

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO



**DEPARTMENT OF RESEARCH
AND DEVELOPMENT**

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1983 ANNUAL SUMMARY REPORT
WATER QUALITY WITHIN THE WATERWAYS SYSTEM OF
THE METROPOLITAN SANITARY DISTRICT
OF GREATER CHICAGO
VOLUME 2
BIOLOGICAL**

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WATER QUALITY WITHIN THE WATERWAYS SYSTEM
OF THE METROPOLITAN SANITARY DISTRICT
OF GREATER CHICAGO

VOLUME II
BIOLOGICAL

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Disclaimer

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

SUMMARY

BACTERIA

At the four stations sampled in Thorn Creek during 1983 the geometric means of the total coliform counts ranged from 7.5×10^3 to 1.3×10^5 per 100 milliliters, the fecal coliform counts ranged from 6.4×10^2 to 4.8×10^3 per 100 milliliters, and the fecal streptococcus counts ranged from 8.9×10^2 to 2.1×10^3 per 100 milliliters. At the three stations sampled in the Little Calumet River during 1983, the geometric means of the total coliform counts ranged from 1.7×10^4 to 1.6×10^6 per 100 milliliters, the fecal coliform counts ranged from 7.0×10^3 to 6.0×10^4 per 100 milliliters, and the fecal streptococcus counts ranged from 1.2×10^3 to 4.2×10^4 per 100 milliliters. These indicator bacteria counts were an order of magnitude greater in the Little Calumet River than in Thorn Creek and suggest that domestic wastes were received by the two streams. The "General Use" criterion, established by the Illinois Pollution Control Board (IPCB), of a geometric mean of 200 fecal coliform per 100 milliliters, based on a minimum of five samples taken over not more than a 30-day period, was not met in either Thorn Creek or the Little Calumet River during 1983.

Standard plate counts, as geometric means, ranged from 2.1×10^4 to 5.7×10^4 per milliliter in Thorn Creek and from 8.8×10^4 to 7.4×10^5 per milliliter in the Little Calumet

River. These counts were comparable to those found in the artificial deep-draft waterway in metropolitan Chicago in 1975, 1976, and 1977 and in the North Branch of the Chicago River in 1980 and 1981.

Pseudomonas aeruginosa counts, as geometric means, ranged from 110 to 280 per 100 milliliters in Thorn Creek and from 240 to 11,000 per 100 milliliters in the Little Calumet River. Salmonella counts, as geometric means, ranged from less than 0.15 to less than 0.2 per 100 milliliters in Thorn Creek and in the Little Calumet River.

In general, higher bacterial counts were encountered in the Little Calumet River, especially at Wentworth Avenue, than in Thorn Creek for all categories of bacteria measured.

PERIPHYTON

In Thorn Creek the periphyton population density, as geometric means, ranged from 1.8×10^4 to 4.7×10^5 organisms per square centimeter, and in the Little Calumet River ranged from 1.7×10^5 to 3.9×10^5 organisms per square centimeter. The average periphyton population density in the two waterways was almost identical with 1.3×10^5 organisms per square centimeter in Thorn Creek and 2.3×10^5 organisms per square centimeter in the Little Calumet River.

The average number of periphyton species per sample in Thorn Creek ranged from 22 to 40. The average number of species per sampling date was 60 species. In the Little Calumet

River the average number of periphyton species per sampling date was 52 species. The total number of species found during the year at each station in Thorn Creek ranged from 79 to 100 species. A total of 164 species was found among the four stations in Thorn Creek during 1983. The total number of species found at each station in the Little Calumet River in 1983 ranged from 85 to 103 species with a total of 151 species found among the three stations.

The average Shannon-Weaver species diversity index in Thorn Creek ranged from 2.36 to 2.68, and in the Little Calumet River ranged from 1.96 to 2.61. The overall average Shannon-Weaver species diversity index was 3.00 in Thorn Creek and 2.62 in the Little Calumet River. In lakes, Margelef has defined trophic status in terms of species diversity as follows: oligotrophic, greater than 3.5; mesotrophic, 2.5 to 3.5; and eutrophic less than 2.5. According to these guidelines, the overall species diversity averages of Thorn Creek and the Little Calumet River indicate mesotrophic to eutrophic waters. Of 31 calculated species diversity indices from Thorn Creek 25 (81 percent) were less than 2.5 and of the 21 species diversities calculated from the Little Calumet River 18 (86 percent) were less than 2.5. These data indicate eutrophy or nutrient enrichment occurring the majority of the time.

The equitability index, based on the Shannon-Weaver species diversity index and the number of species, ranged from

0.08 to 0.09 in the Little Calumet River. Equitability values less than 0.3 indicate moderate to severe pollution. Since all of the average values were less than 0.1 both waterways are severely polluted as measured by this parameter.

The autotrophic index is the ratio of the organic matter concentration to the chlorophyll a concentration and is based on the empirical observation that in relatively clean waters only one to two percent of the organic matter present is chlorophyll a. Values greater than 100 to 200 are indicative of the excessive growth of heterotrophic organisms resulting from organic pollutants. The autotrophic index in Thorn Creek ranged from 304 to 1230, and in the Little Calumet River from 266 to 1884. The average autotrophic index in Thorn Creek was 722 and in the Little Calumet River it was 1030. Both waterways had values well above the 100 to 200 limit established for relatively clean water, and are considered to be polluted by this measurement.

The conclusion derived from the indicator bacteria data that Thorn Creek and the Little Calumet River were receiving domestic wastes was confirmed by the periphyton data. The periphyton population densities (10^5 organisms per square centimeter) were similar to those found in the North Branch of the Chicago River in 1980 and 1981, and in the Des Plaines River in 1979 and 1980. The Shannon-Weaver species diversity indices (less than 2.5) indicated nutrient enrichment, the

equitability indices (less than 0.1) indicated severe pollution, and the autotrophic indices (266 to 1884) indicated organic pollution.

Fish

The number and weight of fish per ten minutes electrofishing were least in the Little Calumet River at the Wentworth Avenue location (0.24 and 2.22 grams, respectively) and in Thorn Creek at the 167/170th Street location (7.00 and 33.46 grams, respectively) suggesting that water quality was poorest for fish at these locations.

The major fish species found in the Little Calumet River, in order of numerical abundance were: Green sunfish (31 percent), gizzard shad (28 percent), and central mudminnow (21 percent). In Thorn Creek the major fish species found were: Green sunfish (58 percent), fathead minnow (18 percent), and creek chub (11 percent). The presence of these species, all tolerant of a wide range of ecological conditions, suggested that the water quality in both streams was relatively poor.

The abundance of fishes, in terms of number or weight per ten minutes electrofishing, places the Little Calumet River, including Thorn Creek (13 and 283 grams, respectively), into the same category as the North Branch of the Chicago River (15.3 and 256 grams, respectively) and Salt Creek (11 and 262 grams, respectively) in terms of water quality as

reflected by their fish population. An example of better water quality would be Hickory Creek with 322 fish weighing 1,921 grams per ten minutes electrofishing.

The percentage of omnivorous fish exceeded 45 percent, and the percentage of green sunfish was 20 percent or more in the Little Calumet River and Thorn Creek; suggesting that the water quality of both streams was poor for fish.

On the basis of the number of species collected, Wentworth Avenue (green sunfish and bluegill) on the Little Calumet River and Joe Orr Road (central mudminnow, fathead minnow, creek chub, green sunfish, largemouth bass) on Thorn Creek appear to be the locations of poorest quality on the respective streams.

Overall, the Little Calumet River and its major tributary, Thorn Creek, were of poor water quality in terms of supporting a varied fish population. The conclusion of poor water quality was supported by the indicator bacteria data, which approximated that found in Chicago's artificial waterways, the Des Plaines River and the North Branch of the Chicago River. Furthermore, the periphyton population densities (10^5 organisms per square centimeter), the large proportion of species diversities which were less than 2.5, the average equitabilities which were less than 0.1, and the autotrophic indices all exceeding the 100 to 200 limit for relatively clean water indicated that the Little Calumet River and Thorn Creek were nutrient enriched by organic

pollution and received large additions of domestic and industrial wastes from combined sewer overflows and effluents from treatment works outside the District's jurisdiction.

CONCLUSIONS

1. Thorn Creek and the Little Calumet River were of poor water quality according to the magnitude and quality of the analyzed bacterial, algal, and fish populations.
2. The water quality was poorest in Thorn Creek at Joe Orr Road, downstream of the Thorn Creek Basin Sewage Treatment Plant (Bloom Township) before entering the District's jurisdiction.
3. The water quality was poorest in the Little Calumet River at Wentworth Avenue, just downstream of where the river crosses from Indiana into Illinois and enters the District's jurisdiction.

INTRODUCTION

The Metropolitan Sanitary District of Greater Chicago (District) is responsible for the quality of the water in the streams and canals within its jurisdiction. In 1975 the District established its Ecosystematic Study Program to monitor these waterways. The monitoring activities under this program are carried out by the Biology Section of the Research Division, Research and Development Department. The field monitoring activities are handled by the following groups within the Biology Section: Analytical Microbiology, Aquatic Biology, and Fisheries.

From 1975 to 1977 the deep-draft waterways of the Chicago and Calumet River Systems were studied (1, 2, 3). The monitoring efforts during 1978 and 1979 were concentrated in that portion of the Des Plaines River within Cook County (4, 5). In 1980 and 1981 that portion of the North Branch of the Chicago River within Cook County, and above its confluence with the North Shore Channel, was monitored (6, 7). During 1982 and 1983 that portion of the Little Calumet River and its main tributary Thorn Creek, within Cook County, were monitored (8).

According to the 1974 Water Quality Standards adopted by the Illinois Pollution Control Board (IPCB), the waters of Thorn Creek and the Little Calumet River were designated for "General Use". By definition, this means that the waters are to be protected, ". . . for aquatic life, agricultural use,

primary and secondary contact use, and most industrial uses, and ensure the aesthetic quality of the State's aquatic environment."

The objectives of this study were to determine the water quality of the Little Calumet River and Thorn Creek by monitoring bacterial, periphyton, and fish populations of each stream. Evaluation of the existing biological community structure in a waterway is useful in detecting pollution and in quantifying the intensity of its effects. When a waterway is stressed due to pollutant additions, the more pollutant-tolerant organisms will increase in abundance and the less tolerant organisms will decrease. Effects of stress can be detected by examining population densities, species composition, and the species diversity of the aquatic community. The District's Biology Section monitored the bacteria, periphyton, and fish communities of Thorn Creek and the Little Calumet River during 1982 and 1983 to establish the water quality conditions of these waterways.

DESCRIPTION OF THE LITTLE CALUMET RIVER

The Little Calumet River basin is located in northeastern Illinois and northwestern Indiana. The watershed drains an area of 242 square miles, 151 square miles of which are in Illinois. The main channel flows in a westerly direction from the Indiana border, joining with the Calumet-Sag Channel and eventually the Chicago Sanitary and Ship Canal (9; Figure 1).

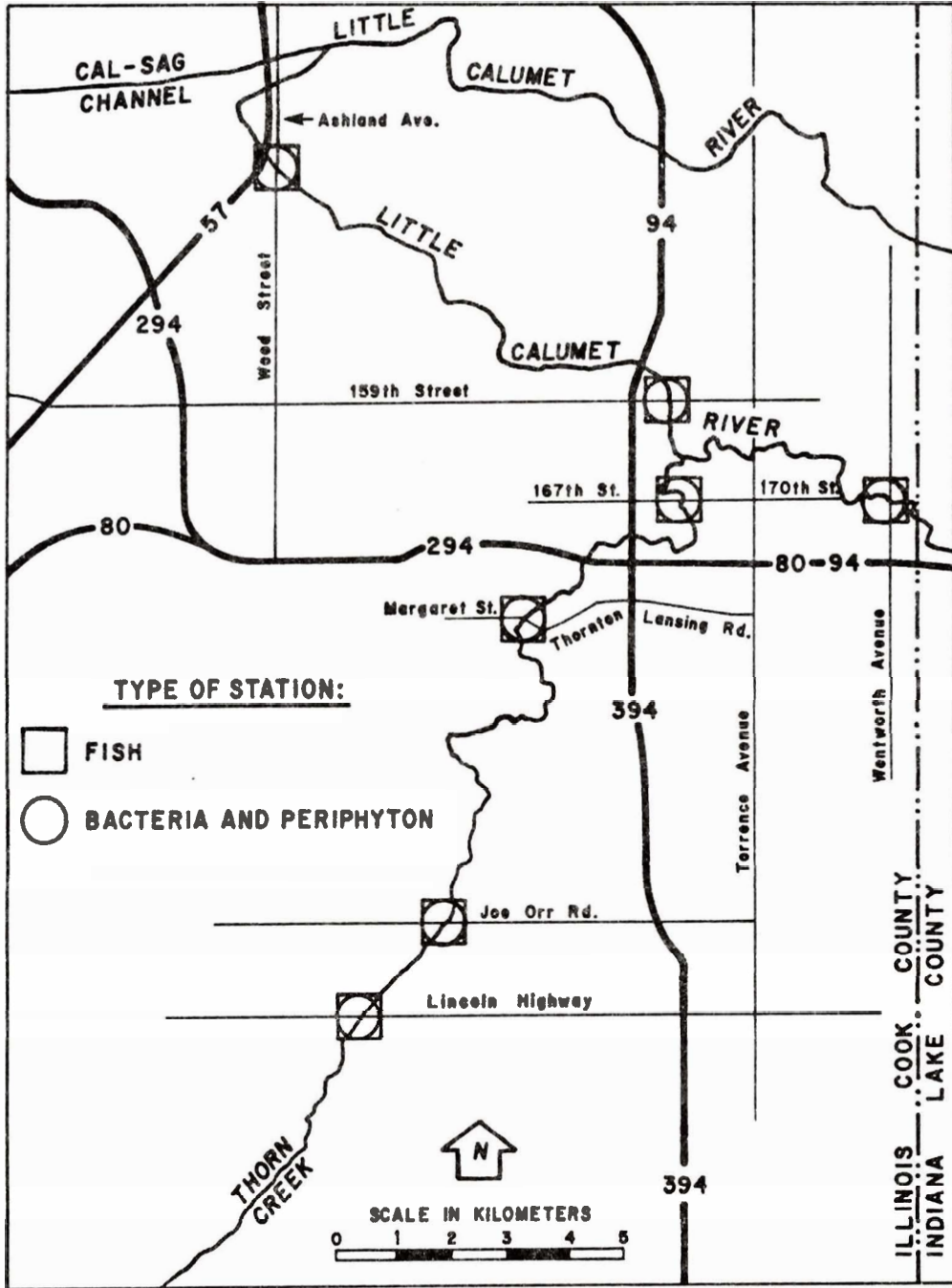
The Little Calumet River system is composed of the Little Calumet River and its most important tributaries: Thorn Creek, Deer Creek, Butterfield Creek, and the Calumet-Union Drainage Ditch. The system is divided into 14 reaches which are distributed as follows: Little Calumet River - 5 reaches, Thorn Creek - 4 reaches, Deer Creek - 2 reaches, Butterfield Creek - 2 reaches, and the Calumet-Union Drainage Ditch - 1 reach (Figure 2).

The 14 reaches of the Little Calumet River system drain an area of approximately 151.2 square miles (392 square kilometers) in Illinois. The drainage areas of Butterfield Creek and Deer Creek, major tributaries of Thorn Creek, are 25.8 square miles (66.82 square kilometers) and 26.7 square miles (71.5 square kilometers), respectively, or 49 percent of the total drainage area of Thorn Creek. Thorn Creek drains 71 percent of the Illinois drainage area of the Little Calumet River, and the Calumet-Union Drainage Ditch drains 15 percent. The remaining 14 percent is drained by the Little Calumet River (9).

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

Figure 1

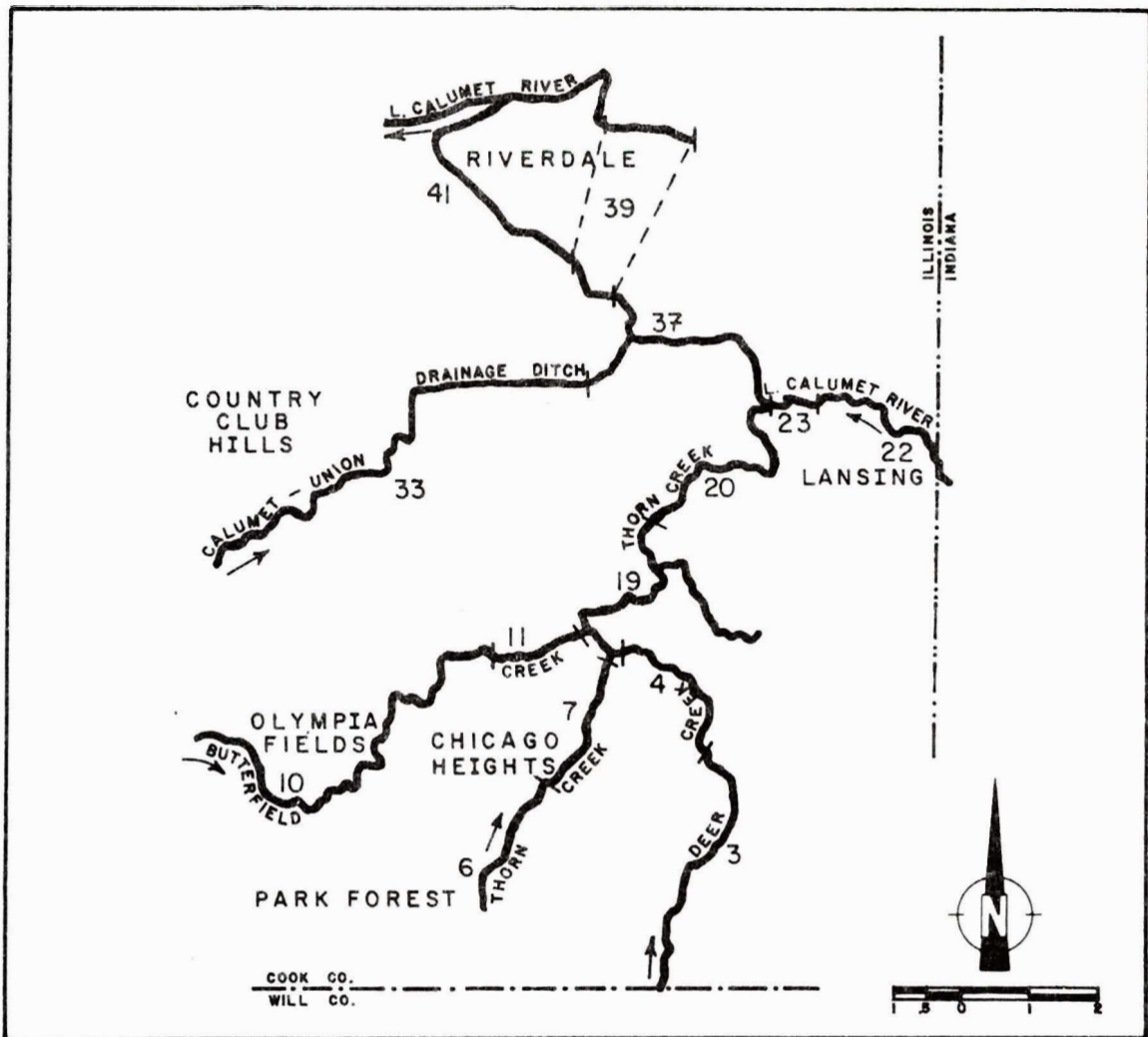
THORN CREEK AND LITTLE CALUMET RIVER
BIOLOGICAL SAMPLING STATIONS



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FIGURE 2

LITTLE CALUMET RIVER WATERWAY SYSTEM REACHES*



*STAFF PAPER FEBRUARY 1981
STREAM USE INVENTORY: LITTLE CALUMET RIVER
NORTHEASTERN ILLINOIS PLANNING COMMISSION

LL/9/85

The Little Calumet River had a total flow measured in reach number 41, at the downstream side of the Cottage Grove Avenue bridge in South Holland, of 249 cubic feet per second (161.9 mgd) in water year 1981. The flow in Thorn Creek was approximately 122 cubic feet per second (79.3 mgd) (10).

In the northern part of the basin there are extensive areas serviced by combined sewers which discharge mainly into the main channel of the Little Calumet River. In one reach of the Little Calumet River flow originating from combined sewers comprises seven percent of the total (9). Numerous treatment plants are located on the tributary streams the most important of which is the Bloom Township Sewage Treatment Plant on Thorn Creek, Butterfield Creek, and Deer Creek, and the presence of many combined sewer overflows in the main channel indicate that a principal use of the Little Calumet River system is wastewater disposal (9).

Many areas of the drainage basin are highly urbanized, as evidenced by high percentages of impervious land cover in most reaches, so that the major secondary use of the Little Calumet River system is for urban drainage (9). However, the headwaters of Butterfield Creek and the Calumet-Union Drainage Ditch have urban drainage as their principal stream use (9) and Deer Creek and the headwaters of Thorn Creek have agricultural drainage as their secondary stream use (9). The agricultural areas are rapidly becoming urbanized.

The main channel of the Little Calumet River is dredged periodically to facilitate the rapid removal of stormwater runoff. Existing flood control structures and proposed new ones indicate that flood control may become an important stream use (9).

DESCRIPTION OF THE BIOLOGICAL CHARACTERISTICS USED TO
DETERMINE THE WATER QUALITY OF THORN CREEK AND THE
LITTLE CALUMET RIVER

Bacteria

INDICATOR BACTERIA

Bacterial analyses such as total coliform (TC), fecal coliform (FC), and fecal streptococcus (FS) tests are used extensively by the District to indicate the sanitary quality of water.

