United States
Environmental Protection
Agency

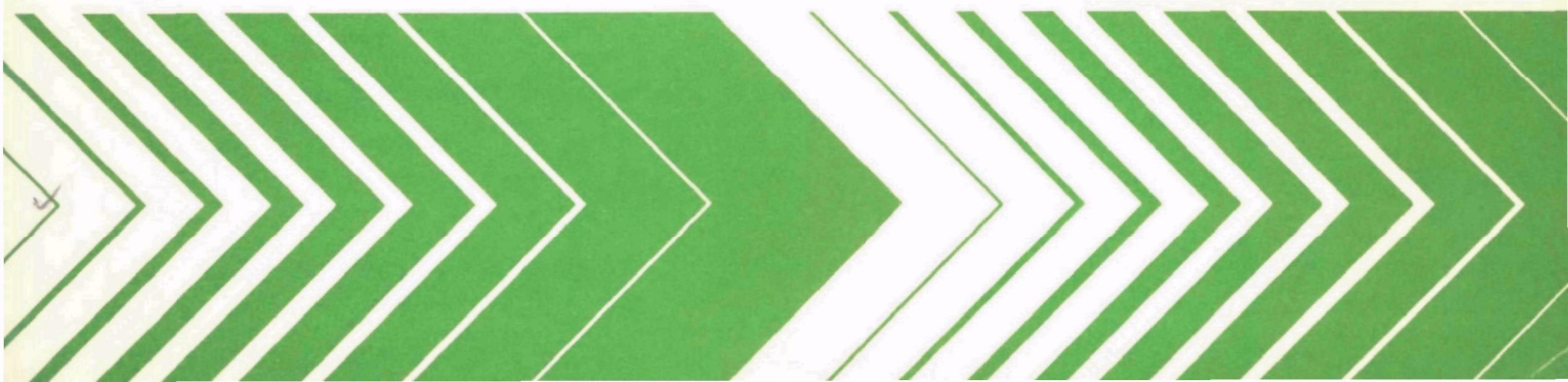
Environmental Monitoring
and Support Laboratory
P.O. Box 15027
Las Vegas NV 89114

EPA-600/3-79-118
December 1979

Research and Development

EPA

Distribution of Phytoplankton in New Mexico Lakes



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EPA-600/3-79-118
December 1979

DISTRIBUTION OF PHYTOPLANKTON IN NEW MEXICO 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 8 lakes sampled by the National Eutrophication Survey in the State of New Mexico, 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
Environmental Monitoring and Support Laboratory
Las Vegas

CONTENTS

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 8 lakes sampled in the State of New Mexico (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 NEW MEXICO

STORET No.	Lake Name	County
3501	Alamogordo Reservoir	De Baca, Guadalupe
3502	Bluewater Lake	Valencia, McKinley
3503	Conchas Reservoir	San Miguel
3504	Eagle Nest Lake	Colfax
3505	Elephant Butte Reservoir	Sierra
3506	El Vado Reservoir	Rio Arriba
3507	Lake McMillan	Eddy
3509	Ute Reservoir	Quay

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	Myxophyceae / Desmideae	0.0-0.4	0.1-3.0
Chlorophycean	Chlorococcales / Desmideae	0.0-0.7	0.2-9.0
Diatom	Centric Diatoms / Pennate Diatoms	0.0-0.3	0.0-1.75
Euglenophyte	Euglenophyta / Myxophyceae + Chlorococcales	0.0-0.2	0.0-1.0
Compound	Myxophyceae + Chlorococcales + Centric Diatoms + Euglenophyta / 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
Gomphonema	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

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 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. 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:

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

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:

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

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 $\log_S S$, 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.

LITERATURE CITED

Basharin, G. P. 1959. On a statistical estimate for the entropy of a sequence of independent random variables, pp. 333-336. In: Theory of Probability and Its Applications (translation of "Teoriya Veroyatnosei i ee Premeneniya"). N. Artin (ed). 4. Society for Industrial and Applied Mathematics, Philadelphia.

Brillouin, L. 1962. Science and Information Theory (2nd ed.). Academic Press, New York. 351 pp.

Hutchinson, G. E. 1967. A Treatise on Limnology. II. Introduction to Lake Biology and the Limnoplankton. John Wiley and Sons, Inc., New York. 1,115 pp.

Nygaard, G. 1949. Hydrobiological studies of some Danish ponds and lakes. II. (K danske Vidensk. Selsk.) Biol. Sci. 7:293.

Palmer, C. M. 1969. A composite rating of algae tolerating organic pollution. J. Phycol. 5:78-82.

Pielou, E. C. 1966. The measurement of diversity in different types of biological collections. J. Theor. Biol. 13:131-144.

Prescott, G. W. 1970. How to Know the Freshwater Algae. William C. Brown Company, Dubuque. 348 pp.

Sager, P. E., and A. D. Hasler. 1969. Species diversity in lacustrine phytoplankton. I. The components of the index of diversity from Shannon's formula. Amer. Natur. 103(929):51-59.

Shannon, C. E., and W. Weaver. 1963. The Mathematical Theory of Communication. University of Illinois Press, Urbana. 117 pp.

U.S. Environmental Protection Agency. 1975. National Eutrophication Survey Methods 1973-1976. Working Paper No. 175. Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, and Corvallis Environmental Research Laboratory, Corvallis, Oregon. 91 pp.

