

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

**RESEARCH AND DEVELOPMENT
DEPARTMENT**

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***BIOLOGICAL WATER QUALITY WITHIN THE
CALUMET WATERWAY SYSTEM***

DURING 1989

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DISCLAIMER

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

EXECUTIVE SUMMARY

The deep draft portion of the Calumet River System, which includes the Calumet River, the Little Calumet River, and the Cal-Sag Channel, was studied during 1989. The study was designed to determine the water quality within the system by examining populations of the indigenous biota, including selected bacterial indicators, benthic invertebrates, fish, and periphyton. A summary of the major results of the biological samplings are shown in Figure 1.

Calumet River Water Quality

BACTERIA

The sanitary water quality of the Calumet River was relatively good. Total coliform (TC) and fecal coliform (FC) bacteria counts were less than in the Little Calumet River or Cal-Sag Channel (Figure 1). Except for a sample at Ewing Avenue collected on May 1, 1989, with a FC density of 560 colony forming units (cfu) per 100 mL, the samples taken from Ewing Avenue and 130th Street for bacterial analysis during 1989 had a FC density less than the General Use Water Quality Standard of 400 cfu/100 mL.

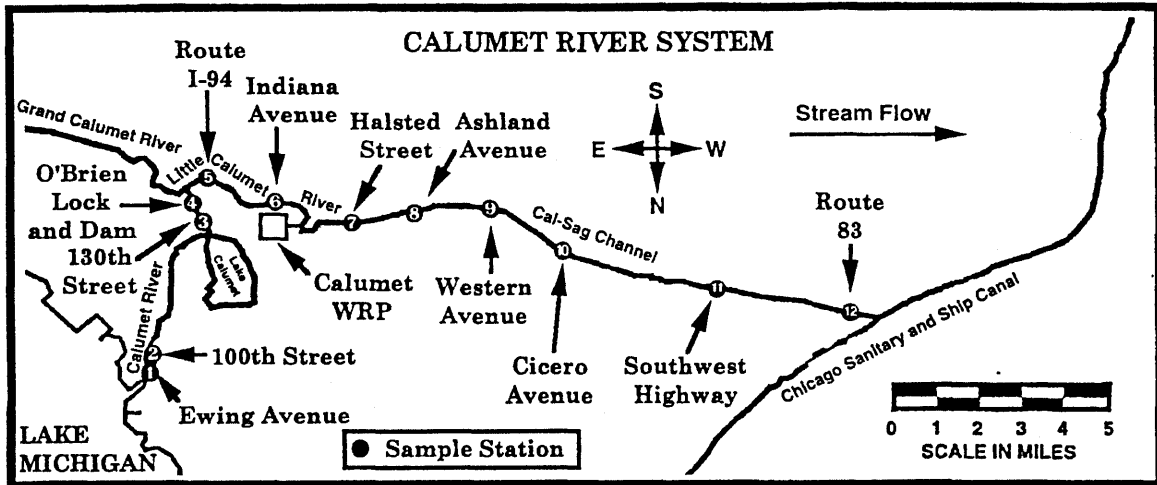
BENTHIC INVERTEBRATES

Fifty-six benthic taxa were identified from the 100th Street and 130th Street stations, with an overall estimated mean faunal density of 14,016 organisms per square centimeter.

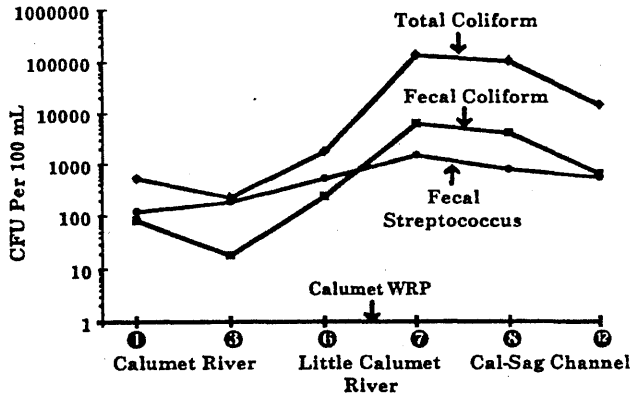
METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO

FIGURE 1

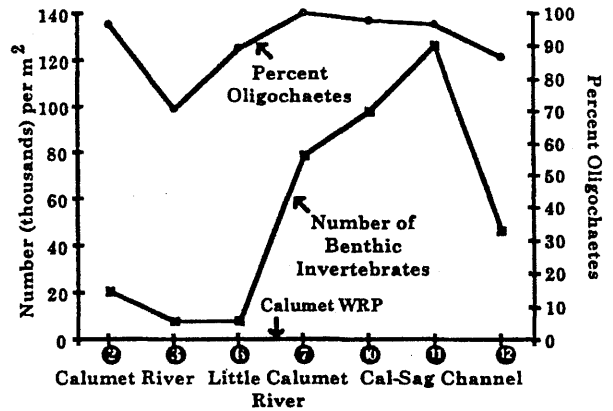
SUMMARY OF BIOLOGICAL SAMPLING RESULTS FROM THE ECOSYSTEMATIC STUDY OF THE CALUMET RIVER SYSTEM DURING 1989



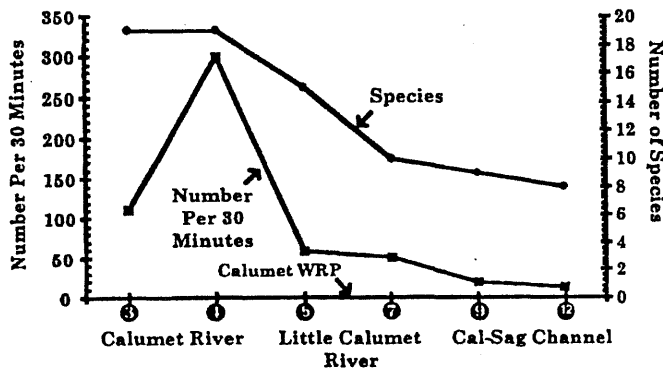
Bacteria



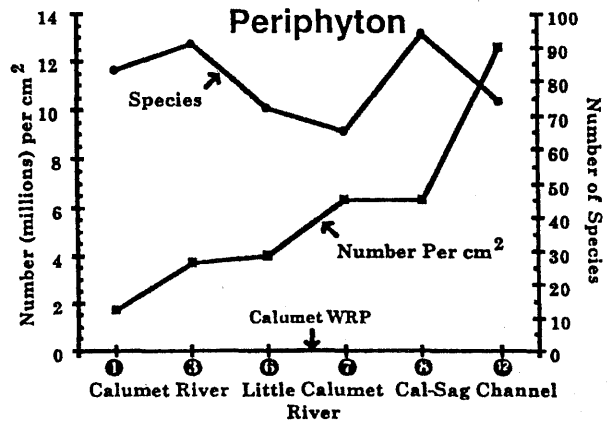
Benthic Invertebrates



Fish



Periphyton



Overall, the benthic community was dominated by the oligochaetes, including the tubificid and naidid worms (1).

The mean number of benthic invertebrates in the Calumet River was higher at 100th Street (20,271 organisms/m²) than at 130th Street (7,795 organisms/m²), as shown in Figure 1. There was evidently an area of organic enrichment of the sediment at the 100th Street station in which the percent oligochaete worms was greater than 90% of the total benthic invertebrate density. The sediment quality of the Calumet River at 130th Street was better, with 71% of the total benthic community made up of oligochaetes.