STANDARD PLATE COUNT (SPC)

An empirical procedure which gives an estimate of the total bacterial population.

PSEUDOMONAS AERUGINOSA

This ubiquitous organism is a common soil, fresh water and marine organism. It is important in the mineralization of organic matter, and is an opportunist human pathogen often causing ear, skin, burn and wound infections.

SALMONELLA

The genus Salmonella contains a variety of species all of which are pathogenic for man or animals and usually for both. They are all facultative intestinal parasites.

Periphyton

PERIPHYTON POPULATION ANALYSIS

Algae are the base of all aquatic food chains by virtue of their ability to convert inorganic substances to organic

substances through the process of photosynthesis which is dependent on the availability of light (turbidity), carbon dioxide and the presence of chlorophyll.

Periphyton are generally defined as microfloral growth on a substrate. This definition includes a variety of zoogleal and filamentous bacteria, protozoans, rotifers, algae, and associated trapped organisms (11). In this study only the algal fraction was analyzed. The periphytic algae were preferentially sampled and analyzed because they are the most numerous organisms under conditions in which the littoral zone approximates the surface area, such as in streams or rivers. Also, periphytic algae are stationary and are thus exposed to all the variations in the concentrations of the constituents in the surface waters.

Periphytic algae have short generation times and are thus very responsive to their environment. A clean undisturbed water environment produces a great variety of periphytic algal species with none dominant in terms of population density. An environment rich in the major nutrients (nitrogen, phosphorus, and potassium), carbon dioxide, and trace elements produces a high density population of periphytic algae with one to several dominant species. Toxic levels of compounds in an environment tend to reduce both the density of periphytic organisms and the number of species.

CHLOROPHYLL a

The concentration of chlorophyll a is a measure of the photosynthetic potential and biomass of chlorophyllous organisms. According to Weber (12) the chlorophyll a content of biomass grown in relatively clean waters is one to two percent of the ash-free dry weight.

ORGANIC MATTER (ASH-FREE DRY WEIGHT)

The organic matter content of a sample is a measure of the total biomass. This biomass may be made up of chlorophyllous and heterotrophic organisms and the latter may be significant in water degraded by dissolved or particulate organic enrichment (12).

AUTOTROPHIC INDEX

The autotrophic index (AI) is the ratio of organic matter to chlorophyll a concentrations. If this ratio exceeds 100 to 200 (based on a chlorophyll a content of relatively clean water of one to two percent) the "excess" organic matter is attributed to heterotrophic organisms responding to enrichment of the water by dissolved or particulate organic matter. Although the tendency is to rank waters according to their AI (the higher the AI the more contamination by organic matter) the work by Weber (12) does not claim this ability. The AI may be used as support for other data, but by itself purports only to separate relatively clean waters from those contaminated by organic matter such as sewage.

The reasoning is that the responding heterotrophic organisms, in kind and numbers, are dependent on the properties of the contaminating organic matter as well as local properties of the waterway system.

EQUITABILITY

Equitability is a comparison of the number of species in a sample with the number of species expected from a truncated lognormal distribution (few relatively abundant species and increasing numbers of species represented by only a few individuals). This truncated lognormal distribution is one frequently observed in nature.

In order to calculate equitability, the Shannon-Weaver mean species diversity index (\bar{d}) must be calculated and used with the tables prepared by Lloyd and Ghelardi to seek the number of expected species (12). The \bar{d} in unpolluted waters is generally in the range from three to four and in polluted waters is generally less than one. While \bar{d} lacks the sensitivity to demonstrate differences between these extremes (12); the equitability is very sensitive, in this region, to very slight degrees of degradation.

Equitability may range from 0 to 1 where the distribution of species in a sample is the same or less equitable than the truncated lognormal distribution (12). Very slight degrees of degradation reduce equitability values to less than 0.5.

Fish

Fish collections and analyses give the most meaningful index of water quality to the public and have been performed on the District waterways since 1974 (1, 2, 3, 4, 5, 6, 7, 8). 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 stream and the numerical relationships of these species provides an excellent biological picture of the watercourse and its well-being. When such 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 (13).

Description of the Sampling Locations and Frequency of Sampling

Seven sampling stations were chosen for the collection of bacteria and periphyton, four on Thorn Creek and three on the Little Calumet River. Figure 1 shows the location of these stations on Thorn Creek and the Little Calumet River in relation to major east-west and north-south roads as well as the major townships. Table 1 identifies the stations according to the nearest major road crossing the waterway and the types of samples collected.

Samples for bacterial analyses were collected April 19,

June 21, August 16, and October 8, 1983. Fecal coliforms were also collected monthly on the routine Industrial Waste Division bridge run collections. Periphyton samples were collected every four weeks beginning with sampler emplacement at the stations on March 1 and terminating with the last collection of samples on November 3, 1983. The periphyton samplers were immersed in the waterway two weeks prior to collection. Fish were collected at each station reach during the period July 12 to August 12, and October 5 to October 28, using electrofishing techniques.

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TABLE 1

BIOLOGICAL SAMPLING SITES* ON THORN CREEK
AND THE LITTLE CALUMET RIVER

Name of Site	Biological Samples
Thorn Creek**	
Lincoln Highway	Bacteria, Periphyton, Fish
Joe Orr Road	Bacteria, Periphyton, Fish
Margaret Street	Bacteria, Periphyton, Fish
167/170th Street	Bacteria, Periphyton, Fish
Little Calumet River**	
Wentworth Avenue***	Bacteria, Periphyton, Fish
159th Street	Bacteria, Periphyton, Fish
Ashland Avenue (near 140th Street)	Bacteria, Periphyton, Fish

*Figure 1 is a map depicting the locations of these sites.

**Order of sampling sites is from upstream to downstream for each waterway. Thorn Creek enters the Little Calumet River upstream of 159th Street.

***The stream reach sampled for fish at Wentworth Avenue extended to Homan Avenue to the east.

METHODS OF BIOLOGICAL ANALYSES OF WATERWAYS SAMPLES

Bacteria

Water samples for bacterial analyses were placed into sterile containers with sufficient sodium thiosulfate to neutralize 15 milligrams per liter chlorine. All samples were taken with a bucket at the stream surface in the center of the waterway. The samples were transported on ice to the Research and Development Laboratory in Stickney, Illinois. Analyses were begun approximately six to 24 hours after sample collection began and from two to 20 hours after the last sample was collected.

INDICATOR BACTERIA (TC, FC, and FS)

Total coliform, FC, and FS analyses were performed according to Standard Methods (11).

STANDARD PLATE COUNT (SPC)

Standard plate counts were performed according to Standard Methods (11).

PSEUDOMONAS AERUGINOSA

P. aeruginosa analyses were performed and confirmed according to a most probable number (MPN) procedure described in Standard Methods (11).

SALMONELLA

Salmonella were estimated using a modification of the MPN technique described by Kenner and Clark (14). Presump-

tive Salmonella were identified biochemically using the Analytical Profile Index (API-20®) system for identification of Enterobacteriaceae. Confirmation of isolates was performed with polyvalent Salmonella "O" antisera. Verification and further serotyping of the isolates were performed by the Illinois Department of Public Health.

Periphyton

Samplers for periphyton consisted of a plastic cage with floats designed to immerse eight microscope slides one centimeter below the surface of the water in a vertical position and perpendicular to the flow. Periphyton were allowed to develop on the glass slides for a period of two weeks. The cages were then recovered, wrapped in aluminum foil, and kept iced until delivered to the laboratory. In the laboratory the slides were removed from the cages and randomly segregated for each analysis.

DIATOMS

Organic matter in the diatom samples was removed by digestion with hydrogen peroxide followed by dichromate. The samples were washed until clean and then were concentrated, mounted in Hyrax®, and examined microscopically for identification and enumeration of diatoms (11).

NON-DIATOMS

After fixation with glutaraldehyde, the samples were concentrated, mounted on slides, and examined microscopically for identification and enumeration of the non-diatoms (11).

CHLOROPHYLL a

Chlorophyll a was estimated in acetone extracts after clarification by centrifugation (11).

ORGANIC MATTER

Organic matter was estimated by drying the slides at 105°C to constant weight and then ashing them in a muffle furnace for 30 minutes at 550 to 600°C. The difference in weight is, by definition, the organic matter.

AUTOTROPHIC INDEX (AI)

The AI which relates the organic matter content of a sample to its chlorophyll a content was calculated using Weber's equation (12):

$$AI = \text{Organic matter (mg/m}^2\text{)} / \text{Chlorophyll a (mg/m}^2\text{)}$$

For convenience $\mu\text{g/cm}^2$ was used instead of mg/m^2 ($\mu\text{g/cm}^2 = 10 \text{ mg/m}^2$). Since the same constant is used in the numerator and denominator for this conversion, it cancels out and doesn't change the ratio.

EQUITABILITY

Equitability was determined using the procedures detailed in Weber's Biological Field and Laboratory Methods (12). The procedure involves the calculation of the Shannon-Weaver species diversity index which provides the data to enter the tables provided (12). Equitability was then calculated.

Fish

In the Little Calumet River fish were collected by use of a direct current backpack electrofisher and dip nets. Often a small boat was used due to the deep deposits of bottom sediments. At the Ashland Avenue sampling reach, a 230 volt alternating current electrofishing boat and a 15 foot, 3/16 inch mesh, minnow seine were used to collect fish on separate occasions.

In Thorn Creek fish were collected by use of a direct current backpack electrofisher and dip nets, often followed with a 15 foot, 3/16 inch mesh, minnow seine. The stream bottom of Thorn Creek was firm enough for wading at all collection locations.

Total stream shoreline distance sampled (in meters) and total electrofishing time required for each sample were noted for all collections. All fish collected were identified to species, measured for standard and total length to the nearest millimeter and weighed to the nearest gram or tenth of a pound.

RESULTS

Bacteria

Sampling runs for bacterial analyses occurred on April 19, June 21, August 16, and October 18, 1983. Geometric means of the resultant data are presented in Table 2.

INDICATOR BACTERIA

Total Coliform. The geometric means of the TC analytical results from the four samples are presented in Table 2 for each of the stations at which samples were collected (Figure 1). From the four stations on Thorn Creek the TC geometric means ranged from 7.5×10^3 to 1.3×10^5 per 100 milliliters and the three TC geometric means from the Little Calumet River ranged from 1.7×10^4 to 1.6×10^6 per 100 milliliters.

The colony confirmation rate for TC during 1983 was 65.4 percent (Table 3).

Fecal Coliform. Samples for FC analysis were collected from Thorn Creek and the Little Calumet River monthly beginning in January and continuing through December, 1983. These samples were part of the Industrial Waste Division's stream monitoring program (bridge-run) and were in addition to the FC samples collected specifically as part of this study on April 19, June 21, August 16, and October 8, 1983.

On Thorn Creek and the Little Calumet River 11 to 16 FC values were used to generate the geometric means presented in Table 2. The FC geometric means for Thorn Creek ranged from

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TABLE 2

GEOMETRIC MEANS OF BACTERIAL COUNTS¹ FOR THORN CREEK AND THE LITTLE CALUMET RIVER
DURING 1983

Station ²	TC ³	FC ³	FS ³	SPC ³	<u>Pseudomonas aeruginosa</u>	<u>Salmonella</u>
Thorn Creek						
Lincoln Highway	1.3 x 10 ⁵	4.8 x 10 ³	2.1 x 10 ³	3.4 x 10 ⁴	1.9 x 10 ²	<2.0 x 10 ⁻¹
Joe Orr Road	2.3 x 10 ⁴	4.1 x 10 ³	1.5 x 10 ³	3.5 x 10 ⁴	1.9 x 10 ²	<1.5 x 10 ⁻¹
Margaret Street	2.8 x 10 ⁴	6.4 x 10 ²	2.0 x 10 ³	5.7 x 10 ⁴	2.8 x 10 ²	<1.5 x 10 ⁻¹
167/170th Street	7.5 x 10 ³	9.6 x 10 ²	8.9 x 10 ⁴	1.1 x 10 ²	1.1 x 10 ²	<1.5 x 10 ⁻¹
Little Calumet River						
Wentworth Avenue	1.6 x 10 ⁶	6.0 x 10 ⁴	4.2 x 10 ⁴	7.4 x 10 ⁵	1.1 x 10 ⁴	<2.0 x 10 ⁻¹
159th Street	3.7 x 10 ⁴	2.1 x 10 ⁴	4.8 x 10 ³	8.8 x 10 ⁴	4.8 x 10 ²	<1.5 x 10 ⁻¹
Ashland Avenue	1.7 x 10 ⁴	7.0 x 10 ³	1.2 x 10 ³	9.8 x 10 ⁴	2.4 x 10 ²	<1.5 x 10 ⁻¹

Table continued on following page.

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TABLE 2 (Continued)

GEOMETRIC MEANS OF BACTERIAL COUNTS¹ FOR THORN CREEK AND THE LITTLE CALUMET RIVER
DURING 1983

Station ²	TC ³	FC ³	FS ³	SPC ³	<u>Pseudomonas aeruginosa</u>	<u>Salmonella</u>
Summary						
Thorn Creek	2.9 x 10 ⁴	1.9 x 10 ³	1.5 x 10 ³	3.5 x 10 ⁴	1.8 x 10 ²	1.6 x 10 ⁻¹
Little Calumet River	1.0 x 10 ⁵	2.1 x 10 ⁴	6.2 x 10 ³	1.9 x 10 ⁵	1.1 x 10 ³	1.7 x 10 ⁻¹

¹All Counts are per 100 mL except SPC which is in counts per mL. Values shown are geometric averages of the analytical results of samples collected April 19, June 21, August 16, and October 18, 1983, except FC results average 11 to 16 samples collected monthly during 1983.

²Figure 1

³TC = Total Coliform
FC = Fecal Coliform

FS = Fecal Streptococci
SPC = Standard Plate Count

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TABLE 3

TOTAL COLIFORM (TC) FECAL COLIFORM (FC) AND FECAL STREPTOCOCCUS (FS) COLONY
 CONFIRMATIONS FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

	TC		FC		FS	
	Typical*	Atypical**	Typical	Atypical	Typical	Atypical
Number Confirmed	125	2	178	5	178	1
Total Confirmations	191	38	194	20	204	3
Percent Confirmed	65.4	5.3	91.8	25	87.3	33.3

*Typical Colonies, TC, red with greenish metallic sheen; FC, blue; FS, salmon to red.
 **Atypical Colonies - Variations in color, size, or shape of typical colonies.

6.4×10^2 to 4.8×10^3 per 100 millimeters; for the stations located on the Little Calumet River the FC geometric means ranged from 2.1×10^4 to 6.0×10^4 per 100 milliliters (Table 2).

The colony confirmation rate for FC during 1983 was 91.8 percent (Table 3).

Fecal Streptococcus. The geometric means of the FS analytical results are presented in Table 2 for each of the stations at which samples were collected (Figure 1). From Thorn Creek the FS geometric means ranged from 8.9×10^2 to 2.1×10^3 per 100 milliliters and the FS geometric means resulting from the Little Calumet River ranged from 1.2×10^3 to 4.2×10^4 per 100 milliliters.

The colony confirmation rate for FS during 1983 was 87.3 percent (Table 3).

STANDARD PLATE COUNTS

The geometric means of the SPC from the four samples collected at each station are presented in Table 2. At the four stations on Thorn Creek the SPC geometric means ranged from 2.1×10^4 to 5.7×10^4 per milliliter. At the three stations on the Little Calumet River, the SPC geometric means ranged from 8.8×10^4 to 7.4×10^5 per milliliter.

PSEUDOMONAS AERUGINOSA

The geometric means of the P. aeruginosa from the four samples collected at each station are presented in Table 2.

From the four stations on Thorn Creek the P. aeruginosa geometric means ranged from 1.1×10^2 to 2.8×10^2 per 100 milliliters and the three P. aeruginosa geometric means from the Little Calumet River stations ranged from 2.4×10^2 to 1.1×10^4 per 100 milliliters.

SALMONELLA

The geometric means of the Salmonella testing results from the four samples collected at each station are presented in Table 2. From the seven stations on Thorn Creek and the Little Calumet River, the Salmonella geometric means ranged from less than 0.15 per 100 milliliters to less than 0.2 per 100 milliliters.

Salmonella were isolated from three of 27 samples collected from Thorn Creek and the Little Calumet River during 1983. Wentworth Avenue yielded two samples which contained Salmonella.

Results of the serotyping performed by the Illinois Department of Public Health are shown in Table 4. The serotypes listed are commonly recovered clinical isolates.

Periphyton

Periphyton samples were collected from Thorn Creek and the Little Calumet River every four weeks from March 15 to November 3, 1983. Nine sampling runs were made and 51 out of a possible 63 samples were collected (81.0 percent recovery)

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TABLE 4

SALMONELLA SEROTYPING RESULTS FOR 1983 FROM
THORN CREEK AND THE LITTLE CALUMET RIVER

STATION	DATE	SEROTYPE	NUMBER ISOLATED
Thorn Creek			
Lincoln Highway	4/19/83	Ser. 67:	1
		Monophasic Newport	2
Little Calumet River			
Wentworth Avenue	4/19/83	Newport	2
		Tennessee	1
Total Number Isolated			6

and analyzed for periphyton populations, chlorophyll a, and organic matter. An autotrophic index and equitability factor were calculated from the results of these analyses and are presented in Tables 5, 6, and 7.

PERIPHYTON POPULATION ANALYSES

In Thorn Creek the geometric means of the periphyton densities for each station sampled (Figure 1) ranged from 18,297 to 467,192 organisms per square centimeter (Table 5) and the average number of species per sample ranged from 22 to 40 (Table 5) while the total number of species identified at each station ranged from 49 to 100 (Table 5).

In the Little Calumet River the geometric means for the periphyton population densities ranged from 166,219 to 390,402 organisms per square centimeter (Table 5) and the average number of species per sample ranged from 28 to 38 (Table 5) while the total number of species identified at each station ranged from 85 to 103 (Table 5). For these same samples the average Shannon-Weaver species diversity index ranged from 1.96 to 2.61 (Table 5).

Because many of the species identified were ephemerals or accidentals (appeared once or a very few times at a station) it was useful to examine those species which were found 50 percent or more of the time at a given station. These species were defined as persistent and their numbers are reported in Table 6. In Thorn Creek the number of persistent

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TABLE 5

PERIPHYTON POPULATION ANALYSES - THORN CREEK AND THE LITTLE CALUMET RIVER - 1983

Station	Geometric Mean of Periphyton Densities Counts/cm ²	Average Number of Species Per Station	Average Shannon- Weaver Species Di- versity Index (d)	Equita- bility (e)	Total Number of Species	Number of Samples
Thorn Creek	133,977	60.0	2.9994	0.069	164	9
Lincoln Highway	150,978	35.1	2.6844	0.090	99	8
Joe Orr Road	18,297	22.0	2.3591	0.088	79	9
Margaret Street	426,693	40.3	2.6312	0.085	100	6
167/170th Street	467,192	35.0	2.5523	0.081	99	8
Little Calumet River	225,136	51.7	2.6151	0.056	151	9
Wentworth Avenue	390,402	38.5	1.9619	0.050	103	6
159th Street	166,219	36.4	2.1298	0.069	85	5
Ashland Avenue	183,959	27.9	2.6113	0.094	90	9

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TABLE 6

PERIPHYTON SPECIES DATA, BY STATION, RELATED TO FREQUENCY OF APPEARANCE
AND THE PRESENCE OF POLLUTANT-TOLERANT SPECIES IN THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Station	Total Number of Species Per Station	Number of Persistent Species Per Station	Percent Persistent Species Per Station	Number of Pollutant- Tolerant Species Per Station	Percent Pollutant- Tolerant Species Per Station	Number of Persistent Pollutant- Tolerant Species per Station	Percent Persistent Pollutant- Tolerant Species per Station	Percent Persistent Pollutant- Tolerant Species of Persistent Species per Station
Thorn Creek	164							
Lincoln Highway	99	32	32.3	23	23.2	15	15.2	47.5
Joe Orr Road	79	19	24.1	21	26.6	10	12.7	52.6
Margaret Street	100	40	40.0	22	22.0	9	9.0	22.5
167/170th Street	99	32	32.3	24	24.2	12	12.1	37.5
Little Calumet River	151							
Wentworth Avenue	103	35	34.0	30	29.1	15	14.6	42.9
159th Street	85	24	28.2	24	28.2	9	10.6	37.5
Ashland Avenue	90	19	21.1	24	26.7	10	11.1	52.6

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TABLE 7

PERIPHYTON DERIVED DATA FROM THORN CREEK AND THE
LITTLE CALUMET RIVER - 1983

	Organic Matter Concentration ($\mu\text{g}/\text{cm}^2$)	Chlorophyll a Concentration ($\mu\text{g}/\text{cm}^2$)	Autotrophic Index
<u>Thorn Creek</u>			
Lincoln Highway	146 ¹	0.85	777 ²
Joe Orr Road	70	0.26	701
Margaret Street	526	0.61	1,230
167/170th Street	203	2.56	304
<u>Little Calumet River</u>			
Wentworth Avenue	1,507	1.90	1,884
159th Street	719	0.86	1,379
Ashland Avenue	183	0.80	266

¹The values reported for each constituent were averaged from the individual values as given in APPENDIX A-II, Table AII-8.

²The AI values given are the averaged values of individual samples and not the result of calculation using averaged organic matter concentration and averaged chlorophyll a concentration.

species ranged from 19 to 40 and in the Little Calumet River the number of persistent species ranged from 19 to 35.

Another subset of the population of species is that defined by Palmer (15,16,17) as pollutant-tolerant species. Their number, found per station, is reported in Table 6. For the reasons given above it was more useful to examine those species that were both persistent and pollutant-tolerant and the results of this segregation are presented in Table 6. The number of persistent pollutant-tolerant species ranged from 9 to 15 in Thorn Creek and in the Little Calumet River.