Wilhm, V. L., and T. C. Dorris. 1968. Biological parameters for water quality criteria. Bio-Science. 18:477.

Zand, S. M. 1976. Indexes associated with information theory in water quality. J. Water Pollut. Contr. Fed. 48(8):2026-2031.

APPENDIX A

PHYTOPLANKTON SPECIES LIST FOR THE STATE OF NEW MEXICO

Achnanthes
Amphora
Anabaena
Anabaenopsis circularis
Anabaenopsis raciborskii
Ankistrodesmus falcatus
Ankistrodesmus falcatus
v. *acicularis*
Ankistrodesmus falcatus
v. *mirabilis*
Aphanizomenon flos-aquae
Aphanothece
Arthrospira tenuis
Asterionella formosa
Binuclearia eriensis
Carteria
Ceratium hirundinella
Ceratium hirundinella
f. *furcoides*
Chlamydomonas
Closterium
Coelastrum cambricum
v. *intermedium*
Coelastrum microporum
Coelastrum reticulatum
Coelastrum sphaericum
Coelosphaerium
Cosmarium
Crucigenia rectangularis
Crucigenia tetrapedia
Cryptomonas erosa
Cryptomonas erosa
v. *reflexa*
Cryptomonas marssonii
Cryptomonas reflexa
Cyclotella meneghiniana
Cymatopleura elliptica
Cymbella cuspidata
Dactylococcopsis irregularis
Dictyosphaerium ehrenbergianum
Dictyosphaerium pulchellum
Dinobryon divergens
Dinobryon sociale
Dinobryon sociale
v. *americanum*
Diploneis
Elakatothrix gelatinosa
Entomoneis ornata
Euglena acus
Euglena oxyuris
v. *minor*
Euglena tripteris
Fragilaria capucina
v. *mesolepta*
Fragilaria crotonensis
Franceia droescheri
Franceia ovalis
Glenodinium edax
Glenodinium gymnodinium
v. *biscutelliforme*
Glenodinium oculatum
Gyrosigma scalproides
Hantzschia amphioxys
Lepocinclis playfairiana
Mallomonas acaroides
Melosira distans
Melosira granulata
Merismopedia minima
Microcystis aeruginosa
Microcystis incerta
Nephrocytium
Nitzschia acicularis
Nitzschia longissima
v. *reversa*
Oedogonium
Oocystis
Oscillatoria limnetica
Pascherina tetras
Pediastrum boryanum
Pediastrum duplex
Pediastrum simplex
v. *duodenarium*
Peridinium quadridens
Phacus acuminatus
Phacus acuminatus
v. *drezepolskii*
Phacus caudatus
Phacus megalopsis
Phacus pseudonordstedtii
Phormidium mucicola
Pinnularia
Planktosphaeria gelatinosa
Raphidiopsis curvata
Scenedesmus abundans
Scenedesmus bicaudatus
Scenedesmus bijuga
Scenedesmus dimorphus
Scenedesmus intermedius
v. *bicaudatus*
Scenedesmus quadricauda
Schroederia setigera

Skeletonema potamos
Sphaerocystis schroeteri
Spirulina subsalsa
Staurastrum
Stephanodiscus niagarae
Surirella ovata
Synedra delicatissima
v. *angustissima*
Synedra ulna
Tetraedron minimum
Tetraedron minimum
v. *scrobiculatum*
Tetrastrum glabrum
Trachelomonas hispida
Trachelomonas intermedia
Trachelomonas urceolata
Trachelomonas volvocina

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: ALAMOGORDO
STORET NUMBER: 3501

NYGAARD TROPHIC STATE INDICES

DATE	05 01 75	08 20 75	10 02 75
MYXOPHYCEAN	01/0 E	07/0 E	05/0 E
CHLOROPHYCEAN	04/0 E	12/0 E	06/0 E
EUGLENOPHYTE	0.40 E	0.42 E	0.18 ?
DIATOM	0.33 E	0.40 E	1.00 E
COMPOUND	08/0 E	29/0 E	15/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 01 75	08 20 75	10 02 75
GENUS	02	15	10
SPECIES	03	04	03

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 01 75	08 20 75	10 02 75
AVERAGE DIVERSITY	H	1.70	3.51	3.69
NUMBER OF TAXA	S	16.00	41.00	21.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	4.00	5.36	4.39
MINIMUM DIVERSITY	MINH	0.10	0.22	0.04
TOTAL DIVERSITY	D	3037.90	8139.69	24844.77
TOTAL NUMBER OF INDIVIDUALS/ML	N	1787.00	2319.00	6733.00
EVENNESS COMPONENT	J	0.43	0.65	0.84
RELATIVE EVENNESS	RJ	0.42	0.65	0.84
MEAN NUMBER OF INDIVIDUALS/TAXA	L	111.69	56.56	320.62
NUMBER/ML OF MOST ABUNDANT TAXON	K	759.00	395.00	979.00

