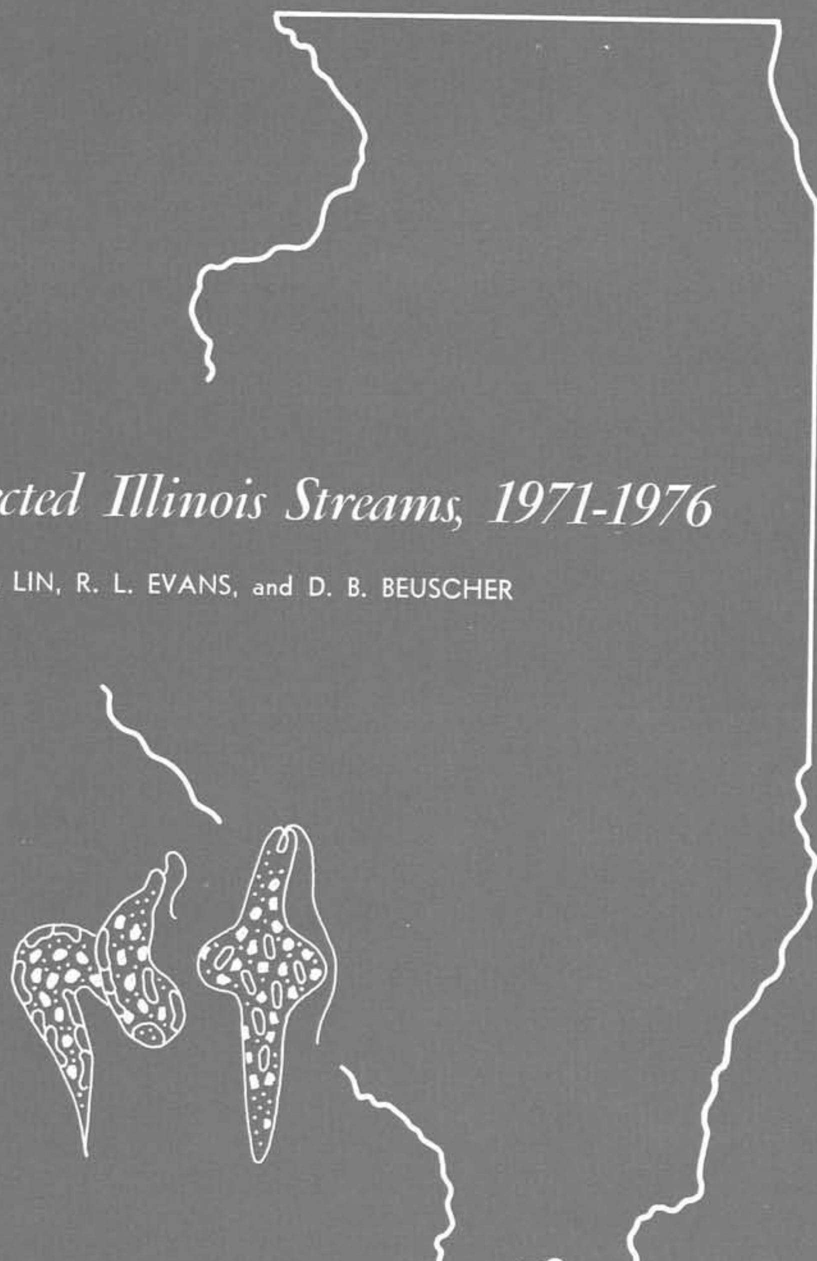
ISWS-78-RI86
REPORT OF INVESTIGATION 86
STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION



Algae in Selected Illinois Streams, 1971-1976

by S. D. LIN, R. L. EVANS, and D. B. BEUSCHER

ILLINOIS STATE WATER SURVEY
URBANA
1978

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by S. D. LIN, R. L EVANS, and D. B. BEUSCHER

Title: Algae in Selected Illinois Streams, 1971-1976.

Abstract: During the 5-year period, October 1971 through September 1976, samples of water from 21 Illinois streams at 26 locations were collected monthly and examined to determine the concentration and genera of algae. Data have been evaluated for algal composition, density, diversity indices, and seasonal succession for each stream location. At most sampling locations, algal densities ranged from 500 to 2000 cts/ml. The 5-year geometric means extended from 880 to 1500 cts/ml. From 24 to 30 different algal genera were recovered from each station and, in all, 56 genera were detected. The average diversity index for each station ranged from 1.11 to 1.36 bits per individual. The highest density of 60,000 cts/ml occurred on July 11, 1975, in the Fox River at Algonquin. The diatoms *Navicula* and *Cyclotella* were the most frequently observed algae. In addition to these, the green algae *Scenedesmus* and *Crucigenia* and the diatom *Melosira* were often dominant. From sample to sample, season to season, and year to year, the genera found at any sampling station varied considerably. Generally, the annual maximum population occurred in the spring. However, the experience gained from this study supports the conclusion that it is impossible to predict algal density, composition, or succession in the flowing streams of Illinois.

Reference: Lin, S. D., R. L. Evans, and D. B. Beuscher. Algae in Selected Illinois Streams, 1971-1976. Illinois State Water Survey, Urbana, Report of Investigation 86, 1978.

Indexing Terms: Algae, algal composition, algal density, algal succession, diversity index, Illinois streams, water quality.

STATE OF ILLINOIS
HON. JAMES R. THOMPSON, Governor

DEPARTMENT OF REGISTRATION AND EDUCATION
JOAN G. ANDERSON, B.S., Director

STATE WATER SURVEY DIVISION
WILLIAM C. ACKERMANN, D.Sc, Chief

URBANA
1978

Printed by authority of the State of Illinois-Cb. 127, IRS, Par. 58.29

(3-78-1500)

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SUMMARY

During the 5-year period, October 1971 through September 1976, 56 algal genera were recovered from 1459 samples collected from 21 Illinois streams at 26 locations. The genera included 15 blue-greens, 17 greens, 25 diatoms, 6 flagellates, and 3 desmids. Diatoms were the dominant type of algae (64 to 80 percent) in Illinois streams. The most common diatoms observed were *Navicula* and *Cyclotella.* Other than diatoms *Scenedesmus,* a green algae, and *Euglena,* a flagellate, were the most frequently observed types. Most streams supported between 24 and 30 different algal genera during the 5-year period. There were no significant differences in algal composition among the sampling locations.

High algal densities were found in the Fox River. On eight occasions, densities exceeded 10,000 cts/ml with a maximum of 60,000 cts/ml occurring because of a *Diogenes* bloom. Most stations had algal densities of 500 to 2000 cts/ml and had geometric means between 880 cts/ml and 1500 cts/ml. Thirty-eight samples collected from 15 locations had algal densities greater than 5000 cts/ml. Of these, 13 samples were from the Fox River.

Both Shannon's and Brillouin's formulas were used for the computation of diversity indices for two stations. It was determined that the more precise Brillouin's formula was not necessary. Thus Shannon's formula was employed for results at all stations. It was also determined that there was no advantage in using 'sits' over bits. The largest index was 3.44 bits per individual for the Fox River at Algonquin. Most stations had 5-year mean indices of 1.11 to 1.36 bits per individual and had maxima of 2.11 to 2.70 bits per individual.

Algal succession in any given location changed greatly from sample to sample, from season to season, and from year to year. This presumably was due to drastic changes in the environment. The annual maximum generally occurred in spring. No genus was consistently dominant throughout the season or the year. Those genera most dominant were *Cyclotella, Navicula, Melosira, Ulothrix, Scenedesmus,* and *Crucigenia.* When *Crucigenia* occurred, it became dominant in the community. It is concluded that there is no way to predict the algal density, the algal composition, nor the dominant genera in Illinois stream waters.

INTRODUCTION

Since 1945 the Illinois State Water Survey, in cooperation with the Champaign District office of the U. S. Geological Survey, has maintained a program designed to assess the mineral quality of selected surface waters in Illinois. The results of this continuing program have been reported in Water Survey Bulletins 45, 54, and 56.[1,2,3]

A new dimension was added to the program in October 1971. Samples were collected at monthly intervals from the waters of 35 streams at 41 locations and were examined for algal

Table 1. Sampling Station Locations and Drainage Areas

Map number (figure 1)	*Sampling station*	*USGS station number*	*Drainage area (sq mi)*
1	Coon Creek - Riley	5-4382.50	85.3
2	Fox River - Algonquin	5-5500.00	1402
3	Des Plaines River - Des Plaines	5-5290.00	359
4	Du Page River - Shorewood	5-5405.00	325
7	Kankakee River — Momence	5-5205.00	2340
8	Vermilion River - Pontiac	5-5545.00	568
10	Mackinaw River — Congerville	5-5675.00	764
14	Edwards River - New Boston	5-4665.00	434
15	Bear Creek - Marcelline	5-4955.00	348
17	Vermilion River - Danville	3-3390.00	1279
18	Sangamon River — Mahomet	5-5710.00	356
19	Salt Creek - Rowell	5-5785.00	334
20	Salt Creek - Greenview	5-5820.00	1800
21	South Fork Sangamon River — Rochester	5-5760.00	869
22	Sangamon River - Oakford	5-5830.00	5120
25	Embarras River - Camargo	3-3434.00	185
27	Kaskaskia River - Cooks Mills	5-5912.00	473
28	Kaskaskia River - Shelbyville	5-5920.00	1030
29	Shoal Creek - Breese	5-5940.00	760
31	Kaskaskia River - New Athens	5-5950.00	5220
32	Little Wabash River - Effingham	3-3786.35	240
33	Little Wabash River - Clay City	3-3795.00	1134
36	Skillet Ford - Wayne City	3-3805.00	464
37	Little Wabash River - Carmi	3-3815.00	3111
39	South Fork Saline River - Carrier Mills	3-3821.00	148
40	Big Muddy River — Murphysboro	5-5995.00	2154

density and type as well as mineral quality. The 15 low flow partial-record sites were terminatec at the end of a 2-year period because of lack of funds. The 26 locations that continued to be a part of the water quality sampling network are shown on figure 1 and identified by map number on table 1. Algae sample collections were terminated in October 1976.

Algae are part of the first trophic level in the aquatic ecosystem and are a principal food source for protozoa, rotifers, worms, crustaceans, fish, and other consumers.[4] Although it is difficult to establish a definitive relationship between algal density and/or types with mineral quality in running water, it is well known that changes in mineral quality are stimulated by algal activity. It is the preeminence of algae to the biotic balance of stream waters together with the need to incorporate other diagnostic procedures for assessing the trend of water quality in Illinoi streams that has led to the assembly of data on algal populations and distribution.

Algal data for the first two years for 41 stations were published in Water Survey Report of Investigation 80.[5] This report includes 5-year (October 1971 through September 1976) results for only 26 sampling locations and covers the identification and enumeration techniques used and the procedures followed in evaluating the data. Data summaries for each sampling station are included. The information should be useful to the individuals, companies, and agenci who have some responsibility for developing, regulating, or managing water resources in Illinois.

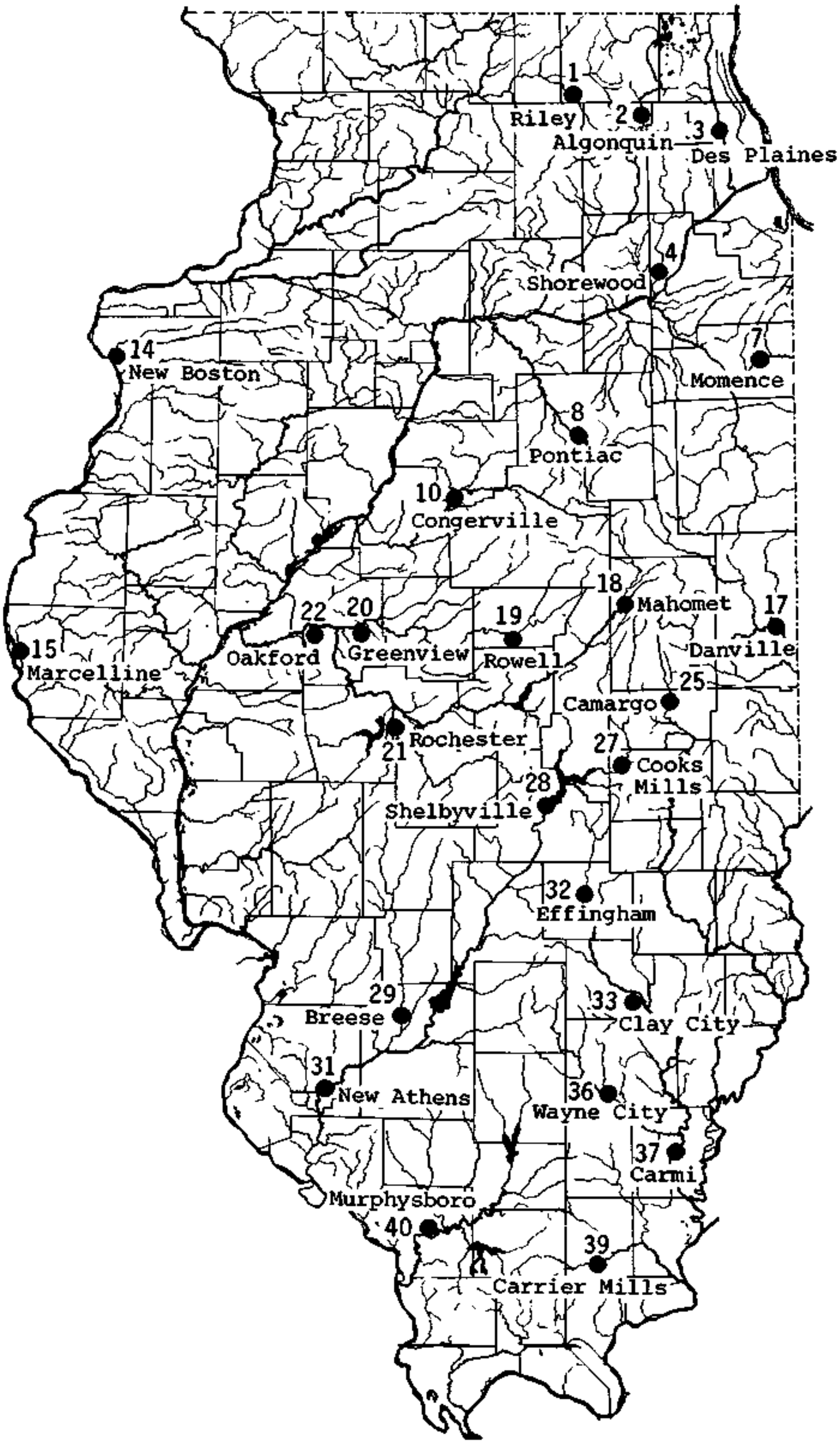

Figure 1. Sampling station locations and watersheds

Acknowledgments

This report was prepared under the general administrative direction of Dr. William C. Ackermann, Chief of the Illinois State Water Survey. We are grateful to the staff of the U.S. Geological Survey, and especially to Mr. Charlie Sieber, for collecting the stream samples. We also are grateful to Rebecca L. Phillips, Randall L. Rohman, Robert A. Grabel, and Michael Toohill for their assistance in data handling; to Miss Rebecca L. Phillips for typing the original manuscript; to Mrs. Patricia A. Motherway and Mrs. J. Loreena Ivens for editing the manuscript; to Mr. John Brother, Jr., for the graphic preparation; and to Mrs. Marilyn J. Innes for composing the camera-ready copy.

Part 1. Field and Laboratory Procedures

The Illinois State Water Survey, in cooperation with the Champaign District Office of the U.S. Geological Survey and others, has maintained a continuous program of sampling and analysis of surface water quality since 1945. The program has been so arranged that consecutive monthly samples are collected from several locations throughout the state and analyzed for 5-year periods. The selection of sampling locations for this study was governed by the requirement of the water quality program. Some locations have been sampling sites during several 5-year periods. Algal samples were collected at 26 locations for the 5-year period, October 1971 through September 1976.

Collection and Preservation

Samples were collected at monthly intervals at mid-stream and, when possible, 12 inches below the water surface. A volume of 380 milliliters (ml) of water was obtained as a grab sample in a small-mouth pint glass bottle. Experience has shown that collection in this manner, in contrast to the use of a plankton net, provides samples containing a natural dispersion of aquatic organisms. The method of collection in midwestern streams is quite critical because small organisms generally predominate and care must be taken that sampling procedures do not favor one size over another. An interval of 30 days between collections is excessive simply because algal populations can change rapidly, especially during seasons of active biological growth. Sample frequency during this study was dictated by other considerations including the fact that the period of sampling was to extend over 5 years.

For the identification and enumeration of phytoplankton, a 40 percent aqueous solution of formaldehyde (10 ml formaldehyde to a 390 ml sample of water) was used by the Water Survey for many years and was satisfactory. When this study was started a change in preservative was undertaken because experience by others had shown that better color retention and less contraction of cells were possible with Lugol's solution (8 g iodine, 12 g potassium iodide, and 20 ml acetic acid in 200 ml distilled water). The preservative was used for the first part of this study (about 3 years), but it was not as good at eliminating cell breakdown as the formaldehyde solution, which was then used for preservation during the last 2 years of the study. Samples were stored at room temperature before examination.

Identification

A 50 ml portion of the preserved samples was passed through a Millipore HA filter (0.45 µm pore diameter). Residues were scraped off with a rubber policeman and flushed from the filter by the filtrate into a test tube to a volume of 10 ml. A 1-ml portion from the test tube was pipetted into a Sedgwick-Rafter counting cell for microscopic examination. An inverted phase contrast microscope equipped with 10X eye-pieces and 20X objectives with a Whipple disc was used for identification and counting. Counts were made from 10 fields. Generally, the procedures outlined in *Standard Methods*[6] were followed.

Algae were identified to genus by employing several keys[7"12] and were grouped in 5 main types, i. e., blue-greens, greens, diatoms, flagellates, and desmids. The algae are grouped, in part, according to their colors.

Algae of the blue-green type, belonging to the class Myxophyceae, are usually characterized by a bluish-green color caused by a blue pigment of phycocyanin in addition to the green pigment of chlorophyll. A red pigment is sometimes present also. This group is also characterized by simplicity of structure and reproduction, with cells in a slimy matrix and containing no starch, nucleus, or platids. These forms may be either autotrophic or heterotrophic. There are about 1500 species. Most blue-green algae grow in nonfilamentous colonies or in branched or unbranched filaments. They are widely distributed and occur in varied habitats, but when they are present in massive numbers (a bloom) they are found at the water surface. They are more frequently found in ponds or lakes rather than in the running water of streams.

