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Distribution of Phytoplankton in Washington Lakes



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DISTRIBUTION OF PHYTOPLANKTON IN WASHINGTON 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 monitoring data base for exposure assessment through 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 13 lakes sampled by the National Eutrophication Survey in the State of Washington, 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.


George B. Morgan
Director
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CONTENTS

	<u>Page</u>
Foreword	iii
Introduction	1
Materials and Methods	2
Lake and Site Selection	2
Sample Preparation	2
Examination	3
Quality Control	4
Results	5
Nygaard's Trophic State Indices	5
Palmer's Organic Pollution Indices	5
Species Diversity and Abundance Indices	7
Species Occurrence and Abundance	9
Literature Cited	10
Appendix A. Phytoplankton Species list for the State of Washington	11
Appendix B. Summary of Phytoplankton Data	15

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 1975, the Survey sampled 156 lakes in 11 States. Over 450 algal species and varieties were identified and enumerated from the 430 water samples examined.

This report presents the species and abundance of phytoplankton in the 13 lakes sampled in the State of Washington (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 WASHINGTON

STORET No.	Lake Name	County
5301	American Lake	Pierce
5302	Banks Lake	Grant, Douglas
5303	Chelan Lake	Chelan
5304	Diamond Lake	Pend Oreille
5305	Green Lake	King
5306	Keechelus Lake	Kittitas
5307	Mayfield Lake	Lewis
5308	Medical Lake	Spokane
5309	Moses Lake	Grant
5310	Ozette Lake	Clallam
5311	Sammamish Lake	King
5312	Whatcom Lake	Whatcom
5313	Lower Granite Reservoir	Garfield, Whitman

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> <u>Pennate Diatoms</u>	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>Arthrospira 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:

$$\text{MinH} = -\frac{S-1}{N} \log_2 \frac{1}{N} - \frac{N-(S-1)}{N} \log_2 \frac{N-(S-1)}{N}$$

given by Zand (1976). The total diversity (D) was calculated from HN (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/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 "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 taxa. Since MaxH equals $\log S$, the expression in sits is equal to $\log S$, 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 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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<i>Achnanthes microcephala</i>	<i>Crucigenia tetrapedia</i>
<i>Actinastrum hantzschii</i>	<i>Cryptomonas erosa</i>
v. <i>fluviatile</i>	<i>Cryptomonas marssonii</i>
<i>Amphora</i>	<i>Cyclotella bodanica</i>
<i>Anabaena flos-aquae</i>	<i>Cyclotella canta</i>
<i>Anabaena plantonica</i>	<i>Cyclotella meneghiniana</i>
<i>Ankistrodesmus falcatus</i>	<i>Cyclotella ocellata</i>
<i>Ankistrodesmus falcatus</i>	<i>Cyclotella stelligera</i>
v. <i>acicularis</i>	<i>Cymatopleura solea</i>
<i>Aphanizomeon flos-aquae</i>	<i>Cymbella mexicana</i>
<i>Aphanocapsa delicatissima</i>	<i>Dactylococcopsis</i>
<i>Aphanocapsa elachista</i>	<i>Desmidium baileyi</i>
<i>Aphanocapsa elachista</i>	v. <i>subcirculare</i>
v. <i>plantonica</i>	<i>Desmidium swartzii</i>
<i>Aphanothece clathrata</i>	<i>Diatoma vulgare</i>
<i>Aphanothece nidulans</i>	<i>Dictyosphaerium pulchellum</i>
<i>Arthrodesmus incus</i>	<i>Dinobryon cylindricum</i>
f. <i>minor</i>	<i>Dinobryon divergens</i>
<i>Arthrodesmus incus</i>	<i>Dinobryon sociale</i>
v. <i>indentatus</i>	<i>Diploneis finnica</i>
<i>Asterionella formosa</i>	<i>Diploneis smithii</i>
<i>Botryococcus braunii</i>	<i>Elakathothrix gelatinosa</i>
<i>Bulbochaete</i>	<i>Elakatothrix viridis</i>
<i>Caloneis amphibiaena</i>	<i>Entomoneis</i>
<i>Ceratium hirundinella</i>	<i>Epithemia adnata</i>
<i>Ceratium hirundinella</i>	v. <i>proboscidea</i>
f. <i>carinthiaceum</i>	<i>Epithemia sorex</i>
<i>Ceratium hirundinella</i>	<i>Epithemia turgida</i>
f. <i>furcoides</i>	v. <i>granulata</i>
<i>Ceratium hirundinella</i>	<i>Euastrum</i>
f. <i>scotticum</i>	<i>Eudorina elegans</i>
<i>Chlamydomonas</i>	<i>Euglena</i>
<i>Chlorella</i>	<i>Eunotia arcus</i>
<i>Chlorosarcina consociata</i>	v. <i>bidens</i>
<i>Chroococcus limneticus</i>	<i>Eunotia incisa</i>
<i>Chroococcus limneticus</i>	<i>Eunotia naegelii</i>
v. <i>distans</i>	<i>Eunotia pectinalis</i>
<i>Chroococcus minimus</i>	v. <i>minor</i>
<i>Chroococcus minutus</i>	<i>Fragilaria construens</i>
<i>Chroococcus turgidus</i>	<i>Fragilaria cotonensis</i>
<i>Closterium aciculare</i>	<i>Fragilaria leptostauron</i>
<i>Cocconeis placentula</i>	<i>Frustulia rhomboides</i>
<i>Cocconeis placentula</i>	<i>Glenodinium</i>
v. <i>lineata</i>	<i>Gloeocapsa</i>
<i>Coelastrum microporum</i>	<i>Gloecystis</i>
<i>Coelastrum reticulatum</i>	<i>Gloeothece rupestris</i>
<i>Coelosphaerium kuetzingianum</i>	<i>Golenkinia</i>
<i>Coelosphaerium naegelianum</i>	<i>Gomphonema herculeana</i>
<i>Cosmarium</i>	<i>Gomphonema acuminatum</i>
<i>Crucigenia apiculata</i>	<i>Gomphonema gracile</i>
<i>Crucigenia rectangularis</i>	

<i>Gamphonema olivaceum</i>	<i>Pediastrum duplex</i>
<i>Gamphonema truncatum</i>	v. <i>reticulatum</i>
<i>Gomphosphaeria lacustis</i>	<i>Pediastrum tetras</i>
<i>Gonatozygon</i>	v. <i>tetraodon</i>
<i>Gymnodinium album</i>	<i>Peridinium inconspicuum</i>
<i>Gyrosigma</i>	<i>Peridinium tabulatum</i>
<i>Hannaea arcus</i>	<i>Peridinium willei</i>
<i>Hantzschia</i>	<i>Phormidium mucicola</i>
<i>Kirchneriella lunaris</i>	<i>Pinnularia gentilis</i>
<i>Kirchneriella subsolitaria</i>	<i>Pinnularia microstauron</i>
<i>Lagerheimia</i>	<i>Pinnularia nobilis</i>
<i>Lepocinclis</i>	<i>Quadrigula</i>
<i>Lyngbya</i>	<i>Raphidiopsis curvata</i>
<i>Mallomonas acaroides</i>	<i>Rhizosolenia eriensis</i>
<i>Melosira ambigua</i>	<i>Rhoicosphenia curvata</i>
<i>Melosira distans</i>	<i>Rhopalodia gibba</i>
<i>Melosira granulata</i>	<i>Scenedesmus abundans</i>
<i>Melosira granulata</i> v. <i>angustissima</i>	<i>Scenedesmus arcuatus</i>
<i>Melosira italica</i>	<i>Scenedesmus balatonicus</i>
<i>Melosira italica</i> v. <i>tenuissima</i>	<i>Scenedesmus bicaudatus</i>
<i>Melosira undulata</i>	<i>Scenedesmus bijuga</i>
<i>Melosira varians</i>	<i>Scenedesmus denticulatus</i>
<i>Merismopedia minima</i>	<i>Scenedesmus denticulatus</i> v. <i>linearis</i>
<i>Merismopedia tenuissima</i>	<i>Scenedesmus dimorphus</i>
<i>Micrasterias</i>	<i>Scenedesmus intermedius</i>
<i>Microcystis aeruginosa</i>	<i>Scenedesmus opoliensis</i>
<i>Microcystis incerta</i>	<i>Scenedesmus protuberans</i>
<i>Mougeotia</i>	<i>Scenedesmus quadricauda</i>
<i>Navicula cuspidata</i>	<i>Scenedesmus quadricauda</i> v. <i>quadrispina</i>
<i>Navicula cuspidata</i> v. <i>major</i>	<i>Scenedesmus serratus</i>
<i>Navicula gastrum</i>	<i>Schroederia setigera</i>
<i>Navicula pupula</i>	<i>Scytonema</i>
v. <i>rectangularis</i>	<i>Skeletonema potamos</i>
<i>Neidium</i>	<i>Sphaerocystis schroeteri</i>
<i>Nephrocytium agardhianum</i>	<i>Spirulina labyrinthiformis</i>
<i>Netrium digitus</i>	<i>Spondylosium planum</i>
<i>Nitzschia acicularis</i>	<i>Staurastum sebaldi</i>
<i>Nitzschia angustata</i>	v. <i>productum</i>
<i>Nitzschia filiformis</i>	<i>Stauroneis anceps</i>
<i>Nitzschia holsatica</i>	f. <i>gracilis</i>
<i>Nitzschia palea</i>	<i>Stauroneis phoenicenteron</i>
<i>Nitzschia vernicularis</i>	<i>Stephanodiscus niagareae</i>
<i>Oocystis</i>	<i>Surirella angustata</i>
<i>Oscillatoria limnetica</i>	<i>Surirella elegans</i>
<i>Oscillatoria limosa</i>	<i>Surirella linearis</i>
<i>Pandorina morum</i>	v. <i>constricta</i>
<i>Pediastrum boryanum</i>	<i>Surirella ovata</i>
<i>Pediastrum duplex</i>	<i>Synedra cyclopum</i>
	<i>Synedra delicatissima</i>

