

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

**RESEARCH AND DEVELOPMENT
DEPARTMENT**

REPORT NO. 91-31

OPERATION LAKE WATCH - 1984

BACTERIA, ALGAE, BENTHOS, AND FISH

IN THE WILMETTE, CHICAGO, AND CALUMET

HARBOR AREAS OF SOUTHWESTERN

LAKE MICHIGAN

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August 1991

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Disclaimer

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

SUMMARY AND CONCLUSIONS

Bacteria

In 1984, of the seven open water Lake Michigan sampling stations only one, station 7-A, located about 300 yards (275 meters) offshore, from the Indiana Harbor Lighthouse, had fecal coliform (FC) levels greater than three per 100 mL. Station 7-A had counts of 55 per 100 mL as a geometric mean. Only this station, in 1984, had counts higher than the Illinois Pollution Control Board Lake Michigan open water quality standard of 20 FC per 100 mL.

In 1984, all locations met the Illinois Department of Public Health Lake Michigan beach standard of 500 FC per 100 mL.

Algae

Comparing summer algae composition with studies conducted during the 1970's by the District and the Great Lakes Environmental Research Laboratory at Ann Arbor, Michigan, a clearly discernible improvement was found for Lake Michigan during 1984. The dominance of the green and blue-green algae in Lake Michigan summer algal populations found during the 1970's did not occur in 1984. Where the diatom contribution in the 1970's had been as low as 5% of the algal population, the diatom contribution in 1984 was never less than 61% of the algal population. The increased dominance and appearance of the oligotrophic indicator species Cyclotella kützingiana and C. ocellata along with the loss of dominance and reduced appearance

of the eutrophic indicator species Fragilaria capucina, Melosira granulata, and Stephanodiscus tenuis and the recently introduced eutrophic species Diatoma tenue var. elongatum, Nitzschia dissipata, Stephanodiscus binderanus, S. subtilis, and Cyclotella stelligera also confirms the improvement in water quality. The loss of Stephanodiscus hantzschii and S. minutus (mesotrophic to eutrophic indicators) from a position of dominance in the population also supports the hypothesis of water quality improvement, even though Fragilaria crotonensis and Asterionella formosa remained as dominants through most of the year. The increased dominance of Tabellaria fenestrata (a mesotrophic indicator) throughout 1984 added weight to the conclusion of improved Lake Michigan water quality as compared to the 1970's.

Benthic Invertebrates

Bottom samples were collected from the inshore area of southwestern Lake Michigan at depths ranging from 15 to 31 feet during April, August, and October 1984. Based on the results from this study, the following conclusions can be made concerning the Lake Michigan benthic invertebrate communities:

1. Sixty-nine benthic taxa, most of which were identified to species, were collected from the study area, with an overall estimated mean density of 2,380 organisms/m².

2. Tubificids, chironomids, naidids, orthocladines, and amphipods accounted for 44, 9, 31.8, 14.5, 3.5, and 1.6 percent, respectively, of the total number of invertebrates.
3. The overall estimated mean abundance of the benthic invertebrates during the spring, summer, and fall was 1,488, 3,220, and 2,433 organisms/m², respectively.
4. The most common invertebrate taxa included the chironomids Chironomus fluviatilis gr., Cyphomella sp., and Polypedilium scalaenum, the naidids Piquetiella michiganensis, and Vejdovskella intermedia, and the tubificid worm Potamothrix vejdoovskyi.
5. Using several numerical indices for oligochaete worms (total and relative abundance) and the indicator species approach, the benthic invertebrate community in Lake Michigan typified an area which has sustained a moderate degree of organic pollution or was characteristic of a mesotrophic habitat.

Sediment Quality

Bottom sediments were collected from the same three stations as the benthic invertebrates in October 1984, and analyzed for 15 constituents. The following conclusions can be made regarding the quality of the Lake Michigan sediment in the study area:

1. The mean percent volatile solids and the mean concentration of the chemical oxygen demand (COD), fats, oils, and greases (FOG), arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc in the surficial sediments was 0.56 percent, 8,117, 24, 0, 0, 6.3, 23.0, 8,430, 20.7, 283, 0.02, 6.7, 3.0, and 63.3 mg/kg, respectively.

2. Using the USEPA's Region V guidelines for evaluating Great Lakes harbor sediments, the Lake Michigan bottom sediments in the study area can be classified as nonpolluted.

Fish

Eight species of fish classified as being intolerant of a variety of disturbances such as water quality degradation, habitat degradation, or a combination of the two, were collected from three Lake Michigan harbors (Wilmette, Chicago, and Calumet Harbors) during 1984. This suggested that these harbors were supportive of fish populations and were of good water quality.

The relatively great proportion of top carnivorous fish species in the three harbors indicated that healthy, trophically diverse fish communities existed in these harbors.

The inshore area of Calumet Harbor appeared to be moderately degraded near the Indiana border based on the percent of omnivorous fish species in the electrofishing catch.

No harbor exceeded 0.2 bluegill toxic units which is considered satisfactory for maintaining fish populations.

INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN

INTRODUCTION

Lake Michigan is one of the Laurentian Great Lakes that form a natural boundary between Canada and the United States of America. The physical characteristics of these lakes were established 10,000 years ago with the retreat of the Wisconsinian glacier, and are stable and slow to change. Because these lakes contain 20 percent of the world's supply of surface fresh water the drainage basin is heavily populated. Eighty percent of the Canadian and 20 percent of the United States populations reside around these lakes.

Lake Michigan is the only Great Lake completely within the boundaries of the United States. It is 350 miles (560 kilometers) long, divided into basins by an underwater ridge, and in the southern basin has a maximum east west width of 84 miles (134 kilometers). The average depth of Lake Michigan is 279 feet (85 meters) with maximum depths in the northern basin of 923 feet (282 meters) and in the southern basin of 548 feet (167 meters). Lake Michigan has a surface area of 22,300 square miles (5,775,674 hectares) and a drainage basin (including the lake) of 67,900 square miles (17,586,012 hectares). Lake Michigan contains 1,180 cubic miles (4,920 cubic kilometers) of water with an average discharge rate (including the Chicago diversion) of 51,000 cubic feet per second (1,444 cubic

meters/sec). By combining this information an emptying or turnover time of 108 years can be calculated for Lake Michigan (1).

The Metropolitan Water Reclamation District of Greater Chicago (District) was created in 1889 to protect the source of the City of Chicago's drinking water supply, Lake Michigan. The District has continued to safeguard this valuable water resource not only through capital improvements such as reversal of flow in the Chicago and Calumet Rivers to the Mississippi River drainage basin, the construction, maintenance, and improvement of water reclamation plants, and more recently the Tunnel and Reservoir Plan (TARP), but also through continuing and extensive water quality monitoring programs for this Great Lake.

OBJECTIVES

A two year survey of the inshore waters of southwestern Lake Michigan was begun in January of 1984. This report describes the results of the first year (1984) of this survey. The primary objective of this survey was to determine the present water quality of this region through the biota collected; e.g. algae as the primary producers, benthos as organisms that are primary and secondary consumers, fish as the ultimate consumer in the aquatic environment, and bacteria as indicators of human activities. Chemical constituents in the water or sediments, as appropriate, were sampled at the same time as the biota. Thus, a composite water quality determination was made.

Comparisons of the data collected were to be made with the Lake Michigan Water Quality Standards (2), published by the Illinois Environmental Protection Agency, previous studies conducted by the District (3), and Argonne National Laboratories (4).

Bacteria

Because there are large numbers of different kinds of bacteria to be found in natural waters the indicators of sanitary quality, total coliform (TC), fecal coliform (FC), and fecal streptococcus (FS) were the first choices for the determination of water quality in the inshore waters of southwestern Lake Michigan. The estimate of total heterotrophs or

standard plate count (SPC), was added to provide an evaluation of bacterial biomass. To satisfy the public health aspect of a bacterial survey the Salmonella (enteric pathogens) group were identified and enumerated, as was Pseudomonas aeruginosa, an organism identified with water body contact infections, such as eye, ear, nose, and wound infections.

Algae

The algae are the primary producers in aquatic systems, analogous to the grasses of land systems. They convert inorganic substances to organic substances such as proteins, carbohydrates, and fats and so are responsible for providing sustenance to the other organisms inhabiting the water. The kinds of algae present can indicate whether or not the system (in this case southwestern Lake Michigan) represents a disturbed or stable environment. To make this determination both planktonic and periphytic algae were collected. **These algae** were identified to species and enumerated.

More than 2,000 species of algae have been previously identified from Lake Michigan (4). Sixty-five percent of these species were classified as diatoms (Bacillariophyceae). The remainder were divided among the green algae (Chlorophyta), blue-green algae (Cyanophyta), golden-brown algae (Chrysophyceae), euglenoids (Euglenophyta), and dinoflagellates and cryptomonads (Pyrrhophyta).

The previous investigations of indicator algal species in Lake Michigan were primarily on diatoms since they had been dominant in both species and number (4). The underlying assumption for determining indicator species was that different taxa were either adapted to, or tolerate water of dissimilar nutrient content.

The Shannon-Weaver species diversity index was used to describe the richness of species and the distribution of individuals among the species (5). The persistence of species through the year showed tolerance to changing climatic conditions and dominance of a species in the population (greater than one percent of the total population) showed that conditions were favorable for that species at that time.

Benthic Invertebrates

The benthic invertebrate community frequently has been used to assess the environmental quality of lakes and rivers. These organisms are sensitive to both physical and chemical changes in the environment. They also have sufficiently long life cycles and low motility, and thus reflect past and present environmental conditions. The community characteristics analyzed included the abundance, percent composition, and seasonal trends of invertebrates.

Sediment Quality

Much of the suspended material that has been discharged from point and nonpoint sources of pollution eventually settles to the bottom of lakes. Some of these wastes can be toxic to aquatic organisms when present in high concentrations. Even though these materials are usually discharged to lakes at sublethal levels, many are capable of being concentrated in aquatic food chains. In this study, sediment samples were collected and analyzed for 15 chemical constituents.

Fish

Fish collections and analyses give the most meaningful index of water quality to the public, and have been performed on the District's waterways since 1974 (10, 11, 12, 13, 14, 15, 16). Fish occupy the upper levels of the aquatic food chain as the ultimate aquatic consumer. Therefore, changes in water quality that significantly affect the other kinds of organisms within the aquatic community will also affect the species composition and abundance of the fish population.

A knowledge of the assemblage of fish species in a lake or a stream and the numerical relationships of these species provides an excellent biological picture of the watercourse and its well-being. When information is available over a long period of time, fishes can be one of the most sensitive indicators of the quality of the aquatic environment (17).

Lake Michigan's native fish stocks have changed vastly in the last 120 years (18). These changes are primarily attributable to exploitation (overfishing), the introduction of exotic (nonnative) species, and accelerated eutrophication or other forms of pollution related events. Exploitation was easily the major factor causing changes in Lake Michigan fish stocks until the smelt became abundant in the 1930's, and probably until the parasitic sea lamprey became established in the 1940's, and the alewife in the 1950's (18). It is believed that the destruction of predators by the sea lamprey allowed the invasion of the alewife (19).

As a prolific forage fish, the alewife, has made possible the outstanding successful coho and chinook salmon stocking programs begun in the mid-1960's in Lake Michigan (18). Predation on the alewife resulted in its decreased abundance, and the yellow perch and bloaters, competitors of the alewife, have increased in abundance (20, 21, 22). Lake trout were stocked during 1965 and are once again abundant in Lake Michigan, as are the other trout and salmon species. The lamprey, though still present, is being controlled chemically (18).

At present, 91 species of fish are known to inhabit Lake Michigan; while 135 species of fish are known to inhabit the tributaries to Lake Michigan (23).

In this study the following characteristics were used to describe the fish populations and the water quality in the Wilmette, Chicago, and Calumet Harbors of Lake Michigan:

1. Number of fish species collected within each harbor, and for all harbors combined.
2. Number and percent of total catch for fish collected per 500 feet of experimental gill net within each harbor, and for all harbors combined.
3. Number and percent of total catch for fish collected per 30 minutes electrofishing within each harbor, and for all harbors combined.
4. Weight (grams) of fish and percent of the weight of the total catch of fish collected per 500 feet of experimental gill net within each harbor, and for all harbors combined.
5. Weight (grams) of fish and percent of the weight of the total catch of fish collected per 30 minutes electrofishing within each harbor, and for all harbors combined.
6. Bluegill toxicity index (24) for each harbor and for all harbors combined.

METHODS AND MATERIALS

Bacteria

Water samples for bacterial analyses were collected at a depth of one meter using a Kemmerer bottle. These samples were placed in sterile four liter containers, containing enough sodium thiosulfate to neutralize 15 mg/L chlorine, and transported on ice to the R&D Laboratory in Stickney, Illinois. Analyses were begun approximately six to twenty-four hours after sample collection began and from two to twenty hours after the last sample was collected. Total coliform (TC), fecal coliform (FC), fecal streptococcus (FS), and standard plate count (SPC) were performed according to Standard Methods for the Examination of Water and Wastewater, 14th Edition (25). Salmonella were estimated using a modification of the MPN technique described by Kenner and Clark (26). Presumptive Salmonella were identified biochemically utilizing the API 20® system for identification of Enterobacteriaceae. Confirmation of Salmonella isolates was performed with polyvalent "O" antisera. Pseudomonas aeruginosa (PA) analyses were performed according to the tentative method in Standard Methods for the Examination of Water and Wastewater, 15th Edition (27). Results were expressed as the geometric mean of samples collected four times during the year.

Colony confirmations for TC, FC, FS, and PA are presented in Table 1. The confirmation rates for typical TC, FC, FS, and PA colonies were 52.6%, 86.7%, 71.4%, and 100%, respectively.

Algae

PLANKTON

"Plankton refers to microscopic aquatic forms having little or no resistance to currents and living free-floating and suspended in open or pelagic waters" (27).

Two types of plankton samples were collected. One type of sample was collected with a Kemmerer water sampler which collected discrete water samples at depths of one, three, and five meters, and the bottom meter. The other type of sample was collected with a plankton net (80 micrometer mesh) by lowering the net to the bottom of the water column and then raising it straight up - this is called a column or vertical plankton net tow and samples the entire water column. Both types of samples were kept in the dark and iced.

Upon return to the laboratory the discrete water samples were divided into four aliquots; one for diatom analysis, one for nondiatom or soft-bodied algae analysis, one for chlorophyll a analysis, and one for organic matter analysis. The vertical plankton net tow sample was divided into two aliquots; one for diatom analysis and one for nondiatom analysis.

Diatoms. The samples for diatom analysis were digested with 30 percent hydrogen peroxide and dichromate as a catalyst as described in Standard Methods (27). Serial concentrations were by sedimentation (27). After mounting in Hyrax® the

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 1

TOTAL COLIFORM (TC), FECAL COLIFORM (FC), FECAL STREPTOCOCCUS (FS)
AND PSEUDOMONAS AERUGINOSA (PA) COLONY CONFIRMATIONS
FROM SAMPLES COLLECTED IN LAKE MICHIGAN IN 1984

	TC		FC		FS		PA	
	Typ ¹	Atyp ²	Typ ¹	Atyp ²	Typ ¹	Atyp ²	Typ ¹	Atyp ²
Number of Colonies Confirmed	40	2	26	0	25	0	15	0
Number of Colonies Tested	76	11	30	4	35		15	3
Percent Confirmed	52.6	18.2	86.7	0.0	71.4	0.0	100	0.0

¹Typical Colonies.

²Atypical Colonies.

counting protocol used was to identify and count 500 organisms or 300 fields, whichever came first.

Nondiatoms. The samples for nondiatom analyses were preserved with 0.5 percent glutaraldehyde, and three drops of concentrated detergent. Serial sedimentation as described in Standard Methods (27) was used to concentrate the organisms two hundred times. Five hundred organisms or 300 fields were identified and counted. To determine the percentage of live diatoms the total number of diatoms was noted as well as those containing chloroplasts. Because the digestion process for diatom preparation destroys those diatoms which are only slightly silicified, such as Rhizosolenia, these organisms were counted in the nondiatom preparation and added to the diatom count.

Chlorophyll a. Samples were filtered through glass fiber filters, extracted with 90 percent acetone, and ground in a tissue grinder as described in Standard Methods (27). Samples were clarified by centrifugation and absorbances determined in a spectrophotometer. Chlorophyll a concentrations were calculated using the UNESCO equations (27).

Organic Matter: The sample for organic matter analysis was dried at 103°C, weighed, fired in the muffle oven at 600°C, and reweighed. The difference in weight is the organic matter (27).

PERIPHYTON

Periphyton are "A community of microscopic plants and animals associated with the surfaces of submerged objects. Some are attached, some move about" (27).

The periphytic algae were sampled by providing artificial substrates (microscope slides) for them to colonize. They were collected at two week intervals, protected from autooxidation by wrapping in aluminum foil, kept viable at 4°C, and transported to the laboratory. The slides were equally divided among the four analyses: diatoms, nondiatoms, chlorophyll a, and organic matter. Because of the variation among slides the distribution to each analysis was made on a rotating basis to minimize sampling bias. Once the samples had been scraped off the slides, the samples were handled as for plankton analyses.

WATER CHEMISTRY

Water samples for chemical analysis were collected at the same time as the algae samples. Temperature, Secchi disk, dissolved oxygen, and pH were determined on site. A total of 49 water quality constituents were measured at each site according to Standard Methods for the Examination of Water and Wastewater, 15th Ed. (27) and the results of these analyses are presented in the Appendix, Tables AII-13 to AII-15.

Benthic Invertebrates

Three replicate bottom samples of 0.05 m² were collected with a Ponar grab sampler during April, August, and October of

1984 from stations near Wilmette, Chicago, and Calumet Harbors. The sediment samples were placed in one gallon plastic containers and returned to the laboratory for analysis. All samples collected were stored at 4°C until processed.

Upon return to the laboratory, the samples were washed and screened through a number 60 U. S. Standard Sieve. The sieved material was examined under a stereomicroscope at 7 to 30 magnifications. All invertebrates were removed from the finer residual material, sorted into major taxonomic groups, and counted within three to four days of the time of sampling. Except for the worms and midges, each organism was examined and identified to the lowest possible taxon with the stereomicroscope. Oligochaete worms and chironomid midge larvae were mounted on slides using a temporary mounting medium (100 mL lactic acid, 100 mL glycerol, and 200 mL tap water), and identified under a compound microscope at 100 to 1,000 magnifications. At least 200 worms were identified from each of the replicate samples.

Identifications were made to the species level whenever possible using the following taxonomic references: Curry (28), Hiltunen and Klemen (29), Hosinger (30), Jackson (31), Klemm (32), Mackie et al. (33), Maschwitz (34), Pennak (35), Saether (36, 37, 38) and Stimson et al. (39) (Hamilton and Saether, personal communication with one of the authors, Irwin Polls).

Sediment Quality

A sediment sample was collected with a Ponar grab sampler during October from the same three stations as benthic invertebrates. The sample was transferred into a quart glass jar and analyzed for percent total and volatile solids, chemical oxygen demand (COD), fat, oils and greases (FOG), arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc. All 15 constituents were analyzed according to Methods for Chemical Analysis of Water and Wastes (40).

Fish

Fish were collected from Calumet Harbor on September 17, 18, and 29, 1984; from Wilmette Harbor on September 24 and 25, 1984; and Chicago Harbor on October 23, 24, and 25, 1984. Fishing gear used included a 230-volt alternating current electrofishing boom mounted on a 14-foot aluminum commercial boat, and 125-foot long, six-foot deep, experimental gill nets (with five 25-foot sections of square mesh size: 3/4-inch, 1-inch, 1-1/4-inch, 1-1/2-inch, and 2-inch).

ELECTROFISHING

Fish were collected with long-handled dip nets (3/8-inch mesh) along a known length of shoreline within each harbor. All electrofishing times were noted. A current of approximately 11 amps was maintained by use of a transformer. The electrofishing

boat circled back at intervals to pick up fish missed during the first pass along the shoreline.

The electrofisher was used in relatively shallow water areas in the harbors, which included the Wilmette Harbor boat yard, the rocky riprap around the Jardine Water Filtration Plant in Chicago Harbor and the rocky riprap near the mouth of the Calumet River as well as the weedy shallows, and the metal piling-enclosed boat launching facility at the U. S. Coast Guard Station in Calumet Harbor.

GILL NET SAMPLE

Two 250-foot lengths of gill netting, each length made up of two 125-foot experimental gill nets tied together, were set near the bottom and perpendicular to the shoreline in each harbor and left overnight. One 250-foot gill net was set relatively close to shore and the other 250-foot gill net was set relatively farther away (near the breakwater structures in Chicago Harbor and in Calumet Harbor). Therefore, a total of 500 feet of experimental gill netting was used to collect a fish sample in each harbor.

Wilmette Harbor is a relatively small harbor when compared with Chicago Harbor and Calumet Harbor. The gill nets at Wilmette Harbor were set in a manner similar to the other two harbors, but were actually outside of the harbor, just to the north and to the south of the Wilmette Harbor mouth. For

purposes of this report this area will also be referred to as Wilmette Harbor.

All fish collected by either method were identified to species, weighed to the nearest gram (small fish) or nearest tenth of a kilogram or tenth of a pound (large fish), and measured for standard and total length to the nearest millimeter. Large fish were identified, weighed and measured in the field. Small fish were preserved in 10 percent formalin, and identified, weighed and measured at a later date, in the laboratory, after being transferred to 40 percent isopropanol.

BLUEGILL TOXICITY INDEX

The bluegill toxicity index (24) was calculated from the results of chemical analyses for various toxic components of the water from which the fish were collected. A component toxicity, expressed in bluegill toxic units (BGTU's) was calculated for each toxicant by dividing the environmental concentration of the toxicant by its 96 hour LC50 (lethal concentration for 50 percent of the individual fish within 96 hours) to bluegill. The component toxicities were then summed to yield the toxicity index (also in BGTU's). A sample of lake water with a toxicity of 1.0 BGTU, for example, would be lethal by definition to 50 percent of the bluegills exposed to it for 96 hours (41).

RESULTS

Bacteria

Geometric means of the bacterial constituents monitored during 1984 in Lake Michigan are shown in Table 2. The complete data from which Table 2 was derived are contained in Appendix AI. (Sampling locations are shown in Figure 1.) Samples were analyzed for total coliform, fecal coliform, fecal streptococci, standard plate count, Pseudomonas aeruginosa, and Salmonella species. The sampling stations included six within Cook County (Stations 1-A through 6-A) and one south of Cook County (Station 7-A).

Algae

A summary of the algae analyses is presented in Table 3. Sample locations are keyed to Figure 1. The column or vertical plankton net tow plankton densities ranged from approximately 542 to 2,081 organisms per mL with 54 to 63 species. The periphyton population densities ranged from 142,040 to 328,932 organisms per cm² with 59 to 126 species. Kemmerer plankton (discrete water samples collected with a Kemmerer bottle) ranged at one meter depth from 4,478 to 5,150 organisms per mL with 150 to 173 species, at three meter depth from 4,122 to 5,105 organisms per mL with 134 to 160 species, at five meter depth from 4,657 to 5,950 organisms per mL with 99 to 163 species, and at the bottom meter from 4,500 to 6,900 organisms per mL with 95 to 159 species. Summarizing the Kemmerer plankton through all

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 2

BACTERIAL COUNTS FOR LAKE MICHIGAN SHORELINE STATIONS¹

Station Location ²	TC ³	FC	FS	SPC	PA	Salmonella
1-A Lake-Cook Road	4 ⁴	2	13	75	1	<0.15
2-A Wilmette Harbor	2	1	6	57	2	<0.15
3-A Montrose Harbor	4	1	9	98	1	<0.15
4-A Chicago Harbor	13	3	13	140	2	<0.15
5-A Jackson Park Harbor	2	1	30	69	1	<0.15
6-A Calumet Harbor	6	2	250	170	2	<0.15
7-A Indiana Harbor Lighthouse	1,000	55	7	66,000	5	<0.15

¹All counts per 100 mL except SPC which is in counts per mL.

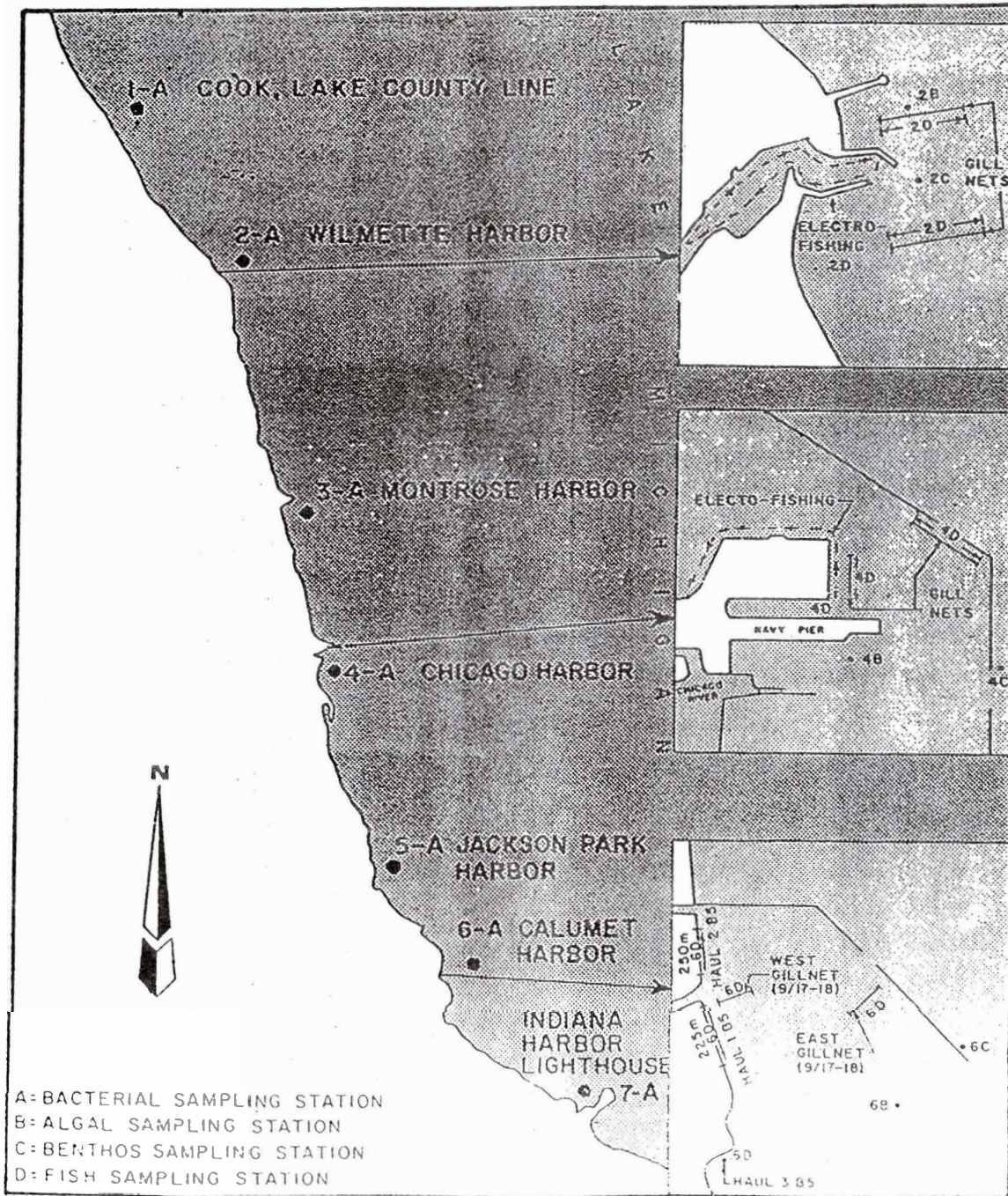
²Figure 1

³TC = total coliform, FC = fecal coliform, FS = fecal streptococcus, SPC = standard plate count, PA = Pseudomonas aeruginosa.

⁴Values shown are the geometric mean of results of analyses of four samples taken April, June, August, and October, 1984. FS are the result of one sampling run in October, 1984.

FIGURE 1

INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN SHOWING BACTERIAL, ALGAL, BENTHOS, AND FISH SAMPLING LOCATIONS DURING 1984



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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituent or Calculated Parameter	*Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
Column Plankton-Net Tow			
Population Density (organisms/mL)	542	588	2,081
Numbers of Species	60	54	63
Periphyton			
Population Density (organisms/cm ²)	142,040	328,932	225,363
Species Diversity	1.06	1.15	1.13
Numbers of Species	59	114	126
Organic Matter (µg/cm ²)	24.0	58.4	53.4
Chlorophyll a (µg/cm ²)	0.02	0.15	0.14
Kemmerer Plankton - 1 Meter			
Population Density (organisms/mL)	4,675	4,478	5,150
Species Diversity	1.18	1.33	1.29
Numbers of Species	150	173	173
Organic Matter (µg/mL)	49	47	52
Chlorophyll a (µg/mL)	3.7	4.0	4.5

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3 (Continued)

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituent or Calculated Parameter	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
Kemmerer Plankton - 3 Meters			
Population Density (organisms/mL)	4,122	4,814	5,105
Species Diversity	1.16	1.28	1.32
Numbers of Species	160	151	134
Organic Matter ($\mu\text{g/mL}$)	48	46	62
Chlorophyll a ($\mu\text{g/mL}$)	3.6	4.3	4.2
Kemmerer Plankton - 5 Meters			
Population Density (organisms/mL)	4,657	4,692	5,950
Species Diversity	1.12	1.27	1.31
Numbers of Species	99	163	131
Organic Matter ($\mu\text{g/mL}$)	56	47	54
Chlorophyll a ($\mu\text{g/mL}$)	3.1	4.4	4.6
Kemmerer Plankton - Bottom			
Population Density (organisms/mL)	5,892	4,527	6,885
Species Diversity	1.19	1.30	1.35
Numbers of Species	95	159	144
Organic Matter ($\mu\text{g/mL}$)	58	47	52
Chlorophyll a ($\mu\text{g/mL}$)	3.2	4.9	5.6

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 3 (Continued)

SUMMARY OF ALGAL DATA COLLECTED FROM THE INSHORE AREAS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituent or Calculated Parameter	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
Site Average			
Kemmerer Plankton			
Population Density (organisms/mL)	4,528	4,637	5,272
Species Diversity	1.19	1.30	1.35
Numbers of Species	208	256	240
Organic Matter ($\mu\text{g/mL}$)	53	47	55
Chlorophyll a ($\mu\text{g/mL}$)	3.4	4.4	4.7
<u>Southwestern Lake Michigan 1984 Average</u>			
Kemmerer Plankton - Overall			
Population Density (organisms/mL)		4,812	
Species Diversity		1.29	
Numbers of Species		350	
Organic Matter ($\mu\text{g/mL}$)		52	
Chlorophyll a ($\mu\text{g/mL}$)		4.2	

*Figure 1 shows location of sampling stations.

depths at each site, the population densities ranged from 4,528 to 5,272 organisms per mL with 208 to 256 species. By combining stations an average Kemmerer plankton population density of 4,811 organisms per mL with a total of 350 species was calculated.

Table 4 shows that eight periphytic organisms were present in more than 90 percent of the samples collected. One of the eight persistent periphytic organisms (Fragilaria crotonensis) was listed by Palmer (42, 43) as a pollutant-tolerant species. Table 5 shows that 16 persistent plankton species were present in the southwestern Lake Michigan harbor area of which three, Fragilaria crotonensis, Melosira granulata, and Nitzschia fonticola, were listed by Palmer as pollutant-tolerant species. Table 6 shows that 50 dominant periphyton were found in Lake Michigan during 1984; 14 of these organisms were listed by Palmer as pollutant-tolerant. Table 7 lists 67 dominant plankton found in Lake Michigan during 1984 with 13 of these organisms listed by Palmer as being pollutant-tolerant.

A summary of the results of the water chemistry analyses is presented in Table 8. The number of observations, mean, and sample standard deviation are given for each of the constituents analyzed.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 4

PERSISTENT PERIPHYTON ORGANISMS (PRESENT IN ≥90 PERCENT OF SAMPLES) COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Persistent Organisms*	Wilmette Harbor Station 2-B	Chicago Harbor Station 4-B	Calumet Harbor Station 6-B
<u>Achnanthes affinis</u>	X		
<u>Asterionella formosa</u>		X	
<u>Cyclotella kuetzingiana</u>	X		
<u>Fragilaria bicapitata</u>	X		
<u>Fragilaria crotonensis**</u>	X		
<u>Fragilaria intermedia</u>	X	X	X
<u>Gomphonema olivaceum</u>	X	X	
<u>Tabellaria fenestrata</u>	X	X	X

*Organisms present in ≥90 percent of the samples collected. Three samples were collected at Wilmette, nine samples at Chicago, and eleven samples at Calumet, (Stations 2-B, 4-B, and 6-B, respectively).

**Pollutant-tolerant (43).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 5

PERSISTENT PLANKTONIC ORGANISMS (PRESENT IN ≥90 PERCENT OF SAMPLES) FROM THE AVERAGED DISCRETE SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Persistent Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Amphora delicatissima</u>		X	X
<u>Asterionella formosa</u>		X	X
<u>Cyclotella kuetzingiana</u>	X	X	X
<u>Cyclotella ocellata</u>	X		
<u>Fragilaria bicapitata</u>	X		
<u>Fragilaria crotonensis**</u>	X	X	X
<u>Fragilaria intermedia</u>	X	X	X
<u>Fragilaria pinnata</u>		X	
<u>Melosira granulata**</u>		X	X
<u>Nitzschia fonticola**</u>			X
<u>Stephanodiscus astraera</u>	X	X	X
<u>Tabellaria fenestrata</u>	X	X	X
<u>Tabellaria flocculosa</u>		X	
<u>Ankistrodesmus convolutus</u>	X		
<u>Dinobryon sertularia</u>	X	X	
<u>Oscillatoria limnetica</u>			X

*Station locations shown in Figure 1

**Pollutant-tolerant (43).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 6

DOMINANT PERIPHYTIC ORGANISMS (≥1 PERCENT OF THE TOTAL PERIPHYTON POPULATION) FROM SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Achnanthes affinis</u>	X	X	X
<u>Achnanthes grimmei</u>		X	
<u>Asterionella formosa</u>	X	X	X
<u>Cocconeis pediculus</u> **			X
<u>Cocconeis placentula</u>		X	X
<u>Cyclotella kuetzingiana</u>	X	X	X
<u>Cyclotella pseudostelligera</u>	X		
<u>Cymbella microcephala</u>			X
<u>Cymbella prostrata</u>	X	X	X
<u>Diatoma elongatum</u>	X	X	X
<u>Diatoma elongatum</u> var. minor	X	X	X
<u>Diatoma tenue</u> var. elongatum		X	
<u>Diatoma vulgare</u> *		X	
<u>Diatoma vulgare</u> var. producta		X	X
<u>Fragilaria bicapitata</u>	X	X	
<u>Fragilaria construens</u>		X	
<u>Fragilaria construens</u> var. venter			X
<u>Fragilaria crotonensis</u> **	X	X	X
<u>Fragilaria intermedia</u>	X	X	X
<u>Gomphonema abbreviatum</u>		X	
<u>Gomphonema olivaceum</u>		X	X
<u>Gomphonema olivaceum</u> var. calcarea			X
<u>Melosira granulata</u> **	X	X	X
<u>Navicula cryptocephala</u> **	X	X	
<u>Navicula cryptocephala</u> var. veneta	X		
<u>Nitzschia dissipata</u> **	X	X	X

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 6 (Continued)

DOMINANT PERIPHYTIC ORGANISMS (≥ 1 PERCENT OF THE TOTAL PERIPHYTON POPULATION) FROM SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Nitzschia fonticola</u> **	X	X	X
<u>Nitzschia frustulum</u>		X	X
<u>Nitzschia gracilis</u> **		X	
<u>Nitzschia palea</u> *	X		
<u>Stephanodiscus astraea</u> var. intermedia		X	X
<u>Stephanodiscus hantzschii</u> **		X	X
<u>Stephanodiscus minutus</u>	X		
<u>Synedra acus</u> **	X	X	X
<u>Synedra nana</u>		X	X
<u>Synedra tenera</u>			X
<u>Synedra ulna</u> var. chaseana**			X
<u>Tabellaria fenestrata</u>	X	X	X
<u>Bulbochaete</u> sp.			X
<u>Cladophora</u> sp.		X	X
<u>Mougeotia</u> sp.			X
<u>Scenedesmus quadricauda</u> **			X
<u>Anabaena flos-aquae</u>			X
<u>Anabaena wisconsinense</u>		X	X
<u>Chroococcus dispersus</u>			X
<u>Chroococcus limneticus</u>			X
<u>Lyngbia limnetica</u>		X	
<u>Oscillatoria limnetica</u>		X	X
<u>Trachilomonas volvocina</u>			X

*Station locations shown in Figure 1.