LAKE NAME: ALAMOGORDO
STORET NUMBER: 3501

CONTINUED

TAXA	FORM	05 01 75			08 20 75			10 02 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
AMPHORA	CEL			X						
ANABAENOPSIS	FIL						X			
ANKISTRODESMUS FALCATUS	CEL						X			
ANKISTRODESMUS FALCATUS V. ACICULARIS	CEL	2	40,0	715		6,4	148			
ANKISTRODESMUS FALCATUS V. MIRABILIS	CEL			X						
ARTHROSPIRA TENUIS	FIL							1	5,5	373
CARTERIA	CEL						X			
CENTRIC DIATOM	CEL			X		6,4	148			
CHLAMYDOMONAS	CEL						X	5	3,8	233
CHROOMONAS ?	CEL	1	42,5	759				14	14,5	979
COELASTRUM SPHAERICUM	COL					2,1	49			
CRUCIGENIA TETRAPEDIA	COL						X			
CRYPTOMONAS EROSA	CEL	5	2,5	45	4	6,4	148			X
CRYPTOMONAS MARSSONII	CEL	4	2,5	45						
CRYPTOMONAS REFLEXA	CEL						X			
CYCLOTELLA MENEGHINIANA	CEL								7,6	513
DACTYLOCOCCOPSIS	CEL							2	11,1	746
DICTYOSPHAERIUM PULCHELLUM	COL					2,1	49			
DIPLONEIS	CEL						X			
EUGLENA #1	CEL			X			X			X
EUGLENA #2	CEL						X			
EUGLENA SPP.	CEL				5	4,3	99			
EUGLENA TRIPTERIS	CEL						X			
FLAGELLATE #2	CEL							2	11,8	793
FRANCEIA DROESCHERI	CEL						X			
FRANCEIA OVALIS	CEL								2,1	140
GLENODINIUM EDAX	CEL			X						
HANTZSCHIA	CEL								0,7	47
LEPOCINCLIS	CEL						X			
MALLOMONAS ACAROIDES	CEL			X						
MERISMOPEDIA MINIMA	COL						X		10,0	670
MICROCYSTIS AERUGINOSA	COL						X			
MICROCYSTIS INCERTA	COL							3	11,1	746
MICROCYSTIS MINIMA	COL						X			
NEPHROCYTIUM	CEL								1,4	93
NITZSCHIA ACICULARIS	CEL								2,8	187
NITZSCHIA ACICULARIS ?	CEL				3	17,0	395			
NITZSCHIA LONGISSIMA V. REVERSA	CEL						X			
OOCYSTIS	CEL			X		8,5	197		3,5	233
OSCILLATORIA LIMNETICA	FIL				2	14,9	346			
PASCHERINA TETRAS	COL						X			
PEDIASTRUM DUPLEX	COL					2,1	49			
PENNATE DIATOM	CEL					4,3	99			
PERIDINIUM QUADRIDENS	CEL						X			
PHACUS	CEL									X
PHACUS #1	CEL						X			
PHACUS ACUMINATUS V. DREZEPOLSKII	CEL			X			X			
PHACUS MEGALOPSIS	CEL						X			
PHORMIDIUM	FIL								2,1	140
PHORMIDIUM MUCICOLA	FIL						X			
RAPHIDIOPSIS CURVATA	FIL	3	12,5	223	1	17,0	395			
SCENEDESMUS ABUNDANS	COL						X			
SCENEDESMUS DIMORPHUS	COL						X			
SCENEDESMUS QUADRICAUDA	COL			X						X
SCHROEDERIA SETIGERA	CEL					2,1	49		2,8	187
SKELETONEMA POTAMOS	CEL					4,3	99		0,3	560
SURIRELLA	CEL			X						
SYNEDRA	CEL			X						
SYNEDRA DELICATISSIMA V. ANGUSTISSIMA	CEL						X			
TETRAEDRON MINIMUM	CEL								1,4	93
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL					2,1	49			
TRACHELOMONAS	CEL						X			
TOTAL				1787			2319			6733

LAKE NAME: BLUEWATER
STORET NUMBER: 3502

NYGAARD TROPHIC STATE INDICES

DATE	05 05 75	08 19 75	10 01 75
MYXOPHYCEAN	01/0 E	03/0 E	01/0 E
CHLOROPHYCEAN	01/0 E	0/0 O	01/0 E
EUGLENOPHYTE	0/02 ?	0/03 ?	0/02 ?
DIATOM	0,33 E	1,00 E	01/0 E
COMPOUND	03/0 E	04/0 E	03/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 05 75	08 19 75	10 01 75
GENUS	08	06	00
SPECIES	02	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 05 75	08 19 75	10 01 75
AVERAGE DIVERSITY	H	2,58	1,63	1,27
NUMBER OF TAXA	S	11,00	8,00	5,00
NUMBER OF SAMPLES COMPOSITED	M	3,00	3,00	3,00
MAXIMUM DIVERSITY	MAXH	3,46	3,00	2,32
MINIMUM DIVERSITY	MINH	0,08	0,05	0,05
TOTAL DIVERSITY	D	4117,68	2906,29	1062,99
TOTAL NUMBER OF INDIVIDUALS/ML	N	1596,00	1783,00	837,00
EVENNESS COMPONENT	J	0,75	0,54	0,55
RELATIVE EVENNESS	RJ	0,74	0,54	0,54
MEAN NUMBER OF INDIVIDUALS/TAXA	L	145,09	222,88	167,40
NUMBER/ML OF MOST ABUNDANT TAXON	K	570,00	1213,00	432,00

