	04 04 73 S	04 04 73 %C	04 04 73 ALGAL UNITS PER ML	07 16 73 S	07 16 73 %C	07 16 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
MERISMOPEDIA TENUISSIMA	COL							2	13.2	536
MICROCYSTIS INCERTA	COL						X			
NAVICULA	CEL			X						X
NITZSCHIA	CEL		0.7	54					0.7	28
OOCYSTIS	CEL						X			
OSCILLATORIA	FIL									X
OSCILLATORIA LIMNETICA	FIL		0.4	27		1.2	223		1.4	56
PANDORINA MORUM	COL			X						
PERIDINIUM	CEL					0.2	45			
PHACUS ACUMINATUS	CEL									X
RAPHIDIOPSIS	FIL						X			
RAPHIDIOPSIS CURVATA	FIL				3	13.3	2501	3	13.9	564
RAPHIDIOPSIS CURVATA ?	FIL									X
SCENEDESMUS	COL					0.5	89			X
SCENEDESMUS DIMORPHUS	COL					0.2	45			X
SCENEDESMUS QUADRICAUDA	COL									X
STAURASTRUM TETRACERUM	CEL						X		0.7	28
STEPHANODISCUS	CEL	1	57.8	4329				4	10.4	423
SYNEDRA #1	CEL	4	2.5	189		6.9	1295		4.9	197
SYNEDRA DELICATISSIMA	CEL			X						
SYNEDRA DELICATISSIMA V. ?	CEL									X
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL					0.2	45		0.7	28
TETRAEDRON TRIGONUM	CEL								0.7	28
TRACHELOMONAS	CEL		0.7	54					0.7	28
TREUBARIA TRIAPPENDICULATA	CEL					0.2	45			
TOTAL				7494			18803			4057

LAKE NAME: LAKE CHESDIN
STORET NUMBER: 5111

NYGAARD TROPHIC STATE INDICES

DATE	04 07 73	07 13 73	09 26 73
MYXOPHYCEAN	03/0 E	4.50 E	1.00 E
CHLOROPHYCEAN	03/0 E	4.00 E	1.33 E
EUGLENOPHYTE	0.50 E	0.41 E	0/07 ?
DIATOM	0.28 ?	0.43 E	0.33 E
COMPOUND	14/0 E	13.5 E	3.33 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 07 73	07 13 73	09 26 73
GENUS	01	15	02
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 07 73	07 13 73	09 26 73
AVERAGE DIVERSITY	H	3.12	2.26	3.06
NUMBER OF TAXA	S	40.00	42.00	26.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	5.32	5.39	4.70
TOTAL DIVERSITY	D	3550.56	16197.42	3157.92
TOTAL NUMBER OF INDIVIDUALS/ML	N	1138.00	7167.00	1032.00
EVENESS COMPONENT	J	0.59	0.42	0.65
MEAN NUMBER OF INDIVIDUALS/TAXA	L	28.45	170.64	39.69
NUMBER/ML OF MOST ABUNDANT TAXON	K	291.00	4388.00	284.00

LAKE NAME: LAKE CHESCIN
STORET NUMBER: 5111

CONTINUED

TAXA	FORM	04 07 73 S	04 07 73 %C	04 07 73 ALGAL UNITS PER ML	07 13 73 S	07 13 73 %C	07 13 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
ACHNANTHES LANCEOLATA ?	CEL			X						
ANABAENA	FIL				2	8.8	631			
ANABAENA #1	FIL					0.9	63			
ANABAENA PLANCTONICA	FIL							1	27.5	284
ANKISTRODESMUS ?	CEL					2.6	189			
APHANIZOMENON ?	FIL			X			X			
ASTERIONELLA FORMOSA	CEL		6.4	73						
CAPARTOGRAMMA CRUCICULA	CEL									X
CERATIUM HIRUNDINELLA	CEL						X		1.7	18
CHLOROPHYTAN LUNATE CELL	CEL		7.5	85						
CHROOCOCCUS	COL						X			
CLOSTERIUM	CEL									X
COCCOID COLONY	COL					0.9	63			
COELASTRUM CAMBRICUM	COL						X			
CRUCIGENIA FENESTRATA	COL		1.1	12						
CYANOPHYTAN COLONY	COL								1.7	18
CYANOPHYTAN FILAMENT	FIL			X						
CYCLOTELLA	CEL		1.1	12						
CYCLOTELLA STELLIGERA	CEL				3	7.5	537	3	13.8	142
CYMBELLA TUMIDA	CEL			X						
CYMBELLA VENTRICOSA	CEL			X						
DACTYLOCOCCOPSIS	CEL			X						
DINOBRYON BAVARICUM	CEL			X						
DINOBRYON DIVERGENS	CEL	2	20.2	230						
DINOFLAGELLATE #2	CEL						X			
DINOFLAGELLATES	CEL		1.1	12						
EUASTRUM	CEL						X		1.7	18
EUDORINA ELEGANS	COL			X						
EUGLENA	CEL		1.1	12						
EUGLENA #1	CEL						X			
EUGLENA #2	CEL						X			
EUGLENA #3	CEL						X			