CHLOROPHYLL a

The results of periphyton chlorophyll a analyses are reported in Table 7 as averages for each station sampled (Figure 1). In Thorn Creek the average chlorophyll a concentrations ranged from 0.61 to 2.56 micrograms per square centimeter and in the Little Calumet River the range was 0.80 to 1.90 micrograms per square centimeter.

ORGANIC MATTER

As with chlorophyll a, organic matter is a measure of the biomass of the sample. The average organic matter content found for each station sampled (Figure 1) is reported in Table 7. In Thorn Creek the average organic matter content ranged from 70 to 526 micrograms per square centimeter and in the Little Calumet River the range was from 183 to 1,507 micrograms per square centimeter.

AUTOTROPHIC INDEX

The autotrophic index is the ratio of the organic matter concentration to the chlorophyll a concentration (12). When the ratio exceeds 100 the presumption is that soluble or particulate organic contamination is present resulting in the enhanced growth of non-chlorophyllous microorganisms. The average autotrophic index at each station is reported in Table 7. In Thorn Creek the average autotrophic index ranged from 304 to 1,230 and in the Little Calumet River the average autotrophic index ranged from 266 to 1,884.

EQUITABILITY

Equitability is a measure comparing the distribution of species in a natural theoretical population with that actually found, using the average Shannon-Weaver species diversity index. The diversity index and the equitabilities for each station sampled are reported in Table 5. In Thorn Creek the average species diversity index ranged from 2.36 to 2.68 and the equitabilities ranged from 0.07 to 0.09. In the Little Calumet River the average species diversity index ranged from 1.96 to 2.61 and the equitabilities ranged from 0.07 to 0.09.

Fish

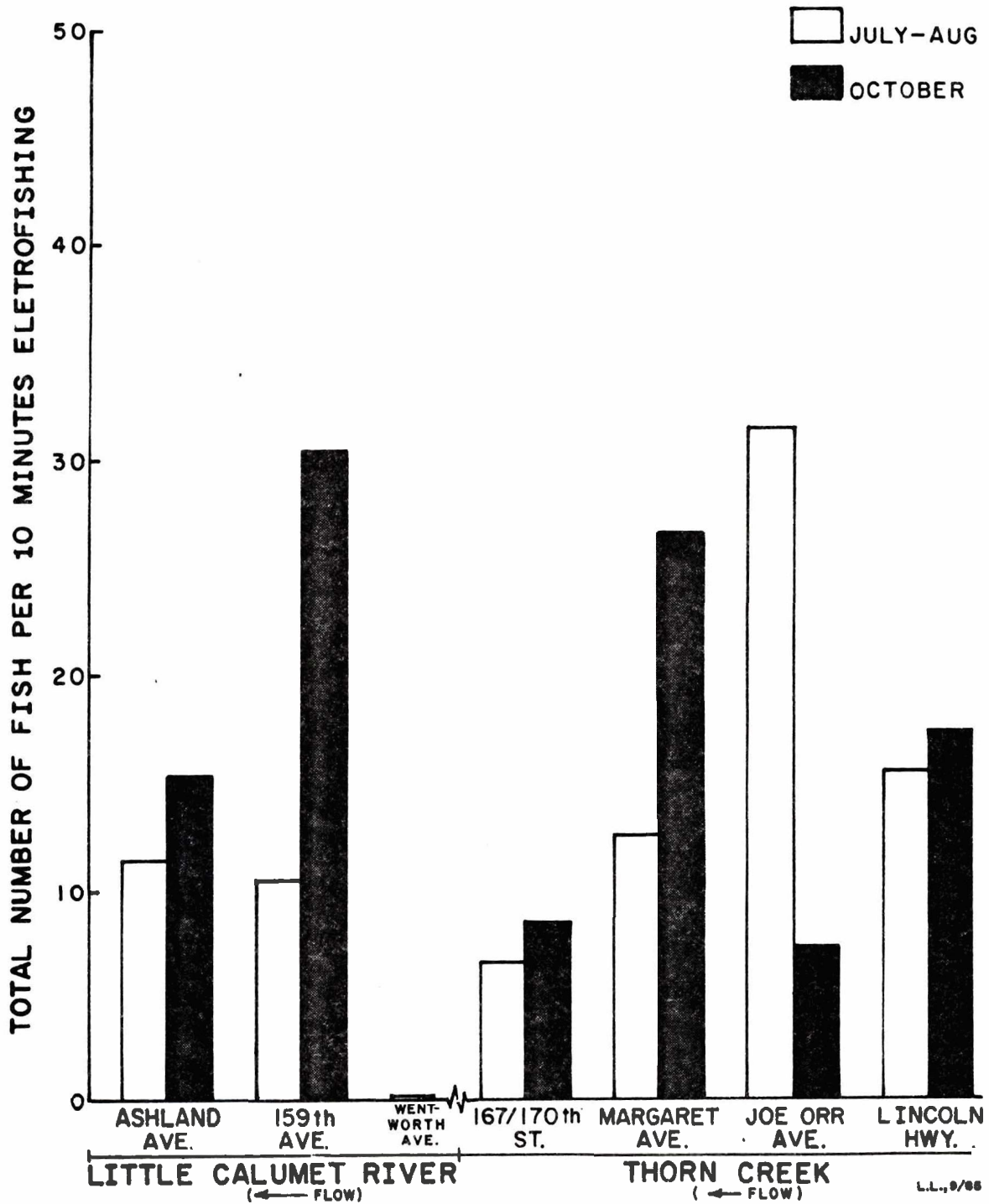
Abundance estimates of fish in terms of total numbers of fish per ten minutes electrofishing at each sampling location (Figure 1), along the Little Calumet River and Thorn Creek col-

lected during July, August, and October are depicted in Figure 3. Total weights of fish per ten minutes electrofishing during the July, August, and October collections are shown in Figure 4. Individual species abundance estimates for each sample within each stream location, as well as statistics for the lengths and weights of individual species, are listed in Appendix III.

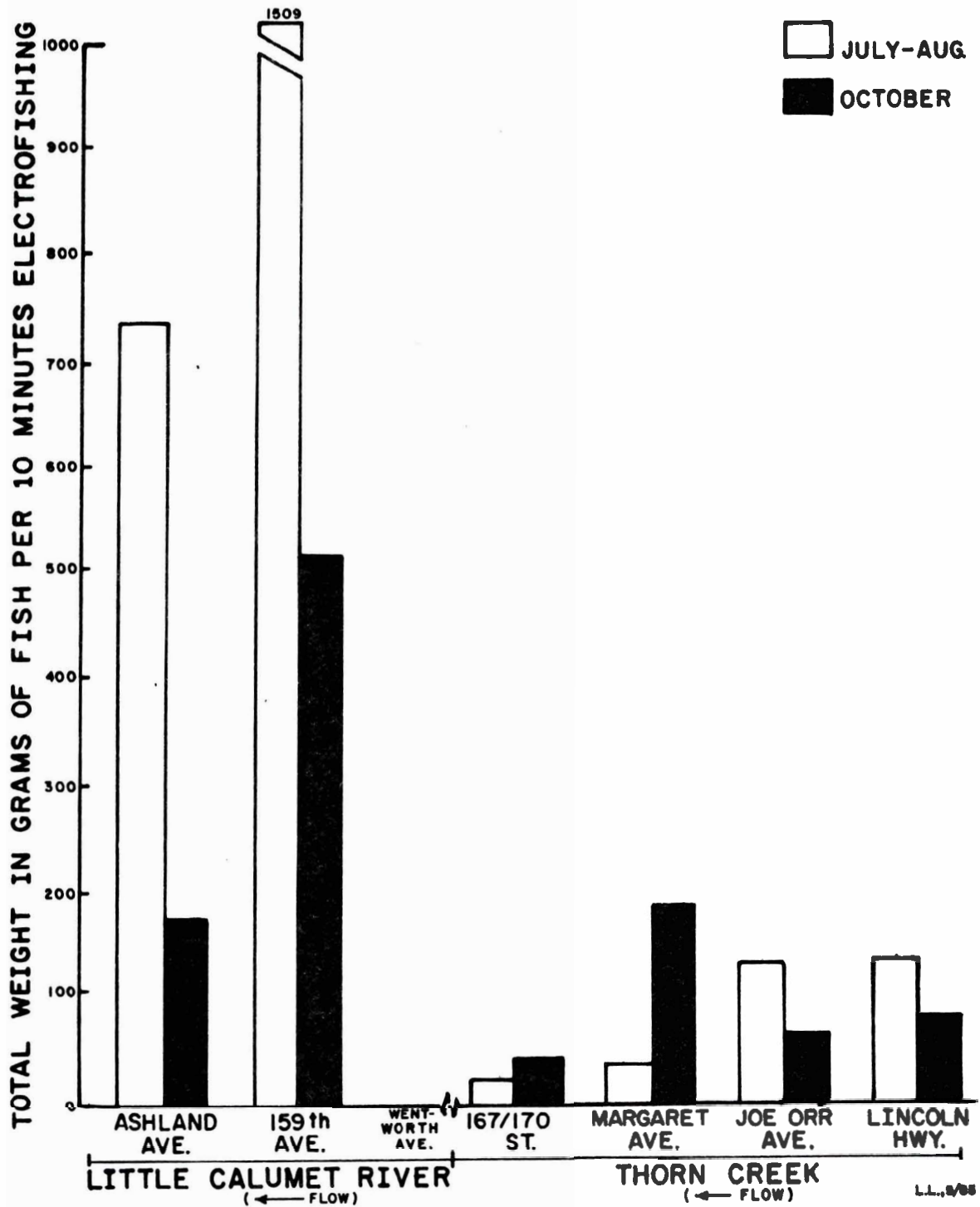
Abundance estimates of each species of fish as an annual average for each sampling location in terms of both numbers and weights of fish per ten minutes electrofishing are given in Tables 8, 9, 10, and 11.

Total numbers of fish species, fish hybrids, and percent composition of the catch composed of omnivorous fish and of green sunfish are listed in Table 12.

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 FIGURE 3
 TOTAL NUMBER OF FISH COLLECTED PER 10 MINUTES
 ELECTROFISHING FROM THE LITTLE CALUMET RIVER
 AND THORN CREEK DURING 1983



THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
 FIGURE 4
 TOTAL WEIGHT IN GRAMS OF FISH COLLECTED
 PER 10 MINUTES ELECTROFISHING FROM THE
 LITTLE CALUMET RIVER AND THORN CREEK DURING 1983



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TABLE 8

AVERAGE NUMBER OF FISH COLLECTED PER 10 MINUTES ELECTROFISHING
FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Fish Species	Little Calumet River			Thorn Creek			
	Ashland Avenue	159th Street	Wentworth Avenue	167/170th Street	Margaret Street	Joe Orr Road	Lincoln Highway
Gizzard shad	0.91	8.27		1.40	0.21	0.23	0.38
Central mudminnow	1.83	5.12		0.17	0.23		
Grass pickerel	0.05						
Brook stickleback	0.08						
Mosquito fish		0.15					
Goldfish	0.62	0.19					0.14
Carp	0.92	0.70					
Carp x goldfish hybrid		0.38					
Fathead minnow	0.51	0.42			1.69	7.44	1.96
Creek chub	0.10			0.33	1.70	1.03	3.75
White sucker							0.14
Black bullhead	0.15	0.29		0.17			
Channel catfish	0.08						
Green sunfish	7.06	3.05	0.12	4.27	13.83	8.01	9.02
Pumpkinseed	0.08						
Orange spotted sunfish	0.24	0.24					
Bluegill	0.36	0.58	0.12	0.33	0.82		0.08
Hybrid sunfish	0.08						0.14
White crappie	0.10	0.43					
Black crappie					0.23		
Largemouth bass	0.05	0.24		0.33		2.03	0.14
Total	13.22	20.06	0.24	7.00	18.71	18.74	15.75

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TABLE 9

PERCENT ABUNDANCE BY NUMBER OF FISH COLLECTED
FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Fish Species	<u>Little Calumet River</u> Percent	<u>Thorn Creek</u> Percent
Gizzard shad	27.0	3.7
Central mudminnow	21	0.7
Grass pickerel	0.2	0
Brook stickleback	0.2	0
Mosquito fish	0.5	0
Goldfish	2.4	0.2
Carp	4.8	0
Carp x goldfish hybrid	1.1	0
Fathead minnow	2.8	18
Creek chub	0.3	11
White sucker	0	0.2
Black bullhead	1.3	0.3
Channel catfish	0.2	0
Green sunfish	31	58
Pumpkinseed	0.2	0
Orange spotted sunfish	1.4	0
Bluegill	3.2	2.0
Hybrid sunfish	0.2	0.2
White crappie	1.6	0
Black crappie	0	0.4
Largemouth bass	0.9	4.2

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TABLE 10

AVERAGE WEIGHT IN GRAMS OF FISH COLLECTED PER 10 MINUTES ELECTROFISHING
FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Fish Species	Little Calumet River				Thorn Creek		
	Ashland Avenue	159th Street	Wentworth Avenue	167/170th Street	Margaret Street	Joe Orr Road	Lincoln Highway
Gizzard shad	9.13	58.92		9.68	1.17	2.26	2.70
Central mudminnow	8.18	16.03		0.19	1.07		
Grass pickerel	2.61						
Brook stickleback	0.09						
Mosquito fish		0.05					
Goldfish	44.24	0.72					1.23
Carp	341.97	660.59					
Carp x goldfish hybrid		177.84					
Fathead minnow	0.76	0.65			0.97	12.64	4.65
Creek chub	0.09			4.06	3.25	12.18	34.42
White sucker							0.15
Black bullhead	15.97	42.74		0.19			
Channel catfish	0.45						
Green sunfish	29.58	7.83	0.73	18.06	58.42	67.92	61.66
Pumpkinseed	0.69						
Orange spotted sunfish	1.02	2.43					
Bluegill	3.07	2.58	1.49	0.83	1.19		0.03
Hybrid sunfish	0.09						0.55
White crappie	1.52	43.09					
Black crappie					1.77		
Largemouth bass	0.09	1.15		0.45		3.75	0.10
Total	599.55	1,014.62	2.22	33.46	67.84	98.75	105.49

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TABLE 11

PERCENT ABUNDANCE BY WEIGHT OF FISH COLLECTED
FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Fish Species	<u>Little Calumet River</u> Percent	<u>Thorn Creek</u> Percent
Gizzard shad	4.6	5.2
Central mudminnow	1.6	0.4
Grass pickerel	0.2	0
Brook stickleback	0.01	0
Mosquito fish	0.003	0
Goldfish	3.1	0.4
Carp	68	0
Carp x goldfish hybrid	12	0
Fathead minnow	0.1	6.0
Creek chub	0.01	18
White sucker	0	0.1
Black bullhead	4.0	0.1
Channel catfish	0.03	0
Green sunfish	2.6	67
Pumpkinseed	0.05	0
Orange spotted sunfish	0.2	0
Bluegill	0.5	0.7
Hybrid sunfish	0.01	0.2
White crappie	3.0	0
Black crappie	0	0.6
Largemouth bass	0.1	1.4

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TABLE 12

NUMBER OF FISH SPECIES AND FISH HYBRIDS, PERCENTAGE OMNIVORES AND PERCENTAGE GREEN SUNFISH IN THE CATCH OF FISH FROM LOCATIONS ON THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Location	Number Collected		Percent Omnivores	Percent Green Sunfish
	Fish Species	Fish Hybrids		
	1983	1983	1983	1983
<u>Little Calumet River</u>				
Wentworth Avenue	2	0	0	50
159th Street	12	1	35	15
Ashland Avenue	16	1	32	53
<u>Thorn Creek</u>				
Lincoln Highway	8	1	37	58
Joe Orr Road	5	0	45	43
Margaret Street	7	0	19	74
167/170th Street	7	0	10	61

DISCUSSION

Bacteria

INDICATOR BACTERIA

Total Coliform. In both Thorn Creek and the Little Calumet River the stations with the highest TC counts (Table 2) were those stations sampled farthest upstream, at Lincoln Highway (1.3×10^5 TC per 100 milliliters) and Wentworth Avenue (1.6×10^6 TC per 100 milliliters), respectively, (Figure 1). The Wentworth Avenue station is only about one-half mile from the Illinois-Indiana border so most of the drainage into the Little Calumet River comes from Indiana. By taking the geometric mean of the TC counts presented for each waterway in Table 2 it was found that Thorn Creek had 2.9×10^4 TC per 100 milliliters compared to 1.0×10^5 TC per 100 milliliters found in the Little Calumet River.

Fecal Coliform. In both Thorn Creek and the Little Calumet River the stations with the highest FC counts (Table 2) were those stations sampled farthest upstream, at Lincoln Highway (4.8×10^3 FC per 100 milliliters) and Wentworth Avenue (6.0×10^4 FC per 100 milliliters), respectively, (Figure 1). None of the samples collected met the "General Use" criterion of 200 FC per 100 milliliters established by the IPCB. This indicated that the drainage basins of both Thorn Creek and the Little Calumet River were receiving significant inputs of domestic waste matter.

Fecal Streptococcus. In Thorn Creek the highest FS counts (Table 2) were found at Lincoln Highway (2.1×10^3 FS per 100 milliliters), the farthest upstream station sampled (Figure 1). In the Little Calumet River the highest FS counts were found at Wentworth Avenue (4.2×10^4 FS per 100 milliliters) the farthest upstream station sampled (Figure 1).

STANDARD PLATE COUNT

The highest SPC in Thorn Creek (Table 2) was found at Margaret Street (5.7×10^4 SPC per milliliter), and the highest SPC in the Little Calumet River (Table 2) was found at Wentworth Avenue (9.8×10^4 SPC per milliliter) (Figure 1). By taking the geometric mean of the values given for SPC in Table 2 for each station it was found that Thorn Creek contained 3.5×10^4 SPC per milliliter and the Little Calumet River 1.9×10^5 SPC per milliliter, an order of magnitude difference between the two streams.

PSEUDOMONAS AERUGINOSA

The highest P. aeruginosa counts in Thorn Creek (Table 2) were found at Margaret Street (2.8×10^2 per 100 milliliters) and in the Little Calumet River (Table 2) were found at Wentworth Avenue (1.1×10^4 per 100 milliliters). By taking the geometric mean of the values given in Table 2 for each station it was found that Thorn Creek contained 1.8×10^2 P. aeruginosa per 100 milliliters and that the Little Calumet

River contained 1.1×10^3 P. aeruginosa per 100 milliliters, almost an order of magnitude difference between the two.

SALMONELLA

In Thorn Creek and the Little Calumet River, all of the stations contained less than 0.2 Salmonella per 100 milliliters.

In general, the farthest upstream station sampled in Thorn Creek and in the Little Calumet River contained the highest bacterial counts of all types except SPC. Both were considered polluted on the basis of the difference in magnitude of FC and FS counts indicating introduction of domestic wastewater. (Values for the bacterial analyses for individual stations collected each date are reported in Appendix I.)

Periphyton

PERIPHYTON POPULATION ANALYSIS

In Thorn Creek the mean periphyton population densities for each station were nearly identical except for Joe Orr Road (Table 5). In the Little Calumet River the mean periphyton population densities decreased slightly from the upstream station, Wentworth Avenue (3.9×10^5 organisms per square centimeter), to the downstream station, Ashland Avenue (1.8×10^5 organisms per square centimeter). The average periphyton population values were almost identical in each river system with 1.5×10^5 organisms per square centimeter found in the Little Calumet River.

The average number of species found in Thorn Creek ranged from 22 at Joe Orr Road to 40 at Margaret Street (Table 5) with an overall average of 33 species per sample. The average number of species found in the Little Calumet River ranged from 28 at Ashland Avenue to 39 at Wentworth Avenue (Table 5) with an overall average of 34 species per sample. Consideration of the total number of species for each waterway station showed a range of 79 to 100 in Thorn Creek (Table 5) with a total for the waterway of 164 species. In the Little Calumet River the total number of species ranged from 85 to 103 (Table 5) with a total for the waterway of 151 species.

Palmer in two publications (15, 16) lists 113 species, which he considers pollutant-tolerant. In Thorn Creek the number of pollutant-tolerant species ranged from 21 at Joe Orr Road to 24 at 167/170th Street (Table 6) or 26.6 to 24.2 percent, respectively, of the total number of species found at these stations. In the Little Calumet River the number of pollutant-tolerant species ranged from 24 at 159th Street and Ashland Avenue to 30 at Wentworth Avenue or 28.2, 26.7 and 29.1 percent, respectively, of the total number of species found for these stations. This would seem to indicate equally poor water quality in the Little Calumet River and in Thorn Creek.

Examination of the persistent species in each waterway showed that in Thorn Creek the number of persistent species (Table 6) ranged from 19 to 40 and were composed of from 22.5

to 52.6 percent pollutant-tolerant species. In the Little Calumet River the number of persistent species varied from station to station (Table 6) with 35 species at Wentworth Avenue, 24 species at 159th Street, and 19 species at Ashland Avenue, of which 42.9, 37.5, and 52.6 percent, respectively, were pollutant-tolerant species. The numbers and proportion of persistent pollutant-tolerant species in the Little Calumet River and Thorn Creek equally indicated poor water quality.

CHLOROPHYLL a

In Thorn Creek the chlorophyll a concentration (Table 7) decreased from Lincoln Highway (0.85 micrograms per square centimeter) to Joe Orr Road, and increased from Joe Orr Road (0.26 micrograms per square centimeter) to 167/170th Street (2.56 micrograms per square centimeter) indicating increasing production of chlorophyllous organisms from upstream to downstream (Figure 1). This trend follows the periphyton densities reported in Table 5.