Synedra delicatissima
v. *angustissima*
Synedra ulna
Tabellaria fenestrata
Tetraedron caudatum
Tetraedron minimum

Tetraedron minimum
v. *scrobiculatum*
Tetraedron muticum
Tetrastrum staurogeniaeforme
Treubaria
Westella botryoides
Xanthidium

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: AMERICAN LAKE
STORET NUMBER: 5301

NYGAARD TROPHIC STATE INDICES

	DATE	04 01 75	07 17 75	10 29 75
MYXOPHYCEAN		2.00 E	3.50 E	3.00 E
CHLOROPHYCEAN		6.00 E	5.00 E	3.00 E
EUGLENOPHYTE		0/08 ?	0/17 ?	0/18 ?
DIATOM		0.40 E	0.29 ?	0.50 E
COMPOUND		10.0 E	9.50 E	6.67 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	04 01 75	07 17 75	10 29 75
GENUS		03	05	07
SPECIES		03	03	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	04 01 75	07 17 75	10 29 75
AVERAGE DIVERSITY	H	2.56	2.50	3.19
NUMBER OF TAXA	S	20.00	34.00	33.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	4.32	5.09	5.04
MINIMUM DIVERSITY	MINH	0.15	0.27	0.22
TOTAL DIVERSITY	D	3975.68	3695.00	5681.39
TOTAL NUMBER OF INDIVIDUALS/ML	N	1553.00	1478.00	1781.00
EVENNESS COMPONENT	J	0.59	0.49	0.63
RELATIVE EVENNESS	RJ	0.58	0.47	0.62
MEAN NUMBER OF INDIVIDUALS/TAXA	L	77.65	43.47	53.97
NUMBER/ML OF MOST ABUNDANT TAXON	K	435.00	529.00	438.00

TAXA	FORM	04 01 75			07 17 75			10 29 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ANABAENA #1	FIL									X
ANABAENA #2	FIL				2.5		37			X
ANKISTRODESMUS FALCATUS	CEL	1	4.0	62	3.7		55			
APHAENOMON FLOS-AQUAE							X	151	4.9	88
APHANOCAPSA DELICATISSIMA	COL			X					6.6	117
APHANOCAPSA GLACHISTA	COL							11	24.6	438
APHANOTHECE ?	COL				3.7		55			
ASTERIONELLA FORMOSA	CEL			X				141	9.8	175
BOTRYOCOCCUS BRAUNII	COL									X
CERATIUM HIRUNDINELLA	CEL				1.2		18			
CHROOCOCCUS	COL									X
CHROOCOCCUS MINUTUS	CEL				1.2		10			
CHROOMONAS ?	CEL	19	24.0	373	12	34.6	511	13	14.8	263
COCCONEIS PLACENTULA	CEL			X			X			
COELASTRUM MICROPORUM	COL						X			
COELOSPHAEPIUM KUETZINGIANUM	COL				15	3.7	55			
COELOSPHAEPIUM NAEGETIANUM	COL									X
COSMARIA	CEL		2.0	31			X			
CRUCIGENIA APIFOLIA	COL						X			
CRYPTOMONAS	CEL				1.2		18			
CRYPTOMONAS EROSA	CEL	14	8.0	124					1.6	29
CRYPTOMONAS MARSHONII	CEL		2.0	31					4.9	88
CYCLOTELLA COMTA	CEL				35.8		529			
CYMBELLA	CEL						X			
DICTYOSPHAERIUM PULCHELLUM	COL			X					1.6	29
DINORRYN CYLINDRICUM	CEL						X			X
DINORRYN DIVERGENS	CEL						X			X
EUDOPINA ELEGANS	COL						X			
FRAGILARIA ?	CEL			X						
FRAGILARIA CROTONENSIS	CEL	11	28.0	435			X	12	18.0	321
KIRCHNERIELLA	CEL			X						
KIRCHNERIELLA LUNARIS	CEL									X
KIRCHNERIELLA SUBSOLITARIA	CEL						X			
MALLOMINAS ACAROIDES	CEL						X			X
MELOSIPA ITALICA	CEL	12	24.0	373	13	6.2	91		3.3	58
MELOSIPA ITALICA ?	CEL									
NAVICULA PUPULA										
V. RECTANGULARIS	CEL									
OOCYSTIS	CEL			X	14	4.9	73			X
OSCILLATORIA	FIL			X						
OSCILLATORIA #1	FIL						X		3.3	58
OSCILLATORIA #2	FIL						X			
PANDORINA MURUM	COL						X			
PEDIASTRUM BORYANUM	COL						X			X
PEDIASTRUM DUPLEX	COL									
PERIDINIUM WILLEI	CEL			X						
PINNULARIA NOBILIS	CEL						X			
SCENEDESMUS DENTICULATUS	COL						X			
SCENEDESMUS QUADRICAUDA	COL			X						
SCHROEDERIA SETIGERA	CEL				1.2		18		1.6	29
SCYTONYNA ?	FIL									X
SPHAEROCYSTIS SCHROETERI	COL									X
SPONDYLOPSIUM PLANUM	CEL									X
STAURASTRUM #1	CEL									X
STAUPASTRUM #2	CEL						X			X
STAURIFIS	CEL						X			
STEPHANODISCUS NIAGARAE	CEL	13	6.0	93					4.9	88
SURIRELLA FLEGANS	CEL						X			
SYNDROM CYCLOPUM	CEL		2.0	31						X
TABELLARIA FENESTRATA	CEL			X						X
TETRAEDRON MINIMUM	CEL						X			
WESTELIA BOTRYOIDES	COL						X			
TOTAL					1553		1478		1781	

LAKE NAME: BANKS LAKE
STORET NUMBER: 5302

NYGAARD TROPHIC STATE INDICES

DATE 04 03 75 07 22 75 09 10 75

MYXOPHYCEAN	02/0 E	03/0 E	04/0 E
CHLOROPHYCEAN	0/0 O	01/0 E	0/0 O
EUGLENOPHYTE	0/02 ?	0/04 ?	0/04 ?
DIATOM	1.00 E	0.62 E	0.75 E
COMPOUND	06/0 E	09/0 E	07/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE 04 03 75 07 22 75 09 10 75

GENUS	00	03	06
SPECIES	00	03	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 04 03 75 07 22 75 09 10 75

AVERAGE DIVERSITY	H	1.32	2.45	2.74
NUMBER OF TAXA	S	14.00	22.00	14.00
NUMBER OF SAMPLES COMPOSITED	M	5.00	5.00	5.00
MAXIMUM DIVERSITY	MAXH	3.81	4.46	3.81
MINIMUM DIVERSITY	MINH	0.04	0.18	0.07
TOTAL DIVERSITY	D	5203.44	3383.45	6173.22
TOTAL NUMBER OF INDIVIDUALS/ML	N	3942.00	1381.00	2253.00
EVENNESS COMPONENT	J	0.35	0.55	0.72
RELATIVE EVENNESS	RJ	0.34	0.54	0.72
MEAN NUMBER OF INDIVIDUALS/TAXA	L	281.57	62.77	160.93
NUMBER/ML OF MOST ABUNDANT TAXON	K	3034.00	662.00	624.00