**Pollutant-tolerant (43)

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7

DOMINANT PLANKTONIC ORGANISMS (≥ 1 PERCENT OF THE TOTAL PLANKTON POPULATION) AVERAGED DISCRETE SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Achnanthes affinis</u>	X	X	X
<u>Amphora delicatissima</u>	X		
<u>Asterionella formosa</u>	X	X	X
<u>Cyclotella glomerata</u>		X	X
<u>Cyclotella kuetzingiana</u>	X	X	X
<u>Cyclotella ocellata</u>	X	X	
<u>Cyclotella pseudostelligera</u>	X	X	
<u>Cyclotella quadrijuncta</u>	X	X	
<u>Diatoma elongatum</u>		X	X
<u>Diatoma elongatum</u> var. minor	X		
<u>Fragilaria bicapitata</u>	X	X	X
<u>Fragilaria capucina</u> **		X	X
<u>Fragilaria construens</u>	X	X	X
<u>Fragilaria construens</u> var. subsalina			X
<u>Fragilaria crotonensis</u> **	X	X	X
<u>Fragilaria harrissonii</u> var. dubia			X
<u>Fragilaria intermedia</u>	X	X	X
<u>Fragilaria pinnata</u>	X	X	X
<u>Melosira granulata</u> **	X	X	X
<u>Melosira islandica</u>	X	X	X
<u>Navicula cryptocephala</u> **		X	
<u>Navicula cryptocephala</u> var. veneta	X	X	
<u>Navicula exigua</u>	X		
<u>Nitzschia acicularis</u>	X	X	
<u>Nitzschia fonticola</u> **	X	X	X
<u>Nitzschia frustulum</u>	X		X

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7 (Continued)

DOMINANT PLANKTONIC ORGANISMS (≥1 PERCENT OF THE TOTAL PLANKTON POPULATION) AVERAGED DISCRETE SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Nitzschia gracilis</u> **	X	X	X
<u>Rhizosolenia longiseta</u>			X
<u>Stephanodiscus astra</u>	X	X	X
<u>Stephanodiscus astra</u> var. <u>intermedia</u>	X	X	
<u>Stephaondiscus hantzschii</u> **		X	X
<u>Stephanodiscus minutus</u>	X	X	X
<u>Synedra acus</u> **	X	X	X
<u>Synedra affinis</u> var. <u>fasciculata</u>		X	X
<u>Synedra gaillonii</u>	X	X	X
<u>Synedra ulna</u> var. <u>chaseana</u> **	X		
<u>Tabellaria fenestrata</u>	X	X	X
<u>Tabellaria flocculosa</u>	X	X	X
<u>Ankistrodesmus convolutus</u>	X		
<u>Chlamydomonas globosa</u>	X		
<u>Cladophora</u> sp. 1		X	
<u>Kirchneriella subsolitaria</u>	X		
<u>Mougeotia</u> sp.	X		
<u>Nephrocytium ecdysiscepanim</u>		X	
<u>Oocystis parva</u>	X	X	X
<u>Scenedesmus arcuatus</u> var. <u>platydisca</u>			X
<u>Scenedesmus bijuga</u> **		X	X
<u>Scenedesmus quadricauda</u> **		X	
<u>Stichococcus bacillaris</u>	X	X	X
<u>Ulothrix</u> sp.		X	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 7 (Continued)

DOMINANT PLANKTONIC ORGANISMS (≥ 1 PERCENT OF THE TOTAL PLANKTON POPULATION) AVERAGED DISCRETE SAMPLES COLLECTED FROM THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

Dominant Organisms	Wilmette Harbor Station 2-B*	Chicago Harbor Station 4-B*	Calumet Harbor Station 6-B*
<u>Dinobryon bavaricum</u>	X		X
<u>Dinobryon cylindricum</u>	X	X	X
<u>Dinobryon divergens</u>	X	X	X
<u>Dinobryon sertularia</u>	X	X	X
<u>Anabaena circinalis</u>	X	X	X
<u>Anabaena wisconsinense</u>			X
<u>Chroococcus dispersus</u> var. minor			X
<u>Chroococcus limneticus</u>	X	X	X
<u>Chroococcus minutus</u>			X
<u>Lyngbia limnetica</u>		X	X
<u>Oscillatoria agardhii</u>	X	X	X
<u>Oscillatoria limnetica</u>	X	X	X
<u>Oscillatoria lutea</u>	X		
<u>Oscillatoria minima</u>		X	
<u>Oscillatoria tenuis**</u>	X	X	X
<u>Cryptomonas erosa**</u>			X

*Station locations shown in Figure 1.

**Pollutant-tolerant (43).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Temperature	°C	8	14.1	5.1	9	13.3	6.4	10	13.4	6.2
Turbidity	NTU	9	8.0	10.3	9	4.7	4.1	10	3.5	3.1
Secchi Disk	meters	8	2.44	1.48	9	1.83	1.13	10	1.9	3.14
pH	STD Units	9	ND	ND	9	ND	ND	10	ND	ND
Alkalinity, Total	mg/L	9	116.7	7.0	9	114.7	7.0	10	126.9	32.5
Sulfate	mg/L	9	22.6	2.2	9	21.8	1.5	10	23	2.5
Fluoride	mg/L	9	0.16	0.02	9	0.16	0.02	10	0.17	0.03
Chloride	mg/L	9	10.7	2.8	9	10.0	2.3	10	11.5	3.1
Phosphorus, Total	mg/L	9	<0.1	0	9	<0.1	0	10	<0.1	0
Phosphorus, Dissolved	mg/L	8	<0.1	0	9	<0.1	0	10	<0.1	0
Silica, Total	mg/L	7	0.57	0.49	8	0.66	0.53	9	0.5	0.4
Calcium	mg/L	8	34.4	10.9	9	30.2	5.6	10	35.2	8.7
Magnesium	mg/L	8	12.1	1.5	9	10.8	0.6	10	11.5	1.1
Potassium	mg/L	8	1.54	0.47	9	1.18	0.32	10	1.59	0.42
Sodium	mg/L	8	7.5	3.4	9	6.9	2.1	10	8	2.4
Solids, Total	mg/L	9	190.6	23.6	9	184	11.2	10	178	32
Solids, Total Volatile	mg/L	9	59.7	15.9	9	56	18.4	10	55.4	15.3
Solids, Suspended	mg/L	9	16.1	19.1	9	6.4	4.2	10	5.3	4.0

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8 (Continued)

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Solids, Volatile Suspended	mg/L	4	5	3.5	3	2.7	1.7	3	1.7	0.5
Oxygen, Dissolved	mg/L	4	9.85	0.87	5	10.35	1.59	6	9.55	1.47
Oxygen Demand, Chemical	mg/L	9	9.7	4.5	9	10.2	5.3	10	7.9	3.5
Oxygen Demand, 5-Day Biochemical	mg/L	9	2.3	0.7	9	2.2	0.6	10	<2	0
Total Organic Carbon	mg/L	1	3.0	0	2	3.0	0	2	4.0	1.0
Nitrogen, Total Kjeldahl	mg/L	9	0.70	0.80	9	0.57	0.49	10	0.35	0.46
Nitrogen, Dissolved Total Kjeldahl	mg/L	8	0.54	0.72	9	0.41	0.52	10	0.32	0.28
Nitrogen, Ammonia	mg/L	9	0.59	0.59	9	<0.1	0	10	<0.1	0
Nitrogen, Nitrate	mg/L	9	0.27	0.12	9	0.24	0.08	10	0.24	0.10
Nitrogen Nitrite	mg/L	9	<0.1	0	9	<0.1	0	10	<0.1	0
Fats, Oils, and Greases	mg/L	9	1.2	0.4	9	1.1	0.3	10	1.3	0.6
Foaming Agents - MBAS	mg/L	8	0.008	0.007	9	0.009	0.007	9	0.007	0.004
Hardness as CaCO ₃	mg/L	7	131.6	13.0	9	123.9	12.8	8	135.6	14.1
by Titration										
Hardness as CaCO ₃ by Calculation	mg/L	8	137.0	32.4	7	129.8	15.3	10	137.1	22.6

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 8 (Continued)

SUMMARY OF WATER QUALITY CONSTITUENTS DETERMINED FROM THE INSHORE WATERS OF
SOUTHWESTERN LAKE MICHIGAN DURING 1984

Constituents	Units	Wilmette Harbor Station 2-B			Chicago Harbor Station 4-B			Calumet Harbor Station 6-B		
		n	Mean	SD	n	Mean	SD	n	Mean	SD
Aluminum	mg/L	8	<1	0	9	<1	0	10	<1	0
Arsenic	mg/L	8	<0.2	0	9	<0.2	0	10	<0.2	0
Barium	mg/L	8	<0.2	0	9	<0.2	0	10	<0.2	0
Cadmium	mg/L	8	<0.02	0	9	<0.02	0	10	<0.02	0
Chromium	mg/L	8	<0.02	0	9	<0.02	0	10	<0.02	0
Copper	mg/L	8	0.03	0.03	9	<0.02	0	10	0.02	0.01
Iron, Total	mg/L	8	0.29	0.15	9	0.21	0.03	10	0.23	0.06
Lead	mg/L	8	0.039	0.035	9	0.021	0.003	10	0.024	0.009
Manganese	mg/L	8	0.02	0.003	9	<0.02	0	10	<0.02	0.003
Mercury	µg/L	8	0.16	0.06	9	0.17	0.06	10	0.17	0.06
Nickel	mg/L	8	<0.2	0	9	<0.2	0	10	<0.2	0
Selenium	mg/L	8	<0.2	0	9	<0.2	0	10	<0.2	0
Zinc	mg/L	8	<0.2	0	9	<0.2	0	10	<0.2	0
Phenol and Like Substances, as Phenol	µg/L	9	1.9	2.2	9	1	0	10	<1	0
Silver	mg/L	8	<0.02	0	9	<0.02	0	10	<0.02	0
Cyanides, Total	µg/L	6	1	1	6	1	1	6	1	1
Conductivity	µmhos/cm	9	262.7	5.4	9	265.9	5.9	10	269.3	7.7

n = Number of Observations.

SD = Standard Deviation.

ND = Not Determined.

Benthic Invertebrates

Sixty-nine benthic invertebrate taxa were identified from the inshore area of southwestern Lake Michigan with an overall estimated mean density of 2,380 organisms/m². There were 16 species of chironomids, 14 naidids, and 10 tubificids. The estimated mean abundance of the benthic invertebrates collected at Stations 2-C, 4-C, and 6-C during the spring, summer, and fall are presented in Tables 9 to 11. Overall, tubificids, chironomids, naidids, orthocladines, and amphipods accounted for 44.9, 31.8, 14.5, 3.5, and 1.6%, respectively, of the total (Figure 2). Eighty-one percent of the tubificids were unidentifiable immature worms. The dominant taxa shifted throughout the year, and seasonally dominant organisms included the chironomids (C. fluviatilis-gr., Cyphomella sp., and P. scalaenum), the naidids (P. michiganensis, and V. intermedia), and the tubificid (P. vej dovskyi).

STATION 2-C NEAR WILMETTE HARBOR

A total of 41 benthic taxa, most of which were identified to species, were collected from Station 2-C near Wilmette Harbor (Table 9). There were 10 species of chironomids, six tubificids, five naidids, and three amphipods. The highest number of taxa (33) was collected during the summer (Figure 3). The estimated means for the spring, summer, and fall sampling periods were 519, 689, and 2,762, organisms/m², respectively,

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 9

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
Coelenterata			
<u>Hydra</u> sp.	19		
Annelida			
Naididae			
<u>Nais variabilis</u>		2	
<u>Piguetiella michiganensis</u>	38	6	323
<u>Specaria josinae</u>		4	
<u>Vejdovskyella intermedia</u>	19	14	19
<u>Uncinaiis uncinata</u>		83	
Tubificidae			
<u>Isochaetides freyi</u>		2	
<u>Limnodrilus cervix</u>	19		
<u>Limnodrilus hoffmeisteri</u>	19	14	
<u>Limnodrilus udekemianus</u>		1	
<u>Potamothrix moldaviensis</u>	2	2	
<u>Potamothrix vejdoskyi</u>	19	1	19
Undetermined immatures			
with capilliforms		4	38
without capilliforms	76	69	38
Hirudinea			
<u>Glossiphonia complanata</u>		13	
Arthropoda			
Crustacea			
Isopoda			
<u>Asellus</u> sp.		6	
Amphipoda			
<u>Gammarus pseudolimnaeus</u>		29	
<u>Hyaella azteca</u>		19	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 9 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT
WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF
SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER
OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
<u>Pontoporeia hoyi</u>	6	13	19
Insecta			
Tricoptera			
<u>Hydroptila</u> sp.		6	
Leptoceridae	6		
Diptera			
Tanypodinae			
<u>Procladius</u> sp.		1	
Diamesinae			
<u>Potthastia</u> cf.		7	
<u>longimanus</u>			
Prodiamesinae			
<u>Monodiamesa depectinata</u>		1	
<u>Monodiamesa</u> cf.		14	10
<u>tuberculata</u>			
Orthocladinae			
<u>Heterotrissocladus</u> cf.		1	
<u>changi</u>			
<u>Orthocladus</u> sp.		1	
<u>Parakiefferiella</u> sp.	63		10
Chironominae			
Chironomini			
<u>Chironomus</u>	32	24	38
<u>fluviatilis</u> gr.			
<u>Cryptochironomus</u>		20	19
<u>digitatus</u>			
<u>Cryptochironomus</u> cf.		3	95
<u>fulvus</u>			
g. nr. <u>Cyphomella</u>		24	2,014
<u>Demicyptochironomus</u>	13		
sp.			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 9 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT WILMETTE HARBOR (STATION 2-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
	----Number of Organisms/m ² ----		
<u>Paracladopelma</u>	44	1	57
<u>camptolabis-gr.</u>			
<u>Paracladopelma nereis</u>		1	
<u>Polypedilium</u> cf.	6	243	57
<u>scalaenum</u>			
<u>Polypedilium</u> cf.	127		
<u>tuberculum</u>			
Tanytarsini			
<u>Tanytarsus</u> sp.		2	
Mollusca			
Gastropoda			
<u>Goniobasis livescens</u>		19	
<u>Pysella</u> sp.		26	
Pelecypoda			
<u>Musculium transversum</u>		13	
<u>Pisidium amnicum</u>	13		
<u>Pisidium</u> sp.			6
Total Density	521	689	2,762
Number of Taxa**	16	33	13

*Three bottom samples were collected during each season.

**Undetermined immatures are not included in the number of taxa.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 10

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
Coelenterata			
<u>Hydra</u> sp.	19	19	
Annelida			
Enchytraeidae	19		6
Lumbriculidae			
<u>Stylodrilus heringianus</u>	19	19	
Naididae			
<u>Amphicaeta leydigi</u>	19	19	
<u>Chaetogaster diaphanus</u>		19	
<u>Chaetogaster diastrophus</u>		19	
<u>Nais variabilis</u>		19	
<u>Piguetiella michiganensis</u>	19	76	399
<u>Pristina foreli</u>		76	6
<u>Stylaria lacustris</u>		152	
<u>Vejdovskyaella intermedia</u>	247	152	38
<u>Uncinaiis uncinata</u>		228	6
Tubificidae			
<u>Aulodrilus americanus</u>		19	11
<u>Aulodrilus pigueti</u>			6
<u>Limnodrilus cervix</u>		19	
<u>Limnodrilus hoffmeisteri</u>	133	19	
<u>Potamothrix moldaviensis</u>	133	76	19
<u>Potamothrix vejdoskyi</u>	684	456	38
<u>Tubifex superiorenis</u>	19		
Undetermined immatures			
with capilliforms	703	1,539	57
without capilliforms	1,102	3,135	285

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 10 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
Arthropoda			
Crustacea			
Amphipoda			
<u>Gammarus</u>	19	19	171
<u>pseudolimnaeus</u>			
<u>Pontoporeia hoyi</u>		19	6
Insecta			
Diptera			
Tanypodinae			
<u>Procladius</u> sp.	6	95	
Diamesinae			
<u>Potthastia</u> cf.	6	95	13
<u>longimanus</u>			
Prodiamesinae			
<u>Monodiamesa</u> cf.	6	38	6
<u>tuberculata</u>			
Orthocladinae			
<u>Heterotrissocladus</u>		38	13
cf. <u>changi</u>			
<u>Parakiefferiella</u> sp.	146	57	70
<u>Psectrocladius</u> sp.		10	
Chironominae			
Chironomini			
<u>Chironomus</u>		76	
<u>anthracinus</u> -gr.			
<u>Chironomus</u>		380	209
<u>fluviatilis</u> -gr.			
<u>Cryptochironomus</u>		57	32
<u>digitatus</u>			
<u>Cryptochironomus</u> cf.	38	82	
<u>fulvus</u>			
g. nr. <u>Cyphomella</u>			13

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 10 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
<u>Demicryptochironomus</u> sp.	32	95	44
<u>Dicrotendipes</u> sp.		38	
<u>Paracladopelma camptolabis</u> -gr.	44	57	114
<u>Paracladopelma nereis</u>		19	
<u>Paracladopelma undine</u>		57	
<u>Paracladopelma winnelli</u>	6	10	
<u>Polypedilium</u> cf. <u>scalaenum</u>	101	57	931
<u>Polypedilium tuberculum</u>	51		25
<u>Pseudochironomus</u> sp.	6		19
Tanytarsini			
<u>Cladotanytarsus</u> sp.			6
<u>Micropecta</u> sp.		19	19
<u>Tanytarsus</u> sp.		38	
Mollusca			
Gastropoda			
<u>Amnicola limosa</u>			19
Pelecypoda			
<u>Musculium lacustre</u> f. <u>jayease</u>	6	6	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 10 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CHICAGO HARBOR (STATION 4-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
	-----Number of Organisms/m ² -----		
<u>Pisidium casartanum</u>			6
<u>Pisidium</u> sp.		38	25
<u>Sphaerium simile</u>			6
Total Density	3,545	7,417	2,700
Number of Taxa**	22	39	30

*Three bottom samples were collected during each season.

**Undetermined immatures are not included in the number of taxa.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 11

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
-----Number of Organisms/m ² -----			
Coelenterata			
<u>Hydra</u> sp.	6		19
Annelida			
Enchytraeidae		25	6
Naididae			
<u>Amphicaeta leydigi</u>	19		
<u>Arcteonais lomondi</u>		6	
<u>Chaetogaster cristallinus</u>		32	
<u>Chaetogaster diaphanus</u>		6	
<u>Chaetogaster diastrophus</u>		13	
<u>Dero</u> sp.			19
<u>Nais communis</u>			13
<u>Nais variabilis</u>		32	38
<u>Piguetiella michiganensis</u>	38	201	101
<u>Pristina foreli</u>			139
<u>Stylaria lacustris</u>		177	
<u>Vejdovskyella intermedia</u>	57	120	51
<u>Uncinaiis uncinata</u>		44	
Tubificidae			
<u>Aulodrilus pigueti</u>	19		
<u>Limnodrilus udekemianus</u>		6	
<u>Quistadrilus multisetosus</u>		6	
<u>Potamothrrix moldaviensis</u>			6
<u>Potamothrrix vej dovskyi</u>			38
Undetermined immatures			
with capilliforms	19	32	146
without capilliforms	38	13	519

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 11 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
Arthropoda			
Crustacea			
Amphipoda			
<u>Gammarus pseudolimnaeus</u>		6	6
<u>Pontoporeia hoyi</u>		19	
Insecta			
Diptera			
Tanypodinae			
<u>Procladius</u> sp.		6	13
Diamesinae			
<u>Potthastia</u>		82	6
cf. <u>longimanus</u>			
Prodiamesinae			
<u>Monodiamesa</u>		6	
cf. <u>depectinata</u>			
<u>Monodiamesa</u>		19	
cf. <u>tuberculata</u>			
Orthocladinae			
Heterotrissocladus		38	6
cf. <u>changi</u>			
<u>Parakiefferiella</u> sp.	44	108	89
<u>Psectrocladius</u> sp.	6		
Chironominae			
Chironomini			
<u>Chironomus</u>	32	6	
<u>anthracinus</u> -gr.			
<u>Chironomus</u>	6	139	25
<u>fluviatilis</u> -gr.			
<u>Cryptochironomus</u>		6	
<u>digitatus</u>			
<u>Demicryptochironomus</u>		6	51
sp.			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 11 (Continued)

THE MEAN DENSITY* OF BENTHIC INVERTEBRATES COLLECTED AT CALUMET HARBOR (STATION 6-C) IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN DURING APRIL, AUGUST, AND OCTOBER OF 1984

Taxon	April	August	October
----Number of Organisms/m ² ----			
<u>Paracladopelma</u> <u>camptolabis-gr.</u>	6	13	152
<u>Paracladopelma</u> <u>nereis</u>	133		
<u>Paracladopelma</u> <u>undine</u>	101		
<u>Paracladopelma</u> <u>winnelli</u>	6		
<u>Polypedilium</u> cf. <u>scalaenum</u>	19	89	165
<u>Polypedilium</u> cf. <u>tuberculum</u>	120		82
<u>Pseudochironomus sp.</u>	6		76
Tanytarsini			
<u>Microspecta sp.</u>			51
<u>Tanytarsus sp.</u>		25	
Mollusca			
Gastropoda			
<u>Pleurocera acuta</u>			13
Total Density	397	1,553	1,836
Number of Taxa**	11	31	24

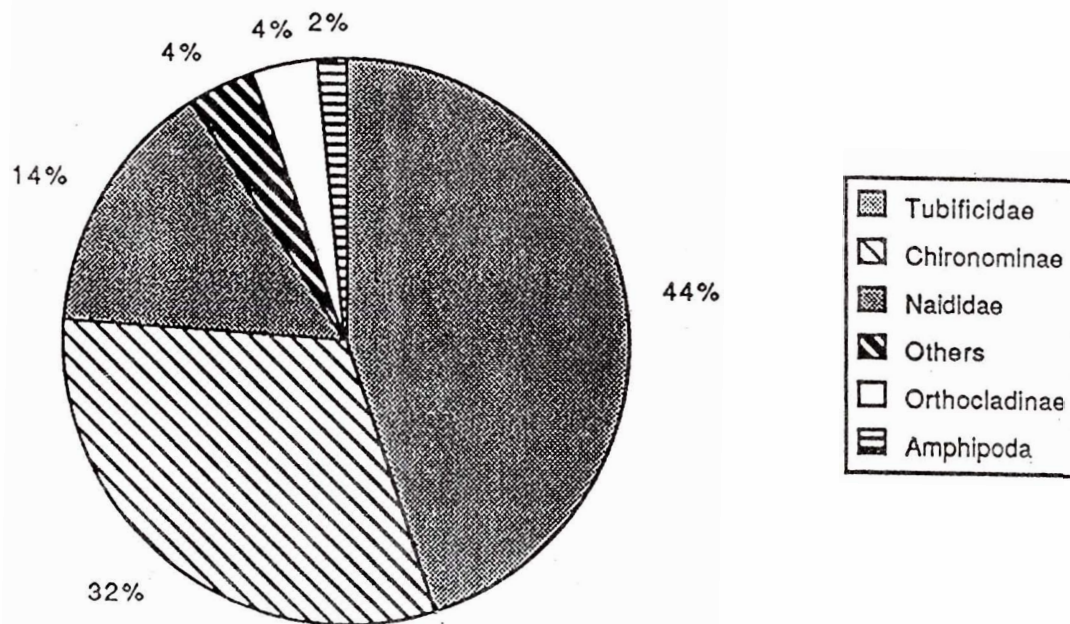
*Three bottom samples were collected during each season.

**Undetermined immatures are not included in the number of taxa.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 2

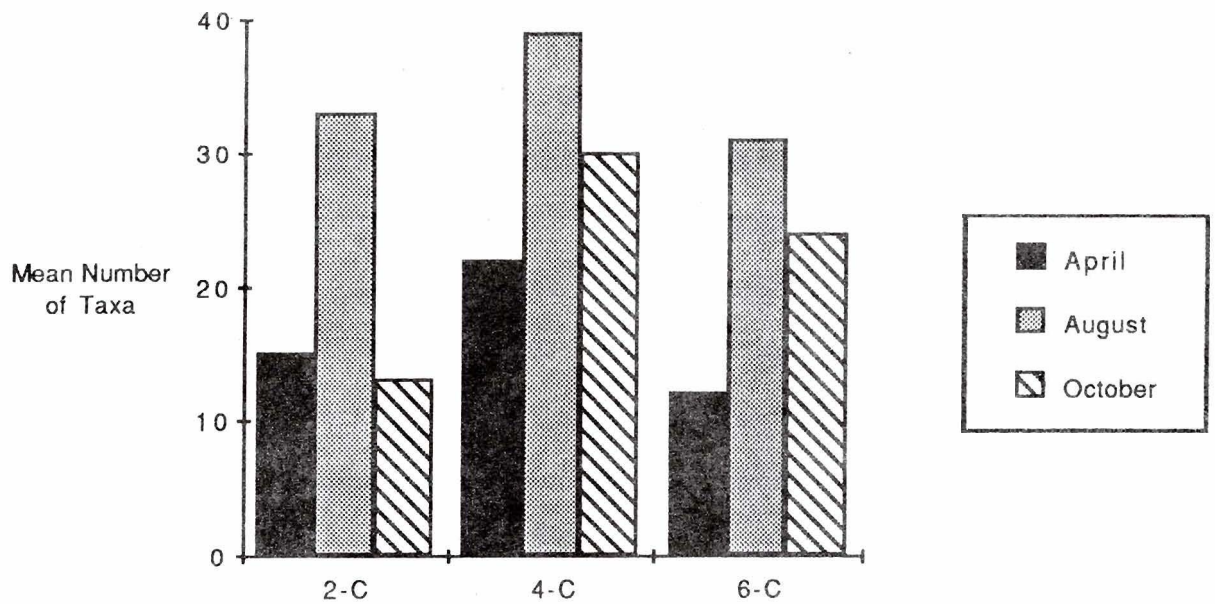
PERCENT COMPOSITION OF BENTHIC INVERTEBRATES FROM THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1984



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 3

MEAN NUMBER OF BENTHIC INVERTEBRATE TAXA FROM STATIONS 2-C,
4-C, AND 6-C IN THE INSHORE AREA OF SOUTHWESTERN LAKE
MICHIGAN, 1984



(Figure 4). The increase in the relative abundance during the fall was due to the high number (2,014/m²) of the chironomid, Cyphomella sp. Overall, chironomids, naidids, tubificids, amphipods, and orthocladines accounted for 71, 13, 8, 2, and 2%, respectively, of the total number of invertebrates (Figure 5). Numerically, the chironomids were the predominant benthic group during all three seasons (Figure 6). The most common invertebrates (total number collected during 1984) at Wilmette included the chironomid Cyphomella sp. (2,038/m²), the naidid worm, P. michiganensis (367/m²) and the chironomid, P. scalaenum (306/m²).

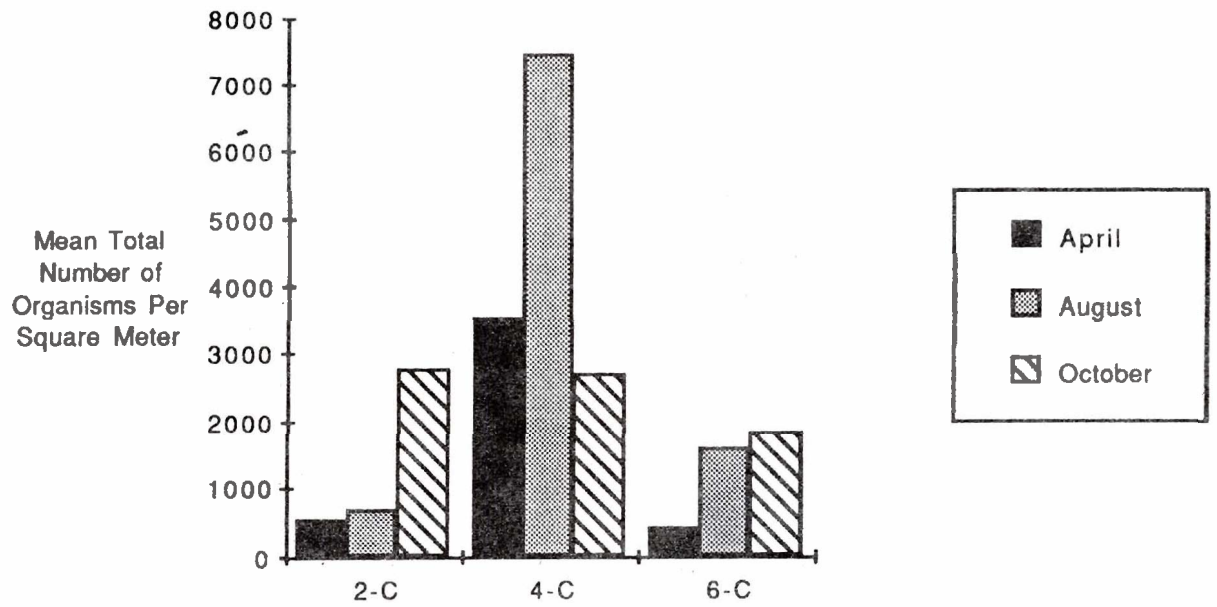
STATION 4-C NEAR CHICAGO HARBOR

Forty-nine taxa, most of which were identified to species, were collected from Station 4-C near Chicago Harbor (Table 10). These included 17 species of chironomids, nine naidids, and seven tubificids. The greatest number of taxa (39) was found during the summer (Figure 3). Estimated mean densities for the spring, summer, and fall were 3,545, 7,417, and 2,700 organisms/m², respectively, (Figure 4). The high number of undetermined immature tubificids (4,674/m²) collected during August accounted for the increased abundance of invertebrates during the summer. Overall, the benthos was dominated numerically by the tubificids (62%), chironomids (19%), and naidids (11%) (Figure 5). Tubificids predominated at all times during the year (Figure 6). The most abundant invertebrate taxa

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 4

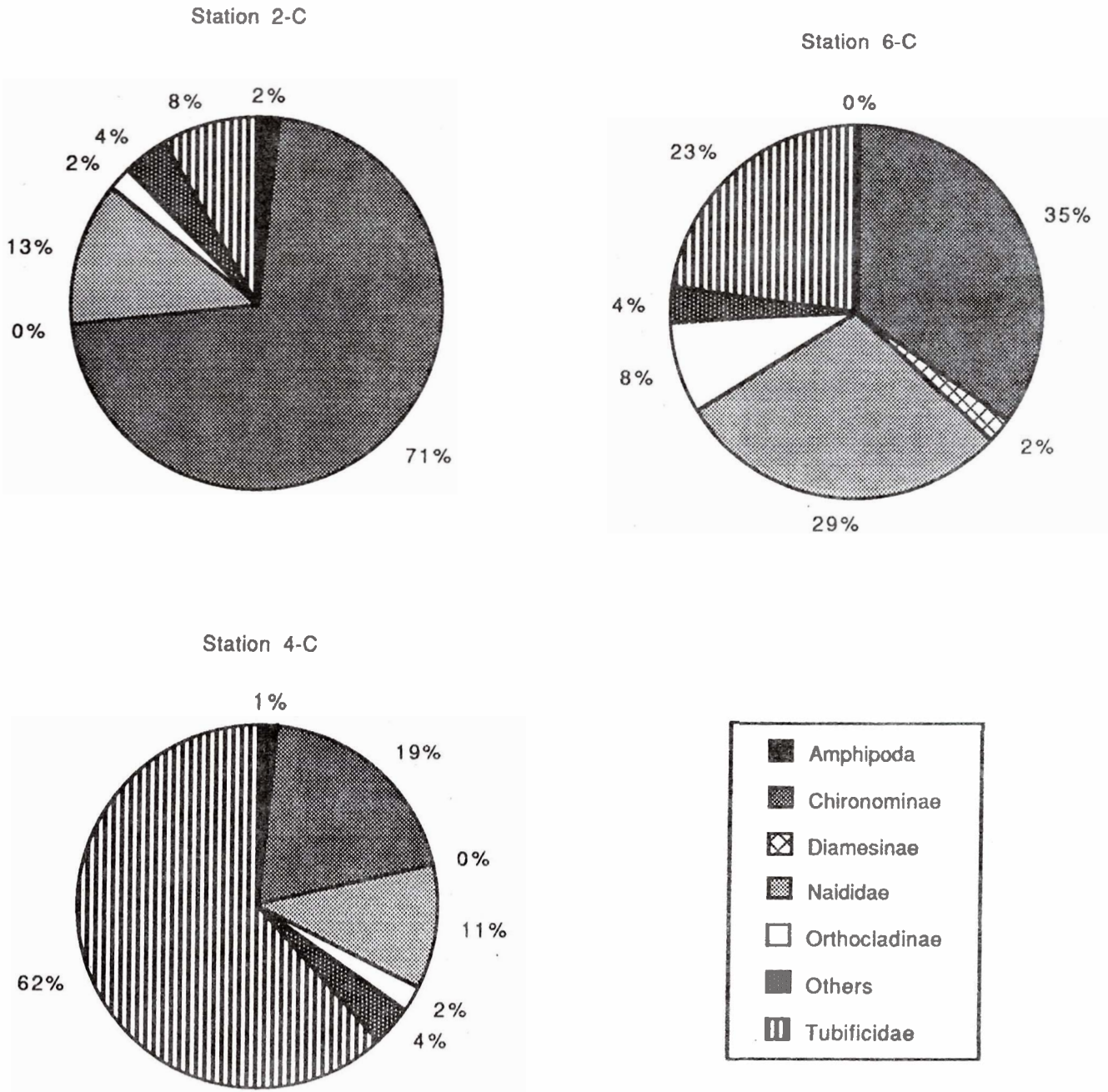
MEAN NUMBER OF BENTHIC INVERTEBRATES FROM STATIONS 2-C, 4-C,
AND 6-C IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN,
1984



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 5

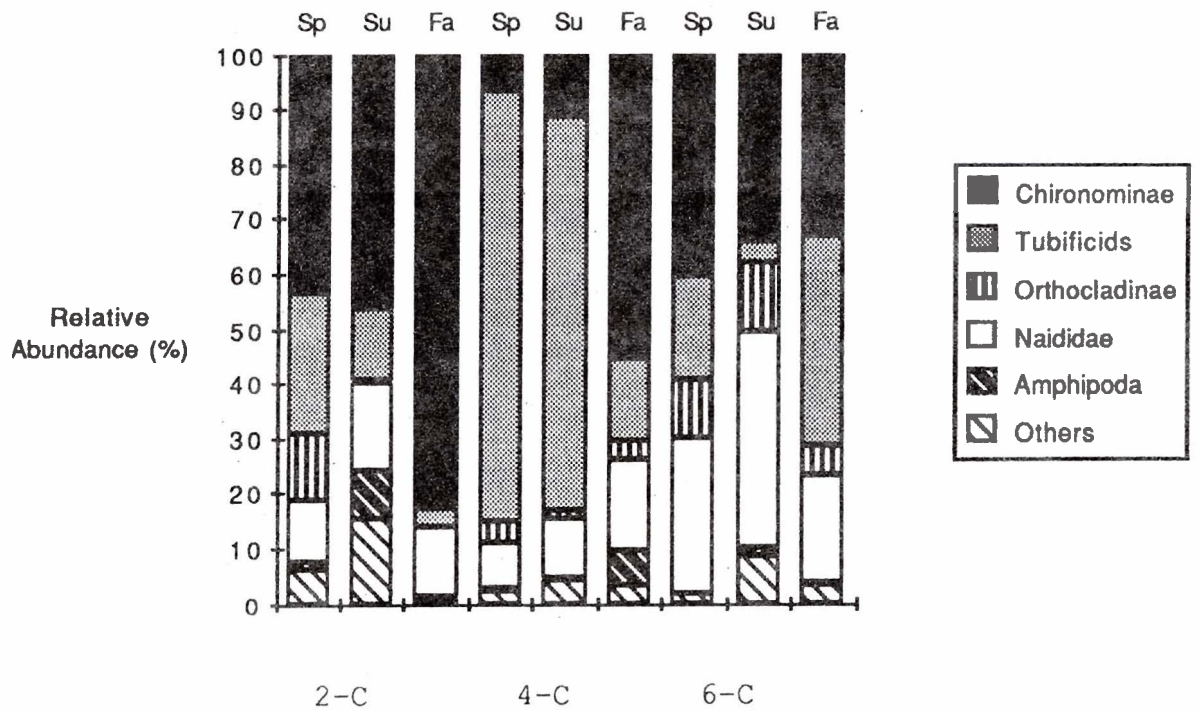
RANKED RELATIVE ABUNDANCE (PERCENT COMPOSITION)
OF BENTHIC INVERTEBRATES FROM STATIONS 2-C, 4-C, AND 6-C
IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1984



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 6

SEASONAL RELATIVE ABUNDANCE OF BENTHIC INVERTEBRATES FROM STATIONS 2-C, 4-C AND 6-C IN THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN, 1984 (SP=SPRING, SU=SUMMER, FA=FALL)



(total number collected during 1984) at Station 4-C were the undetermined immature tubificids (6,821/m²), followed by the tubificid *P. vejdovskyi* (1,178/m²), the chironomids *P. scalaenum* (1,089/m²) and *C. fluviatilis-gr* (589/m²), and the naidids *P. michiganensis* (494/m²) and *V. intermedia* (437/m²).