In the Little Calumet River, the chlorophyll a concentrations (Table 7) decreased from Wentworth Avenue (1.90 micrograms per square centimeter) to Ashland Avenue (0.80 micrograms per square centimeter) indicating decreased production of chlorophyllous organisms from upstream to downstream (Figure 1). This is supported by the periphyton densities report-

ed in Table 5 where the average periphyton densities decreased from 3.9×10^5 at Wentworth Avenue to 1.8×10^5 organisms per square centimeter at Ashland Avenue.

The chlorophyll data for Thorn Creek indicated that perhaps the tributaries to Thorn Creek, such as Deer Creek and Butterfield Creek, add sufficient nutrients to enhance the production of chlorophyllous organisms at Margaret Street and 167/170th Street.

The chlorophyll data for the Little Calumet River, as well as the periphyton density data, indicated a decrease in the standing crop of chlorophyllous organisms with distance downstream of Wentworth Avenue.

ORGANIC MATTER

In Thorn Creek the organic matter concentration (Table 7) decreased from Lincoln Highway (176 micrograms per square centimeter) to Joe Orr Road and then increased from 70 micrograms per square centimeter at Joe Orr Road to 526 micrograms per square centimeter at Margaret Street and then decreased to 203 micrograms per square centimeter at 167/170th Street. This pattern was similar to that found for chlorophyll a. The decreased concentration of organic matter or biomass found at 167/170th Street may be explained as a dilution effect of organic constituents in Thorn Creek by the entering tributaries, Deer and Butterfield Creeks, thus reducing the growth of heterotrophic organisms.

In the Little Calumet River the organic matter concentration (Table 7) decreased from 1,507 micrograms per square centimeter at Wentworth Avenue to 183 micrograms per square centimeter at Ashland Avenue. The accumulated biomass decreased from upstream to downstream, as did the chlorophyllous biomass (Table 7), but the periphyton densities (Table 5) remained alike; this indicated that some condition present was changing the algal composition - retaining standing crop density with a loss of biomass.

AUTOTROPHIC INDEX

In Thorn Creek the autotrophic index (Table 7) was approximately the same from Lincoln Highway (777) to Joe Orr Road (701), increased at Margaret Street (1,230) and then decreased at 167/170th Street (304). This indicated a decreased concentration of soluble or particulate organic contamination after Margaret Street, a dilution effect of organic constituents in Thorn Creek by the entering tributaries, Deer and Butterfield Creeks.

In the Little Calumet River the autotrophic index (Table 7) varied from 1,884 at Wentworth Avenue to 1,379 at 159th Street and to 266 at Ashland Avenue. This indicated a high level of pollution at Wentworth Avenue which decreased toward Ashland Avenue.

All of the autotrophic index values exceeded 200 which has been established as the point beyond which organic pollu-

tion was indicated (11, 12). Therefore, Thorn Creek and the Little Calumet River can be classed as polluted at all stations sampled.

EQUITABILITY

In Thorn Creek and the Little Calumet River all equitabilities calculated (Table 5) were less than 0.1, indicating severe pollution (12).

In general, the magnitude of the periphyton densities, the low average number of species, the low number of persistent species, the high proportion of pollutant-tolerant species, the magnitude of the autotrophic index, and the very low equitabilities all indicated that Thorn Creek and the Little Calumet River were polluted. The number and proportion of pollutant-tolerant species were almost the same in the Little Calumet River and in Thorn Creek. The autotrophic index was higher in the Little Calumet River than in Thorn Creek. The total number of species was higher in Thorn Creek than in the Little Calumet River. There were slightly more average number of species in Thorn Creek, but almost twice the periphyton density in the Little Calumet River. The average species diversity was higher in Thorn Creek than in the Little Calumet River, but these values were both in the mesotrophic range (2.5 to 3.5), while the majority of the time (greater than 80 percent) the species diversities were in the eutrophic range (less than 2.5). Equitabilities were the same for both systems.

COMPARISON OF BACTERIAL AND PERIPHYTON DATA

Analysis of the Little Calumet River water generated bacterial counts an order of magnitude greater than found in Thorn Creek for four of the six parameters tested (Table 2). Total coliforms were found to be 1.0×10^5 per 100 milliliters in the Little Calumet River, compared to 2.9×10^4 per 100 milliliters in Thorn Creek. Fecal coliforms were 2.1×10^4 per 100 milliliters in the Little Calumet River compared to 1.9×10^3 per 100 milliliters in Thorn Creek. Fecal streptococci were found to be the same in the Little Calumet River and Thorn Creek with 6.2×10^3 and 1.5×10^3 per 100 milliliters, respectively. The standard plate counts were 1.9×10^5 per milliliter in the Little Calumet River and 3.4×10^4 per milliliter in Thorn Creek. Pseudomonas aeruginosa counts were greater in the Little Calumet River (1.1×10^3 per 100 milliliters) than in Thorn Creek (1.8×10^2 per 100 milliliters) and Salmonella counts were the same for both river systems (1.7×10^{-1} and 1.7×10^{-1} per 100 milliliters, respectively).

The Little Calumet River, because of the higher bacterial counts found, would be considered more polluted than Thorn Creek. For both river systems the farthest upstream locations sampled were found to have higher bacterial counts than the farthest downstream station. This indicated that pollution, in terms of the bacterial parameter tested, occurred upstream of the study area.

Periphyton analyses confirmed that the Little Calumet River was more polluted than Thorn Creek. A greater number of species were found per sampling date in Thorn Creek (60 species) than in the Little Calumet River (52 species). Over the entire sampling period a greater number of species were found in Thorn Creek (164 species) than in the Little Calumet River (151 species) which generated a higher average Shannon-Weaver species diversity index for Thorn Creek (2.99) than for the Little Calumet River (2.62). The average standing crop was similar for both systems, 1.5×10^5 organisms per square centimeter in Thorn Creek and 2.3×10^5 organisms per square centimeter in the Little Calumet River.

The autotrophic index (Table 7) and equitabilities (Table 6), while they do not establish trends, indicate that both Thorn Creek and the Little Calumet River were polluted.

In contrast to the bacterial data, the periphyton data suggested increased pollution from upstream to downstream. In Thorn Creek, the average periphyton density decreased by an order of magnitude from Lincoln Highway ($150,978/\text{cm}^2$) to Joe Orr Road ($18,297/\text{cm}^2$) and then increased at Margaret Street and 167/170th Street to $426,693/\text{cm}^2$ and $467,192/\text{cm}^2$, respectively. The average number of species decreased from 35 at Lincoln Highway to 22 at Joe Orr Road before increasing to 40 at Margaret Street and back to 35 at 167/170th Street. The average species diversity index, too, decreased from Lincoln

Highway (2.68) to Joe Orr Road (2,36) and then increased at Margaret Street (2.63) and 167/170th Street (2.55).

The periphyton data, therefore, indicated that Thorn Creek overall was polluted, but there were indications of fluctuations in water quality at Joe Orr Road and at Margaret Street.

In the Little Calumet River the periphyton density decreased 50 percent from upstream to downstream with $3.9 \times 10^5/cm^2$ at Wentworth Avenue decreasing to $1.8 \times 10^5/cm^2$ at Ashland Avenue. The average number of species per sample also decreased from 38 at Wentworth Avenue to 28 at Ashland Avenue. In contrast, the average species diversity index increased from 2.0 at Wentworth Avenue to 2.6 at Ashland Avenue, indicating an improvement in the quality of the river water. In addition, the number of pollutant-tolerant organisms decreased from 30 at Wentworth Avenue to 24 at Ashland Avenue, but the percentage of pollutant-tolerant organisms, based on persistent species, rose from 42.9 percent to 52.6 percent, respectively, indicating deteriorating water quality downstream.

Fish

Fish were collected from the Little Calumet River and Thorn Creek during July 12 through August 12 and October 5 through October 28, 1983. A total of 17 species of fish, plus the carp x goldfish hybrid and hybrid sunfish, were col-

lected from the Little Calumet River. A total of 11 fish species, plus hybrid sunfish, were collected from Thorn Creek.

Abundance of fish in terms of number and weight of fish collected per ten minutes electrofishing are depicted in Figures 3 and 4 for the Little Calumet River and Thorn Creek. Total number of fish per ten minutes electrofishing ranged from 0.5 fish at Wentworth Avenue to 11 fish at Ashland Avenue during July through August and from none at Wentworth Avenue to 30 fish at 159th Street during October in the Little Calumet River.

In Thorn Creek, total number of fish per ten minutes electrofishing ranged from 6 fish at 167/170th Street to 31 fish at Joe Orr Road during July through August, and from 7 fish at Joe Orr Road to 26 fish at Margaret Street during October.

Total weight of fish (in grams) per ten minutes electrofishing ranged from 4 grams at Wentworth Avenue to 1,509 grams at 159th Street during July through August and from none (no fish collected) at Wentworth Avenue to 520 grams at 159th Street during October in the Little Calumet River. In Thorn Creek, the total weight of fish per ten minutes electrofishing ranged from 25 grams at 167/170th Street to 134 grams at Lincoln Highway and at Joe Orr Road during July through August and from 42 grams at 167/170th Street to 186 grams at Margaret Street during October.

The number and weight of fish per ten minutes electro-fishing were least during both collection periods at Wentworth Avenue on the Little Calumet River than at any other sampling location in the Little Calumet River/Thorn Creek watershed. This suggested that the water quality was poorest at this location in that fish were unable to reach very large numbers under the existing conditions.

In decreasing order of abundance, the major species in the 1983 Little Calumet River collection based on number of fish per ten minutes electrofishing were: green sunfish (31 percent), gizzard shad (27 percent), and the central mudminnow (21 percent). In Thorn Creek the major fish species in the 1983 collection were: green sunfish (58 percent), the fathead minnow (18 percent), and the creek chub (11 percent) (Table 9).

Karr (18) has mentioned that a measure of water quality conditions in a stream is the abundance of green sunfish. This species is often the dominant or only sunfish present at the sites of degraded water quality. Pflieger (19) noted that the green sunfish tolerated extremes of turbidity, dissolved oxygen, temperature, and flow, and that it did well where few other sunfishes occurred. According to Karr (18), high abundance of this species (greater than 20 percent of total individuals) indicated degraded conditions.

The green sunfish was the most numerous fish species in both the Little Calumet River and Thorn Creek collections, com-

prising much more than 20 percent of either collection for the entire stream. Based upon the percent composition of green sunfish alone, both streams would appear to be of poor water quality.

The gizzard shad, which comprised 27 percent of the Little Calumet River collection, is usually found in deep, quiet pools of streams with silt and debris on the bottom. The gizzard shad is highly specialized for mud feeding and it has probably increased in abundance in Illinois (present day as compared with the turn of the century) because of the increase of silt in many streams (20).

The central mudminnow comprised 21 percent of the 1983 Little Calumet River collection. This species is known to tolerate low dissolved oxygen conditions and thrives in those areas of streams with a muddy bottom (20).

The abundance dominance of gizzard shad and central mudminnow suggested that one of the major factors governing the fish populations of the Little Calumet River was its muddy bottom which was composed of deep deposits of silt and sludge. These deep deposits of bottom sediments were greatest at Wentworth Avenue, still deep but somewhat less so at 159th Street, and least at Ashland Avenue.

The fathead minnow comprised 18 percent of the Thorn Creek collection. The fathead minnow is tolerant of high temperature, extreme turbidity, and low dissolved oxygen concentrations (19).

The creek chub comprised 11 percent of the Thorn Creek collection and this species is especially abundant in low gradient streams with mud or clay substrates. It has increased in abundance in Illinois as a result of the increase in silt, the temporary decrease in the size of many streams, and the elimination of competing species by human modification of streams and watersheds (20).

These fish species are generally recognized as being relatively ecologically tolerant species, as are the majority of the other species collected in both the Little Calumet River and Thorn Creek. This indicated a stressful environment due to less than optimum water quality conditions in the Little Calumet River and in Thorn Creek.

The green sunfish, gizzard shad, central mudminnow, fat-head minnow, and creek chub were also dominant in terms of weight of fish collected per unit effort of electrofishing, as presented in Tables 10 and 11 for both the Little Calumet River and Thorn Creek. However, in the Little Calumet River the carp and the carp x goldfish hybrid comprised the greatest percentage of the weight of the total collection. The carp comprised 68 percent and the carp x goldfish hybrid 12 percent of the total weight of the collection.

Carp are very adaptable fish (19). The carp feeds on both plant and animal matter and often congregates where sewage is discharged into streams (20). Carp can tolerate

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TABLE 13

AVERAGE CATCH PER 10 MINUTES ELECTROFISHING FOR BACKPACK/SEINE
COLLECTIONS FROM THE CHICAGO WATERWAYS¹

Waterway	Year	Number of Collections	Drainage Area (square miles)	Number of Species Per Collection		Fish Per 10 Minutes Electrofishing	
				Average	Maximum	Number	Weight (grams)
Jackson Creek ²	1976	7	52.7	9.1	19	78	618
Mill Creek ²	1976	5	65.3	8.4	10	87	856
Hickory Creek ⁴	1976	9	109	10.1	20	322	1,921
North Branch Chicago River	1976	4	113	3.5	6	19	179
North Branch Chicago River	1980	16	113	2.6	6	12	330
North Branch Chicago River	1981	16	113	4.3		15	260
Salt Creek ²	1976	6	150	4.0	13	11	262
Nippersink Creek ³	1976	9	205	6.8	14	61	657
Little Calumet River	1976	13	291	1.9	5	15	235
Little Calumet River	1983	15	291	5.9	11	13	283
DuPage River	1976	14	376	8.7	15	134	2,889

¹All 1976 data from Reference 22.

²Tributary to Des Plaines River.

³Tributary to Fox River.

low concentrations of dissolved oxygen (21). Carp hybridize freely with goldfish in the polluted streams of the Chicago area and the hybrid seems better adapted for survival in these marginal habitats than is the carp (20).

Compared with other waterways (Table 13) in the Chicago metropolitan area, which have similar drainage areas, the Little Calumet River (including Thorn Creek) was similar, in abundance of fishes by weight or by number, to the North Branch of the Chicago River and to Salt Creek, and presumably was similar in water quality to these waterways.

Karr (18) found that green sunfish present in abundance of greater than 20 percent indicated degradation of water quality. He also found that as a stream reach declined in water quality that the proportion of omnivorous fish increased. Omnivorous fish consume both plant and animal matter. The common omnivores of small midwestern streams are the blunt-nose minnow and the fathead minnow. Carp are found over a wider range of stream sizes. The most degraded streams also commonly support large populations of goldfish. In general, Karr (18) found that fish collections with fewer than 20 percent individual fish as omnivores indicated good water quality and those collections with more than 45 percent omnivores indicated poor water quality.

As mentioned previously, the Wentworth Avenue collection from the Little Calumet River had the fewest numbers, least

weight of catch, and fewest number of species than collected at any other station in the watershed. Only one green sunfish and one bluegill were collected in two sampling efforts during 1983. Presumably, this location had poorer water quality than any of the other locations sampled in the Little Calumet River/Thorn Creek watershed.

On Thorn Creek the only location which had more than 20 percent green sunfish and 45 percent omnivorous fish species was the Joe Orr Road location (Figure 1, Table 1). Presumably, this location also was of the poorest in water quality of those four locations sampled on Thorn Creek. However, all locations sampled in the watershed showed poor water quality, either with 50 percent or more abundance of green sunfish or in combination with the abundance of omnivorous fish (159th Street on the Little Calumet River and Joe Orr Road on Thorn Creek).

Several relationships can be found between sampling locations and the number of fish species found (Table 12). On the Little Calumet River the number of species found increased with distance downstream; from 2 species at Wentworth Avenue to 12 species at 159th Street to 16 species at Ashland Avenue. On Thorn Creek, the number of species found at Joe Orr Road (5 species) was less than that found upstream at Lincoln Highway (8 species), and less than that found downstream at Margaret Street (7 species), and 167/170th Street (7 species).

This indicated that severe stress to the fish occurred in the vicinity of Joe Orr Road and that the water quality was poorest at this location on Thorn Creek.

COMPARISON OF BACTERIAL, PERIPHYTON, AND FISH DATA

The bacterial data showed greater degradation at the upstream stations of Thorn Creek and the Little Calumet River than at the downstream stations. Every constituent tested (TC, FC, FS, SPC, P. aeruginosa, Salmonella) showed higher, or the same densities, upstream than were found downstream (Table 2). Four of the six constituents tested (TC, FC, SPC, and P. aeruginosa) were found to be an order of magnitude greater in density in the Little Calumet River than in Thorn Creek.

In Thorn Creek, the periphyton densities showed severe stress was exerted on the organisms at Joe Orr Road by depressing the densities an order of magnitude from those found at Lincoln Highway (150,000 organisms per square centimeter). Periphyton densities returned to pre-stress densities at Margaret Street and 167/170th Street (Table 5). The average number of species per sample and the total number of species were also depressed significantly at Joe Orr Road. And while the average Shannon-Weaver species diversity index was depressed from 2.7 at Lincoln Highway to 2.4 at Joe Orr Road, the closest point of recovery was at Margaret Street with a 2.6 average diversity index.

In the Little Calumet River the periphyton densities decreased from upstream to downstream as did the average number of species per sample and the total number of species (Table 5). However, the average Shannon-Weaver species diversity index increased with distance downstream from 2.0 at Wentworth Avenue to 2.6 at Ashland Avenue. Thus, the overall effect of decreased periphyton density and decreased number of species was an increased species diversity, which indicated improvement in water quality. The number of persistent species (signifying environmental stability) decreased from Wentworth Avenue (35 persistent species) to Ashland Avenue (19 persistent species) and the number of pollutant-tolerant species decreased from 30 at Wentworth Avenue to 24 species at Ashland Avenue (Table 6).

In Thorn Creek the number of persistent species decreased from 32 at Lincoln Highway to 19 at Joe Orr Road, and then increased to 40 at Margaret Street before dropping back to the original value of 32 at 167/170th Street. The number of pollutant-tolerant species was approximately the same throughout the reach studied. Coupled with the decreased number of species and density at Joe Orr Road, these data confirmed very stressful conditions at Joe Orr Road. This stressful situation at Joe Orr Road was confirmed by the fish data as it was the only location of Thorn Creek where the collection of fish was composed of more than 20 percent green sunfish

and more than 45 percent omnivorous fish. This led to the conclusion that this location had the poorest water quality in Thorn Creek. As indicated by the periphyton and bacterial data, the other locations sampled on Thorn Creek had poor water quality which was confirmed by fish data such as number of species found. The number of fish species decreased from 8 species at Lincoln Highway to 5 species at Joe Orr Road and then increased to 7 species at both Margaret and 167/170th Streets.

In the Little Calumet River, the fish data confirmed the bacterial and periphyton data that these waters were of poorer quality than the waters found in Thorn Creek. Wentworth Avenue had the fewest numbers of fish, the least weight of catch, and the fewest number of species found at any other location sampled in the watershed. The fish data collected farther downstream confirmed the bacterial data that some improvement in water quality occurred. The number of fish species collected increased from 2 at Wentworth Avenue to 12 at 159th Street to 16 species at Ashland Avenue, in contrast to the periphyton data where the average and total number of species decreased from 39 and 103, respectively, at Wentworth Avenue to 28 and 90, respectively, at Ashland Avenue.

In summary, the Little Calumet River watershed contained poor water as shown by bacterial, periphyton, and fish analy-

sis. Thorn Creek, the largest drainage area tributary to the Little Calumet River, was shown to be of better quality than the river.

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APPENDIX I

BACTERIAL DATA COLLECTED FROM THORN CREEK
AND THE LITTLE CALUMET RIVER DURING 1983

KEY TO APPENDIX A

Geo \bar{x} = geometric mean
TC = Total Coliform
FC = Fecal Coliform
FS = Fecal Streptococcus
SPC = Standard Plate Count
PA = Pseudomonas aeruginosa
Sal = Salmonella

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TABLE AI-1

BACTERIAL DATA FROM THORN CREEK DURING 1983 AT LINCOLN HIGHWAY

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	28,000	2,100	960	3,900	130	0.45
6/21/83	180,000	6,000	3,000	140,000	230	<0.15
8/16/83	N.S.*	N.S.*	N.S.*	N.S.*	N.S.*	N.S.*
10/18/83	400,000	28,000	3,400	70,000	230	<0.15
Geometric Mean	130,000	7,100	2,100	34,000	190	<0.2

*No sample - No Flow in Creek

All counts expressed as counts per 100 milliliters except SPC which is counts per milliliter.

AI-3

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TABLE AI-2

BACTERIAL DATA FROM THORN CREEK DURING 1983 AT JOE ORR ROAD

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	52,000	10,000	4,700	11,000	310	<0.15
6/21/83	41,000	2,200	1,100	110,000	230	<0.15
8/16/83	6,200	200	360	76,000	80	<0.15
10/18/83	23,000	5,700	2,400	16,000	230	<0.15
Geometric Mean	23,000	2,200	1,500	35,000	190	<0.15

All counts expressed as counts per 100 milliliters excepts SPC which is counts per milliliter.

AI-4

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TABLE AI-3

BACTERIAL DATA FROM THORN CREEK DURING 1983 AT MARGARET STREET

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	1,900	94	480	2,200	130	<0.15
6/21/83	13,000,000	670,000	36,000	1,400,000	630	<0.15
8/16/83	5,200	1,200	2,200	150,000	330	<0.15
10/18/83	5,000	220	540	23,000	230	<0.15
Geometric Mean	28,000	2,000	2,000	57,000	280	<0.15

AI-5

All counts expressed as counts per 100 milliliters excepts SPC, which is counts per milliliter.