LAKE NAME: BANKS LAKE
STORED NUMBER: 5302

CONTINUED

TAXA	FORM	04 03 75			07 22 75			09 10 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ANABAENA #1	FIL			12 12.01	166		3.1			69
ANABAENA #2	FIL			14 4.01	55					X
ANKistrodesmus falcatus	CEL			1 4.01	55					
APHANIZOMENON	FIL						14 7.7			173
APHANIZOMENON FLOS-AQUAE	FIL			15 2.01	28					
ASTERIONELLA FORMOSA	CEL	11 77.01	3034	13 10.01	248	12 27.7		624		
CENTRIC DIATOM	CEL	1 1.01	72							
CHROOMonas ?	CEL	1 2.41	96	1 4.01	55	1 10.8		243		
CRYPTOMONAS	CEL			X						X
CYMBELLA	CEL						X			
DACTYLOCUCOPHYSE	CEL	15 2.41	96							
DINOBRYON DIVERGENS	CEL	13 3.01	119			X				X
EPITHEMIA BOREX	CEL					X				
FLAGELLATE #9	CEL				2.0	28				
FRAGILARIA CROTONENSIS	CEL			X	2.01	28	13 18.5		416	
GYMNODINIUM	CEL			X						
LYNGBYA	FIL	14 4.21	167							
MELGORIRA GRANULATA										
V. ANGUSTISSIMA	CEL				2.01	28	15 7.7		173	
MELOSIRA ITALICA	CEL			X	147.91	662				X
MELOSIRA VARIANS	CEL			X			X			
MOGEOTIA	FIL					X				
NITZSCHEA	CEL				2.01	28				
NITZSCHEA HOLSATICA	CEL					X				
NITZSCHEA VERMICULARIS	CEL			X						
OSCILLATORIA	FIL							3.1		69
STEPHANODISCUS	CEL					X				
STEPHANODISCUS NIAGARAE	CEL			X		X		1.6		35
SYNEDRA	CEL					X				
SYNEDRA CYCLOPUM	CEL					X				X
TABELLARIA FENESTRATA	CEL	12 9.11	358			X	11 20.01		451	
ULOTHRIX ?	FIL					X				
TOTAL				3942		1381		2253		

LAKE NAME: CHELAN LAKE
STORET NUMBER: 5303

NYGAARD TROPHIC STATE INDICES

	DATE	04 02 75	07 21 75	09 11 75
MYXOPHYCEAN		0/0 0	01/0 E	01/0 E
CHLOROPHYCEAN		02/0 E	02/0 E	0/0 0
EUGLENOPHYTE		0/02 ?	0/03 ?	0/01 ?
DIATOM		0.25 ?	0/03 ?	0/03 ?
COMPOUND		04/0 E	03/0 E	01/0 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	04 02 75	07 21 75	09 11 75
GENUS		01	00	00
SPECIES		00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	04 02 75	07 21 75	09 11 75
AVERAGE DIVERSITY	H	1.74	1.62	0.00
NUMBER OF TAXA	S	13.00	10.00	5.00
NUMBER OF SAMPLES COMPOSITED	M	7.00	6.00	7.00
MAXIMUM DIVERSITY MAXH		3.70	3.32	2.32
MINIMUM DIVERSITY MINH		0.18	0.20	0.27
TOTAL DIVERSITY	D	1266.72	764.64	0.00
TOTAL NUMBER OF INDIVIDUALS/ML	N	728.00	472.00	122.00
EVENNESS COMPONENT	J	0.47	0.49	0.00
RELATIVE EVENNESS	RJ	0.45	0.46	-0.13
MEAN NUMBER OF INDIVIDUALS/TAXA	L	56.00	47.20	24.40
NUMBER/ML OF MOST ABUNDANT TAXON	K	374.00	262.00	122.00

LAKE NAME: CHELAN LAKE
STORET NUMBER: 9303

CONTINUED

TAXA	FORM	04 02 75			07 21 75			09 11 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
APHAENOTHECE	COL	1	1		161	5.51	26	1	1	
ASTERTONELLA FORMOSA	CEL	1	1	51.4	374	12	22.21	105	1	X
CHLAMYDOMONAS	CEL	1	1		1	1		1	1	X
CHLOROPHYTAN COLONY	COL	1	1		13	16.71	79	1	1	
COELASTRUM MICROPORUM	COL	1	1				X	1	1	
CRYPTOMONAS	CEL			X			X			
CYCLOTELLA OCELLATA	CEL	1	1	20.11	146					
CYMBELLA	CEL	1	1	2.91	21					
DINOBRYON CYLINDRICUM	CEL						X			
EUNOTIA	CEL								X	
EUNOTIA NAEGELII	CEL						X			
FRAGILARIA	CEL	1	1		X	1				
MALLOMONAS	CEL	1	1				X			
MELOBIRIA	CEL	1	1		X	1				
NAVICULA	CEL	1	1		X	1				
NITZSCHIA	CEL	1	1		X	1				
OOCYSTIS	CEL	1	1	2.91	21					
OSCILLATORIA	FIL	1	1						X	
SCENEDESMUS SERRATUS	COL	1	1				X			
SURIRELLA ANGUSTATA	CEL			X						
SYNEDRA ?	CEL			X						
TABELLARIA FENESTRATA	CEL	1	1	22.81	166	1155.51	262	1	1	100.1
TETRASTRUM STAUROGENIAEFORME	COL	1	1	X	1	1	1	1	1	122
TOTAL					728		472			122

LAKE NAME: DIAMOND LAKE
STORET NUMBER: 5304

NYGAARD TROPHIC STATE INDICES

DATE	06	04	75	07	23	75	09	10	75	10	24	75
MYXOPHYCEAN	1.00	E		0.67	E		2.67	E		6.00	E	
CHLOROPHYCEAN	3.00	E		0.17	O		1.33	E		4.00	E	
EUGLENOPHYTE	0/04	?		0/10	?		0.08	?		0/10	?	
DIATOM	0.20	?		0.11	?		0.15	?		0.25	?	
COMPOUND	5.00	E		1.00	O		5.67	E		11.0	E	

PALMER'S ORGANIC POLLUTION INDICES

DATE	06	04	75	07	23	75	09	10	75	10	24	75
GENUS			01			09			19			00
SPECIES			00			00			00			00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	06	04	75	07	23	75	09	10	75	10	24	75
AVERAGE DIVERSITY	H		2.27	.		3.85		4.53		0.68		
NUMBER OF TAXA	S		17.00			51.00		52.00		22.00		
NUMBER OF SAMPLES COMPOSITED	M		2.00			2.00		2.00		2.00		
MAXIMUM DIVERSITY	MAXH		4.09			5.67		5.70		4.46		
MINIMUM DIVERSITY	MINH		0.25			0.14		0.18		0.62		
TOTAL DIVERSITY	D		1582.19			19461.75		17114.34		225.08		
TOTAL NUMBER OF INDIVIDUALS/ML	N		697.00			5055.00		3778.00		331.00		
EVENNESS COMPONENT	J		0.56			0.68		0.79		0.15		
RELATIVE EVENNESS	RJ		0.53			0.68		0.79		0.02		
MEAN NUMBER OF INDIVIDUALS/TAXA	L		41.00			99.12		72.65		15.05		
NUMBER/ML OF MOST ABUNDANT TAXON	K		306.00			969.00		366.00		289.00		

TAXA	FORM	06 04 75			07 23 75			09 10 75			10 24 75		
		IS	SC	ALGAL UNITS PER ML	IS	SC	ALGAL UNITS PER ML	IS	SC	ALGAL UNITS PER ML	IS	SC	ALGAL UNITS PER ML
ACHNANTHES	CEL												
ANABENA	FIL	4.0	28		11.0	554							
ANKISTRODESMUS FALCATUS	CEL												
V. ACICULARIS	FIL												
APHANIZOMENON FLOS-AQUAE	COL												
APHANOcapsa ELACHISTA	COL												
APHANOTHECE	COL												
APHANOTHECE MIDULANS	COL			X			X		1.1	41			
ASTERIONELLA FORMOSA	COL												
BOTRYOCOCCUS BRAUNII	COL						X						
BULBOCHAETE	FIL												
CERATUM HIRUNDINELLA	CEL												
CHLOROPHYTAN FILAMENT	FIL	8.0	56										
CHLORUSAPCINA CONCACIATA	COL								0.5	20			
CHROOCOCCUS LIMNETICUS ?	COL												
CHROOCOCCUS LIMNETICUS	COL												
V. DISTANS	COL												
CHROOCOCCUS MINIMUS	COL												
CHROOCOCCUS TURGIDUS	COL												
CHROOMONAS ?	CEL	8.0	56		1.4	69							
CLOSTERIUM	CEL												
COCCONEIS PLACENTULA	CEL												
COELASTRUM MICROPORUM	COL												
COELOSPHERIUM KUETZINGIANUM	COL												
COSMARIUM	CEL												
COSMARIUM #1	CEL												
COSMARIUM #2	CEL												
COSMARIUM #3	CEL												
COSMARIUM #4	CEL												
COSMARIUM #5	CEL												
COSMARIUM spp.	CEL												
CRYPTOMONAS	CEL			X									
CRYPTOMONAS EROSA	CEL												
CRYPTOMONAS MARSSONI	CFL	4.0	28		0.7	35			1.1	41			
CYANOPHYTAN FILAMENT	FIL								2.1	81			
CYCLOTELLA	CEL								4.8	193			
CYCLOTELLA COMTA	CEL												
CYCLOTELLA spp.	CEL												
CYCLOTELLA STELLIGERA	CEL	24.0	167						7.5	284			
CYMATOPLEURA	CEL												
CYMBELLA #1	CEL												
CYMBELLA #2	CEL								3.8	142			
CYMBELLA #3	CEL								4.3	163			
CYMBELLA #4	CEL								0.5	20			
CYMBELLA spp.	CEL												
DESMIDIUM BAILEYI	CEL												
V. SUBCIRCULARE	CEL												
DESMIDIUM SWARTZII	CEL												
DIATOMA VULGARE	CEL												
V. BREVE ?	CEL												
DINOBRYON DIVERGENS	CEL	43.9	306		0.7	35							
DIPLONEIS SMITHII	CEL												
ELAKATOTHRIX GELATINOSA	CEL												
ELAKATOTHRIX VIRIDIS	CEL			X									
EPITHEMIA #1	CEL												
EPITHEMIA ADNATA	CEL												
V. PROROSIDEA	CEL												
EPITHEMIA SOREX	CEL												
EPITHEMIA TURGIDA	CEL												
V. GRANULATA	CEL												
EUASTRUM	CEL												
EUGLEMA	CEL												
EUGLENOPHYTAN CELL	CEL												
EUNOTIA ARCUS	CEL												
V. BIDENS	CEL												
EUNOTIA spp.	CEL												
EUNOTIA VALIDA ?	CEL												
FRAGILARIA #2	CEL												
FRAGILARIA CONSTRIENS	CEL												
FRAGILARIA CROTONENSIS	CEL												
GLOEOCAPSA	COL												
GLOEOCAPSA ?	COL												
GLOEOCAPSA RUPESTRIS	COL												
GOMPHONEMA ACUMINATUM	CEL												
GOMPHONEMA GRACILE	CEL												
GOMPHONEMA OLIVACEUM	CEL												
GONATOZYGIUM	CEL												
GYMNODINIUM	CEL												
LYNGBYA	FIL												
MELOBIRA GRANULATA	CEL			X					1.6	61			
MELOBIRA ITALICA	CEL												
MERISMOPEDIA MINIMA	COL								5.4	203			
MICRASTERIAS	CEL								5.4	203			
NAVICULA	CEL			X	2.7	138							
NAVICULA #1	CEL												