LAKE NAME: BLUEWATER
STORET NUMBER: 3502

CONTINUED

TAXA	FORM	05 05 75			08 19 75			10 01 75		
		IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML	IS	%C	ALGAL UNITS PER ML
APHANIZOMENON FLOS-AQUAE	FIL				11	60.0	1213	11	41.9	351
ASTERIONELLA FORMOSA	CEL			X						
CHLAMYDOMONAS	CEL	15	7.1	114	12	8.5	152			
CHROOMONAS ?	CEL	13	10.7	171	14	8.5	152	12	51.6	432
CRYPTOMONAS EROSA	CEL			X	13	6.4	114	13	6.5	54
CRYPTOMONAS EROSA V. REFLEXA	CEL			X						
CYCLOTELLA	CEL				15	4.3	76			
CYCLOTELLA MENEGHINIANA	CEL	11	21.4	342						
DACTYLOCOCCOPSIS	CEL	1	7.1	114						
FLAGELLATE	CEL	12	35.7	570						
MELOSIRA	CEL									X
MICROCYSTIS AERUGINOSA	COL						X			
NITZSCHIA	CEL	1	3.6	57			X			
PHORMIDIUM	FIL					4.3	76			
SCHROEDERIA SETIGERA	CEL	14	10.7	171						X
SURIRELLA OVATA	CEL	1	3.6	57						
TOTAL				1596			1783			837

LAKE NAME: CONCHAS RES.
STORET NUMBER: 3503

NYGAARD TROPHIC STATE INDICES

DATE	05 01 75	08 21 75	10 02 75
MYXOPHYCEAN	0/0 D	4.00 E	1.50 E
CHLOROPHYCEAN	04/0 E	3.00 E	4.00 E
EUGLENOPHYTE	0/04 ?	0.29 E	0.82 E
DIATOM	0.33 E	0/03 ?	0.33 E
COMPOUND	05/0 E	9.00 E	10.5 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 01 75	08 21 75	10 02 75
GENUS	02	07	00
SPECIES	03	03	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 01 75	08 21 75	10 02 75
AVERAGE DIVERSITY	H	1.38	2.24	2.33
NUMBER OF TAXA	S	11.00	20.00	32.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00	4.00
MAXIMUM DIVERSITY	MAXH	3.46	4.32	5.00
MINIMUM DIVERSITY	MINH	0.08	0.24	1.01
TOTAL DIVERSITY	D	1972.02	1968.96	682.69
TOTAL NUMBER OF INDIVIDUALS/ML	N	1429.00	879.00	293.00
EVENNESS COMPONENT	J	0.40	0.52	0.47
RELATIVE EVENNESS	RJ	0.39	0.50	0.34
MEAN NUMBER OF INDIVIDUALS/TAXA	L	129.91	43.95	9.16
NUMBER/ML OF MOST ABUNDANT TAXON	K	915.00	402.00	118.00

LAKE NAME: CONCHAS RES.
STORET NUMBER: 3503

CONTINUED

TAXA	FORM	05 01 75 IS	05 01 75 %C	05 01 75 ALGAL UNITS PER ML	08 31 75 IS	08 31 75 %C	08 31 75 ALGAL UNITS PER ML	10 02 75 IS	10 02 75 %C	10 02 75 ALGAL UNITS PER ML
ANABAENA	FIL						X			
ANKISTRODESMUS FALCATUS V. ACICULARIS	CEL				2	12,5	110	1	9,9	29
ANKISTRODESMUS FALCATUS V. MIRABILIS	CEL	12	23,4	335						X
ASTERIONELLA FORMOSA	CEL	1	3,1	45			X			
CHROOMONAS 7	CEL	11	64,0	915	11	45,7	402	2	40,3	118
CLOSTERIUM #1	CEL						X			X
CLOSTERIUM #2	CEL									X
COELASTRUM CAMBRICUM V. INTERMEDIUM	CEL									X
CRYPTOMONAS EROSA	CEL			X	5	4,2	37	11	20,3	59
CYCLOTELLA	CEL									X
CYCLOTELLA MENEGHINIANA	CEL			X						
CYMATOPLEURA ELLIPTICA	CEL			X						
DACTYLOCOCCOPSIS IRREGULARIS	CEL									X
DINOBRYON DIVERGENS	CEL						X			X
DINOBRYON SOCIALE	CEL									X
DINOBRYON SOCIALE V. AMERICANUM	CEL						X			
ELAKATOTHRIX GELATINOSA	COL									X
EUGLENA #1	CEL						X			
EUGLENA #2	CEL									X
EUGLENA #3	CEL									X
EUGLENA TRIPTERIS	CEL									X
FRAGILARIA CROTONENSIS	CEL						X			X
GLENODINIUM	CEL			X						
GLENODINIUM GYMNODINIUM V. BISCUTELLIFORME	CEL						X			X
LEPOCINCLIS	CEL									X
MALLOMONAS	CEL						X			
MICROCYSTIS AERUGINOSA	COL						X			
MICROCYSTIS INCERTA	COL				1	4,2	37			
NITZSCHIA	CEL			X						
OOCYSTIS	CEL	3	9,4	134	14	20,8	183			
OSCILLATORIA LIMNETICA	FIL				3	8,3	73			X
PEDIASTRUM SIMPLEX V. DUODENARIUM	COL			X						
PERIDINIUM QUADRIDENS	CEL						X			X
PHACUS	CEL						X			
PHACUS ACUMINATUS	CEL									X
PHACUS ACUMINATUS V. DREZEPOLSKII	CEL							1	9,9	29
PHACUS PSEUDONORDSTEDTII	CEL									X
PLANKTOSPHAERIA GELATINOSA	COL			X						
SCENEDESMUS BIJUGA	COL							1	9,9	29
SCENEDESMUS QUADRICAUDA	COL									X
SPHAEROCYSTIS SCHROETERI	COL									X
SPIRULINA SUBSALSA	FIL									X
SYNEDRA	CEL						X			X
SYNEDRA ULNA	CEL									X
TETRAEDRON MINIMUM V. SCHROEDERIANUM	CEL				1	4,2	37			X
TRACHELOMONAS	CEL									X
TRACHELOMONAS INTERMEDIA	CEL							1	9,9	29
TOTAL				1429			879			293