Green algae, the class nonmotile Chlorophyceae, etc., usually contain one major group of pigments, the chlorophylls, and most are autotrophic. The storage food is starch. The green algae group includes about 7000 species. Although a number live in salt water, the group as a whole is more characteristic of fresh water. They may be either free-floating or attached, and are usually either single cells or filamentous colonies that, if numerous, display a green cast to water.

Somewhat intermediate between the blue-green and green algae are a group known as diatoms, the class of Bacillariophyceae. Diatoms are characterized by the presence of silica in the cell walls, which are sculptured with striae and other markings, and by the presence of a brown pigment associated with the chlorophyll. Also, cells may contain green, yellow, or brown pigments depending on the stage of their life. The number of species is about 16,000 and they vary in color from brown to green. Although there is variation in shape, generally the cell is oblong to circular. The cell wall is composed of two halves (valves) one overlapping the other like the top and bottom of a pill box. Diatoms are generally unicellular and free-floating; however, some live attached to plants or inert objects.

In several classes (Chrysophyceae, Euglenophyceae, etc.) of algae, including green, there are numerous flagellated forms that are unicellular and equipped with flagella which are whiplike organs that make mobility possible. These are flagellates. The flagellate may also be either autotrophic or heterotrophic. Depending upon the species, the cells range from spherical to ovoid. They are frequently found in organically enriched waters.

Desmids are aquatic free-floating green algae of the subgroup Desmidiaceae. Most desmids are characterized by a median constriction that divides the cell into two halves equal in shape, size, and contents. There are numerous species of desmids and they are usually associated with ponds and lakes.

For enumeration, blue-green algae were counted by the number of trichomes. Green algae were counted by individual cells, except *Actinastrum*, *Coelastrum*, and *Pediastrum* which were counted by each colony observed. *Scenedesmus* was recorded by each cell packet. Diatoms were counted as one organism regardless of their grouping or connections.

Data Evaluation and Discussion

The data were evaluated solely on the observed algal composition and density. No effort was made to develop causal relationships. In addition to composition and density, the diversity index of each collection station was computed, and the occurrence of various density ranges was noted. These data are presented in tabular form along with a descriptive notation regarding algal succession at each station.

Algal Composition

During the 5-year study period, 56 algal genera were recovered from 1459 samples taken at the 26 sampling locations. The genera included 5 blue-greens, 17 greens, 25 diatoms, 6 flagellates, and 3 desmids. The types of algae found and their occurrences are shown in table 2. The number of genera per station ranged from 23 (station 37, Little Wabash River at Carmi) to 39 (station 2, Fox River at Algonquin). Eighteen algal genera were observed at all 26 sampling locations. Table 3 lists some very broad classifications of the frequently recovered algae as related to water quality.

As shown in table 2, the occurrence of desmids was negligible. Also the occurrence of blue-greens was not significant except for the station on the Fox River at Algonquin. Diatoms were clearly the dominant type of algae in Illinois streams. The most common diatoms observed were *Navicula* and *Cyclotella.* The diatoms *Synedra, Melosira,* and *Surirella* were also recovered frequently, although *Melosira* was not so important during the first 2 years of the study period.[5] The predominant green alga was *Scenedesmus.* The only flagellate of importance was *F.uglena.* These seven genera were observed at all 26 sampling stations. Similarly, they were the most important algae in the Upper Illinois Waterway[13] and in the Spoon River.[14] On the other hand, 15 algal genera were recovered from only one sampling location. Of these, 7 were recovered from the Fox River station. This is the only stream station located downstream of a glacial lake system.

The 5-year average recovery rates for the 18 most predominant algae at the 26 stream locations are depicted on figure 2. The recovery rate for *Navicula* in the Kaskaskia River at Cooks Mills was not more than 20 percent of the time during the first 2 years of the study period,[5] whereas it was recovered about 55 percent of the time during the 5-year period. From table 2 and figure 2, it can be seen that no algal genera were recovered over 60 percent of the time. For the 2-year period,[5] 15 out of 39 stations showed recovery rates for *Navicula* of over 60 percent with the highest recovery at 81 percent. Figure 2 also indicates the relative importance among the algal genera for each station in an array from the top to the bottom, i.e., from *Navicula* to *Fragilaria.*

A summary of 5-year average compositions for each algal group at the 26 sampling locations is included in table 4. Also shown is the maximum percent composition of blue-greens, greens, and flagellates for each station. The maximum for diatoms was 100 percent at each location, i.e., at one time or another all algae in a water sample for each station consisted solely of diatoms.

The samples at 19 of the 26 stations consisted solely of green algae on occasion. For the first 2 years only 9 of these stations produced samples consisting solely of green algae.[5] Although blue-green algae were recovered from 13 stations, they occurred only once at 10 locations, 2 times in the Mackinaw River near Congerville, and more often at the Fox River at Algonquin. A sample from the Little Wabash River below Clay City on February 8, 1974, consisted only of the blue-green alga *Oscillatoria.* The flagellates *Euglena* and *Phacus* were the only algae observed in a sample collected from the Kaskaskia River at Cooks Mills on August 11, 1975.

Table 2. The Occurrence and Type of Algae at 26 Sampling Stations

(Percentage of time present at sampling stations)

Station number → (figure 1) **Algal type**	*1*	*2*	*3*	*4*	*7*	*8*	*10*	*14*	*15*	*17*	*18*	*19*	*20*	*21*	*22*	*25*	*27*	*28*	*29*	*31*	*32*	*33*	*36*	*37*	*39*	*40*	*Number of stations*
Blue-green algae																											
Anabaena		13	2											2			2	2					2			2	7
Anacystis		6			2																						2
Aphamzomenon		6		2		2	4						2			2											6
Cylindrospermum		2																									1
Oscillatoria		2																				2					2
Green algae																											
Actinastrum	8	12	2	18	7	9	7	5	3	12	11	9	4	13	6	14	8	16	9	9	4	4	9	2	5	5	26
Ankistrodesmus	11	12	11	5	7	5	5	11	16	4	9	9	2	9	7	9	12	5	9	7	2	13	7	5	4	16	26
Chlorella	2	2				4	2		2	2	2	2	2	2			3			4			7		4	2	15
Cblorococcum		2																									1
Clostendium																			2							2	2
Coelastrum	6	8	7	14	9	13	9	7	7	7	7	4	13	5	6	7	3	7	12	4	6	11	7	5	5	2	26
Crucigenia	4	4	4	4	2	2	5	4	5	5	2	5	2	2	6	9	5	7	5	5	8	2	9	4	7	7	26
Diogenes		2																									1
Mougeotia			2										2														2
Oocystis	4			4		4	4	2	2	4	2			5	6	2	3	4	2	5	2	2	4	4	5	5	21
Pediastrum	9	13	5	4	11	7	7	4	3	5	4	9	4	4	7	5	7	11	10	5	6	2	9	9	16	11	26
Phytoconis																											1
Scenedesmus	21	46	14	26	12	24	21	11	19	16	21	16	21	34	15	14	28	16	14	23	20	13	16	16	28	23	26
Tetraedron		2																									1
Treubaria		2																									1
Ulothrix	13	17	25	9	14	4	20	18	21	7	9	2	9	7	6	22	5	5	12	9	12	13	9	14	14	11	26
Zygnema			5	2					3	2		2	4						3	2						2	9
Diatoms																											
Achnanthes							2																				1
Astenonella	4	19		5	9	2	2	7	4	3	7	5	4	5	4	2	3	7	9	5		7	2	7	2	2	24
Caloneis	4	10	5	9	16	7	11	4	14	2	12	14	12		9	10	12	12	5	11	2	9	5	7	2	4	25
Cocconeis		2											2	5													3
Cyclotella	36	56	43	44	50	49	39	44	34	46	37	33	45	41	37	41	47	37	31	42	29	35	39	33	32	43	26
Cymatopleura		4		2																		2					3
Cymbella	4		2			2	2	5								2						2					7
Diatoma	6	8	7	9	9	9	5	11	3	12	4	5	13	7	4	7	12	9	2	4	16	7	4	9	4	7	26
Diplonets					2																						1
Epithemia					2																						1
Fragilaria	11	8	5	12	2	7	5	5	7	5	7	7	9	4	6	3	3	12	3	7	6	4	5	7	2	13	26
Frustulia	2																										1
Gomphonema	2	2		2			2	2																			5
Gyrostgma	8	13	11	9	14	11	9	16	9	14	16	7	11	7	11	7	13	5	14	9	4	11	9	12	12	20	26
Hantzschia		2	2			2		4					2		2	2	2				2	2	2				11
Melosira	15	37	21	10	7	9	14	18	17	11	7	14	9	14	24	10	13	18	14	14	4	15	14	17	23	16	26
Mendium										2																	1
Navicula	43	48	38	35	50	36	57	47	45	51	39	37	39	46	37	40	55	51	45	42	45	44	35	43	32	41	26
Neidium													2			2						2					3
Nitzscbta	23	23	23	21	20	18	18	21	16	19	14	23	23	21	20	26	17	25	14	23	28	20	19	19	16	23	26
Pleurosigma			4	2	2		2									2											5
Stephanodiscus	4	8	2	2	2	2	2	2	2		4		2	7	4		2	4	3	5	6	2	2	2		2	22
Sunrella	11	27	11	9	18	27	14	11	12	12	14	18	18	16	7	12	10	11	19	12	14	15	12	9	7	7	26
Synedra	17	19	13	25	16	18	11	12	24	9	21	23	20	14	19	12	13	14	9	14	8	16	16	12	12	21	26
Tabellaria	15	4	9	16	9	4	11	5	7	5	16	11	4	7	19	14	15	9	19	11	6	5	7	12	7	5	26
Flagellates																											
Cblamydomonas			5	2	4			4							2	2	3		2				2			2	10
Dinobryon		2	2		4	2	2	2		4								2		4		2					10
Eudonna	2					4	2	4			2	4	2				2				2		4		2		11
Euglena	9	35	25	9	29	22	16	18	21	30	7	19	9	21	17	22	18	18	19	25	18	18	12	21	18	14	26
Gymnodinium																2											1
Pbacus	2	8	5	9	5	5	4	4	7	9	7	4	4	5		2	7	11	7	4	8	4	7	4	4	2	25
Desmid																											
Amphiprora		2																									1
Desmidium																				2							1
Staurastrum		2																									1
Number of genera	28	39	30	29	28	29	31	29	25	26	25	24	30	24	24	29	29	25	26	27	24	29	28	23	24	28	
Number of samples	53	52	56	57	56	55	56	57	58	57	57	57	56	56	54	58	60	57	58	57	49	55	57	58	57	56	

Table 3. Water Quality Significance of Frequently Observed Algae

Algae	Attached	Clean water	Filter clogging	Polluted water	Surface water	Taste and odor
Blue-green algae						
Anabaena			X	X		X
Aphanizomenon						X
Green algae						
Actinastrum					X	
Ankistrodesmus		X			X	
Chlorella			X	X	X	
Coelastrum					X	
Crucigenia					X	
Oocystis					X	
Pediastrum					X	X
Scenedesmus				X	X	X
Ulothrix	X	X	X		X	
Zygnema			X		X	
Diatoms						
Asterionella			X			X
Caloneis				X		
Cyclotella		X	X		X	X
Diatoma			X			X
Fragilaria			X		X	X
Gyrosigma					X	
Melosira			X	X	X	
Navicula		X	X	X	X	
Nitzschia		X	X	X		
Stephanodiscus				X	X	X
Surirella		X		X		
Synedra		X	X		X	X
Tabellaria			X			X
Flagellate						
Euglena		X		X	X	X

With the exception of station 39, the South Fork Saline River near Carrier Mills, as shown in table 4, diatoms accounted for 64 to 80 percent of the total algal population at all stations and green algae made up 15 to 29 percent. At Carrier Mills during each of the 5 years of study diatoms made up 77, 46, 47, 38, and 76 percent of the population; for the same years, green alga made up 19, 48, 53, 57, and 17 percent of the algae population. This shifting of predominance of algal types is unusual compared with observations at the other stations. There was no difference in algal compositions between northern and southern watersheds.

Algal Density

An examination of the algal density data, expressed as cell counts per milliliter (cts/ml), for each station showed them to be generally distributed in a log-normal pattern. Therefore, the central tendency and dispersion of the data have been expressed in geometric terms. These data are summarized in Part 2 of this report.

The geometric mean (M_g) values at most locations were not significantly different from year to year, except when a sample did not contain algae. This happened frequently during winter

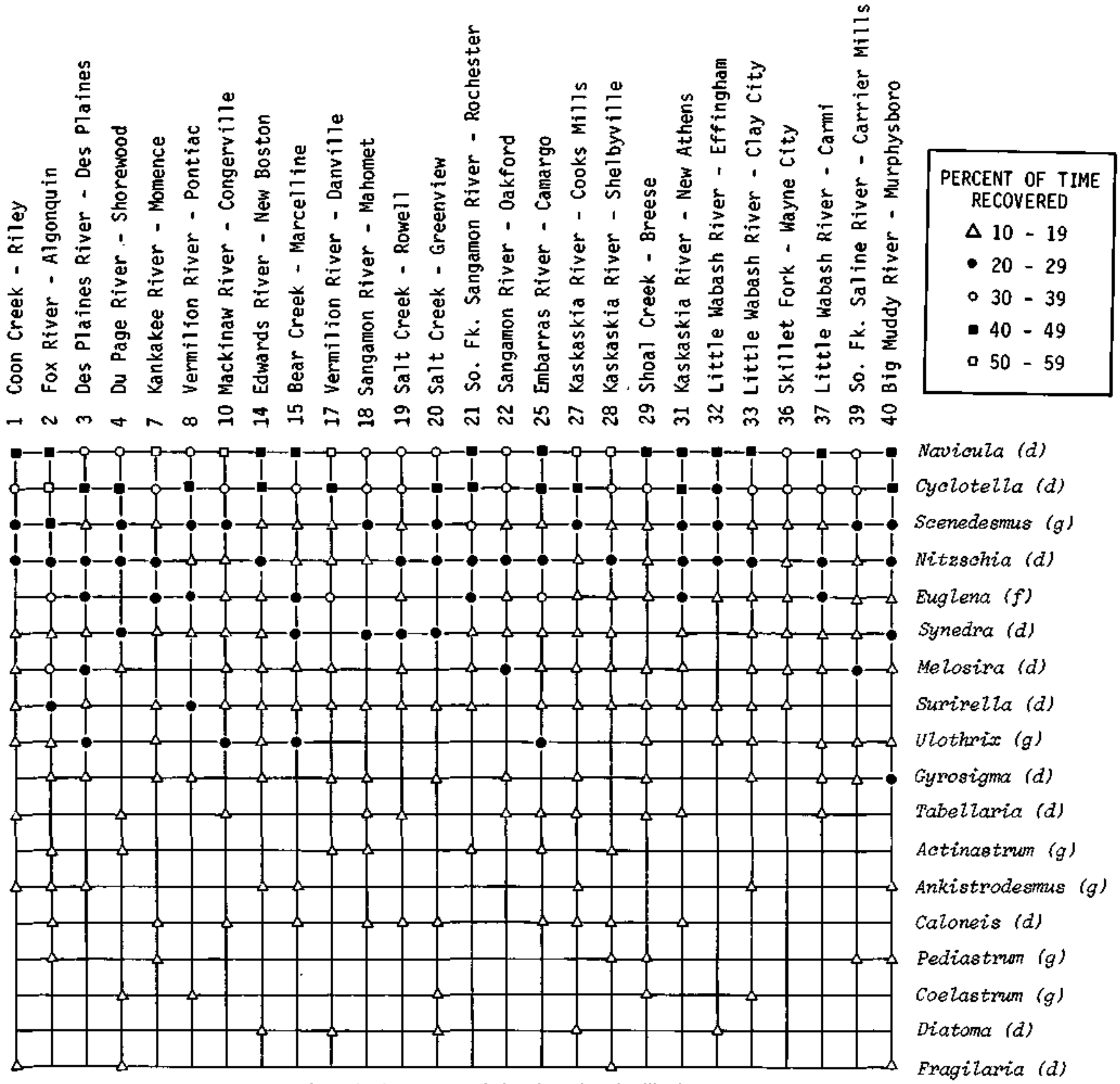

Figure 2. Occurrence of abundant algae in Illinois streams

Table 4. Summary of Average Composition of the Algal Types

	Sampling location (figure 1)	5-year average (%)				Maximum (%)*		
		Blue-green	Green	Diatom	Flagellate	Blue-green	Green	Flagellate
1	Coon Creek — Riley		23.3	72.5	4.2		100	80.0
2	Fox River — Algonquin	7.2	21.3	64.9	4.6	72.7	100	66.7
3	Des Plaines River — Des Plaines	0.3	24.0	67.9	7.8	20.0	81.2	71.5
4	Du Page River — Shorewood	0.5	28.7	67.4	3.4	23.1	100	37.5
7	Kankakee River — Momence	0.6	20.0	70.2	9.4	33.3	100	71.4
8	Vermilion River — Pontiac	1.3	20.0	70.5	8.2	66.7	100	90.9
10	Mackinaw River — Congerville	1.8	27.5	65.5	5.2	50.0	100	60.0
14	Edwards River — New Boston		18.4	75.0	6.6		100	42.9
15	Bear Creek — Marcelline		24.8	67.5	7.7		100	75.0
17	Vermilion River — Danville		22.1	68.7	9.2		100	61.9
18	Sangamon River — Mahomet		24.7	71.8	3.5		100	75.0
19	Salt Creek - Rowell		18.7	73.2	8.1		93.7	71.4
20	Salt Creek — Greenview	1.2	15.3	79.9	3.6	66.7	90.9	66.7
21	South Fork Sangamon River — Rochester		28.6	66.1	5.3		100	66.7
22	Sangamon River — Oakford		21.3	74.5	4.2		100	63.6
25	Embarras River — Camargo	0.3	24.0	68.3	7.4	16.7	100	85.7
27	Kaskaskia River — Cooks Mills	0.5	22.5	69.9	7.1		92.3	100
28	Kaskaskia River — Shelbyville	0.4	18.3	75.7	5.6	23.1	90.9	42.9
29	Shoal Creek — Breese		22.6	67.7	9.7		100	80.0
31	Kaskaskia River — New Athens		21.3	71.6	7.1		94.1	80.0
32	Little Wabash River — Effingham		24.8	67.9	7.3		100	91.7
33	Little Wabash River - Clay City	2.0	20.4	70.9	6.7	100	100	62.5
36	Skillet Fork - Wayne City	0.5	27.2	64.2	8.1	27.3	92.3	83.4
37	Little Wabash River — Carmi		20.6	74.5	4.9		100	50.0
39	South Fork Saline River — Carrier Mills		38.6	56.7	4.7		100	36.4
40	Big Muddy River — Murphysboro	0.9	26.2	69.7	3.2	50.0	100	33.3

* *Maximum value for diatoms was 100 percent for all 26 stations*

months, especially during January and February. Also, the geometric standard deviation (SD_g) becomes quite large if samples with no algae are included in the computations.