LAKE NAME: DIAMOND LAKE
STONET NUMBER: 5304

CONTINUED

TAXA	FORM	06 04 75			07 23 75			09 10 75			10 24 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
NAVICULA #2	CEL						X			X			
NAVICULA #3	CEL						6.8	346					X
NAVICULA spp.	CEL												
NETRIUM DIGITUS	CEL						X			244			
NITZSCHIA FILIFORMIS	CEL												
OOCYSTIS	CUL		8.0	56						1.6	61		
OSCILLATORIA	FIL						0.7	35					X
OSCILLATORIA LIMOSA	FIL							X					
PERIDINIUM TABULATUM	CEL												
PERIDINIUM WILLEI	CEL												X
PHORMIDIUM	FIL						19.2	969					
PLANULARIA	CEL							X					
PINNULARIA MICROSTAURON	CEL									1.1	41		
RHOPALODIA GIBBA	CEL							X					
SCENEDESMUS	CUL						0.7	35					
SCENEDESMUS ARCUATUS	CUL						X						
SCENEDESMUS BIJUGA	CUL						2.1	104		0.5	20		
SCENEDESMUS DENTICULATUS	COL									2.1	81		
V. LINEARIS	COL												
SCENEDESMUS QUADRICAUDA	COL									0.5	20		
V. QUADRISPINA	COL												
SCYTONEEMA	FIL									7.5	284		
STAURASTRUM	CEL												
STAURASTRUM #1	CEL						1.4	69					X
STAURASTRUM SEBALDI	CEL												
V. PRODUCTUM	CEL							X					
STAURONEIS	CEL						0.7	35					
STAURONEIS ANCEPS	CEL									1.6	61		
F. GRACILIS	CEL												
STEPHANODISCUS	CEL												
SURIRELLA LINEARIS	CEL												
V. CONSTRICTA	CEL												X
SINEDRA ULCNA	CEL												X
TABELLARIA FENESTRATA	CEL						X	0.7	35	4.3	163		
TETRAEDRON MINIMUM	CEL												
V. SCORICULATUM	CEL						0.7	35		1.1	41		
XANTHIDIUM	CEL												
TOTAL				697			5055			3778			331

LAKE NAME: GREEN LAKE
STOREY NUMBER: 5305

NYGAARD TROPHIC STATE INDICES

DATE 04 01 75 07 18 75 10 29 75

MIXOPHYCEAN	02/0	E	1.33	E	1.00	E
CHLOROPHYCEAN	03/0	E	0.67	?	1.50	E
EUGLENOPHYTE	0/05	?	0/06	?	0/10	?
DIATOM	0.38	E	0.25	?	0.62	E
COMPOUND	10/0	E	2.67	E	3.75	E

PALMER'S ORGANIC POLLUTION INDICES

DATE 04 01 75 07 18 75 10 29 75

GENUS	00	07	00
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 04 01 75 07 18 75 10 29 75

AVERAGE DIVERSITY	H	1.85	2.19	2.48
NUMBER OF TAXA	S	31.00	22.00	32.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00	2.00
MAXIMUM DIVERSITY	MAXH	4.95	4.46	5.00
MINIMUM DIVERSITY	MINH	0.05	0.23	0.26
TOTAL DIVERSITY	D	15321.70	2323.59	3583.60
TOTAL NUMBER OF INDIVIDUALS/ML	N	8282.00	1061.00	1445.00
EVENNESS COMPONENT	J	0.37	0.49	0.50
RELATIVE EVENNESS	RJ	0.37	0.47	0.47
MEAN NUMBER OF INDIVIDUALS/TAXA	L	267.16	48.23	45.16
NUMBER/ML OF MOST ABUNDANT TAXON	K	3960.00	341.00	676.00

LAKE NAME: GREEN LAKE
STORET NUMBER: 5305

CONTINUED

TAXA	FORM	04 01 75			07 18 75			10 29 75		
		IS	%C	PER ML	IS	%C	PER ML	IS	%C	PER ML
AMPHORA	CEL	1	1	1	1	1	1	1	1	X
ANABAENA	FIL									X
ANABAENA #1	FIL	151	0.5	38				1110.9	157	
ANKISTRODESmus FALCATUS	CEL			X						X
APHANIZOMENON FLORS-AQUAE	FIL	1130.0	0.01	2487				1216.5	94	
ASTERIONELLA FORMOSA	CEL	2147.8	0.1	3960				13146.0	676	
CENTRIC DIATOM	CEL	1	0.7	57				111.1	16	
CHLAMYDOMONAS ?	CEL	1	0.51	38						
CHLOROPHYTAN COLONY	COL	1	0.21	19						
CHROOMONAS ?	CEL				10.7		114			
CHRYZOPHYTAN FLAGELLATE	CEL							15114.0	204	
CHRYZOPHYTAN FLAGELLATED EPIPHYTE	CEL									X
CLOSTERIUM	CEL			4	3.6		38			X
COCCONEIS PLACENTULA										
V. ?	CEL									
COELASTRUM MICROPORUM	COL									X
COELASTRUM RETICULATUM	COL			X						X
COSMARIUM	CEL									X
CRYPTOMONAS	CEL	1	0.5	38				3.3	47	
CYCLOTELLA BODANICA	CEL			2117.0		189				X
CYMATOPLEURA SOLEA	CEL			X						
CYMBELLA #1	CEL									
CYMBELLA #2	CEL			X			X			X
DICTYOSPHELIUM PULCHELLUM	COL									
DINOBRYON CYLINDRICUM	CEL	1	0.2	19			X			
DIPLONEIS PINNICA	CEL			X						
ENTOMONEIS	CEL			X						
EPITHEMIA	CEL			X						
FUDORINA ELEGANS	COL			X						
FUNOTIA INCISA ?	CEL			X						
FLAGELLATE	CEL	141	3.5	287						
FRAGILARIA #1	CEL						X			
FRAGILARIA #2	CEL									X
FRAGILARIA CROTONENSIS	CEL	13115.7	1	1301			X	1410.9	157	
GLOEOPCYSTIS	COL			51	3.6		38			
GOMPHONEMA TRUNCATUM	CEL						X			
GYROBIGMA	CEL			X			X			
MALLOMONAS	CEL							1.1	16	
MELOBIRIA	CEL			X						X
MELOBIRIA AMBIGUA	CEL			X						
MELOBIRIA ITALICA	CEL			X						
MELOBIRIA UNDULATA	CEL			X						
MICROCYTIS INCERTA	COL			1132.1		341				
NAVICULA CUSPIDATA										
V. MAJOR	CEL			X						
HITZBCHIA TRYBLIONELLA										
V. DEBILIS ?	CEL			X						
OOCYSTIS	CEL									
OSCILLATORIA	CEL						X		2.1	31
PEDIASTRUM BORYANUM	FIL			3132.1		341		1.1	16	
PERIDINIUM WILLEI	COL									X
PENNULARIA GENTILIS	CEL			X						
RHOPALODIA GIBBA	CEL			X						X
SCHROEDERIA BETIGERA	CEL	1	0.2	19						
Sphaerocystis SCHAUETERI	COL							2.1	31	
SPONDYLOSIMUM PLANUM	CEL									X
STAURASTRUM	CEL						X			X
STYURONEIS PHOENICENTERON	CEL						X			
STEPHANO DISCUS	CEL	1	0.21	19						
STEPHANO DISCUS #1	CEL						X			X
STEPHANO DISCUS NIAGARAE	CEL			X						
SURIRELLA	CEL			X						
TOTAL					8282		1061		1445	