LAKE NAME: EAGLE NEST LAKE
STORET NUMBER: 3504

NYGAARD TROPHIC STATE INDICES

DATE	05 06 75	08 21 75	10 07 75
MYXOPHYCEAN	0/0 O	2.00 E	04/0 E
CHLOROPHYCEAN	01/0 E	3.00 E	02/0 E
EUGLENOPHYTE	0/01 ?	0/05 ?	0/06 ?
DIATOM	1.00 E	0.50 E	1.00 E
COMPOUND	02/0 E	6.00 E	07/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 06 75	08 21 75	10 07 75
GENUS	00	00	05
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 06 75	08 21 75	10 07 75
AVERAGE DIVERSITY	H	0.94	1.96	1.44
NUMBER OF TAXA	S	5.00	11.00	12.00
NUMBER OF SAMPLES COMPOSITED	M	2.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	2.32	3.46	3.58
MINIMUM DIVERSITY	MINH	0.01	0.16	0.03
TOTAL DIVERSITY	D	4460.30	1330.84	8184.96
TOTAL NUMBER OF INDIVIDUALS/ML	N	4745.00	679.00	5684.00
EVENNESS COMPONENT	J	0.41	0.57	0.40
RELATIVE EVENNESS	RJ	0.41	0.55	0.40
MEAN NUMBER OF INDIVIDUALS/TAXA	L	949.00	61.73	473.67
NUMBER/ML OF MOST ABUNDANT TAXON	K	3042.00	389.00	3639.00

LAKE NAME: EAGLE NEST LAKE CONTINUED
STORET NUMBER: 3504

TAXA	FORM	05 06 75 %S	05 06 75 %C	05 06 75 ALGAL UNITS PER ML	08 21 75 %S	08 21 75 %C	08 21 75 ALGAL UNITS PER ML	10 07 75 %S	10 07 75 %C	10 07 75 ALGAL UNITS PER ML
ANABAENA	FIL						X			
ANABAENOPSIS CIRCULARIS	FIL									X
ANKISTRODESMUS FALCATUS	CEL			X						
APHANIZOMENON FLOS-AQUAE	FIL					57,3	389		64,0	3639
CHROOMONAS ?	CEL	2	35,9	1703	4	19,1	130	4	20,7	1178
CLOSTERIUM	CEL						X			
CRYPTOMONAS EROSA	CEL	1	64,1	3042	1	4,7	32			X
CRYPTOMONAS MARSSONII	CEL									X
CRYPTOMONAS SPP.	CEL							2	3,0	173
CYMATOPLEURA	CEL			X			X			
FRAGILARIA CAPUCINA V. MESOLEPTA	CEL									X
MICROCYSTIS AERUGINOSA	COL									X
OOCYSTIS	CEL					4,7	32			
OSCILLATORIA ?	FIL							1	11,6	659
PINNULARIA	CEL						X			
SCENEDESMUS	COL					4,7	32			
SCHROEDERIA SETIGERA	CEL				1	4,7	32	1	0,6	35
SPHAEROCYSTIS SCHROETERI	COL									X
STEPHANODISCUS NIAGARAE	CEL			X	2	4,7	32			X
TOTAL				4745			679			5684

LAKE NAME: ELEPHANT BUTTE RES.
STORET NUMBER: 3505

NYGAARD TROPHIC STATE INDICES

DATE	05 02 75	08 19 75	10 03 75
MYXOPHYCEAN	0/01 O	3.00 E	0/01 O
CHLOROPHYCEAN	5.00 E	3.00 E	0/01 O
EUGLENOPHYTE	0/05 ?	0/06 ?	0/0 ?
DIATOM	0.50 E	01/0 E	0.50 E
COMPOUND	6.00 E	7.00 E	1.00 O

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 02 75	08 19 75	10 03 75
GENUS	02	02	00
SPECIES	03	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 02 75	08 19 75	10 03 75
AVERAGE DIVERSITY	H	1.39	2.83	0.93
NUMBER OF TAXA	S	12.00	12.00	5.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00	4.00
MAXIMUM DIVERSITY	MAXH	3.58	3.58	2.32
MINIMUM DIVERSITY	MINH	0.09	0.09	0.47
TOTAL DIVERSITY	D	2008.55	4403.48	57.66
TOTAL NUMBER OF INDIVIDUALS/ML	N	1445.00	1556.00	62.00
EVENNESS COMPONENT	J	0.39	0.79	0.40
RELATIVE EVENNESS	RJ	0.38	0.79	0.25
MEAN NUMBER OF INDIVIDUALS/TAXA	L	120.42	129.67	12.40
NUMBER/ML OF MOST ABUNDANT TAXON	K	722.00	437.00	41.00