LAKE NAME: LAKE CHESDIN
STORET NUMBER: 5111

CONTINUED

TAXA	FORM	04 07 73 S	04 07 73 %C	04 07 73 ALGAL UNITS PER ML	07 13 73 S	07 13 73 %C	07 13 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
FLAGELLATES	CEL	1	25.6	291	4	6.2	442	4	12.0	124
FRAGILARIA	CEL									X
FRAGILARIA CROTONENSIS	CEL						X			
GLENODINIUM	CEL			X						
GOMPHONEMA	CEL			X						
GOMPHOSPHAERIA ?	COL						X			
GYROSIGMA	CEL			X						X
LEPOCINCLIS	CEL			X						
LUNATE CELL	CEL								1.7	18
MELOSIRA DISTANS	CEL			X	5	3.5	252		3.5	36
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL		4.2	48	1	61.2	4388	2	20.6	213
MELOSIRA VARIANS	CEL	4	1.1	12						
MERISMOPEDIA TENUISSIMA	COL					1.3	95			
MICROCYSTIS AERUGINOSA	COL						X			
MICROCYSTIS INCERTA	COL						X			
MOUGEOTIA	FIL						X			
NAVICULA #1	CEL									X
NAVICULA #2	CEL						X			
NAVICULA #3	CEL			X			X			
NAVICULA #4	CEL			X						
NAVICULA CUSPIDATA	CEL			X						
NAVICULA HAMBERGII	CEL		1.1	12						
NAVICULA INTEGRA	CEL						X			
NAVICULA PUPULA V. RECTANGULARIS	CEL			X			X			X
NITZSCHIA	CEL		1.1	12					1.7	18
OSCILLATORIA	FIL					0.9	63			
OSCILLATORIA ?	FIL									X
PANDORINA MORUM	COL	3	2.1	24		0.4	32			
PEDIASTRUM DUPLEX V. RETICULATUM	COL						X			X

LAKE NAME: LAKE CHESDIN
STORET NUMBER: 5111

CONTINUED

TAXA	FORM	04 07 73 S	04 07 73 %C	04 07 73 ALGAL UNITS PER ML	07 13 73 S	07 13 73 %C	07 13 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
PENNATE DIATOM	CEL		9.6	109						
PENNATE DIATOMS	CEL							5	6.9	71
PHACUS ACUMINATUS	CEL						X			
PHACUS HELIKOIDES	CEL						X			
PINNULARIA	CEL			X			X			
SCENEDESMUS #1	COL		1.1	12			X			
SCENEDESMUS #2	COL			X						
SCENEDESMUS #3	COL					0.4	32			
SCENEDESMUS BIJUGA	COL					1.8	126		1.7	18
SCENEDESMUS INTERMEDIUS	COL									X
SCHROEDERIA SETIGERA	CEL					0.4	32			
STAURASTRUM	CEL						X			
STAURASTRUM #2	CEL								3.5	36
STEPHANODISCUS	CEL	5	16.0	182						
SURIRELLA	CEL			X						
SYNEDRA #2	CEL			X		0.9	63			X
SYNEDRA PARASITICA ?	CEL			X						
SYNEDRA ULNA	CEL			X						
SYNEDRA VAUCHERIAE	CEL									X
TABELLARIA	CEL									X
TETRAEDRON MINIMUM	CEL								1.7	18
TETRAEDRON MUTICUM	CEL					0.4	32			
TRACHELOMONAS #1	CEL			X		1.3	95			
TRACHELOMONAS #2	CEL					0.4	32			
TOTAL				1138			7167			1032