LAKE NAME: KEECHELUS LAKE
STORET NUMBER: 5306

NYGAARD TROPHIC STATE INDICES

	DATE	07 21 75	09 12 75	10 28 75
MYXOPHYCEAN		01/0 E	02/0 E	1,00 E
CHLOROPHYCEAN		0/0 O	01/0 E	0/01 O
EUGLENOPHYTE		0/01 ?	0/03 ?	0/01 ?
DIATOM		2,00 E	0,25 ?	01/0 E
COMPOUND		03/0 E	05/0 E	2,00 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	07 21 75	09 12 75	10 28 75
GENUS		02	01	00
SPECIES		00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	07 21 75	09 12 75	10 28 75
AVERAGE DIVERSITY	H	1,30	1,75	1,01
NUMBER OF TAXA	S	6,00	18,00	7,00
NUMBER OF SAMPLES COMPOSTED	M	3,00	3,00	3,00
MAXIMUM DIVERSITY MAXH		2,58	4,17	2,81
MINIMUM DIVERSITY MINH		0,08	0,33	0,86
TOTAL DIVERSITY	D	865,80	948,50	48,48
TOTAL NUMBER OF INDIVIDUALS/ML	N	666,00	542,00	48,00
EVENNESS COMPONENT	J	0,50	0,42	0,36
RELATIVE EVENNESS RJ		0,49	0,37	0,08
MEAN NUMBER OF INDIVIDUALS/TAXA	L	111,00	30,11	6,86
NUMBER/ML OF MOST ABUNDANT TAXON	K	466,00	195,00	24,00

LAKE NAME: KEECHELUS LAKE
STORE NUMBER: 5306

CONTINUED

TAXA	FORM	07 21 75			09 12 75			10 28 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ANABAENA	FIL			X						
ANABAENA FLOES-AQUAE	FIL									
APHAENOCAPSIA	COL						X			X
CERATIUM HIRUNDINELLA	CEL									
F. CARTHAGINUM	CEL						X			
CHLORELLA	CEL									
CHLOROPHYTAN CELL	CEL			2136.0		195				
CHLOROPHYTAN COLONY	COL									X
CHROOMONAS ?	CEL	14	13.4	89				2150.0		24
COSMARIA	CEL									
CRYPTOMONAS	CEL	13	3.3	22	14	4.1	22			X
CYCLOTELLA STELLIGERA	CEL	11	70.0	466						X
CYMBELLA	CEL						X			
DINORRYON SOCIALE	CEL				1136.0		195	1150.0		24
FRAGILARIA CROTONENSIS	CEL						X			
MELOSIRA DISTANS	CEL	12	13.4	89	3124.0		130			X
MELOSIRA GRANULATA	CEL						X			
NAVICULA	CEL						X			
NEIDIUM	CEL						X			
NITZSCHIA	CEL						X			
NITZSCHIA VERMICULARIS	CEL						X			
OSCILLATORIA LIMNETICA	FIL						X			
PENNATE DIATOM	CEL				11		X	11		1
PERIDINIUM INCONSPICUUM	CEL						X			
TABELLARIA FENESTRATA	CEL	11	1	X	11	1	X	11	1	
TOTAL				666			542			40

LAKE NAME: MAYFIELD LAKE
STORET NUMBER: 5307

NYGAARD TROPHIC STATE INDICES

DATE	03 28 75	07 17 75	10 30 75
MYXOPHYCEAN	2.00 E	0/0 0	01/0 E
CHLOROPHYCEAN	1.00 E	0/0 0	0/0 0
EUGLENOPHYTE	0/03 ?	0/0 ?	0/01 ?
DIATOM	0.22 ?	0.29 ?	0.50 E
COMPOUND	5.00 E	02/0 E	04/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	03 28 75	07 17 75	10 30 75
GENUS	01	00	00
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	03 28 75	07 17 75	10 30 75	
AVERAGE DIVERSITY	H	1.33	0.51	0.66
NUMBER OF TAXA	S	18.00	12.00	11.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY MAXH		4.17	3.58	3.46
MINIMUM DIVERSITY MINH		0.40	0.10	0.51
TOTAL DIVERSITY	D	574.56	687.48	114.84
TOTAL NUMBER OF INDIVIDUALS/ML	N	432.00	1348.00	174.00
EVENNESS COMPONENT	J	0.32	0.14	0.19
RELATIVE EVENNESS	RJ	0.25	0.12	0.06
MEAN NUMBER OF INDIVIDUALS/TAXA	L	24.00	112.33	15.82
NUMBER/ML OF MOST ABUNDANT TAXON	K	297.00	1223.00	145.00

LAKE NAME: MAYFIELD LAKE
STORET NUMBER: 5307

CONTINUED

TAXA	FORM	03 28 75			07 17 75			10 30 75		
		18	%C	PER ML	18	%C	PER ML	18	%C	PER ML
ANABRENA	FIL	1	1	X	1	1	1	1	1	1
APHANIZOMENON FLOS-AQUAE	FIL				11	90.7	1223	11	93.3	X
ASTERIONELLA FORMOSA	CEL			X						
CHLOROPHYTAN FILAMENT	FIL						X			
CHROOMONAS ?	CEL	14	6.2	27				12	16.7	29
CLOSTERIUM	CEL			X						
COCCONEIS	CEL			X						
CRYPTOMONAS ERDIA	CEL	12	18.7	81	13	1.9	25			
CYMBELLA	CEL			X						
CYMBELLA MEXICANA	CEL								X	
DINORRYON CYLINDRICUM	CEL						X			
EUDORINA ELEGANS	COL			X						
EUNOTIA PECTINALIS	CEL									
V. MINOR	CEL						X			
FRAGILARIA	CEL			X						
FRAGILARIA CROTOWENSIS	CEL			X			X			
FRUSTULIA RHOMBOIDES	CEL						X			
GOMPHONEMA HERCULEANA	CEL									
HELOSIRA ITALICA	CEL								X	
HELOSIRA ITALICA	CEL	11	68.7	297			X		X	
V. TENUISSIMA	CEL						X			
NITZCHIA	CEL						X			
OSCILLATORIA	FIL			X						
PENNATE DIATOM	CEL	13	6.2	27			X			
RHOPALODIA GIBBA	CEL			X						
SPHAEROCYSTIS SCHROETERI	COL			X						
STEPHANODISCUS #1	CEL									
STEPHANODISCUS #2	CEL			X					X	
SYNEDRA	CEL								X	
SYNEDRA ULNA	CEL			X					X	
TABELLARIA FENESTRATA	CEL	11	1	X	121	7.4	100	11	1	X
TOTAL					432		1348		174	

LAKE NAME: MEDICAL LAKE
STORET NUMBER: 5308

NYGAARD TROPHIC STATE INDICES

DATE	06 03 75	07 23 75	09 11 75	10 24 75
MYXOPHYCEAN	05/0 E	2.00 E	4.00 E	2.00 E
CHLOROPHYCEAN	05/0 E	1.50 E	2.00 E	1.00 E
EUGLENOPHYTE	0/10 ?	0/07 ?	0/06 ?	0/06 ?
DIATOM	0/01 ?	0/02 ?	0.50 E	0.25 ?
COMPOUND	10/0 E	3.50 E	7.00 E	3.50 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	06 03 75	07 23 75	09 11 75	10 24 75
GENUS	01	05	03	01
SPECIES	00	05	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	06 03 75	07 23 75	09 11 75	10 24 75
AVERAGE DIVERSITY	H	1.82	2.22	2.52
NUMBER OF TAXA	S	13.00	14.00	12.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	2.00	2.00
MAXIMUM DIVERSITY	MAXH	3.70	3.81	3.58
MINIMUM DIVERSITY	MINH	0.08	0.04	0.04
TOTAL DIVERSITY	D	3538.08	9403.92	10059.84
TOTAL NUMBER OF INDIVIDUALS/ML	N	1944.00	4236.00	3992.00
EVENNESS COMPONENT	J	0.49	0.58	0.70
RELATIVE EVENNESS	RJ	0.49	0.58	0.71
MEAN NUMBER OF INDIVIDUALS/TAXA	L	149.54	302.57	332.67
NUMBER/ML OF MOST ABUNDANT TAXON	K	769.00	2267.00	1331.00
				2047.61
				2467.00
				0.21
				0.20
				154.19
				2032.00