Table 5 summarizes the statistical data for algal densities at each sampling location. The maximum algal density of 60,000 cts/ml occurred in the Fox River at Algonquin (station 2) on February 11, 1976. Eight samples collected from the same station (Fox River) had algal densities over 10,000 cts/ml for the period of 1974 through 1976. Two other stations, Edwards River near New Boston (station 14) and Bear Creek near Marcelline (station 15) also showed densities in excess of 10,000 cts/ml. For the 2-year data,[5] the maximum algal density was 7100 cts/ml and occurred in the Des Plaines River near Des Plaines (station 3) on May 7, 19.73, and in the Kaskaskia River at New Athens (station 31) on June 6, 1972.

If the samples in which algae were not detected are omitted from computation, the annual geometric mean ranged from 1000 to 2600 cts/ml for all stations except the Fox River at Algonquin. The 5-year geometric means for all 26 stations ranged from 600 to 2800 cts/ml (table 5). The lower algal counts were observed in the southeastern part of the state (stations 32 through 39). The highest geometric mean was for the Fox River. This station is influenced significantly by the upstream Fox Chain of Lakes.[15] The majority of sampling locations (20 stations) had geometric means between 880 and 1500 cts/ml.

Table 5. Summary of 5-Year Algal Densities

	Sampling location (figure 1)	*Maximum (cts/ml)*	*Geometric mean (cts/ml)*	*Geometric standard deviation*
1	Cook Creek - Riley	5000	1000	4.70
2	Fox River — Algonquin	60,000	2800	4.83
3	Des Plaines River — Des Plaines	8200	1300	4.52
4	Du Page River — Shorewood	4700	1100	7.37
7	Kankakee River — Momence	3300*	1300	1.99
8	Vermilion River — Pontiac	4100	1200	3.16
10	Mackinaw River — Congerville	7200	1200	4.64
14	Edwards River — New Boston	13,000	1000	6.22
15	Bear Creek — Marcelline	11,000	880	7.30
17	Vermilion River — Danville	6600	1000	5.85
18	Sangamon River — Mahomet	3500*	1100	1.96
19	Salt Creek - Rowell	4400	1200	3.21
20	Salt Creek — Greenview	3900	1200	4.38
21	South Fork Sangamon River — Rochester	6600	1200	4.77
22	Sangamon River — Oakford	6700	1000	4.91
25	Embarras River — Camargo	4700	1200	4.46
27	Kaskaskia River — Cooks Mills	5000	1200	4.34
28	Kaskaskia River — Shelbyville	4400	1000	5.84
29	Shoal Creek — Breese	5300	1100	5.73
31	Kaskaskia River — New Athens	7200	1500	3.33
32	Little Wabash River — Effingham	4900	600	12.05
33	Little Wabash River — Clay City	4700	720	9.29
36	Skillet Fork - Wayne City	4900	790	8.97
37	Little Wabash River — Carmi	6900	900	5.80
39	South Fork Saline River — Carrier Mills	9700	600	12.64
40	Big Muddy River — Murphysboro	7100	1300	3.35

** All Samples contained algae*

Wide ranges of annual geometric standard deviations for each station were observed (see Part 2). If samples with no algae were included for computation, the yearly geometric standard deviations were between 8 and 31. The annual geometric standard deviation for all samples containing algae ranged from 1.46 to 3.34. Two locations, the Kankakee River at Momence (station 7) and the Sangamon River at Mahomet (station 18), had the lowest geometric standard deviations (table 5). All water samples collected from these two locations contained algae. It is interesting to note that the maximum algal densities for these two stations were the lowest among the 26 stations.

Evaluation of the density ranges for each sampling station showed that most of the algal counts were between 500 and 2000 cts/ml. Approximately one-third of the samples have algal densities of 2000 to 5000 cts/ml. About 11 percent of the samples had algal densities less than 500 cts/ml. In 38 of the 1459 samples collected, algal counts exceeded 5000 cts/ml. These 38 samples were obtained from 15 sampling locations and 13 of them were obtained from the Fox River at Algonquin (station 2).

The number and types of algae in running water depend on many factors.[16,17,18] Among them are size and shape of the stream, water temperature, stream velocity, depth, light penetration, nutrient availability, grazing animals, and human activity. Thus, it is extremely difficult to reasonably predict the population and composition of algae in streams.[13,14] No attempt was made to correlate algal density or composition with environmental factors.

Diversity Index

There have been many methods suggested for defining the structure of a biological community. The most widely used procedure is the diversity index and the one most commonly used is Shannon's diversity index[19] which was derived from information theory. For the purposes of this report the diversity index for each station on each day of collection was calculated by formula[20] as follows:

$$D = -\sum_{i=1}^{m} p_i \log_2 p_i$$

where $p_i = N_i/N_s$ is the probability of the occurrence of the ith genus, N_i is the density of the i genus, N_s is the total algal density of the sample, and m is the number of genera per sample. For convenience $\log_2 p_i$ may be expressed as $1.44 \ln p_i$. The index D has a minimum value when $m = 1$ and a maximum value when $m = N_s$.

Recently, Zand[21] demonstrated the differences between Shannon's and Brillouin's formulas with 16 hypothetical biological samples. He suggested that the diversity index be expressed in 'sits' (s-ary digit) per individual unit rather than the presently used bits (binary digit) per individual. Also the redundancy R or evenness E should be replaced by a relative evenness ratio e. The diversity index in 'bits per individual' is equal to the diversity index in 'sits per individual' multiplied by $\log_2 s$. Logan,[22] in a follow-up discussion, argued that changes in terminology are not necessary.

Ninety-six samples collected from Coon Creek and Fox River, which respectively represent average and relatively high algal densities, were subjected to the two formulas for determining diversity indices. Diversity indices calculated by both Brillouin's and Shannon's formulas were almost identical. However, computer (Wang 720 series) time for Brillouin's formula is approximately 10 to 20 times longer than that for Shannon's formula. Also, as expected, diversity in 'sits' is numerically close to the relative evenness ratio. The diversity index in bits per individual is high when the number of biological species and the number of individuals are high. The diversity index in sits per individual is a normalized number and ranges from 1 to 0. On the basis of the data obtained, there is no advantage in using sits per individual calculated by Brillouin's formula. Thus the bits per individual calculated by Shannon's formula were used in this report.

The computed diversity indices are given in Part 2 of this report. The maximum, mean, and standard deviation for each sampling location are summarized in table 6. The largest index was 3.44 bits per individual for the Fox River at Algonquin on July 11, 1974. Twenty-one algal genera with a density of 24,000 cts/ml were in the sample. At the same location, in contrast, the diversity index was zero for the February 11, 1976, sample which had a density of 60,000 cts/ml. This was caused by a uniculture situation. The diversity index has a minimum value of zero when $m = 1$ and a maximum value when $m = N$. In general, the greater the number of species, with a higher proportion of rare varieties, the greater the diversity value. Inspection of table 6 shows that the highest average index of 1.57 occurred at the Fox River. Most stations had a mean diversity index between 1.11 and 1.36 bits per individual and had a maximum between 2.11 and 2.70 bits per individual. Standard deviations for all locations were from 0.46 for the Kaskaskia River at Cooks Mills to 0.68 for the Fox River at Algonquin.

Wilhm and Dorris[23] suggested the use of the diversity index for assessing water quality. They proposed that an index of greater than 3.0 is indicative of 'clean' water, from 1.0 to 3.0 of 'moderately polluted' water, and less than 1.0 of 'heavily polluted' water. Based solely on these criteria and the average indices, the water quality of the Illinois streams could classify as moderately polluted. This is only a broad assumption without any regard to chemical, physical, or other biological considerations of the stream waters.

Table 6. Summary of 5-Year Algal Diversity Indices*

	Sampling location (figure 1)	*Maximum*	*Mean*	*Standard deviation*
1	Cook Creek — Riley	2.19	1.17	0.50
2	Fox River — Algonquin	3.44	1.57	0.68
3	Des Plaines River — Des Plaines	2.11	1.26	0.48
4	Du Page River — Shorewood	2.55	1.27	0.60
7	Kankakee River — Momence	2.71	1.35	0.54
8	Vermilion River — Pontiac	2.10	1.32	0.47
10	Mackinaw River — Congerville	2.50	1.32	0.54
14	Edwards River — New Boston	2.63	1.20	0.66
15	Bear Creek — Marcelline	2.03	1.20	0.60
17	Vermilion River — Danville	2.29	1.23	0.59
18	Sangamon River — Mahomet	2.26	1.11	0.55
19	Salt Creek - Rowell	2.15	1.19	0.55
20	Salt Creek — Greenview	2.15	1.19	0.53
21	South Fork Sangamon River — Rochester	2.17	1.26	0.57
22	Sangamon River — Oakford	2.11	1.11	0.58
25	Embarras River — Camargo	2.48	1.16	0.63
27	Kaskaskia River — Cooks Mills	2.46	1.36	0.46
28	Kaskaskia River — Shelbyville	2.26	1.29	0.56
29	Shoal Creek — Breese	2.38	1.24	0.60
31	Kaskaskia River — New Athens	2.31	1.24	0.49
32	Little Wabash River — Effingham	2.50	1.02	0.64
33	Little Wabash River — Clay City	2.27	1.09	0.62
36	Skillet Fork - Wayne City	1.97	1.14	0.53
37	Little Wabash River — Carmi	1.89	1.14	0.60
39	South Fork Saline River — Carrier Mills	2.16	1.01	0.66
40	Big Muddy River — Murphysboro	2.22	1.25	0.54

** Bits per individual calculated by Shannon 's formula*

Mitchell and Buzzell[24] reported that the use of the algal genera diversity index was the best parameter for assessing the effects of various chemicals and wastewater on an algal population in laboratory microcosms. Nevertheless, the use of the diversity index did not have any more advantage than the use of algal composition and algal density on the streams studied. Also the application of diversity indices to stream waters based only on genera, in contrast to species identification, may be questionable. Similar results were found in the upper Illinois waterway[13] and in the Spoon River.[14] Hurlbert[25] states that the diversity index has two shortcomings: 1) the formula is inadequate because it is "insensitive to the rare species which may play a substantial role in the ecosystem," and 2) the index does not assume that "the more abundant a particular species, the more important it is to the community."

Part 2. Data Summaries

1. COON CREEK AT RILEY

During 1972 the initial algal maximum occurred in May. The ratios of diatoms:greens:flagellates at that time were 2:2:1. Algal densities subsequently decreased during the summer. The next maximum occurred on August 10 with the diatoms *Navicula* and *Fragilaria* representing about 81 percent of the population. Algal densities decreased from that date and reached a winter low of 470 cts/ml on January 12, 1973.

Two pulses also occurred during May and August 1973. In May the predominant genera were *Ulothrix* and *Scenedesmus,* both greens. In August the predominant alga was the diatom *Melosira.*

Four samples collected from April through July 1974 contained only diatoms. *Navicula* was dominant in the May sample. *Surirella* was important in the April and May samples. The dominant alga for the April and July samples was *Tabellaria.* The 1974 annual maximum occurred on November 18 and consisted solely of diatoms with *Navicula* the dominant one.

In 1975, high algal counts occurred from February through April. The greens, *Chlorella* and *Ankistrodesmus* dominated the February sample. Diatoms made up 96 percent of the algal count on March 19 and *Cyclotella* was the prevailing alga. Another green alga, *Ulothrix* was abundant (19 percent) in the March sample.

A spring maximum was observed on March 30, 1976, consisting mainly of the diatom *Melosira* (63 percent) and the green alga *Scenedesmus* (33 percent). In 1976 another high algal density occurred on August 2 and consisted mostly of the diatom *Tabellaria* and the green alga *Ulothrix.*

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density* Range	M_g	*SD* g	*Diversity' index* Range	*M*	*SD*	*Algal density occurrence (% of time)* <500	500 to 2000	2001 to 5000	>5000
11/71-9/72	11	470-5000	1600	2 00	0 72-2 19	1 43	0 50	9 1	54 5	27 3	9 1
10/72-9/73	12	470-4600	1300	1 98	0 81-1 41	1 13	0 19	9 1	63 6	27 3	
10/73-9/74	12	160-3100	1300	2.24	0-2 19	1 22	0 6 1	8 3	66 7	25 0	
10/74-9/75	11	ND -3500	400	20 52	0-1 72	0 97	0 5 3	18.2	45 5	36 4	
10/75-8/76	10	160-4200	1000	2 61	0-1 66	1 05	0 50	20	60 0	20 0	
5-year	56	ND -5000	1000	4 70	0-2 19	1 17	0 50	12 9	58 1	27 2	1 8

• ND = Alga not detected

Summary of Data

Date	*Algal density (cls/ml)*	*Diversity index*
1971		
11/5	2400	1.29
12/6	790	0.72
1972		
1/5	470	0.92
2/10	1700	1 32
3/24	940	1 59
4/26	1900	2 09
5/31	3000	2 19
6/27	2200	1 72
7/12	790	0 72
8/10	5000	1 63
9/18	1900	1 56
10/19	790	0 97
11/9	-630	0.81
12/5	1100	0 99
1973		
1/12	470	0 92
3/15	2400	1 23
4/11	1300	1 41

Date	*Algal density (cts/ml)*	*Diversity index*
5/8	4600	1 20
6/9	1400	1.39
7/11	1700	1.10
8/14	3000	1 19
9/10	940	1 25
10/6	1400	1 22
11/14	790	0.72
12/14	1400	1 39
1974		
1/15	790	1 37
2/12	160	0
3/13	1900	1 83
4/16	3000	2 19
5/15	3100	1 41
6/12	940	0 65
7/11	1900	0 65
8/13	1400	1 58
9/11	2500	1 62
10/8	ND	0
11/18	3300	0 86
12/18	790	1 37

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
2/21	2200	1 72
3/19	3500	1 46
4/14	2700	0 67
5/21	1600	0 72
6/16	ND	0
7/21	940	0 65
8/21	790	0 72
9/16	630	1 50
10/14	1100	1 15
12/23	160	0
1976		
1/15	1400	1 22
2/27	1700	1 49
3/30	4200	1 12
4/9	1100	0 59
5/21	790	0 72
6/30	310	1 0
7/22	1100	1 66
8/2	2800	1 50

2. FOX RIVER AT ALGONQUIN

This location was the most productive one among the studied streams. Algal genera and densities are influenced by the Fox Chain of Lakes. During the winter of 1971-1972 the diatom *Cyclotella* was dominant. In June 1972 a *Euglena* bloom developed followed by the blue-green *Anabaena* in July. A combination of blue-greens and the diatom *Melosira* made up about 97 percent of the 4700 cts/ml on July 10. An autumn pulse did not materialize.

In February 1973 densities of about 3100 cts/ml occurred consisting principally of the green alga *Crucigenia.* The diatom *Fragilaria* was predominant in April. The annual maximum density of 5000 cts/ml occurred in May and *Cyclotella* made up 50 percent of the population. The green alga *Coelastrum* was dominant among the greens.

The algal counts and the number of the genera (7-21) were consistently high from April through December 1974. In the April and May samples, diatoms were dominant and consisted mainly of *Cyclotella, Melosira, Nitzschia,* and *Navicula. Navicula* with 6 other diatoms made up 93 percent of algal population on June 12. The highest number (21) of algal genera was found in the July 11 sample. The ratio of diatoms:greens: blue-greens in that sample was approximately 4:5:1. The diversity index at the time was the highest, i.e., 3.44.

The bloom of the blue-green alga, *Oscillatoria,* occurred on October 9, 1974, and made up more than one-half of the algal count. The diatoms *Melosira* and *Cyclotella* were also important in that sample. The 1974 annual maximum occurred on November 12 consisting mainly of *Cyclotella* (72 percent) and *Oscillatoria* (15 percent). *Cyclotella* was the dominant alga (88 percent) in the December sample.

The annual peak for 1975 occurred on April 11. *Cyclotella* and *Melosira* were the dominant genera at that time. During the summer of 1975 there was no significant algal peak. A pulse was observed on November 11 consisting mainly of *Cyclotella* and the blue-green *Aphanizomenon.*

It is interesting to note that the green alga *Diogenes* was detected only once. On February 11, 1976, a sample containing solely *Diogenes* had an algal density of 60,000 cts/ml. On May 11, 1976, the diatoms *Cyclotella* and *Melosira* again were responsible for another algal pulse. Similar to the previous years, the summer of 1976 was not a productive period.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*M_g*	* *SD_g*	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
11/71-9/72	11	630-4700	1900	1.79	0.44-2 29	1.54	0.59		36 4	63.6	
10/72-9/73	12	310-5000	1700	2.16	0.65-1 77	1 26	0 43	16.7	41 7	33.3	8.3
10/73-7/74	10	ND -24,000	1500	16.98	0-3 44	1.64	0.10	10.0	50 0	10.0	30.0
10/74-9/75	11	1400-32,000	6500	2 98	0 88-2 74	1.74	0.54		9 1	45.5	45 5
11/75-8/76	8	1400-60,000	6700	3 34	0-2 32	1.74	0.79		12 5	37 5	50 0
5-year	52	ND-60,000	2800	4 83	0-3.44	1.57	0 68	5 3	29 9	38 0	26 8

• ND = Alga not detected

Summary of Data

Dale	***Algal** d.**enstty** (cts/ml)*	*Diversity index*
1971		
11/5	3000	2 29
12/6	2000	1 88
1972		
1/3	630	0 81
2/7	1700	0.44
3/20	2200	2 12
4/26	2400	1.86
5/31	940	1.92
6/27	3000	1.72
7/10	4700	1 60
8/7	2500	0.87
9/21	1100	1 38
10/19	630	0 81
11/9	310	1 00
12/11	1700	1 69
1973		
1/15	940	0.65
2/12	3000	1.76
3/12	1900	1 33

Date	*Algal density (cts/ml)*	*Diversity index*
4/10	2700	0.79
5/8	5000	1.77
6/8	1300	1 30
7/10	2800	1.50
8/15	2800	1 71
9/10	1900	0 82
10/15	1400	1.75
11/13	1600	0 72
12/17	790	1.37
1974		
1/14	ND	0
2/14	1400	1.22
3/11	1900	1 04
4/15	21,000	1.87
5/15	6900	2 39
6/12	4600	2 60
7/11	24,000	344
10/9	17,000	1 88
11/12	32,000	1 52
12/11	26,000	0.88

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
2/11	3800	1.18
3/13	1400	1.75
4/11	19,000	1 95
5/15	6700	2 74
6/9	2000	2.08
7/15	2800	1.22
8/12	4900	2 31
9/10	3100	1.68
11/19	8800	2 02
1976		
1/6	1400	1.22
2/11	60,000	0
4/2	6300	2.24
5/11	22,000	2.27
6/23	2800	2.32
7/13	3500	2 05
8/4	4100	1 82

3. DES PLAINES RIVER NEAR DES PLAINES

On November 3, 1971, algal counts were high (3300 cts/ml) because of *Cyclotella* development. From that date through all of 1972 there were no significant pulses. There were no spring or autumn maxima and the population consisted mostly of diatoms.