LAKE NAME: CHICKAHOMINY LAKE
STORET NUMBER: 5112

NYGAARD TROPHIC STATE INDICES

DATE	04 09 73	09 26 73
MYXOPHYCEAN	2.00 E	1.75 E
CHLOROPHYCEAN	3.00 E	4.25 E
EUGLENOPHYTE	0.20 ?	0/24 ?
DIATOM	0.33 E	0.75 E
COMPOUND	10.0 E	8.25 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	04 09 73	09 26 73
GENUS	01	17
SPECIES	00	02

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		04 09 73	09 26 73
AVERAGE DIVERSITY	H	2.80	3.92
NUMBER OF TAXA	S	51.00	51.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00
MAXIMUM DIVERSITY	MAXH	5.67	5.67
TOTAL DIVERSITY	D	6750.80	28776.72
TOTAL NUMBER OF INDIVIDUALS/ML	N	2411.00	7341.00
EVENESS COMPONENT	J	0.49	0.69
MEAN NUMBER OF INDIVIDUALS/TAXA	L	47.27	143.94
NUMBER/ML OF MOST ABUNDANT TAXON	K	820.00	1657.00

LAKE NAME: CHICKAHOMINY LAKE CONTINUED
STORET NUMBER: 5112

TAXA	FORM	04 09 73 S	04 09 73 %C	04 09 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
ACHNANTHES LANCEOLATA	CEL			X			
ACTINASTRUM HANTZSCHII	COL					1.0	71
ANABAENA	FIL			X			
ANABAENA #1	FIL					1.0	71
ANABAENA #2	FIL						X
ANKISTRODESMUS	CEL					1.3	95
APHANIZOMENON ?	FIL					2.6	189
ATTHEYA	CEL					2.3	166
CLOSTERIOPSIS	CEL						X
CLOSTERIUM	CEL			X			
COCCONEIS	CEL		0.5	11			
COELASTRUM MICROPORUM	COL		0.5	11			
COSCINODISCUS	CEL			X		1.0	71
COSMARIUM ?	CEL					0.6	47
CRUCIGENIA TETRAPEDIA	CEL						X
CYANOPHYTAN FILAMENT	FIL			X			
CYCLOTELLA MENEGHINIANA	CEL	5	0.9	22		3.2	237
CYCLOTELLA STELLIGERA	CEL			X			
DACTYLOCOCCOPSIS	CEL		10.7	258			
DINOBRYON	CEL			X			
DIPLONEIS #1	CEL			X			
DIPLONEIS ELLIPTICA ?	CEL			X			
EUASTRUM	CEL					0.3	24
EUNOTIA	CEL			X			
EUNOTIA INCISA	CEL			X			
FLAGELLATE #1	CEL	2	34.0	920			
FLAGELLATES	CEL					2.3	166
FRAGILARIA CROTONENSIS	CEL			X			
FRUSTULIA	CEL			X			
GLENODINIUM	CEL		0.9	22			
GOMPHONEMA #1	CEL		0.5	11			
GOMPHONEMA #2	CEL			X			

LAKE NAME: CHICKAHOMINY LAKE CONTINUED
STORET NUMBER: 5112

TAXA	FORM	04 09 73 S	04 09 73 %C	04 09 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
GYMNODINIUM	CEL			X			
GYROSIGMA	CEL		0.9	22			X
GYROSIGMA MACRUM	CEL						X
HANTZSCHIA	CEL			X			
LAGERHEIMIA	CEL						X
LYNGBYA	FIL					0.6	47
MALLCMONAS	CEL			X			
MELOSIRA #2	CEL	1	21.9	528	1	15.8	1160
MELOSIRA #3	CEL						X
MELOSIRA #4	CEL				2	22.6	1657
MELOSIRA BINDERANA	CEL				3	14.5	1065
MELOSIRA DISTANS	CEL		8.4	202			
MELOSIRA GRANULATA							
V. ANGUSTISSIMA	CEL	3	5.1	123			
MELOSIRA HERZOGII	CEL				4	5.2	379
MELOSIRA VARIANS	CEL			X			
MERISMOPEDIA TENUISSIMA	COL					1.3	95
MICROCYSTIS INCERTA	COL					3.5	260
MOUGEOTIA ?	FIL				5	4.8	355
NAVICULA #1	CEL		0.5	11			
NAVICULA #2	CEL					0.3	24
NAVICULA #3	CEL					1.3	95
NAVICULA #4	CEL			X			
NITZSCHIA #1	CEL		1.4	34			
NITZSCHIA #2	CEL			X		0.3	24
NITZSCHIA #4	CEL						X
NITZSCHIA #5	CEL			X			
NITZSCHIA ACICULARIS	CEL			X			X
OSCILLATORIA LIMNETICA	FIL			X		1.9	142
PEDIASTRUM BIRADIATUM							
V. LONGECORNUTUM	COL					0.6	47
PEDIASTRUM DUPLEX							
V. RETICULATUM	COL					0.6	47