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TABLE AI-4

BACTERIAL DATA FROM THORN CREEK DURING 1983 AT 167th/170th STREET

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	5,300	330	100	1,600	80	<0.15
6/21/83	14,000	240	2,000	36,000	20	<0.15
8/16/83	11,000	1,600	4,300	140,000	460	<0.15
10/18/83	3,900	440	730	23,000	230	<0.15
Geometric Mean	7,500	490	890	21,000	110	<0.15

All counts expressed as counts per 100 milliliters except SPC, which is counts per milliliter.

AI-6

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AI-5

BACTERIAL DATA FROM THE LITTLE CALUMET RIVER DURING 1983 AT WENTWORTH AVENUE

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	570,000	160,000	65,000	88,000	5,400	0.45
6/21/83	18,000,000	1,200,000	400,000	4,800,000	35,000	0.15
8/16/83	12,000,000	1,300,000	110,000	9,200,000	350,000	<0.15
10/18/83	51,000	340	1,100	76,000	230	<0.15
Geometric Mean	1,600,000	96,000	42,000	740,000	11,000	<0.2

All counts expressed as counts per 100 milliliters except SPC, which is counts per milliliter.

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THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AI-6

BACTERIAL DATA FROM THE LITTLE CALUMET RIVER DURING 1983 AT 159th STREET

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	590,000	53,000	19,000	48,000	1,100	<0.15
6/21/83	11,000	1,400	4,600	55,000	310	<0.15
8/16/83	42,000	5,500	3,900	410,000	700	<0.15
10/18/83	7,000	280	1,600	56,000	230	<0.15
Geometric Mean	37,000	3,300	4,800	88,000	480	<0.15

All counts expressed as counts per 100 milliliters except SPC, which is counts per milliliter.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AI-7

BACTERIAL DATA FROM THE LITTLE CALUMET RIVER DURING 1983 AT ASHLAND AVENUE

Date	TC	FC	FS	SPC	PA	SAL
4/19/83	300,000	15,000	8,500	26,000	310	<0.15
6/21/83	11,000	270	440	395,000	80	<0.15
8/16/83	4,800	2,400	4,700	520,000	400	<0.15
10/18/83	4,700	260	120	17,000	310	<0.15
Geometric Mean	17,000	1,300	1,200	98,000	240	<0.15

AI-9

All counts expressed as counts per 100 milliliters except SPC, which is counts per milliliter.

THE CHICAGO METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AI-8

FECAL COLIFORM DATA* FOR MONTHLY WATERWAYS SAMPLES TAKEN FROM THORN CREEK
AND THE LITTLE CALUMET RIVER DURING 1983

Location	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Geo- metric mean
Thorn Creek													
Lincoln Highway	NS ¹	NS ¹	3.20	2.51	2.90	4.04	3.85	NS ²	4.49	4.30	3.78	NS ¹	3.63
Joe Orr Road	5.54	4.15	1.30	4.20	4.23	2.34	3.64	2.61	4.26	3.26	3.70	3.58	3.57
Margaret Street	2.32	2.32	2.38	1.70	2.73	3.08	3.49	2.70	3.61	2.32	2.53	NS ³	2.65
167/170th Street	NS ¹	2.68	2.43	2.45	3.18	3.52	3.70	3.54	3.60	2.71	2.76	NS ³	3.04
Little Calumet River													
Wentworth Avenue	5.26	5.08	4.85	1.00	5.56	6.15	3.38	6.11	>5.78 ⁴	3.70	4.41	4.56	4.65
159th Street	4.71	4.41	3.74	4.54	5.20	5.83	5.38	3.61	4.48	2.70	4.26	NS ³	4.45
Ashland Avenue	NS ³	3.54	3.51	4.11	4.32	4.04	5.04	3.23	3.74	2.30	4.38	4.72	3.90

*Units are Log₁₀/100 mL

¹NS = No sample, water frozen.

²NS = No sample, creek dried up.

³NS = No sample, none collected.

⁴Estimated count according to standard technique on highest dilution.

APPENDIX II
PERIPHYTON DATA COLLECTED FROM THORN CREEK AND
THE LITTLE CALUMET RIVER DURING 1983

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-1

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT LINCOLN HIGHWAY IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>coarctata</u>								
	var. <u>elliptica</u>			1,108					
<u>A.</u>	<u>conspicua</u>			950		1,042	955		
<u>A.</u>	<u>hungarica</u>					347			
<u>A.</u>	<u>lanceolata</u>		2,444	475	49				
<u>A.</u>	<u>lanceolata</u>								
	var. <u>rostrata</u>								102
<u>Amphiprora</u>	<u>alata</u>					347		2,412	407
<u>Amphora</u>	<u>delicatissima</u> ¹			1,662	196	1,736	2,865	1,608	407
<u>A.</u>	<u>veneta</u>						1,432		
<u>Anomoeoneis</u>	<u>serians</u> var.								
	<u>brachysira</u>						1,432		
<u>Caloneis</u>	<u>bacillum</u>								102
<u>Cocconeis</u>	<u>placentula</u> ³			871	1,273	1,736	2,865	1,608	204
<u>Cuclotella</u>	<u>glomerata</u>		1,222	237	245				
<u>C.</u>	<u>kutzingiana</u> ³		611						
<u>C.</u>	<u>meneghiniana</u> ³	3,056	1,833	1,029	98	4,514	2,865	8,041	1,120
<u>C.</u>	<u>stelligera</u>				49				
<u>Cymbella</u>	<u>microcephala</u>		611						
<u>C.</u>	<u>sinuata</u>			158			477	804	
<u>C.</u>	<u>ventricosa</u>								102
<u>Diploneis</u>	<u>ovalis</u> ¹			79		347	4,774	3,216	306
<u>D.</u>	<u>pseudoyalis</u>				49				
<u>D.</u>	<u>puella</u> ¹					1,042	2,387	804	611

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT LINCOLN HIGHWAY IN THORN CREEK DURING 1983

AII-3

Genus	Species	3/1 to 3/15	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Fragilaria</u>	<u>intermedia</u>	3,056	1,833						102
<u>Gomphonema</u>	<u>gracile</u>					347			204
<u>G.</u>	<u>olivaceum</u>	29,028	8,556	79					
<u>G.</u>	<u>parvulum</u> ³	1,528	7,944	1,662	392	1,389	3,342	5,629	1,528
<u>G.</u>	<u>subcavatum</u> var. <u>mexicanum</u>				98		477		
<u>Gyrosigma</u>	<u>kutzingii</u>						955		
<u>Hantzschia</u>	<u>elongatum</u> ¹		4,278			694		804	306
<u>H.</u>	<u>UV</u>				49				
<u>Melosira</u>	<u>granulata</u> ³			79	49		4,297		407
<u>M.</u>	<u>granulata</u> var. <u>angustissima</u> ¹	3,056	1,222	712	49				
<u>M.</u>	<u>varians</u> ³		611	712	49	1,736	10,981	2,412	
<u>Navicula</u>	<u>atomus</u> ²						1,910		
<u>N.</u>	<u>capitata</u>			79	49				
<u>N.</u>	<u>cincta</u> var. <u>heifleri</u> ²								102
<u>N.</u>	<u>contenta</u>			475					
<u>N.</u>	<u>contenta</u>								
<u>N.</u>	<u>f. biceps</u>			79					
<u>N.</u>	<u>cryptocephala</u> ³	140,556	177,222	237	196	17,708	27,691	58,699	2,750
<u>N.</u>	<u>cryptocephala</u> var. <u>veneta</u> ³		2,444	712	196	2,083	2,387		611
<u>N.</u>	<u>exigua</u> ¹	114,583	9,167	79	98	347			204
<u>N.</u>	<u>gregaria</u> ³	27,500	22,000	4,275	343	1,042	3,819	804	1,528

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT LINCOLN HIGHWAY IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>minima</u>				49				
<u>N.</u>	<u>muralis</u>			79					
<u>N.</u>	<u>mutica</u> var.								
	<u>cohnii</u> ¹			79					
<u>N.</u>	<u>secura</u> ¹				196	3,819	3,819		509
<u>N.</u>	<u>tripunctata</u> ¹					77,431	38,194	118,202	4,380
<u>N.</u>	<u>viridula</u>								
	var. <u>avenacea</u>			5,462	539		1,910		204
<u>N.</u>	<u>vitabunda</u>				294				
<u>Nitzschia</u>	<u>amphibia</u>					347	955		
<u>N.</u>	<u>communis</u> var.								
	<u>abbreviata</u> ³	1,528		7,441	1,126	22,917	33,898	4,825	2,954
<u>N.</u>	<u>dissipata</u> ³	1,528		2,444	544	1,736			509
<u>N.</u>	<u>fonticola</u> ³	6,111	5,500	3,483	2,252	15,971	40,104	17,690	4,991
<u>N.</u>	<u>frustulum</u> ¹		611	871	98	4,167	4,774	2,412	407
<u>N.</u>	<u>gracilis</u> ²				49	1,048			
<u>N.</u>	<u>hungarica</u> ¹	10,694	3,056	792	98	1,048	2,387	4,825	2,241
<u>N.</u>	<u>linearis</u> ³	6,111		396	49				917
<u>N.</u>	<u>longissima</u> ¹			158		3,125	24,349	172,076	20,574
<u>N.</u>	<u>thermalis</u> ²			237					
<u>N.</u>	<u>tryblionella</u>								
	var. <u>levidensis</u>	3,056		317					102

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT LINCOLN HIGHWAY IN THORN CREEK DURING 1983

AII-5

Genus	Species	3/1 to 3/15	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Nitzschia</u>	<u>tryblionella</u>								
	var. <u>victoriae</u>					347			
<u>Pleurosigma</u>	<u>elongatum</u>					694	955		
<u>Rhoicosphenia</u>	<u>curvata</u> ¹	29,028	1,222	1,742	832	6,944	10,981	5,629	2,139
<u>Rhopalodia</u>	<u>musculus</u>								102
<u>Stephanodiscus</u>	<u>dubius</u>					147			
<u>S.</u>	<u>hantzschii</u>				79				
<u>Surirella</u>	<u>angustata</u>	3,056			79		477		
<u>S.</u>	<u>ovalis</u>	7,639	6,722	158			955		815
<u>S.</u>	<u>ovata</u> ³	514,861	43,389	1,029	196	347			306
<u>Synedra</u>	<u>affinis</u> ¹	10,694	1,833	158					204
<u>S.</u>	<u>gaillonii</u>		611	237					
<u>S.</u>	<u>ulna</u> ²			158					
<u>Thalassiosira</u>	<u>pseudonana</u>			950					
<u>Ankistrodesmus</u>	<u>convolutus</u>					41	76	138	
<u>Characium</u>	<u>hookeri</u>	95							
<u>Chlamydomonas</u>	<u>globosa</u>	286	181						
<u>C.</u>	<u>mucicola</u>			91				138	92
<u>Closterium</u>	<u>lunula</u>						38		
<u>Oedogonium</u>	<u>sp.</u>		35,384			372			
<u>Planctonema</u>	<u>lauterbornii</u>						1,134		
<u>Scenedesmus</u>	<u>bijuga</u> ³			91	69	248	76		
<u>S.</u>	<u>quadricauda</u> ³			182		83	302	554	
<u>Selenastrum</u>	<u>minutum</u>			182	34				

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-1 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT LINCOLN HIGHWAY IN THORN CREEK DURING 1983

Genus	Species	3/1	4/26	6/1	6/28	7/26	8/23	9/21	10/18
		to 3/15	to 5/10	to 6/14	to 7/12	to 8/9	to 9/8	to 10/4	to 11/3
<u>Spirogyra</u>	<u>U 1</u>			365					
<u>Stigeoclonium</u>	<u>nanum</u>		3,972						
<u>Anabaena</u>	<u>flos-aquae</u>							831	
<u>A.</u>	<u>wisconsinense</u>							831	
<u>Chroococcus</u>	<u>dispersus</u>				414				
<u>Lyngbia</u>	<u>limnetica</u> ¹	6,009	7,943	729	952			41,122	43,493
<u>Oscillatoria</u>	<u>limnetica</u>						189	19,938	
<u>O.</u>	<u>nigra</u>							2,769	
<u>O.</u>	<u>subbrevis</u> ¹				414		605	2,769	2,124
<u>Spirulina</u>	<u>laxissima</u>	95							
<u>S.</u>	<u>major</u>							138	
<u>Euglena</u>	<u>gracilis</u> ²	95							
<u>E.</u>	<u>minuta</u>	95		91			38		
<u>E.</u>	<u>proxima</u> ²	2,385							646
<u>E.</u>	<u>cysts</u>							138	
<u>Phacus</u>	<u>orbicularis</u>		90						
Total		925,729	355,498	41,929	9,602	178,923	242,127	482,004	98,812
Nos. Spp.		26	30	49	34	37	39	31	39

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-2

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT JOE ORR ROAD IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>coarctata</u> var.								
A.	<u>elliptica</u>			46					
A.	<u>conspicua</u>							202	
A.	<u>kolbei</u>						1,389		
A.	<u>lanceolata</u>						694	202	
A.	<u>U l</u>	175							
<u>Amphiprora</u>	<u>alata</u>						694		
<u>Amphora</u>	<u>delicatissima</u>		80	228	364	45	1,389	759	591
<u>Anomoeoneis</u>	<u>serians</u> var.								
	<u>brachysira</u>							101	
<u>Asterionella</u>	<u>formosa</u>				182				
<u>Cocconeis</u>	<u>placentula</u> ²							152	
<u>Cyclotella</u>	<u>glomerata</u>		160					101	
C.	<u>memeghiniana</u> ³	175		46	182		2,083	152	
C.	<u>turgida</u>				182				
<u>Diploneis</u>	<u>ovalis</u>							101	
D.	<u>puella</u>							51	
<u>Fragilaria</u>	<u>construens</u>			46					
F.	<u>intermedia</u>			46		445	17,361		
F.	<u>nitzschioides</u>					45			
<u>Gomphonema</u>	<u>gracile</u>				82		13,194		
G.	<u>olivaceum</u>	87							
G.	<u>parvulum</u> ³	3,056	120	365	61,293	267	106,944	708	99
<u>Hantzschia</u>	<u>amphioxys</u> ²						1,389		

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT JOE ORR ROAD IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Hantzschia</u>	<u>elongatum</u>							694	101	
H.	U V					364				
<u>Melosira</u>	<u>granulata</u>							694	51	49
M.	<u>granulata</u> var.									
	<u>angustissima</u>								202	
M.	<u>varians</u> ²				91				51	99
<u>Navicula</u>	<u>accomoda</u>				137		178	8,333	304	49
N.	<u>cincta</u> var.									
	<u>heufleri</u> ²								51	
N.	<u>confervacea</u>								860	
N.	<u>cryptocephala</u> ³	1,222	38			182	45	1,389	961	148
N.	<u>cryptocephala</u>									
	var. <u>veneta</u> ³	1,397	38	40	684	1,637	89	11,111	1,315	838
N.	<u>exigua</u> ¹	18,071	790	40		182				
N.	<u>gregaria</u> ³	2,532	75	281	182	364		694	253	
N.	<u>mutica</u> var.									
	<u>cohnii</u>									49
N.	<u>pupula</u> var.									
	<u>mutata</u>						89			
N.	<u>pygmaea</u>								202	
N.	<u>secura</u>								51	99
N.	<u>tripunctata</u> ¹						223	61,111	1,771	542
N.	<u>viridula</u> var.									
	<u>avenacea</u>			321	182	728				

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT JOE ORR ROAD IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>vitabund</u>					364				
<u>Nitzschia</u>	<u>amphibia</u>								51	
<u>N.</u>	<u>communis</u> var.									
	<u>abbreviata</u> ³	175			91	182	89	7,639	607	345
	<u>dissipata</u> ³	87			46			694	101	
	<u>filiformis</u> ²							694	51	49
	<u>fonticola</u> ³	2,095	38	120	1,323	2,372	2,272	118,749	4,553	690
	<u>frustulum</u>						89	12,500	152	
	<u>hungarica</u> ¹	698	75		46	909	267	694	405	49
	<u>linearis</u> ³	87	75						101	49
	<u>longissima</u> ¹				91			6,250	911	49
	<u>thermalis</u> ²								202	
	<u>tryblionella</u>									
	var. <u>levidensis</u>	87							51	
	<u>tryblionella</u>									
	var. <u>victoriae</u>								102	
<u>Pinnularia</u>	<u>fasciata</u>				46					
<u>Rhoicosphenia</u>	<u>curvata</u> ¹	1,048			137				658	197
<u>Stephanidiscus</u>	<u>hantzschii</u> ²	175								
<u>Surirella</u>	<u>angustata</u>								51	
<u>S.</u>	<u>ovalis</u> ⁴	524				364		1,389	51	
<u>S.</u>	<u>ovata</u> ³	12,659	301	481	274	364	45		51	
<u>Synedra</u>	<u>affinis</u>				91					
<u>S.</u>	<u>gaillonii</u>				46					
<u>S.</u>	<u>ulna</u> var.									
	<u>contracta</u> ²						45			
<u>Ankistrodesmus</u>	<u>braunii</u> ¹				2,776	15,688	7,696	206,148	781	235

AII-9

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-2 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT JOE ORR ROAD IN THORN CREEK DURING 1983

AII-10

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Characium</u>	<u>ambiguum</u>	993			601	5,369				
<u>Chlamydomonas</u>	<u>mucicola</u>							568		
<u>C.</u>	<u>sphagnicola</u>							568		
<u>Cladophora</u>	<u>sp.</u>		1,030							
<u>Scenedesmus</u>	<u>dimorphus</u>					47				
<u>Anabaena</u>	<u>wisconsinense</u>		141						92	
<u>Chroococcus</u>	<u>dispersus</u>							71,556		
<u>Lyngbia</u>	<u>limnetica</u>								735	3,291
<u>Oscillatoria</u>	<u>agardhii</u>						1,425	5,111		
<u>O.</u>	<u>limnetica</u>						1,018			
<u>O.</u>	<u>subbrevis</u>						489			
<u>O.</u>	<u>tenuis</u> ²							1,136		
<u>Euglena</u>	<u>minuta</u>					47		1,136	46	
<u>E.</u>	<u>proxima</u> ²	43								
<u>E.</u>	<u>cysts</u>							1,136		
Total		45,386	2,601	1,643	7,621	113,448	14,861	664,437	18,201	7,557
Nos. Spp.		20	10	9	23	22	19	32	43	20

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-3

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT MARGARET STREET IN THORN CREEK DURING 1983

AII-11

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>affinis</u>	NS	121	NS		NS				
<u>A.</u>	<u>coarctata</u>									
	<u>var. elliptica</u>				4,365					
<u>A.</u>	<u>conspicua</u> ¹				7,275		3,638	4,493	1,528	300
<u>A.</u>	<u>exigua</u>				728					
<u>A.</u>	<u>hungarica</u>							1,797		
<u>A.</u>	<u>lanceolata</u> ¹		121		29,828		8,003	2,696	2,292	3,295
<u>A.</u>	<u>lapponica</u>						728			
<u>A.</u>	<u>pinnata</u>		182							
<u>Amphiprora</u>	<u>alata</u> ¹				728		728	899	10,694	4,793
<u>Amphora</u>	<u>delicatissima</u> ¹				2,183		728			1,198
<u>A.</u>	<u>veneta</u> ¹							899	3,056	1,498
<u>Anomoeoneis</u>	<u>serians</u> var.									
	<u>brachysira</u>						728			
<u>Cocconeis</u>	<u>placentula</u> ³				25,463		2,183		4,583	300
<u>Cyclotella</u>	<u>glomerata</u> ¹				13,823		5,093	899		
<u>C.</u>	<u>kutzingiana</u>				2,183					
<u>C.</u>	<u>meneghiniana</u>		243		5,093		13,823	19,771	3,819	2,996
<u>Cymbella</u>	<u>microcephala</u> ¹				2,183		1,455			
<u>Diatoma</u>	<u>tenue</u>						728			
<u>D.</u>	<u>elongatum</u>		849							
<u>Diploneis</u>	<u>ovalis</u> ¹						2,183	4,493	17,569	2,397
<u>D.</u>	<u>puella</u>						7,275	899		599
<u>Fragilaria</u>	<u>intermedia</u>		121							300

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT MARGARET STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Frustulia</u>	<u>vulgaris</u>	NS		NS		NS	728			
<u>Gomphonema</u>	<u>brevistriata</u>						1,455			
<u>G.</u>	<u>gracile</u> ¹		61		728		899			
<u>G.</u>	<u>olivaceum</u> ¹		6,609		1,455			764		
<u>G.</u>	<u>parvulum</u>		2,122		111,310		2,183	14,379	3,056	3,295
<u>G.</u>	<u>scalproides</u>						899			
<u>Hantzschia</u>	<u>amphioxys</u> ²						1,797			
<u>H.</u>	<u>elongatum</u> ¹		61					764		599
<u>Melosira</u>	<u>granulata</u> ²						899			
<u>M.</u>	<u>granulata</u> var.									
	<u>angustissima</u>						1,455			
<u>M.</u>	<u>varians</u> ²						2,183	3,595		
<u>Meridian</u>	<u>circulare</u>		303							
<u>Navicula</u>	<u>accomoda</u> ¹				728		2,696	1,528		599
<u>N.</u>	<u>capitata</u> ¹		61		728					2,097
<u>N.</u>	<u>cincta</u> var.									
	<u>heufleri</u> ²									599
<u>N.</u>	<u>cryptocephala</u> ³		1,031		1,455		4,365	27,859	9,167	4,194
<u>N.</u>	<u>cryptocephala</u> var.									
	<u>veneta</u> ³		303		6,548		728	3,595	3,056	8,388
<u>N.</u>	<u>elginesis</u> var.									
	<u>rostrata</u>									10,185
<u>N.</u>	<u>exigua</u> ¹		424				728		764	300
<u>N.</u>	<u>gregaria</u> ³		4,669		5,820		5,093	899	4,583	599
<u>N.</u>	<u>integra</u>		61							