LAKE NAME: ELEPHANT BUTTE RES. CONTINUED
STORET NUMBER: 3505

TAXA	FORM	05 02 75 %S	05 02 75 %C	05 02 75 ALGAL UNITS PER ML	08 19 78 %S	08 19 78 %C	08 19 78 ALGAL UNITS PER ML	10 03 75 %S	10 03 75 %C	10 03 75 ALGAL UNITS PER ML
ANABAENA	FIL				15	1.7	27			
ANKISTRODESMUS FALCATUS V. ACICULARIS	CEL	14	3.9	56						
CARTERIA	CEL				11	21.1	320			
CERATIUM HIRUNDINELLA F. FURCOIDES	CEL						X			
CHROOMONAS ?	CEL	12	42.3	611	1	17.5	273	12	33.9	21
CLOSTERIUM	CEL			X	1	3.5	55			X
COELASTRUM MICROPORUM	COL	13	3.9	56						
CRYPTOMONAS EROSA	CEL			X	14	5.3	82			
CRYPTOMONAS MARSSONII	CEL			X						
CYMBELLA	CEL			X						
FRAGILARIA CROTONENSIS	CEL									X
MELOSIRA GRANULATA	CEL									X
MERISMOPEDIA MINIMA	COL				1	7.0	109			
MICROCYSTIS INCERTA	COL				13	7.0	109			
OOCYSTIS	CEL			X	1	1.7	27			
PEDIASTRUM BORYANUM	COL			X						
PENNATE DIATOM	CEL							11	66.1	41
SCENEDESMUS INTERMEDIUS V. BICAUDATUS	COL			X						
SCHROEDERIA SETIGERA	CEL				1	7.0	109			
SPHAEROCYSTIS SCHROETERI	CEL						X			
STEPHANODISCUS	CEL	11	50.0	722	12	28.1	437			
SYNEDRA	CEL			X						
TOTAL				1445			1556			62

LAKE NAME: EL VADO RES.
STORET NUMBER: 3506

NYGAARD TROPHIC STATE INDICES

DATE	05 05 75	08 19 75	10 01 75
MYXOPHYCEAN	0/0 O	01/0 E	02/0 E
CHLOROPHYCEAN	0/0 O	0/0 O	0/0 O
EUGLENOPHYTE	0/0 ?	0/01 ?	0/02 ?
DIATOM	0,20 ?	0/0 ?	01/0 E
COMPOUND	01/0 E	01/0 E	03/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 05 75	08 19 75	10 01 75
GENUS	00	00	00
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 05 75	08 19 75	10 01 75
AVERAGE DIVERSITY	H	2,05	0,33	1,60
NUMBER OF TAXA	S	10,00	2,00	7,00
NUMBER OF SAMPLES COMPOSITED	M	3,00	3,00	3,00
MAXIMUM DIVERSITY	MAXH	3,32	1,00	2,81
MINIMUM DIVERSITY	MINH	0,28	0,02	0,13
TOTAL DIVERSITY	D	631,40	171,93	782,40
TOTAL NUMBER OF INDIVIDUALS/ML	N	308,00	521,00	489,00
EVENNESS COMPONENT	J	0,62	0,33	0,57
RELATIVE EVENNESS	RJ	0,59	0,32	0,55
MEAN NUMBER OF INDIVIDUALS/TAXA	L	30,80	260,50	69,86
NUMBER/ML OF MOST ABUNDANT TAXON	K	123,00	490,00	234,00

LAKE NAME: EL VADO RES.
STORET NUMBER: 3506

CONTINUED

TAXA	FORM	05 05 75 IS	05 05 75 %C	05 05 75 ALGAL UNITS PER ML	08 19 75 IS	08 19 75 %C	08 19 75 ALGAL UNITS PER ML	10 01 75 IS	10 01 75 %C	10 01 75 ALGAL UNITS PER ML
ANABAENA	FIL									X
APHANIZOMENON FLOS-AQUAE	FIL				2	6.0	31	1	7.9	234
CHROOMONAS ?	CEL	13	29.9	92	1	4.0	490	2	36.0	176
CRYPTOMONAS EROSA	CEL	1	9.9	123				3	12.1	59
CRYPTOMONAS MARSSONII	CEL	2	10.1	31				4	4.1	20
CYCLOTELLA	CEL	4	10.1	31						
GLENODINIUM OCULATUM	CEL			X						X
NANTZSCHIA	CEL			X						
NANTZSCHIA AMPHIOXYS	CEL			X						
NEIDIUM ?	CEL			X						
NITZSCHIA	CEL	5	10.1	31						
STEPHANODISCUS	CEL									X
SURIRELLA	CEL			X						
TOTAL				309			521			489