STATION 6-C NEAR CALUMET HARBOR

A total of 43 taxa, most of which were identified to species, was collected from Station 6-C near Calumet Harbor (Table 11). There were 13 species of chironomids, 13 naidids, and five tubificids. The number of taxa ranged from a low of 11 during the spring to a maximum of 31 in the summer (Figure 3). The mean estimated densities of invertebrates collected during the spring, summer, and fall were 397, 1,553, and 1,836 organisms/m², respectively (Figure 4). Overall, the major invertebrate groups which contributed more than 90% of the fauna during 1984 were the chironomids (35%), naidids (28%), tubificids (23%), and orthocladines (8%) (Figure 5). Especially noteworthy was the large number of naidids (631/m²) collected during the summer which accounted for 41% of the total benthic fauna (Figure 6). The predominant organisms (total number collected during 1984 at Station 6-C) were the undetermined immature tubificids (769/m²), the naidid, *P. michiganensis* (340/m²), and the midges, *P. scalaenum* (273/m²), *Parakiefferiella* sp. (241/m²), and *P. tuberculum* (202/m²).

Sediment Quality

The chemical characteristics and trace metal concentrations in sediments for Stations 2-C, 4-C, and 6-C are summarized in Tables 12 and 13, respectively.

STATION 2-C NEAR WILMETTE HARBOR

The percent total and volatile solids measured in the sediment at Station 2-C near Wilmette Harbor were 82.9 and 0.48%, respectively. The concentration of chemical oxygen demand (COD) in bottom sediment was 13,400 mg/kg. Fats, oils, and greases (FOG) measured 34 mg/kg in sediment (Table 12). Arsenic, cadmium, and nickel were all below the detection limit (Table 13). The concentrations of chromium, copper, iron, lead, manganese, mercury, silver, and zinc in sediments at Station 2-C were 6, 19, 4,440, 20, 194, 0.02, 3, and 50 mg/kg, respectively.

STATION 4-C NEAR CHICAGO HARBOR

At Station 4-C near Chicago Harbor, the percent total and volatile solids were 82.6 and 1.11%, respectively. The COD measured 8,200 mg/kg in bottom sediment. The concentration of FOG was 37 mg/kg (Table 12). Arsenic, cadmium, and nickel were all below the detection limit (Table 13). The concentrations of chromium, copper, iron, lead, manganese, mercury, silver, and zinc in sediment at Station 4-C were 7, 24, 7,450, 23, 214, 0.03, 3, and 80 mg/kg, respectively.

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TABLE 12

CHEMICAL CHARACTERISTICS OF BOTTOM SEDIMENTS IN
THE INSHORE AREA OF SOUTHWESTERN LAKE MICHIGAN
OCTOBER 1984

Station	Constituent			
	Total Solids (%)	Volatile Solids (%)	Chemical Oxygen Demand (mg/kg)	Fats, Oils, and Greases (mg/kg)
Wilmette Harbor 2-C	82.9	0.48	13,400	34
Chicago Harbor 4-C	82.6	1.11	8,200	37
Calumet Harbor 6-C	83.4	0.10	2,750	<5

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 13

TRACE METALS IN BOTTOM SEDIMENTS IN THE INSHORE AREA OF
SOUTHWESTERN LAKE MICHIGAN, OCTOBER 1984

Station	Metal*										
	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
Wilmette Harbor 2-C	<1.0	<0.02	6.0	19.0	4,440	20.0	194	0.02	<0.2	3.0	50
Chicago Harbor 4-C	<1.0	<0.02	7.0	24.0	7,450	23.0	214	0.03	<0.2	3.0	80
Calumet Harbor 6-C	<1.0	<0.02	6.0	26.0	13,400	19.0	440	0.01	20.0	3.0	60

*Expressed in mg/kg of dry sediment (parts per million dry basis).

STATION 6-C NEAR CALUMET HARBOR

The percent total and volatile solids in sediment of Station 6-C near Calumet Harbor were 83.4 and 0.1%, respectively. The COD concentration in bottom sediment at Station 6-C was 2,750 mg/kg. FOG measured in the sediment was <5 mg/kg (Table 12). Arsenic and cadmium were all below the detection limit of 1.0 and 0.02 mg/kg, respectively (Table 12). The concentrations of chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc in the sediment were 6, 26, 13,400, 19, 440, 0.01, 20, 3, and 60 mg/kg, respectively.

Fish

Fish species collected during September and October 1984 from Wilmette, Chicago and Calumet Harbors of Lake Michigan are listed in Table 14. A total of 11 fish species was collected from Wilmette Harbor, 12 fish species from Chicago Harbor, and 19 fish species from Calumet Harbor. A total of 25 fish species was collected from this shallow water portion of southwestern Lake Michigan (all three harbor collections combined).

Results for the number of fish collected in the experimental gill nets are listed in Table 15. The percent fish species composition for these gill net collections are listed in Table 16 for each harbor and for all three harbors combined. The yellow perch was by far the most numerous fish collected with the experimental gill nets in the open water of each harbor. In Wilmette Harbor, Station 2-D, 142 yellow perch were

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 14

FISH SPECIES COLLECTED FROM SOUTHWESTERN LAKE MICHIGAN (WILMETTE, CHICAGO,
AND CALUMET HARBORS) DURING SEPTEMBER AND OCTOBER, 1984

Common Name*	Scientific Name*	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D
Alewife	<u>Alosa pseudoharengus</u> (Wilson)	+	-	+
Gizzard shad	<u>Dorosoma cepedianum</u> (Lesueur)	+	+	+
Coho salmon	<u>Oncorhynchus kisutch</u> (Walbaum)	-	+	
Chinook salmon	<u>Oncorhynchus tshawytscha</u> (Walbaum)			
Rainbow trout	<u>Salmo gairdneri</u> (Richardson)	+	+	-
Brown trout	<u>Salmo trutta</u> (Linnaeus)	+	+	-
Lake trout	<u>Salvelinus namaycush</u> (Walbaum)	+	+	+
Rainbow smelt	<u>Osmerus mordax</u> (Mitchill)	+	+	+
Goldfish	<u>Carassius auratus</u> (Linnaeus)			+
Carp	<u>Cyprinus carpio</u> (Linnaeus)			+
Emerald shiner	<u>Notropis atherinoides</u> (Rafinesque)			+
Bigmouth shiner	<u>Notropis dorsalis</u> (Agassiz)			+
Spottail shiner	<u>Notropis hudsonius</u> (Clinton)	-	+	+
Bluntnose minnow	<u>Pimephales notatus</u> (Rafinesque)	+	+	+
Fathead minnow	<u>Pimephales promelas</u> (Rafinesque)			+
White sucker	<u>Catostomus commersoni</u> (Lacepede)			
Black bullhead	<u>Ictalurus melas</u> (Rafinesque)	+		+
Rock bass	<u>Ambloplites rupestris</u> (Rafinesque)	-	-	+

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 14 (Continued)

FISH SPECIES COLLECTED FROM SOUTHWESTERN LAKE MICHIGAN (WILMETTE, CHICAGO,
AND CALUMET HARBORS) DURING SEPTEMBER AND OCTOBER, 1984

Common Name*	Scientific Name*	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D
Green sunfish	<u>Lepomis cyanelus</u> (Rafinesque)	+	-	-
Pumpkinseed	<u>Lepomis gibbosus</u> (Linnaeus)	-	-	+
Smallmouth bass	<u>Micropterus dolomieu</u> (Lacepede)		+	-
Largemouth bass	<u>Micropterus salmoides</u> (Lacepede)		-	+
Johnny darter	<u>Etheostoma nigrum</u> (Rafinesque)	-	-	+
Yellow perch	<u>Perca flavescens</u> (Mitchill)	+	+	+
Mottled sculpin	<u>Cottus bairdi</u> (Girard)	+	-	+
Total Number of Species Identified		11	12	19

*Following the nomenclature of Bailey et al., 1970, (44).

+ = species present in catch.

- = Species absent from catch.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 15

NUMBER OF FISH COLLECTED WITH 500 FEET OF EXPERIMENTAL GILL
NETS IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	17	0	0	17
Gizzard shad	0	1	1	2
Rainbow trout	1	0	0	1
Brown trout	0	6	0	6
Lake trout	17	11	4	32
Coho salmon	0	1	0	1
Chinook salmon	0	0	1	1
Rainbow smelt	2	7	3	12
Goldfish	0	0	0	0
Carp	0	0	0	0
Emerald shiner	0	0	0	0
Bigmouth shiner	0	0	0	0
Spottail shiner	0	1	0	1
Bluntnose minnow	0	0	0	0
Fathead minnow	0	0	0	0
White sucker	0	0	2	2
Black bullhead	0	0	1	1
Rock bass	0	0	0	0

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 15 (Continued)

NUMBER OF FISH COLLECTED WITH 500 FEET OF EXPERIMENTAL GILL
NETS IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Green sunfish	0	0	0	0
Pumpkinseed	0	0	0	0
Smallmouth bass	0	0	0	0
Largemouth bass	0	0	0	0
Johnny darter	0	0	0	0
Yellow perch	142	29	78	249
Mottled sculpin	0	0	0	0
Total	179	56	90	325

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 16

PERCENT OF TOTAL GILL NET CATCH FOR FISH COLLECTED IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	9.50	0.00	0.00	5.23
Gizzard shad	0.00	1.79	1.11	0.62
Rainbow trout	0.56	0.00	0.00	0.31
Brown trout	0.00	10.71	0.00	1.85
Lake trout	9.50	19.64	4.44	9.85
Coho salmon	0.00	1.79	0.00	0.31
Chinook salmon	0.00	0.00	1.11	0.31
Rainbow smelt	1.12	12.50	3.33	3.69
Goldfish	0.00	0.00	0.00	0.00
Carp	0.00	0.00	0.00	0.00
Emerald shiner	0.00	0.00	0.00	0.00
Bigmouth shiner	0.00	0.00	0.00	0.00
Spottail shiner	0.00	1.79	0.00	0.31
Bluntnose minnow	0.00	0.00	0.00	0.00
Fathead minnow	0.00	0.00	0.00	0.00
White Sucker	0.00	0.00	2.22	0.62
Black bullhead	0.00	0.00	1.11	0.31
Rock bass	0.00	0.00	0.00	0.00
Green sunfish	0.00	0.00	0.00	0.00

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 16 (Continued)

PERCENT OF TOTAL GILL NET CATCH FOR FISH COLLECTED IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Pumpkinseed	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00
Largemouth bass	0.00	0.0	0.00	0.00
Johnny darter	0.00	0.00	0.00	0.00
Yellow perch	79.33	51.79	86.67	76.62
Mottled sculpin	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00

collected which was 79% of the total Wilmette Harbor gill net catch. In Chicago Harbor, Station 4-D, 29 yellow perch were collected which was 52% of the total Chicago Harbor gill net catch. In Calumet Harbor, Station 6-D, 78 yellow perch were collected which was 87% of the total Calumet Harbor gill net catch. Other species present in relatively large numbers (i.e., 5% or more of the gill net catch) were:

1. Wilmette Harbor (Station 2-D): Alewife and lake trout, each with 17 fish collected, 10% of the gill net catch.
2. Chicago Harbor (Station 4-D): Lake trout (11 trout collected, 20% of the catch), rainbow smelt (7 smelt collected, 13% of the catch), and brown trout (6 brown trout collected, 11% of the catch).
3. Calumet Harbor (Station 6-D): none of the six other species comprised more than 10% of the catch.

In terms of total numbers of fish from all three harbors, yellow perch was the most numerous fish species with 249 perch collected or 77% of the total southwestern Lake Michigan harbor gill net collection. Other fish species present in relatively large numbers in the total southwestern Lake Michigan harbor gill net collection were: Lake trout (32 collected, 10% of the catch) and alewife (17 collected, 5% of the catch).

Results for the number of fish collected by electrofishing are listed in Table 17. The percent (%) fish species composition for these electrofishing collections are listed in Table 18 for each harbor and for all three harbors combined

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 17

NUMBER OF FISH COLLECTED ELECTROFISHING IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	4	0	6	10
Gizzard shad	1	0	0	1
Rainbow trout	0	30	0	30
Brown trout	1	11	0	12
Lake trout	0	1	0	1
Coho salmon	0	0	0	0
Chinook salmon	0	1	0	1
Rainbow smelt	46	0	0	46
Goldfish	0	0	1	1
Carp	0	0	4	4
Emerald shiner	0	0	5	5
Bigmouth shiner	0	0	3	3
Spottail shiner	0	0	5	5
Bluntnose minnow	12	2	79	93
Fathead minnow	0	0	68	68
White sucker	0	1	0	1
Black bullhead	104	0	2	106
Rock bass	0	0	4	4

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 17 (Continued)

NUMBER OF FISH COLLECTED ELECTROFISHING IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Green sunfish	1	0	0	1
Pumpkinseed	0	0	03	3
Smallmouth bass	0	1	0	1
Largemouth bass	0	0	4	4
Johnny darter	0	0	3	3
Yellow perch	20	1	69	90
Mottled sculpin	1	0	1	2
Total	190	48	257	495

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 18

PERCENT OF TOTAL ELECTROFISHING CATCH FOR FISH COLLECTED
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	2.11	0.00	2.33	2.02
Gizzard shad	0.53	0.00	0.00	0.20
Rainbow trout	0.00	62.50	0.00	6.06
Brown trout	0.53	22.92	0.00	2.42
Lake trout	0.00	2.08	0.00	0.20
Coho salmon	0.00	0.00	0.00	0.00
Chinook salmon	0.00	2.08	0.00	0.20
Rainbow smelt	24.21	0.00	0.00	9.29
Goldfish	0.00	0.00	0.39	0.20
Carp	0.00	0.00	1.56	0.81
Emerald shiner	0.00	0.00	1.95	1.01
Bigmouth shiner	0.00	0.00	1.17	0.61
Spottail shiner	0.00	0.00	1.95	1.01
Bluntnose minnow	6.32	4.17	30.74	18.79
Fathead minnow	0.00	0.00	26.46	13.74
White sucker	0.00	2.08	0.00	0.20
Black bullhead	54.74	0.00	0.78	21.41

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 18 (Continued)

PERCENT OF TOTAL ELECTROFISHING CATCH FOR FISH COLLECTED
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Rock bass	0.00	0.00	1.56	0.81
Green sunfish	0.53	0.00	0.00	0.20
Pumpkinseed	0.00	0.00	1.17	0.61
Smallmouth bass	0.00	2.08	0.00	0.20
Largemouth bass	0.00	0.00	1.56	0.81
Johnny darter	0.00	0.00	1.17	0.61
Yellow perch	10.53	2.08	26.85	18.18
Mottled sculpin	0.53	0.00	0.39	0.40
Total	100.00	100.00	100.00	100.00

Those fish species collected by electrofishing in the greatest numbers were:

1. Wilmette Harbor (Station 2-D): In the Wilmette Harbor electrofisher catch, more black bullheads were collected (104 bullheads, 55% of the total catch) than any other species. Other species collected in relatively great numbers with the electrofisher in Wilmette Harbor were rainbow smelt (46 smelt, 24% of the total catch).
2. Chicago Harbor (Station 4-D): Rainbow trout (30 rainbow trout, 63% of the catch) and brown trout (11 brown trout, 23% of the catch) were collected in the greatest numbers in the Chicago Harbor electrofisher catch.
3. Calumet Harbor (Station 6-D): Bluntnose minnows, (79 bluntnose minnows, 31% of the catch) were collected in the greatest numbers in the Calumet Harbor electrofisher catch.

The electrofishing effort within each harbor area was quite different. The total electrofishing times were: 47 minutes in Wilmette Harbor, 90 minutes in Chicago Harbor, and 88 minutes in Calumet Harbor. In order to standardize reporting of these data, the results are reported as number of fish collected per 30 minutes electrofishing for each harbor, the average electrofishing catch among all harbors and the percent of total electrofishing catch for all three harbors. These results are listed in Table 19.

In terms of the combined harbor electrofishing collection, the black bullhead (22 black bullhead per 30 minutes electrofishing, 30% of the total electrofisher catch), the yellow perch and the bluntnose minnow (each with 132 fish per 30

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 19

NUMBER OF FISH COLLECTED PER 30 MINUTES ELECTROFISHING AND PERCENT OF
TOTAL CATCH FOR FISH COLLECTED FROM WILMETTE, CHICAGO, AND
CALUMET HARBORS DURING 1984

Fish Species	Wilmette	Chicago	Calumet	Average	All Stations Percent of Total Catch
	Harbor Station 2-D	Harbor Station 4-D	Harbor Station 6-D		
	Number of Fish per 30 Minutes				
Alewife	2.55	0.00	2.05	1.53	2.04
Gizzard shad	0.64	0.00	0.00	0.21	0.28
Rainbow trout	0.00	10.00	0.00	3.33	4.45
Brown trout	0.64	3.67	0.00	1.43	1.91
Lake trout	0.00	0.33	0.00	0.11	0.15
Coho salmon	0.00	0.00	0.00	0.00	0.00
Chinook salmon	0.00	0.33	0.00	0.11	0.15
Rainbow smelt	29.36	0.00	0.00	9.79	13.06
Goldfish	0.00	0.00	0.34	0.11	0.15
Carp	0.00	0.00	1.36	0.45	0.61
Emerald shiner	0.00	0.00	1.70	0.57	0.76
Bigmouth shiner	0.00	0.00	1.02	0.34	0.45
Spottail shiner	0.00	0.00	1.70	0.57	0.76
Bluntnose minnow	7.66	0.67	26.93	11.75	15.68
Fathead minnow	0.00	0.00	23.18	7.73	10.31

Table continued on following page.

METROPOLITAN WATER REACLAMATION DISTRICT OF GREATER CHICAGO

TABLE 19 (Continued)

NUMBER OF FISH COLLECTED PER 30 MINUTES ELECTROFISHING AND PERCENT OF
TOTAL CATCH FOR FISH COLLECTED FROM WILMETTTE, CHICAGO, AND
CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station -D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	Average	All Stations Percent of Total Catch
	Number of Fish per 30 Minutes				
White sucker	0.00	0.33	0.00	0.11	0.15
Black bullhead	66.38	0.00	0.68	22.35	29.82
Rock bass	0.00	0.00	1.36	0.45	0.61
Green sunfish	0.64	0.00	0.00	0.21	0.28
Pumpkinseed	0.00	0.00	1.02	0.34	0.45
Smallmouth bass	0.00	0.33	0.00	0.11	0.15
Largemouth bass	0.00	0.00	1.36	0.45	0.61
Johnny darter	0.00	0.00	1.02	0.34	0.45
Yellow perch	12.77	0.33	23.52	12.21	16.28
Mottled sculpin	0.64	0.00	0.34	0.33	0.44
Total	121.28	16.00	87.61	74.96	100.00

minutes electrofishing, 16% of the total electrofisher catch), rainbow smelt (10 rainbow smelt per 30 minutes electrofishing, 13% of the total electrofisher catch), and the fathead minnow (8 fathead minnow per 30 minutes, 10% of the total electrofisher catch) constituted the major species present in the electrofishing catch in terms of numbers.

Results for the weight (in grams) or biomass of the fish catch for the three harbors were treated in the same manner as were those for the numbers of fish collected listed above. Results for the weight of fish collected in the experimental gill nets are listed in Table 20. The percent composition of the total weight for these gill net collections are listed in Table 21 for each harbor, and for all three harbors combined.

The lake trout comprised the greatest weight of the gill net catch in all three harbors. They were 53,660 grams (118 pounds) or 76% of the gill net catch weight in Wilmette Harbor, 27,840 grams (61 pounds) or 79% of the gill net catch weight in Chicago Harbor, and 11,500 grams (25 pounds) or 50% of the gill net catch weight in Calumet Harbor.

The yellow perch made up the second greatest portion of weight of total gill net catch in each harbor. They were 14,835 grams (33 pounds) or 21% of the total gill net catch weight in Wilmette Harbor, 3,297 grams (7 pounds) or 9% of the total gill net catch weight in Chicago Harbor, and 6,267 grams (14 pounds) or 27% of the total gill net catch weight in Calumet Harbor.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 20

WEIGHT (GRAMS) OF FISH COLLECTED WITH 500 FEET OF EXPERIMENTAL GILL NETS
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	753.19	0	0	753.19
Gizzard shad	0	810.60	21.50	832.10
Rainbow trout	1,200.00	0	0	1,200.00
Brown trout	0	2,836.17	0	2,836.17
Lake trout	53,660.00	27,836.17	11,500.00	93,070.00
Coho salmon	0	296.33	0	296.33
Chinook salmon	0	0	4,300.00	4,300.00
Rainbow smelt	41.77	186.38	85.87	314.02
Goldfish	0	0	0	0
Carp	0	0	0	0
Emerald shiner	0	0	0	0
Bigmouth shiner	0	0	0	0
Spottail shiner	0	17.79	0	17.79
Bluntnose minnow	0	0	0	0
Fathead minnow	0	0	0	0
White sucker	0	0	823.84	823.84
Green sunfish	0	0	0	0

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 20 (Continued)

WEIGHT (GRAMS) OF FISH COLLECTED WITH 500 FEET OF EXPERIMENTAL GILL NETS
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Black bullhead	0	0	56.38	56.38
Rock bass	0	0	0	0
Pumpkinseed	0	0	0	0
Smallmouth bass	0	0	0	0
Largemouth bass	0	0	0	0
Johnny darter	0	0	0	0
Yellow perch	14,835.30	3,297.18	6,267.14	24,399.62
Mottled sculpin	0	0	0	0
Total	70,490.26	35,354.45	23,054.73	128,899.44

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 21

PERCENT OF WEIGHT OF TOTAL GILL NET CATCH FOR FISH COLLECTED IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	1.07	0.00	0.00	0.58
Gizzard shad	0.00	2.29	0.09	0.65
Rainbow trout	1.70	0.00	0.00	0.93
Brown trout	0.00	8.02	0.00	2.20
Lake trout	76.12	78.94	49.88	72.20
Coho salmon	0.00	0.84	0.00	0.23
Chinook salmon	0.00	0.00	18.65	3.34
Rainbow smelt	0.06	0.53	0.37	0.24
Goldfish	0.00	0.00	0.00	0.00
Carp	0.00	0.00	0.00	0.00
Emerald shiner	0.00	0.00	0.00	0.00
Bigmouth shiner	0.00	0.00	0.00	0.00
Spottail shiner	0.00	0.05	0.00	0.01
Bluntnose minnow	0.00	0.00	0.00	0.00
Fathead minnow	0.00	0.00	0.00	0.00
White sucker	0.00	0.00	3.57	0.64
Black bullhead	0.00	0.00	0.24	0.04
Rock bass	0.00	0.00	0.00	0.00
Green sunfish	0.00	0.00	0.00	0.00

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 21 (Continued)

PERCENT OF WEIGHT OF TOTAL GILL NET CATCH FOR FISH COLLECTED IN WILMETTE,
CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Pumpkinseed	0.00	0.00	0.00	0.00
Smallmouth bass	0.00	0.00	0.00	0.00
Largemouth bass	0.00	0.00	0.00	0.00
Johnny darter	0.00	0.00	0.00	0.00
Yellow perch	21.05	9.33	27.18	18.93
Mottled sculpin	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00

Of all the harbor gill net collections, only the brown trout (2,836 grams [6 pounds] or 8% of the total Chicago Harbor gill net catch) in Chicago Harbor made up more than 5% of the total weight of the gill net catch in a single harbor.

In terms of the total weight of fish from all three harbors, the lake trout (93,070 grams [205 pounds] or 72% of the total gill net catch) and the yellow perch (24,399 grams [54 pounds] or 19% of the total gill net catch) made up the greatest weight (117,469 grams [259 pounds] or 91% of the catch) of the total gill net catch from the three harbors in southwestern Lake Michigan.

Results for the weight of fish collected by electrofishing are listed in Table 22, and the percent composition of the total weight for these electrofishing collections are listed in Table 23 for the collection in each harbor and for all three harbor collections combined, respectively. Those species comprising a relatively large portion (more than 5%, by weight, of the total catch) of the electrofishing catch in the harbors were:

1. Wilmette Harbor (Station 2-D), each species total weight: Yellow perch (106.9 grams, 29% of the total catch weight), black bullhead (88.4 grams, 24% of the total catch weight), bluntnose minnow (76.6 grams, 20% of the total catch weight), gizzard shad (46 grams, 13% of the total catch weight).

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 22

WEIGHT (GRAMS) OF FISH COLLECTED ELECTROFISHING IN
WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	6.89	0	9.29	16.18
Gizzard shad	46.89	0	0	46.89
Rainbow trout	0	3,828.29	0	3,828.29
Brown trout	15.92	795.24	0	811.16
Lake trout	0	2,450.00	0	2,450.00
Coho salmon	0	0	0	0
Chinook salmon	0	4,640.00	0	4,640.00
Rainbow smelt	14.21	0	0	14.21
Goldfish	0	0	286.83	286.83
Emerald shiner	0	0	12.26	12.26
Bigmouth shiner	0	0	7.94	7.94
Spottail shiner	0	0	46.90	46.90
Bluntnose minnow	76.58	12.16	232.90	321.63
Fathead minnow	0	0	206.09	206.09
White sucker	0	546.90	0	546.90
Black bullhead	88.40	0	114.49	202.89
Rock bass	0	0	35.59	35.59
Green sunfish	10.41	0	0	10.41

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHIAGO

TABLE 22 (Continued)

WEIGHT (GRAMS) OF FISH COLLECTED ELECTROFISHING IN
WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Pumpkinseed	0	0	181.12	181.12
Smallmouth bass	0	139.59	0	139.59
Largemouth bass	0	0	41.23	41.23
Johnny darter	0	0	6.91	6.91
Yellow perch	106.90	2.70	649.84	759.44
Mottled sculpin	8.95	0	9.94	18.89
Total	375.15	12,414.87	7,475.62	20,265.64

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 23

PERCENT OF WEIGHT OF TOTAL ELECTROFISHING CATCH FOR FISH COLLECTED
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Alewife	1.84	0.00	0.12	0.08
Gizzard shad	12.50	0.00	0.00	0.23
Rainbow trout	0.00	30.84	0.00	18.89
Brown trout	4.24	6.41	0.00	4.00
Lake trout	0.00	19.73	0.00	12.90
Coho salmon	0.00	0.00	0.00	0.00
Chinook salmon	0.00	37.37	0.00	22.90
Rainbow smelt	3.79	0.00	0.00	0.07
Goldfish	0.00	0.00	3.84	1.42
Carp	0.00	0.00	75.37	27.80
Emerald shiner	0.00	0.00	0.16	0.06
Bigmouth shiner	0.00	0.00	0.11	0.04
Spottail shiner	0.00	0.00	0.63	0.23
Bluntnose minnow	20.41	0.10	3.12	1.59
Fathead minnow	0.00	0.00	2.76	1.02
White sucker	0.00	4.41	0.00	2.70
Black bullhead	23.56	0.00	1.53	1.00
Rock bass	0.00	0.00	0.48	0.18
Green sunfish	2.77	0.00	0.00	0.05

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 23 (Continued)

PERCENT OF WEIGHT OF TOTAL ELECTROFISHING CATCH FOR FISH COLLECTED
IN WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D	All Stations
Pumpkinseed	0.00	0.00	2.42	0.89
Smallmouth bass	0.00	1.12	0.00	0.69
Largemouth bass	0.00	0.00	0.55	0.20
Johnny darter	0.00	0.00	0.09	0.03
Yellow perch	28.50	0.02	8.69	3.75
Mottled sculpin	2.39	0.00	0.13	0.09
Total	100.00	100.00	100.00	100.00

Chicago Harbor (Station 4-D): Chinook salmon (4,540 grams [10 pounds], 37% of the total catch weight), rainbow trout (3,828 grams [8 pounds], 31% of the total catch weight), lake trout (2,450 grams [5 pounds], 20% of the total catch weight), brown trout (795 grams [1.8 pounds], 6% of the total catch weight).

3. Calumet Harbor (Station 6-D): Carp (5,634 grams [12 pounds], 75% of the total catch weight) and yellow perch (650 grams [1.4 pounds], 9% of the total catch weight).

The results of the electrofishing collections were standardized to the weight of fish collected per 30 minutes to account for variations in effort within each harbor. These data along with the average weight of catch among all harbors and percent of total weight of the electrofishing catch for all three harbors combined are listed in Table 24.

In all harbors combined, the following species comprised the greatest weight of electrofishing catch based on weight of fish collected per 30 minutes electrofishing: carp average weight of 640 grams (1.4 pounds) or 28% of the weight, chinook salmon average weight of 516 grams (1.1 pound) or 22% of the weight, rainbow trout average weight of 425 grams (0.9 pounds) or 18% of the weight, and lake trout average weight of 272 grams (0.6 pounds) or 12% of the total combined electrofishing catch.

Results for average, minimum, and maximum, standard and total length, and for average, minimum, and maximum weight in grams for all fish species collected are listed in Appendix Tables AIII-1 through AIII-9.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 24

WEIGHT (GRAMS) OF FISH COLLECTED PER 30 MINUTES ELECTROFISHING AND PERCENT OF WEIGHT OF TOTAL CATCH FOR FISH COLLECTED FROM WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette	Chicago	Calumet	Average	All Stations Percent of Total Catch
	Harbor Station	Harbor Station	Harbor Station		
Weight (Grams) of Fish per 30 Minutes					
Alewife	4.40	0.00	3.17	2.52	0.11
Gizzard shad	29.93	0.00	0.00	9.98	0.43
Rainbow trout	0.00	1,276.10	0.00	425.37	18.42
Brown trout	10.16	265.08	0.00	91.75	3.97
Lake trout	0.00	816.67	0.00	272.22	11.79
Coho salmon	0.00	0.00	0.00	0.00	0.00
Chinook salmon	0.00	1,546.67	0.00	515.56	22.33
Rainbow smelt	9.07	0.00	0.00	3.02	0.13
Goldfish	0.00	0.00	97.78	32.59	1.41
Carp	0.00	0.00	1,920.78	640.26	27.73
Emerald shiner	0.00	0.00	4.18	1.39	0.06
Bigmouth shiner	0.00	0.00	2.71	0.90	0.04
Spottail shiner	0.00	0.00	15.99	5.33	0.23
Bluntnose minnow	48.88	4.05	79.40	44.11	1.91
Fathead minnow	0.00	0.00	70.26	23.42	1.01

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 24 (Continued)

WEIGHT (GRAMS) OF FISH COLLECTED PER 30 MINUTES ELECTROFISHING AND PERCENT OF WEIGHT OF TOTAL CATCH FOR FISH COLLECTED FROM WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Fish Species	Wilmette	Chicago	Calumet	Average	All Stations
	Harbor Station	Harbor Station	Harbor Station		
	Weight (Grams) of Fish per 30 Minutes				Percent of Total Catch
White sucker	0.00	182.30	0.00	60.77	2.63
Black bullhead	56.43	0.00	39.03	31.82	1.38
Rock bass	0.00	0.00	12.13	4.04	0.18
Green sunfish	6.64	0.00	0.00	2.21	0.10
Pumpkinseed	0.00	0.00	61.75	20.58	0.89
Smallmouth bass	0.00	46.53	0.00	15.51	0.67
Largemouth bass	0.00	0.00	14.06	4.69	0.20
Johnny darter	0.00	0.00	2.36	0.79	0.03
Yellow perch	68.23	0.90	221.54	96.89	4.20
Mottled sculpin	5.71	0.00	3.39	3.03	0.13
Total	239.46	4,138.29	2,548.51	2,308.75	100.00

Results of chemical analyses of harbor water samples are listed in Table 25. These samples were collected during the times of each harbor fish collection.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 25

RESULTS OF CHEMICAL ANALYSIS OF WILMETTE, CHICAGO, AND
CALUMET HARBOR WATER SAMPLES TAKEN DURING
THE HARBOR FISH COLLECTIONS

Constituents	Units	9/26/84	10/23/84	9/17/84
		Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D
Air Temperature	°C	13	9	20
Water Temperature	°C	10	12.5	18
Turbidity	NTU	16	2.4	2.3
Secchi Disk	Feet	NA	4	NA
pH Laboratory	STD units	8.2	8.2	8.4
pH Field	STD units	8.3	7.9	8.0
Alkalinity, Total as CaCO ₃	mg/L	130	120	120
Sulfate	mg/L	26	23	25
Fluoride	mg/L	0.15	0.15	0.16
Chloride	mg/L	10	8	12
Phosphorus	mg/L	0.1	0.1	0.1
Calcium	mg/L	32	31	28
Magnesium	mg/L	12	11	10
Potassium	mg/L	1	1	1
Sodium	mg/L	6	6	8
Solids, Total	mg/L	198	178	177
Solids, Total Volatile	mg/L	47	59	46
Solids, Suspended	mg/L	34	7	2
Solids, Volatile Suspended	mg/L	4	0	0
Dissolved Oxygen, Winkler	mg/L	11.1	9.8	9.6
Dissolved Oxygen, Meter	mg/L	11.3	10.2	9.6
Oxygen Demand, Chemical	mg/L	12	12	7
Oxygen Demand, 5-Day, Biochemical	mg/L	2	2	2
Total Organic Carbon	mg/L	3	9	5

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE 25 (Continued)

RESULTS OF CHEMICAL ANALYSIS OF WILMETTE, CHICAGO, AND
CALUMET HARBOR WATER SAMPLES TAKEN DURING
THE HARBOR FISH COLLECTIONS

Constituents	Units	9/26/84	10/23/84	9/17/84
		Wilmette Harbor Station 2-D	Chicago Harbor Station 4-D	Calumet Harbor Station 6-D
Nitrogen, Total Kjeldahl	mg/L	0.3	0.3	0.1
Nitrogen, Ammonia	mg/L	1.8	0.1	0.1
Nitrogen, Nitrate	mg/L	0.5	0.1	0.2
Nitrogen, Nitrite	mg/L	0.1	0.1	0.1
Fats, Oils and Greases	mg/L	1	1	1
Foaming Agents-MBAS	mg/L	0.004	0.00	0.01
Aluminum	mg/L	1.0	1.0	1.0
Arsenic	mg/L	<0.2	<0.2	<0.2
Barium	mg/L	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.02	<0.02	<0.02
Copper	mg/L	0.02	0.03	<0.02
Iron	mg/L	0.5	0.4	<0.2
Lead	mg/L	<0.02	0.02	<0.02
Manganese	mg/L	<0.02	<0.02	<0.02
Mercury	µg/L	<0.2	<0.2	<0.2
Nickel	mg/L	<0.2	<0.2	<0.2
Selenium	mg/L	<0.2	<0.2	<0.2
Silver	µg/L	<1	1	<1
Cyanides, Total	mg/L	0.000	0.002	0.000
Phenol - like Substances as Phenol	µg/L	1	1	1
Conductivity, Laboratory	µmhos/cm	260	276	250
Conductivity, Field BGTU	µmhos/cm	280 0.1476	285 0.0510	300 0.0082

NA = No Analysis.