TAXA	FORM	06 03 75			07 23 76			09 11 75			10 24 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
AHABAENA	FIL			X									
AHABAENA FLOS-AQUAE	FIL												
AHABAENA PLANCTONICA	FIL												
APHANOTOMENON FLOS-AQUAE	FIL			X			2.0			86			
APHANOCAPSA DELICATISSIMA	COL						151	6.11		257			
ASTERIONELLA FORMORA	CEL												
CHROODMONAS ?	CEL	11	39.61	769	141	9.11		142					
CLOSTERIUM	CEL												
CLOSTERIUM ACICULARE	CEL									X			
COELASTRUM MICROPORUM	COL									X			
COELASTRUM RETICULATUM	COL												
CRYPTOMONAS	CEL			X									
CRYPTOMONAS EROSA	CEL												
CRYPTOMONAS MARSHONII	CEL	21	11.61	226	131	9.11		385					
CYANOPHYTA FILAMENT	FIL			X									
CYST	CEL												
ELAKATOTHRIX GELATINOSA	CEL			X				X					
FLAGELLATE	CEL							2.0		86			
FRAGILARIA	CEL			X									
FRAGILARIA CROTONENSIS	CEL												
MEDOZIRA	CEL												
MELOSIRA DISTANS	CEL									2.3			
MERISMOPEDIA TENUISSIMA	COL												
MICROCYSTIS AERUGINOSA	COL			X									
MICROCYSTIS INCERTA	COL												
NAVICULA	CEL												
NITZSCHIA	CEL												
NITZSCHIA PALEA	CEL												
OSCILLATORIA	FIL												
PANDORINA MORUM	COL												
PEDIASTRUM BORYANUM	COL									X			
PEDIASTRUM BORYANUM ?	COL												
PEDIASTRUM DUPLEX	COL			X									
PENNATE DIATOM	CEL												
PHORMIDIUM	FIL	14	13.91	271	11		4.0		171	51	28.7		1147
PHORMIDIUM MUCICOLA	FIL												
RHOOPALODIA GIBRA	CEL												
SCHROEDERIA BETIGERA	CEL	13	34.91	678	11						1.21		46
SCHAEROCYSTIS SCHROETERI	COL			X									
STAURASTRUM	CEL									X			
TOTAL					1944				4236			3992	
													2467

LAKE NAME: MOSES LAKE
STORET NUMBER: 5309

NYGAARD TROPHIC STATE INDICES

DATE	04	03	75	07	21	75	09	10	75
MYXOPHYCEAN	2.00	E		10.0	E		3.50	E	
CHLOROPHYCEAN	8.00	E		18.0	E		5.00	E	
EUGLENOPHYTE	0/10	?		0/28	?		0.12	?	
DIATOM	0.16	?		0.67	E		1.50	E	
COMPOUND	14.0	E		32.0	E		11.0	E	

PALMER'S ORGANIC POLLUTION INDICES

DATE	04	03	75	07	21	75	09	10	75
GENUS				10			14		
SPECIES				04			06		

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	04	03	75	07	21	75	09	10	75
AVERAGE DIVERSITY	H		0.69		2.78		1.89		
NUMBER OF TAXA	S		45.00		41.00		30.00		
NUMBER OF SAMPLES COMPOSITED	M		5.00		5.00		5.00		
MAXIMUM DIVERSITY	MAXH		5.49		5.36		4.91		
MINIMUM DIVERSITY	MINH		0.02		0.05		0.04		
TOTAL DIVERSITY	D	28257.57		34421.96		19982.97			
TOTAL NUMBER OF INDIVIDUALS/ML	N	40953.00		12382.00		10573.00			
EVENNESS COMPONENT	J		0.13		0.52		0.38		
RELATIVE EVENNESS	PJ		0.13		0.52		0.38		
MEAN NUMBER OF INDIVIDUALS/TAXA	L	910.07		302.00		352.43			
NUMBER/ML OF MOST ABUNDANT TAXON	K	37528.00		5406.00		7171.00			

TAXA	FORM	04 03 75			07 21 75			09 10 75		
		18	%	ALGAL UNITS PER ML	18	%	ALGAL UNITS PER ML	18	%	ALGAL UNITS PER ML
ACTINASTRUM	CEL						X			
AMPHORA	CEL			X						
ANABAENA	FIL					0.3	34			
ANABAENA #1	FIL							0.7	74	
ANKISTRODESMUS FALCATUS	CEL									
V. ACICULARIS	CEL			X						
APHANIZOMONION FLOS-AQUAE	FIL				143.7		5406		67.8	7171
ASTERIONELLA FORMOSA	CEL	15	0.61	257						
CALONEIS AMPHIBRAENA	CEL			X						
CERATIUM HIRUNDINELLA	CEL							0.3	37	
F. SCOTTICUM	CEL									
CHROOCOCCUS LIMNETICUS	COL				0.31		34		0.3	37
CHROOMONAS ?	CEL	1.0		428	3.91		479		3.1	333
COCCONEIS PLACENTULA	CEL									
V. LINEATA	CEL			X						
COELASTRUM MICROPORUM	COL						X			
COELASTRUM RETICULATUM	COL									
COELOSPHERIUM NAEGELIANUM	COL			X			X		0.31	37
COSMARIUM	CEL				0.51		68			
CRYPTOMONAS	CEL				0.01		103			
CRYPTOMONAS EROSA	CEL	13	1.61	642				41	6.61	702
CRYPTOMONAS MARSSONII	CEL			X						
CYCLOTELLA MENEGHINIANA	CEL				0.51		68			
CYMATOPLEURA	CEL			X						
CYMATOPLEURA SOLEA	CEL			X						
CYMBELLA #1	CEL			X						
CYMBELLA #2	CEL			X						
CYMBELLA MEXICANA	CEL			X						
DIATOMA VULGARE	CEL			X						
DICTYOSPHARIUM PULCHELLUM	COL									
EPITHHEMIA	CEL						X			
EPITHHEMIA TRUNCATA ?	CFL			X						
EUGLENA	CEL							0.31	37	
FUNOTIA INCISA	CEL			X						
FRAGILARIA COMSTRUENS	CEL	1	0.71	300						
FRAGILARIA CROTONENSIS	CEL			X						
FRAGILARIA LEPTOSTAURON	CEL			X						
GLENODINIUM	CEL						X			
GOLENKINIA	CEL			X						
GYMNODINIUM ALBULUM	CEL	1	0.21	86		0.31	34			
HANTZSCHIA	CEL									
LAGERHEIMIA	CEL					0.51	68			
LEPOCINCLIS	CEL									
MELOSIRA	CEL									
MELOSIRA GRANULATA	CEL	14	0.81	342	51	1.1	137	121	4.51	481
MELOSIRA GRANULATA	CEL									
V. ANGSTISSIMA	CEL				41	5.01	616			
MELOSIRA VARIAENS	CEL			X						
MERISMOPEDIA MINIMA	COL				0.51		68			
MICROCYSTIS AERUGINOSA	COL			X			X			
MICROCYSTIS INCERTA	COL				0.51		68			
NAVICULA	CEL			X						
NAVICULA CUSPIDATA	CEL			X						
NAVICULA GASTRUM	CEL			X						
NITZSCHIA	CEL	1	0.41	171			X			
NITZSCHIA ANGUSTATA	CEL						X			
NITZSCHIA VERMICULARIS	CEL			X			X			
OOCYSTIS	CEL	1	0.21	86	2122.71		2806	151	8.01	850
OSCILLATORIA	CFL								0.31	37
OSCILLATORIA TENUIS ?	FIL				0.51		68	131	4.21	444
PEDIASTRUM BORYANUM	COL	1	0.11	43	1.71		205	11	0.31	37
PEDIASTRUM DUPLEX	COL									
PEDIASTRUM DUPLEX	COL									
V. RETICULATUM	COL			X		0.51	68			
PEDIASTRUM SIMPLEX	COL									
V. T	COL									
PEDIASTRUM TETRAS	COL									
V. TETRAODON	COL									
PHOMIDIUM MUCICOLA	FIL						X			
PIMMULAPIA MICROSTAURON	CEL			X						
RHOOPALODIA GIBBA	CEL									
SCENEDESMUS ABUNDANS	COL				4.41		547			
SCENEDESMUS BALATONICUS	COL				0.81		103		0.31	37
SCENEDESMUS BICAUDATUS	COL									
SCENEDESMUS BIJUGA	COL	1	0.31	128						
SCENEDESMUS DIMORPHUS	COL			X						
SCENEDESMUS INTERMEDIUS	COL								0.31	37
SCENEDESMUS OPOLIENSIS	COL			X						
SCENEDESMUS PHOTUBERANS	COL				31	6.61	621	11	1.71	185
SCENEDESMUS QUADRICAUDA	COL	121	1.71	605						
SCHROEDERIA SETIGERA	CEL						X		0.71	74
SPIRULINA LABYRINTIFORMIS	CEL						X			
STAURASTRUM	CEL			X						
STEPHANODISCUS	CEL	1	0.61	37528						
STEPHANODISCUS NIAGARA	CEL	1	0.21	86			X			
SURIRELLA	CEL			X						