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT MARGARET STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>laterostrata</u>	NS		NS		NS			26,736	
<u>N.</u>	<u>mutica</u>							1,797		300
<u>N.</u>	<u>mutica</u> var.									
	<u>tropica</u>							4,493		1,797
<u>N.</u>	<u>mutica</u> var.									
	<u>undulata</u>						728			
<u>N.</u>	<u>pygmaea</u> ¹						728	1,797		300
<u>N.</u>	<u>secura</u> ¹						2,910	6,291	5,347	4,194
<u>N.</u>	<u>tripunctata</u> ¹						27,646	98,856	132,917	12,582
<u>N.</u>	<u>viridula</u> var.									
	<u>avenacea</u> ¹				5,820			1,797	1,528	
<u>Nitzschia</u>	<u>amphibia</u>								1,528	
<u>N.</u>	<u>communis</u> var.									
	<u>abbreviata</u> ³		61		728		3,638	2,696	1,528	1,797
<u>N.</u>	<u>dissipata</u> ²		303							899
<u>N.</u>	<u>filiformis</u> ²									899
<u>N.</u>	<u>fonticola</u> ³		1,394		104,034		237,169	200,408	135,208	53,322
<u>N.</u>	<u>frustulum</u> ¹						6,548	8,088	2,292	599
<u>N.</u>	<u>gracilis</u> ²								1,528	
<u>N.</u>	<u>hungarica</u> ¹		182		12,368		5,093	4,493	10,694	5,392
<u>N.</u>	<u>linearis</u> ³		121				4,365	4,493		1,498
<u>N.</u>	<u>longissima</u> ¹		182					899	764	599
<u>N.</u>	<u>thermalis</u> ²						1,455			
<u>N.</u>	<u>tryblionella</u> var.									
	<u>levidensis</u> ¹				12,368		728		3,819	

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT MARGARET STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Nitzschia</u>	<u>tryblionella</u>	NS		NS		NS				
	var. <u>victoriae</u> ¹		121				728	1,797		
<u>Pleurosigma</u>	<u>elongatum</u>							14,379	2,292	
<u>Rhoicosphenia</u>	<u>curvata</u> ¹		243		6,548			5,392	4,583	2,996
<u>Stauroneis</u>	<u>anceps</u> var.									
	<u>gracilis</u>				728					
<u>Stephanodiscus</u>	<u>hantzschii</u> ²		121				728			
<u>Surirella</u>	<u>angustata</u> ¹		61				1,455	3,595	6,875	2,996
S.	<u>ovalis</u> ¹		121				2,910	4,493	764	300
S.	<u>ovata</u> ³		9,640		16,005		8,730	4,493	12,222	9,286
<u>Synedra</u>	<u>acus</u> ²		121							
S.	<u>affinis</u> ¹		121		728					300
S.	<u>amphicephala</u>		61							
S.	<u>gaillonii</u>		61							300
S.	<u>ulna</u> ²		121							
S.	<u>ulna</u> var.									
	<u>contracta</u>									1,498
<u>Thalassiosira</u>	<u>pseudonana</u>				1,455					
<u>Ankistrodesmus</u>	<u>braunii</u>						590		135	
A.	<u>falcatus</u> ²				201					
<u>Characium</u>	<u>hookeri</u>				201					
<u>Chlamydomonas</u>	<u>sphagnicola</u>		184		67					
<u>Cladophora</u>	sp.				1,471					
<u>Oedogonium</u>	sp.								632	
<u>Planctonema</u>	<u>lauterbornii</u>						8,260			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-3 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT MARGARET STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Protoderma</u>	<u>viride</u>	NS		NS	735	NS				
<u>Scenedesmus</u>	<u>quadricauda</u> ²									1,486
<u>Sphaerocystis</u>	<u>schroeteri</u>				134					
<u>Stigeoclonium</u>	<u>nanum</u>				5,633				271	
<u>Anabaena</u>	<u>flos-aquae</u>							9,375		
A.	<u>wisconsinense</u>								497	
<u>Aphanothece</u>	<u>nidulans</u>						590			
<u>Lyngbia</u>	<u>limnetica</u> ¹		99,365		25,541		142,776		6,639	198,735
<u>Oscillatoria</u>	<u>limnetica</u>							597,679		
O.	<u>nigra</u>								271	
O.	<u>subbrevis</u> ¹						155,166	21,095	226	
<u>Spirulina</u>	<u>laxissima</u>				67					
S.	<u>subsalsa</u>								45	
<u>Euglena</u>	<u>minuta</u>				67				45	
Total			129,926		417,573		679,152	1,095,769	426,609	351,505
Nos. Spp.			36		39		43	40	41	43

NS = No sample

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-4

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 167/170th STREET IN THORN CREEK DURING 1983

AII-16

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>coarctata</u> var.									
	<u>elliptica</u>				1,528					
A.	<u>conspicua</u> ¹			3,819	3,056					
A.	<u>exigua</u>						6,111	1,175		
A.	<u>lanceolata</u> ¹		168	17,188	9,167		3,056			
A.	<u>linearis</u> var.						64,167	24,679	1,389	1,175
	<u>curta</u>		224							
<u>Amphiprora</u>	<u>alata</u>							2,938	12,500	10,107
<u>Amphora</u>	<u>delicatissima</u>							588		235
A.	<u>veneta</u> ¹			1,910	1,528		21,389	1,763	5,556	940
<u>Cocconeis</u>	<u>placentula</u> ³				139,028		16,806	44,658	20,833	940
<u>Cyclotella</u>	<u>glomerata</u>				12,222					
C.	<u>meneghiniana</u>	2,183	56	1,910			13,750	5,288	18,056	705
<u>Cymatopleura</u>	<u>solea</u> ²		56							
<u>Cymbella</u>	<u>microcephala</u>				1,528					
<u>Diatoma</u>	<u>tenue</u>									470
D.	<u>tenue</u> var.									
	<u>elongatum</u>	139,683	951	1,910						
<u>Diploneis</u>	<u>ovalis</u>						1,528	8,227		2,821
D.	<u>puella</u> ¹						39,722	3,526	2,778	940
<u>Fragilaria</u>	<u>intermedia</u>	2,183	168	13,368						
<u>Frustulia</u>	<u>vulgaris</u>				1,528			588		
<u>Gomphonema</u>	<u>brevistriata</u>						4,583			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 167/170th STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Gomphonema</u>	<u>gracile</u>	37,103						1,763		
<u>G.</u>	<u>olivaceum</u>	56,746	1,399	43,924		NS		588		235
<u>G.</u>	<u>parvulum</u>	39,286	1,343	74,479	597,361		197,083	15,278	4,167	1,175
<u>Hantzschia</u>	<u>amphioxys</u> ²							588		
<u>H.</u>	<u>elongatum</u>						3,056	1,763		1,880
<u>Melosira</u>	<u>granulata</u>									470
<u>M.</u>	<u>varians</u> ³						12,222	1,175	5,556	235
<u>Navicula</u>	<u>capitata</u> ¹						21,389	588	1,389	705
<u>N.</u>	<u>cincta</u> var.									
<u>N.</u>	<u>heuffleri</u> ²								1,389	
<u>N.</u>	<u>cryptocephala</u> ³	2,183	448	1,910			10,694	55,823	16,667	7,756
<u>N.</u>	<u>cryptocephala</u> var. <u>veneta</u> ³		448	13,368	1,528			588		470
<u>N.</u>	<u>elginesis</u> var. <u>rostrata</u>									4,231
<u>N.</u>	<u>exigua</u> ¹	52,381	728	11,458						235
<u>N.</u>	<u>gregaria</u>	34,921	5,652	78,299	1,528					1,410
<u>N.</u>	<u>integra</u>	4,365	112							
<u>N.</u>	<u>laterostrata</u>								26,389	
<u>N.</u>	<u>mutica</u>		56					1,763		
<u>N.</u>	<u>mutica</u> var.									
<u>N.</u>	<u>tropica</u>									235
<u>N.</u>	<u>pygmaea</u>						1,528			235
<u>N.</u>	<u>secura</u> ¹		56				1,528	1,763		940
<u>N.</u>	<u>tripunctata</u> ¹		56				166,528	40,545	209,722	21,154

AII-17

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 167/170th STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>viridula</u> var. <u>avenacea</u> ¹			19,097	1,528	NS		588		940
<u>Nitzschia</u>	<u>communis</u> var. <u>abbreviata</u> ³						12,222	4,113	1,389	1,880
N.	<u>dissipata</u> ³		112	3,819	1,528			1,763		1,410
N.	<u>filiformis</u> ²									235
N.	<u>fonticola</u> ³	19,643	1,119	143,229	51,944		236,806	65,224	306,944	23,974
N.	<u>frustulum</u> ¹		168	15,278			13,750	12,927	11,111	470
N.	<u>gracilis</u> ²								4,167	235
N.	<u>hungarica</u> ¹	8,730	448	11,458	3,056		7,639	3,526	11,111	8,227
N.	<u>linearis</u> ³		56				7,639	1,763		3,761
N.	<u>longissima</u>		56	11,458			1,528	1,763	15,278	940
N.	<u>thermalis</u>								1,389	235
N.	<u>tryblionella</u> var. <u>levidensis</u> ¹		56				1,528		1,389	705
N.	<u>tryblionella</u> var. <u>victoriae</u>						1,528	588		
N.	<u>U V</u>		112							
<u>Pinnularia</u>	<u>divergentissima</u>		224							
<u>P.</u>	<u>microstauron</u>								1,389	
<u>Pleurosigma</u>	<u>elongatum</u>							2,938	2,778	
<u>Rhoicosphenia</u>	<u>curvata</u> ¹			1,910	1,528		4,583	2,350	1,389	1,410
<u>Stephanodiscus</u>	<u>hantzschii</u> ²								1,389	
<u>Surirella</u>	<u>angustata</u> ¹	13,095		1,910					5,556	3,291
S.	<u>ovalis</u> ¹	34,921	224					2,350	4,167	1,410
S.	<u>ovata</u> ³	1,089,087	13,655	609,201	1,528				8,333	7,286

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-4 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
FOUNT AT 167/170th STREET IN THORN CREEK DURING 1983

Genus	Species	3/1 to 3/15	3/28 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Synedra</u>	<u>affinis</u>		56			NS		588		235
<u>S.</u>	<u>gaillonii</u>			1,910						
<u>S.</u>	<u>nana</u>			1,910						235
<u>S.</u>	<u>parasitica</u> var. <u>subconstricta</u>							588	1,389	1,410
<u>S.</u>	<u>pulchella</u>	2,183	56							
<u>S.</u>	<u>ulna</u> ²			1,910						
<u>Ankistrodesmus</u>	<u>braunii</u>						2,692		130	
<u>A.</u>	<u>convolutus</u>						174			
<u>Botryococcus</u>	<u>sudeticus</u>			13,388			174			
<u>Characium</u>	<u>hookeri</u>				85		87			
<u>Chlamydomonas</u>	<u>globosa</u>						174		195	
<u>C.</u>	<u>muciocola</u>	566								
<u>C.</u>	<u>klebsii</u>				85					
<u>C.</u>	<u>sphagnicola</u>			154	169		174			
<u>Coelastrum</u>	<u>microporum</u> ²						87			
<u>Gleocystis</u>	<u>gigas</u>			1,077						
<u>Oedogonium</u>	<u>sp.</u>				3,217		1,216			
<u>Oocystis</u>	<u>pusilla</u>						1,563			
<u>Protoderma</u>	<u>viride</u> ¹	94			254		1,129	123		
<u>Scenedesmus</u>	<u>quadricauda</u> ²						695		260	
<u>Selenastrum</u>	<u>minutum</u>									70
<u>Spirogyra</u>	<u>U</u>							3,525		
<u>Stigeoclonium</u>	<u>nanum</u> ¹	2,075		7,925	33,019		24,057	1,476	1,170	
<u>Ulothrix</u>	<u>subtillissima</u>	7,829								

Table continued on followig page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO
 TABLE AII-4 (Continued)
 PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 167/170th STREET IN THORN CREEK DURING 1983

Genus	Species	3/1	3/28	4/26	6/1	6/28	7/26	8/23	9/21	10/18
		to 3/15	to 4/12	to 5/10	to 6/14	to 7/12	to 8/9	to 9/8	to 10/4	to 11/3
<u>Ulothrix</u>	<u>U</u>			4,001	2,371	NS	3,735			
<u>Anabaena</u>	<u>flos-aquae</u>						1,650	246		
<u>A.</u>	<u>wisconsinense</u>			1,154						
<u>Chroococcus</u>	<u>dispersus</u>						347			
<u>Lyngbia</u>	<u>limnetica</u> ¹	33,769	22,381	15,466	2,963		2,432		455	19,538
<u>Microcystis</u>	<u>incerta</u>						87			
<u>Oscillatoria</u>	<u>limnetica</u>							615		
<u>O.</u>	<u>nigra</u>						521			
<u>O.</u>	<u>subbrevis</u>	755			1,355		4,690			
<u>Euglena</u>	<u>minuta</u>									70
<u>E.</u>	<u>proxima</u> ²		203	154			87			
<u>Phacus</u>	<u>acuminatus</u>								65	
<u>Trachelomonas</u>	<u>pulchella</u>	94								
Total		1,583,875	50,847	1,129,952	874,632		918,134	322,909	707,834	137,666
Nos. Spp.		23	31	32	26		46	41	35	46

NS = No Sample

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-5

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT WENTWORTH AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1	3/29	4/26	6/1	6/28	7/26	8/23	9/21	10/18
		to 3/15	to 4/12	to 5/10	to 6/14	to 7/12	to 8/9	to 9/8	to 10/4	to 11/3
<u>Achnanthes</u>	<u>conspicua</u>		NS	NS		527	764		NS	
A.	<u>hungarica</u>						191			
A.	<u>lanceolata</u> ¹	239			1,019	2,371	764	1,528		1,528
A.	<u>lapponica</u>	239			1,019					
A.	<u>montana</u>						191			
<u>Amphora</u>	<u>coffeiformis</u>						191			
A.	<u>commutata</u>						191			
A.	<u>delicatissima</u>						191			
A.	<u>veneta</u>				1,019					109
<u>Cocconeis</u>	<u>pediculus</u>						191			
C.	<u>placentula</u> ³	239					382	1,528		
<u>Coscinodiscus</u>	<u>rothii</u>					263				
<u>Cyclotella</u>	<u>glomerata</u>						10,694			
C.	<u>kutzingiana</u>	955					382			
C.	<u>meneghiniana</u> ³	47,982			13,241	41,619	24,635	42,778		13 859
C.	<u>oecolata</u>							3,056		
C.	<u>stelligera</u>					527				
<u>Cymbella</u>	<u>microcephala</u>									218
C.	<u>ventricosa</u>									218
<u>Diploneis</u>	<u>ovalis</u>									327
D.	<u>puella</u>						382			218
<u>Fragilaria</u>	<u>construens</u>									
F.	var. <u>binodis</u>							191		
F.	<u>intermedia</u> ¹	955				790				109
<u>Frustulia</u>	<u>vulgaris</u>							191		
<u>Gomphonema</u>	<u>gracile</u>							191		327

Table continued on next page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT WENTWORTH AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Gomphonema</u>	<u>olivaceum</u> ¹	2,626	NS	NS		1,580	382		NS	
<u>G.</u>	<u>parvulum</u> ³	4,297			4,074	70,800	2,463	18,333		3,383
<u>Hantzschia</u>	<u>amphioxys</u> ²						1,337			109
<u>H.</u>	<u>elongata</u> ¹	4,058				527				437
<u>Melosira</u>	<u>granulata</u> ³	716					191			1,419
<u>M.</u>	<u>granulata</u> var. <u>angustissima</u>	1,671				263	4,965			
<u>M.</u>	<u>varians</u>				9,167	2,898	1,528	12,222		437
<u>Meridian</u>	<u>circulare</u> ¹	1,194						1,528		109
<u>Navicula</u>	<u>angelica</u>									109
<u>N.</u>	<u>capitata</u> ¹	1,671				1,054	573			3,165
<u>N.</u>	<u>cincta</u> var. <u>heufleri</u> ²									109
<u>N.</u>	<u>cryptocephala</u> ³	9,549			2,037	3,161	1,146	1,528		1,528
<u>N.</u>	<u>cryptocephala</u> var. <u>veneta</u> ²						3,056			1,310
<u>N.</u>	<u>elginensis</u> var. <u>rostrata</u>									3,165
<u>N.</u>	<u>exigua</u>				2,037		573			
<u>N.</u>	<u>gregaria</u> ³	10,503			6,111	7,639	2,865	9,167		3,492
<u>N.</u>	<u>integra</u>	2,387								
<u>N.</u>	<u>mutica</u> ¹					1,054	573	1,528		
<u>N.</u>	<u>mutica</u> var. <u>cohnii</u>									
<u>N.</u>	<u>mutica</u> var. <u>tropica</u>	716				527				

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT WENTWORTH AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>mutica</u> var.									
	<u>undulata</u>	239	NS	NS					NS	
N.	<u>pygmaea</u>					263				218
N.	<u>secura</u> ¹						1,528	1,528		437
N.	<u>tripunctata</u> ¹						764	1,528		109
N.	<u>viridula</u> var.									
	<u>avenacea</u> ³				2,037		764			109
N.	<u>viridula</u> var.									
	<u>rostellata</u> ²	239								
<u>Nitzschia</u>	<u>communis</u> var.									
	<u>abbreviata</u> ²	239								
N.	<u>dissipata</u> ³	239					573	1,528		109
N.	<u>fasciculata</u> ¹						573			
N.	<u>fonticola</u> ³	10,981			482,778	48,994	28,073	747,083		13,422
N.	<u>frustulum</u>						573			327
N.	<u>hungarica</u> ¹	1,432			3,056	2,107	764			982
N.	<u>linearis</u> ²	2,387								
N.	<u>thermalis</u> ³	477				263	30,556			1,637
<u>Rhoicosphenia</u>	<u>curvata</u> ¹	239				527	573			
<u>Stephanodiscus</u>	<u>hantzschii</u> ¹	239			2,037		191			
<u>Surirella</u>	<u>angustata</u> ¹	477				263	191			546
S.	<u>ovalis</u>	716								
S.	<u>ovata</u> ³	10,503			8,148	3,688	1,146	1,528		873
<u>Synedra</u>	<u>acus</u> ²	239								
S.	<u>affinis</u>				2,037	527				

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT WENTWORTH AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Synedra</u>	<u>gailonii</u> ¹	239	NS	NS	2,037	1,317	191		NS	109
<u>S.</u>	<u>parasitica</u> var. <u>subconstricta</u>				1,019					
<u>S.</u>	<u>pulchella</u>						191			
<u>S.</u>	<u>ulna</u> ²	716								
<u>Actinastrum</u>	<u>hantzschii</u> var. <u>elongatum</u> ²					3,901				
<u>Ankistrodesmus</u>	<u>braunii</u>									319
<u>A.</u>	<u>convolutus</u>							172		
<u>A.</u>	<u>falcatus</u> ³	1,654			9,705	300	151			160
<u>Chlamydomonas</u>	<u>mucicola</u>					150				
<u>C.</u>	<u>sphagnicola</u>				2,080					
<u>Chlorella</u>	<u>vulgaris</u> ²					300				
<u>Closterium</u>	<u>lunula</u>									160
<u>Coelastrum</u>	<u>microporum</u> ²					150		344		
<u>Kirschneriella</u>	<u>lunaris</u>						151			
<u>Scenedesmus</u>	<u>bijuga</u> ³					600	906			319
<u>S.</u>	<u>quadricauda</u> ³					600	1,812	2,755		319
<u>Selenastrum</u>	<u>minutum</u> ¹				693	1,500				159
<u>Ulothrix</u>	<u>U</u> ₂							12,744		
<u>Anabaena</u>	<u>helicoidea</u>						20,837			
<u>Unknown Green</u>							151			
<u>Chroococcus</u>	<u>limneticus</u>					600				
<u>C.</u>	<u>minutus</u>						1,812			
<u>Lyngbia</u>	<u>limnetica</u>	785,515			66,551	6,302				70,127
<u>Merismopedia</u>	<u>glauca</u>							172		

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-5 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT WENTWORTH AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Merismopedia</u>	<u>tenuissima</u>		NS	NS			453		172	
<u>Microcystis</u>	<u>aeruginosa</u>							1,378		
<u>Oscillatoria</u>	<u>amphibia</u>						6,342			
<u>O.</u>	<u>limnetica</u> ¹					14,405	10,720		8,955	
<u>O.</u>	<u>nigra</u> ¹				282,843	1,350	25,970		34,615	479
<u>O.</u>	<u>subbrevis</u> ¹	6,615				15,155	2,416		29,449	9,425
<u>O.</u>	<u>tenuis</u> ²						3,473		6,544	
<u>Spirulina</u>	<u>laxissima</u>								689	
<u>S.</u>	<u>subsalsa</u>								344	
<u>Euglena</u>	<u>acus</u> ²				693					
<u>E.</u>	<u>proxima</u> ²	72,764								160
<u>E.</u>	<u>cysts</u>								1,206	
<u>Phacus</u>	<u>acuminatus</u>								5,683	
<u>P.</u>	<u>alatus</u>						755			
<u>Trachelomonas</u>	<u>hispidus</u>						151		344	
<u>T.</u>	<u>volvocina</u> ²								172	
Total		986,146			905,438	178,862	171,569	982,685		136,190
Nos. Spp.		37			23	38	57	33		44

NS = No Sample

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-6

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 159th STREET IN THE LITTLE CALUMET RIVER DURING 1983