BGTU = Bluegill Toxic Units.

DISCUSSION

Bacteria

The southernmost station sampled in Lake Michigan, Station 7-A (Figure 1) is located within 275 meters of the mouth of Indiana Harbor. This station had the highest concentration of SPC, TC, FC, and PA, and was the only station which could not meet the standard of 20 FC per 100 mL (geometric mean). No other station had a geometric mean greater than 3 FC per 100 mL. All stations met the Illinois Department of Public Health beach standard of 500 FC per 100 mL. Salmonella was not recovered from any station.

The results of the bacterial analyses (Table 2) indicate good water quality in Lake Michigan for the four samples collected in April, June, August, and October, 1984.

Algae

POPULATIONS

Algal population densities determined for a body of water describe how many primary producers (algae) are supported by that water. Oligotrophic conditions are characterized by low population densities, eutrophic conditions are characterized by large populations, and mesotrophic conditions are characterized by populations intermediate to these extremes.

Three methods were used in 1984 to collect and estimate the total population densities of algae: (1) the column plankton-

net tow, (2) periphyton sampling, and (3) Kemmerer water bottle sampling.

The column plankton-net tow included all those organisms retained by the plankton-net mesh when hauled from the bottom to the surface at each station in Lake Michigan. Column plankton-net tow population densities (Table 3) ranged from 542 organisms/mL in Wilmette Harbor to 2,081 organisms/mL in Calumet Harbor

Periphyton were those algae growing or captured on microscope slides immersed for two weeks at the surface of the water column at each station in Lake Michigan. The total periphyton populations ranged from 142,040 organisms/cm² in Wilmette Harbor to 328,932 organisms/cm² in Chicago Harbor (Table 3).

Kemmerer plankton were those planktonic algae captured in a Kemmerer water bottle at discrete depths. Four depths (1, 3, and 5 meters, and 1 meter above the bottom) were sampled in each area (Wilmette, Chicago, and Calumet Harbors - Figure 1) of Lake Michigan. The average total Kemmerer plankton population at the three harbors ranged from 4,528 organisms/mL in Wilmette Harbor to 5,272 organisms/mL in Calumet Harbor (Table 3).

Each of the methods used to estimate population densities produced different results, but the results were consistent within each method. For each method the conclusion was that the

three areas sampled could be considered as one large sampling area.

Comparing the plankton-net tow population densities in this study (Table 3) with those determined for the vicinity of Zion during 1970 through 1975 (3) we find that offshore open areas of Lake Michigan had much lower plankton-net tow population densities in 1970-75 than the three harbor areas in 1984. In the Zion study (3) plankton-net tow densities of 25 to 61 organisms/mL were found during 1975 compared to the plankton-net tow densities of 542 to 2,081 organisms/mL for this study at Chicago, Wilmette, and Calumet Harbors during 1984.

Kemmerer water bottle samples were collected at Zion at the one meter depth from 1972 through 1975 (3) and the range of plankton organisms found was 519 to 4,079 organisms/mL. When compared to the range of plankton organisms found at the one meter depth in 1984 (4,478 to 5,150/mL) in the three harbor areas (Table 3) it is obvious that the open areas of Lake Michigan in the vicinity of the Zion nuclear power station had a much wider range of plankton densities in 1975 than the harbor areas had in 1984.

The conclusion based on these data regarding population densities is that the water quality of the Lake Michigan harbor areas in 1984 was slightly poorer than the Zion area was during 1970-1975 (3).

COMMUNITY STRUCTURE

Community structure refers to the organisms making up the community and the number of species found. The numbers of species found in the column plankton-net tow was 60, 54, and 63 for the Wilmette, Chicago, and Calumet Harbor areas, respectively (Table 3). These data indicated a similarity among the stations, and indeed only two species Cerasterias irregulare and Fragilaria pinnata were unique to Wilmette Harbor. Chicago Harbor had no unique species, and the Calumet Harbor had two unique species Amphiprora ornata and Rhoicosphenia curvata, (Tables AII-1 to AII-3). However, of the 85 species found in the column plankton-net tow samples only 13 species were common to all three harbor areas sampled (Tables AII-1 to AII-3), signifying that there are differences among the harbors.

The numbers of periphyton species (Table 3) were 59, 114, and 126 for the Wilmette (Station 2-B), Chicago (Station 4-B), and Calumet (Station 6-B) Harbor areas, respectively. The total number of species found was 165.

The numbers of plankton species collected at each of the three harbor areas with the Kemmerer bottle water samples (Table 3) were 208, 256, and 240, respectively at Stations 2-B, 4-B, and 6-B (Figure 1). The close correspondence of the number of plankton species suggested a similarity of environment for the Wilmette, Chicago, and Calumet Harbor areas. The total number of plankton species found from the Kemmerer water bottle samples collected from all three harbor areas in southwestern Lake

Michigan was 350 species. Thirty-three of these plankton species (9.4 percent) were common to all stations, eight species (2.3 percent) were unique to the Wilmette Harbor area (Station 2-B), twenty-five species (7.1 percent) were unique to the Chicago Harbor area (Station 4-B), and thirty-five species (10 percent) were unique to the Calumet Harbor area (Station 6-B), Tables AII-7 to AII-9. These data indicated the individuality of each area sampled.

Species diversities; i.e., the Shannon-Weaver Index, were reported by Tarapchak and Stoermer (4) to indicate trophic status as follows: >3.5 = oligotrophic (water deficient in nutrients), 3.5 to 2.5 = mesotrophic (water contains some nutrients), <2.5 = eutrophic (water is enriched with nutrients).

The mean species diversity (4, 27) at Wilmette Harbor (Station 2-B), Chicago Harbor (Station 4-B), and Calumet Harbor (Station 6-B) (Figure 1) for the Kemmerer plankton ranged from 1.12 to 1.35. Tarapchak and Stoermer (4) reported that in 1971, Schelske found in the inshore waters of Lake Michigan at Grand Haven, Michigan, species diversities of 1.79 to 2.93. Tarapchak and Stoermer also reported on the work by Piala and Lambie for 1971. Piala and Lambie found for the inshore waters of Lake Michigan at Zion that species diversities varied from 1.75 in late July to 3 in mid-January. The species diversities found in this study (1984) were less in the heavily populated areas from

Wilmette Harbor to Calumet Harbor than those found in 1971 from areas relatively unpopulated. The results of the Grand Haven and Zion studies established the range for species diversities for the southeastern and southwestern inshore waters of Lake Michigan during 1971. The species diversity results of this study were somewhat less in value ($d = 1.12$ to 1.35) and would indicate water of poorer quality than that found at Grand Haven and Zion in 1971.

Examination of Tables 4 and 5, which lists those organisms found in more than 90% of the samples collected and analyzed, shows that one of the eight periphyton and three of the sixteen planktonic (Kemmerer) organisms were considered pollutant indicators by Palmer (42, 43). Tarapchak and Stoermer (4) called these same organisms listed by Palmer (42, 43) eutrophic and mesotrophic to eutrophic indicators, (organisms that tolerated moderate enrichment), and added three oligotrophic organisms: Cyclotella compacta, Cyclotella kuetzingiana and Cyclotella ocellata. Two of these species (Cyclotella kuetzingiana and Cyclotella ocellata) were found in the plankton at Station 2-B at Wilmette Harbor (Tables 5 and 7) and one (Cyclotella kuetzingiana) was found in the periphyton (Tables 4 and 6). Tarapchak and Stoermer (4) also listed three mesotrophic indicators (organisms found in oligotrophic waters that decreased in abundance with enrichment), Cyclotella michiganiana, Melosira islandica, and Tabellaria fenestrata.

Tabellaria fenestrata was found persistent at all stations sampled in this study (Table 4 and Table 5). Of the four mesotrophic to eutrophic indicator organisms listed by Tarapchak and Stoermer (4), Asterionella formosa, Fragilaria crotonensis, Stephanodiscus hantzschii, and Stephanodiscus minutus, only two (Asterionella formosa and Fragilaria crotonensis) were found to be persistent in this study (1984) among the periphyton (Table 4), and the plankton (Table 5). Among the eutrophic indicators listed by Tarapchak and Stoermer (4) (Fragilaria capucina, Melosira granulata, and Stephanodiscus tenuis) only Melosira granulata occurred persistently among the plankton (Table 5) during 1984. One category of indicator organisms listed by Tarapchak and Stoermer (4) was referred to as introduced eutrophic forms. This was defined as organisms previously present only in small percentages, and which were now among the dominants, or the dominant species in nutrient enriched water, and which did not exist in Lake Michigan prior to cultural eutrophication. These organisms were: Diatoma tenue var. elongatum, Nitzschia dissipata (an indicator of advanced eutrophication), Stephanodiscus binderanus, and Stephanodiscus subtilis. None of these organisms was persistent during 1984.

Among the dominant organisms listed in Tables 6 and 7, 14 of 50 periphytic organisms (28 percent) and 13 of 16 plankton organisms (81 percent) were listed by Palmer (42, 43) as being pollutant-tolerant. According to the classification by

Tarapchak and Stoermer (4) the oligotrophic indicator Cyclotella kuetzingiana was dominant (>1% of the total population) at all stations among both plankton and periphyton. Cyclotella ocellata, an oligotrophic indicator, was found dominant among the plankton in Chicago Harbor (Station 4-B) and Calumet Harbor (Station 6-B). Among the mesotrophic indicators, Tabellaria fenestrata was dominant at all stations among both periphyton and plankton. Melosira islandica, another mesotrophic indicator, was found dominant at all stations among the plankton. The four organisms characterized as mesotrophic to eutrophic by Tarapchak and Stoermer (4) (Asterionella formosa, Fragilaria crotonensis, Stephanodiscus hantzschii, Stephanodiscus minutus) were found as dominants among both periphyton and plankton. Melosira granulata, a eutrophic indicator, was found dominant at every station among both periphyton and plankton (Tables 6 and 7). Fragilaria capucina, a eutrophic indicator, was found among the plankton in both Chicago and Calumet Harbors (Table 7). Of the five organisms listed by Tarapchak and Stoermer (4) as being introduced eutrophic forms none were dominants among the plankton, but Diatoma tenue var. elongatum was found among the periphyton at Station 4-B and Nitzschia dissipata, an indicator of advanced eutrophication, was found among the periphyton at all the stations sampled.

As was found with the persistent organisms, those organisms found as dominants were indicators of oligotrophy, mesotrophy, and eutrophy; i.e., the organisms found were indicative of a wide range of conditions.

Besides the organisms that are present it is sometimes helpful to examine those organisms that no longer inhabit this area. Historically Lake Michigan phytoplankton were still numerically dominated by diatoms (>70% diatoms) in 1962 through 1963 (45). By 1969 shifts in phytoplankton composition were noted by Schelske and Stoermer (46), to dominance by greens, blue-greens, and golden brown algae. By August of 1969, Schelske and Stoermer found that up to 80% of the population density was reported to be blue-green algae. The blue-greens remained dominant through October after the fall overturn resupplied the euphotic zone with nutrients.

During the monitoring conducted in this study (1984) diatoms maintained a numerical dominance of the population in the three harbors for all dates sampled except on December 23, 1984 at Wilmette (24.9% diatoms) and Chicago Harbors (18.1% diatoms). At Wilmette Harbor, the dominant organisms were the green alga, Stichococcus bacillaris (7.1%); the chrysophyte, Dinobryon divergens (10.3%); the blue-greens, Oscillatoria agardhii (33.4%) and Oscillatoria limnetica (7.9%). At Chicago Harbor the dominant organisms were the green alga, Stichococcus bacillaris (10.7%); the chrysophyte, Dinobryon divergens

(25.2%); the blue-greens, Oscillatoria limnetica (12.1%) and Oscillatoria tenuis (9.1%). Tables AII-7 to AII-9 contains the list of species present at lower densities. For the remainder of the year the diatom contribution to the population was 78 to 96% at Wilmette Harbor, 61 to 97% at Chicago Harbor, and 74 to 99% at Calumet Harbor.

The blue-green algal blooms reported in 1969 (46) and in 1970 to 1975 (69) no longer occur. Apparently, a change in the water quality, a reduction of nutrients, has restored Lake Michigan to its former state in which diatoms dominated the algae population.

Comparing summer algal composition with studies conducted during the 1970's by the District (3), and Argonne National Laboratories (4), a clearly discernible improvement was found for Lake Michigan during 1984. The dominance of the green and blue-green algae in lake Michigan summer algal populations found during the 1970's did not occur in 1984. In the 1970's the diatom contribution had been as low as 5% of the algal population, whereas, in 1984 the lowest diatom contribution was 61% of the algal population. The increased dominance and appearance of the oligotrophic indicator species Cyclotella kützingiana and C. ocellata along with the loss of dominance and reduced appearance of the eutrophic indicator species Fragilaria capucina, Melosira granulata, and Stephanodiscus tenuis, and the recently introduced eutrophic species Diatoma tenue var.

elongatum, Nitzschia dissipata, Stephanodiscus binderanus, S. subtilis, and Cyclotella stelligera confirms the improvement in water quality. The loss of Stephanodiscus hantzschii and S. minutus (mesotrophic to eutrophic indicators) from a position of dominance in the population also supports the hypothesis of water quality improvement; even though Fragilaria crotonensis and Asterionella formosa remained as dominants through most of the year. The increased dominance of Tabellaria fenestrata (mesotrophic indicator) throughout 1984 added weight to the conclusion of improved Lake Michigan water quality as compared to the 1970's.

Benthic Invertebrates

RELATIVE ABUNDANCE AND SPECIES COMPOSITION

Benthic surveys similar to the present study have been conducted in the inshore area of Lake Michigan. These studies were done by Mozley and Garcia (50), and by the Great Lakes Research Division (51, 52, 53). The published data from these studies was recalculated to provide more comparable mean abundance, and percent composition data for the total benthos at depths in the approximate range of 15 to 35 feet.

The present study (1984) showed that the invertebrate fauna of the inshore area of southwestern Lake Michigan at depths of 15 to 31 feet was dominated numerically by oligochaetes (58%) and chironomids (36%). In 1972, Mozley and Garcia (50) found

that the most abundant major invertebrate groups in the coastal zone of southwestern Lake Michigan from depths ranging from 12 to 35 feet were the oligochaetes (50%) and chironomids (26%). However, the relative abundance of amphipods (17%) and sphaeriids (8%) was much greater in the 1972 survey than found in the present study (2 and <1%, respectively).

Findings similar to that of the present study have also been reported by Ladronka (51), and Winnell (52, 53) in the near shore area of southwestern Lake Michigan at depths from 24 to 36 feet; with the benthos dominated numerically by the oligochaetes (53%) and chironomids (21%). As was shown by Mozley and Garcia (50), amphipods accounted for a greater percentage of the benthic invertebrates (13%) compared to the present 1984 study (2%).

Even though the percent composition of the predominant benthic groups was similar in the above mentioned studies, the species composition differed. The 1972 survey by Mozley and Garcia was composed primarily of Pontoporeia affinis, L. hoffmeisteri, P. nereis, Cryptochironomus sp., C. fluviatilis gr., and S. striatinum. In the 1984 study, the dominant invertebrates were P. vejdovskyi, A. pluriseta, P. hoyi, C. fluviatilis-gr., P. michiganensis, P. moldaviensis, Cladotanytarsus sp., Cryptochironomus sp. and S. lacustris. The most common benthic taxa in the present study included

Cyphomella sp., C. fluviatilis-gr., P. scalaenum, P. michiganensis, V. intermedia, P. vejdoovskyi, and G. pseudolimnaeus.

TROPHIC INDICES

Oligochaetes, because they comprise a major faunal group consisting of various species assemblages in habitats with all ranges of organic enrichment, have provided the basis for several indices of pollution which have been applied to the Great Lakes. Two of these indices, total and relative abundance, were applied to the present (1984) data.

The total number of oligochaetes was first proposed by Wright and Tidd (54) as a pollution index. They classified those benthic habitats possessing oligochaetes less than 1,000/m² as having "negligible pollution." The presence of 1,000-5,000 oligochaetes/m² indicated "mild pollution," and more than 5,000/m² as evidence of "severe pollution." Based upon this classification, Station 2-C at Wilmette Harbor (mean = 277/m²) and Station 6-C at Calumet Harbor (mean = 660/m²) would be considered nonpolluted, and Station 4-C at Chicago Harbor (mean = 3,337/m²) moderately polluted.

Goodnight and Whitley (55), working in a midwestern stream, used the relative abundance of oligochaetes as a measure of the extent of organic enrichment. Fewer than 60% oligochaetes indicated good conditions, between 60 and 80% doubtful conditions, and more than 80% indicating "...a high degree of either organic enrichment or industrial pollution" (56). Using

this index, Stations 2-C at Wilmette Harbor (21%) and 6-C at Calumet Harbor (51%) would be classified as good, and Station 4-C at Chicago Harbor (73%) doubtful.

INDICATOR SPECIES

Another method frequently used to assess environmental quality is the indicator species approach. Benthic invertebrates are assigned to three classifications depending upon the tolerance of each species to different concentrations of inorganic and/or organic wastes:

1. Intolerant - organisms which live in a narrow range of environmental conditions and are associated with "clean water."
2. Tolerant - organisms which can survive adverse environmental conditions.
3. Facultative - organisms capable of living which are associated with moderate amounts of pollution.

In other words, certain benthic invertebrate species have well-defined ecological requirements, and their presence or absence can be used as an indication of water quality.

In the present study, the benthic invertebrate community was dominated numerically by the naidids *P. michiganensis*, *V. uncinata*, and *V. intermedia*, the tubificid, *P. vej dovskyi*, and the chironomids *Cyphomella* sp., *P. scalaenum*, and *P. tuberculum*. Except for the midge *Cyphomella* sp., whose pollution tolerance is unknown, the other six benthic invertebrates are classified as facultative organisms (57, 58, 59, 53; J. K. Hiltunen

personal communication with Irwin Polls, 1985), and are characteristic of mesotrophic or slightly enriched areas. Therefore, the high number of these facultative organisms at each of the three sampling stations (2-C, 4-C, and 6-C) suggests that these areas are mesotrophic.

Sediment Quality

Guidelines for the evaluation of Great Lakes harbor sediments, based on bulk sediment analysis, have been developed by the USEPA, Region V (60). Sediments are classified as heavily polluted, moderately polluted, or nonpolluted depending on the concentrations of 19 constituents. The overall classification of a sample is based on the most predominant classification of the individual constituents.

Using the USEPA's guidelines for volatile solids, COD, FOG, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, and zinc, the bottom sediments of the inshore area of southwestern Lake Michigan can be classified as nonpolluted. However, the concentrations of copper (26 mg/kg), manganese (440 mg/kg), and nickel (20 mg/kg) at Station 6-C at Calumet Harbor, would classify the sediments as moderately polluted.

Fish

Of the 25 fish species collected from the three southwestern Lake Michigan harbors sampled during the period September 17 through October 25, 1984 (Table 14), eight species (32%) are considered to be intolerant of polluted conditions by the Illinois Department of Conservation (W. Bertrand, Northern Streams Biologist, Illinois Department of Conservation, personal communication with Samuel G. Dennison, 1985) and are indicative of good water quality by their presence in the catch. These intolerant species and the harbor areas with which they were associated were:

- Coho salmon--Chicago Harbor
- Chinook salmon--Chicago Harbor
- Rainbow trout--Wilmette and Chicago Harbors
- Brown trout--Wilmette and Chicago Harbors
- Lake trout--Wilmette, Chicago and Calumet Harbors
- Rock bass--Calumet Harbor
- Smallmouth bass--Chicago Harbor
- Mottled sculpin--Wilmette and Calumet Harbors

NUMBER AND WEIGHT OF FISH COLLECTED - GILL NETS

Yellow perch: The yellow perch comprised, numerically, the greatest portion of the gill net catch in all three harbors, and was second only to the lake trout in terms of the weight of the gill net catch in these same harbors.

The yellow perch in Lake Michigan has been important as a commercial species since the 1880's, and as a sport fish since at least the 1920's (61). Annual commercial production has usually fluctuated between 0.5 and 1.5 million kilograms (1.1 and 3.3 million pounds). Yellow perch are distributed

throughout Lake Michigan where depths are suitable. Young perch live mostly in depths less than 5 meters (16 feet) until fall. In October and November they are most numerous at depths of 13 to 22 meters (43 to 72 feet), but have been found as deep as 31 meters (102 feet). After their first year they are mainly at depths of 9 to 27 meters (30 to 89 feet) in winter and early spring, less than 18 meters (59 feet) in late spring and early summer, less than 27 meters (89 feet) in late summer, and 18 to 37 meters (59 to 121 feet) in fall. In summer, perch are often concentrated in a relatively small interval within the depth ranges given above and the depth of greatest abundance may shift rapidly as bottom temperatures fluctuate (61).

The yellow perch has been classified as a top carnivorous fish species by the Illinois Department of Conservation (W. Bertrand, Northern Streams Biologist, Illinois Department of Conservation, personal communication with Samuel G. Dennison, 1985). Top carnivores or piscivores include all species which are predominantly fish eating as adults. Some feed on invertebrates, fish, juveniles, and fry. Viable and healthy populations of top carnivore species indicate a healthy, trophically diverse community (W. Bertrand, Northern Streams Biologist, Illinois Department of Conservation, personal communication with Samuel G. Dennison, 1985).

Lake Trout: The lake trout comprised the greatest weight of the gill net catch in all three harbors and was second in

numerical abundance to the yellow perch in these same harbors. Lake trout are coldwater fish and do not thrive in water with temperatures over 65°F (18.3°C) (61). They inhabit cold deep lakes, but come into shallow water in October to spawn over rubble and gravel (62) when temperatures are near 50°F (10°C) (63).

Larger lake trout feed primarily upon fish in most lakes (63) and they are classified as a top carnivorous fish species by the Illinois Department of Conservation (W. Bertrand, Northern Streams Biologist, Illinois Department of Conservation, personal communication with Samuel G. Dennison, 1985). Other top carnivorous fish present in the gill net catches included:

Coho salmon--Chicago Harbor
Chinook salmon--Calumet Harbor
Rainbow trout--Wilmette Harbor
Brown trout--Chicago Harbor

From the results of our gill net collections, lake trout were obviously present in relatively great numbers in the comparatively shallow water of Chicago area harbors during late September and October and constituted a significant portion of the fish biomass in the harbors during these months. It should be noted that these large lake trout, as well as many of the larger fish of the other trout and salmon collected with the gill nets, were caught in the gill nets by entanglement of the netting with their teeth and not by being caught in the mesh of the nets by their gill covers.

The results of the gill net catches indicated that there were many top carnivorous fish present in each of the three harbors under study; which is indicative of healthy, trophically diverse fish communities in the harbor areas.

NUMBER AND WEIGHT OF FISH COLLECTED - ELECTROFISHING BOAT

Major fish ranked by number per 30 minutes electrofishing from Table 19 were:

<u>Wilmette Harbor</u>	<u>Chicago Harbor</u>	<u>Calumet Harbor</u>
Black Bullhead (66)	Rainbow Trout (10)	Bluntnose Minnow (27)
Rainbow Smelt (29)	Brown Trout (4)	Yellow Perch (24)
Yellow Perch (13)		Fathead Minnow (23)

Major fish ranked by weight per 30 minutes electrofishing from Table 24 were:

<u>Wilmette Harbor</u>	<u>Chicago Harbor</u>	<u>Calumet Harbor</u>
Yellow Perch (68 g)	Chinook Salmon 1,547 g)	Carp (1,921 g)
Black Bullhead (56 g)	Rainbow Trout (1,276 g)	Yellow Perch (222 g)
Bluntnose Minnow (49 g)	Lake Trout (817 g)	
Gizzard Shad (30g)	Brown Trout (265 g)	

The fish species comprising the greatest numbers and the greatest weights of the electrofishing catches from Wilmette Harbor and Calumet Harbor were a mixture of a top carnivorous species (yellow perch), species which feed on fish and benthos (rainbow smelt and black bullheads in Wilmette Harbor), and omnivorous fish species, which routinely take significant quantities of both plant and animal material, often including

detritus, and have the ability to utilize both (61). These included the bluntnose minnow and gizzard shad in Wilmette Harbor, and the bluntnose minnow, fathead minnow, and carp in Calumet Harbor. Those species collected in the greatest numbers or the greatest weights in the electrofishing collection in Chicago Harbor were all top carnivorous species, including the rainbow trout, brown trout, chinook salmon, and lake trout.

Karr (62) indicates that the dominance of omnivorous fish species (species whose diet is at least 25% each of plant and animal food) presumably arises as a result of degradation in the food base, especially invertebrates. As a result, their opportunistic foraging ecology makes them successful relative to more specialized foragers. Omnivores can become dominant in degraded conditions, apparently as a result of irregular supply of both plant and invertebrate foods. Irregularity in plant or invertebrate availability results in declining abundances of fish that specialize on one food type or the other.

A list of the percent composition of omnivorous fish species is presented in Table 26. The percentage of omnivores was very low (zero in Wilmette Harbor, 1.79 percent in Chicago Harbor and 1.11 percent in Calumet Harbor) for fish collected with the gill nets in the deeper waters of the harbors. The percentage of omnivores increased in the electrofisher catches in the shallower water which were carried out along the harbor

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TABLE 26

PERCENT COMPOSITION OF OMNIVOROUS FISH SPECIES IN THE CATCH
FROM WILMETTE, CHICAGO, AND CALUMET HARBORS DURING 1984

Gear	Wilmette	Chicago	Calumet
	Harbor Station 2-D	Harbor Station 4-D	Harbor Station 6-D
	<u>Percent Omnivores</u>		
Gill Net	0.00	1.79	1.11
Electrofisher	6.85	4.17	60.32
Both Gear Types	3.52	2.88	29.97

shorelines. Percent omnivores were 6.85, 4.71 and 60.32 in Wilmette, Chicago and Calumet Harbors, respectively. From the percentage of omnivores in the electrofisher catch of Calumet Harbor it would appear that the water quality of the inshore area, especially near the Indiana border, is somewhat degraded relative to the other harbors, though the deeper water areas of all the harbors appear to have similarly good water quality as reflected by the fish collections.

BLUEGILL TOXICITY INDEX

Lubinski and Sparks (41) concluded that since their mean bluegill toxicity index for the Illinois River remained generally at or below 0.1 Bluegill Toxic Units (BGTU), acute toxicity probably did not constitute a major sustained problem for fish populations during their 1972 to 1973 project period. The basis for this was that other researchers have concluded that fish populations in rivers could be maintained if the toxicity remained generally below 0.2 to 0.4 toxic units and satisfactory oxygen concentrations were maintained. A satisfactory oxygen concentration can be considered to be 5 mg/L. For a variety of fish species, dissolved oxygen concentrations below 5 mg/L have deleterious effects on embryonic development and survival, fecundity, growth, food conversion, swimming ability, respiration, circulatory dynamics, metabolism, behavior, and sensitivity to toxic stress (64).

A bluegill toxicity index, expressed in bluegill toxic units (BGTU's), calculated for the water from each of the three harbors at the time they were being sampled for fish were as follows:

<u>Wilmette Harbor</u>	<u>Chicago Harbor</u>	<u>Calumet Harbor</u>
0.148 BGTU	0.051 BGTU	0.008 BGTU
DO = 11.1 mg/L	DO = 9.8 mg/L	DO = 9.6 mg/L
NH ₃ -N = 1.8 mg/L	NH ₃ -N = <0.1 mg/L	NH ₃ -N = 0.1 mg/L

Wilmette Harbor had the highest calculated bluegill toxicity unit of 0.148 BGTU for a water sample collected on September 26, 1984, Chicago Harbor was second highest with a calculated value of 0.051 BGTU for a water sample collected on October 23, 1984, and Calumet Harbor had the lowest bluegill toxicity value of 0.008 BGTU for a water sample collected on September 17, 1984.

All these values were less than that of the 0.2 BGTU level mentioned by Lubinski and Sparks (41) under which fish populations may be maintained. The relatively high bluegill toxicity unit value among the harbors of 0.148 BGTU's calculated for the Wilmette Harbor sample was due primarily to the 1.8 mg/L concentration of ammonia nitrogen found in the sample. The component toxicity of this compound alone was 0.122 BGTU or 82% of the total calculated bluegill toxicity unit of 0.148 BGTU.

Bluegill toxicity indices, expressed in BGTU's, calculated for the water from each of the three harbors for monthly samples throughout the year 1984 (from data listed in Appendix Tables AII-13 to AII-15) are depicted in Figures 7 to 9. Average

bluegill toxicity values for the three harbors throughout 1984 were: Wilmette Harbor, 0.036 BGTU (Range 0.008 to 0.148 BGTU), Chicago Harbor 0.018 BGTU (Range 0.004 to 0.051 BGTU), and Calumet Harbor 0.019 BGTU (Range 0.008 to 0.039 BGTU).

Comparison of Bacteria, Algal, Benthos, and Fish Data

The four sets of bacterial data collected during 1984 from Lake Michigan showed no recovery of Salmonella and minimal counts for SPC, TC, FC, and PA. These indicated good water quality in Lake Michigan at the Wilmette, Chicago, and Calumet Harbors.

Although algal population densities increased significantly over the past ten years, and the decreased number of species resulted in lowered species diversity indices for Lake Michigan the dominant kinds of organisms present have changed back from blue-green algae to diatoms. The persistently dominant organisms were consistently indicative of mesotrophic to oligotrophic conditions, and so the algae also indicated a good water quality for the harbor areas studied in 1984.

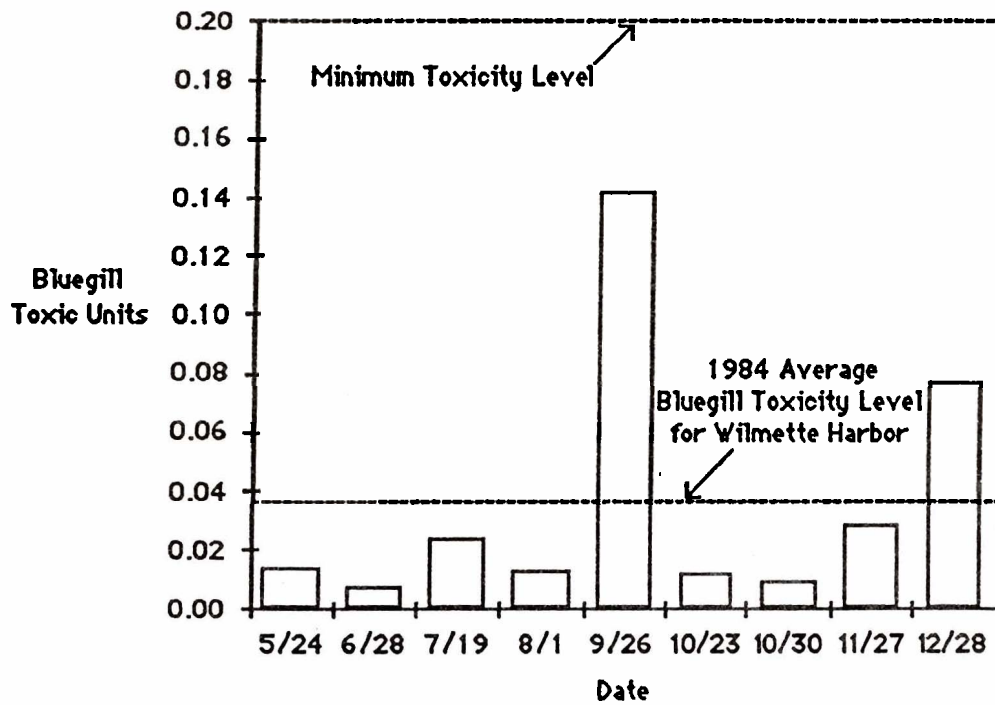
The dominant benthic invertebrates were classified as facultative; i.e., organisms tolerating the wide range of conditions associated with moderate amounts of pollution. This is characteristic of the mesotrophic condition and so determined the water quality.