LAKE NAME: LAKE MCMILLAN
STORET NUMBER: 3507

NYGAARD TROPHIC STATE INDICES

DATE	05 01 75	08 20 75	10 02 75
MYXOPHYCEAN	0/0 D	4.00 E	04/0 E
CHLOROPHYCEAN	02/0 E	2.00 E	05/0 E
EUGLENOPHYTE	0/02 ?	1.17 E	0.56 E
DIATOM	0.25 ?	0.50 E	0/03 ?
COMPOUND	03/0 E	14.0 E	14/0 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 01 75	08 20 75	10 02 75
GENUS	01	13	13
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 01 75	08 20 75	10 02 75
AVERAGE DIVERSITY	H	2.11	2.19	2.41
NUMBER OF TAXA	S	10.00	22.00	21.00
NUMBER OF SAMPLES COMPOSITED	M	3.00	3.00	3.00
MAXIMUM DIVERSITY	MAXH	3.32	4.46	4.39
MINIMUM DIVERSITY	MINH	0.02	0.21	0.06
TOTAL DIVERSITY	D	15523.27	2573.25	10560.62
TOTAL NUMBER OF INDIVIDUALS/ML	N	7357.00	1175.00	4382.00
EVENNESS COMPONENT	J	0.64	0.49	0.55
RELATIVE EVENNESS	RJ	0.64	0.47	0.55
MEAN NUMBER OF INDIVIDUALS/TAXA	L	735.70	53.41	208.67
NUMBER/ML OF MOST ABUNDANT TAXON	K	2733.00	550.00	2280.00

LAKE NAME: LAKE MCMILLAN CONTINUED
STORET NUMBER: 3507

TAXA	FORM	05 01 75			08 20 75			10 02 75		
		%	%	ALGAL UNITS PER ML	%	%	ALGAL UNITS PER ML	%	%	ALGAL UNITS PER ML
ACHNANTHES	CEL	1	37.1	2733						
ANABAENA	FIL							4	8.7	380
ANABAENOPSIS CIRCULARIS	FIL						X		1.3	58
ANABAENOPSIS RACIBORSKII	FIL								0.7	29
ANKISTRODESMUS FALCATUS V. MIRABILIS	CEL									X
BINUCLEARIA ERIENSIS	FIL								2.3	146
CHLOROPHYTAN CELL #9	CEL						X		0.7	29
CHLOROPHYTAN COCCOID CELLED COLONY	CEL					3.1	37			X
CHLOROPHYTAN LUNATE CELL	CEL	3	22.0	1682						
CHROOMONAS ?	CEL		8.7	420						
COELOSPHAERIUM	COL						X			
COSMARIUM	CEL						X			
CRYPTOMONAS EROSA	CEL				8	3.1	37			
CYCLOTELLA	CEL	2	27.1	1997		3.1	37			
DICTYOSPHAERIUM PULCHELLUM	COL									X
DIPLONEIS	CEL	8	2.9	210				8	2.7	117
ENTOMONEIS ORNATA	CEL						X		0.7	29
EUGLENA #1	CEL				2	12.5	147		5.3	146
EUGLENA #2	CEL									X
EUGLENA #3	CEL									X
EUGLENA ACUS	CEL						X			
EUGLENA OXYURIS V. MINOR	CEL						X			
EUGLENA TRIPTERIS	CEL						X			
GLENODINIUM OCULATUM	CEL			X			X			
HANTZSCHIA AMPHIOXYS	CEL			X						
LEPOCINCLIS PLAYFAIRIANA	CEL						X			
NITZSCHIA	CEL				11	46.8	550	11	52.0	2280
NITZSCHIA LONGISSIMA V. REVERSA	CEL				3	10.7	220	3	10.0	438
OOCYSTIS	COL	4	4.3	315					0.7	29
OSCILLATORIA	FIL						X	2	14.0	614
OSCILLATORIA LIMNETICA	FIL				4	12.5	147			
PEDIASTRUM DUPLEX	COL			X						
PHACUS ACUMINATUS	CEL						X			
PHACUS PSEUDONORDSTEDTII	CEL						X		0.7	29
SCENEDESMUS BIJUGA	COL						X			X
SURIRELLA	CEL			X						
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL						X		0.7	29
TRACHELOMONAS URCEOLATA	CEL								0.7	29
TOTAL				7387			1178			4382

LAKE NAME: UTE RES.
STORET NUMBER: 3509

NYGAARD TROPHIC STATE INDICES

DATE	05 02 75	08 20 75	10 03 75
MYXOPHYCEAN	02/0 E	1.00 E	0.80 E
CHLOROPHYCEAN	04/0 E	2.33 E	1.60 E
EUGLENOPHYTE	0.17 ?	0.30 E	0.33 E
DIATOM	0.40 E	0.50 E	2.00 E
COMPOUND	09/0 E	4.67 E	3.60 E

PALMER'S ORGANIC POLLUTION INDICES

DATE	05 02 75	08 20 75	10 03 75
GENUS	00	03	03
SPECIES	00	00	00

SPECIES DIVERSITY AND ABUNDANCE INDICES

DATE		05 02 75	08 20 75	10 03 75
AVERAGE DIVERSITY	H	1.84	3.19	2.93
NUMBER OF TAXA	S	17.00	28.00	27.00
NUMBER OF SAMPLES COMPOSITED	M	4.00	4.00	4.00
MAXIMUM DIVERSITY	MAXH	4.09	4.81	4.75
MINIMUM DIVERSITY	MINH	0.20	0.23	0.53
TOTAL DIVERSITY	D	1654.16	4408.58	1494.30
TOTAL NUMBER OF INDIVIDUALS/ML	N	899.00	1382.00	510.00
EVENNESS COMPONENT	J	0.45	0.66	0.62
RELATIVE EVENNESS	RJ	0.43	0.65	0.57
MEAN NUMBER OF INDIVIDUALS/TAXA	L	52.88	49.36	18.89
NUMBER/ML OF MOST ABUNDANT TAXON	K	490.00	280.00	142.00