LAKE NAME: CHICKAHOMINY LAKE CONTINUED
STORET NUMBER: 5112

TAXA	FORM	04 09 73 S	04 09 73 %C	04 09 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
PENNATE DIATOMS	CEL	4	12.1	292			
PHACUS	CEL		0.5	11			
PINNULARIA #2	CEL						X
PINNULARIA BIHASTATA	CEL			X			
PINNULARIA STOMATOPHORA	CEL			X			
QUADRIGULA	CEL					0.3	24
RHOPALODIA	CEL						X
SCENEDESMUS #1	COL					1.3	95
SCENEDESMUS #2	COL					0.3	24
SCENEDESMUS ABUNDANS	COL					0.6	47
SCENEDESMUS ACUMINATUS V. BERNARDII	COL						X
SCENEDESMUS DIMORPHUS	COL					0.3	24
SCENEDESMUS ECORNIS V. DISCIFORMIS	COL		0.5	11			
SCENEDESMUS INTERMEDIUS	COL			X			
SCHROEDERIA SETIGERA	CEL			X			
SELENASTRUM	CEL		0.5	11			
STAURASTRUM #1	CEL					0.3	24
STAURASTRUM LEPTOCLADUM V. CORNUTUM	CEL			X			X
STEPHANODISCUS	CEL			X		4.5	331
SURIRELLA	CEL			X		0.3	24
SYNEDRA	CEL					0.3	24
SYNEDRA #1	CEL		0.5	11			
SYNEDRA #2	CEL			X			
TABELLARIA	CEL					1.3	95
TETRAEDRON	CEL						X
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL			X			X
TETRAEDRON REGULARE V. INCUS	CEL						X

LAKE NAME: CHICKAHOMINY LAKE CONTINUED
STORET NUMBER: 5112

TAXA	FORM	04 09 73 S	04 09 73 %C	04 09 73 ALGAL UNITS PER ML	09 26 73 S	09 26 73 %C	09 26 73 ALGAL UNITS PER ML
TETRASTRUM HETERACANTHUM	COL					1.3	95
TRACHELOMONAS INTERMEDIA	CEL			X			
TOTAL				2411			7341

LAKE NAME: RIVANNA RES.
STORET NUMBER: 5113

NYGAARD TROPHIC STATE INDICES

DATE	07 19 73	09 29 73
MYXOPHYCEAN	1.00 E	6.00 E
CHLOROPHYCEAN	2.33 E	2.00 E
EUGLENOPHYTE	0.20 ?	0/08 ?
DIATOM	0.25 ?	05/0 E
COMPOUND	4.67 E	13.0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	07 19 73	09 29 73
GENUS	04	03
SPECIES	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		07 19 73	09 29 73
AVERAGE DIVERSITY	H	2.79	3.19
NUMBER OF TAXA	S	27.00	16.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00
MAXIMUM DIVERSITY	MAXH	4.75	4.00
TOTAL DIVERSITY	D	1757.70	5209.27
TOTAL NUMBER OF INDIVIDUALS/ML	N	630.00	1633.00
EVENESS COMPONENT	J	0.59	0.80
MEAN NUMBER OF INDIVIDUALS/TAXA	L	23.33	102.06
NUMBER/ML OF MOST ABUNDANT TAXON	K	191.00	322.00