On April 5, 1973, another *Cyclotella* bloom occurred with the peak at 6400 cts/ml. A spring maximum of 7100 cts/ml occurred in May with the diatoms *Cyclotella* and *Asterionella* and the blue-green *Anabaena* dominating. Algal populations were sharply reduced during the summer and there was no autumn maximum.

A spring pulse was observed on May 8, 1974, made up only of the diatom *Fragilaria* and the green alga *Zygnema.* Following the low summer algal densities, the 1974 maximum of 8200 cts/ml occurred on November 15. This consisted mainly of the green alga *Scenedesmus* (3100 cts/ml), the flagellate *Euglena* (2400 cts/ml), and the diatom *Melosira* (2000 cts/ml).

The years 1975 and 1976 were without significant algal pulses at this location. For 18 samples collected during this period, the highest algal count was of 2700 cts/ml, dominated by the diatom *Tabellaria,* on February 5, 1975.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*Mg*	*SDg*	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
11/71-9/72	11	470-3300	1700	1 72	0 92-1.95	1 48	0 30	9.1	36 4	54 5	
10/72-9/73	12	790-7100	1800	2.07	0 37-1 98	0 98	0 45		58.3	25 0	16.7
10/73-9/74	12	630-3500	1700	1 65	0 50-2 11	1 31	040		50.0	50 0	
10/74-9/75	12	630-8200	1600	2.02	0.67-1 90	1 35	0 43		66 7	25.0	8 3
10/75-9/76	9	ND-2500	330	27 65	0-1 98	1.15	0 72	22 2	33 3	444	
5-year	56	ND -8200	1300	4 52	0-2.11	1 26	0 48	63	48 9	39.8	5 0

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*
1971			5/7	7100	1.98	1975		
11/3	3300	1.12	6/5	1100	1 15	1/8	1300	1 30
12/9	470	0.92	7/5	2500	0 81	2/5	2700	0 67
1972			8/9	1400	1 35	3/4	940	1 79
1/11	940	1.46	9/5	1600	0 97	4/7	2000	1 42
2/2	1400	1.44	10/10	3000	1.24	5/5	790	0 72
3/15	1400	1 35	11/12	2700	1.61	6/3	940	100
4/26	1700	1.82	12/12	2400	2 11	7/10	1900	1 73
5/31	2200	1.95	1974			8/5	1300	1 30
6/27	2000	1.35	1/9	1100	0 99	9/3	630	1.50
7/12	2400	1 64	2/6	630	1.50	10/8	630	1 50
8/3	2700	1 66	3/7	1400	1 53	11/12	2500	0 87
9/6	2000	1.58	4/11	2000	1 20	12/3	2000	1 57
10/4	790	0 72	5/8	3500	0 95	1976		
11/9	2200	0.37	6/15	1400	0 50	2/12	ND	0
12/11	790	0 72	7/3	1100	1 38	3/23	1900	1 78
1973			8/7	1400	1.35	5/4	1300	1.41
1/15	2000	0 39	9/5	2200	1.38	6/16	2500	1 25
2/12	940	1 25	10/3	1400	0.99	7/30	2500	1.98
3/6	1600	1.30	11/15	8200	1 90	9/14	ND	0
4/5	6400	0.77	12/5	3000	1 89			

4. DU PAGE RIVER AT SHOREWOOD

Algal pulses were poorly developed during 1972. *Cyclotella* and *Navicula* were the predominant diatoms and *Actinastrum* was the dominant green alga. In 1973 a maximum count of 4100 cts/ml unexpectedly occurred in February. It consisted principally of the diatom *Melosira*. The second pulse of about 3500 cts/ml which occurred on June 18 also consisted mainly of *Melosira*. The dominant green alga during 1973 was *Scenedesmus*. Blue-green algae were not a significant factor in the river.

Algae detected during February through May 1974 were mostly diatoms with a diverse genera. *Fragilaria* was important in April and May. On August 10, 1974, the green alga *Pediastrum* represented 50 percent of the algal population.

The green alga *Crucigenia* (2500 cts/ml) accounted for most of the algal density on January 27, 1975. A spring peak as well as a 1975 maximum was found on April 24. Most of the algae were the diatoms *Cyclotella*, *Asterionella*, and *Melosira*. In 1976, algal densities were not high. With exception of the growth of *Ulothrix* in May and June, most of algae were diatoms during 1976.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density* *Range*	*Algal density* *M_g*	*SDg*	*Diversity indcx* *Range*	*Diversity indcx* *M*	*Diversity indcx* *SD*	*Algal density occurrence (% of time)* *<500*	*500 to 2000*	*2001 to 5000*	*>5000*
11/71-9/72	11	310-2400	1300	1.82	0 97-1 85	1 41	0 30	9 1	54 5	36 4	
10/72-9/73	12	ND-4100	810	9 61	0-2 02	1 12	0 67	16 7	25 0	58 3	
10/73-9/74	12	790-3800	2100	1 62	0-2 55	1.50	0 67		41 7	58 3	
10/74-9/75	12	ND-4700	1000	9 25	0-2 07	1.25	0 58	8 3	58 3	33 3	
10/75-8/76	10	ND-2400	400	23 98	0-2 18	1.07	0.70	2 0	40 0	40 0	
5-year	57	ND-4700	1100	7 37	0-2 55	1 27	0.60	10 8	43 9	45.3	

• ND = Alga n ot detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
11/2	2200	1.69
12/7	1100	1 15
1972		
1/6	940	146
2/15	310	100
3/28	1700	1.32
4/28	1400	1 53
5/31	2400	1 24
6/29	1600	1.85
7/25	2000	1.78
8/15	790	0.97
9/14	2000	1 58
10/12	470	0
11/20	790	0.72
12/19	1600	1.16
1973		
1/17	ND	0
2/7	4100	1 21
3/19	790	0.72
4/17	2800	146
5/14	2500	1 76
6/18	3500	1 02
7/16	3000	2 02
8/21	2700	1 50
9/18	2500	1 85
10/16	1100	1 15
11/13	2500	2 35
12/17	2200	1 75
1974		
1/21	1900	1 63
2/19	3000	2 55
3/12	3100	1 82
4/23	3800	1.55
5/20	2800	1 39
6/10	790	0
7/15	1300	1 06
8/10	3100	1 79
9/16	1600	0 92
10/8	1700	0 68
11/18	1600	0 97
12/26	1400	1 66
1975		
1/27	3500	1 24
2/24	1300	1 56
3/24	2500	1 59
4/24	4700	2 07
5/27	ND	0
6/23	1300	0 95
7/28	2400	1 93
8/26	1400	0 99
9/22	1700	1 32
10/21	1100	1 38
11/19	1600	1 36
1976		
1/26	ND	0
2/17	2000	0 89
3/9	1700	0 68
4/21	1900	1 78
5/18	2400	1.24
6/16	2000	1 15
7/12	ND	0
8/26	2400	2 18

7. KANKAKEE RIVER AT MOMENCE

During 1972, maxima occurred on June 2 and September 8. In both instances diatoms made up more than 80 percent of the algal population and *Navicula* was the principal genus on each date. Although the blue-green *Anacystis* was detected in the July sample, neither blue-green nor green algae were in significant densities during 1972.

In 1973 a maximum population occurred on June 14 consisting mainly of diatoms with *Caloneis* being the predominant genus. With the exception of the green alga *Crucigenia* that occurred in relatively large numbers (1300 cts/ml) in March, only diatoms were significant during 1973.

During the spring of 1974, relatively high algal counts (2000-3000 cts/ml) were found consisting mostly of diatoms. A small algal pulse occurred on October 10, 1974; the green alga *Pediastrum* was dominant. It is difficult to determine algal pulses in 1975 because of the poor sampling schedule. Algae were not abundant in the river in 1975 nor in 1976. As mentioned earlier this station was one of the least productive locations.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	M_g	SD_g	Diversity' index Range	M	SD	Algal density occurrence (% of time) <500	500 to 2000	2001 to 5000	>5000
10/71-9/72	12	470-3100	1600	1 75	0 72-2 47	1 59	0 48	8 3	50 0	41 7	
10/72-9/73	12	790-3300	1400	1 51	0.59-1 66	1 28	0 27		75 0	25 0	
10/73-8/74	11	160-3100	1100	2 42	0-2 71	1 21	0 77	18 2	54 5	27 3	
10/74-9/75	9	310-3100	1400	2 23	0-1 90	1 15	0 58	11 1	44 4	44 4	
10/75-9/76	12	310-2000	1100	1.62	0 39-2 05	1 43	0 47	8 3	83 3	8 3	
5-year	56	160-3300	1300	1 99	0-2 71	1 35	0 54	9 2	60 4	29 3	

Summary of Data

Date	Algal density (cts/ml)	Diversity index
1971		
10/7	1700	2.19
11/15	1700	1 31
12/6	1600	1 76
1972		
1/18	470	0.92
2/7	940	1 46
3/2	2000	2 47
4/13	790	0 72
5/4	1400	1 53
6/2	2500	1 78
7/11	2400	1 69
8/1	2700	1 73
9/8	3100	1 52
10/13	1100	0 59
11/17	940	1 46
12/7	1600	1 36
1973		
1/2	2000	1 14
2/8	1400	1 22
3/8	2400	1 00

Date	Algal density (cts/ml)	Diversity index
4/3	1100	1 38
5/15	1100	1.66
6/14	3300	1 36
7/3	1700	1 44
8/16	790	1.37
9/20	1400	1.39
10/3	160	0
11/5	1300	1 00
12/6	1700	1 24
1974		
1/6	940	0
2/14	310	1 00
3/18	2000	1 35
4/10	3100	2 71
5/15	2200	1 38
6/13	940	1.79
7/16	1600	1 72
8/13	1600	1.16
10/10	3100	1 54
11/6	2500	1 58
12/12	790	0 72

Date	Algal density (cts/ml)	Diversity index
1975		
1/13	1700	1 32
3/26	3000	1 47
5/8	1100	0 86
6/11	3000	1 90
8/28	310	0 0
9/12	790	0 97
10/21	940	1 46
11/26	940	0 99
12/2	1300	1 75
1976		
1/13	310	1 00
2/27	1300	1 91
3/2	790	1 37
4/6	2000	0 39
5/25	1600	2.05
6/29	1100	1 38
7/16	1400	1 88
8/11	1700	1 68
9/29	1300	1 30

8. VERMILION RIVER AT PONTIAC

The maximum density observed in 1972 was 3300 cts/ml on August 3. The diatom *Navicula* and the green alga *Actinastrum* were dominant. There were no other significant pulses during the year, and the diatoms *Navicula, Cyclotella,* and *Surirella* were the main genera. However, on December 1 a bloom (2700 cts/ml) of the green alga *Ulothrix* occurred and it was the only genus detected in the sample.

In January 1973 diatoms once again made up most of the population and generally prevailed during the year. However, *Actinastrum* pulsed again on April 2 along with *Ulothrix* making up 92 percent of the population. On May 8, at the time of the annual maximum, the diatoms *Cyclotella* and *Caloneis* made up 74 percent of the total algal density.

Four genera of diatoms were detected from the March 18, 1974, sample in which *Cyclotella* and *Navicula* were dominant. The diatoms *Navicula, Synedra,* and *Diatoma* contributed the major (85 percent) portion of the annual maximum on June 10, 1974. Another pulse occurred on November 4, 1974, in which two-thirds of the algae were *Melosira.*

In 1975, algal densities at this location were low and continued to be until March 1976, when a density of 3100 cts/ml occurred consisting mostly of *Cyclotella.* Diatoms dominated during 1975 and 1976.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Range* (Algal density)	*Algal density M_g*	*SD_g*	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	790-3300	1400	1.46	0-1 84	1 37	0.53		81 8	18.2	
10/72-9/73	12	310-3600	1400	2 00	0-1 66	1 21	0 47	16 7	50.0	33 3	
10/73-8/74	11	310-4100	1600	2 10	0-2.10	1 41	0 57	9.1	54 5	36 4	
10/74-9/75	9	310-3300	1100	2 06	0 92-1 76	1 33	0 25	22.2	66 7	11 1	
10/75-9/76	12	ND-3100	800	8 79	0-1 75	1 28	0.51	16 7	50 0	33 3	
5-year	55	ND-4100	1200	3.16	0-2 10	1 32	0 47	12 9	60.6	26 5	

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/12	1400	1 84
11/8	1300	1 75
12/3	1700	1 49
1972		
1/12	1400	0
2/28	790	0 97
4/10	1100	1 38
5/5	1400	1 84
6/2	2200	1 56
7/5	1400	1 53
8/3	3300	1 62
9/11	1100	1.15
10/2	470	0 92
11/7	310	1 00
12/1	2700	0
1973		
1/2	2200	1.49
2/5	1100	0 99
3/5	1400	1 66

Date	*Algal density (cts/ml)*	*Diversity index*
4/2	2000	1 30
5/8	3600	1 47
6/7	1300	1 56
7/9	1600	1 49
8/13	1900	1 65
9/12	1400	0 99
10/1	940	1.25
11/5	1700	1 24
12/3	790	1.37
1974		
1/7	310	0
2/4	1700	1.57
3/18	3500	1.85
4/8	1700	1 49
5/13	1400	1 75
6/10	4100	2 10
7/9	2700	0 98
8/5	2500	1.85
10/7	1900	1 42
11/4	3300	1 49

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/16	1600	1 76
3/27	1100	1 38
5/5	1700	1.32
6/6	940	1.25
7/23	1100	1 38
8/29	470	0.92.
9/12	310	1 00
10/16	470	0.92
11/26	1400	144
12/1	1900	146
1976		
1/2	ND	0
2/27	940	0.65
3/1	3100	1 52
4/5	1300	1.75
5/24	1700	1.67
6/7	940	1 46
7/29	2400	1 34
8/9	2400	1.56
9/28	2000	1.55

10. MACKINAW RIVER NEAR CONGERVILLE

A significant number of algae were detected on December 14, 1971. They consisted of the blue-green *Aphanizomenon* (1400 cts/ml), the flagellate *Euglena* (630 cts/ml), and 4 genera of diatoms. The blue-green algae originated from a newly formed impoundment upstream of the sampling location. In May and June 1972, *Ulothrix* was abundant. Algal densities were recorded at 3800 cts/ml on August 9 and at 3900 cts/ml on September 6, 1972. The dominant genus in August was *Navicula;* in September it was *Cyclotella.*

The highest densities for 1973 occurred during April and May and *Cyclotella* once again prevailed. There were no significant pulses or changes in population makeup during the rest of the year.

A spring pulse occurred on March 27, 1974, and contained six diatoms with *Asterionella* dominating. *Cyclotella* and *Navicula* were prevalent in April and June, with an annual maximum of 7200 cts/ml accruing in June. Green algae were dominant for the next two collections *Crucigenia* (71 percent) dominated in July and *Chlorella* in August.

In 1975, the highest densities occurred in March and May. The green algae *Ulothrix* (58 percent) and the diatom *Fragilaria* (23 percent) were the major algae in March. The dominant alga in May was *Surirella.* Algal pulses did not develop in 1976. Samples collected in 1976 contained mainly diatoms at relatively low algal densities.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	M_g	SD_g	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	ND-3900	930	10 41	0-2 16	1 31	0 59	9 1	36 4	54.5	
10/72-9/73	12	790-3000	1400	1 58	0 65-1 87	1 35	0 47		66.7	33.3	
10/73-8/74	11	310-7200	2000	2 42	0 65-2.50	1 59	0 61	10.0	40 0	40 0	10.0
10/74-9/75	9	ND-4900	610	10 22	0-2 01	1 08	0 65	25 0	58 3	16 7	
10/75-9/76	12	470-2200	1300	1 64	0 47-1 79	1 25	0 40	8 3	66 7	25 0	
5-year	55	ND-7200	1200	4 64	0-2 50	1 32	0 54	10 5	53 6	33.9	2 0

• ND = Alga not detected

Summary of Data

Date	*Altai density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*
1971			4/20	2500	1 70	1975		
10/8	1100	1.84	5/8	3000	1 66	1/17	1900	0 81
11/18	1300	1.41	6/12	2000	1.46	3/26	4900	1 64
12/14	3100	2 16	7/27	790	1 37	4/23	1300	1 41
1972			8/23	1600	1.69	5/29	3500	2 01
1/31	790	0 72	9/6	1700	1 87	6/13	1300	1 41
2/24	ND	0	10/3	940	0 65	7/30	470	0 92
4/6	790	0 97	11/2	310	1.00	8/29	790	0 72
5/10	2400	1 38	12/27	1700	1.82	9/4	ND	0
6/6	2500	1 59	1974			10/31	2200	1 20
7/7	2000	1.20	1/3	1700	2.12	11/22	2000	1 58
8/9	3800	1 74	2/27	1300	2 50	12/5	1700	1 28
9/6	3900	1 41	3/27	2800	2.26	1976		
10/13	940	1 46	4/26	2400	1.00	1/5	1600	0 47
11/27	790	0 97	6/8	7200	1.42	2/24	1100	1 45
12/29	1300	1 30	7/7	4400	1 31	3/5	630	1 50
1973			8/26	3500	1.84	4/9	1700	1 32
1/4	2200	1.49	10/9	160	0	5/20	1700	0 95
2/7	940	0 65	11/19	790	1 37	6/8	940	1.25
3/8	1300	1 06	12/9	1700	1.57	7/12	470	1 59
						8/13	1100	0.59
						9/24	2200	1 79

14. EDWARDS RIVER NEAR NEW BOSTON

The main diatoms observed in the stream were *Cyclotella* and *Navicula,* and the main greens were *Ulothrix* and *Ankistrodesmus.* During the 8 months from October 1971 through May 1972 only diatoms and *Euglena* were detected. A pulse on November 10, 1971, was made up mostly of the diatom *Cocconeis.* On April 20, 1972, *Navicula* predominated with the algal denisty of 4200 cts/ml. On July 18, 1972, an immense growth was detected at 13,000 cts/ml made up mainly of *Cyclotella* and *Gyrosigma* and the green alga *Ankistrodesmus.*

In 1973, algal growth was not as prolific. During winter and spring the diatoms *Cyclotella, Navicula,* and *Nitzscbia* were dominant. There were no significant pulses until September when *Asterionella* (2200 cts/ml) was the prominent alga in a total density of 3900 cts/ml.