The sediments sampled were all classified as nonpolluted except for the sediments at Station 6-C at Calumet Harbor where

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FIGURE 7

BLUEGILL TOXICITY INDEX FOR WILMETTE HARBOR DURING 1984



METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 8

BLUEGILL TOXICITY INDEX FOR CHICAGO HARBOR DURING 1984

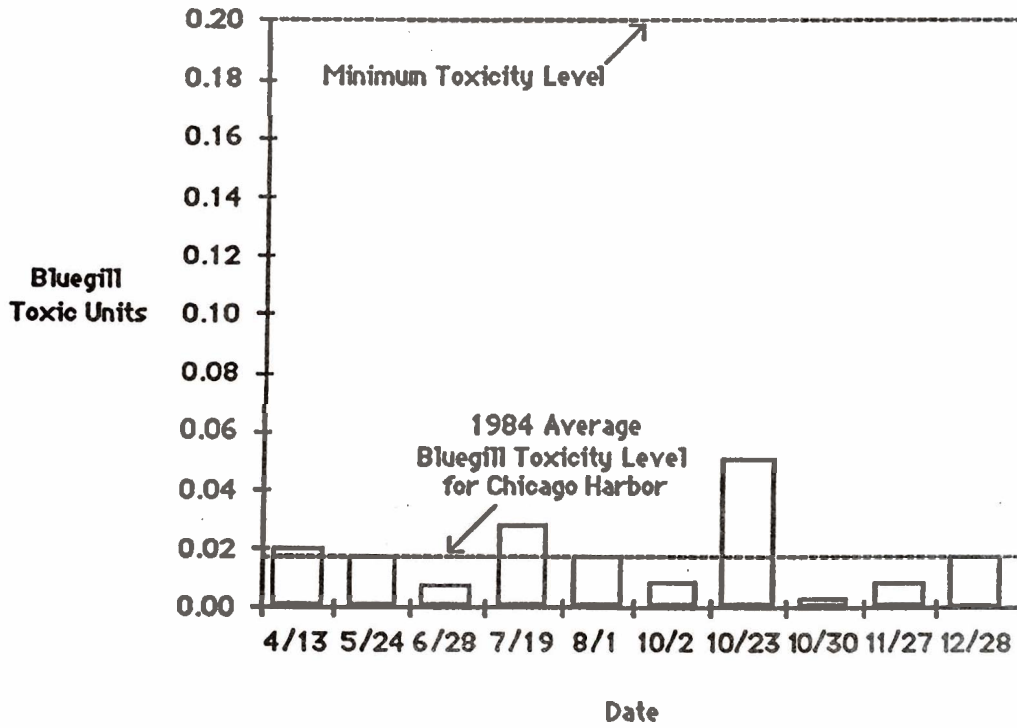
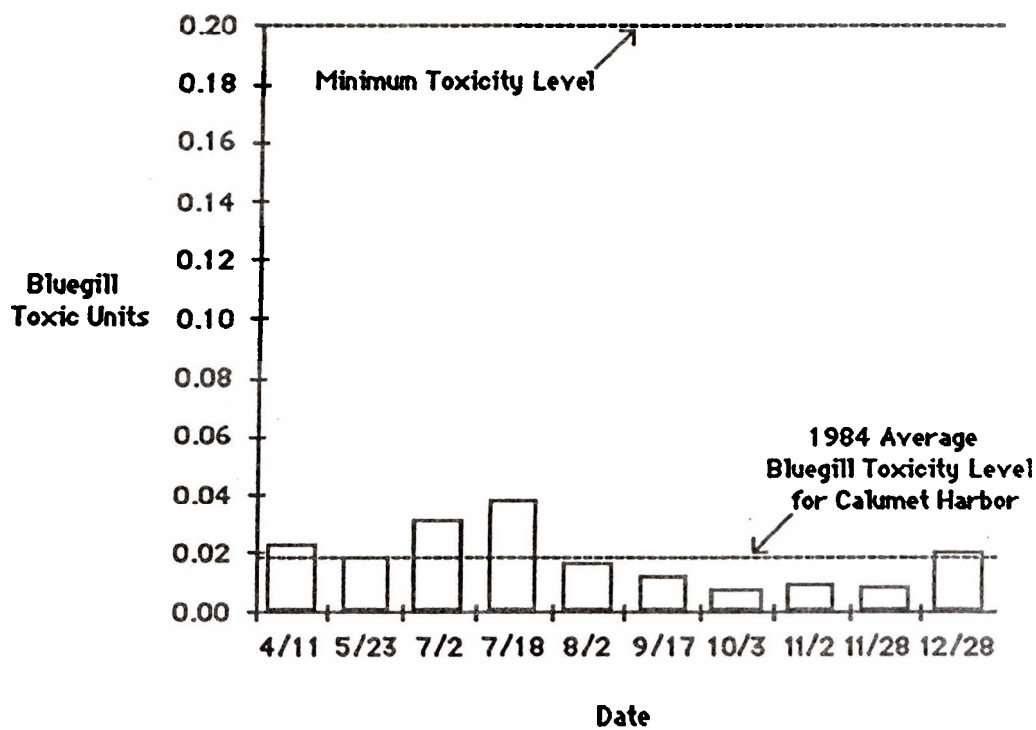


FIGURE 9

BLUEGILL TOXICITY INDEX FOR CALUMET HARBOR DURING 1984



the concentrations of copper, manganese, and nickel would classify the sediments as moderately polluted.

Thirty-two percent of the fish species collected were intolerant of polluted conditions. The presence of many top carnivorous fish was indicative of a healthy, trophically diverse fish community. The low percentage of omnivores is another indication that the water quality of the Lake Michigan harbor areas was good.

In summary, it was the consensus of the data for the four ecological levels of biota that the water quality of the three harbor areas, Wilmette, Chicago and Calumet, in southwestern Lake Michigan was good.

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APPENDIX AI
BACTERIAL RESULTS OF LAKE MICHIGAN
SHORELINE SAMPLING - 1984

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-1

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
OFFSHORE AT LAKE-COOK COUNTY LINE (STATION 1-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-12-84	3	<1	NA**	55	<2	<0.15
06-28-84	3	<1	NA	76	<2	<0.15
08-07-84	<1	<1	NA	77	<1	<0.15
10-17-84	44	11	13	100	<1	<0.15
Geometric Mean	4	1.8	13	75	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis.

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-2

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
OFFSHORE AT WILMETTE HARBOR (STATION 2-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-12-84	<1	<1	NA**	41	<2	<0.15
06-28-84	<1	<1	NA	34	<2	<0.15
08-01-84	<1	20	NA	76	5	<0.15
10-17-84	17	<1	6	100	<1	<0.15
Geometric Mean	2.0	1.2	6	57	2	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis.

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

AI-3

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-3

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
OFFSHORE AT MONTROSE HARBOR (STATION 3-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-12-84	2	<1	NA**	19	<2	<0.15
06-14-84	3	<1	NA	72	<2	<0.15
08-01-84	<1	<1	NA	720	<1	<0.15
10-17-84	26	5	9	92	<1	<0.15
Geometric Mean	4	1.5	9	98	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-4

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
 OFFSHORE AT BREAKWATER GAP FOR CHICAGO HARBOR (STATION 4-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-12-84	1	<1	NA**	50	<2	<0.15
06-14-84	3	<1	NA	270	<2	<0.15
08-01-84	90	10	NA	190	2	<0.15
10-17-84	110	12	13	160	<1	<0.15
Geometric Mean	13	3.3	13	142	2	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-5

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
OFFSHORE AT JACKSON PARK HARBOR (STATION 5-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-11-84	<1	<1	NA**	30	<2	<0.15
06-14-84	<1	<1	NA	25	<2	<0.15
08-01-84	1	<1	NA	94	<1	<0.15
10-30-84	24	5	30	260	<1	<0.15
Geometric Mean	2	1.5	30	69	<1	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis.

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-6

BACTERIAL RESULTS FROM SAMPLES COLLECTED 1,000 YARDS (915 METERS)
 OFFSHORE AT BREAKWATER GAP FOR CALUMET HARBOR (STATION 6-A, Figure 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-11-84	6	<1	NA**	94	<2	<0.15
06-14-84	1	<1	NA	160	<2	<0.15
08-01-84	<1	<1	NA	260	2	<0.15
10-30-84	280	30	250	230	<1	<0.15
Geometric Mean	6	2.34	250	170	<2	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis.

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AI-7

BACTERIAL RESULTS FROM SAMPLES COLLECTED 300 YARDS (275 METERS) OFFSHORE
AT LIGHTHOUSE AT MOUTH OF INDIANA HARBOR (STATION 7-A, FIGURE 1) DURING 1984

Date	TC*	FC	FS	SPC	PA	Salmonella
04-11-84	770	22	NA**	2.6 x 10 ⁴	12	<0.15
06-14-84	2,000	46	NA	4.0 x 10 ⁴	<2	<0.15
08-01-84	5,800	590	NA	33.0 x 10 ⁴	17	<0.15
10-30-84	120	15	7	5.4 x 10 ⁴	2	<0.15
Geometric Mean	1,000	55	7	6.6 x 10 ⁴	5	<0.15

*TC = Total Coliform, FC = Fecal Coliform, FS = Fecal Streptococcus, SPC = Standard Plate Count, PA = Pseudomonas aeruginosa.

**NA = No Analysis.

Note: All counts expressed as colony forming units per 100 mL except SPC which is colony forming units per mL.

APPENDIX AII

ALGAE AND CHEMICAL RESULTS FROM SAMPLES COLLECTED FROM THE
INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN DURING 1984

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Amoeba</u>									4	5		3	2		
sp.															
<u>Amphiprora</u>										<1					
sp.															
<u>Anabaena</u>												9	7		
sp.															
<u>Ankistrodesmus</u>			<1					<1	2	<1					
sp.															
<u>Aphanothece</u>			2				<1					3			
<u>nidulans</u>															
<u>Asplanchnia</u>							<1								
sp.															
<u>Asterionella</u>			17		1	11		2	12	80	122	30	161	122	
<u>formosa</u>															
<u>Bosmina</u>					<1	3									
sp.															
<u>Cerasterias</u>											1		<1		
<u>irregulare</u>															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

Organisms	<u>Number of Organisms/Milliliter</u>														
	<u>Dates - 1984</u>														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Ceratium</u>															
<u>hirundinella</u>															
<u>Characium</u>					<1	4	<1								
sp.															
<u>Chlamydomonas</u>					<1					3	<1	5	4	<1	
sp.															
<u>Chlorella</u>													2		
sp.															
<u>Chroococcus</u>							3						1		
sp.															
<u>Cladocera</u>											<1				
sp.															
<u>Closteriopsis</u>					<1										
sp.															
<u>Copepoda</u>							1	2							
sp.															
<u>Cosmarium</u>														1	
sp.															
<u>Cyclotella</u>				<1											
sp.															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Cymbella</u>							1							<1	
sp.															
<u>Diatoma</u>						6	<1								
sp.															
<u>Diceras</u>															3
sp.															
<u>Dinobryon</u>			30		2	167	15								
<u>cylindricum</u>															
<u>Dinobryon</u>			6		2	<1	<1								
<u>sertularia</u>															
<u>Epistylus</u>														<1	
sp.															
<u>Euglena</u>												2	<1		
sp.															
<u>Fragilaria</u>			78		20										29
sp.															
<u>Fragilaria</u>					36	205	7								
<u>capucina</u>															
<u>Fragilaria</u>			364		28	454	37	7	57	238	564	119	560	729	
<u>crotonensis</u>															

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/15	10/30	11/13	11/27	12/12	12/28
<u>Fragilaria</u>			9		17	53	12				59	23	39	45	
<u>intermedia</u>															
<u>Fragilaria</u>											21	4			
<u>pinnata</u>															
<u>Gomphosphaeria</u>							<1	<1							
<u>lacustris</u>															
<u>Keratella</u>					<1	3		<1				<1			
sp.															
<u>Keratella</u>										<1					
<u>cochlearis</u>															
<u>Melosira</u>			11		4					6	8	12	3	11	
sp.															
<u>Merismopedia</u>										<1					
sp.															
<u>Mougeotia</u>					1										5
sp.															
<u>Navicula</u>						<1				9	2	4	2	2	
sp.															
<u>Oedogonium</u>			17			9									
sp. 1															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

9-IIIV

Organisms	Number of Organisms/Milliliter															
	Dates - 1984															
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28	
<u>Oedogonium</u>			30													
sp. 2																
<u>Oocystis</u>						<1										
sp.																
<u>Oscillatoria</u>			14		10	3					<1	47	19			
sp.																
<u>Oscillatoria</u>							2									
<u>limnetica</u>																
<u>Paramecium</u>													<1	5		
sp.																
<u>Pediastrum</u>															<1	
<u>boryanum</u>																
<u>Rhizoclonium</u>													3			
sp.																
<u>Rhizosolenia</u>			4		<1	1			9	5					6	
<u>eriensis</u>																
<u>Scenedesmus</u>											<1	<1				
sp.																
<u>Scenedesmus</u>												<1				
<u>quadricauda</u>																

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, WILMETTE HARBOR (STATION 2-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Schizochlamys															<1
sp.															
Selenastrum					<1										
sp.															
Spirulina												5	<1		
sp.															
Synedra			76		4	4	<1	3	18	3	1	5	33		
sp.															
Synedra									2	11	3	2	2	4	
ulna															
Tabellaria			86		25	31	6	2	17	68	103	3	48	101	
fenestrata															
bellaria					5	8	5		5	106	28	32	40	56	
flocculosa															
Trachelomonas															<1
sp.															
Unidentified flagellates						24									
Unidentified green flagellates			3												
Total			749		162	992	101	19	126	543	918	305	903	1150	

AII-7

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1)

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Organisms	<u>Number of Organisms/Milliliter</u>														
	<u>Dates - 1984</u>														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Amoeba</u>	3	2	<1	1		<1					3	1	<1		
sp.															
<u>Amphiprora</u>	<1														
sp.															
<u>Anabaena</u>															<1
sp.															
<u>Ankistrodesmus</u>											<1				
sp.															
<u>Aphanothece</u>		3	2			3					<1				
sp.															
<u>Aphanothece</u>							<1								
<u>nidulans</u>															
<u>Asterionella</u>	108	144	14			7	5	3	10	43	60	116	124	50	58
<u>formosa</u>															
<u>Bosmina</u>					<1		<1	<1							
sp.															
<u>Calothrix</u>					1	<1									
sp.															
<u>Ceratium</u>								3							
<u>hirundinella</u>															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HAROBR (STATION 4-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Characium							2								
sp.															
Chlamydomonas											2	7	2	<1	3
sp.															
Cladophora					<1										
sp.															
Cocconeis					3					<1					
sp.															
Copepoda													<1		
sp.															
Cosmarium														<1	
sp.															
Cyclotella	<1			1					<1						
sp.															
Cymbella				<1											
sp.															
Diatoma		4													
sp.															
D.															
vulgaris															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Diceras</u>															2
sp.															
<u>Dinobryon</u>							1								
<u>havaricum</u>															
D. <u>cylindricum</u>							82	4							
D. <u>sertularia</u>				1			4	2							
<u>Fragilaria</u>			37		10	8		4		4		17			
sp.															
E. <u>capucina</u>	25	8		105	13										
E. <u>crotonensis</u>	80	104	270	299	31	111	1110	20	28	91	184	882	1140	859	523
E. <u>inflata</u>												55	29		43
E. <u>intermedia</u>	5	6		62	8						4		59	46	66

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTER LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1)

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Organisms	Number of Organisms/Milliliter														
	Dates - 1984.														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Gomphosphaeria</u>	<1									1	<1		<1		
sp.															
<u>Gomphosphaeria</u>	1	<1					<1						1		
<u>lacustris</u>															
<u>Keratella</u>					<1									<1	
sp.															
<u>Melosira</u>	66	14	10	4					1		2	1	3		
sp.															
<u>Nauplii</u>								<1							
<u>larvae</u>															
<u>Navicula</u>	1		<1			<1	<1	<1		<1	<1	<1			
sp.															
<u>Nitzschia</u>							<1								
sp.															
<u>Oedogonium</u>			2	<1		2									
sp.															
<u>Oscillatoria</u>			2	2	7									3	
sp.															

Table continued on following page.

METROPOL

RECLAMATION

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Oscillatoria</u>							1								
<u>limnetica</u>															
<u>Paramecium</u>	1														
sp.															
<u>Pediastrum</u>								<1					<1		
<u>borvanum</u>															
<u>Rhizoclonium</u>				14										2	
sp.															
<u>Rhizosolenia</u>									3	6	<1				
<u>eriensis</u>															
<u>Scenedesmus</u>	<1										<1				
sp.															
<u>Schizochlamys</u>				6											
sp.															
<u>Spirocyra</u>							<1								
sp.															
<u>Stephanodiscus</u>														<1	
sp.															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CHICAGO HARBOR (STATION 4-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	6/28	7/18	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Synedra</u>	163	202	35	58	2	3	<1	<1	2	8	2	1	8	21	33
sp.															
<u>Synedra</u>									2	<1		<1	4	4	6
<u>ulna</u>															
<u>Tabellaria</u>	12	32	44	80	8	15	2	5	12	28	26	40	91	52	91
<u>fenestrata</u>															
<u>Tabellaria</u>	<1	2	4	5	<1	4			8	18	6	37	53	40	43
<u>flocculosa</u>															
Unidentified flagellates					42	10									
Unidentified green flagellates	13		4												
Total	487	523	425	651	124	248	1135	42	67	205	292	1164	1522	1074	867

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Amoeba</u>	<1	<1	2	1	2	7		<1							
sp.															
<u>Amphiprora</u>						<1	<1								
sp.															
<u>Amphiprora</u>															2
<u>ornata</u>															
<u>Anabaena</u>													10		
sp.															
<u>Ankistrodesmus</u>									<1	3					
sp.															
<u>Aphanothece</u>	3	<1	3	<1		2									
sp.															
<u>Aphanothece</u>							<1								
<u>nidulans</u>															
<u>Asterionella</u>	32	173	37				4	2	7	42	326	1020	1370	827	425
<u>formosa</u>															
<u>Bosmina</u>							<1	<1							
sp.															
<u>Calothrix</u>					1										
sp.															

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT TO GREATER CHICAGO

TALBE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Characium</u>							1								
sp.															
<u>Chlamydomonas</u>					<1			<1			7	16	16	3	
sp.															
<u>Chroococcus</u>							2								
sp.															
<u>Closteriopsis</u>													2		
sp.															
<u>Cocconeis</u>										<1					
sp.															
<u>Cocconeis</u>															
<u>placentula</u>															
<u>Copepoda</u>	3	<1				<1	2	<1							
sp.															
<u>Cyclops</u>								<1							
sp.															
<u>Cyclotella</u>			2					<1		2					
sp.															
<u>Cyclotella</u>								<1							
<u>ocellata</u>															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter															
	Dates - 1984															
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28	
sp.							<1	<1	2		3		3			
<u>Diatoma</u>				3												
<u>Dictyosphaerium</u>									2	2						
<u>pulchellum</u>											2					
sp.																
<u>Dirobryon</u>						2										
<u>bavaricum</u>																
<u>D.</u>				<1	8	36										
<u>cylindricum</u>																
<u>D.</u>								<1					2			
<u>sertularia</u>																
<u>Fragilaria</u>								32								
sp.																
<u>F.</u>	7	20		53	6					121						
<u>capucina</u>																

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE
MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Fragilaria</u>	29	165	145	285	29	58	167	22	87	115	1840	5360	3860	5100	2870
<u>crononensis</u>															
<u>F.</u>													222	40	47
<u>inflata</u>															
<u>F.</u>	8	38		76	15	56						164	222	66	98
<u>intermedia</u>															
<u>Gomphonema</u>							4	<1				2	3		
sp.															
<u>Gomphosphaeria</u>										5			13		
sp.															
<u>G.</u>															
<u>lacustris</u>															
<u>Heliozoan</u>											5				
sp.															
<u>Keratella</u>			1	<1			<1	<1				3			
sp.															
<u>K.</u>															
<u>cochlearis</u>															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Lynobia</u>							4								
sp.															
<u>Melosira</u>	33	42						3		32		61			41
sp.															
<u>Micractinium</u>						<1									
sp.															
<u>Microspora</u>							<1								
sp.															
<u>Navicula</u>						2	<1	1	47	9	3			3	
sp.															
<u>Nematoda</u>							<1								
sp.															
<u>Nitzschia</u>							<1								
sp.															
<u>N. sigmoidea</u>											3				2
<u>Oedogonium</u>							43								
sp.															

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	8/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Oocystis</u>							<1								
sp.															
<u>Oscillatoria</u>	6			17					2						
sp.															
<u>Q.</u>							2								
<u>limnetica</u>															
<u>Paramecium</u>											3				
sp.															
<u>Pediastrum</u>								<1							
sp.															
<u>Rhizoclonium</u>										4				62	
sp.															
<u>R.</u>	<1		<1					<1	20	9	13	11	22	70	
<u>eriensis</u>															
<u>Rhoicosphenia</u>							<1	1			3				
<u>curvata</u>															
<u>Stephanodiscus</u>		<1											2		
sp.															

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PLANKTON POPULATION ESTIMATES FOR THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN - 1984. COLUMN PLANKTON TOW, CALUMET HARBOR (STATION 6-B, FIGURE 1)

Organisms	Number of Organisms/Milliliter														
	Dates - 1984														
	4/11	4/25	5/23	6/8	7/2	7/18	8/1	9/18	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Synedra</u>	44	222	67	23	<1	2	<1	<1	3	16	20	14	70	137	122
sp.															
<u>Synedra</u>									2	19	9		3	18	13
<u>ulna</u>															
<u>Tabellaria</u>	2	22	38	25	7	34	8	8	39	381	362	225	252	543	383
<u>fenestrata</u>															
<u>T.</u>			<1	5	1	5		8	125	194	69	162	162	250	13
<u>floculosa</u>															
<u>Trachelomonas</u>													2		
sp.															
Unidentified									34						
flagellates															
Unidentified	37														
green															
flagellates															
Total	206	688	295	491	71	279	252	63	402	1226	3349	7393	5688	6714	4096

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Achnanthes</u>	379	45,571	10
<u>affinis</u>			
A.	20		
<u>conspicua</u>			
A.	20		
<u>exigua</u>			
A.	20		
<u>lanceolata</u>			
<u>Amphipleura</u>	80	524	
<u>pellucida</u>			
<u>Amphora</u>	20		
<u>delicatissima</u>			
A.		1,048	
<u>veneta</u>			
<u>Asterionella</u>	120	2,095	
<u>formosa</u>			
<u>Caloneis</u>		524	
<u>ladogensis</u>			
<u>Cocconeis</u>		524	13
<u>pediculus</u>			
<u>Cyclotella</u>	80		
<u>glomerata</u>			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Cyclotella</u>	1,678	25,143	5
<u>kuetzingiana</u>			
C. <u>pseudostelligera</u>	479		
C. <u>quadriiuncta</u>		524	
<u>Cymbella</u>	40	4,714	
<u>prostrata</u>			
<u>Diatoma</u>	120	36,667	
<u>elongatum</u>			
D. <u>elongatum</u>	1,098		
var. minor			
D. <u>vulgare</u>			5
<u>Eucocconeis</u>	20		
<u>lapponica</u>			
<u>Fragilaria</u>	40	3,143	15
<u>bicapitata</u>			
<u>Fragilaria</u>	439	39,286	30
<u>crotonensis</u>			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Fragilaria</u>	2,496	59,714	10
<u>intermedia</u>			
E.	20		
<u>pinnata</u>			
<u>Gomphonema</u>	40		
<u>abbreviatum</u>			
G.	60	2,095	5
<u>olivaceum</u>			
<u>Hantzschia</u>		524	
<u>elongata</u>			
<u>Melosira</u>	120	3,143	
<u>granulata</u>			
<u>Navicula</u>		524	
<u>anglica</u>			
N.	120	1,571	
<u>cryptocephala</u>			
N.	140		3
<u>cryptocephala</u>			
var. <u>veneta</u>			
N.	20	1,571	
<u>exigua</u>			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Navicula</u>	20		
<u>platystoma</u>			
<u>Nitzschia</u>	20		
<u>acicularis</u>			
N. <u>acuta</u>	20		
N. <u>dissipata</u>	20	5,762	
N. <u>fonticola</u>	359	6,810	
N. <u>frustulum</u>	60	1,571	
N. <u>gracilis</u>	40	524	
N. <u>palea</u>	180	524	
<u>Pinnularia</u>		524	
<u>sublinearis</u>			
<u>Rhoicosphenia</u>			
<u>curvata</u>			

Table continued on following page.

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METROPOLITAN WATER RE LAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Stephanodiscus</u>	20	1,571	
<u>astraea</u>			
S.	40		
<u>hantzschii</u>			
S.	120	1,048	
<u>minutus</u>			
<u>Surirella</u>	40		
<u>angustata</u>			
<u>Synedra</u>	220	524	
<u>acus</u>			
S.		1,571	
<u>ulna</u>			
var. <u>chaseana</u>			
<u>Tropidoneis</u>	20		
<u>lepidoptera</u>			
<u>Tabellaria</u>	1,658	21,476	20
<u>fenestrata</u>			
T.			
<u>flocculosa</u>	60		3
Total Diatoms	10,565	270,810	120
<u>Ankistrodesmus</u>		29	
<u>convolutus</u>			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	<u>7/18-8/1</u>	<u>8/1-8/15</u>	<u>11/13-11/27</u>
	----- (Number per square centimeter) -----		
<u>Mougeotia</u>	30	88	
sp.			
<u>Scenedesmus</u>		118	
<u>bijuga</u>			
S.	30	353	
<u>quadricauda</u>			
Total Greens	60	588	
<u>Dinobryon</u>	45	88	
<u>divergens</u>			
<u>Dinobryon</u>	37	295	
<u>sertularia</u>			
Total Chrysophytes	83	383	
<u>Oscillatoria</u>		1,090	
<u>limnetica</u>			
Q.		442	
<u>tenuis</u>			
Total Blue-Greens		1,532	
<u>Glenodinium</u>		59	
<u>borgei</u>			
Total Dinoflagellates		59	
Total	10,707	273,372	120

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Achnanthes</i>			40,964	1,589	658,854	24,927	38	20	48
<i>affinis</i>									
<i>conspicua</i>						402			
<i>exigua</i>			143	15	1,910				
<i>grimaldi</i>		6,548							
<i>hungarica</i>			573						
<i>lanceolata</i>			143						
var. <i>elliptica</i>									
<i>Amphipleura</i>		437		15	3,819				
<i>pellucida</i>									
<i>Amphora</i>		873		60		402	8		8
<i>delicatissima</i>									
<i>veneta</i>	50	437		15			8		8
<i>Asterionella</i>	249	5,238	573	75	3,819		8	60	8
<i>formosa</i>									
<i>Caloneis</i>			143						
<i>ladogensis</i>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Cocconeis</i>			143					20	
<i>pediculus</i>									
<i>C.</i>			143	870					
<i>placentula</i>									
<i>Cyclotella</i>	50								
<i>comensis</i>									
<i>C.</i>	50	873							48
<i>glomerata</i>									
<i>C.</i>									8
<i>iris</i>									
<i>C.</i>			3,294	615	22,917	74,781	160	161	105
<i>kentzingiana</i>									
<i>C.</i>		437							
<i>meneghiniana</i>									
<i>C.</i>		437				402	8		8
<i>ocellata</i>									
<i>C.</i>			15						
<i>pseudostelligera</i>									
<i>C.</i>		437							
<i>quadriurata</i>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/29-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Cymbella</i>									20
<i>affinis</i>									
<i>lanceolata</i>						402			
<i>prostrata</i>	299	7,421	716	45	11,458		46		
<i>turgida</i>									24
<i>Diatoma</i>	299	6,111		240	93,576			7,478	1,906
<i>elongatum</i>									
<i>elongatum</i> var. <i>minor</i>			6,159			71,162	2,399		
<i>tenue</i>		123,532							
var. <i>elongatum</i>									
<i>vulgare</i>	747	437		402	160	462	249		
<i>vulgare</i> var. <i>producta</i>	11,658								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Eudorcia</i>						402			
<i>dactinalis</i>									
var. minor									
<i>Fragilaria</i>			286	105	5,729		53	121	121
<i>bispinata</i>									
<i>E.</i>			573	225		4,925			
<i>constricta</i>									
<i>E.</i>									40
<i>constricta</i>									
var. subsalina									
<i>E.</i>		2,193	3,294		17,188	1,608	153	523	281
<i>croticensis</i>									
<i>E.</i>	5,679	16,587	5,586	720	22,917	8,041	199	342	346
<i>intermedia</i>									
<i>E.</i>	50	437		75	1,910	402			16
<i>pinnata</i>									
<i>Gomphonema</i>	6,078		1,146	210					
<i>abbreviatum</i>									
<i>G.</i>								20	
<i>acuminatum</i>									
var. coronata									
<i>G.</i>							15		
<i>constrictum</i>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	5/1-5/15	5/15-5/24	5/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Gomphonema</i>		23,571	1,146	15	11,458	1,608	313	382	137
<i>olivaceum</i>									
G.					11,458				
<i>parvulum</i>									
<i>Gyrosigma</i>							8		
<i>attenuatum</i>									
<i>Hantzschia</i>		437	143						
<i>elongata</i>									
<i>Melosira</i>		1,310	430	30				40	
<i>granulata</i>									
M.							53		40
<i>islandica</i>									
<i>Navicula</i>			1,003	300	7,639	2,010	8		24
<i>curvirocephala</i>									
N.			716		1,910				
<i>curvirocephala</i>									
var. <i>veneta</i>									
N.			143						
<i>exigua</i>									
N.					45				
<i>platystoma</i>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPLYHTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	6/1-8/15	8/15-8/24	8/27-9/28	9/29-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<i>Navicula</i>									15
<i>protracta</i>									
<i>N. schonfeldii</i>				120					
<i>N. viridula</i>						402			
<i>Nitzschia acicularis</i>	100	873							
<i>N. angustata</i>				15	1,910				
<i>N. angustata</i>							402		
var. <i>acuta</i>									
<i>N. dissipata</i>	149	437	430	150					
<i>N. fonticola</i>			1,862	765	24,826	16,082	84	121	40
<i>N. frustulum</i>		873		105	3,819				24
<i>N. gracilis</i>	50	437	286		15,278	3,216	15		56

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Nitzschia</u>				15					
<u>ignorata</u>									
N. <u>linearis</u>				45				20	32
N. <u>palea</u>	50			165					
N. <u>recta</u>				15					
N. <u>ryhlicionella</u>								20	
var. <u>levidensis</u>									
<u>Pinnularia</u>				15					
<u>viridis</u>									
<u>Rhizosolenia</u>	28								
<u>longiseta</u>									
<u>Sphaeroneis</u>									8
<u>smithii</u>									
<u>Stephanodiscus</u>		437		15	1,910				
<u>astraea</u>									
S. <u>astraea</u>	448	6,984							
var. <u>intermedia</u>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Stephanodiscus</u>				30	5,729				
<u>binderanus</u>									
<u>S.</u> <u>hantzschii</u>	199			135					
<u>S.</u> <u>minus</u>			430		1,910			20	48
<u>Scrippsella</u> <u>ovata</u>	50								
<u>S.</u> <u>ovalis</u>		437		15					
<u>Synedra</u> <u>acuta</u>	50	24,008	430	120	11,458				
<u>S.</u> <u>affinis</u> var. fasciculata	50	873							
<u>S.</u> <u>gaillonii</u>	100	437							
<u>S.</u> <u>nana</u>	349						8		56
<u>S.</u> <u>pulchella</u>	100			30					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

T E AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Synedra</u>						6.031			
<u>tenura</u>									
S. <u>tenura</u>	149						53	161	24
S. <u>ulra</u>					13 368		31	20	32
S. <u>ulra</u> var. <u>chaseana</u>									
<u>Tabellaria</u>		4,365	2,005	480	9,549	804	23	221	281
<u>fenestrata</u>									
D. <u>fiocculosa</u>		873							16
Total Diatoms	27,080	238,777	72,903	7,514	966,319	218,713	3,866	10,232	4,042
<u>Ankistrodesmus</u>	28	56							
<u>braunii</u>									
A. <u>convolutus</u>		196	32		1,617				
A. <u>falcatus</u>		140							
<u>Cladophora</u> sp.					17,790				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Coelastrum</u>		28							
<u>microporum</u>									
<u>Mougeotia</u>		2,181	2,520	43	145,557	7,723			
sp.									
<u>Planktonema</u>		951							
<u>lauerbornii</u>									
<u>Scenedesmus</u>					3,235	368			
<u>acuriformis</u>									
S. <u>nitens</u>	55				1,617	184			
S. <u>dimorphus</u>					3,235				
S. <u>quadricauda</u>					3,235				
<u>Ulothrix</u>	140	168							
<u>unk. 1</u>									
Total Greens	224	3,720	2,552	43	176,286	8,275			
<u>Dinobryon</u>		112							
<u>bavaricum</u>									
D. <u>cylindricum</u>		224							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Dinobryon</u>					809	92			
<u>divergens</u>									
D. <u>sertularia</u>		811	128						
Total Chrysophytes		1,147	128		809	92			
<u>Anabaena</u>					124,532	368			
<u>wisconsinense</u>									
<u>Chroococcus</u>					7,278				
<u>dispersus</u>									
<u>Gomphosphaeria</u>							184		
<u>lacustris</u>									
<u>Lynobia</u>					26,685				
<u>limnerica</u>									
<u>Merismopedia</u>					1,617				
<u>elegans</u>									
<u>Oscillatoria</u>		336							
<u>agardhii</u>									
Q. <u>limnerica</u>		280	1,116		84,908				
<u>Spirulina</u>					809				
<u>laxa</u>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Organisms	4/13-4/26	4/26-5/24	8/1-8/15	8/15-8/24	8/27-9/28	9/28-10/16	11/13-11/27	11/27-12/10	12/10-12/28
	----- (Number per square centimeter) -----								
<u>Spirulina</u>		28							
<u>laxissima</u>									
<u>S. major</u>					809				
Total Blue-Greens		644	1,116		246,638	552			
<u>Gleocodium</u>			32						
<u>hargrei</u>									
Total Pyrrophyta			32						
<u>Trachelomonas</u>		28							
<u>volvocina</u>									
Total Euglenophytes		28							
Total	27,305	244,316	76,731	7,557	1,390,052	227,632	3,666	10,252	4,042

Note: Nondiatom periphyton samples for November 13 through 27, November 27 through December 10, and December 10 through 28, 1984, were destroyed during laboratory painting.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Achnanthes</i>				15,889		194,048	155,048	193	759	22	126
<i>affinis</i>											
<i>A.</i> <i>conspicua</i>				1,637							
<i>A.</i> <i>grinnelii</i>		7									
<i>A.</i> <i>hawkiana</i>											5
<i>A.</i> <i>hungarica</i>						2,381		53	10		
<i>A.</i> <i>lancaolata</i>							18				
var. <i>elliptica</i>											
<i>Amphipleura</i>		7									
<i>alata</i>											
<i>A.</i> <i>pellucida</i>			3,056	327							
<i>Amphora</i>	4					1,190	1,048		30	15	35
<i>delicatissima</i>											
<i>A.</i> <i>holsatica</i>						1,190					

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Amphora</i>					327						
<i> venera</i>											
<i>Asperionella</i>	36	<36		1,222			3,143			15	15
<i> formosa</i>											
<i>Crocosneis</i>	2			<1,310				498	90		
<i> pediculus</i>											
<i> C. placentula</i>								617	45		348
<i>Cyclotella</i>	11										
<i> cornensis</i>											
<i> C. glomerata</i>	13	<7									
<i> C. iris</i>								18		22	
<i> C. keutzingiana</i>				611	<42,887	<32,143	16,762	5,374	698	202	25
<i> C. ocellata</i>				611							
<i> C. pseudostelligera</i>								70			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Cyclotella</i>					327	2,381					
<i>quadrilunata</i>											
<i>Cymbella</i>											22
<i>laterostrata</i>											
C. <i>microcephala</i>		7	679	4,869	5,893						
C. <i>obtusiuscula</i>		7									
C. <i>prostrata</i>		22		1,833	10,804	5,952	3,143	16	20		
C. <i>turgida</i>											15
<i>Diaroma</i>	11>		340			20,238	57,619	88			66
<i>elongatum</i>				443,056	55,327					831	
D. <i>elongatum</i> var. <i>minor</i>			340				1,048	35		711	10
D. <i>vulgare</i>											

Table continued on following page.