LAKE NAME: RIVANNA RES.
STORET NUMBER: 5113

CONTINUED

TAXA	FORM	07 19 73 S	07 19 73 %C	07 19 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
ANABAENA #1	FIL				1	11.3	184
ANABAENA #2	FIL				2	11.3	184
ANABAENA #3	FIL					4.2	69
ANKISTRODESMUS	CEL	5	6.0	38			
APHANIZOMENON ?	FIL			X			X
CERATIUM HIRUNDINELLA	CEL						X
COCCONEIS	CEL			X			
COELASTRUM MICROPORUM	COL			X			
COELOSPHAERIUM NAEGELIANUM	COL					1.4	23
COSCINODISCUS	CEL					1.4	23
CYCLOTELLA STELLIGERA	CEL				4	19.7	322
CYMBELLA	CEL		3.0	19			
CYMBELLA TUMIDA	CEL			X			
EUGLENA	CEL			X			
FLAGELLATES	CEL	4	21.3	134	5	16.9	276
FRAGILARIA CROTONENSIS	CEL			X			
MELOSIRA #2	CEL				3	16.9	276
MELOSIRA DISTANS	CEL					5.6	92
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL	1	30.3	191			
MELOSIRA VARIANS	CEL			X			X
MICROCYSTIS AERUGINOSA	COL			X		5.6	92
NAVICULA	CEL		3.0	19			
NAVICULA SALINARIUM V. INTERMEDIA	CEL	3	12.1	76			
OOCYSTIS	CEL			X			
OSCILLATORIA	FIL			X			
PEDIASTRUM DUPLEX V. RETICULATUM	COL			X			
PHACUS ACUMINATUS	CEL			X			
SCENEDESMUS BIJUGA V. DISCIFORMIS	COL			X			

LAKE NAME: RIVANNA RES.
STORET NUMBER: 5113

CONTINUED

TAXA	FORM	07 19 73 S	07 19 73 %C	07 19 73 ALGAL UNITS PER ML	09 29 73 S	09 29 73 %C	09 29 73 ALGAL UNITS PER ML
SCENEDESMUS DENTICULATUS	COL		3.0	19			
SCENEDESMUS DIMORPHUS	COL		3.0	19		1.4	23
SPHAERELLOPSIS	CEL	2	15.2	96			
STAURASTRUM #1	CEL		3.0	19			
STAURASTPUM #2	CEL			X		2.8	46
STAURASTRUM #3	CEL			X			
SURIRELLA	CEL			X			
SYNEDRA ULNA							
V. ?	CEL			X			
TETRAEDRON GRACILE							
V. ?	CEL					1.4	23
TOTAL				630			1633

*U.S. GOVERNMENT PRINTING OFFICE: 1977 - 785-011/1011 Region No. 9-1

TECHNICAL REPORT DATA

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-600/3-77-100		

4. TITLE AND SUBTITLE
DISTRIBUTION OF PHYTOPLANKTON IN VIRGINIA LAKES

5. REPORT DATE
September 1977

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
J.W. Hilgert, V.W. Lambou, F.A. Morris, R.W. Thomas, M.K. Morris, L.R. Williams, W.D. Taylor, F.A. Hiatt, S.C. Hern

8. PERFORMING ORGANIZATION REPORT NO.

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Environmental Monitoring and Support Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Las Vegas, NV 89114

10. PROGRAM ELEMENT NO.
1BA608

11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS
U.S. Environmental Protection Agency - Las Vegas, NV
Office of Research and Development
Environmental Monitoring and Support Laboratory
Las Vegas, NV 89114

13. TYPE OF REPORT AND PERIOD COVERED
03-07-73 to 11-14-73

14. SPONSORING AGENCY CODE
EPA/600/07

15. SUPPLEMENTARY NOTES
Previously released in limited distribution No.692 in the Working Paper Series for the National Eutrophication Survey.

16. ABSTRACT

This is a data report presenting the species and abundance of phytoplankton in the 8 lakes sampled by the National Eutrophication Survey in the State of Virginia. Results from the calculation of several water quality indices are also included (Nygaard's Trophic State Index, Palmer's Organic Pollution Index, and species diversity and abundance indices).

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
*aquatic microbiology lake *phytoplankton water quality	Virginia lake eutrophication Nygaard's trophic indices Palmer's organic pollution indices Species diversity and abundance indices	06 C 08 H 13 B

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
RELEASE TO PUBLIC	UNCLASSIFIED	48
	20. SECURITY CLASS (This page)	22. PRICE
	UNCLASSIFIED	

EPA Form 2220-1 (9-73)