AII
6

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>conspicua</u> ¹				NS	NS	NS		NS	504
<u>A.</u>	<u>lanceolata</u>	1,389	945	1,273				804		1,007
<u>Amphiprora</u>	<u>alata</u>							268		1,007
<u>Amphora</u>	<u>delicatissima</u>									168
<u>A.</u>	<u>veneta</u>							268		504
<u>Anomoeoneis</u>	<u>serians</u> var.									
	<u>brachysira</u>									336
<u>Cocconeis</u>	<u>placentula</u> ³		158	182				804		504
<u>Cyclotella</u>	<u>glomerata</u>			1,091				268		
<u>C.</u>	<u>kutzingiana</u>							268		168
<u>C.</u>	<u>meneghiniana</u> ³	5,556	945	1,273				10,989		2,015
<u>C.</u>	<u>stelligera</u>									168
<u>Cymbella</u>	<u>microcephala</u>									168
<u>C.</u>	<u>sinuata</u>									168
<u>C.</u>	<u>ventricosa</u>			182						
<u>Diatoma</u>	<u>tenue</u>		1,418							
<u>D.</u>	<u>tenue</u> var.									
	<u>elongatum</u>	4,167								
<u>Diploneis</u>	<u>ovalis</u>							536		839
<u>D.</u>	<u>puella</u>									168
<u>Fragilaria</u>	<u>capucina</u> ²		630							
<u>F.</u>	<u>intermedia</u>	2,778		728						
<u>Gomphonema</u>	<u>gracile</u> ¹	11,111						1,072		504
<u>G.</u>	<u>olivaceum</u> ¹	16,667	29,138	1,455						839

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 159th STREET IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Gomphonema</u>	<u>parvulum</u> ³	2,798	5,985	3,274	NS	NS	NS	8,041	NS	4,029
<u>Gyrosigma</u>	<u>kutzingii</u>	1,389	315							
<u>G.</u>	<u>scalproides</u>		315	182						
<u>Hantzschia</u>	<u>amphioxys</u> ²									336
<u>H.</u>	<u>elongata</u> ¹	1,389	1,418	1,273						672
<u>Melosira</u>	<u>granulata</u> ²							1,072		
<u>M.</u>	<u>granulata</u> var. <u>angustissima</u>	5,556								168
<u>M.</u>	<u>varians</u> ³		315	364				1,340		
<u>Navicula</u>	<u>accomoda</u>							268		
<u>N.</u>	<u>capitata</u>			364				268		
<u>N.</u>	<u>cryptocephala</u> ³	2,778	6,143	546				23,587		3,022
<u>N.</u>	<u>cryptocephala</u> var. <u>veneta</u> ³	2,778	945	546				2,412		3,861
<u>N.</u>	<u>elginensis</u> var. <u>rostrata</u>									2,015
<u>N.</u>	<u>exigua</u> ¹	4,167	630	1,819				268		
<u>N.</u>	<u>gregaria</u> ³	5,556	3,938	20,552				1,072		672
<u>N.</u>	<u>incerta</u>			315						
<u>N.</u>	<u>integra</u>			158						
<u>N.</u>	<u>laterostrata</u>									336
<u>N.</u>	<u>mutica</u>		158	182						
<u>N.</u>	<u>mutica</u> var. <u>stigma</u>									168
<u>N.</u>	<u>pygmaea</u>							1,340		168

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 159th STREET IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Navicula</u>	<u>secura</u>				NS	NS	NS		NS	2,686
<u>N.</u>	<u>tripunctata</u>							12,329		5,876
<u>N.</u>	<u>viridula</u> var. <u>avenacea</u> ²			6,548				268		
<u>Nitzschia</u>	<u>communis</u> var. <u>abbreviata</u> ²			182						1,675
<u>N.</u>	<u>dissipata</u> ²							1,340		672
<u>N.</u>	<u>filiformis</u> ²							268		336
<u>N.</u>	<u>fonticola</u> ³	43,056		6,730				59,503		37,943
<u>N.</u>	<u>frustulum</u> ¹			182				268		1,343
<u>N.</u>	<u>gracilis</u> ²							804		
<u>N.</u>	<u>hungarica</u>	11,111	5,040	6,366				268		2,854
<u>N.</u>	<u>linearis</u> ²	1,389								2,015
<u>N.</u>	<u>longissima</u>							536		1,511
<u>N.</u>	<u>thermalis</u> ²							1,876		
<u>N.</u>	<u>tryblionella</u>		158							168
<u>N.</u>	<u>tryblionella</u> var. <u>levidensis</u> ¹	1,389		182						168
<u>N.</u>	<u>tryblionella</u> var. <u>victoriae</u>			182				268		
<u>Pinnularia</u>	<u>brebissonii</u> var. <u>diminuta</u>			182						
<u>Pleurosigma</u>	<u>elongatum</u>									168
<u>Rhoicospenia</u>	<u>curvata</u> ¹	2,778	788	364				1,340		336
<u>Stephanodiscus</u>	<u>hantzschii</u> ²	4,167								
<u>Surirella</u>	<u>angustata</u> ¹		158	364						1,175

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-6 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT 159th STREET IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1	3/29	4/26	6/1	6/28	7/26	8/23	9/21	10/18
		to 3/15	to 4/12	to 5/10	to 6/14	to 7/12	to 8/9	to 9/8	to 10/4	to 11/3
<u>Surirella</u>	<u>ovalis</u> ¹	18,056	1,260	364	NS	NS	NS	268	NS	672
<u>S.</u>	<u>ovata</u> ³	581,944	16,695	33,284				804		1,175
<u>Synedra</u>	<u>affinis</u>			546						168
<u>S.</u>	<u>gaillonii</u> ¹	1,389	1,260	182						
<u>S.</u>	<u>nana</u>			364						
<u>S.</u>	<u>parasitica</u> var. <u>subconstricta</u>									168
<u>S.</u>	<u>pulchella</u> ¹		473	364						
<u>Ankistrodesmus</u>	<u>braunii</u>							45		
<u>A.</u>	<u>falcatus</u> ²									65
<u>Chlamydomonas</u>	<u>globosa</u>	362								
<u>Closterium</u>	<u>lunula</u>							45		
<u>Coelastrum</u>	<u>microporum</u> ²		191							
<u>Cladophora</u>	<u>sp.</u>							1,965		
<u>Planctonema</u>	<u>lauterbornii</u>			129						
<u>Scenedesmus</u>	<u>quadricauda</u> ²							134		
<u>Stigeoclonium</u>	<u>nanum</u>							357		
<u>Lyngbia</u>	<u>limnetica</u> ¹	176,309	4,485	904						30,834
<u>Oscillatoria</u>	<u>subbrevis</u> ¹	4,344						7,013		4,834
<u>O.</u>	<u>tenuis</u> ²							357		
<u>Euglena</u>	<u>minuta</u>									65
<u>E.</u>	<u>proxima</u> ²	3,620								131
<u>Total</u>		917,973	84,377	92,705				145,001		121,888
<u>Nos. Spp.</u>		27	28	35				40		51

NS = No Sample

¹Persistent species.

²Pollutant-tolerant species.

³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-7

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT ASHLAND AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Achnanthes</u>	<u>conspicua</u> ¹	318		764	76	239	3,819	3,565	1,068	
A.	<u>hungarica</u>							509	268	
A.	<u>lanceolata</u> ¹	106	3,819			716	1,528		268	206
<u>Amphiprora</u>	<u>alata</u>									206
<u>Amphora</u>	<u>delicatissima</u>			764						
A.	<u>veneta</u>								268	413
<u>Cocconeis</u>	<u>placentula</u> ³	212		1,528	27,347		764	35,818	1,876	413
<u>Cyclotella</u>	<u>glomerata</u>	106		764	1,986		12,222	170	804	
C.	<u>meneghiniana</u>		1,273			3,342	42,778	4,244	7,237	1,445
C.	<u>stelligera</u>									206
<u>Diatoma</u>	<u>tenue</u>		31,829							
D.	<u>tenue</u> var. <u>elongatum</u>	637								
<u>Diploneis</u>	<u>ovalis</u>						764	8,318	2,680	
D.	<u>puella</u>					1,528		509	268	
<u>Fragilaria</u>	<u>capucina</u> ²			2,292						
F.	<u>intermedia</u>	1,167	1,273							
F.	<u>pinnata</u>								268	
<u>Gomphonema</u>	<u>brevistriata</u>							170		
G.	<u>gracile</u>	318	50,926							3,510
G.	<u>lanceolatum</u>	212								1,032
G.	<u>olivaceum</u> ¹	30,662	82,755	67,986				509	4,020	
G.	<u>parvulum</u> ³	8,063	213,889	193,264	6,951	104,080	42,014	4,244	39,133	80,105
<u>Hantzschia</u>	<u>elongata</u>								1,072	413
<u>Melosira</u>	<u>granulata</u> ²						764			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT ASHLAND AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
Melosira	varians						4,583	679	268	
Meridian	circularis	106								
Navicula	accomoda								268	
N.	capitata									206
N.	cryptocephala ³		16,551	764			764	509	536	413
N.	cryptocephala var. veneta ³	106		764		239	764	170		
N.	exigua		2,546	764						
N.	gregaria ³	106	28,009	9,931	76	716		170	1,072	413
N.	incerta								268	
N.	laterostrata								268	
N.	mutica							170		
N.	mutica									
N.	var. cohnii		5,093							
N.	pygmaea						764	509	1,609	
N.	secura					477	1,528	1,188		206
N.	tripunctata						6,875	1,528	3,484	1,239
N.	viridula var. avenacea ²			12,222	76					
Nitzschia	capitellata								268	
N.	communis var. abbreviata ³					239	2,292	12,222	1,608	619
N.	dissipata ²		2,546	1,528						
N.	fonticola ³	2,228	6,366	22,917	1,451	7,161	260,486	17,485	25,999	8,258
N.	frustulum	106					4,583	1,528	268	

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT ASHLAND AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3
<u>Nitzschia</u>	<u>hungarica</u> ¹	212	7,639	3,819		477	764		1,072	206
<u>N.</u>	<u>linearis</u>					239		170	536	206
<u>N.</u>	<u>longissima</u>			764				170	1,072	413
<u>N.</u>	<u>sinuata</u> var. <u>tabellaria</u>					239				
<u>Rhoicosphenia</u>	<u>curvata</u>		1,273		76	1,671		679	20,102	826
<u>Stauroneis</u>	<u>smithii</u>				76					
<u>Stephanodiscus</u>	<u>hantzschii</u> ²			764					268	206
<u>Surirella</u>	<u>angustata</u>	212	1,273							
<u>S.</u>	<u>ovalis</u>	212	5,093						268	413
<u>S.</u>	<u>ovata</u> ³	6,472	165,509	61,111	458	955			268	
<u>Synedra</u>	<u>acus</u> ²	212	3,819	1,528				170		
<u>S.</u>	<u>affinis</u> ¹		6,366	3,819				340	2,680	2,065
<u>S.</u>	<u>amphicephala</u>		1,273							
<u>S.</u>	<u>gaillonii</u>	1,591	6,366	2,292						
<u>S.</u>	<u>nana</u>			764						
<u>S.</u>	<u>pulchella</u>	1,804	2,546	3,056						
<u>S.</u>	<u>ulna</u> ²	212		764						
<u>Thalassiosira</u>	<u>pseudonana</u>				50	477	1,439			
<u>Ankistrodesmus</u>	<u>braunii</u>			150						
<u>A.</u>	<u>falcatus</u> ²									
<u>Characium</u>	<u>ambiguum</u>					283				
<u>C.</u>	<u>hookeri</u>							11,702	124	42
<u>Chlamydomonas</u>	<u>sphagnicola</u>			225						

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-7 (Continued)

PERIPHYTON SPECIES AND DENSITIES (ORG/CM²)
 FOUND AT ASHLAND AVENUE IN THE LITTLE CALUMET RIVER DURING 1983

AII-33

Genus	Species	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/11 to 10/4	10/18 to 11/3
<u>Closterium</u>	<u>lunula</u>						120			
<u>Coelastrum</u>	<u>microporum</u> ²						360	192		
<u>Pediastrum</u>	<u>duplex</u> var. <u>gracilimum</u> ²						240			
<u>Planctonema</u>	<u>lauterbornii</u>					943				
<u>Protoderma</u>	<u>viride</u>				149		839		249	
<u>Scenedesmus</u>	<u>bijuga</u> ²						480			
<u>S.</u>	<u>quadricauda</u>						6,356			
<u>Selenastrum</u>	<u>minutum</u>					283				
<u>Spirogyra</u>	<u>U</u> ₁						7,915			
<u>Stigeoclonium</u>	<u>nanum</u> ¹			150	11,336	5,280	6,236	85,748	871	423
<u>Ulothrix</u>	<u>subtillissima</u>	463								
<u>U.</u>	<u>U</u> ₁		1,409	1,648			4,078			
<u>Anabaena</u>	<u>flos-aquae</u>						480			
<u>Aphanothece</u>	<u>saxicola</u>	116								
<u>Chroococcus</u>	<u>minimus</u>						480			
<u>Lyngbia</u>	<u>limnetica</u> ¹	27,465	48,551	9,588		377	600		13,943	14,477
<u>Oscillatoria</u>	<u>nigra</u>						4,197			
<u>O.</u>	<u>subbrevis</u>	289					15,830	1,151	374	
<u>O.</u>	<u>tenuis</u> ²						10,554			
<u>Euglena</u>	<u>minuta</u>				50				124	
<u>E.</u>	<u>proxima</u> ²	809					360			
<u>Phacus</u>	<u>acuminatus</u>							192		
Total		84,628	697,992	406,694	50,158	128,433	450,148	194,728	149,426	118,640
Nos. Spp.		29	25	29	14	20	36	31	40	27

NS = No Sample ¹Persistent species. ²Pollutant-tolerant species. ³Persistent pollutant-tolerant species.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-8

PERIPHYTON DENSITIES⁺ PER SQUARE CENTIMETER AND NUMBER OF SPECIES⁺⁺
 FOUND IN THORN CREEK AND THE LITTLE CALUMET RIVER
 DURING 1983

Sampling Locations	Dates of Samples - 1983										Average Density	Average Number Species
	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3			
Thorn Creek												
Lincoln Highway	9.26 (26)	NS	3.55 (30)	0.42 (49)	0.10 (34)	1.79 (37)	2.42 (39)	4.82 (31)	0.99 (39)	2.92	(35.6)	
Joe Orr Road	0.45 (20)	0.03 (10)	0.02 (9)	0.08 (23)	1.13 (22)	0.15 (19)	6.64 (32)	0.18 (43)	0.08 (20)	0.97	(22)	
Margaret Street	NS	1.30 (36)	NS	4.18 (39)	NS	6.79 (43)	10.96 (40)	4.27 (41)	3.52 (43)	7.12	(40.3)	
167/170th Street	15.84 (23)	0.51 (31)	11.30 (32)	8.75 (26)	NS	9.18 (46)	3.23 (41)	7.08 (35)	1.38 (46)	8.71	(35)	

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-8 (Continued)

PERIPHYTON DENSITIES⁺ PER SQUARE CENTIMETER AND NUMBER OF SPECIES⁺⁺
 FOUND IN THORN CREEK AND THE LITTLE CALUMET RIVER
 DURING 1983

Sampling Locations	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3	Average Density	Average Number Species
Little Calumet River											
Wentworth Avenue	9.86 (37)	NS	NS	9.05 (23)	1.79 (38)	1.72 (57)	9.83 (33)	NS	1.36 (44)	5.60	(38.7)
159th Street	9.18 (27)	0.84 (28)	0.93 (35)	NS	NS	NS	1.45 (40)	NS	1.22 (51)	2.72	(36.2)
Ashland Avenue	0.85 (29)	6.98 (25)	4.07 (29)	0.50 (14)	1.28 (20)	4.50 (36)	1.95 (31)	1.49 (40)	1.19 (27)	2.53	(27.9)

⁺Clump count x 10⁵ per cm²

⁺⁺Number of species in parentheses.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-9

ORGANIC MATTER⁺, CHLOROPHYLL a⁺⁺, AND AUTOTROPHIC INDEX⁺⁺⁺
 DETERMINED FROM THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Sampling Locations	Consti- tuents	Dates of Samples - 1983										Avg.
		3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3		
Thorn Creek	OM	359		456	47	32	100	192	84	141	176.4	
Lincoln Highway	Chl a	4.14	N.S.	1.54	0.09	0.03	0.16	0.13	0.65	0.07	0.85	
	AI	86.7		296.1	522.2	1066.7	625.0	1476.9	129.2	2014.3	777.1	
Joe Orr Road	OM	43	19	12	9	19	41	252	30	207	70.2	
	Chl a	0.32	0.00	0.01	0.03	0.07	0.03	1.89	0.02	0.00	0.26	
	AI	134.4	N.A.	1200.0	300.0	271.4	1366.7	133.3	1500.0	N.A.	700.8	
Margaret Street	OM		41		165		1478	887	213	371	525.8	
	Chl a	N.S.	0.04	N.S.	1.10	N.S.	0.86	0.82	0.69	0.12	0.61	
	AI		1025.0		150		1718.6	1081.7	308.7	3091.7	1229.3	

Table continued on following page

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-9 (continued)

ORGANIC MATTER⁺, CHLOROPHYLL a⁺⁺, AND AUTOTROPHIC INDEX⁺⁺⁺
 DETERMINED FROM THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Sampling Locations	Constituents	Dates of Samples - 1983									Avg.
		3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3	
Thorn Creek											
167th/170th Street	OM	328	47	332	153		208	243	169	141	202.6
	Chl a	5.61	0.04	6.21	2.45	N.S.	2.75	0.76	2.39	0.23	2.55
	AI	58.5	1175.0	53.5	62.4		75.6	319.7	70.7	613.0	303.6
Little Calumet River											
Wentworth Avenue	OM	3853			822	1169	1013	625		1557	2739.8
	Chl a	1.45	N.S.	N.S.	5.14	1.24	1.37	1.97	N.S.	0.24	1.90
	AI	2657.2			159.9	942.7	739.4	317.3		6487.5	1884.0
159th Street											
159th Street	OM	518	1383	907				443		344	719.0
	Chl a	1.10	1.96	0.66	N.S.	N.S.	N.S.	0.49	N.S.	0.10	0.86
	AI	470.9	705.6	1374.2				904.1		3440.0	1379.0

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-9 (continued)

ORGANIC MATTER⁺, CHLOROPHYLL a⁺⁺, AND AUTOTROPHIC INDEX⁺⁺⁺
 DETERMINED FROM THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Sampling Locations	Constituents	Dates of Samples - 1983									Avg.
		3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 9/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3	
Little Calumet River	OM	48	487	322	19	121	320	105	133	95	183.3
Ashland Avenue	Chl a	0.11	1.78	0.81	0.26	0.31	1.15	0.83	1.66	0.28	0.80
	AI	436.4	273.6	397.5	73.1	390.3	278.3	126.5	80.1	339.3	266.1

+Organic Matter = OM
 ++Chlorophyll a = Chl a
 +++Autotrophic Index = AI

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-10

PERIPHYTON AVERAGE SHANNON-WEAVER SPECIES DIVERSITY INDEX (\bar{d})
CALCULATED FOR THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Sampling Locations	Dates of Samples - 1983									Avg. \bar{x}
	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3	
Thorn Creek	1.5967	1.3955	2.1362	1.8894	1.6683	2.6261	2.6524	2.3329	2.3505	2.9994
Lincoln Highway	1.5815	NS	1.9557	3.0720	2.7556	2.1726	2.6101	1.9972	2.1101	2.6844
Joe Orr Road	1.8385	1.6277	1.9185	2.2255	1.4026	1.7247	2.1119	2.9491	2.0653	2.3591
Margaret Street	NS	1.0718	NS	2.4300	NS	2.0223	1.7236	2.2212	1.8606	2.6312
167th/170th Street	1.3515	1.7632	1.7967	1.1742	NS	2.3597	2.5812	1.8615	2.8445	2.5523
Little Calumet River	1.5855	2.2139	2.0331	1.4892	2.2062	2.3047	1.7239	2.4600	2.3742	2.6151
Wentworth Avenue	0.9513	NS	NS	1.3047	2.4206	2.8141	1.0598	NS	1.9751	1.9619
159th Street	1.3695	2.2492	2.2105	NS	NS	NS	2.1856	NS	2.5200	2.1298
Ashland Avenue	1.8089	2.1298	1.7799	1.2943	0.9098	1.7779	1.9354	2.4600	1.3358	2.6113

NS = No Sample.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AII-11

EQUITABILITIES (e) CALCULATED FOR THORN CREEK AND THE LITTLE CALUMET RIVER DURING 1983

Sampling Locations	Dates of Samples - 1983									Avg. e
	3/1 to 3/15	3/29 to 4/12	4/26 to 5/10	6/1 to 6/14	6/28 to 7/12	7/26 to 8/9	8/23 to 9/8	9/21 to 10/4	10/18 to 11/3	
Thorn Creek	0.096	0.067	0.130	0.066	0.094	0.105	0.117	0.097	0.106	0.069
Lincoln Highway	0.147	NS	0.169	0.242	0.276	0.162	0.219	0.170	0.147	0.090
Joe Orr Road	0.232	0.392	0.548	0.273	0.150	0.223	0.180	0.252	0.277	0.088
Margaret Street	NS	0.070	NS	0.188	NS	0.125	0.106	0.152	0.110	0.085
167th/170th Street	0.145	0.141	0.141	0.106	NS	0.151	0.201	0.135	0.218	0.081
Little Calumet River	0.075	0.164	0.118	0.110	0.131	0.095	0.062	0.188	0.096	0.056
Wentworth Avenue	0.062	NS	NS	0.131	0.192	0.172	0.424	NS	0.117	0.050
159th Street	0.118	0.228	0.177	NS	NS	NS	0.152	NS	0.154	0.069
Ashland Avenue	0.157	0.232	0.153	0.213	0.110	0.123	0.161	0.188	0.115	0.094

NS = No Sample.