LAKE NAME: UTE RES.
STORET NUMBER: 3509

CONTINUED

TAXA	FORM	05 02 75 IS	05 02 75 %C	05 02 75 ALGAL UNITS PER ML	08 20 75 IS	08 20 75 %C	08 20 75 ALGAL UNITS PER ML	10 03 75 IS	10 03 75 %C	10 03 75 ALGAL UNITS PER ML
ANKISTRODESMUS FALCATUS V. MIRABILIS	CEL									X
APHANIZOMENON FLOS-AQUAE	FIL			X						
APHANOTHECE	COL									X
CERATIUM HIRUNDINELLA	CEL					1.4	19			
CHLAMYDOMONAS	CEL									X
CHROOMONAS ?	CEL	4	54.5	490	4	20.3	280			
CLOSTERIUM #1	CEL						X	5	11.2	57
CLOSTERIUM #2	CEL									X
COELASTRUM RETICULATUM	COL						X			
COSMARIUM #1	CEL						X		5.5	28
COSMARIUM #2	CEL									X
CRUCIGENIA RECTANGULARIS	COL					1.4	19			
CRUCIGENIA TETRAPEDIA	COL						X			
CRYPTOMONAS EROSA	CEL	1	10.1	163	1	14.8	205	1	27.8	142
CRYPTOMONAS MARSSONII	CEL	2	13.7	123						
CYCLOTELLA	CEL					5.4	75			
CYCLOTELLA MENEGHINIANA	CEL	1	4.6	41						
CYMBELLA	CEL			X						
CYMBELLA CUSPIDATA	CEL			X						
DACTYLOCOCCOPSIS IRREGULARIS	CEL			X	3	10.8	149		5.5	28
DICTYOSPHAERIUM EHRENBERGIANUM	COL									X
DICTYOSPHAERIUM PULCHELLUM	COL									X
DINOBRYON SOCIALE	CEL						X			X
EUGLENA	CFI									X
FRAGILARIA	CEL	3	9.1	82						
GLENODINIUM GYMNODINIUM V. BISCUTELLIFORME	CEL						X			
GLENODINIUM OCULATUM	CEL					1.4	19			
GLOEOCYSTIS ?	CEL						X			
GYROSIGMA SCALPROIDES	CEL						X			
MELOSIRA DISTANS	CEL									X
MELOSIRA GRANULATA	CEL			X						
MERISMOPEDIA MINIMA	COL				5	16.2	224	4	11.2	57
OEDOGONIUM	FIL						X			
OOCYSTIS	COL			X		4.1	56	2	11.2	57
OSCILLATORIA LIMNETICA	FIL					2.7	37			X
PEDIASTRUM SIMPLEX V. DUODENARIUM	COL			X						
PERIDINIUM QUADRIDENS	CEL						X			
PHACUS ACUMINATUS V. DREZEPOLSKII	CEL						X			X
PHACUS CAUDATUS	CEL								5.5	28
PHACUS MEGALOPSIS	CEL						X			
PINNULARIA	CEL			X						
SCENEDESMUS BICAUDATUS	COL									X
SCENEDESMUS BIJUGA	COL			X			X			X
SCENEDESMUS QUADRICAUDA	COL					1.4	19			
SPHAEROCYSTIS SCHROETERI	COL			X						X
STAURASTRUM	CEL						X			X
STEPHANODISCUS	CEL								5.5	28
SYNEDRA	CEL				2	16.2	224	3	16.7	85
SYNEDRA ULNA	CEL			X						
TETRAEDRON MINIMUM V. SCROBICULATUM	CEL					1.4	19			
TETRASTRUM GLABRUM	COL									X
TRACHELOMONAS HISPIDA	CEL					2.7	37			
TRACHELOMONAS INTERMEDIA	CEL									X
TRACHELOMONAS VOLVOCINA	CEL			X						
TOTAL				899			1382			810

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

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA-600/3-79-118		

4. TITLE AND SUBTITLE	5. REPORT DATE
DISTRIBUTION OF PHYTOPLANKTON IN NEW MEXICO LAKES	December 1979
	6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
V.W. Lambou, F.A. Morris, M.K. Morris, W.D. Taylor, L.R. Williams, and S.C. Hern	

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT NO.
Environmental Monitoring and Support Laboratory Office of Research and Development U.S. Environmental Protection Agency Las Vegas, NV 89114	1BD884
	11. CONTRACT/GRANT NO.

12. SPONSORING AGENCY NAME AND ADDRESS	13. TYPE OF REPORT AND PERIOD COVERED
U.S. Environmental Protection Agency-Las Vegas, NV Office of Research and Development Environmental Monitoring and Support Laboratory Las Vegas, NV 89114	02-21-75 to 12-11-75
	14. SPONSORING AGENCY CODE EPA/600/07

15. SUPPLEMENTARY NOTES

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 New Mexico. 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	New Mexico lake eutrophication Nygaard's trophic indices Palmer's organic pollution indices Species diversity and abundance	06 C, M 08 H 13 B

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
RELEASE TO PUBLIC	UNCLASSIFIED	38
	20. SECURITY CLASS *(This page)*	22. PRICE
	UNCLASSIFIED	

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

* U.S. GOVERNMENT PRINTING OFFICE: 1979—683-282/2215