The maximum algal density in 1974 was observed on June 24 with a composition mainly of the diatom *Cyclotella* (48 percent) and two greens *Ulotbrix* (26 percent) and *Scenedesmus* (17 percent). On December 4, 1974, *Cyclotella* made up 50 percent of the algal count.

The growth of algae in 1975 and 1976 was not as prolific. The 1975 maximum occurred on May 6. The flagellate *Euglena* was prevalent and the green alga *Ulotbrix* was second in numbers. Relatively higher counts were observed in April and May 1976. The dominant alga in April was *Ulotbrix* (95 percent) and in May they were *Cyclotella* (54 percent) and *Navicula* (29 percent).

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*Algal density M_g*	*SD_g*	*Diversity index Range*	*Diversity index M*	*Diversity index SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	790-13,000	1900	2.56	0.72-1.95	1 32	0.45		63.6	18 2	18 2
10/72-9/73	12	940-3900	1800	1.60	0-2.10	1 27	0.57		50.0	50 0	
10/73-9/74	11	160-7200	1400	2.47	0-2 63	1 34	0 74	9 1	63 6	182	9 1
10/74-9/75	11	ND -3000	300	18 75	0-1 98	1.05	0 75	27 3	54 5	18 2	
10/75-9/76	12	ND-3800	700	9.17	0-2.13	1 02	0.78	16 7	66.7	16 7	
5-year	57	ND -13,000	1000	6.22	0-2.63	1 20	0 66	10 6	59 7	24.3	5.5

• ND = Alga not detected

Summary of Data

Date	*Algol density (cts/ml)*	*Diversity index*
1971		
10/5	940	0.92
11/10	2800	1.14
12/8	1100	1 38
1972		
1/13	790	0.97
2/23	790	0 72
4/20	4200	1 93
5/11	1900	146
6/30	940	0.92
7/18	13,000	1.95
8/16	5500	1 23
9/20	1100	1.95
10/26	3500	1 22
11/30	1900	0
12/20	940	146
1973		
1/17	2200	0.59
2/15	1300	0.95
3/14	1300	0 95
4/25	2500	1.59

Date	*Algal density (cts/ml)*	*Diversity index*
5/11	2400	1.57
6/12	2000	2.10
7/18	940	1.46
8/19	1400	1.75
9/19	3900	1.62
10/18	1100	0.99
11/13	1400	1.22
12/11	1400	1.35
1974		
1/9	1300	0.54
2/26	160	0
3/22	1900	2 63
4/18	2200	2.26
5/25	2500	1 41
6/24	7200	1 85
8/16	1600	0 97
9/24	1100	1.56
10/12	1100	0.99
11/4	1400	1.75
12/4	2500	1.70

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/8	160	0
2/6	1100	1 15
3/17	1900	1 65
5/6	3000	1 98
6/17	ND	0
7/25	470	0 92
8/6	ND	0
9/2	940	1 46
10/15	1300	0 95
11/25	1900	2 13
12/2	1300	1 41
1976		
1/13	160	0
2/24	1100	1 84
3/25	940	1 00
4/6	3100	0 29
5/19	3800	1 56
6/29	1900	1 19
7/14	630	0
8/12	ND	0
9/29	1700	1.82

15. BEAR CREEK NEAR MARCELLINE

Two population pulses occurred in 1972. On June 15 (3300 cts/ml) the major types were *Navicula* (48 percent) and *Cyclotella* (24 percent). On December 20 (3300 cts/ml) the population consisted mainly of *Ulothrix, Melosira,* and *Navicula.*

In 1973 the vernal maximum occurred on May 16 (3000 cts/ml) and consisted principally of *Ulothrix* and *Euglena.* The green alga *Chlorella* (53 percent) dominated during a pulse on September 13.

A large population was detected on June 22, 1974. The principal algae were *Cyclotella* (5000 cts/ml), *Navicula* (2500 cts/ml), and the green alga *Scenedesmus* (2500 cts/ml). For the period of July 1974 to February 1975, the algal densities generally exceeded 2000 cts/ml. *Navicula*, *Crucigenia*, and *Surirella* were dominant during August, October, and November, respectively. The green alga *Ulothrix* was the major type in December through February. The diatom *Melosira* was the second highest in December 1974. Unexpectedly, the maximum algal population in 1976 occurred in January.

Algal densities were not high in nine samples collected in 1976. They contained mostly diatoms. *Melosira* was the principal type in July and August while *Synedra* (1600 cts/ml) was important in September.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*Algal density M_g*	*SD_g*	*Diversity index Range*	*Diversity index M*	*Diversity index SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	12	ND -3300	790	9 37	0-2 03	1 26	0 70	16 7	50 0	33 3	
10/72-9/73	12	940-3300	1700	1.59	0 86-1 83	1 44	0 36		66.7	33 3	
10/73-8/74	11	ND -11,000	660	11 11	0-1 93	1 14	0 79	27.3	45.5	18 2	19 1
10/74-9/75	11	ND -3900	870	10.17	0-1 84	1.01	0.57	18 2	36 4	45 5	
10/75-9/76	12	ND -2000	680	8.20	0-1 91	1 13	053	16 7	75 0	83	
5-year	58	ND -11,000	880	7 30	0-2.03	1.20	0.60	15 8	54 7	27 7	3.8

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/5	1900	1 00
11/8	940	1 46
12/9	1700	1 91
1972		
1/6	ND	0
2/16	160	0
3/29	790	0 72
4/18	1300	1 55
5/10	1700	1 97
6/15	3300	2 03
7/18	2000	1 34
8/22	3000	1.63
9/27	2200	1 56
10/26	1100	0 86
11/22	940	1 00
12/20	3300	1 69
1973		
1/10	1100	1.45
2/14	1700	1 82
3/14	940	1.25

Date	*Algal density (cts/ml)*	*Diversity index*
4/11	1700	0 92
5/16	3000	1 83
6/7	1400	1 66
7/17	2500	1.81
8/16	1900	1 33
9/13	3000	1.68
10/11	1400	1 27
11/9	630	1.50
12/12	940	1 46
1974		
1/9	470	0 92
2/4	ND	0
3/21	160	0
4/18	1900	1 73
5/23	1300	0
6/22	11,000	1 93
7/25	2200	1.83
8/21	2800	1 92
10/3	2700	0 32
11/7	1900	0.82
12/6	3900	1 18

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/8	2700	0.79
2/5	2400	0.70
3/19	1400	1 75
4/21	1400	1 84
6/5	2000	1.55
7/29	ND	0
8/29	470	0 92
9/26	940	1.25
10/7	1300	1 91
11/18	1400	1 22
12/16	470	0 92
1976		
1/7	1700	1.79
2/18	ND	0
3/31	940	0.92
4/13	630	1 50
5/12	1600	1 52
6/8	940	1 25
7/21	1900	1.04
8/3	2000	0.77
9/1	1900	0 65

17. VERMILION RIVER NEAR DANVILLE

Melosira and *Cyclotella* were the major genera in a population of 2500 cts/ml that occurred on November 2, 1971. In 1972 the spring maximum occurred on April 11 at which time a density of 4700 cts/ml was about equally divided between *Ulothrix* and the diatoms *Cyclotella* and *Navicula.* In November, the diatom *Tabellaria* accounted for 84 percent of the density.

During 1973 a spring maximum consisting of the diatoms *Navicula* and *Nitzschia* along with the green alga *Scenedesmus* made up most of the density of 2700 cts/ml that occurred on April 17. A summer pulse of 2800 cts/ml occurred on July 13 with *Chlorella* and *Cyclotella* predominant.

Only diatoms were recovered in samples collected from October 1973 through April 1974. The April sample contained 3 diatoms *Nitzschia* (43 percent), *Surirella* (33 percent), and *Navicula* (24 percent). A peak occurred on June 7, 1974, and *Cyclotella* was one-half of the algal population. On December 2, 1974, the green alga *Crucigenia* (2800 cts/ml) and the diatom *Nitzschia* (1300 cts/ml) made up the annual maximum density.

No samples were collected in February or March 1975. The 1975 maximum occurred on April 4. Its principal constituents were the diatom *Navicula* (2500 cts/ml) and the flagellates *Dinobryon* (2200 cts/ml) and *Euglena* (1600 cts/ml). Thereafter no high algal densities were observed until May 18, 1976. At that time a pulse developed consisting mainly of the diatoms *Melosira* (2800 cts/ml) and *Cyclotella* (1100 cts/ml).

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	Algal density M_g	SD_g	Diversity index Range	Diversity index M	Diversity index SD	Algal density occurrence (% of time) <soo	500 to 2000	2001 to 5000	>5000
10/71-9/72	12	630-4700	1700	1 67	1.04-2 29	1 61	0.33		58 3	41 7	
10/72-9/73	12	ND-2800	790	9 47	0-2 04	1 17	0 66	16 7	41 7	41 7	
10/73-9/74	12	310-3300	1300	1 91	0 65-1 78	1 25	0 43	8 3	58 3	33 3	
10/74-9/75	9	630-6600	1800	2 10	0-1 76	1 11	0 52		55 6	33 3	11 1
10/75-9/76	12	ND-5000	440	17 90	0-2 10	1 13	0 77	16 7	66 7	8 3	8 3
5-year	57	ND-6600	1000	5 85	0-2 29	1 23	0 59	8 3	56 1	317	39

* ND = Alga not detected

Summary of Data

Dale	Algal density (cts/ml)	Diversity index
1971		
10/5	1700	1 57
11/2	2500	1 27
12/7	1900	1 04
1972		
1/6	1300	-1 81
2/17	630	1.50
3/22	2000	1 57
4/11	4700	1 81
5/8	1300	1 91
6/8	1600	1.72
7/10	2000	1 53
8/8	2400	2 29
9/11	940	1 25
10/10	630	1 50
11/20	1900	0 82
12/1	1400	1.53
1973		
1/12	2000	0.77
2/7	ND	0
3/5	160	0

Date	Algal density (cts/ml)	Diversity index
4/17	2700	1 90
5/16	1900	1 46
6/8	2400	2 04
7/13	2800	1 75
8/13	2200	0.59
9/10	1400	0.50
10/8	630	0.81
11/5	940	0 65
12/12	2400	1 51
1974		
1/14	1100	1.45
2/14	310	1 00
3/8	1300	0 81
4/1	3300	1 55
5/2	1400	1.75
6/7	2500	1.65
7/2	1700	0.68
8/9	1300	1.41
9/13	2000	1.78
10/4	2000	1.24
11/5	1700	1.24
12/2	4100	0.89

Date	Algal density (cts/ml)	Diversity index
1975		
1/7	940	0 92
4/4	6600	1 76
5/8	1400	1 66
6/9	630	0
7/29	2200	1 26
9/26	940	1 00
10/22	ND	0
11/7	1100	1 38
12/16	ND	0
1976		
1/30	1100	0.86
2/27	940	0
3/3	1400	1 53
4/7	1900	0 82
5/18	5000	1 85
6/7	1300	1 56
7/8	1100	1.84
8/6	1100	1 56
9/27	2400	2.10

18. SANGAMON RIVER AT MAHOMET

In 1972 the spring maximum (2200 cts/ml) was made up of *Cyclotella* and *Stephanodiscus* and occurred on April 11. The summer maximum on July 7 consisted principally of *Navicula* and *Ulothrix.*

The algal densities during the winter and spring of 1973 were low and a significant pulse did not occur until July. The diatom *Cyclotella* was the major genus of the population at that time. The high densities persisted in August at which time *Navicula* made up 78 percent of the population.

The algal densities at the river were generally low during the three water years 1973, 1974, and 1975. No significant algal pulses were observed. Most of the algae found were diatoms except for the sample collected on May 14, 1975, in which the green alga *Crucigenia* (2000 cts/ml) was most abundant.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density*			*Dtverstty index*			*Algal density occurrence (% of time)*			
		Range	M_g	SD_g	*Range*	*M*	*SD*	*<500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	12	310-3500	1200	2 34	0-2.26	1 32	0.60	25 0	33 3	41 7	
10/72-9/73	12	630-3300	1100	1.74	0-1.90	1.10	0.48		83 3	16 7	
10/73-8/74	11	160-2500	990	2 10	0-1 92	0 91	0 64	9 1	81.8	9 1	
10/74-9/75	11	470-2400	1300	1.70	0 70-2 15	1 12	0.43	9 1	63 6	27 3	
10/75-9/76	12	160-2200	1000	1.99	0-1.78	1.07	0.57	8 3	75 0	16 7	
5-year	58	160-3500	1100	1 96	0-2 26	1 11	0 55	10 3	67.4	22 3	

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*
1971			4/11	1100	0 99	1975		
10/7	1100	1 38	5/15	1100	1 15	1/8	1700	1.50
11/3	1300	1 50	6/4	1400	1 45	3/31	940	0 92
12/6	1900	1 78	7/12	3300	0 96	5/14	2400	0 70
1972			8/8	2800	0.94	6/10	940	0 92
1/7	310	1 00	9/13	1600	1.90	7/30	2400	2 15
2/14	310	1 00	10/2	1400	1.35	8/26	470	0 92
3/23	310	0	11/1	2500	1 88	9/8	790	0 72
4/11	2200	0 94	12/11	630	0 72	10/6	790	0
5/9	1600	1 36	1974			11/14	1900	1 63
6/7	2000	2.26	1/4	1100	1.15	12/19	160	0
7/7	3500	1 55	2/12	630	0.81	1976		
8/2	2000	2.10	3/5	1900	0 92	1/16	940	1 25
9/7	2000	0.99	4/3	1700	0.44	2/4	790	0 72
10/6	630	1 50	5/1	940	1.92	3/22	1100	1 45
11/21	630	081	6/5	1300	0 81	4/22	1300	1 06
12/8	790	0 72	7/1	160	0	5/3	2000	1 78
1973			8/8	940	0	6/14	790	0 97
1/8	790	1 37	10/9	1400	0.99	7/15	790	1 37
2/5	790	0	11/11	2000	1 24	8/30	1300	1 41
3/6	790	1.37	12/5	1100	1.15	9/9	2200	1 20

19. SALT CREEK NEAR ROWELL

In November and December of 1971 diatom pulses produced densities of 3300 cts/ml and 2700 cts/ml, respectively. They consisted mainly of *Navicula* and *Cyclotella.* The occurrence of green algae was spotty during 1972 and *Euglena* counts were generally limited to May, June, and July. A summer maximum occurred on June 5 (2800 cts/ml) and was made up of *Euglena, Navicula,* and the green algae *Scenedesmus, Pediastrum,* and *Ankistrodesmus.*

During 1973 the only months of significant productivity were April and May. In April, at a density of about 3600 cts/ml, a green alga *Actinastrurn* was the prominent genus. In May a density of 4400 cts/ml occurred consisting mainly of *Cyclotella.* During the months of June through September the only algae detected were diatoms.

In 1974, *Melosira* appeared in a large number (2500 cts/ml) on February 11. The algal count persisted high in March and the dominating algae shifted to *Surirella* and *Cyclotella.* Two additional algal pulses were observed in October and December. *Melosira* and the flagellate *Eudorina* were the dominating algae in October. The annual maximum occurred on December 5 with the green alga *Crucigenia* prevailing. *Crucigenia* was also prevalent in June and July 1974.

High algal counts were found on January 21 and March 31, 1975. Both samples consisted mainly of the diatom *Melosira.* There were no samples collected in February, April, or June.

Algal densities in the creek were low during 1976. The highest one was 2000 cts/ml in March. *Cblorella* was the principal alga (54 percent) in the sample. On February 9, 1976, only *Nitzscbia* was recovered.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	M_g	SD_g	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	12	310-3300	1300	2.20	0-2.15	1.45	0.56	16.7	50 0	33.3	
10/72-9/73	12	ND-4400	780	8.86	0-1 91	1 20	0.50	16 7	66 7	16.7	
10/73-9/74	11	630-3800	1700	1 74	0.54-1 92	1 30	0.43	9.1	81.8	9.1	
10/74-9/75	10	ND -4200	890	13.62	0-1.89	1 16	0 54	1.0	60.0	30.0	
10/75-10/76	12	310-2000	960	1 67	0-1.46	0.81	0 56	8 3	75 0	16 7	
5-year	57	ND-4400	1200	3 21	0-2.15	1.19	0.55	12 2	66 7	21 2	

* ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/14	630	1.50
11/4	3300	146
12/2	2700	1.28
1972		
1/4	310	0
2/14	630	1.50
3/21	1300	1 91
4/13	1900	1 46
5/4	1100	1.66
6/5	2800	2 15
7/5	2500	1 70
8/3	1900	1 90
9/5	470	0 92
10/2	1100	1 38
11/6	1400	1.53
12/15	1100	0.86
1973		
1/10	470	0 92
2/8	1900	1.56
3/1	ND	0
4/3	3600	1 91

Date	*Algal density (cts/ml)*	*Diversity index*
5/1	4400	1 35
6/2	1400	1.35
7/6	1600	1.36
8/15	1400	1 39
9/12	790	0.72
10/24	2200	1 26
11/6	790	1 37
12/11	1300	0.54
1974		
1/16	1300	1.81
2/11	3100	0 88
3/6	3800	1.92
4/3	630	1 50
5/7	940	1 46
6/13	2500	0.67
7/9	2200	1 10
8/19	2000	1.53
9/1	1900	1.56
10/25	3500	1.22
11/15	1100	0.86
12/5	4100	1.29

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/21	4200	1.40
3/31	3000	1.36
5/12	1400	1 89
7/2	ND	0
8/5	1100	0.86
9/24	1100	1 56
10/4	1300	1 30
11/25	790	0
12/18	470	0.92
1976		
1/21	940	0.65
2/9	1600	0
3/5	2000	1 30
4/21	310	0
5/27	1300	1 41
6/30	940	0 65
7/9	940	1.46
8/11	1300	0.81
10/4	940	1.25

20. SALT CREEK NEAR GREENVIEW

With the exception of *Ulothrix* blooms in October and November of 1972, practically all of the algal types detected were diatoms during the first 2-year study. During the maxima of June, July, and August, diatoms represented 96, 80, and 95 percent, respectively, of the population. The principal diatoms during this 3-month period were *Cyclotella, Melosira,* and *Navicula.*

In 1973 *Cyclotella* and *Navicula* generally prevailed. A spring maximum of 2500 cts/ml occurred on April 3. On August 21 a maximum density of about 3800 cts/ml occurred consisting mainly of *Cyclotella* and *Asterionella.* A pulse on December 7 was mainly made up of *Melosira* (81 percent).