METROPOLITAN WATER RELAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<u>Diatoma</u>	75	2,343	288,580								
<u>vulgare</u>											
var. <u>producta</u>											
D. <u>vulgare</u>		22									
var. <u>ovalis</u>											
<u>Fragilaria</u>			340			3,571	1,048	70		37	10
<u>bicapitata</u>											
E. <u>construens</u>					655		1,048				
E. <u>construens</u>	11										
var. <u>subsalina</u>											
E. <u>construens</u>	43										
var. <u>venter</u>											
E. <u>crotonensis</u>	2	15	4,753	22,611	27,172		2,095	105		112	222
E. <u>harrissonii</u>								18			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Fragilaria</i>	316	378	9,846	27,500	13,750	9,524	94,286	1,668	172	1,086	96
<i>intermedia</i>											
<i>F.</i>				982			3,143	35	789	179	45
<i>pinnata</i>											
<i>F.</i>						1,190					
<i>pinnata</i>											
var. <i>lanzettula</i>											
<i>Gomphonema</i>							1,048				
<i>abbreviatum</i>											
<i>G.</i>	224	80	679	1,222				35	789	179	45
<i>olivaceum</i>											
<i>G.</i>										152	
<i>olivaceum</i>											
var. <i>calcerea</i>											
<i>G.</i>				611							
<i>parvulum</i>											
<i>Gyrosigma</i>											10
<i>keutzingii</i>											
<i>Hantzschia</i>	2									7	
<i>alongata</i>											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Meiosira</i>	6		340	611	2,292	1,190	1,048	158		15	
<i>granulara</i>											
M. <i>islandica</i>											101
M. <i>varians</i>						1,190		35			
<i>Meridion</i>								18			
<i>circulata</i>											
<i>Navicula</i>					327					7	
<i>capitata</i>											
N. <i>cryptocephala</i>			340		1,637	3,571	2,095	35	10	22	5
N. <i>cryptocephala</i> var. <i>veneta</i>							5,238		10	7	20
N. <i>lanceolata</i>										7	
N. <i>longirostris</i>											10
N. <i>tripunctata</i>		36								15	15

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	(Number per square centimeter)										
<i>Nitzschia</i>											
<i>acicularis</i>	9	51	679								
N. <i>angustata</i>						2,381					
N. <i>discolorata</i>	4	7		1,833	688	3,571	6,288		20		
N. <i>ferruginea</i>	6	51	3,056		1,310	8,333	23,048	474	152	80	45
N. <i>frustulum</i>					1,310	5,952	8,381	88	20		5
N. <i>gracilis</i>	6		340					70	51	37	61
N. <i>linearis</i>			1,019			2,381	1,048				
N. <i>palea</i>				1,222							
N. <i>recta</i>						2,381	1,048		10		
N. <i>stagnorum</i>		7			327						

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<u>Pinnularia</u>	2										
<u>microstauron</u>											
var. <u>diminuta</u>											
<u>P.</u>							2,381				
<u>viridis</u>											
<u>Phaeocephalia</u>		7							61	7	20
<u>curvata</u>											
<u>P.</u>					327	2,381	2,095	18	10		
<u>stephanodiscus</u>											
<u>astraea</u>											
<u>P.</u>	122	44	679								
<u>astraea</u>											
var. <u>intermedia</u>											
<u>P.</u>	43	7									
<u>hanzschii</u>											
<u>P.</u>				2,444				70		37	15
<u>minusus</u>											
<u>Surirella</u>		7									
<u>ovalis</u>											
<u>Synedra</u>	47	269	4,074	1,222			9,381				
<u>acus</u>											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Synedra</i>			679								
<i>affinis</i>											
var. <i>fasciculata</i>							2,098				
<i>S.</i> <i>gallionii</i>	4		679								
<i>S.</i> <i>nana</i>	72	247	679								
<i>S.</i> <i>multicella</i>	6									22	35
<i>S.</i> <i>ulna</i>	9									30	
<i>S.</i> <i>ulna</i>		7									
var. <i>chaseana</i>											
<i>Tabellaria</i>	4	36	5,432	2,444	9,167	33,333	10,476	53	2	82	131
<i>fenestrata</i>											
<i>T.</i> <i>flocculosa</i>	4	7	1,698		1,310						
Total Diatoms	1,094	3,714	328,307	529,831	180,060	342,826	411,718	8,817	4,726	4,081	1,563

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<u>Ankistrodesmus</u>				63							
<u>braunii</u>											
B. <u>convolutus</u>			54								
<u>Eulachnastera</u>									1,252		
sp.											
<u>Chlamydomonas</u>							58				
<u>sphaerioleka</u>											
<u>Cladophora</u>									4,327		
sp.											
<u>Cosmarium</u>						160					
<u>lenticense</u>											
C. <u>pachydermum</u>					205						
var. <u>pusillum</u>											
C. <u>undulatum</u>				31							
<u>Mougeotia</u>		1,191	4,469	34,816	75,591	4,503	64				
sp. I											
M. <u>sp. II</u>				4,506							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<i>Cedogonium</i>			325								
sp.											
<i>Coocystis</i>								8			
<i>parva</i>											
D.						639					
<i>pusilla</i>											
Total Greens		1,570	4,563	39,527	76,390	4,561	72	5,579			
<i>Dicobryon</i>			487								
<i>cylindricum</i>											
D.				126	205						
<i>divergens</i>											
D.				31							
<i>sertularia</i>											
Total			487	157	205						
Chrysophytes											
<i>Anabaena</i>					1,024						
<i>circinalis</i>											
A.								346		171	
<i>flos-aquae</i>											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<u>Anabaena</u>			217								
<u>inequalis</u>											
A. <u>missouriensis</u>					2,867						
<u>Anabaenopsis</u>							320				
<u>stuartii</u>											
<u>Chroococcus</u>					4,710						
<u>dispersus</u>											
G. <u>limneticus</u>					7,168						
<u>Dactylopusopsis</u>					205						
<u>raphidioides</u>											
<u>Gomphosphaeria</u>				31							
<u>lacustris</u>											
G. <u>lacustris</u>					205						
var. <u>compacta</u>											
<u>Merismopedia</u>					614						
<u>glauca</u>											
M. <u>tenuissima</u>							160				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

POPULATION DENSITY OF PERIPHYTIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Organisms	4/11-4/25	5/23-6/6	6/6-7/2	7/2-7/28	7/18-8/2	8/2-8/21	8/21-9/5	9/5-9/18	10/3-10/17	11/14-11/28	12/12-12/28
	----- (Number per square centimeter) -----										
<u>Capsillareria</u>			4,873	5,602	38,297	6,392	6,570		1,252		
<u>linnetica</u>											
<u>Q.</u>			541				346				
<u>tenella</u>											
<u>Rhodospirillum</u>					1,434						
<u>missouriense</u>											
<u>Spirulina</u>					205						
<u>laxissima</u>											
Total Blue-Greens			5,631	5,633	56,729	6,872	7,562		1,413		
<u>Peridinium</u>					205						
<u>inconspicuum</u>											
Total Pyrrophyta					205						
<u>Trachelomonas</u>	12										
<u>volvocina</u>											
Total Euglenophyta	12										
Total	1,106	3,714	335,995	540,184	276,726	426,088	423,841	8,889	11,728	4,081	1,563

Note: Nondiatom periphyton samples for November 14 through 28, and December 12 through 28, 1984 were destroyed during laboratory painting.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Bacillariophyceae													
<i>Achnanthes</i>													
<i>affinis</i>				79	39	16	4	44	53	6	10		<1
A. <i>clevis</i>									26		<1		
A. <i>clevis</i> var. <i>rostrata</i>											3		
A. <i>conspicua</i>			<1		4	2		18		7	4	5	
A. <i>conspicua</i> var. <i>brevistriata</i>						<1							
A. <i>delicatula</i>					3								<1
A. <i>exigua</i>					3			9			7		
A. <i>haukiana</i>					1					17	9	8	2
A. <i>hungarica</i>				34	3	2			8		4		
A. <i>lanceolata</i>					4	<1					<1		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Achnanthes</i>				9									
<i>lanceolata</i>													
var. <i>rostrata</i>													
<i>A. minutissima</i>					3								
<i>Amphipleura pellucida</i>		15	<1	3	1		7						
<i>Amphora delicatissima</i>	2		<1	17	2	3		18		29	20	12	5
<i>A. ovalis</i>				5					8	9	1		
<i>A. ovalis</i> var. <i>pediculus</i>					1								2
<i>A. veneta</i>			<1	3		1		9		19	5	10	8
<i>Asterionella formosa</i>	247	474	26	89	104	27	61	441	518				
<i>Caloneis ladogensis</i>				7		<1				4	1		
<i>Cocconeis diminuta</i>		4									4		2

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Cocconeis pediculus</i>					1				5	46	8		3
<i>C. placentula</i>						<1			5	3			2
<i>Cyclotella comensis</i>	16	20											
<i>C. iris</i>								9	26		<1	16	3
<i>C. kuetzingiana</i>	3		2	258	1,258	931	2,812	5,006	759	20	68	43	<1
<i>C. meneghiniana</i>	2												
<i>C. ocellata</i>	3	13	2	44	10	9	4		12	4	<1	3	<1
<i>C. pseudostelligera</i>			<1	32	110	15	3						
<i>C. quadriuncta</i>				5	51	4							
<i>C. stelligera</i>	5												
<i>Cymatopleura alliptica</i>										2			
<i>C. solea</i>				3							<1		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Cymbella</i>										4	1		
<i>gracilis</i>													
<i>C. microcephala</i>			<1										
<i>C. perpusilla</i>												5	
<i>C. prostrata</i>										6	2		<1
<i>C. sinuata</i>												3	
<i>C. turgida</i>													<1
<i>C. ventricosa</i>										5	6		6
<i>Diatoma</i>	42	132	13	19	1	<1	25	18	49				
<i>elongatum</i>				68	5								
<i>D. elongatum</i> var. minor													
<i>D. vulgare</i>									5				
<i>D. vulgare</i> var. producta		4	2										

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Diploneis</i>										2			
<i>elliptica</i>													
D. <i>ovalis</i>					1						1		<1
D. <i>ovalis</i>							3						
var. <i>oblongella</i>													
<i>Epithemia</i>										2			
<i>zebra</i>													
<i>Fragilaria</i>	8	52	3	57	19	10	3		58	62	43	127	28
<i>bicapitata</i>													
E. <i>construens</i>			33	188	25	9	11		32				
<i>Fragilaria</i>										6	5	15	
<i>construens</i>													
var. <i>subsalina</i>													
E. <i>crotonensis</i>	1,211	1,417	189	1,612	268	53	179	476	1,289	312	136	1,215	<1
E. <i>harrissonii</i>										6	3	3	
E. <i>intermedia</i>	30	112	38	45	12	3	45	62	87	22	13	5	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Enagilaria</u>													
<u>pinnata</u>		4		6	5	3			34	40	93	46	44
<u>E.</u>								9			<1	7	
<u>pinnata</u>													
var. <u>lanzettula</u>													
<u>Gomphonema</u>					1	<1							
<u>abbreviatum</u>													
<u>G.</u>													<1
<u>gracile</u>													
<u>G.</u>					1		19	8		6	<1		<1
<u>olivaceum</u>													
<u>G.</u>											<1		
<u>olivaceum</u>													
var. <u>calcareo</u>													
<u>G.</u>				4									
<u>parvulum</u>													
<u>Gyrosigma</u>													
<u>kützingii</u>										2			<1
<u>Hantzchia</u>	18	24	<1	4	1				20				
<u>elongatum</u>													
<u>Melosira</u>	43	38	2	18	2	5	14	9	43	27	5	39	67
<u>granulata</u>													

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Melosira islandica</i>		19			2		14		14	30	22	69	40
<i>M. varians</i>			<1								1		
<i>Navicula anglica</i>	3			6		<1			8	10	1		<1
<i>N. bacillaris</i>				6									
<i>N. binodis</i>			<1										
<i>N. capitata</i>		4		3							<1		
<i>N. cryptocephala</i>		6		18	23	4			32	2	8		
<i>N. cryptocephala</i> var. <i>veneta</i>			<1	62	17	8	4		5	15	12		<1
<i>N. cuspidata</i>				3									
<i>N. exigua</i>			3	1	2	3				20	6		
<i>N. gastrum</i>				31									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Navioula</i>													
<u>grimmei</u>						<1							
N. <u>laterostrata</u>									8				
N. <u>muralis</u>			<1		3			9					
N. <u>placentula</u> var. <u>rostrata</u>										2			
N. <u>platystoma</u>											1		1
N. <u>pupula</u>			<1	26	5	4		9					
N. <u>reinhardtii</u>													<1
N. <u>secura</u>	2												
N. <u>subhamulata</u>				1									
N. <u>tripunctata</u>				3									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Navicula verecunda</i>			<1										
<i>Nedium dubium</i>				1									
<i>Nitzschia acicularis</i>	40	322	2	13	2	1		9					
<i>N. angustata</i>										2	7		
<i>N. dissipata</i>			<1	38	12	7		9	23				
<i>N. fonticola</i>	3	93	7	148	29	8	60	212	217	6	15	13	
<i>N. frustulum</i>				10	5	3	4		38	9	17	13	<1
<i>N. gracilis</i>	5	61	12	23	3			167	162		4		
<i>N. hungarica</i>								9	12				
<i>N. linearis</i>	3	33	2	5		<1				2	<1		
<i>N. palea</i>		33		8	1								
<i>N. paleacea</i>			<1										

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Nitzschia</i>					1	<1	3	9					
<u>recta</u>													
N. <u>stagnorum</u>				6									
N. <u>thermalis</u>				6									
N. <u>tryblionella</u>													2
var. <u>levidensis</u>													
<i>Pinnularia</i>						<1							
<u>leptosoma</u>													
E. <u>rupestris</u>													<1
<i>Rhizosolenia</i>	11	3	3	1	6		4						
<u>eriensis</u>													
R. <u>longiseta</u>	21	9	1										
<i>Rhoicosphenia</i>											<1		
<u>curvata</u>													
<i>Scoliopleura</i>													2
<u>peisonis</u>													

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Stephanodiscus</u>	5	11	5	3	1	<1	3		23	17	25	35	43
<u>astraea</u>													
<u>S. astraea</u>	155	297	5										
var. <u>intermedia</u>													
<u>S. hantzschii</u>	14	9	1	3	1								
<u>S. minutus</u>			5	88	17	4	4		8	9	5	5	
<u>Surirella</u>				11					8				
<u>angustata</u>													
<u>S. ovalis</u>						<1							
<u>Synedra</u>	2,587	3,620	140	63	39	4	51	9	35		<1		
<u>acua</u>													
<u>S. affinis</u>	18	57	12										
var. <u>fasciculata</u>													
<u>S. gaillonii</u>	80	247	2										
<u>S. nana</u>	24	64						97			2		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Synedra</u>											<1		
<u>parasitica</u>													
S. <u>ulna</u>			31	31	1		61	53	28	11	2	30	
var. <u>chaseana</u>													
S. <u>ulna</u>													<1
var. <u>impressa</u>													
<u>Tabellaria</u>	825	2,018	524	1,739	543	106	317	2,397	2,503	1,066	324	2,136	18
<u>fenestrata</u>													
T. <u>flocculosa</u>	18	132	31		45	<1	6	123	182			296	13
<u>Tropidoneis</u>											2		
<u>lepidoptera</u>													
Chlorophyceae													
<u>Ankistrodesmus</u>				2			1	1					
<u>braunii</u>													
A. <u>convolutus</u>	7	20	4	2		<1	11	10	12	4	<1	15	19
A. <u>falcatus</u>		3				<1			5		<1		2
A. <u>falcatus</u>		<1											
var. <u>acicularis</u>													

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Ankistrodesmus</u>					<1								
<u>fractus</u>													
<u>Botryococcus</u>									2				
<u>braunii</u>													
B.					<1								
<u>protuberans</u>													
var. minor													
<u>Chlamydomonas</u>	4						2						19
<u>globosa</u>													
C.							10						
<u>sphagnicola</u>													
<u>Cladophora</u>			9										
sp. 1													
<u>Closteriopsis</u>		1	<1						1				2
<u>longissima</u>													
C.			<1		<1								
<u>longissima</u>													
var. tropica													
<u>Cosmarium</u>	<1												
<u>ocellatum</u>													
var. incrassatum													
C.			<1	1	4			3	2				
<u>pachydermum</u>													
var. pussillum													

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Crucigenia</i>						<1		6	2				
<i>quadrata</i>													
<i>Dictyosphaerium</i>			<1					1			2		
<i>pulchellum</i>													
<i>Franceia</i>									2				
<i>ovalis</i>													
<i>Gleocystis</i>					4								
<i>vesiculosa</i>													
<i>Kirchneriella</i>							<1						13
<i>subsolitaria</i>													
<i>Lagerheimia</i>					<1	<1							
<i>longiseta</i>													
<i>Micractinium</i>			2										
<i>pusillum</i>													
<i>Mougeotia</i>								2				17	14
sp.													
<i>Oocystis</i>				<1									
<i>elliptica</i>													
<i>parva</i>			<1	2	14	3	10	15	3		8	10	39
<i>pusilla</i>				<1		5		6					

Table continued on following page.

METROPLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Oocystis</u>						<1		1	2			2	
<u>solitaria</u>													
<u>Quadrigula</u>		3		1	3								
<u>lacustris</u>													
<u>Scenedesmus</u>								14	6				
<u>acutiformis</u>													
<u>S. bijuga</u>		6		2	2	<1	10	3	3		6	16	3
<u>S. dimorphus</u>									6				
<u>S. opoliensis</u>					5								
<u>S. quadricauda</u>		2			<1	4	3	14	15	5	6	13	
<u>Schizochlamys</u>		1											
<u>compacta</u>													
<u>Selenastrum</u>													
<u>minus</u>			<1		<1	<1	4			<1	3	2	3
<u>Stichococcus</u>	84	129					61	30					86
<u>bacillaris</u>													
<u>Tetraedron</u>													
<u>minimum</u>					<1								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Chrysophyceae													
<i>Diceras</i>					3	2	1						
sp.													
<i>Dinobryon</i>	35	19	3				76	50		8		5	
<i>bavaricum</i>													
<i>D. cylindricum</i>	57	73	90										
<i>D. divergens</i>				174	128	13	<1	10	113	46	26	89	125
<i>D. sertularia</i>	1,017	806	87	161	118	136	41	29	62	10		13	19
Heterokontae													
<i>biflagellate</i>						2							
Myxophyceae													
<i>Anabaena</i>				117	120	8				9			
<i>circinalis</i>													
<i>A. flos-aquae</i>		41											
<i>A. scheremetievi</i>											4	5	
<i>A. wisconsinense</i>				3		<1			10	5	6		

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Aphanocapsa</u> <u>delicatissima</u>	1							4	8				2
A. <u>elachista</u>								1					
A. <u>elachista</u> var. <u>conferta</u>	<1												
<u>Aphanothece</u> <u>nidulans</u>	<1			<1	2	3	9	9	2				
<u>Chroococcus</u> <u>dispersus</u>					2	2	3	1	2			2	3
M. <u>dispersus</u> var. <u>minor</u>		1	<1			<1	<1						
C. <u>limneticus</u>				7	10	12	18	12					13
C. <u>minutus</u>			<1										
C. <u>varius</u>				3									
<u>Coelosphaerium</u> <u>pallidum</u>		<1											

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<u>Gleotheca</u>							2						
<u>rupestris</u>													
<u>Gomphosphaeria</u>							<1	4	5		4	8	2
<u>lacustris</u>													
<u>G.</u>				<1	<1	<1		7	3		5	3	
<u>lacustris</u>													
var. <u>compacta</u>													
<u>Merismopedia</u>					<1				2		10		
<u>glauca</u>													
<u>M.</u>				2									
<u>tenuissima</u>													
<u>Oscillatoria</u>	17		27										404
<u>agardhii</u>													
<u>Q.</u>	291	448	80	21	14		31		164	7	12	37	96
<u>limnetica</u>													
<u>Q.</u>													44
<u>lutea</u>													
<u>Q.</u>								12	19				
<u>subbrevis</u>													
<u>Q.</u>		197						92		19		152	
<u>tenuis</u>													
<u>Spirulina</u>	<1		<1										
<u>laxissima</u>													

Table continued on following page.

METROPLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Dinophyceae													
<i>Glenodinium</i>	2	3	<1	5	5	5	8		2				
<i>borgei</i>													
<i>G.</i>							1						
<i>pulvisculus</i>													
<i>Peridinium</i>				4	<1	<1		3					
<i>inconspicuum</i>													
<i>P.</i>									2		<1		
<i>willei</i>													
Euglenophyceae													
<i>Euglena</i>	<1												
<i>acus</i>													
<i>E.</i>				1					2				
<i>proxima</i>													
<i>Lepocinclis</i>	6	2											
<i>sphagnophila</i>													
<i>Trachelomonas</i>					<1								
<i>volvocina</i>													
Cryptophyceae													
<i>Cryptomonas</i>	1	2	<1		8			9	26		<1	2	2
<i>erosa</i>													
<i>Chroomonas</i>									3				
<i>nordstedtii</i>													

Table continued on following page.

METROPLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
Total Diatoms	5,444	9,347	1,111	4,996	2,697	1,261	3,734	9,248	6,323	1,871	1,018	4,159	310
Total Nondiatoms	1,529	1,759	313	512	453	209	303	350	485	115	102	391	823
Total Algae	6,973	11,106	1,424	5,508	3,150	1,470	4,037	9,598	6,808	1,986	1,120	4,550	1,133

Note: Density units = organisms per mL.

3METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
Bacillariophyceae									
<i>Achnanthes affinis</i>							23	27	14
<i>A. biasoletiana</i>								2	<1
<i>A. clevei</i>					21				
<i>A. clevei</i>							2		
var. rostrata									
<i>A. coarctata</i>									
var. elliptica									
<i>A. conspicua</i>				8	9	<1	3		1
<i>A. delicatula</i>									<1
<i>A. exigua</i>					3			8	<1
<i>A. exigua</i>								3	
var. heterovalvata									
<i>A. grimmei</i>						16			
<i>A. haukiana</i>									
<i>A. hungarica</i>						4	<1	6	2
<i>A. kolbei</i>									
<i>A. lanceolata</i>	2	4							
<i>A. lanceolata</i>	7					3			
var. elliptica									
<i>A. lanceolata</i>	2								
var. rostrata									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Achnanthes marginulata</u>		6		3		<1			
<u>A. minutissima</u>								11	
<u>A. montana</u>						<1			
<u>Amphipleura pellucida</u>					4	<1	1		
<u>Amphiprora ornata</u>						2			
<u>Amphora delicatissima</u>	13		9	7	10	2	3	66	2
<u>A. normanii</u>						<1			
<u>A. ovalis</u>									<1
<u>A. veneta</u>	3	11	11	7		2	2	2	2
<u>Asterionella formosa</u>	192	2,196	1,845	693	366	14	68	51	20
<u>Caloneis bacillum</u>									
<u>C. zachariasii</u>						<1			
<u>Cocconeis diminuta</u>	2					<1		2	<1
<u>C. pediculus</u>							2	2	<1
<u>C. placentula</u>	3	6						4	2
<u>Coscinodiscus lacustris</u>					4	6			
<u>Cyclotella glomerata</u>	127	51	16	36	64	12	11	49	<1
<u>C. iris</u>									
<u>C. kuetzingiana</u>	39	57	14	22	12	12	293	1,364	543
<u>C. meneghiniana</u>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

nisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>C. ocellata</i>	79	42	17	3	3		29	1	<1
<i>C. pseudostelligera</i>							15	48	9
<i>C. quadriiuncta</i>	6	6		7	3		28	27	4
<i>C. stelligera</i>	19	20	4		7	1	2		
<i>Cymatopleura elliptica</i>									
<i>C. solea</i>									
<i>Cymbella amphicephala</i>									
<i>C. microcephala</i>	5	16			7	4	7	9	
<i>C. prostrata</i>						<1	<1		<1
<i>C. pusilla</i>									
<i>C. sinuata</i>								2	
<i>C. turgida</i>	3								
<i>C. ventricosa</i>			4						
<i>Diatoma elongatum</i>		558	1,145	123	152	8	4	3	<1
<i>D. minutum</i>							13	17	3
<i>D. minor</i>	18								
<i>D. grande</i>									
<i>D. grande</i>				14	12	4			
<i>D. grande roducta</i>									
<i>D. grande ovalis</i>	5		4		3				
<i>D. grande</i>									
<i>D. grande pusilla</i>									<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Diploneis puella</u>									
<u>Epithemia sorex</u> var. <u>gracilis</u>									
<u>Fragilaria bicapitata</u>			39			3	5	6	9
<u>E. capucina</u>	116	4							
<u>E. construens</u>							72	22	2
<u>E. construens</u> var. <u>subsalina</u>									
<u>E. crotonensis</u>	21	362	499	1,576	1,090	233	863	130	31
<u>E. harrissonii</u>	2	4							
<u>E. harrissonii</u> var. <u>dubia</u>	16								
<u>E. harrissonii</u> var. <u>rhomboides</u>									
<u>E. intermedia</u>	41	131	36	32	64	44	70	55	13
<u>E. lapponica</u>									
<u>E. pinnata</u>		23	13	7	23	3	18	21	5
<u>E. pinnata</u> var. <u>lanzettula</u>								1	
<u>Gomphonema abbreviatum</u>						<1			
<u>G. bohemicum</u>								2	

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEI RER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

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Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>Gomphonema gracile</i>									
<i>G. olivaceum</i>						<1		6	<1
<i>G. olivaceum</i> var. <i>minutissima</i>								2	<1
<i>G. parvulum</i>	2	4					2		
<i>Hantzschia amphioxys</i>									
<i>H. elongatum</i>	4	48	37	11	15		2		<1
<i>Melosira granulata</i>	224	294	126	4	33	4	6	16	6
<i>M. islandica</i>	100	190	79	15	27			5	2
<i>M. varians</i>	6	16							
<i>Navicula anglica</i>	3	11	4					5	1
<i>N. bacillaria</i>									<1
<i>N. capitata</i>	3					<1		3	<1
<i>N. cryptocephala</i>	6		4		11	1	12	30	6
<i>N. cryptocephala</i> var. <i>intermedia</i>	19					<1			
<i>N. cryptocephala</i> var. <i>veneta</i>	5		14				9	20	10
<i>N. exigua</i>	5					<1			3
<i>N. hungarica</i>									
<i>N. hungarica</i> var. <i>lunebergensis</i>						<1			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>Navicula kotschyi</i>	3								
<i>N. laterostrata</i>								1	
<i>N. longirostris</i>						<1			
<i>N. minima</i>									
<i>N. muralis</i>								4	
<i>N. mutica</i>						<1			
<i>N. mutica</i>			4						
var. <i>tropica</i>									
<i>N. platystoma</i>							1		
<i>N. pupula</i>		6	4				3	1	<1
<i>N. pupula</i>	5								
var. <i>rectangularis</i>									
<i>N. secura</i>		11				4			
<i>N. tripunctata</i>									
<i>N. unknown</i>							1		
<i>Nitzschia acicularis</i>				108	97	2	1		
<i>N. angustata</i>		5							<1
<i>N. dissipata</i>	3		4	18	7	1	4	8	<1
<i>N. fonticola</i>	28	9	11	7	39	8	94	67	6
<i>N. frustulum</i>	3			4	11	<1	3	15	2
<i>N. gracilis</i>		79	27	22	80	4	<1	1	
<i>N. hungarica</i>									

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>Nitzschia linearis</i>					11	<1		1	
<i>N. palea</i>		6			3	<1	<1		<1
<i>N. punctata</i>								2	
<i>N. recta</i>	5						1	3	<1
<i>N. thermalis</i>							<1		
<i>N. thermalis</i> var. minor									
<i>N. tryblionella</i> var. levidensis									
<i>Pinnularia fasciata</i>									
<i>P. microstauron</i> fo. diminuta									
<i>Rhizosolenia ariensis</i>		4		4	4	2	1	<1	
<i>R. longiseta</i>	3	13	7	9	18				<1
<i>Rhoicosphenia curvata</i>	2		5				1		
<i>Stauroneis parvula</i>	2								
<i>Stephanodiscus astraea</i>	349	63	54	8	11	6	8	11	1
<i>S. astraea</i>	1,353	3,712	1,929	310	376	50			
var. intermedia									
<i>S. hinderana</i>				7					
<i>S. hantzschii</i>	175	847	259	70	43	10		31	<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION
 DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

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Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Stephanodiscus minutus</u>							68	126	13
<u>Surirella angustata</u>	2			4				1	<1
<u>S. ovata</u>	2	10							
<u>Synedra acus</u>	41	1,266	1,853	2,595	2,621	24	20	21	<1
<u>S. affinis</u>						3			
<u>S. affinis</u>	8	6	16	28	43	13			
var. fasciculata									
<u>S. gaillonii</u>		5	56	94	297	60			
<u>S. nana</u>	16				6	<1			
<u>S. ulna</u>		4							
<u>S. ulna</u>							25	3	<1
var. chaseana									
<u>Tabellaria fenestrata</u>	207	263	571	1,678	1,929	356	823	141	57
<u>T. flocculosa</u>	25	38	16	103	106	27	20	3	<1
<u>Tetracyclus emarginatus</u>									
Chlorophyceae									
<u>Ankistrodesmus braunii</u>				<1			3		
<u>A. convolutus</u>	7	15	38	3	9	<1			
<u>A. falcatus</u>			4			<1			
<u>Botryococcus protuberans</u>								4	
var. minor									
<u>B. sudeticus</u>									<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION
 DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Stephanodiscus minutus</u>							68	126	13
<u>Surirella angustata</u>	2			4				1	<1
<u>S. ovata</u>	2	10							
<u>Synedra acus</u>	41	1,266	1,853	2,595	2,621	24	20	21	<1
<u>S. affinis</u>						3			
<u>S. affinis</u> var. fasciculata	8	6	16	28	43	13			
<u>S. gaillonii</u>		5	56	94	297	60			
<u>S. nana</u>	16				6	<1			
<u>S. ulna</u>		4							
<u>S. ulna</u> var. chaseana							25	3	<1
<u>Tabellaria fenestrata</u>	207	263	571	1,678	1,929	356	823	141	57
<u>T. flocculosa</u>	25	38	16	103	106	27	20	3	<1
<u>Tetracyclus emarginatus</u>									
Chlorophyceae									
<u>Ankistrodesmus braunii</u>				<1			3		
<u>A. convolutus</u>	7	15	38	3	9	<1			
<u>A. falcatus</u>			4			<1			
<u>Botryococcus protuberans</u> var. minor								4	
<u>B. sudeticus</u>									<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>Micractinium pusillum</i>									
<i>Mougeotia</i> sp.							9		
<i>Nephrocytium agardhianum</i>									
<i>N. ecdysiscepanum</i>									
<i>Oocystis naegeli</i>	4								
<i>O. parva</i>				6	3	4	18	2	13
<i>O. pusilla</i>								5	3
<i>O. solitaria</i>									<1
<i>Planktosphaeria gelatinosa</i>					2				
<i>Quadrigula closterioides</i>									
<i>Q. lacustris</i>		<1							<1
<i>Scenedesmus abundans</i>									<1
<i>S. acutiformis</i>									
<i>S. bijuga</i>	2	8		3		2		5	
<i>S. brasiliensis</i>									2
<i>S. dimorphus</i>									7
<i>S. hystrix</i>									
<i>S. opoliensis</i>							2		3
<i>S. quadricauda</i>	3						4	25	2
<i>Selenastrum minutus</i>							1		
<i>S. westii</i>	6								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Stichococcus bacillaris</u>			16	99	141	7			2
<u>Tetraedron minimum</u>									
Chrysophyceae									
<u>Chroomonas nordstedtii</u>						<1			
<u>Diceras sp.</u>								<1	<1
<u>Dinobryon bavaricum</u>			10	41	32	<1			
<u>D. cylindricum</u>		4	148	103	39	48			
<u>D. divergens</u>						13	207	82	14
<u>D. sertularia</u>			66	725	827	42	184	61	95
<u>D. sociale</u>	1								
<u>Gonyostomum semen</u>		<1							
<u>Mallomonas tonsurata</u>								5	<1
Xanthophyceae									
<u>Chlorochromonas minuta</u>		<1							
Myxophyceae									
<u>Anabaena affinis</u>									
<u>A. circinalis</u>						<1			
<u>A. flos-aquae</u>									
<u>A. helicoida</u>				8					
<u>A. inaequalis</u>	9				3				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<u>Anabaena scheremetievi</u>									
<u>A. wisconsinense</u>								2	
<u>A. unispora</u>		20							
<u>Aphanocapsa delicatissima</u>				1					
<u>A. pulchra</u>						<1			
<u>Aphanothece gelatinosa</u>									<1
<u>A. microscopica</u>									
<u>A. nidulans</u>				1	<1		<1		5
<u>Chroococcus dispersus</u>		<1	<1				1		<1
<u>C. dispersus</u>			2	<1	2				2
var. minor									
<u>C. limneticus</u>		6					7	9	7
<u>C. minutus</u>		<1							
<u>Gomphosphaeria aponina</u>		<1							
<u>G. lacustris</u>						<1		<1	
<u>G. lacustris</u>							<1	<1	
var. compacta									
<u>Gleothece rupestris</u>									
<u>Lyngbia limnetica</u>	172								
<u>Merismopedia glauca</u>									
<u>Oscillatoria agardhii</u>	27		23		22	30	3		<1
<u>O. limnetica</u>		230	428	592	690	83	9		

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
<i>Oscillatoria minima</i>									
<i>O. nigra</i>			17	18					
<i>O. rubescens</i>			6	48					
<i>O. tenuis</i>				94	257	4			
<i>Rhabdoderma irregulare</i>									
<i>Spirulina laxa</i>			2						
<i>S. laxissima</i>					1	3		<1	
Dinophyceae									
<i>Ceratium hirundinella</i>									<1
<i>Cystodinium cornifax</i>	1								
<i>Glenodinium armatum</i>						1			
<i>G. borgei</i>						<1	6	10	
<i>G. pulvisculus</i>									
<i>Peridinium inconspicuum</i>								3	
<i>P. willei</i>									
Euglenophyceae									
<i>Euglena acus</i>									
var. <i>rigita</i>									
<i>E. cyst</i>		<1							
<i>E. proxima</i>		<1							
<i>Trachelomonas volvocina</i>						<1			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) MARCH 2 TO AUGUST 15, 1984

Organisms	3/2	4/13	4/26	5/24	6/8	6/28	7/19	8/1	8/15
Cryptophyceae									
<i>Cryptomonas erosa</i>		<1						<1	<1
<i>Chroomonas nordstedtii</i>									
Diatoms	3,335	10,407	8,736	7,637	7,652	942	2,644	2,471	798
Nondiatoms	250	301	767	1,649	2,033	271	467	232	181
Total Algae	3,585	10,708	9,503	9,286	9,685	1,213	3,111	2,703	979

Note: Density units = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
Bacillariophyceae							
<u>Achnanthes affinis</u>	44	39	12	43	<1	13	<1
<u>A. biasoletiana</u>							
<u>A. clevei</u>							
<u>A. clevei</u>							
var. rostrata							
<u>A. coarctata</u>				2			
var. elliptica							
<u>A. conspicua</u>	17	2	<1	11	3		
<u>A. delicatula</u>							
<u>A. exigua</u>	2			2	<1	4	
<u>A. exigua</u>							
var. heterovalvata							
<u>A. grimmei</u>							
<u>A. haukiana</u>				4	<1		
<u>A. hungarica</u>	3		10	2	8		
<u>A. kolbei</u>	2						
<u>A. lanceolata</u>		2	<1				
<u>A. lanceolata</u>				5			
var. elliptica							
<u>A. lanceolata</u>	2		1		<1		
var. rostrata							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Achnanthes marginulata</i>							
<i>A. minutissima</i>							
<i>A. montana</i>							
<i>Amphipleura pellucida</i>	3						
<i>Amphiprora ornata</i>					<1		
<i>Amphora delicatissima</i>	17	5	7	11	7	4	<1
<i>A. normanii</i>				2			
<i>A. ovalis</i>			3		1	9	
<i>A. veneta</i>	11				3		1
<i>Asterionella formosa</i>	814	314	165	135		41	
<i>Caloneis bacillum</i>							<1
<i>C. zachariasii</i>							
<i>Cocconeis diminuta</i>				<1			
<i>C. pediculus</i>	1			<1	<1		
<i>C. placentula</i>	2		1		1		<1
<i>Coscinodiscus lacustris</i>							
<i>Cyclotella glomerata</i>							<1
<i>C. iris</i>	5	2	3	2	3	3	1
<i>C. kuetzingiana</i>	1,760	3,001	499	428	45	186	
<i>C. meneghiniana</i>							<1