APPENDIX III
FISH DATA COLLECTED FROM THORN CREEK AND
THE LITTLE CALUMET RIVER DURING 1983

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Ashland Avenue Little Calumet River Boat Electrofisher, 60 minutes	0.6	8/5	Gizzard shad	7	1.17	12.28	44.03	7.39	0.60
			Central mudminnow	1	0.17	1.75	1.04	0.17	0.01
			Goldfish	3	0.50	5.26	22.47	3.77	0.31
			Carp	12	2.01	21.05	6,833.04	1,146.80	93.74
			Fathead minnow	8	1.34	14.04	8.72	1.46	0.12
			Creek chub	1	0.17	1.75	0.80	0.13	0.01
			Black bullhead	3	0.50	5.26	334.11	56.07	4.58
			Green sunfish	15	2.52	26.32	15.00	2.52	0.21
			Orangespotted sunfish	5	0.84	8.77	21.20	3.56	0.29
			Bluegill	1	0.17	1.75	6.77	1.14	0.09
			Largemouth bass	1	0.17	1.75	1.85	0.31	0.03
			Total				57	9.57	100
Ashland Avenue Little Calumet River Backpack Electrofisher on Boat, 25 minutes	0.6	8/19	Central mudminnow	2	0.79	3.64	4.27	1.69	0.92
			Grass pickerel	1	0.39	1.82	54.56	21.55	11.80
			Goldfish	3	1.18	5.45	39.99	15.80	8.65
			Carp	2	0.79	3.64	53.20	21.01	11.51
			Creek chub	1	0.39	1.82	0.97	0.38	0.21
			Green sunfish	41	16.19	74.55	225.74	89.17	48.83

Table continued on following page .

AIII-2

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Ashland Avenue Little Calumet River Backpack Electrofisher on Boat, 25 minutes	0.6	8/19	Bluegill	3	1.18	5.45	51.85	20.48	11.22
			White crappie	2	0.79	3.64	31.74	12.54	6.87
			Total	55	21.72	100	462.32	182.61	100
Ashland Avenue Little Calumet River Boat Electrofisher 61 minutes	0.6	10/12	Gizzard shad	7	1.15	7.61	85.61	14.04	7.95
			Central mudminnow	20	3.28	21.74	95.40	15.65	8.85
			Goldfish	4	0.66	4.35	503.00	82.50	46.68
			Carp	3	0.49	3.26	156.00	25.59	14.48
			Fathead minnow	1	0.16	1.09	3.57	0.59	0.33
			Channel catfish	1	0.16	1.09	5.47	0.51	0.90
			Brook stickleback	1	0.16	1.09	1.08	0.10	0.18
			Green sunfish	51	8.37	55.43	214.71	19.93	35.22
			Green x bluegill sunfish hybrid	1	0.16	1.09	1.05	0.10	0.17
			Pumpkinseed	1	0.16	1.09	8.33	0.77	1.37
			Bluegill	2	0.33	2.17	3.28	0.30	0.54
			Total	92	15.09	100	1,077.50	100	176.74

Table continued on following page.

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THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Ashland Avenue (Roll Street) Little Calumet River Backpack Electrofisher on Boat, 20 minutes	1.0	8/19	Central mudminnow	1	0.51	16.67	2.08	1.06	16.72
			Fathead minnow	1	0.51	16.67	0.95	0.48	7.64
			Green sunfish	4	2.03	66.67	9.41	4.78	75.64
			Total	6	3.05	100	12.44	6.32	100
159th Street Little Calumet River Backpack Electrofisher on Boat, 54 minutes	8.1	8/12	Gizzard shad	4	0.74	7.69	51.36	9.47	0.63
			Central mudminnow	29	5.35	55.77	64.96	11.98	0.79
			Goldfish	2	0.37	3.85	7.76	1.43	0.09
			Carp	6	1.10	11.54	7,065.94	1,303.28	86.37
			Carp x goldfish hybrid	1	0.18	1.92	948.00	174.85	11.59
			Fathead minnow	3	0.55	5.77	3.57	0.66	0.04
			Green sunfish	5	0.92	9.62	22.05	4.07	0.27
			Orangespotted sunfish	1	0.18	1.92	14.97	2.76	0.18
			Largemouth bass	1	0.18	1.92	2.29	0.42	0.03
Total	52	9.57	100	8,180.90	1,508.93	100			

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Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
159th Street Little Calumet River Backpack Electrofisher on Boat, 85 minutes	8.1	10/28	Gizzard shad	55	6.82	56.70	377.33	46.82	21.17
			Central mudminnow	15	1.86	15.46	57.85	7.18	3.25
			Carp	1	0.12	1.03	62.29	7.73	3.49
			Carp x goldfish hybrid	2	0.25	2.06	629.60	78.11	35.32
			Fathead minnow	1	0.12	1.03	2.19	0.27	0.12
			Black bullhead	2	0.25	2.06	297.62	36.93	16.70
			Green sunfish	12	1.49	12.37	23.75	2.95	1.33
			Orangespotted sunfish	1	0.12	1.03	7.30	0.91	0.41
			Bluegill	4	0.50	4.12	17.91	2.22	1.00
			Largemouth bass	1	0.12	1.03	6.55	0.81	0.37
			White crappie	3	0.37	3.09	300.06	37.23	16.83
			Total	97	12.03	100	1,782.45	221.15	100
159th Street (Mouth of Thorn Creek) Little Calumet River Backpack Electrofisher on Boat, 10 minutes	8.7	10/28	Central mudminnow	2	1.96	22.22	12.01	11.76	41.47
			Mosquitofish	1	0.98	11.11	0.31	0.30	1.07
			Green sunfish	6	5.87	66.67	16.64	16.29	57.46
			Total	9	8.81	100	28.96	28.35	100

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Wentworth Avenue Little Calumet River (IL/IN State Line) Backpack Electrofisher on Boat, 42 minutes	12.9	8/4	Green sunfish	1	0.24	50.00	6.09	1.45	32.85
			Bluegill (picked up dead)	1	0.24	50.00	12.45	2.97	67.15
			Total	2	0.48	100	18.54	4.42	100
Wentworth Avenue Little Calumet River (IL/IN State Line) Backpack Electrofisher on Boat, 31 minutes	12.9	10/20	No fish collected						
167/170th Street Thorn Creek Backpack Electrofisher 30 minutes	9.7	7/27	Central mudminnow	1	0.33	5.88	1.14	0.37	1.48
			Creek chub	2	0.66	11.76	24.72	8.11	32.02
			Black bullhead	1	0.33	5.88	1.17	0.38	1.52
			Green sunfish	9	2.95	52.94	42.39	13.97	54.91
			Bluegill	2	0.66	11.76	5.04	1.65	6.53
			Largemouth bass	2	0.66	11.76	2.74	0.90	3.55
Total	17	5.58	100	77.20	25.34	100			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
167/170th Street Thorn Creek Backpack Electrofisher 32 minutes	9.7	10/7	Gizzard shad	9	2.79	33.33	62.46	19.36	46.64
			Green sunfish	18	5.58	66.67	71.46	22.15	53.36
			Total	27	8.37	100	133.92	41.50	100
Margaret Street Thorn Creek Back Electrofisher 43 minutes (20 minutes with seine)	12.9	7/14	Central mudminnow	2	0.46	4.00	9.24	2.13	5.71
			Fathead minnow	12	2.76	24.00	4.32	0.99	2.67
			Creek chub	5	1.15	10.00	6.55	1.51	4.05
			Green sunfish	29	6.68	58.00	126.44	29.11	78.11
			Black crappie	2	0.46	4.00	15.32	3.53	9.46
Total	50	11.51	100	161.87	37.27	100			
Margaret Street Thorn Creek Backpack Electrofisher, 49 minutes, plus 2 seine hauls, 48 meters	12.9	10/14	Gizzard shad	2	0.41	1.57	11.42	2.33	2.37
			Fathead minnow	3	0.61	2.36	4.59	0.94	0.95
			Creek chub	11	2.24	8.66	24.42	4.98	5.06
			Green sunfish	103	20.98	81.10	430.54	87.72	89.20
			Bluegill	8	1.63	6.30	11.68	2.38	2.42
Total	127	25.87	100	482.65	186.05	100			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Joe Orr Road Thorn Creek Backpack Electrofisher, 22 minutes, plus seine	18.6	7/28	Fathead minnow	30	13.50	44.12	49.20	22.15	16.50
			Creek chub	1	0.45	1.47	5.34	2.40	1.79
			Green sunfish	28	12.60	41.18	227.08	102.21	76.13
			Largemouth bass	9	4.05	13.24	16.65	7.49	5.58
			Total	68	30.61	100	298.27	134.26	100
Joe Orr Road Thorn Creek Backpack electrofisher 44 minutes, plus one seine haul, 20 meters	18.6	10/26	Gizzard shad	2	0.46	6.67	19.82	4.52	7.15
			Fathead minnow	6	1.37	20.00	13.74	3.13	4.96
			Creek chub	7	1.60	23.33	96.25	21.95	34.71
			Green sunfish	15	3.42	50.00	147.45	33.63	53.18
Total	30	6.84	100	277.26	63.23	100			
Route 30 Thorn Creek Backpack Electrofisher 36 minutes, plus one seine haul, 10 meters	21.4	7/2	Goldfish	1	0.28	1.92	8.74	2.45	1.83
			Fathead minnow	8	2.24	15.38	18.56	5.19	3.88
			Creek chub	11	3.08	21.15	156.86	43.90	32.83
			White sucker	1	0.28	1.92	1.04	0.29	0.22
			Green sunfish	29	8.12	55.77	287.97	80.59	60.27

Table continued on following page .

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

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Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Route 30 Thorn Creek Backpack electrofisher 36 minutes, plus one seine haul, 10 meters	21.4	7/2	Green x warmouth						
			sunfish hybrid	1	0.28	1.92	3.91	1.09	0.82
			Largemouth bass	1	0.28	1.92	0.73	0.20	0.15
			Total	52	14.55	100	477.81	133.72	100
Route 30 Thorn Creek Backpack electrofisher, 66 minutes plus 3 seine hauls, 31 meters	21.4	10/5	Gizzard shad	5	0.76	4.50	35.35	5.39	6.96
			Fathead minnow	11	1.68	9.91	26.95	4.11	5.31
			Creek chub	29	4.42	26.13	163.56	24.94	32.21
			Green sunfish	65	9.91	58.56	280.15	42.72	55.17
			Bluegill	1	0.15	0.90	1.81	0.05	0.36
Total	111	16.93	100	507.82	77.21	100			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Cottage Grove Avenue North Creek Backpack Electrofisher followed by 15 ft. seine, 30 minutes	14.4	6/23	Fathead minnow	4	1.33	50.00	6.40	2.13	16.53
			Creek chub	4	1.33	50.00	32.32	10.76	83.47
			Total	8	2.66	100	38.72	12.89	100
135th Street Tinley Creek (Tributary to Cal-Sag Channel) Backpack Electrofisher 31 minutes, plus seine hauls through each of 3 pools	1.8	6/24	Central mudminnow	6	1.93	3.02	28.38	9.11	2.82
			Central stoneroller	22	7.06	11.06	78.32	25.14	7.78
			Hornyhead chub	1	0.32	0.50	78.00	25.04	7.75
			Bluntnose minnow	2	0.64	1.01	1.98	0.64	0.20
			Fathead minnow	8	2.57	4.02	16.96	5.44	1.68
			Creek chub	76	24.40	38.19	358.72	115.16	35.64
			White sucker	1	0.32	0.50	0.21	0.07	0.02
			Green sunfish	83	26.65	41.71	444.05	142.55	44.11
Total	199	63.88	100	1,006.62	323.15	100			

Table continued on following page.

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THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-1 (Continued)

ELECTROFISHING RESULTS (TOTAL NUMBERS AND WEIGHTS, PERCENTAGES AND CATCH PER 10 MINUTES) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name and Gear Used	River Mile	Date	Species Name	Number of Fish	Number per 10 Minutes	% Total Number	Total Weight (grams)	Weight (grams) Per 10 Minutes	% Total Weight
Halsted Street Little Calumet River Boat Electrofisher 69 Minutes	320.1	10/19	Gizzard shad	4	0.58	36.36	20.04	2.89	0.21
			Chinook salmon*	1*	-	-	1,814.40*	-	-
			Carp	6	0.86	54.55	9,400.50	1,353.56	99.74
			Carp x goldfish	1	0.14	9.09	4.58	0.66	0.05
Total				11	1.58	100	9,425.12	1,357.11	100
Lake Calumet 115th Street Boat Electrofisher 62 Minutes		10/6	Gizzard shad	82	13.15	12.77	900.36	144.37	2.45
			Rainbow trout**	1**	-	-	-	-	-
			Goldfish	8	1.28	1.25	756.64	121.32	2.06
			Carp	18	2.89	2.80	30,206.16	4,843.32	82.12
			Golden shiner	8	1.28	1.25	75.92	12.17	0.21
			Bluntnose minnow	165	26.45	25.75	399.30	64.02	1.09
			Fathead minnow	1	0.16	0.16	3.02	0.48	0.01
			Black bullhead	3	0.48	0.47	45.81	7.35	0.12
			Green sunfish	61	9.78	9.50	355.02	56.92	0.97
Pumpkinseed	70	11.22	10.90	812.70	130.31	2.21			

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
Ashland Avenue Little Calumet River	0.6	8/5	Gizzard shad	7	82	71	96	6.29	2.84	10.46
			Central mudminnow	1	41	41	41	1.04	1.04	1.04
			Goldfish	3	71	61	78	7.49	4.11	9.79
			Carp	12	296	80	514	569.42	8.57	1,950.48
			Fathead minnow	8	46	39	59	1.09	0.61	2.19
			Creek chub	1	40	40	40	0.80	0.80	0.80
			Black bullhead	3	193	172	209	111.37	84.83	141.57
			Green sunfish	15	34	22	60	1.00	0.17	4.70
			Orangespotted sunfish	5	53	30	72	4.24	0.37	8.71
			Bluegill	1	70	70	70	6.77	6.77	6.77
			Largemouth bass	1	52	52	52	1.85	1.85	1.85
			Ashland Avenue Little Calumet River	0.6	8/19	Central mudminnow	2	52	47	57
Grass pickerel	1	191				191	191	54.56	54.56	54.56
Goldfish	3	87				79	95	13.33	8.90	17.57
Carp	2	109				82	136	26.60	11.90	41.30
Creek chub	1	43				43	43	0.97	0.97	0.97
Green sunfish	41	49				21	142	5.51	0.17	66.28
Bluegill	3	74				25	123	17.28	0.21	44.75
White crappie	2	118				118	118	15.87	15.61	16.13

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
Ashland Avenue Little Calumet River	0.6	10/12	Gizzard shad	7	101	73	122	12.23	3.23	24.00
			Central mudminnow	20	70	60	81	4.77	2.77	7.76
			Goldfish	4	185	173	196	125.75	101.00	151.00
			Carp	3	150	140	165	52.00	42.00	68.00
			Fathead minnow	1	68	68	68	3.57	3.57	3.57
			Channel catfish	1	91	91	91	5.47	5.47	5.47
			Brook stickleback	1	48	48	48	1.08	1.08	1.08
			Green sunfish	51	56	41	101	4.21	1.29	22.22
			Green x bluegill sunfish hybrid	1	39	39	39	1.05	1.05	1.05
			Pumpkinseed	1	74	74	74	8.33	8.33	8.33
			Bluegill	2	44	34	54	1.64	0.57	2.70
Ashland Avenue (Roll Street) Little Calumet River	1.0	8/19	Central mudminnow	1	53	53	53	2.08	2.08	2.08
			Fathead minnow	1	45	45	45	0.95	0.95	0.95
			Green sunfish	4	44	31	68	2.35	0.58	6.50

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

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Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
159th Street Little Calumet River	8.1	8/12	Gizzard shad	4	104	98	113	12.84	10.27	17.43
			Central mudminnow	29	51	38	101	2.24	0.76	12.47
			Goldfish	2	61	56	65	3.88	2.84	4.91
			Carp	6	399	187	487	2,646.98	126.99	1,723.68
			Carp x goldfish hybrid	1	378	378	378	948.00	948.00	948.00
			Fathead minnow	3	46	37	52	1.19	0.47	1.79
			Green sunfish	5	54	34	86	4.41	0.75	13.11
			Orangespotted sunfish	1	84	84	84	14.97	14.97	14.97
			Largemouth bass	1	53	53	53	2.29	2.29	2.29
			159th Street Little Calumet River	8.1	10/28	Gizzard shad	55	88	76	101
Central mudminnow	15	66				49	75	3.86	1.31	5.20
Carp	1	149				149	149	62.29	62.29	62.29
Carp x goldfish hybrid	2	226				132	320	314.80	44.68	584.92
Fathead minnow	1	61				61	61	2.19	2.19	2.19
Black bullhead	2	206				196	216	148.81	123.07	174.55
Green sunfish	12	46				31	57	1.98	0.65	3.82
Orangespotted sunfish	1	75				75	75	7.30	7.30	7.30
Bluegill	4	60				40	85	4.48	0.97	11.00
Largemouth bass	1	78				78	78	6.55	6.55	6.55
White crappie	3	190				158	216	100.02	51.00	144.14

Table continued on following page .

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
159th Street (Mouth of Thorn Creek)	8.7	10/28	Central mudminnow	2	77.00	67	87	6.01	3.87	8.14
			Mosquitofish	1	30.00	30	30	0.31	0.31	0.31
			Green sunfish	6	48.83	39	77	2.77	1.19	8.69
Wentworth Avenue (IL/IN State Line) Little Calumet River	12.9	8/4	Green sunfish	1	64	64	64	6.09	6.09	6.09
			Bluegill (picked up dead)	1	85	85	85	12.45	12.45	12.45
Wentworth Avenue (IL/IN State Line) Little Calumet River	12.9	10/20	No fish collected in 30 minutes 49 seconds of stream sampling							

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
167/170th Street Thorn Creek	9.7	7/27	Central mudminnow	1	46	46	46	1.14	1.14	1.14
			Creek chub	2	99	95	103	12.36	10.74	13.98
			Black bullhead	1	43	43	43	1.17	1.17	1.17
			Green sunfish	9	56	22	92	4.71	0.19	17.67
			Bluegill	2	47	27	66	2.52	0.28	4.75
			Largemouth bass	2	47	40	53	1.37	0.86	1.88
167/170th Street Thorn Creek	9.7	10/7	Gizzard shad	9	85	79	91	6.94	4.83	8.84
			Green sunfish	18	53	32	84	3.97	0.65	12.99
Margaret Street Thorn Creek	12.9	7/14	Central mudminnow	2	66	47	84	4.62	1.40	7.84
			Fathead minnow	12	33	22	38	0.36	0.08	0.57
			Creek chub	5	37	23	76	1.31	0.11	5.68
			Green sunfish	29	54	40	100	4.36	1.01	25.39
			Black crappie	2	86	81	90	7.66	6.10	9.21

Table continued on following page.

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THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
Margaret Street Thorn Creek	12.9	10/14	Gizzard shad	2	84	79	89	5.71	5.42	6.00
			Fathead minnow	3	51	45	58	1.53	1.04	2.14
			Creek chub	11	58	43	71	2.22	1.00	3.92
			Green sunfish	103	56	36	120	4.18	0.85	31.13
			Bluegill	8	46	41	50	1.46	0.93	1.97
Joe Orr Road Thorn Creek	18.6	7/28	Fathead minnow	30	49	38	59	1.64	0.64	2.85
			Creek chub	1	75	75	75	5.34	5.34	5.34
			Green sunfish	28	67	50	107	8.11	2.56	31.25
			Largemouth bass	9	48	41	59	1.85	1.09	3.45
Joe Orr Road Thorn Creek	18.6	10/26	Gizzard shad	2	103	96	109	9.91	8.32	11.49
			Fathead minnow	6	58	53	64	2.29	1.58	3.40
			Creek chub	7	94	52	132	13.76	1.43	28.60
			Green sunfish	15	75	54	117	9.83	3.07	37.69

Table continued on following page.

THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO

TABLE AIII-2 (Continued)

MEAN, MINIMUM AND MAXIMUM TOTAL LENGTH (TL) AND WEIGHT (WT) FOR FISH COLLECTED FROM THE LITTLE CALUMET RIVER AND THORN CREEK DURING 1983

Station Name	River Mile	Date	Species Name	Number of Fish	Mean TL (mm)	Min. TL (mm)	Max. TL (mm)	Mean WT (g)	Min. WT (g)	Max. WT (g)
Cottage Grove Avenue North Creek	14.4	6/23	Fathead minnow	4	49	40	56	1.60	0.68	2.35
			Creek chub	4	85	67	94	8.08	3.83	10.36
135th Street Tinley Creek	1.8	6/24	Central mudminnow	6	68	56	81	4.73	2.70	7.62
			Central stoneroller	22	66	47	104	3.56	1.14	12.00
			Hornyhead chub	1	187	187	187	78.00	78.00	78.00
			Bluntnose minnow	2	46	45	46	0.99	0.91	1.07
			Fathead minnow	8	50	39	93	2.12	0.62	10.21
			Creek chub	76	66	43	144	4.72	0.85	32.88
			White sucker	1	31	31	31	0.21	0.21	0.21
Green sunfish	83	60	42	120	5.35	1.34	43.00			
Halsted Street	320.1	10/19	Gizzard shad	4	80	77	84	5.01	4.13	5.83
			Chinook salmon	1	611	611	611	1,814.40	1,814.40	1,814.40
			Carp	6	451	343	515	1,566.75	578.00	2,313.36
			Carp x goldfish	1	64	64	64	4.58	4.58	4.58

Table continued on following page.