From December 1973 through June 1974, only diatoms were detected in the creek. The spring pulses occurred in May and June 1974. The dominating algae were *Synedra* and *Nitzschia* in May and *Cyclotella* in June. The green alga *Ulothrix* was the principal contributor to the annual maximum occurring on September 5, 1974. The creek became much less productive without significant pulses during the last 2 years of the study period.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density*			*Diversity index*			*Algal density occurrence (% of time)*			
		Range	*Mg*	SD_g	*Range*	*M*	*SD*	*<S00*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	790-3900	2000	1 67	0 50-2 15	1 49	0 48		45 5	54 5	
10/72-9/73	11	1100-3800	1800	1 52	0 44-1 75	1 21	0 39		63 6	36 4	
10/73-9/5	12	310-3800	1400	2 15	0-1 79	1 11	0.51	8 3	50 0	41 7	
10/74-9/18	11	470-2500	1400	1 73	0-1 80	0 96	0 50	9 1	54 5	36 4	
10/2-9/28	11	ND-1700	350	18 28	0-1.84	1 08	0 61	18 2	72 7	9 1	
5-year	56	ND-3900	1200	4 38	0-2 15	1 19	053	7 1	57 3	35 6	

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/7	3100	1.79
11/8	2400	1.56
12/1	1400	1.66
1972		
1/11	1400	0 50
2/14	790	0 97
4/5	1600	1 96
5/1	2000	1 49
6/7	3500	2 15
7/12	3900	1.60
8/7	3300	1.69
9/14	1300	1 00
10/4	2800	1 22
11/13	1700	044
12/8	1400	0 99
1973		
1/3	1700	1 28
2/12	1100	0 59
3/1	1100	1.56
4/3	2500	1 75

Date	*Algal density (cts/ml)*	*Diversity index*
5/9	2400	1 38
7/2	1300	1 41
8/21	3800	1 39
9/13	1300	1 30
10/12	2000	1 53
11/8	940	1 79
12/7	2500	0 87
1974		
1/7	630	0 81
2/12	310	1 00
3/11	630	0
4/9	1300	1 56
5/13	2800	1 25
6/5	3100	0.47
7/8	940	1.25
8/22	1700	1 24
9/5	3800	1 55
10/3	1900	0 41
11/13	1300	1 06
12/3	1400	1 22

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/7	2500	1 42
3/19	2000	0 89
4/30	630	0
5/30	2200	0 99
6/12	1100	0 59
7/31	2500	1 80
8/6	470	0 92
9/18	1700	1 24
10/2	2000	0 99
11/10	ND	0
12/10	1100	1 84
1976		
1/29	1400	0 92
2/11	1100	1 56
4/14	ND	0
5/24	1300	1 00
6/11	1300	1 30
7/6	1100	1 56
8/23	940	1 25
9/28	1700	1 49

21. SOUTH FORK SANGAMON RIVER NEAR ROCHESTER

Diatoms were the prevalent type of algae and *Scenedesmus* and *Actinastrum* were the predominant green types. There were no significant pulses during 1972. *Euglena* was detected only during June, July, and August 1972.

In 1973 a spring maximum of about 4900 cts/ml occurred on May 1 and about 97 percent of the population were diatoms. The principal ones were *Cyclotella* and *Navicula. Cyclotella* persisted in the June 6 collection making up about 60 percent of the total, and accounted for 70 percent of the algal density on December 6, 1973.

In 1974, algal densities were high during March through June. The dominant diatom genus for each collection was: *Cyclotella* during March (56 percent) and June (38 percent), *Surirella* during April (50 percent), and *Nitzschia* during May (63 percent). *Surirella* persisted with high densities (1300 to 2500 cts/ml) for 3 months from April through June. The green alga *Ulothrix* and the diatom *Tabellaria* were also important in April (25 percent) and in June (31 percent), respectively. Algae did not grow well in the summer of 1974. Later a pulse occurred on October 4 containing mostly *Cyclotella* (2400 cts/ml) and the flagellate *Euglena* (1300 cts/ml).

Similarly, algal counts were high from February through May 1975. Both diatoms *Nitzschia* and *Synedra* made up 42 percent of the total in February. *Scenedesmus* (48 percent) and *Cyclotella* (38 percent) were the principal type in March. In the April sample, the dominant algae were *Cyclotella* (40 percent) and *Melosira* (32 percent). *Melosira* was also the preminent alga (3500 cts/ml) on May 28.

From July 1975 through September 1976, the algal densities were generally low. Algal pulses were poorly developed except on August 17, 1976, when one-half of the population was made up of *Ulothrix.* Although *Navicula* occurred most frequently in the river, it was never the dominant genus.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*M_g*	*SD_g*	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	310-2400	1400	1 77	0-1 97	1.31	0.63	9.1	72 7	18.2	
10/72-9/73	12	310-4900	1400	2 07	0-2 17	1 25	0 58	8.3	66 7	25 0	
10/73-9/74	12	ND-6600	1000	10 30	0-1 81	1 24	0 52	8.3	41 7	50 0	
10/74-9/75	9	1100-5000	2600	1 76	1 04-1 96	1 37	0 31		444	44 4	11 2
10/75-9/76	12	160-2800	700	8.99	0-2 04	1 18	0 76	16 7	66 7	16 7	
5-year	56	ND -6600	1200	4.77	0-2 17	1 26	0 57	85	58 4	30 9 ,	2 2

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/8	2000	1 83
11/11	2400	1.29
12/12	1700	1.87
1972		
1/12	790	0 72
2/16	310	0
4/4	1600	1.97
5/2	1600	1 90
6/7	1900	1 78
7/12	1900	0.92
8/11	1600	1.16
9/13	1300	1.00
10/11	940	0.65
11/10	310	0
12/7	1100	1.38
1973		
1/10	630	1 50
2/7	1300	0.95
3/2	1600	0.97
4/2	2400	1 23

Date	*Algal density (cts/ml)*	*Diversity index*
5/1	4900	1.53
6/6	3100	1 35
7/2	1900	2.06
8/2	940	1 25
9/12	1600	2.17
10/11	2200	1.38
11/7	790	0 72
12/6	3100	1.08
1974		
1/16	790	0.72
2/14	ND	0
3/14	2800	1.66
4/9	5000	1.70
5/14	6600	1.45
6/3	5000	1 81
7/11	1400	1.39
8/23	630	1 50
9/12	940	1 46
10/4	3800	1.14
11/13	1900	1.33

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
2/5	5000	1.54
3/21	3300	1.44
4/29	3900	1 96
5/28	4600	1.04
7/30	1900	1 65
8/29	1100	1.15
9/10	1300	1 06
10/28	940	1.46
11/10	ND	0
12/8	1300	1.30
1976		
1/22	1900	1.25
2/9	630	0
3/3	160	0
4/15	1700	1 87
5/25	2200	1.10
6/30	1900	1 92
7/12	1600	1 49
8/17	2800	1 70
9/30	1700	2.04

22. SANGAMON RIVER NEAR OAKFORD

The stream site was not a particularly productive one. During the period October 1971 to April 1972 only diatoms were detected. They were principally *Cyclotella* and *Navicula.* On April 4, 1972, *Euglena* represented 64 percent of the population. The major pulses occurred during the period June through August and the diatoms *Navicula* and *Synedra* were dominant during June, *Cyclotella* during July, and *Melosira* and *Tabellaria* during August.

In 1973 diatoms continued to dominate and only the green algae *Scenedesmus* and *Ulotbrix* provided some diversity. There were no singular pulses until June 2 when *Melosira* and *Ulothrix* were dominant. The green alga *Crucigenia* was abundant during November and December 1973.

During the spring of 1974, algal counts were relatively high. *Cyclotella* accounted for one-half of the totals during both March and April. *Surirella* was also important during March. The dominant alga on May 13 was *Melosira* (72 percent). The 1974 annual maximum occurred on July 9 and consisted mostly of *Fragilaria* (37 percent), *Melosira* (32 percent), and *Navicula* (19 percent). On August 22, 1974, *Crucigenia* bloomed with a density of 4100 cts/ml. *Melosira* again was the major type in the November 13 sample.

There were no samples collected during the first 5 months of 1975. The algal pulses were poorly developed from June 1975 through July 1976. A peak was detected on August 25, 1976, and *Melosira* (3300 cts/ml) was the abundant type. *Navicula* was recovered only six times during the last 3 years of sampling.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density*			*Diversity index*			*Algal density occurrence (% of time)*			
		Range	M_g	SD_g	*Range*	*M*	*SD*	*<500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	630-2800	1600	1.57	0 94-2.11	1 59	0 35	9.1	54 5	36.4	
10/72-9/73	12	160-3300	1200	2 13	0-1 79	1 28	0.47	8.3	75 0	16 7	
10/73-9/74	12	160-6700	1900	2 55	0-1 98	1 02	0.56	8 3	41.7	41 7	8 3
10/74-9/75	7	ND-2700	320	14 87	0-1.96	0.81	0.70	42 8	42.8	14 2	
10/75-9/76	12	ND-3900	560	8 75	0-1 53	0.80	053	33.3	5 0	16.7	
5-year	54	ND-6700	1000	4 91	0-2 11	1 11	0 58	20.4	52 8	25.1	1 7

•ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/7	1400	1 66
11/8	1900	1 28
12/1	2200	0.94
1972		
1/11	630	1 50
2/14	1100	1.38
4/4	1700	1 49
5/1	1300	1 91
6/14	2500	2.11
7/13	2400	1 89
8/7	2800	1 91
9/14	1100	1 38
10/4	790	1.37
11/15	1600	1 36
12/7	1400	0 99
1973		
1/3	790	1 37
2/12	160	0
3/1	1600	1.77
4/3	1900	1.46

Date	*Algal density (cts/ml)*	*Diversity index*
5/9	1100	1.45
6/2	3300	1 46
7/3	940	1.00
8/31	2200	1 79
9/13	1300	1 30
10/16	1100	1 45
11/8	2700	0.98
12/6	1400	0.50
1974		
1/8	1600	1 00
2/12	160	0
3/12	3100	1 36
4/10	3100	1 69
5/13	2800	1.23
6/4	1600	0 72
7/9	6700	1.98
8/22	4400	0 44
9/10	1700	0.87
10/3	ND	0
11/3	2700	0.98
12/4	940	1 25

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
6/19	160	0
7/31	1600	1.96
8/29	470	0 92
9/18	1100	0 59
10/2	940	1 25
11/10	1100	1 38
12/10	2400	1 53
1976		
1/28	ND	0
2/11	470	0 92
3/5	1400	0
4/1	1900	0.81
5/24	1600	1 16
6/11	470	0 92
7/7	160	0
8/25	3900	0 76
9/29	630	0 81

25. EMBARRAS RIVER NEAR CAMARGO

Comparatively, the stream site is a very productive one. With seven exceptions, algal densities of 800 cts/ml were equaled or exceeded during every sample collection. Although diatoms were the dominant algal type, green algae were present in significant numbers during spring and summer. The major greens generally included *Scenedesmus, Ulothrix,* and *Actinastrum.*

The major peak during 1972 occurred on August 16 (4700 cts/ml). It consisted mainly of *Cyclotella, Ulothrix,* and *Scenedesmus.* The high counts persisted in the September sample, but were made up mostly of *Navicula* and *Ulothrix.*

During 1973 a *Melosira* bloom was detected in the January sample. Algal peaks occurred in April, July, and September. The April population (3900 cts/ml) was made up of *Navicula, Surirella,* and *Ulothrix.* In July (3500 cts/ml) the greens *Oocystis, Crucigenia,* and *Actinastrum* were in greater numbers than the diatoms, but in September (2800 cts/ml) the diatom *Cyclotella* prevailed. *Ulothrix* was abundant in the November 1973 sample.

There were no algal pulses of significance until May and June of 1974. *Nitzschia* (80 percent) was the dominant type during May. The June sample consisted mainly of *Melosira, Euglena,* and *Actinastrum.* The 1974 maximum occurred on October 2 mainly consisting of *Melosira* (2700 cts/ml) and *Cyclotella* (1300 cts/ml). Only two greens, *Crucigenia* (2800 cts/ml) and *Ankistrodesmus* (700 cts/ml) were recovered on November 5, 1974.

Two algal pulses were detected on January 6 and March 18, 1975. The dominant algae *were Melosira* (81 percent) and *Ulothrix* (72 percent) during January and March, respectively. During the period of May 1975 to August 1976, algal population peaks were poorly developed.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	Algal density M_g	SD_g	Diversity index Range	Diversity index M	Diversity index SD	Algal density occurrence (% of time) <500	500 to 2000	2001 to S000	>5000
10/71-9/72	12	ND-4700	1100	10 71	0-2 48	1 55	0 70	8 3	33 3	58 3	
10/72-9/73	12	470-3900	1700	1 96	0-2.23	1 10	0 61	8 3	41 7	50 0	
10/73-9/74	12	ND-3500	870	8 82	0-2 20	1 17	0 67	8 3	58.3	33 3	
10/74-9/75	11	160-4200	1500	2 58	0-1 78	0 96	0 52	9 1	54 5	36 4	
10/75-9/76	12	630-2500	1200	1 56	0-1 90	1 01	0 56		91 7	8 3	
5-year	59	ND-4700	1200	4.46	0-2 48	1.16	0.63	6 8	55.9	37 3	

• ND = Alga not detected

Summary of Data

Date	Algal density (cts/ml)	Diversity index
1971		
10/5	2800	2 48
11/10	2000	2 13
12/1	1300	1 30
1972		
1/12	ND	0
2/9	2500	0.87
4/4	1300	1 55
5/15	1100	1 15
6/1	2700	2 12
7/13	2000	1.57
8/16	4700	1 88
9/8	4400	2 00
10/6	790	0 72
11/3	470	0
12/14	940	0 65
1973		
1/9	2000	0 39
2/6	1100	0 99
3/19	3000	1 72
4/11	3900	1 43

Date	Algal density (cts/ml)	Diversity index
5/14	1900	1 48
6/6	2500	1 01
7/11	3500	2 23
8/7	1100	1 15
9/11	2800	1 46
10/9	ND	0
11/1	2000	0.39
12/10	790	0 72
1974		
1/3	1400	0.50
2/8	1100	1 66
3/8	1400	2 20
4/5	1100	1 38
5/8	3100	0 92
6/6	3500	1 87
7/3	2400	1 43
8/6	1400	1 22
9/12	1400	1 75
10/2	4200	1 29
11/5	3500	0 68
12/4	1100	0 59

Date	Algal density (cts/ml)	Diversity index
1975		
1/6	3300	0 86
2/10	940	0 65
3/18	3900	1 02
5/1	1400	1.75
6/23	160	0
7/24	940	0 92
8/13	1100	0 99
9/30	1900	1 78
10/30	1700	1 32
11/14	790	0
12/22	1700	1 49
1976		
1/19	630	0 81
2/11	630	1 00
3/23	1900	0
4/5	1300	1 00
5/6	1100	1 15
6/18	940	0.92
7/12	1300	1 50
8/30	2500	1 01
9/7	1600	1 90

27. KASKASKIA RIVER AT COOKS MILLS

The maximum density at this site during the first 2-year study period occurred on December 8, 1971, when a bloom of the diatom *Fragilaria* made up 72 percent of the 5000 cts/ml. *Cyclotella* and *Navicula* were generally the dominant genera. During 1972 peaks persisted in June and July. *Navicula* was most numerous in June and *Cyclotella* prevailed in July. In December another pulse occurred consisting mainly of the diatom *Melosira.*

In 1973 there were no significant pulses until August when *Cyclotella* and *Navicula* accounted for most of the 2800 cts/ml. Although greens were detected, their diversity was limited and *Scenedesmus* and *Actinastrum* prevailed in April and May, respectively.

The three diatoms *Cyclotella* (50 percent), *Navicula* (25 percent), and *Synedra* (25 percent) were solely responsible for 5000 cts/ml on April 8, 1974. This density was equivalent to the maximum occurrence on December 8, 1971. In 1974, two other pulses occurred during July and September consisting mainly of *Cyclotella* and *Crucigenia,* respectively.