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

 AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Cyclotella ocellata</i>	5			2		4	<1
<i>C. pseudostelligera</i>	5	2				2	
<i>C. quadriiuncta</i>							
<i>C. stelligera</i>		2					<1
<i>Cymatopleura elliptica</i>					<1		
<i>C. solea</i>	3					2	
<i>Cymbella amphicephala</i>	2						<1
<i>C. microcephala</i>							
<i>C. prostrata</i>	5						
<i>C. pusilla</i>							<1
<i>C. sinuata</i>		2					
<i>C. turgida</i>							
<i>C. ventricosa</i>			2	<1			2
<i>Diatoma elongatum</i>	17	52	35	22		5	
<i>D. elongatum</i>	4		<1				
var. minor							
<i>D. tenue</i>							
<i>D. vulgare</i>						<1	
<i>D. vulgare</i>							
var. producta							
<i>Diploneis ovalis</i>						<1	
<i>D. ovalis</i>			<1				
var. pusilla							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Diploneis puella</i>				2			
<i>Epithemia sorex</i>							<1
var. <i>gracilis</i>							
<i>Fragilaria bicapitata</i>	10	2	22	49	42	64	8
<i>E. capucina</i>							
<i>E. construens</i>	12	19	15				<1
<i>E. construens</i>				30	7	16	
var. <i>subsalina</i>							
<i>E. crotonensis</i>	129	348	549	1,344	313	2,216	<1
<i>E. harrissonii</i>	3		2	2	1	2	
<i>E. harrissonii</i>							
var. <i>dubia</i>							
<i>E. harrissonii</i>				2			
var. <i>rhomboides</i>							
<i>E. intermedia</i>	34	43	21	57	11	12	
<i>E. lapponica</i>							<1
<i>E. pinnata</i>	40	20	22	11	23	18	5
<i>E. pinnata</i>				5			<1
var. <i>lanzettula</i>							
<i>Gomphonema abbreviatum</i>	5	4	2		<1		
<i>G. bohemicum</i>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Gomphonema gracile</i>							<1
<i>G. olivaceum</i>			1	3	<1		
<i>G. olivaceum</i> var. minutissima							
<i>G. parvulum</i>							
<i>Hantzschia amphioxys</i>						2	
<i>H. elongatum</i>	3		1				
<i>Melosira granulata</i>	41	87	28	29	8	23	7
<i>M. islandica</i>			14	10	19	5	7
<i>M. varians</i>							
<i>Navicula anglica</i>	9	5	4	6	2		<1
<i>N. bacillaria</i>							
<i>N. capitata</i>				7		2	
<i>N. cryptocephala</i>	7	2	3	18	3	<1	
<i>N. cryptocephala</i> var. intermedia							
<i>N. exigua</i>	5		3	14	4	5	
<i>N. hungarica</i>		4					
<i>N. hungarica</i> var. lunebergensis							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Navicula kotschyi</i>							
<i>N. laterostrata</i>				6			
<i>N. longirostris</i>							
<i>N. minima</i>					3		
<i>N. muralis</i>							
<i>N. mutica</i>							
<i>N. mutica</i>							
var. <i>tropica</i>							
<i>N. platystoma</i>					1		
<i>N. pupula</i>			3	2		2	
<i>N. pupula</i>							
var. <i>rectangularis</i>							
<i>N. secura</i>							
<i>N. tripunctata</i>					1	3	
<i>N. unknown</i>							
<i>Nitzschia acicularis</i>							
<i>N. angustata</i>	1				4		
<i>N. dissipata</i>				4			<1
<i>N. fonticola</i>	69	63	40	113	10	19	
<i>N. frustulum</i>	17	9	10	16	10		
<i>N. gracilis</i>	37	13	28	68	6	22	
<i>N. hungarica</i>	3		1				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>N. linearis</i>	2						
<i>N. palea</i>							
<i>N. punctata</i>							
<i>N. recta</i>	5		2	5			
<i>N. thermalis</i>							
<i>N. thermalis</i> var. minor							<1
<i>N. tryblionella</i> var. levidensis							<1
<i>Pinnularia fasciata</i>				<1			
<i>P. microstauron</i> fo. diminuta		2					
<i>Rhizosolenia ariensis</i>	2	3	<1			<1	
<i>R. longiseta</i>	<1			<1		<1	
<i>Rhoicosphenia curvata</i>	2		2				
<i>Stauroneis parvula</i>							
<i>Stephanodiscus astraes</i>	17		7	18		17	7
<i>S. astraes</i> var. intermedia		2			13		
<i>S. binderana</i>	19						
<i>S. hantzschii</i>	5			3			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Stephanodiscus minutus</i>	62	23	14	16	3	19	<1
<i>Surirella angustata</i>				2		3	
<i>S. ovata</i>						2	
<i>Synedra acus</i>	47	57	9				
<i>S. affinis</i>							
<i>S. affinis</i> var. <i>fasciculata</i>						2	
<i>S. gaillonii</i>							
<i>S. nana</i>							
<i>S. ulna</i>							<1
<i>S. ulna</i> var. <i>chaseana</i>	13	12	4		1	26	
<i>Tabellaria fenestrata</i>	609	1,319	779	1,337	614	1,620	17
<i>T. flocculosa</i>	39	86	18	41	3	124	9
<i>Tetracyclus emarginatus</i>							<1
Chlorophyceae							
<i>Ankistrodesmus braunii</i>						<1	
<i>A. convolutus</i>	4	1	2	11	5	8	9
<i>A. falcatus</i>	<1	2	3		<1		
<i>Botryococcus protuberans</i> var. <i>minor</i>							
<i>B. sudeticus</i>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER LANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Chlamydomonas globosa</i>						3	
<i>Chlorella vulgaris</i>							
<i>Cladophora</i> sp. 1							
<i>Closteriopsis longissima</i>				<1		<1	
<i>C. longissima</i> var. <i>tropica</i>							
<i>Coelastrum microporum</i>							
<i>Cosmarium ocellatum</i> var. <i>incrassatum</i>							
<i>C. pachydermum</i> var. <i>pussillum</i>					<1	<1	<1
<i>Crucigenia quadrata</i>	7						
<i>C. tetrapedia</i>		<1					
<i>Dactylococcus infusionium</i>							
<i>Dictyosphaerium pulchellum</i>			<1				
<i>Franceia ovalis</i>	2	10	<1				
<i>Gleocystis gigas</i>							
<i>Golenkinia radiata</i>		2					
<i>Kirchneriella contorta</i>			2			4	
<i>K. obesa</i>							
<i>Lagerheimia longiseta</i>							
<i>L. quadriseta</i>	<1		<1				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<u>Micractinium pusillum</u>		11					
<u>Mougeotia</u> sp.		5		15	7	13	
<u>Nephrocytium acardhianum</u>		3					
<u>N. ecdysiscepanuum</u>					21		
<u>Oocystis</u>							
<u>O. parva</u>	14	1		1	4	6	5
<u>O. pusilla</u>		1	3	2	3		
<u>O. solitaria</u>							
<u>Planktosphaeria gelatinosa</u>							
<u>Quadrigula closterioides</u>						3	
<u>Q. lacustris</u>							2
<u>Scenedesmus abundans</u>	1						
<u>S. acutiformis</u>					5		3
<u>Scenedesmus bijuca</u>	6	10	3	7	5	11	5
<u>S. brasiliensis</u>							
<u>S. dimorphus</u>	3	11	3	6	?		
<u>S. hystrix</u>							3
<u>S. opoliensis</u>							
<u>S. quadricauda</u>	1	24	13	19	10		6
<u>Selenastrum minutus</u>	<1	2	<1	2	1	<1	<1
<u>S. westii</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<u>Stichococcus bacillaris</u>	29				14	11	43
<u>Tetraedron minimum</u>			<				
Chrysophyceae							
<u>Chroomonas nordstedtii</u>							
<u>Diceras</u> sp.							
<u>Dinobryon bavaricum</u>	30	2		5	3	10	<1
<u>D. cylindricum</u>							
<u>D. divergens</u>		7	65	101	84	133	101
<u>D. sertularia</u>	9	6	8	18	1	2	8
<u>D. sociale</u>							
<u>Gonyostomum semen</u>							
<u>Mallomonas tonsurata</u>							
Xanthophyceae							
<u>Chlorochromonas minuta</u>							
Myxophyceae							
<u>Anabaena affinis</u>		34					
<u>A. circinalis</u>							
<u>A. flos-aquae</u>	7						
<u>A. helicoida</u>							
<u>A. inaequalis</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Anabaena scheremetievi</i>	15		9		8		
<i>A. wisconsinense</i>	2	7	2				2
<i>A. unispora</i>							
<i>Aphanocapsa delicatissima</i>			2		<1	2	3
<i>A. pulchra</i>		<1					
<i>Aphanothece gelatinosa</i>							
<i>A. microscopica</i>						<1	
<i>A. nidulans</i>		3				<1	1
<i>Chroococcus dispersus</i>	<1			<1	<1	<1	
<i>C. dispersus</i>	<1	<1					
var. minor							
<i>C. limneticus</i>	8		2	9	65	9	18
<i>C. minutus</i>			<1				
<i>Gomphosphaeria aponina</i>							
<i>G. lacustris</i>	1	2	<1		1	1	<1
<i>G. lacustris</i>	<1	<1	4	1	1		
var. compacta							
<i>Gleotheca rupestris</i>		<1					
<i>Lyngbia limnetica</i>							
<i>Merismopedia glauca</i>							
<i>Oscillatoria agardhii</i>							17
<i>O. limnetica</i>	20	8	34	44	27	32	49

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER LANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
<i>Oscillatoria minima</i>							11
<i>O. nigra</i>							
<i>O. rubescens</i>							
<i>O. tenuis</i>				33	22	78	37
<i>Rhabdoderma irregulare</i>		5					
<i>Spirulina laxa</i>							
<i>S. laxissima</i>							
Dinophyceae							
<i>Ceratium hirundinella</i>							
<i>Cystodinium cornifax</i>							
<i>Glenodinium armatum</i>							
<i>G. borgei</i>	<1						
<i>G. pulvisculus</i>		5					
<i>Peridinium inconspicuum</i>		36					
<i>P. willei</i>		<1		<1		<1	<1
Euglenophyceae							
<i>Euglena acus</i>	<1						
var. <i>rigita</i>							
<i>E. cyst</i>							
<i>E. proxima</i>							
<i>Trachelomonas volvocina</i>							

*Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-9 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) OCTOBER 2 TO DECEMBER 28, 1984

Organisms	10/2	10/16	10/30	11/13	11/27	12/10	12/28
Cryptophyceae							
<u>Cryptomonas erosa</u>	9	25	14	2	4	4	2
<u>Chroomonas nordstedtii</u>		5	2				
Diatoms	3,990	5,547	2,351	3,910	1,189	4,514	87
Nondiatoms	176	234	178	279	299	338	330
Total Algae	4,166	5,781	2,529	4,189	1,488	4,852	417

Note: Density units = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
Bacillariophyceae									
<i>Achnanthes affinis</i>	2								24
<i>A. brasolettiana</i>		3							
<i>A. breviceps</i>						3			
var. <i>intermedia</i>									
<i>A. clevei</i>									
var. <i>rostrata</i>									
<i>A. conspicua</i>				3		<1	3	3	
<i>A. delicatula</i>								?	
<i>A. exigua</i>									
<i>A. exigua</i>		3							
var. <i>heterovalvata</i>									
<i>A. haukiana</i>									
<i>A. hungarica</i>	3					1	2	2	14
<i>A. lancunarium</i>									6
<i>A. lanceolata</i>	1					<1			3
<i>A. lanceolata</i>									
var. <i>rostrata</i>									
<i>A. linearis</i>	1								2
<i>A. marginulata</i>									
<i>Amphipleura pellucida</i>					6	<1			2
<i>Amphiprora ornata</i>									
<i>Amphora commutata</i>									

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

 AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Amphora delicatissima</i>	8	32		7	4		3	1	3
<i>A. ovalis</i>	10								
var. <i>pediculus</i>									
<i>A. veneta</i>	11	14	6			2	3	2	7
<i>Anomoeoneis exiles</i>									
<i>Asterionella formosa</i>	84	847	2,494	1,177	449	20	43	51	89
<i>Cocconeis diminuta</i>	5	8	4						
<i>C. pediculus</i>	3								
<i>C. placentula</i>		3			3			17	
<i>Coscinodiscus lacustris</i>	14				3	1			
<i>C. rothii</i>	1								
<i>C. rothii</i>				8					
var. <i>subsalina</i>									
<i>Cyclotella comensis</i>			29	11	32	8	6		
<i>C. comta</i>							2		
<i>C. glomerata</i>	84	157	66	95	19	20	12		
<i>C. iris</i>									7
<i>C. kuetszingiana</i>	22	15	50	33	9	12	317	2,275	2,844
<i>C. meneghiniana</i>	3	3							
<i>C. ocellata</i>	120	62	4		3		13		9
<i>C. pseudostelligera</i>							21	32	25
<i>C. quadriinuncta</i>	11	15	6			1	4	29	7

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Cyclotella stelligera</i>	5	48	32	3	6	4	6		
<i>C. striata</i>	3								
<i>Cymatopleura solea</i>	2								
<i>C. solea</i> var. <i>apiculata</i>						1			
<i>Cymbella microcephala</i>	4		4					2	
<i>C. perpusilla</i>	1					<1			
<i>C. prostrata</i>	7					1	2		
<i>C. sinuata</i>						1	1		
<i>C. ventricosa</i>	2					1			
<i>Diatoma elongatum</i>		120	1,124	275	64	4	28	1	15
<i>D. elongatum</i> var. <i>minor</i>								1	3
<i>D. tenue</i>	4								
<i>D. tenue</i> var. <i>crassula</i>	1								
<i>D. vulgare</i>	2								
<i>D. vulgare</i> var. <i>producta</i>				3		7			
<i>Diploneis ovalis</i>	2								
<i>D. ovalis</i> var. <i>oblongella</i>									4

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Epithemia sorex</i>	1								
var. <i>gracilis</i>									
<i>Eunotia valida</i>	1								
<i>Eragilaria bicapitata</i>			37	17		8	9		26
<i>E. capucina</i>	200								
<i>E. construens</i>							84	20	26
<i>E. construens</i>	5								
var. <i>subsalina</i>									
<i>E. construens</i>		3							
var. <i>venter</i>									
<i>E. crotonensis</i>		165	425	1 213	937	511	917	161	182
<i>E. harrissonii</i>	7					1	1		3
<i>E. harrissonii</i>	27								
var. <i>dubia</i>									
<i>E. intermedia</i>	24	22	41	59	81	111	34	2	36
<i>E. pinnata</i>		12	18	22	6	10	13	5	8
<i>E. pinnata</i>									
var. <i>lanzettula</i>									
<i>Gomphonema olivaceum</i>		7		7			3	3	
<i>G. parvulum</i>								5	
<i>Gyrosigma kützingii</i>	3								
<i>Hantzschia elongatum</i>	2	6	53	28	3		2		

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Mastogloia smithii</i>	1								
<i>Melosira granulata</i>	422	377	144	48	87	14	7	5	28
<i>M. islandica</i>	35	118	47	6		5	2	5	22
<i>M. varians</i>	15	36					1		
<i>Navicula amphibola</i>	3								
<i>N. anglica</i>	3	11	4			3	1	3	3
<i>N. capitata</i>	7						3	5	4
<i>N. cryptocephala</i>	2			7		5	32	7	9
<i>N. cryptocephala</i> var. <i>intermedia</i>	11								
<i>N. cryptocephala</i> var. <i>veneta</i>	4	3	4			3	2	5	25
<i>N. crucicula</i>							2		
<i>N. exigua</i>			6			4	1	2	3
<i>N. gastrum</i>							2		
<i>N. hungarica</i>	1								
<i>N. laterostrata</i>		6							
<i>N. menisculus</i>							4		
<i>N. pupula</i>	1		4				4	3	10
<i>N. pupula</i> var. <i>rostrata</i>	2								
<i>N. pusilla</i>	2								
<i>N. pygmaea</i>	1								

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Navicula schonfeldii</i>									3
<i>N. secura</i>	1		6						
<i>N. tripunctata</i>	5						1		
<i>Nedium dubium</i>									
<i>Nitzschia acicularis</i>			8	56	33	3			
<i>N. acuta</i>									
<i>N. angustata</i>	1								
<i>N. communis</i>									3
<i>N. dissipata</i>	4	3	11		6	<1	13	5	3
<i>N. fonticola</i>	13	3	24	26	10	20	50	6	264
<i>N. frustulum</i>	5		8			5	8	3	39
<i>N. gracilis</i>			24	34	3	2	2		43
<i>N. hungarica</i>									
<i>N. kuetszingiana</i>	1								
<i>N. linearis</i>	1					<1			3
<i>N. palea</i>		47				1			
<i>N. recta</i>	4								
<i>N. thermalis</i>									
<i>N. tryblionella</i> var. <i>levidensis</i>									
<i>N. unknown V</i>									
<i>Opephora martyi</i>						<1			

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Pinnularia fasciata</i>									2
<i>P. sublinearis</i>				7					
<i>Rhoicosphenia curvata</i>	5						2		
<i>Rhizosolenia eriensis</i>	10	5	<1	8	7				<1
<i>R. longiseta</i>		15	38	15	21				
<i>Rhopalodia gibba</i>	1								
<i>Stauroneis montana</i>	4								
<i>Stephanodiscus astraea</i>	395	142	64	14	10	8	9	9	17
<i>S. astraea</i>	395	1,847	1,997	476	263	68			
var. <i>intermedia</i>									
<i>S. binderana</i>			7		3				
<i>S. hantzschii</i>	52	1,242	422	70	6	11	10	5	3
<i>S. minutus</i>							80	27	26
<i>Surirella angustata</i>	2								2
<i>Synedra acus</i>	37	451	1,969	3,151	2,358	18	17	14	156
<i>S. affinis</i>	7	14	19	40	9	32			
var. <i>fasciculata</i>									
<i>S. gaillonii</i>		11	29	96	252	6			
<i>S. nana</i>	1		70		37	1			
<i>S. rumpens</i>			9						
<i>S. ulna</i>	5								
<i>S. ulna</i>							11		17
var. <i>chaseana</i>									

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Tabellaria fenestrata</i>	502	148	302	1,432	2,017	525	937	177	473
<i>T. flocculosa</i>	38	10	13	76	129	26	33		
Chlorophyceae									
<i>Ankistrodesmus convolutus</i>	1	19	60	12	14	<1			6
<i>A. braunii</i>								<1	
<i>A. falcatus</i>					<1	<1		<1	<1
<i>A. falcatus</i> var. <i>acicularis</i>		<1							
<i>Carteria klebsii</i>			<1						
<i>Camydomonas globosa</i>		1	2	1		<1			
<i>C. sphagnicola</i>			<1						
<i>Chlorella ellipsoidea</i>		2							
<i>C. vulgaris</i>	4	<1							
<i>Cladophora</i> sp. 1									7
<i>Closteriopsis longissima</i>			<1	<1	<1				
<i>C. longissima</i> var. <i>tropica</i>					2		1		
<i>Cosmarium pachydermum</i>							2	2	
<i>Cosmarium</i> var. <i>pussillu</i>									
<i>Crucigenia quadrata</i>									<1
<i>C. tetrapedia</i>									2
<i>Dictyosphaerium pulchellum</i>					1				

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<u>Franceia ovalis</u>							<1		<1
<u>Gleocystis ampla</u>								2	
<u>G. gigas</u>		4						10	
<u>G. major</u>		<1							
<u>Golenkinia radiata</u>	10	<1							
<u>Kirchneriella contorta</u>									2
<u>Lagerheimia citrifomis</u>									2
<u>L. longiseta</u>								2	<1
<u>Mougeotia</u> sp.									16
<u>Oocystis naegelii</u>									
<u>O. parva</u>		3		<1	<1	3	20	57	33
<u>O. solitaria</u>									1
<u>O. submarina</u>									
<u>Pediastrum boryanum</u>							<1		
<u>Planktonema lauterbornii</u>									2
<u>Planktosphaeria gelatinosa</u>					1				
<u>Quadrigula lacustris</u>									
<u>Scenedesmus abundans</u>			1						
<u>S. acutiformis</u>									
<u>S. arcuatus</u>									2
<u>S. arcuatus</u> var. platydisca									

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

 AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CA MET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Scenedesmus bijuga</i>		2	5	2	4	<1	<1	3	42
<i>S. dimorphus</i>								3	17
<i>S. opoliensis</i>						3	2		
<i>S. quadricauda</i>		2		2		<1		4	18
<i>S. serratus</i>									2
<i>Selenastrum minutum</i>		<1	<1					2	
<i>Spirogyra</i> sp.									
<i>Stichococcus bacillaris</i>			67	48	239		6		
<i>Tetraedron regulare</i>						1			
<i>Ulothrix</i> sp.	42								
Chrysophyceae									
<i>Diceras phaseolus</i>							<1	<1	
<i>Dinobryon bavaricum</i>		2	17	88	32	<1			
<i>D. cylindricum</i>		4	61	39	22		226		
<i>D. divergens</i>						123	65	68	2
<i>D. sertularia</i>	1		8	1,070	393	26	118	149	16
<i>D. sociale</i>	1								
<i>Mallomonas tonsurata</i>								11	<1
<i>Uroglenopsis americana</i>					1				
Xanthophyceae									
<i>Chlorochromonas minuta</i>		1							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Myxophyceae</i>									
<i>Anabaena circinalis</i>						15	294	13	7
<i>A. helicoidea</i>				2 ^o					
<i>A. inequalis</i>		7			7				
<i>A. unisporea</i>		19	11						
<i>A. wisconsinense</i>							62		2
<i>Aphanocapsa delicatissima</i>				1					7
<i>Aphanothece microscopica</i>									<1
<i>A. nidulans</i>							<1	<1	5
<i>Chroococcus dispersus</i>		16	4	2				3	5
<i>C. dispersus</i>			4	<1			<1	48	
var. minor									
<i>C. limneticus</i>							24	41	22
<i>C. minutus</i>									
<i>Gomphosphaeria lacustris</i>						1			1
<i>G. lacustris</i>	3							<1	2
var. compacta									
<i>Lyngbia limnetica</i>	51		285						
<i>Merismopedia convoluta</i>								<1	
<i>M. elegans</i>									2
<i>M. glauca</i>									
<i>M. tenuissima</i>									3

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
<i>Oscillatoria agardhii</i>	62			27	135				
<i>O. limnetica</i>	15	151	772	299	631	1	74	3	4
<i>O. nigra</i>			2		52				
<i>O. subbrevis</i>									34
<i>O. tenuis</i>		13			219	4			36
<i>Spirulina laxissima</i>		1	2		1				
Dinophyceae									
<i>Ceratium hirundinella</i>								<1	
<i>Glenodinium armatum</i>		<1							
<i>G. borgei</i>			<1	1		2	16	11	3
<i>G. penardiforme</i>	2								
<i>G. pulvisculus</i>									<1
<i>G. sp.</i>									
<i>Peridinium inconspicuum</i>								4	
Euglenophyceae									
<i>Euglena minuta</i>									
<i>E. proxima</i>		1	4						
<i>Lepocinclis sphagnophila</i>		<1						2	
<i>Phacus caudata</i>									
<i>Trachelomonas volvocina</i>		<1		<1					

Table continued on following page

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-10 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) MARCH 1 TO SEPTEMBER 18, 1984

Organisms	3/1	4/11	4/25	5/23	6/6	7/2	7/18	8/2	9/18
Cryptophyceae									
<u>Cryptomonas erosa</u>		3	<1		3		4	9	3
<u>Chroomonas nordstedtii</u>									
Chloromonadineae									
<u>Gonyostomum semen</u>		1							
Total Diatoms	2,686	6,034	9,623	8,523	6,876	1,495	2,774	2,895	4,506
Total Nondiatoms	193	260	1,251	1,625	1,746	185	931	459	313
Total Algae	2,879	6,294	10,874	10,148	8,622	1,680	3,705	3,354	4,819

Note: Density units = organisms per mL.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
Bacillariophyceae							
<i>Achnanthes affinis</i>	69	18	28	40	9	15	
<i>A. brasolettiana</i>							
<i>A. breviceps</i>							
var. <i>intermedia</i>							
<i>A. clevei</i>							
var. <i>rostrata</i>							
<i>A. conspicua</i>				10	9		4
<i>A. delicatula</i>							8
<i>A. exigua</i>						15	
<i>A. exigua</i>							
var. <i>heterovalvata</i>							
<i>A. haukiana</i>			37			7	2
<i>A. hungarica</i>	11			10	17		
<i>A. lacunarum</i>							
<i>A. lanceolata</i>							
<i>A. lanceolata</i>			18				
var. <i>rostrata</i>							
<i>A. linearis</i>							
<i>A. marginulata</i>							
<i>Amphipleura pellucida</i>			9				
<i>Amphiprora ornata</i>							2
<i>Amphora commutata</i>				10			

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1964

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<i>Amphora delicatissima</i>	11	9	28	40	17	7	6
<i>Amphora ovalis</i>							
var. <i>pediculus</i>							
<i>A. veneta</i>			28			7	
<i>Anomoeoneis exiles</i>			9				
<i>Asterionella formosa</i>	160	165	559	149		192	
<i>Cocconeis diminuta</i>							
<i>C. pediculus</i>		9			17	7	
<i>C. placentula</i>					9		
<i>Coscinodiscus lacustris</i>							
<i>C. rothii</i>							
<i>C. rothii</i>							
var. <i>subsalina</i>							
<i>Cyclotella comensis</i>							
<i>C. comta</i>							
<i>C. glomerata</i>							
<i>C. iris</i>				10	9	7	4
<i>C. kuetzingiana</i>	3,529	1,861	1 503	468	138	207	4
<i>C. meneghiniana</i>							
<i>C. ocellata</i>					9		
<i>C. pseudostelligera</i>							
<i>C. quadriuncta</i>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Cyclotella stelligera</u>							
<u>C. striata</u>							
<u>Cymatopleura solea</u>							
<u>C. solea</u>							
var. apiculata							
<u>Cymbella microcephala</u>							
<u>C. perpusilla</u>							
<u>C. prostrata</u>							
<u>C. sinuata</u>							
<u>C. ventricosa</u>					9		
<u>Diatoma elongatum</u>			18	10		22	
<u>D. elongatum</u>		9	9				
var. minor							
<u>D. tenue</u>							
<u>D. tenuis</u>							
var. crassula							
<u>D. vulgare</u>							
<u>D. vulgare</u>							
var. producta							
<u>Diploneis ovalis</u>							
<u>D. ovalis</u>							
var. oblongella							

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Epithemia sorex</u>							
var. <u>gracilis</u>							
<u>Eunotia valida</u>							
<u>Fragilaria bicapitata</u>	11	9	59	50	60	67	132
<u>F. capucina</u>							
<u>F. construens</u>		9	55				
<u>F. construens</u>				30	52	30	
var. <u>subsalina</u>							
<u>F. construens</u>							
var. <u>venter</u>							
<u>F. crotonensis</u>	229	550	798	2,102	2,286	1,656	25
<u>F. harrissonii</u>							
<u>F. harrissonii</u>							
var. <u>dubia</u>							
<u>F. intermedia</u>	57	110	110	80	34	30	
<u>F. pinnata</u>				50			15
<u>F. pinnata</u>					9		
var. <u>lanzettula</u>							
<u>Gomphonema olivaceum</u>		9			9		
<u>G. parvulum</u>							
<u>Gyrosigma kützingii</u>							
<u>Hantzschia elongatum</u>							

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

 AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF
 SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Mastogloia smithii</u>							
<u>Melosira granulata</u>		18	37	50	26	7	17
<u>M. islandica</u>	46		28				10
<u>M. varians</u>							
<u>Navicula amphibola</u>							
<u>N. anglica</u>	11	18	28	10			
<u>N. capitata</u>		10	37	10			
<u>N. cryptocephala</u>		9	18	40	9		
<u>N. cryptocephala</u> var. <u>intermedia</u>							
<u>N. cryptocephala</u> var. <u>veneta</u>		37	46		9		
<u>N. crucicula</u>							
<u>N. exigua</u>			9	10	26		
<u>N. grastrum</u>							
<u>N. hungarica</u>							
<u>N. laterostrata</u>							
<u>N. menisculus</u>							
<u>N. pupula</u>		9					
<u>N. pupula</u> var. <u>rostrata</u>							
<u>N. pusilla</u>							
<u>N. pygmaea</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Navicula schonfeldii</u>							
<u>N. secura</u>							
<u>N. tripunctata</u>						7	
<u>Nedium dubium</u>	11	9					
<u>Nitzschia acicularis</u>							
<u>N. acuta</u>				19			
<u>N. angustata</u>							
<u>N. communis</u>							
<u>N. dissipata</u>			18				
<u>N. fonticola</u>	160	119	266	70	34	37	4
<u>N. frustulum</u>	11	9	73	30	34		
<u>N. gracilis</u>	138	119	229	110	9	37	
<u>N. hungarica</u>				10			
<u>N. kuetzingiana</u>							
<u>N. linearis</u>							
<u>N. palea</u>							
<u>N. recta</u>			18				
<u>N. thermalis</u>							
<u>N. tryblionella</u>							4
var. levidensis							
<u>N. unknown V</u>							
<u>Opephora martyi</u>							

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Pinnularia fasciata</u>							
<u>P. sublinearis</u>							
<u>Rhoicosphenia curvata</u>							
<u>Rhizosolenia eriensis</u>	2	2	6	3	10		
<u>R. longiseta</u>	2	3					
<u>Rhopalodia gibba</u>							
<u>Stauroneis montana</u>							
<u>Stephanodiscus astra</u> <u>aea</u>		9	18	30			17
<u>S. astra</u> <u>aea</u>							
var. <u>intermedia</u>							
<u>S. binderana</u>							
<u>S. hantzschii</u>	2						
<u>S. minutus</u>	11		37		17	22	
<u>Surirella angustata</u>		9			9		
<u>Synedra acus</u>	34	37	18			7	
<u>S. affinis</u>							
var. <u>fasciculata</u>							
<u>S. gaillonii</u>	11						
<u>S. nana</u>							
<u>S. rumpens</u>							
<u>S. ulna</u>							
<u>S. ulna</u>				20	9		10
var. <u>chaseana</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Tabellaria fenestrata</u>	1,169	1,485	1,128	1,534	1,555	1,515	575
<u>T. flocculosa</u>	138			80	112		146
Chlorophyceae							
<u>Ankistrodesmus convolutus</u>	3	6		10	9	3	6
<u>A. braunii</u>							
<u>A. falcatus</u>							3
<u>A. falcatus</u> var. acicularis							
<u>Carteria klebsii</u>							
<u>Chlamydomonas globosa</u>				7			
<u>C. sphericola</u>							
<u>Chlorella ellipsoidea</u>							
<u>C. vulgaris</u>							
<u>Cladophora</u> sp. 1							
<u>Closteriopsis longissima</u>		3					
<u>C. longissima</u> var. tropica							
<u>Cosmarium pachydermum</u>	2			3			3
var. pussillum							
<u>Crucigenia quadrata</u>							
<u>C. tetrapedia</u>							
<u>Dictyosphaerium pulchellum</u>	3						

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Franceia ovalis</u>		3					
<u>Gleocystis ampla</u>							
<u>G. gigas</u>		3					
<u>G. major</u>							
<u>Golenkinia radiata</u>							
<u>Kirchneriella contorta</u>							
<u>Lagerheimia citriformis</u>							
<u>L. longiseta</u>							
<u>Mougeotia sp.</u>							
<u>Oocystis naegelii</u>							
<u>O. parva</u>	6	12				13	
<u>O. solitaria</u>							
<u>O. submarina</u>		23					
<u>Pediastrum boryanum</u>							
<u>Planktonema lauterbornii</u>							
<u>Planktosphaeria gelatinosa</u>							
<u>Quadrigula lacustris</u>							
<u>Scenedesmus abundans</u>							
<u>S. acutiformis</u>	6	12					
<u>S. arcuatus</u>							
<u>S. arcuatus</u>							
var. platydisca							104

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Scenedesmus bijuga</u>	6			7	9	20	18
<u>S. dimorphus</u>	14				2		
<u>S. opoliensis</u>							
<u>S. quadricauda</u>	9	23		34	9		
<u>S. serratus</u>							
<u>Selenastrum minutum</u>	2				2		
<u>Spirogyra</u> sp.		63					
<u>Stichococcus bacillaris</u>							40
<u>Tetraedron regulare</u>							
<u>Ulothrix</u> sp.							
Chrysophyceae							
<u>Diceras phaseolus</u>							
<u>Dinobryon bavaricum</u>	65			10	2	3	
<u>D. cylindricum</u>							
<u>D. divergens</u>				17	16	30	
<u>D. sertularia</u>	14	121		10	5		
<u>D. sociale</u>							
<u>Mallomonas tonsurata</u>							
<u>Uroglenopsis americana</u>							
Xanthophyceae							
<u>Chlorochromonas minuta</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Myxophyceae</u>							
<u>Anabaena circinalis</u>							
<u>Anabaena helicoidea</u>							
<u>A. inequalis</u>							
<u>A. unispora</u>							
<u>A. wisconsinense</u>							
<u>Aphanocapsa delicatissima</u>							
<u>Aphanothece microscopica</u>							
<u>A. nidulans</u>		3					
<u>Chroococcus dispersus</u>							
<u>C. dispersus</u>							
var. minor							
<u>C. limneticus</u>	11	23					
<u>C. minutus</u>	86						
<u>Gomphosphaeria lacustris</u>							
<u>G. lacustris</u>		6		7			
var. compacta							
<u>Lyngbia limnetica</u>							
<u>Merismopedia convoluta</u>							
<u>M. elegans</u>							
<u>M. glauca</u>							
<u>M. tenuissima</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
<u>Oscillatoria agardhii</u>							
<u>Q. limnetica</u>	46	40		74		72	101
<u>Q. nigra</u>							
<u>Q. subbrevis</u>							
<u>Q. tenuis</u>		89			9		
<u>Spirulina laxissima</u>							
Dinophyceae							
<u>Ceratium hirundinella</u>							
<u>Glenodinium armatum</u>							
<u>G. borgei</u>	5						
<u>G. penardiforme</u>							
<u>G. pulvisculus</u>							
<u>G. sp.</u>	2						
<u>Peridinium inconspicuum</u>							
Euglenophyceae							
<u>Euglena minuta</u>	2	35					
<u>E. proxima</u>							
<u>Lepocinclis sphagnophila</u>							
<u>Phacus caudata</u>		3					
<u>Trachelomonas volvocina</u>							

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-11 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B FIGURE 1) OCTOBER 3 TO DECEMBER 28, 1984

Organisms	10/3	10/17	11/2	11/14	11/28	12/12	12/28
Cryptophyceae							
<u>Cryptomonas erosa</u>	15	112		10	14	3	
<u>Chroomonas nordstedtii</u>					2		
Chloromonadineae							
<u>Gonyostomum semen</u>							
Total Diatoms	5,855	4,660	5,282	5,085	4,552	3,908	986
Total Nondiatoms	297	586	0	189	69	144	370
Total Algae	6,152	5,246	5,282	5,274	4,621	4,052	1,356

Note: Density units = organisms per mL.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
5/24	1	12.0	11.3	105.0	7.9	49.6	3.79	7,596	0.8453	2.25	26
	3	12.0	11.2	104.1	8.0	46.0	3.46	6,811	0.8525		32
	5	12.0	11.5	106.9	8.1	47.6	3.46	6,093	0.8470		31
	8	11.0	11.8	107.2	8.1	44.8	4.17	7,564	0.9502		32
6/8	1	15.0	10.7	106.3	8.1	37.6	4.62	11,907	0.9957	2.00	39
	3	14.5	10.7	105.1	8.3	40.0	4.32	10,430	0.9991		32
	5	14.5	10.8	106.1	8.3	38.0	4.82	8,010	0.9318		35
	8	14.0	10.8	105.0	8.2	53.2	4.72	14,513	1.0524		35
6/28	1	18.0	9.7	102.6	8.3	52.8	0.76	585	1.1020	4.50	35
	3	17.0	10.8	111.9	8.3	57.2	2.51	1,204	0.9793		33
	5	16.0	10.8	109.6	8.3	50.0	3.52	1,529	0.9704		29
	8	16.0	11.0	111.7	8.3	51.2	3.75	2,326	0.8877		34
7/19	1	21.0	9.4	105.6	8.1	61.6	2.14	5,620	0.9895	3.00	53
	3	19.5	9.8	106.9	8.2	52.4	2.43	3,562	1.1716		47
	5	19.5	9.8	106.4	8.2	60.4	3.77	6,712	0.9456		43
	6	19.0	9.6	103.7	8.2	60.8	3.61	6,284	1.0377		48
8/1	1	21.0	9.0	101.1	8.2	72.0	1.07	2,594	0.9428	4.00	47
	3	21.0	9.1	101.7	8.3	68.8	0.93	3,240	0.9655		42
	5	20.5	9.0	100.2	8.2	68.4	1.21	3,456	0.9791		44
	7	20.5	9.2	102.4	8.3	70.4	1.75	3,211	0.9976		40
8/15	1	25.0	8.8	106.8	8.19	65.6	0.53	1,012	0.8611	3.00	40
	3	24.5	9.1	109.4	8.27	65.2	1.56	1,248	0.6777		40
	5	24.0	8.7	103.6	8.30	73.0	0.10	2,140	0.5801		42
	7	24.0	8.8	104.8	8.30	66.8	0.05	1,451	0.7382		30

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Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-12 (Continued)

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
10/2	1	14.0	NA ⁵	NA	7.77	38.8		4,550	0.5559	3.5	39
	3	13.0	NA	NA	7.83	37.2	0.96	3,512	0.7128		42
10/16	1	13.0	NA	NA	7.94	44.4	3.03	10,045	0.7193	1.5	39
	3	13.0	NA	NA	7.87	45.6	2.98	9,174	0.6935		37
10/30	1	12.0	NA	NA	7.2	48.8	3.26	8,263	1.0037	1.5	52
	3	12.0	NA	NA	7.7	40.8	3.17	5,367	0.9706		45
11/13	1	8.0	NA	NA	7.76	40.0	4.34	2,058	0.8883	0.25	42
	3	7.5	NA	NA	7.74	49.2	3.74	1,901	0.8229		39
11/27	1	8.0	NA	NA	7.48	45.6	4.95	1,219	1.1226	0.25	50
	3	8.25	NA	NA	7.63	51.6	6.42	825	1.2453		53
12/12	1	3.5	NA	NA	7.54	41.2	6.16	3,787	0.8329	0.5	32
	3	3.5	NA	NA	7.50	42.4	6.74	5,432	0.7433		33
12/28	1	7.0	NA	NA	7.60	30.4	6.70	1,541	0.9877	0.5	50
	3	6.5	NA	NA	7.68	30.4	6.17	880	1.2008		40

¹OM = Organic Matter.