LAKE NAME: MOSES LAKE
STORE NUMBER: 5309

CONTINUED

TAXA	FORM	04 03 75			07 21 75			09 10 75		
		IS	AC	ALGAL UNITS PER ML	IS	AC	ALGAL UNITS PER ML	IS	AC	ALGAL UNITS PER ML
SURIRELLA OVATA	CEL	1	1	1	X	1	1	1	1	1
SYNEDRA	CEL	1	1	0.41	171	1	1	1	1	1
SYNEDRA DFPLICATISSIMA	CEL	1	1	1	1	0.51	68	1	1	1
TETRAEDRON CAUDATUM	CEL	1	1	1	1	1	X	1	1	1
TETRAEDRON MINIMUM	CEL	1	1	1	1	0.31	34	1	1	1
TETRAEDRON MUTICUM	CEL	1	1	1	1	0.31	34	1	1	1
TETRASTRUM STAUROGENIAFFORME	CUL	1	1	1	1	3.31	411	1	1	1
TREUBARIA	CEL	1	1	1	1	0.31	34	1	1	1
TOTAL				40953			12382			10573

LAKE NAME: OZETTE LAKE
STORET NUMBER: 5310

NYGAARD TROPHIC STATE INDICES

DATE	03 31 75	07 18 75	10 29 75
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MYXOPHYCEAN	1.00 E	1.00 E	0.67 E
CHLOROPHYCEAN	0.50 ?	1.00 E	1.33 E
EUGLENOPHYTE	0.33 E	0/04 ?	0/06 ?
DIATOM	0.33 E	0.75 E	0.33 E
COMPOUND	3.00 E	3.50 E	2.33 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	03 31 75	07 18 75	10 29 75
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GENUS	02	03	00
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	03 31 75	07 18 75	10 29 75
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AVERAGE DIVERSITY	H	1.84	2.36	2.38
NUMBER OF TAXA	S	18.00	18.00	16.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	4.17	4.17	4.00
MINIMUM DIVERSITY	MINH	0.60	0.13	0.62
TOTAL DIVERSITY	D	496.80	3785.44	523.60
TOTAL NUMBER OF INDIVIDUALS/ML	N	270.00	1604.00	220.00
EVENNESS COMPONENT	J	0.44	0.57	0.60
RELATIVE EVENNESS	RJ	0.35	0.56	0.53
MEAN NUMBER OF INDIVIDUALS/TAXA	L	15.00	89.11	13.75
NUMBER/ML OF MOST ABUNDANT TAXON	K	120.00	719.00	66.00

LAKE NAME: ODETTE LAKE
STOREY NUMBER: 5310

CONTINUED

TAXA	FORM	03 31 75			07 18 75			10 29 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ANABAENA	FIL			X	31	3.4	55			
ANKISTRODESMUS	CEL					6.9	111			
ANKISTRODESMUS FALCATUS	CEL			X						
ANKISTRODESMUS FALCATUS V. ACICULARIS	CEL									
ARTHRODESMUS	CEL			X						X
ARTHRODESMUS INCUS	CEL									
F. MINOR	CEL									X
ARTHRODESMUS INCUS	CEL									
V. INDENTATUS	CEL				21	3.4	55			
ASTERIONELLA FORMOSA	CEL			X			X			
CERATIUM HIRUNDINELLA	CEL			X						
CHROOMONAS ?	CEL	1144.4		120						
CHRISOPHYTAN FLAGELLATE	CEL			X			X			
CLUSTERIUM	CEL			X						
COSMARIUM	CEL						X			
CRYPTOMONAS	CEL	2111.1		30						
CRYPTOMONAS EROSA	CEL				15	6.9	111			X
CYCLOTELLA	CEL	3122.2		60						
DICTYOSPHAERIUM PULCHELLUM	COL									
DIPLONEIS FINNICA	CEL			X						
EUGLENA	CEL			X						
FLAGELLATE #2	CEL				120.7		332			
FRAGILARIA #1	CEL			X						
FRAGILARIA #2	CEL			X						
FRAGILARIA CROTONENSIS	CEL									X
GLOEOPCYSTIS	COL						X			
GYMNODINIUM #1	CEL									
GYMNODINIUM #2	CEL				3.4		55			22
KIRCHNERIELLA	CEL									
KIRCHNERIELLA LUNARIS	CEL						X			X
LYNGBYA	FIL			X						
MELOSIRA DISTANS	CEL	4122.2		60	1144.0		719			
MICROCYSTIS	COL						X			
NAVICULA	CEL			X			X			
OSCILLATORIA LIMNETICA	FIL									
PENNATE DIATOMS	CEL				410.3		166			
RHIZOSOLENIA	CEL						X			
SPHAEROCYSTIS SCHROETERI	COL									
SPONDYLOSITUM PLANUM	CEL									
STEPHANODISCUS	CEL									
SYNEDRA	CEL									
TABELLARIA FENESTRATA	CEL			X			X			X
TOTAL					270		1604			220

LAKE NAME: SAMMAMISH LAKE
STORET NUMBER: 5311

NYGAARD TROPHIC STATE INDICES

DATE 03 31 75 07 17 75 10 28 75

MYXOPHYCEAN	3.00	E	05/0	E	05/0	E
CHLOROPHYCEAN	2.00	E	06/0	E	02/0	E
EUGLENOPHYTE	0/05	?	0/11	?	0/07	?
DIATOM	0.62	E	0.33	E	1.00	E
COMPOUND	10.0	E	13/0	E	11/0	E

PALMER'S ORGANIC POLLUTION INDICES

DATE 03 31 75 07 17 75 10 28 75

GENUS	03		01		01	
SPECIES	00		00		00	

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE 03 31 75 07 17 75 10 28 75

AVERAGE DIVERSITY	H	1.93	1.80	2.19		
NUMBER OF TAXA	S	22.00	23.00	19.00		
NUMBER OF SAMPLES COMPOSITED	M	2.00	4.00	4.00		
MAXIMUM DIVERSITY	MAXH	4.46	4.52	4.25		
MINIMUM DIVERSITY	MINH	0.04	0.13	0.10		
TOTAL DIVERSITY	D	15675.46	3889.80	4758.87		
TOTAL NUMBER OF INDIVIDUALS/ML	N	8122.00	2161.00	2173.00		
EVENNESS COMPONENT	J	0.43	0.40	0.52		
RELATIVE EVENNESS	RJ	0.43	0.39	0.51		
MEAN NUMBER OF INDIVIDUALS/TAXA	L	369.18	93.96	114.37		
NUMBER/ML OF MOST ABUNDANT TAXON	K	5024.00	1081.00	683.00		

LAKE NAME: SANNAMISH LAKE
STORE NUMBER: 5311

CONTINUED

TAXA	FORM	03 31 75			07 17 75			10 28 75		
		IS	SC	ALGAL UNITS PER ML	IS	SC	ALGAL UNITS PER ML	IS	SC	ALGAL UNITS PER ML
ACHMANTHES MICROCEPHALA	CEL						X			
ANABAENA	FIL			X	5	2.1	45			X
APHAZONEMON	FIL							1	1.41	31
APHANOCAPSA DELICATISSIMA	COL							2	31.41	683
APHANOCAPSA ELACHISTA										
V. PLANCTONICA	COL				11	50.01	1081			
APHANOTHECE CLATHRATA	COL	1	0.41	34	2	35.41	765			
ASTERIONELLA FORMOSA	CEL	4	6.0	551						
MOTRYOCOCCUS BRAUNII	COL					2.11	45			X
CERATIUM HIRUNDINELLA										
F. PURCOIDES	CEL			X						X
CHLOROPHYTAN COLONY	COL				4	2.11	45			
CHROMONAS ?	CEL	1	1.7	138		4.21	90	124	31	528
CLOSTERIUM	CEL			X						
COCCONEIS	CEL									X
COCCONEIS PLACENTULA										
V. LINEATA	CEL						X			
COELOSPHAERIUM MARCETIANUM	COL			X			X	13	1.41	31
CRUCIGENIA RECTANGULARIS	COL						X			
CRYPTOMONAS	CEL			X						
CRYPTOMONAS MARSSONII	CEL				13	2.11	45	14	5.71	124
DICTYOSPHERIUM PULCHELLUM	COL						X			
ELAKATOTHRIX GELATINGOSA	CEL			X						
EPITHEMIA	CEL						X			
EPITHEMIA TURGIDA	CEL			X			X			
FRAGILARIA	CEL			X						
FRAGILARIA CRUTONENSIS	CEL	2	14.0	1136			X	1	31.41	683
MALLomonas ACAROIDES	CEL						X			
MELOSIRA ITALICA	CEL	11	61.9	5024			X			
MELOSIRA VARIANS	CEL			X						X
MICROCYSTIS INCERTA	COL									X
NAVICULA	CEL						X			
NEPHROCYTUM AGARDHIANUM	CEL						X			
NITZSCHIA	CEL						X			
ONCYSTIS	CEL	1	0.8	69			X			
PHORMIDIUM ?	FIL						X			
RHIZOBLENIA ERIENSIS	CEL			X		2.11	45	15	1.41	31
Sphaerocystis SCHROETERI	COL						X			
STEPHANODISCUS	CEL	13	7.21	585						
STEPHANODISCUS NIAGARAE	CEL	15	5.71	138						X
SYNEDRA	CEL	1	4.21	344						
SYNEDRA DELICATISSIMA	CEL	1	1.31	103						
V. ANGUSTISSIMA	CEL			X						
TABELLARIA FENESTRATA	CEL									X
TOTAL				8122			2161			2173