The 1975 maximum (3300 cts/ml) occurred on March 17 when the green alga *Chlorella* (62 percent) and the blue-green *Anabaena* (29 percent) dominated. Another pulse was detected on December 17. It consisted principally of *Melosira.*

The algal densities for the fifth study year were much less than those for other years. In 1976, an algal peak developed by *Navicula* (61 percent) and *Oocystis* (39 percent) occurred on May 10.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	M_g	SD_g	*Diversity index Range*	*M*	*SD*	*Algal density occurrence (% of time) <500*	*500 to 2000*	*2001 to 5000*	*>5000*
10/71-9/72	11	630-5000	1800	2 09	1 12-2 46	1.66	0 41		54 5	364	9 1
10/72-9/73	12	470-4400	1200	1 94	0 50-1.74	1 22	0 41	16 7	58 3	25 0	
10/73-9/74	13	630-5000	1900	1 86	0 65-1 79	1 47	0 29		53 8	385	7 7
10/74-9/75	12	470-3300	1400	1 98	0 72-2 11	1 23	0 41	16 7	41 7	41 7	
10/75-9/76	12	ND -3000	430	17 46	0-1 84	1 24	0 65	16 7	66 7	16 7	
5-year	60	ND -5000	1200	4 34	0-2 46	1 36	0 46	10 0	55 0	31 7	3 4

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
10/6	4100	1 45
11/5	2500	2 13
12/8	5000	1 12
1972		
1/7	790	1.37
2/23	630	1 50
4/13	940	1 46
5/16	1900	1 95
6/5	3100	2 02
7/17	3300	1 41
8/21	1900	2 46
9/13	790	1 37
10/17	790	0 97
11/8	1100	0 59
12/6	4400	1 58
1973		
1/11	470	0 92
2/12	470	1 59
3/5	940	1 46
4/4	1600	1 16
5/4	2000	1 74

Date	*Algal density (cts/ml)*	*Diversity index*
6/14	1100	1 15
7/5	1100	1 45
8/14	2800	1.57
9/10	1400	0.50
10/9	2800	1.62
11/6	1600	1 52
12/10	1400	1 61
1974		
1/7	3100	1.65
2/8	630	1 50
3/11	1400	1 75
3/27	940	0 65
4/8	5000	1 50
5/8	1700	1 79
6/12	1600	1 30
7/10	4100	1 34
8/8	1100	1.45
9/11	3600	1 47
10/2	2400	1 05
11/6	2000	1 31
12/9	2200	1 15

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/13	790	0 72
2/10	2500	2 11
3/17	3300	1 36
4/1	1700	1 82
5/7	1900	1 28
6/24	470	0 92
7/28	730	0 81
8/11	470	0 92
9/29	1400	1 35
10/30	940	1 79
11/11	1700	0 99
12/17	3000	1 64
1976		
1/19	ND	0
2/11	1400	1 75
3/25	1100	1 66
4/5	1100	1 84
5/10	2800	0 96
6/21	1400	1 35
7/15	1100	1 38
8/2	1300	1 55
9/7	ND	0

28. KASKASKIA RIVER AT SHELBYVILLE

The diatoms *Cyclotella*, *Navicula*, and *Melosira* were the most numerous algae at the site. On January 6, 1972, a population of 3000 cts/ml developed solely from *Melosira* and *Cyclotella.* The spring maximum of 2800 cts/ml occurred in May and was made up mainly of *Fragilaria.* A summer pulse in August of 3000 cts/ml was caused mainly by *Cyclotella.* Green algae were more numerous during summer months, but there were no significant densities of them.

In January 1973 the diatoms *Cyclotella, Navicula,* and *Surirella* were solely responsible for 2500 cts/ml. A pulse consisting mainly of *Navicula* occurred in March. *Cyclotella* and *Diatoma* prevailed in the population densities that occurred on July 9. Another pulse developed on November 9, 1973, when *Melosira* (2800 cts/ml) prevailed.

In May 1974, the diatoms *Tabellaria, Nitzschia,* and *Navicula* prevailed. Algal densities during the summer months were high. The prominent algae were *Melosira* during July and August (75 and 72 percent) and *Crucigenia* (70 percent) during September 1974. A winter peak was observed on December 10, 1974, when *Navicula* was prevalent.

Samples collected during 1975 and 1976 showed algal densities equal to or less than 2400 cts/ml except in the April 28, 1976, sample. On that date an algal density of 3600 cts/ml was observed.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	M_g	SD_g	Diversity index Range	M	SD	Algal density occurrence (% of time) <500	500 to 2000	2001 to 5000	>5000
10/71-9/72	11	310-3000	1400	2 27	0-2 26	1 42	0 62	27 3	27 3	45 4	
10/72-9/93	12	ND -2700	890	8 96	0-1 93	1 35	053	16 7	41 7	41 7	
10/73-9/74	12	ND-4400	1000	10 19	0-2 25	1.26	0.70	16.7	25.0	58 3	
10/74-9/75	10	470-3000	1100	1.73	0 63-1 92	1 26	0.37	10 0	80 0	10 0	
10/75-9/76	12	ND -3600	770	8 52	0-1 92	1 16	0 67	83	66 7	25.0	
5-year	57	ND-4400	1000	5 84	0-2 26	1 29	0 56	12 8	48 1	36 1	

•ND = Alga not detected

Summary of Data

Date	Algal density (cts/ml)	Diversity index	Date	Algal density (cts/ml)	Diversity index	Date	Algal density (cts/ml)	Diversity index
1971			5/15	1900	1 46	1975		
10/7	1400	1.66	6/20	1700	1 32	1/17	1300	1 41
11/5	2000	1.46	7/9	2700	1.93	3/20	1900	1 38
12/3	470	0 92	8/21	1600	1.72	5/5	1700	1 10
1972			9/13	2000	1.46	7/1	630	1.50
1/6	3000	0 98	10/11	1300	1 41	7/22	470	0.92
2/21	310	0	11/9	4400	1 30	8/22	790	1 92
4/13	1400	1 53	12/11	2400	1 77	9/16	940	0 92
5/11	2800	1 79	1974			10/9	1400	1.59
6/5	1900	2 12	1/24	310	0	11/17	2200	0.74
7/13	2400	2 26	2/12	ND	0	12/8	1300	1.06
8/21	3000	1 30	3/15	2500	2.25	1976		
9/20	470	1 59	4/10	1700	1 10	1/15	1100	1.15
10/13	940	1.59	5/10	3300	2.17	2/13	940	1 25
11/7	470	0.92	6/14	630	1.50	3/17	790	1 92
12/11	1600	0.88	7/12	3100	0 99	4/28	3600	1.90
1973			8/15	3900	1 32	5/20	ND	0
1/15	2500	1 48	9/17	3100	1.26	6/15	1100	1 45
2/13	ND	0	10/9	1100	1.45	7/14	790	1.37
3/15	2500	1.59	11/12	1300	1 41	8/24	2400	1.04
4/18	2000	1.83	12/10	3000	0.63	9/24	1700	0.44

29. SHOAL CREEK NEAR BREESE

Cyclotella showed up in most of the samples during 1971 and 1972, but appeared only once in 1973. *Euglena* and *Melosira* were responsible for the 1972 summer maximum of 5200 cts/ml on July 20. *Ulothrix* dominated the autumnal peak on October 5.

Algal densities during 1973 ranged from 1300 to 2000 cts/ml from January through August. There were no significant pulses during this period. A relatively high count of 2800 cts/ml occurred in September consisting mainly of *Asterionella, Fragilaria,* and *Nitzscbia.*

There were several pulses detected during 1974. *Melosira* (48 percent), the flagellate *Euglena* (50 percent), the green *Crucigenia* (47 percent), and the diatom *Nitzschia* (35 percent) were the prevailing algae, respectively, in pulses observed during January, April, June, and August.

Only diatoms were recovered during January, March, April, and May of 1975. However, only green algae were detected in the June sample. *Caloneis* (50 percent) and *Gyrosigma* (40 percent) were the principal algae recovered from the 1975 maximum on March 13. Thereafter and through the end of the study period in 1976, no algal pulse was observed. The highest algal count for these 18 samples was 1700 cts/ml. The majority were diatoms.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	Algal density M_g	Algal density SD_g	Diversity index Range	Diversity index M	Diversity index SD	Algal density occurrence (% of time) <S00	500 to 2000	2001 to 1000	>5000
11/71-9/72	10	310-5200	1600	2.34	0-2 20	1 34	0 64	20 0	20 0	50 0	10 0
10/72-9/73	12	1100-2800	1800	1.35	0 78-1.86	1 40	0 35		66 7	33.3	
10/73-9/74	12	310-5300	1800	2 45	0-2.38	1 40	0.70	16 7	25 0	58 3	
10/74-9/75	12	ND-3100	420	17 39	0-1 75	1 01	0 61	16 7	58 3	25 0	
10/75-9/76	12	ND-1700	710	7 99	0-1.79	1 09	0 61	16 7	83 3		
5-year	58	ND-5300	1100	5 73	0-2.38	1 24	0.60	14.0	50 7	33.3	2 0

• ND = Alga not detected

Summary of Data

Date	Algol density (cts/ml)	Diversity index
1971		
11/4	2500	1.98
12/7	1400	0.99
1972		
1/21	470	0 92
2/18	310	0
4/11	2500	2 20
5/25	1300	1 75
6/6	2800	1 75
7/20	5200	1.35
8/14	2200	1.44
9/12	2000	0 99
10/5	3100	1 60
11/10	1100	1 15
12/5	1600	0 88
1973		
1/8	2000	0.78
2/5	1900	1.86
3/8	1900	1.65
4/6	1300	1 00
5/11	1600	1 57

Date	Algal density (cts/ml)	Diversity index
6/18	2000	1 61
7/13	1600	1.52
8/10	1700	1.68
9/18	2800	1 50
10/23	2000	1 95
11/7	2700	2.38
12/7	470	0.92
1974		
1/14	3300	1.75
2/27	310	1.00
3/22	2200	2.22
4/11	4400	1.72
5/28	630	0
6/3	5300	1.76
7/3	1700	1.50
8/21	3100	0.75
9/11	1900	0.89
10/7	2000	1 30
11/4	ND	0
12/13	790	0.72

Date	Algal density (cts/ml)	Dtverstty tndex
1975		
1/3	2500	1 75
2/13	ND	0
3/13	3100	1 36
4/21	1400	0 50
5/29	1600	1 49
6/13	1100	1 38
7/17	940	0 65
8/13	1300	1.50
9/16	940	1 46
10/1	1300	1 06
11/11	1400	1 45
12/8	1700	0 87
1976		
1/14	1100	0 59
2/10	ND	0
3/15	1600	0
4/26	940	1.46
5/24	1400	1 39
6/10	1700	1 79
7/22	1100	1 45
8/5	1300	1 75
9/1	940	1 25

31. KASKASKIA RIVER AT NEW ATHENS

Productivity was generally stable during November and December 1971 and the early months of 1972. During June, July, and August, however, algal densities were 7100, 3100, and 6400 cts/ml, respectively. The June maximum consisted solely of diatoms, principally *Cyclotella* and *Navicula.* In July *Navicula* and *Scenedesmus* prevailed. In August *Ulotbrix* coupled with *Navicula* were the dominant algae. Algal densities did not exceed 1400 cts/ml during the remainder of the year. In 1973, there was a single pulse of *Melosira* in January; thereafter, *Cyclotella* and *Navicula* were the principal diatoms. The annual maximum of 5500 cts/ml occurred in April and consisted mostly of *Cyclotella.*

In 1974, the algal maximum developed on May 23. It contained two greens *Scenedesmus* and *Ulothrix* (both 39 percent) and the diatom *Cyclotella.* In a pulse on September 9, 1974, *Cyclotella* accounted for 95 percent of the total.

A maximum density of 10,000 cts/ml occurred on April 3, 1975. The sample consisted of *Cyclotella* (6300 cts/ml) and two greens *Ankistrodesmus* and *Crucigenia* (both 1900 cts/ml). There were no significant pulses detected from the summer of 1975 through the summer of 1976. However, five of the nine samples collected in 1976 had algal densities equal to or greater than 200 cts/ml.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	M_g	SD_g	Diversity index Range	M	SD	Algal density occurrence (% of time) <500	500 to 2000	2001 to 5000	>5000
11/71-9/72	10	1400-7100	2600	1 75	0 72-2 31	1 51	0.51		30 0	50.0	20 0
10/72-9/73	12	630-5500	1900	1 92	0 54-1.79	1 24	0 42		41 7	500	8 3
10/73-9/74	12	470-7200	1600	2 03	0 31-1 59	1.23	0.42	8-3	58.3	25 0	8 3
10/74-9/75	11	ND-10,000	800	11 55	0-1.81	1 00	0 61	18.2	45 5	27 3	9.1
10/75-9/76	12	790-2700	1600	1 59	0.72-2 12	1 24	0 42		50 0	50 0	
5-year	57	ND-10,000	1600	3 38	0-2.31	1.24	0 49	5.3	45 1	405	9 1

• ND = Alga not detected

Summary of Data

Date	Algal density (cts/ml)	Diversity index
1971		
11/19	1600	1.49
12/10	2000	1.83
1972		
1/26	2400	2.31
3/8	1600	0.72
4/12	2400	1 89
5/24	2500	1.92
6/6	7100	0.91
7/10	3100	1 68
8/11	6400	1.00
9/11	1400	1.39
10/6	940	0.92
11/29	790	1.52
12/11	630	0.81
1973		
1/9	3300	1 52
2/2	1300	0.54
3/7	3300	0.82
4/4	5500	1.13
5/1	2200	1.79

Date	Algal density (cts/ml)	Diversity index
6/18	2700	0 98
7/10	2200	1.58
8/16	1700	1.50
9/11	2700	1.71
10/25	1100	0.99
11/6	1400	1.27
12/6	470	1.59
1974		
1/23	1700	1 32
2/26	940	1.46
3/20	1300	1.30
4/15	1300	1 50
5/23	7200	1 54
6/4	2500	0 95
7/15	2500	0 95
8/8	790	0.72
9/9	2800	0 31
10/14	2400	1.53
11/20	1900	1.33
12/13	790	0.72

Date	Algal density (cts/ml)	Diversity index
1975		
2/10	1400	1.59
3/10	4100	1.14
4/3	10,000	1 33
5/28	160	0
6/9	ND	0
7/18	2200	0 95
8/14	940	0 65
9/16	1300	1 81
10/1	1300	1 56
11/5	2000	0 99
12/4	790	0 72
1976		
1/20	790	1 37
2/10	2400	0 72
3/16	940	1 00
4/13	2400	1 56
5/18	2200	0 74
6/8	1100	1 45
7/13	2700	1 22
8/10	2400	1 38
9/14	1700	2 12

32. LITTLE WABASH RIVER NEAR EFFINGHAM

Sample collection was limited to only eight samples during 1972. Two pulses were detected during the year. *Navicula* was primarily responsible for 2800 cts/ml in July and *Cyclotella* accounted for most of the population in November.

In 1973, two peaks also occurred. *Cyclotella, Synedra,* and the green alga *Coelastrum* were prevalent during the March pulse. On September 11, *Melosira* and *Navicula* were prevalent. The occurrence of green algae and flagellates was generally sporadic.

Algal pulses were poorly developed in 1974. The prevailing algae were *Navicula, Cyclotella, Ulothrix,* and *Crucigenia,* respectively, occurring in the samples of March, May, July, and October.

The maximum for 1975 was found on March 26 when *Ulothrix* (2700 cts/ml) dominated. A small pulse which occurred on June 11, 1975, consisted mostly of *Melosira* (87 percent).

In the March 15, 1976, sample no alga was detected. However, the maximum algal count of 3900 cts/ml was recovered on April 19. It contained mainly *Crucigenia* (48 percent) and *Tabellaria* (36 percent).

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density* *Range*	*M_g*		*Diversity index* *Range*	*M*	*SD*	*Algal density occurrence (% of time)* *<500*	*500 to 2000*	*2001 to 5000*	*>5000*
12/71-7/72	7	ND -3000	500	16 99	0-2 50	1 23	1 04	28 6	42 8	28 6	
11/72-9/73	10	630-4900	1800	1 85	0-2 06	1.19	0 59		60 0	40 0	
10/73-9/74	12	ND -2700	780	8 95	0-1 38	0 89	0 43	16 7	41 7	41 7	
10/74-9/75	11	ND -3500	330	18 82	0-1 95	1 02	0 66	27 3	45 5	27 3	
10/75-6/76	9	ND -3900	310	26 61	0-1 46	0 85	0 60	22 2	55 6	22 2	
5-year	49	ND -4900	600	12 05	0-2 50	1 02	0 64	19 0	49 1	32 0	

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
12/8	310	0
1972		
1/12	1400	1.66
2/29	ND	0
4/4	2400	2.50
5/16	1900	1 96
6/5	1400	1 98
7/7	2800	0.50
11/3	3000	0 59
12/5	1400	0 92
1973		
1/9	1100	1.56
3/7	3500	1 54
4/4	2200	0 95
5/9	1400	2 06
6/6	1100	1 38
7/11	1700	1 50

Dale	*Algal density (cts/ml)*	*Diversity index*
8/7	630	0
9/11	4900	1 36
10/15	1600	1 30
11/21	2700	1 38
12/6	310	1 00
1974		
1/8	1100	1 15
2/6	ND	0
3/6	2500	1 30
4/11	630	0 81
5/7	2000	0.39
6/6	1100	0 59
7/24	2500	0 67
8/14	2000	1.31
9/16	1900	0 82
10/11	2500	1.95
11/8	ND	0
12/6	630	1.50

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
2/11	1400	1 84
3/26	3500	0.94
4/22	1100	1 15
5/27	ND	0
6/11	2400	0 70
7/22	630	1 50
8/13	470	0 92
9/16	790	0 72
10/1	940	1 46
11/10	1300	0.54
12/8	1400	0 99
1976		
1/6	ND	0
2/22	1300	0.54
3/15	ND	0
4/19	3900	1 46
5/20	1100	1.45
6/15	2700	1 22

33. LITTLE WABASH RIVER BELOW CLAY CITY

There were no significant peaks during 1972 and the diatom *Navicula* generally was the dominant genus. On two occasions during 1972, green algae prevailed in samples. On August 8, *Scenedesmus* was most abundant, and on November 10, *Ulothrix* prevailed.

Diatoms, generally *Navicula* or *Cyclotella,* were dominant in all 1973 samples. In February the diatom *Melosira* made up about 88 percent of the 2500 cts/ml. A sample in which diatoms were not the major algae was collected in July when the green alga *Ankistrodesmus* was dominant. The maximum for 1973 (3300 cts/ml) occurred on October 1 consisting mainly of the diatoms *Asterionella* and *Melosira.*

In 1974, there were several algal peaks and no-alga samples. The dominant algae were *Scenedesmus* and *Asterionella* in May, *Euglena* in June, *Cyclotella* in July, *Cyclotella* and *Euglena* in October, and *Melosira* and *Ulothrix* in November. Algae were not recovered in the samples collected on August 14 and September 19, 1974.

Blooms of the diatom *Nitzschia* and the flagellate *Dinobryon* were responsible for the March 18, 1975, maximum. During the rest of the year, algal recoveries were generally very low.