²Chl a = Chlorophyll a, Monochromatic Method.

³d = Shannon-Weaver diversity index.

⁴No. sp. = Number of algal species.

⁵NA = No Analysis.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
3/2	1	3	13.2	98.2	7.0	52.0	5.01	3,434	1.2177	0.25	44
	3	2	13.2	95.6	7.8	48.8	5.36	3,384	1.0043		33
	5	2	13.2	95.6	7.5	52.8	5.37	3,587	0.9799		40
	6	2	13.3	96.3	7.7	50.8	5.36	3,921	0.9807		39
4/13	1	4.0	12.8	97.8	NA ⁵	38.8	8.32	12,251	1.0071	0.75	42
	3	4.5	12.5	96.7	NA	38.4	9.04	11,567	0.8871		35
	5	5.0	12.9	101.2	NA	38.0	8.34	9,500	0.8937		29
	7	5.0	12.9	101.2	NA	39.2	9.09	9,587	0.9362		33
4/26	1	6.0	11.8	94.9	NA	39.2	9.21	7,900	1.0189	0.25	35
	3	6.0	11.8	94.9	NA	40.0	23.30	11,712	0.9444		32
	5	6.0	11.8	94.9	NA	45.6	9.03	10,028	1.0303		31
	6	6.0	11.8	94.9	NA	48.4	9.97	8,705	1.0194		32
5/24	1	12.0	11.1	103.2	8.2	50.0	3.76	9,448	0.9464	2.50	32
	3	11.0	11.2	101.7	8.1	48.0	3.75	8,248	1.0121		37
	5	11.0	11.0	99.9	8.2	48.8	4.03	10,858	0.9877		32
	7	11.0	11.2	101.7	8.2	46.8	3.88	9,018	0.9824		32
6/8	1	14.0	10.3	100.1	8.3	56.4	5.13	8,314	1.0274	1.5	40
	3	14.5	10.3	101.2	8.3	29.6	4.72	9,745	1.0480		40
	5	14.5	10.6	104.1	8.2	37.2	4.81	10,111	1.0840		42
	8	14.0	10.6	103.0	8.3	36.0	5.98	10,784	1.0267		37
6/28	1	18.0	10.0	105.8	7.8	55.6	1.71	1,008	0.9998	3.0	37
	3	17.0	10.2	105.7	8.1	40.8	2.45	924	0.8909		35
	5	17.0	10.2	105.7	8.2	44.4	3.30	960	0.9552		35
	9	15.0	10.0	99.3	8.2	48.4	3.03	1,908	1.2413		45

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
7/19	1	20.0	9.7	106.9	7.7	56.0	1.33	2,105	1.0443	4.0	37
	3	19.5	9.9	108.0	7.8	56.0	1.78	3,338	1.0956		43
	5	19.0	9.7	104.8	8.0	59.2	1.88	3,467	0.9633		35
8/1	6	18.5	9.8	104.8	8.1	33.6	2.00	3,925	0.9922	2.5	41
	1	24.5	8.0	96.2	8.2	73.6	1.05	2,281	0.9116		45
	3	22.0	8.2	94.0	8.2	74.4	1.24	2,419	0.8328		42
	5	21.5	8.3	94.2	8.0	67.6	1.47	2,594	0.9717		45
8/15	9	21.0	6.65	74.7	7.9	72.4	0.67	3,363	1.1266	3.5	48
	1	24.0	8.9	106.0	8.38	64.0	1.00	704	0.9959		48
	3	24.0	8.7	103.6	8.40	58.0	0.77	521	0.8986		38
	5	24.0	8.4	100.0	8.35	61.6	1.07	1,462	0.7615		47
	8	23.5	8.2	96.7	8.32	59.2	N/A	1,204	0.8521		48
10/2	1	14.0	NA	NA	7.94	42.8	1.09	6,446	0.8136		48
	3	14.0	NA	NA	7.82	38.4	1.21	2,758	0.8359		40
	5	14.0	NA	NA	7.81	39.2	0.58	3,258	0.9349		41
	7	14.0	NA	NA	7.88	44.4	2.72	3,536	0.8433		45
10/16	1	16.0	NA	NA	8.26	40.8	3.16	5,176	0.7827	2.0	38
	3	16.0	NA	NA	8.28	40.8	4.17	8,789	0.6920		30
	5	16.0	NA	NA	8.27	46.8	4.22	4,599	0.7095		33
	7	15.5	NA	NA	8.18	47.2	4.16	4,332	0.6911		31
10/30	1	13.0	NA	NA	7.66	46.4	1.65	857	0.9748	1.25	38
	3	13.0	NA	NA	7.72	38.4	1.76	2,605	0.9349		41
	5	13.0	NA	NA	7.73	43.2	2.26	2,885	0.8885		35
	7	13.0	NA	NA	7.87	45.2	1.78	2,924	0.9544		38

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-13 (Continued)

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
11/13	1	9.0	NA	NA	7.54	34.4	4.19	4,597	0.9739	0.33	43
	3	9.0	NA	NA	7.58	35.2	4.67	5,580	0.8802		35
	5	9.0	NA	NA	7.62	30.0	4.99	4,556	0.8169		34
	7	8.5	NA	NA	7.72	38.8	4.54	2,021	0.9825		37
11/27	1	6.0	NA	NA	7.57	42.4	5.50	1,360	1.0165	0.75	40
	3	6.0	NA	NA	7.55	47.6	4.74	452	1.0810		32
	5	6.0	NA	NA	7.54	38.4	5.54	1,208	0.9774		43
	7	6.0	NA	NA	7.71	40.0	4.86	2,905	0.7316		34
12/10	1	4.0	NA	NA	7.65	41.6	4.06	5,315	0.7449	1.0	31
	3	3.0	NA	NA	7.65	32.4	2.92	4,578	0.7486		36
	5	3.0	NA	NA	7.63	34.0	3.11	5,637	0.6712		30
	7	4.0	NA	NA	7.65	42.4	3.92	3,928	0.6552		34
12/28	1	8.0	NA	NA	7.34	38.0	1.87	458	1.0937	0.75	31
	3	8.0	NA	NA	7.44	34.4	4.75	410	0.9964		28
	5	8.0	NA	NA	7.47	32.4	4.54	360	1.0387		29
	7	7.5	NA	NA	7.48	35.6	5.45	377	1.0131		28

¹OM = Organic Matter.

²Chl a = Chlorophyll a, Monochromatic Method.

³d = Shannon-Weaver diversity index.

⁴No. Sp. = Number of algal species.

⁵NA = No Analysis.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-14

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
3/1	1	2	14.0	101.4	6.8	68.8	3.73	2,690	1.1738	0.25	43
	3	3	13.6	101.2	7.3	172.0	3.13	2,171	1.2018		42
	5	3	13.5	100.4	7.4	89.6	3.29	2,451	1.2109		45
	8	1	13.9	98.0	7.4	61.6	4.13	3,008	1.1127		46
4/11	1	4	12.5	95.5	NA ⁵	38.8	3.63	6,362	0.9922	0.5	41
	3	3	12.8	95.2	NA	38.8	6.08	5,583	1.0543		40
	5	3	12.8	95.2	NA	40.0	5.87	7,388	0.9926		38
	8	3	13.1	97.5	NA	40.4	6.21	5,823	1.0160		40
4/25	1	4	11.5	87.9	NA	58.8	8.84	10,273	0.9969	0.5	34
	3	7	11.7	96.5	NA	46.8	10.80	9,329	1.0415		42
	5	7	11.8	97.4	NA	37.2	12.25	12,987	0.9796		40
	8	7	11.8	97.4	NA	36.8	11.18	11,077	0.9776		31
5/23	1	12.5	10.2	95.9	7.8	35.2	2.16	9,060	0.8890	2.75	28
	3	12.0	11.0	102.2	8.0	35.6	3.69	8,319	0.9463		31
	5	12.0	11.1	103.2	8.1	38.4	3.63	8,741	0.9419		27
	8	10.0	11.9	105.6	8.2	43.2	7.30	16,464	1.0561		34
6/6	1	13.0	11.3	107.4	7.9	43.6	2.93	8,546	1.0469	3.0	36
	3	12.0	11.6	107.8	7.6	55.6	3.26	7,926	0.8695		28
	5	12.0	11.4	105.9	7.8	64.0	3.80	9,084	0.9418		29
	8	11.0	11.5	104.4	7.7	61.2	5.48	8,737	1.0312		37
7/2	1	19.0	9.0	97.2	8.1	52.4	2.11	1,380	0.9534	3.0	34
	3	19.0	9.4	101.5	8.1	47.6	3.47	1,197	0.8840		32
	5	18.5	9.8	104.8	8.2	51.6	3.67	1,869	0.8743		34
	8	17.0	9.0	93.3	8.2	52.0	1.64	2,283	0.9774		43

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-14 (Continued)

DEPTH PROFILES OF SELECTED WATER QUALITY INDICATORS FOR THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Date	Depth (m)	Temp. (°C)	DO (mg/L)	DO (% sat.)	pH	OM ¹ (mg/L)	Chl a ² (µg/L)	Plankton (org/mL)	d ³	Secchi Disk (m)	No. sp. ⁴
7/18	1	20.0	9.0	99.2	7.1	54.4	2.78	3,150	1.0060	2.0	43
	3	19.5	9.9	108.0	7.2	52.4	2.62	3,630	1.0454		43
	5	19.0	9.9	106.9	7.5	54.4	3.00	3,235	1.0343		44
	8	18.5	9.9	105.8	7.7	55.6	7.89	4,828	1.1005		45
8/2	1	25.0	8.6	104.4	8.1	61.6	1.03	2,925	0.6184	4.0	34
	3	24.5	8.6	103.4	8.2	56.0	0.80	3,619	0.4889		33
	5	23.0	9.0	105.1	8.2	57.2	1.20	3,103	0.5337		29
9/18	8	22.0	8.4	96.3	7.9	56.8	1.83	3,746	0.8632	2.0	39
	1	12.0	8.0	74.3	8.3	58.8	0.99	5,930	0.7172		44
	3	12.0	9.5	88.3	8.3	52.4	1.57	4,174	0.7677		41
	5	12.0	9.6	89.2	8.3	56.0	1.96	3,453	0.9180		54
10/3	8	11.5	9.0	82.7	8.3	58.8	1.22	6,003	0.8700	2.0	54
	1	15.5	NA	NA	8.90	45.6	2.33	6,154	0.7188		41
10/17	1	17.0	NA	NA	8.05	45.6	3.16	5,275	0.9262	2.0	49
11/2	1	12.0	NA	NA	8.02	45.6	6.61	5,300	0.9898	1.0	41
11/14	1	8.0	NA	NA	7.72	54.8	10.69	5,312	0.8700	0.25	40
11/28	1	7.0	NA	NA	7.58	42.4	5.34	4,619	0.6639	1.0	39
12/12	1	7.0	NA	NA	7.46	43.2	5.29	4,061	0.7108	1.0	30
12/28	1	7.0	NA	NA	7.29	22.8	7.00	1,356	0.9128	0.75	27

¹OM Organic Matter.

²Chl a = Chlorophyll a, Monochromatic Method

³d = Shannon-Weaver diversity index.

⁴No. Sp. = Number of algal species.

⁵NA = No Analysis.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Temperature	°C	12.0	18.0	21.0	21.0	NA ²	14.0	12.0	8.0	7.0
Turbidity	NTU	1.3	0.9	1.2	0.9	16	1.4	3.0	32.0	15.0
Secchi Disk	m	2.25	4.5	3.0	4.0	NA	3.5	1.5	0.25	0.5
pH	STD Units	8.0	8.4	7.9	8.1	8.2	8.3	8.0	8.1	8.2
Alkalinity as CaCO ₃	mg/L	106	118	114	122	130	120	120	110	110
Sulfates	mg/L	21	21	19	22	26	22	24	26	22
Fluorides	mg/L	0.17	0.15	0.14	0.16	0.15	0.14	0.13	0.18	0.18
Chlorides	mg/L	10	18	10	10	10	10	12	8	8
Phosphorus, Total	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphorus, Dissolved	mg/L	<0.1	<0.1	<0.1	<0.1	NA	<0.1	<0.1	<0.1	<0.1
Silica, Total	mg/L	0.3	0.2	0.2	0.3	NA	0.4	1.0	1.6	NA
Calcium	mg/L	28	25	60	42	NA	26	31	31	32
Magnesium	mg/L	11	10	15	13	NA	12	11	13	12
Potassium	mg/L	1.2	<1.0	2.0	2.0	NA	1.1	2.0	1.0	2.0
Sodium	mg/L	5	6	11	15	NA	6	5	5	7
Solids, Total	mg/L	185	178	193	169	198	160	187	248	197
Solids, Total Volatile	mg/L	65	80	63	59	47	35	84	65	39
Solids, Suspended	mg/L	2	11	3	2	34	1	6	60	26
Solids, Volatile Suspended	mg/L	NA	11	NA	NA	4	NA	NA	3	2
Oxygen, Dissolved	mg/L	11.3	9.7	9.4	9.0	NA	NA	NA	NA	NA

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2*	10/30	11/27	12/28
Oxygen Demand, Chemical	mg/L	11	2	6	6	12	10	14	18	8
Oxygen Demand, 5-Day Biochemical	mg/L	<2	<2	<2	<2	<2	<2	3	4	2
Total Organic Carbon	mg/L	NA	NA	3.0	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	<0.1	<0.1	0.3	0.2	0.3	0.6	2.4	0.3	1.7
Nitrogen, Dissolved Total Kjeldahl	mg/L	<0.1	<0.1	0.3	0.2	NA	0.4	2.4	0.3	0.5
Nitrogen, Ammonia	mg/L	<0.1	<0.1	<0.1	<0.1	1.8	<0.1	<0.1	<0.1	<0.1
Nitrogen, Nitrate	mg/L	0.2	<0.1	0.2	0.2	0.5	0.3	0.3	0.2	0.4
Nitrogen, Nitrite	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fats, Oils, and Greases	mg/L	<1	<1	<1	2	<1	<1	<1	2	<1
Foaming Agents- MBAS	mg/L	0.01	0.01	0.00	0.01	NA	0.02	0.00	0.00	0.01
Hardness Titration as CaCO ₃	mg/L	136	128	134	158	NA	114	120	131	NA

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-15 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Hardness Atomic Absorption de- termination of Ca and Mg then cal- culated as CaCO ₃	mg/L	115	104	211	140	NA	102	146	140	138
Aluminum	mg/L	<1.0	<1.0	<1.0	1.0	NA	<1.0	1.0	<1.0	<1.0
Arsenic	mg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.02	<0.02	<0.02	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Chromium	mg/L	<0.02	<0.02	<0.02	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Copper	mg/L	<0.02	<0.02	0.02	0.02	NA	<0.02	<0.02	0.02	0.11
Iron, Total	mg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	0.2	0.6	0.5
Lead	mg/L	<0.02	<0.02	0.03	0.03	NA	<0.02	0.03	0.03	0.13
Manganese	mg/L	<0.02	<0.02	<0.02	<0.02	NA	<0.02	0.02	0.03	0.02
Mercury	µg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.05	<0.05
Nickel	mg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Selenium	mg/L	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Zinc	mg/l	<0.2	<0.2	<0.2	<0.2	NA	<0.2	<0.2	<0.2	<0.2
Phenol-like Substances as Phenol	µg/L	8	<1	<1	2	<1	<1	<1	<1	<1
Silver	mg/L	<0.02	<0.02	<0.02	<0.02	NA	<0.02	<0.02	<0.02	<0.02
Cyanides, Total	mg/L	0.001	0.000	0.002	NA	<0.001	<0.001	NA	NA	0.001
Conductivity	µmhos/cm	268	258	261	275	260	264	262	257	259

¹Dennison collected sample.

²NA= No Analysis

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Temperature	°C	4.0	12.0	18.0	20.0	14.0	24.5	13.0	6.0	8.0
Turbidity	NTU	14	1.4	1.5	0.9	4.0	2.0	3.5	8.0	7.0
Secchi Disk	m	0.75	2.5	3.0	4.0	1.0	2.5	1.25	0.75	0.75
pH	STD Unit	7.4	8.1	8.4	7.9	8.2	7.8	8.2	8.1	8.2
Alkalinity as CaCO ₃	mg/L	110	106	114	112	130	120	110	120	110
Sulfates	mg/L	23	21	20	19	23	21	24	23	22
Fluorides	mg/L	0.14	0.19	0.14	0.14	0.15	0.17	0.15	0.17	0.17
Chlorides	mg/L	14.0	10	12	6	12	10	8	10	8
Phosphorus, Total	mg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Phosphorus, Dissolved	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Silica, Total	mg/L	0.7	0.2	0.2	0.2	1.2	0.2	1.3	1.3	NA
Calcium	mg/L	31	28	25	45	26	30	29	27	31
Magnesium	mg/L	12	11	10	11	10	10	11	11	11
Potassium	mg/L	1.4	1.2	1.0	2.0	1.0	1.0	1.0	1.0	1.0
Sodium	mg/L	8	5	6	12	6	8	5	5	7
Solids, Total	mg/L	190	204	173	196	185	172	174	172	190
Solids, Total Volatile	mg/L	67	62	87	63	55	14	50	48	58
Solids, Suspended	mg/L	13	3	2	2	7	3	5	12	11
Solids, Volatile Suspended	mg/L	5	NA	NA	NA	NA	NA	NA	2	1
Oxygen, Dissolved	mg/L	12.8	11.1	10.0	9.7	NA	8.0	NA	NA	NA

Table continued on following page.

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Oxygen Demand, Chemical	mg/L	17	9	4	10	14	4	20	8	6
Oxygen Demand, 5-Day Biochemical	mg/L	2	<2	<2	<2	<2	<2	2	4	<2
Total Organic Carbon	mg/L	3.0	NA	NA	3.0	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	<0.1	0.6	0.3	0.5	0.4	<0.1	1.8	0.4	0.9
Nitrogen, Dissolved Total Kjeldahl	mg/L	<0.1	<0.1	<0.1	0.1	0.4	<0.1	1.8	0.4	0.6
Nitrogen, Ammonia	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrogen, Nitrate	mg/L	0.3	0.2	<0.1	0.2	0.3	0.2	0.3	0.2	0.4
Nitrogen, Nitrite	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fats, Oils, and Greases	mg/L	<1	<1	<1	1	<1	1	<1	2	<1
Foaming Agents- MBAS	mg/L	0.004	0.02	0.01	0.01	0.01	0.02	0.00	0.01	0.00
Hardness Titration as CaCO ₃	mg/L	127	136	140	138	106	116	118	113	140

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-16 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CHICAGO HARBOR (STATION 4-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection								
		5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Hardness Atomic Absorption determination of Ca and Mg then calculated as CaCO ₃	mg/L	NA	115	104	158	134	142	118	130	NA ²
Aluminum	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	<1.0	<1.0	<1.0
Arsenic	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Barium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Total	mg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3
Lead	mg/L	<0.02	<0.02	<0.02	0.03	<0.02	0.02	<0.02	<0.02	0.02
Manganese	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mercury	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05
Nickel	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phenol-like Substances as Phenol	µg/L	<1	<1	<1	1	<1	1	<1	<1	<1
Silver	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanides, Total	mg/L	0.002	0.001	0.000	0.002	0.001	NA	NA	NA	0.001
Conductivity	µmhos/cm	267	270	255	262	268	275	264	260	272

¹Dennison collected sample

²NA = No Analyses.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-4

STANDARD LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-D) DURING 1984

Fish Species	Number of Fish Collected	Standard Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Gizzard Shad	1	316		316	316
Rainbow Trout	30	137	68	100	490
Brown Trout	17	171	97	71	411
Lake Trout	12	549	29	506	603
Coho Salmon	1	248		248	248
Chinook Salmon	1	670		670	670
Rainbow Smelt	7	134	10	120	145
Spottail Shiner	1	99		99	99
Bluntnose Minnow	2	68	8	62	73
White Sucker	1	290		290	290
Smallmouth bass	1	170		170	170
Yellow Perch	30	170	39	55	260

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection									
		4/11	5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Temperature	°C	4.0	12.5	19.0	20.0	25.0	15.5	12.0	12.0	7.0	7.0
Turbidity	NTU	12	1.2	1.9	1.8	1.0	1.6	2.1	3.5	4.5	5.0
Secchi Disk	m	0.5	2.75	3.0	2.0	4.0	2.0	2.0	1.0	1.0	0.75
pH	STD units	7.9	8.3	7.9	8.1	8.2	8.4	8.3	8.1	8.2	8.2
Alkalinity as CaCO ₃	mg/L	110	220	110	114	120	120	140	100	115	120
Sulfates	mg/L	23	20	20	21	20	26	27	23	25	25
Fluorides	mg/L	0.21	0.19	0.16	0.17	0.22	0.14	0.16	0.14	0.17	0.16
Chlorides	mg/L	18.0	10	12	5	14	10	10	12	12	12
Phosphorus, Total	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Phosphorus, Dissolved	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Silica, Total	mg/L	1.3	0.2	0.2	0.2	0.4	0.2	0.6	1.0	0.8	NA
Calcium	mg/L	41	28	24	55	44	30	30	31	36	33
Magnesium	mg/L	11	11	10	13	14	12	11	11	11	11
Potassium	mg/L	1.3	1.2	<1.0	2.0	2.0	1.4	1.0	2.0	2.0	2.0
Sodium	mg/L	8	6	7	10	14	7	7	5	7	9
Solids, Total	mg/L	198	210	137	196	188	176	197	189	193	99
Solids, Total Volatile	mg/L	58	88	28	65	36	54	52	59	53	61
Solids, Suspended	mg/L	11	3	2	2	1	2	3	11	7	11
Solids, Volatile Suspended	mg/L	2	NA ²	NA	NA	NA	NA	NA	2	NA	1
Oxygen, Dissolved	mg/L	12.5	10.2	9.0	9.0	8.6	NA	8.0	NA	NA	NA

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

Constituents	Units	Dates of Collection									
		4/11	5/24	6/28	7/19	8/1	10/2	9/26*	10/30	11/27	12/28
Oxygen Demand, Chemical	mg/L	11	6	2	12	002	10	10	10	6	10
Oxygen Demand, 5-Day Biochemical	mg/L	<2	2	<2	2	<2	<2	<2	<2	<2	2
Total Organic Carbon	mg/L	5.0	NA	NA	3.0	NA	NA	NA	NA	NA	NA
Nitrogen, Total Kjeldahl	mg/L	0.3	0.3	0.2	0.2	0.4	0.4	0.1	0.1	0.1	1.7
Nitrogen, Dissolved Total Kjeldahl	mg/L	0.3	0.3	0.2	0.2	0.4	0.4	0.1	0.1	0.1	1.1
Nitrogen, Ammonia	mg/L	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1
Nitrogen, Nitrate	mg/L	<0.1	0.2	<0.1	0.2	0.2	0.3	0.2	0.4	0.3	0.4
Nitrogen, Nitrite	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fats, Oils, and Greases	mg/L	1	2	<1	1	1	<1	<1	3	1	<1
Foaming Agents-MBAS	mg/L	0.005	0.01	0.01	0.01	0.01	0.01	0	NA	0.01	0
Hardness Titration as CaCO ₃	mg/L	NA	136	144	136	167	124	120	123	135	NA

Table continued on following page.

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METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-17 (Continued)

CHEMICAL ANALYSES OF WATER SAMPLES COLLECTED FROM THE INSHORE WATERS
OF SOUTHWESTERN LAKE MICHIGAN AT CALUMET HARBOR (STATION 6-B, FIGURE 1) DURING 1984

AII-17

Constituents	Units	Dates of Collection									
		4/11	5/24	6/28	7/19	8/1	9/26 ¹	10/2	10/30	11/27	12/28
Hardness Atomic Absorption determination as Ca and Mg then calculated as CaCO ₃	mg/L	148	115	101	191	140	138	130	124	140	144
Aluminum	mg/L	<1	<1	<1	<1	1	<1	<1	1	<1	<1
Arsenic	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Barium	mg/L	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cadmium	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Copper	mg/L	0.02	<0.02	0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron, Total	mg/L	0.2	<0.2	0.3	0.2	<0.2	<0.2	0.4	0.2	<0.2	0.2
Lead	mg/L	<0.02	0.02	0.05	<0.02	<0.02	<0.02	<0.02	0.03	0.02	<0.02
Manganese	mg/L	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Mercury	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.05	<0.05
Nickel	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phenol-like Substances as Phenol	µg/L	1	<1	1	<1	1	1	1	<1	<1	1
Silver	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cyanides, Total	mg/L	0.001	0.002	0.001	0.002	NA	0.001	<0.001	NA	NA	NA
Conductivity	µmhos/cm	278	274	266	263	278	271	261	262	259	281

¹Dennison collected sample.

²NA = No Analysis.

APPENDIX AIII

DATA FOR FISH COLLECTED DURING 1984 FROM THE INSHORE AREAS
OF SOUTHWESTERN LAKE MICHIGAN (WILMETTE, CHICAGO,
AND CALUMET HARBORS)

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-1

STANDARD LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT WILMETTE HARBOR (STATION 2-D) DURING 1984

Fish Species	Number of Fish Collected	Standard Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	21	116	35	46	164
Gizzard Shad	1	122		122	122
Rainbow Trout	1	366		366	366
Brown Trout	1	94		94	94
Lake Trout	17	573	29	535	645
Rainbow Smelt	48	39	19	28	137
Bluntnose Minnow	12	66	11	38	77
Black Bullhead	104	24	9	16	101
Green Sunfish	1	63		63	63
Yellow Perch	162	155	45	39	231
Mottled Sculpin	1	66		66	66

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-2

TOTAL LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT WILMETTE HARBOR (STATION 2-D) DURING 1984

Fish Species	Number of Fish Collected	Total Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	21	147	45	56	208
Gizzard Shad	1	155		155	155
Rainbow Trout	1	443		443	443
Brown Trout	1	111		111	111
Lake Trout	17	681	35	631	763
Rainbow Smelt	48	46	23	33	165
Bluntnose Minnow	12	80	13	47	92
Black Bullhead	104	31	11	21	124
Green Sunfish	1	78		78	78
Yellow Perch	162	184	53	49	275
Mottled Sculpin	1	84		84	84

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-3

TOTAL WEIGHT FOR FISH COLLECTED FROM LAKE MICHIGAN
AT WILMETTE HARBOR (STATION 2-D) DURING 1984

Fish Species	Number of Fish Collected	Total Weight (gm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	21	36.19	20.67	1.42	85.52
Gizzard Shad	1	46.89		46.89	46.89
Rainbow Trout	1	1,200.00		1,200.00	1,200.00
Brown Trout	1	15.92		15.92	15.92
Lake Trout	17	3,156.47	690.62	2,300.00	4,600.00
Rainbow Smelt	48	1.17	4.37	0.11	27.75
Bluntnose Minnow	12	6.38	2.79	0.86	9.95
Black Bullhead	104	0.85	3.15	0.18	32.52
Green Sunfish	1	10.41		10.41	10.41
Yellow Perch	162	92.24	55.92	0.99	246.10
Mottled Sculpin	1	8.95		8.95	8.95

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-5

TOTAL LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-D) DURING 1984

Fish Species	Number of Fish Collected	Total Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Gizzard Shad	1	385		385	385
Rainbow Trout	30	167	81	123	587
Brown Trout	17	204	114	87	490
Lake Trout	12	655	34	601	721
Coho Salmon	1	294		294	294
Chinook Salmon	1	823		823	823
Rainbow Smelt	7	160	12	144	173
Spottail Shiner	1	126		126	126
Bluntnose Minnow	2	82	11	74	89
White Sucker	1	350		350	350
Smallmouth Bass	1	205		205	205
Yellow Perch	30	202	45	68	306

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-6

TOTAL WEIGHT FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CHICAGO HARBOR (STATION 4-D) DURING 1984

Fish Species	Number of Fish Collected	Total Weight (gm)			
		Mean	Std. Dev.	Minimum	Maximum
Gizzard Shad	1	810.60		810.60	810.60
Rainbow Trout	30	127.61	495.49	16.28	2,750.00
Brown Trout	17	213.61	382.87	6.99	1,580.00
Lake Trout	12	2,530.00	420.93	2,000.00	3,380.00
Coho Salmon	1	296.33		296.33	296.33
Chinook Salmon	1	4,640.00		4,640.00	4,640.00
Rainbow Smelt	7	26.63	8.24	15.23	36.38
Spottail Shiner	1	17.79		17.79	17.79
Bluntnose Minnow	2	6.08	2.60	4.24	7.91
White Sucker	1	546.90		546.90	546.90
Smallmouth Bass	1	139.59		139.59	139.59
Yellow Perch	30	110.00	81.82	2.70	420.00

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-7

STANDARD LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-D) DURING 1984

Fish Species	Number of Fish Collected	Standard Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	6	45	9	33	54
Gizzard Shad	1	101		101	101
Lake Trout	4	570	25	535	592
Chinook Salmon	1	666		666	666
Rainbow Smelt	3	140	2	139	142
Goldfish	1	179		179	179
Carp	4	278	179	105	460
Emerald Shiner	5	55	6	48	63
Bigmouth Shiner	3	53	2	52	55
Spottail Shiner	5	76	22	39	98
Bluntnose Minnow	79	53	11	24	74
Fathead Minnow	68	52	4	41	62
White Sucker	2	261	21	246	275
Black Bullhead	3	142	31	119	178
Rock Bass	4	51	27	27	74
Pumpkinseed	3	104	1	103	105
Largemouth Bass	4	72	10	62	84
Johnny Darter	3	52	11	39	60
Yellow Perch	147	117	54	41	250
Mottled Sculpin	1	73		73	73

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-8

TOTAL LENGTH FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-D) DURING 1984

Fish Species	Number of Fish Collected	Total Length (mm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	6	57	11	45	68
Gizzard Shad	1	126		126	126
Lake Trout	4	673	26	635	694
Chinook Salmon	1	798		798	798
Rainbow Smelt	3	166	1	165	166
Goldfish	1	229		229	229
Carp	4	359	237	132	607
Emerald Shiner	5	69	7	60	79
Bigmouth Shiner	3	67	2	65	69
Spottail Shiner	5	95	28	49	124
Bluntnose Minnow	79	64	13	28	88
Fathead Minnow	68	64	5	50	77
White Sucker	2	317	23	301	333
Black Bullhead	3	169	34	144	208
Rock Bass	4	66	34	36	96
Pumpkinseed	3	131	1	131	132
Largemouth Bass	4	89	11	78	103
Johnny Darter	3	63	14	47	72
Yellow Perch	147	140	63	50	296
Mottled Sculpin	1	89		89	89

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AIII-9

TOTAL WEIGHT FOR FISH COLLECTED FROM LAKE MICHIGAN
AT CALUMET HARBOR (STATION 6-D) DURING 1984

Fish Species	Number of Fish Collected	Total Weight (gm)			
		Mean	Std. Dev.	Minimum	Maximum
Alewife	6	1.55	0.99	0.38	2.59
Gizzard Shad	1	21.50		21.50	21.50
Lake Trout	4	2,875.00	457.35	2,200.00	3,200.00
Chinook Salmon	1	4,300.00		4,300.00	4,300.00
Rainbow Smelt	3	28.62		27.08	30.33
Goldfish	1	286.83		286.83	286.83
Carp	4	1,408.57	1,639.46	40.83	3,450.00
Emerald Shiner	5	2.45	1.01	1.37	3.82
Bigmouth Shiner	3	2.65	0.20	2.43	2.83
Spottail Shiner	5	9.38	6.20	0.92	17.52
Bluntnose Minnow	79	2.95	1.58	0.18	8.39
Fathead Minnow	68	3.03	0.92	1.30	8.39
White Sucker	2	411.92	98.19	342.49	481.35
Black Bullhead	3	56.96	11.84	45.42	69.07
Rock Bass	4	8.90	9.18	0.90	17.09
Pumpkinseed	3	60.37	3.65	57.22	64.37
Largemouth Bass	4	10.31	4.59	6.55	16.48
Johnny Darter	3	2.30	1.32	0.79	3.17
Yellow Perch	147	47.05	58.69	0.87	350.06
Mottled Sculpin	1	9.94		9.94	9.94

METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

AVERAGE POPULATION DENSITY OF KEMMERER PLANKTONIC ALGAL SPECIES COLLECTED FROM THE INSHORE WATERS OF SOUTHWESTERN LAKE MICHIGAN AT WILMETTE HARBOR (STATION 2-B, FIGURE 1) DURING 1984

Organisms	5/24	6/8	6/28	7/19	8/1	8/15	10/2	10/16	10/30	11/13	11/27	12/12	12/28
<i>Melosira islandica</i>		19			2		14		14	30	22	69	40
<i>M. varians</i>			<1								1		
<i>Navicula anglica</i>	3			6		<1	9		8	10	1		<1
<i>N. bacillaria</i>				6									
<i>N. binodis</i>			<1										
<i>N. capitata</i>		4		3								<1	
<i>N. cryptocephala</i>		6		18	23	4			32	2	8		
<i>N. cryptocephala</i> var. <i>veneta</i>			<1	62	17	8	4		5	15	12		<1
<i>N. cuspidata</i>				3									
<i>N. exigua</i>			3	31	2	3	4			20	6		1
<i>N. gastrum</i>				31									

Table continued on following page.