LAKE NAME: WHATCOM LAKE
STURET NUMBER: 5312

NYGAARD TROPHIC STATE INDICES

DATE	03 31 75	07 18 75	10 29 75
MYXOPHYCEAN	0/0 D	2.00 E	1.50 E
CHLOROPHYCEAN	01/0 E	1.00 E	1.00 E
EUGLENOPHYTE	0/01 ?	0/06 ?	0/05 ?
DIATOM	0.67 E	0.33 E	0.40 E
COMPOUND	03/0 E	3.50 E	3.50 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	C 31 75	07 18 75	10 29 75
GENUS	01	02	01
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE	03 31 75	07 18 75	10 29 75
AVERAGE DIVERSITY	H	2.03	1.15
NUMBER OF TAXA	S	8.00	15.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00
MAXIMUM DIVERSITY	MAXH	3.00	3.91
MINIMUM DIVERSITY	MINH	0.05	0.16
TOTAL DIVERSITY	D	3282.51	1152.30
TOTAL NUMBER OF INDIVIDUALS/ML	N	1617.00	1002.00
EVENNESS COMPONENT	J	0.68	0.29
RELATIVE EVENNESS	RJ	0.68	0.27
MEAN NUMBER OF INDIVIDUALS/TAXA	L	202.13	66.80
NUMBER/ML OF MOST ABUNDANT TAXON	K	735.00	733.00

LAKE NAME: WHATCOM LAKE
STORET NUMBER: 5312

CONTINUED

TAXA	FORM	03 31 75			07 18 75			10 29 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ANADAGNA	FJD	1	1		1	1	X	1	1	X
APHANOCAPSA	COL	1	1		1	1	X	1	1	
APHANOCAPSA ELACHISTA	COL	1	1		1	1		1	1	8.31
ROTTERDAMIA FORMOSA	CEL	12120.51	331		1	1	X	11120.91	184	
CHROOMONAS 7	CEL	15115.91	257		1	1	X	15116.71	147	
COELOSOPHAEPIUM MAECELIANUM	COL	1	1		1	1	X	1	1	
COSMARIA	CEL	1	1		1	1	X	1	1	
CRUCIGENIA TETRAPEDIA	COL	1	1		1	1		1	1	
CRYPTOMONAS EROSEA	CEL	1	1	X	1	1		1	1	
CYCLOTELLA	CEL	1	1		1	1		1	1	
DINOBYRON DIVERGENS	CEL	1	1		1	1		1	1	
ELAKATOTHRIX GELATINOSA	CEL	1	1		1	1		1	1	
FRAGILARIA CROTONENSIS	CEL	1	1	X	1	1		1	1	
GLOEOSTYLTIS	COL	1	1		1	1	X	1	1	
GOMPHOSPHAFRIA LACUSTRIS	COL	1	1		1	1	X	1	1	
GYMNODINIUM	CEL	1	1		1	1		1	1	
MALLomonas	CEL	1	1		1	1		1	1	
MELOSIRA ITALICA	CEL	11145.51	735		1	1		1	1	
QUADRIGULA	CEL	1	1		1	1	X	1	1	
SCENEDESmus ABUNDANS	COL	1	1		1	1	X	1	1	
SPHAEROCYSTIS SCHROETERI	COL	1	1		1	1		1	1	
SPONDYLOSIMUM PLANUM	CEL	1	1		1	1	X	12120.91	184	
STEPHANODISCUS	CEL	13111.41	184		1	1		1418.31	73	
SYNEDRA	CEL	1	1		12119.31	193		1	1	
SYNEDRA ULNA	CEL	1	1		1	1		1	1	
TABELLARIA FENESTRATA	CEL	1416.81	110	11173.21	733	1	1	1	1	X
TOTAL				1617			1002			882

LAKE NAME: LOWER GRANITE RES.
STORET NUMBER: 5313

NYGAARD TROPHIC STATE INDICES

	DATE	07 23 75	09 12 75
MYXOPHYCEAN		1.00 E	04/0 E
CHLOROPHYCEAN		7.00 E	03/0 E
EUGLENOPHYTE		0/08 ?	0/07 ?
DIATOM		0.58 E	0.40 E
COMPOUND		15.0 E	13/0 E

PALMER'S ORGANIC POLLUTION INDICES

	DATE	07 23 75	09 12 75
GENUS		03	15
SPECIES		01	03

SPECIES DIVERSITY AND ABUNDANCE INDICES

	DATE	07 23 75	09 12 75
AVERAGE DIVERSITY	H	2.28	3.59
NUMBER OF TAXA	S	33.00	31.00
NUMBER OF SAMPLES COMPOSITED	M	6.00	6.00
MAXIMUM DIVERSITY	MAXH	5.04	4.95
MINIMUM DIVERSITY	MINH	0.23	0.13
TOTAL DIVERSITY	D	3762.00	10346.38
TOTAL NUMBER OF INDIVIDUALS/ML	N	1650.00	2882.00
EVENNESS COMPONENT	J	0.45	0.73
RELATIVE EVENNESS	RJ	0.43	0.72
MEAN NUMBER OF INDIVIDUALS/TAXA	L	50.00	92.97
NUMBER/ML OF MOST ABUNDANT TAXON	K	630.00	778.00

TAXA	FORM	07 23 75			09 12 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
ACTINASTRUM HANTZSCHII	CEL			X			
V. FLUVIATILE	FIL						
ANABAENA PLANCTONICA	CEL		1.8	30			X
ANKYTOPODEMUS FALCATUS	CEL			X			
ASTERIONELLA FORMOSA	CEL	11	32.7	540			
CENTRIC DIATOMS	CEL			X			
CHLAMYDOMONAS	CEL			X	1	2.3	65
CHROOCOCCUS MINIMUS	CEL				1	3.4	97
CHROOMONAS ?	CEL		3.6	60	12	27.0	778
COCCONEIS PLACENTULA	CEL			X	1	1.1	32
COELASTRUM MICROPORUM	COL			X			
COSMARIA	CEL			X			
CRYPTOMONAS	CEL			X	1	1.1	32
CYANOPHYTAN FILAMENT	FIL				1	3.4	97
CYCLOTELLA	CEL				13	5.6	162
CYCLOTELLA MENEGHINIANA	CEL			X			
CYMBELLA	CEL			X	1		X
DACTYLOCOCCOPSIS	CEL				1	1.1	32
DIATOMA VULGARE	CEL			X	14	3.4	97
EPITHENIA BOREX	CEL			X	15	1.1	32
FRAGILARIA #1	CEL		*				X
FRAGILARIA #2	CEL				1	1.1	32
FRAGILARIA CROTONENSIS	CEL	13	12.7	210		1.1	32
GLENKINIA	CEL			X			
GOMPHONEMA	CEL			X			
GOMPHONEMA #1	CEL				1	1.1	32
GOMPHONEMA OLIVACEUM	CEL				1		X
HANVAEA ARCUS	CEL			X			
KIRCHNERIELLA	CEL						X
MELOSIRA DISTANS	CEL				11	2.1	324
MELOSIRA GRANULATA	CEL			X	11	5.0	454
MELOSIRA GRANULATA V. ANGUSTISSIMA	CEL				1	1.1	32
MELOSIRA VARIANS	CEL			X			
NAVICULA	CEL	18	1.8	30		1.4	97
NAVICULA #1	CEL						X
NAVICULA #2	CEL						X
NITZSCHIA	CEL				4.5		130
NITZSCHIA ACICULARIS	CEL	14	3.6	60			
OCCYSTIS	CEL		3.6	60			
PANDORINA MORUM	COL			X			
RAPHIDIOPSIS CURVATA	FIL			X			
RHOICOSPHEMIA CURVATA	CEL			X	1	2.3	65
SCENEDESMUS PROTUBERANS	COL		1.8	30			
SCENEDESMUS QUADRICAUDA	COL						X
SCHROEDERIA SETIGERA	CEL			X			
SKELETONEMA POTAMOS	CEL	12	38.2	630		6.0	195
SPHAEROCYSTIS SCHROETERI	COL						X
STEPHANODISCUS	CEL			X			
SYNEDRA ULNA	CEL			X	1	2.3	65
TABELLARIA FENESTRATA	CEL			X			
TOTAL				1650		2882	

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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16. ABSTRACT This is a data report presenting the species and abundance of phytoplankton in the 13 lakes sampled by the National Eutrophication Survey in the State of Washington. 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 lakes *phytoplankton water quality	Washington lake eutrophication Nygaard's trophic indices Palmer's organic pollution indices Species diversity and abundance	06 C, M 08 H 13 B
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