The sample collected on January 26 had the highest algal density (2800 cts/ml) among the nine collections in 1976. *Cyclotella* prevailed in the January sample. Although *Navicula* was not abundant, it was detected in seven of the nine collections.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	M_g	SD_g	Diversity index Range	M	SD	Algal density occurrence (% of time) <500	500 to 2000	2001 to 5000	>5000
11/71-9/72	11	940-2400	1600	1 30	1 06-1 76	1 45	0 23		72 7	27 3	
10/72-9/73	12	160-3000	1200	2 36	0-2 27	0 97	0 73	8 3	50 0	41 7	
10/73-9/74	12	ND-4700	520	21 17	0-1 77	0 94	0 62	25 0	16 7	58 3	
10/74-9/75	10	ND-5300	360	26 32	0-1 85	0 93	0 73	30 0	40 0	30 0	
10/75-9/76	11	160-2800	480	8 80	0-1 59	1 15	0 58	27 3	63 6	9 1	
5-year	56	ND-4700	720	9 29	0-2 27	1 09	0 62	18 1	48 6	33 3	

• ND = Alga not detected

Summary of Data

Date	Algal density (cts/ml)	Diversity index
1971		
11/15	2000	1 76
12/10	2400	1 40
1972		
1/3	1300	1 06
2/16	940	1 46
3/22	1600	1 36
4/25	2000	1 15
5/11	1600	1 76
6/6	1900	1 50
7/11	1400	1 35
8/8	1400	1 66
9/14	1700	1 49
10/5	1000	0 99
11/10	630	0
12/14	940	1 79
1973		
1/15	160	0
2/22	2500	0 67
3/19	2500	1 41
4/13	1700	1 35

Dale	Algal density (cts/ml)	Diversity index
5/15	2500	1 27
6/11	2400	1 24
7/20	940	0 65
8/9	630	0
9/18	3000	2 27
10/1	3300	1 22
11/7	1600	0 72
12/12	2200	0 95
1974		
1/10	2400	1 16
2/8	160	0
3/13	2200	1 45
4/16	940	1 25
5/21	4700	1 77
6/4	2500	1 30
7/23	3900	1 43
8/14	ND	0
9/19	ND	0
10/18	4100	1 54
11/21	5000	1 79
12/11	ND	0

Date	Algal density (cts/ml)	Diversity index
1975		
2/12	1600	1 85
3/18	5300	1 26
5/27	1900	1 19
6/4	ND	0
7/18	160	0
8/7	790	0 72
9/17	790	0 97
10/2	470	1 59
11/10	ND	0
1976		
1/26	2800	1 41
2/5	160	0
3/2	790	1 52
4/27	940	1 46
5/25	940	1 25
6/14	1700	1 32
7/22	1100	1 38
8/23	940	1 46
9/27	1300	1 30

36. SKILLET FORK AT WAYNE CITY

The 1972 maxima were poorly marked and diatoms, as usual, generally prevailed. *Scenedesmus* was the prominent green alga. The highest population detected for total algae was 2400 cts/ml on August 11.

After the winter low counts, a significant *Cyclotella* bloom (2400 cts/ml) and an *Ulothrix* bloom (2200 cts/ml) occurred on March 6, 1973. A summer maximum of 3500 cts/ml consisting mostly of *Navicula* occurred on June 20. The highest algal count for the 24-month period occurred on September 28, 1973. It was composed mainly of *Scenedesmus* (2400 cts/ml) and *Asterionella* (1400 cts/ml).

The green alga *Crucigenia* contributed 57 percent of the total 3300 cts/ml during the autumn pulse on September 13, 1974.

The 1975 spring pulses occurred in March and April. In March *Cyclotella* prevailed; in April *Navicula* and *Synedra* dominated. During the period of May 1975 through August 1976, algal growths were generally sporadic and densities were low. An *Ulothrix* bloom (2700 cts/ml) in combination with *Cyclotella* was the cause for a peak on September 24, 1976. About 83 percent of the algae recovered in the stream during the fifth year of study were diatoms.

Statistical Summary of Algal Data

Study period	Number of samples	Algal density Range	M_g	SD_g	Diversity index Range	M	SD	Algal density occurrence (% of time) <S00	500 to 2000	2001 to 5000	>5000
11/71-9/72	11	470-2400	1300	1 71	0 37-1 85	1 31	0.47	9 1	63.6	27 3	
10/72-9/73	12	160-4900	1600	2 53	0-1 97	1 15	0.53	8 3	50 0	41 7	
10/73-9/74	11	ND-3300	1000	10 10	0-1.86	1 30	0 54	9 1	54 5	36 4	
10/74-9/75	11	ND-2800	680	9 47	0-1 72	1 03	0.45	27 3	54 5	18 2	
10/75-9/76	12	ND-3900	220	27 05	0-1.69	0.91	0 60	33 3	58 3	8.3	
5-year	57	ND-4900	790	"8 97	0-1.97	1 14	0 53	17 4	56 2	26 4	

• ND = Alga not detected

Summary of Data

Date	Algal density (cts/ml)	Diversity index
1971		
11/12	2200	0 37
12/7	2400	1 05
1972		
1/11	940	1 25
2/22	630	0.81
3/16	1100	1.84
4/14	1700	1.57
5/18	1600	1.85
6/6	470	0 92
7/7	1300	1.56
8/11	2400	1.52
9/12	1700	1.68
10/5	790	0.72
11/15	940	0.65
12/9	1700	0 99
1973		
1/5	1700	1.32
2/1	160	0
3/6	4700	1 18
4/5	2000	1.35
5/8	1300	1 41
6/20	3500	1.09
7/5	1400	1.35
8/7	2400	1 97
9/28	4900	1 82
10/5	1900	1 78
11/12	1900	1.86
12/5	2700	1.38
1974		
1/25	2800	1.35
2/15	ND	0
3/12	1600	0 72
4/4	1900	1 46
5/20	1400	1 66
6/21	1600	1 52
7/23	2000	0 99
9/13	3300	1.58
10/4	1700	0.85
11/1	1900	0.82
12/2	1600	1 36
1975		
2/3	1600	1 72
3/3	2800	1 05
4/17	2700	1 40
5/27	1300	0.95
6/20	790	1.37
7/18	470	0 92
8/11	470	0.92
9/17	ND	0
10/6	1100	1 38
11/10	1300	1 30
12/9	ND	0
1976		
1/5	1300	1 00
2/2	940	0 86
3/15	1600	1 16
4/28	1600	1.69
5/21	ND	0
6/9	470	0 92
7/20	1900	1.56
8/12	ND	0
9/24	3900	1 08

37. LITTLE WABASH RIVER AT CARMI

This is a typical diatom-dominated site. However, on three separate occasions green algae were a significant portion of the total algal population. On August 7, 1972, *Scenedesmus* constituted a major portion of the 2700 cts/ml total. On April 12, 1973, *Ulothrix* represented about 41 percent of the 4200 cts/ml. This was the annual maximum for 1973. On September 13, the green alga *Pediastrum,* an alga occurring infrequently in Illinois streams, bloomed and represented about 67 percent of the 2400 cts/ml detected.

Algae were not productive during 1974 at this site. Only a small peak occurred in July. The two samples taken in February 1975 had high algal counts. *Navicula* was most numerous (1700 cts/ml) on February 13. The three diatoms *Surirella* (46 percent), *Melosira*, and *Navicula* (both 27 percent) accounted for the 1975 maximum on February 28. A *Crucigenia* bloom on October 6, 1975, made up 55 percent of the total algal count.

Melosira was responsible for high counts on March 19 and April 28, 1976. *Ulotbrix* (1600 cts/ml) and *Cyclotella* (940 cts/ml) made up the rest of the total during April.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density* Range	M_g	SD_g	*Diversity index* Range	*M*	*SD*	*Algal density occurrence (% of time)* <500	500 to 2000	2001 to 5000	>5000
11/71-9/72	11	790-2800	1700	1 46	0 97-1 85	1 58	0 27		63 6	36 4	
10/72-9/73	12	ND-4200	810	8 88	0-1 82	1 12	0 60	16.7	50 0	33 3	
10/73-9/74	12	ND-2500	470	851	0-1 89	0 80	0 66	33 3	58.3	8 3	
10/74-9/75	11	ND -6900	660	10.98	0-1 81	1.08	0 77	27 3	54 5	9 1	9.1
10/75-9/76	12	630-4400	1400	1.85	0-1 53	1.12	0 43		81 8	27.3	
5-year	58	ND-6900	900	5 80	0-1 89	1.14	0 60	15 5	61 6	22.9	1.8

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*	*Date*	*Algal density (cts/ml)*	*Diversity index*
1971			5/16	1600	0 97	1975		
11/10	790	0 97	6/26	2500	1.63	2/13	3000	1 57
12/1	2200	1.48	7/18	1400	1 75	2/28	6900	1 54
1972			8/10	1300	1 31	5/29	1300	1 30
1/6	1600	1.85	9/13	2400	1 16	6/6	1100	1 45
2/14	1900	1 73	10/17	1300	1 00	7/9	ND	0
3/28	1700	1.68	11/28	160	0	8/15	790	1 37
4/20	1400	1 75	12/21	1400	0.99	9/18	470	0
5/26	2200	1 78	1974			10/6	3300	1 31
6/6	2800	1.22	1/18	1400	1 89	11/14	1300	1 41
7/17	1300	1 56	2/13	ND	0	12/10	790	1.37
8/7	2700	1 57	3/14	1100	1 15	1976		
9/15	1300	1 75	4/17	1600	0.72	1/14	940	0 92
10/6	940	0	5/13	1400	1 35	2/12	1600	0 92
11/9	470	0.92	6/7	310	1 00	3/19	2200	1 43
12/7	1100	0 99	7/22	2500	1 55	4/28	4400	1 53
1973			8/16	160	0	5/25	630	0
1/12	ND	0	9/12	940	0	6/11	630	0 81
2/8	1100	1 45	10/10	1100	0	7/23	1100	1.15
3/21	2200	1 48	11/25	1300	1 81	8/26	1700	1 10
4/12	4200	1 82	12/13	940	1 79	9/30	1100	1 45

39. SOUTH FORK SALINE RIVER NEAR CARRIER MILLS

Two high population peaks occurred in 1972 and in each case green algae were not present. The density (2800 cts/ml) on June 5 was made up mainly of *Navicula* and *Melosira.* On July 5 (1600 cts/ml) the same diatoms were prevalent.

In 1973, the spring maximum on March 12 was composed mainly of the green algae *Scenedesmus* and *Actinastrum.* *Ulothrix* was responsible for the three pulses on July 24 (2200 cts/ml), October 5 (2500 cts/ml), and November 21, 1973 (2800 cts/ml).

High algal densities were also found in the spring of 1974. *Melosira* accounted for 75 percent of the total on March 6. An abundant growth of the green *Chlorella* (9100 cts/ml) was detected on April 1. In the August 6 collection, the diatom *Fragilaria* made up 75 percent of the total count. Another pulse on September 3, 1974, was principally composed of *Ulothrix* (2200 cts/ml) and *Cyclotella* (1600 cts/ml).

Ulothrix was also prevalent (63 percent) on February 14, 1975. The maximum for 1975 occurred on April 16 and *Crucigenia* (3500 cts/ml) and *Cyclotella* (2700 cts/ml) prevailed. Algal densities were very low during the summer of 1975.

During the fifth study year, the highest density was 2200 cts/ml. The algal peaks were poorly developed. During this period, the diatoms accounted for 76 percent of the total population. *Cyclotella* and *Navicula* appeared most frequently.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density*			*Diversity index*			*Algal density occurrence (% of time)*			
		Range	M_g	SD_g	*Range*	*M*	*SD*	*<500*	*500 to 2000*	*2001 to 5000*	*>5000*
11/71-9/72	10	ND-4400	330	24 11	0-1 85	1.07	0 85	30 0	40 0	30 0	
10/72-9/73	11	790-2700	1600	1.67	0 72-1 71	1 22	0 33		63 6	36.4	
10/73-9/74	12	ND -9700	500	21 67	0-1.46	0 62	0 55	25 0	25 0	41.9	8.3
10/74-9/75	12	ND -6900	250	31 06	0-1 68	0 78	0 65	33 3	33 3	25 0	8 3
10/75-9/76	12	160-2200	1100	2 01	0-2.16	1 46	0 52	8 3	83 3	8.3	
5-year	57	ND -9700	600	12 64	0-2 16	1 01	0.66	19 3	49 0	28.3	3.3

• ND = Alga not detected

Summary of Data

Date	*Algal density (cts/ml)*	*Diversity index*
1971		
11/12	160	0
12/2	ND	0
1972		
1/13	ND	0
3/3	1100	1 38
4/14	2000	1 78
5/24	4400	1 85
6/5	2800	1.66
7/5	1600	1.85
8/9	1400	1 75
9/15	1700	044
10/3	790	1 37
11/1	1600	1 30
12/6	1600	1 30
1973		
1/9	790	0.72
2/12	790	0.72
3/12	2500	1 50
4/20	2400	1 71

Date	*Algal density (cts/ml)*	*Diversity index*
6/5	1900	0 82
7/24	3100	1 18
8/7	1300	1.30
9/12	2500	1.50
10/5	2700	0 32
11/21	3000	0.30
12/6	940	1 46
1974		
1/23	160	0
2/12	ND	0
3/6	2500	1.06
4/1	9700	0.35
5/13	1100	0.59
6/11	ND	0
7/15	940	1 46
8/6	2400	0 72
9/3	3900	1 18
10/1	1300	0.81
11/6	2200	0.59
12/13	1700	1.68

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
1/7	310	1.00
2/14	4200	1 50
3/4	2700	0 94
4/16	6900	1 54
5/28	940	1 25
6/20	ND	0
7/15	630	0
8/12	ND	0
9/17	ND	0
10/1	1900	1 33
11/11	790	1.37
12/9	1700	2.01
1976		
1/8	160	0
2/10	1300	2 16
3/22	1900	1 55
4/15	1700	1 50
5/21	1100	1 45
6/14	2200	1 73
7/26	940	146
8/24	940	1.46
9/24	940	146

40. BIG MUDDY RIVER AT MURPHYSBORO

The site is quite productive and from the standpoint of diatom genera, more diversified than other collection sites. In addition to the prevalent algae *Cyclotella* and *Navicula,* occasional blooms of *Nitzschia, Melosira,* and *Fragilaria* were detected. The predominant green algae were *Scenedesmus, Ulothrix,* and *Ankistrodesmus.*

The annual maximum for 1972 occurred on August 7 and was composed mostly of *Navicula.* About 30 days earlier the predominant genus was *Cyclotella.* In 1973, the spring maximum was detected on March 16 (3600 cts/ml) and *Ulothrix* was the prevailing alga followed by *Scenedesmus* and *Euglena.* There were no diatoms in the sample. Another pulse occurred in May and the diatoms *Nitzschia* and *Cyclotella* were the major contributors.

In 1974, a winter maximum was detected on February 14 and *Cyclotella* (3000 cts/ml) prevailed. Another pulse occurring on May 16 was composed mostly of *Crucigenia* (2500 cts/ml) and *Navicula* (1300 cts/ml). The algal densities were low during the summer of 1974. During the fall of 1974, the abundant algae were *Nitzschia* in October and *Navicula* and *Cyclotella* in November.

A *Navicula* (3800 cts/ml) bloom in combination with *Cyclotella* and *Ulothrix* (both 1600 cts/ml) was the cause for the 1975 maximum on March 17. Thereafter, and until the end of the study period in 1976, the only significant algal growth developed on November 11, 1975. In that sample, *Melosira* and *Euglena* were abundant.

Statistical Summary of Algal Data

Study period	*Number of samples*	*Algal density Range*	*Algal density* M_g	SD_g	*Diversity index Range*	*Diversity index M*	*SD*	*Algal density occurrence (% of time)* <500	*500 to 2000*	*2001 to 5000*	*>5000*
11/71-9/72	10	940-4600	2300	1 70	1 14-2.22	1.64	0.37		30.0	70 0	
10/72-9/73	12	790-3600	1700	1 68	0 72-2 05	1 35	0 42		66.7	33 3	
10/73-9/74	12	310-4400	1300	2 15	0-1.58	1 06	0.58	8 3	58 3	33 3	
10/74-9/7:	10	310-7100	1500	2 43	0 70-1 94	1 31	0.41	20 0	40 0	30 0	10.0
10/75-9/76	12	ND -2200	600	8 53	0-2.10	0 99	0 64	16 7	58 3	25 0	
5-year	56	ND -7100	1300	3 35	0-2.22	1.25	0.54	9 0	50 7	38 3	2 0

• ND = Alga not detected

Summary of Data

Dale	*Algal density (cts/ml)*	*Diversity index*
1971		
11/11	3000	1 71
12/9	2200	1 92
1972		
1/10	1100	1 38
3/7	940	1 25
4/20	3000	1 75
5/24	2000	2 13
6/5	2800	2 22
7/5	4200	1 51
8/7	4600	1 14
9/8	1600	1 36
10/2	2700	1 22
11/13	1900	1 04
12/20	1300	1 30
1973		
1/20	790	0 72
2/14	1300	1.81
3/16	3600	1.35
4/3	2400	1 24

Date	*Algal density (cts/ml)*	*Diversity index*
5/21	3500	1 69
6/15	1600	2 05
7/9	790	0 97
8/15	1100	1 84
9/10	1700	0 87
10/15	1400	1 53
11/27	2000	1.58
12/12	310	0
1974		
1/25	1400	1.35
2/14	3900	1 10
3/18	2200	1.20
4/17	1100	0 59
5/16	4400	1 52
6/14	940	1 46
7/18	1400	1 53
8/6	630	0 81
9/10	630	0
10/8	2500	0 70
11/26	2400	1 53
12/10	940	1 25

Date	*Algal density (cts/ml)*	*Diversity index*
1975		
2/13	1600	0 97
3/17	7100	1 57
5/2	2200	1 81
6/6	470	0.92
7/11	1700	1.94
8/19	310	1.00
9/15	1400	•1 39
10/1	940	0 65
11/11	2700	2.10
12/15	1400	1.35
1976		
1/19	160	0
2/9	2200	1 52
3/15	2000	0 39
4/12	1100	1.15
5/17	1300	1.06
6/7	940	1 25
7/12	1100	1 56
8/9	630	0 81
9/13	ND	0

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