FISH

More fish and fish species were collected in the Calumet River than in the Little Calumet River or in the Cal-Sag Channel (Figure 1). Relative abundance of fish was 111 fish and 300 fish per 30 minutes, with 19 and 20 fish species, at the 130th Street and O'Brien Lock and Dam sample stations, respectively. The total catch in the Calumet River was 1,736 fish composed of 23 species. The total weight of the catch was 264 kilograms (581 pounds). The major species, by number, was the alewife and the major species, by weight, was the carp. Harvestable size fish included bluegill, carp, channel catfish, freshwater drum, largemouth bass, white bass, white sucker, and yellow bass. In 1989, the Calumet River was a

moderate aquatic resource with fair stream quality for fish (2).

PERIPHYTON

The periphyton results also indicated water of good quality and low in nutrient enrichment. The greatest numbers of periphyton species occurred in the Calumet River, as well as the smallest numbers of total periphyton (Figure 1).

Little Calumet River Water Quality

BACTERIA

The Little Calumet River, from its junction with the Grand Calumet River to the Cal-Sag Channel, is a designated secondary contact water and has no bacterial water quality standard.

Compared with the 130th Street station on the Calumet River, the geometric means of the TC and FC densities increased significantly at Indiana Avenue on the Little Calumet River (Figure 1). The TC density increased from 220 cfu/100 mL to 1,800 cfu/mL, an 8-fold increase. The FC density increased from 18 cfu/100 mL to 230 cfu/100 mL, a 13-fold increase. These increases in TC and FC densities upstream of the Calumet WRP at Indiana Avenue suggest a discharge of wastewater upstream of the Calumet WRP outfall. This wastewater could have come from a WRP in Indiana discharging to the Grand Calumet River, which joins the Little Calumet River

upstream of the Calumet WRP discharge, or from combined sewer overflows.

Compared with the Indiana Avenue station, the geometric means of the TC and FC densities increased significantly at Halsted Street. The TC density increased from 1,800 cfu/100 mL to 130,000 cfu/100 mL, a 72-fold increase. The FC density increased from 230 cfu/100 mL to 6,200 cfu/100 mL, a 27-fold increase. These increases in TC and FC densities below the discharge of the Calumet WRP at Halsted Street reflect the input of treated, unchlorinated, wastewater to the Little Calumet River by the Calumet WRP.

BENTHIC INVERTEBRATES

Twenty-seven species of benthic invertebrates were collected from the Indiana Avenue and Halsted Street stations in the Little Calumet River. The overall mean abundance was 43,270 organisms per square meter (1). The benthic invertebrate results indicated degraded water quality below the Calumet WRP outfall. The mean number of benthic invertebrates increased in the Little Calumet River, at the Indiana Avenue station (7,900 organisms/m²) and at the Halsted Street station (78,639 organisms/m²), as shown in Figure 1.

FISH

In comparison with the Calumet River, the number of fish and fish species decreased in the Little Calumet River, as

shown in Figure 1. Relative abundance was 60 and 51 fish per 30 minutes, with 15 and 10 fish species, at the Indiana Avenue and Halsted Street sample stations, respectively. The total catch in the Little Calumet River was 678 fish composed of 15 fish species. The total weight of the catch was 121 kilograms (266 pounds). The major species, by number, was the gizzard shad, and the major species, by weight, was the carp. Harvestable size fish included black bullhead, bluegill, carp and largemouth bass. In 1989, the Little Calumet River was a limited aquatic resource with poor stream quality for fish (2).

PERIPHYTON

The periphyton results also indicated degraded water quality both above and below the Calumet WRP discharge. The number of periphyton species decreased while the total number of periphyton increased (Figure 1), indicating nutrient enrichment.

Cal-Sag Channel Water Quality

BACTERIA

The TC and FC counts at the Route 83 station, 17 miles downstream of the Calumet WRP discharge, were of the same order of magnitude as the values for these bacterial groups upstream of the Calumet WRP. The values at Route 83 had decreased from the relatively high numbers at the Halsted Street and Ashland Avenue stations, indicating that a natural reduction in numbers of bacteria had occurred by the time the

water reached the Route 83 station in the Cal-Sag Channel. This corroborated the conclusion of Haas et al. (14) that receiving water bacterial concentrations immediately downstream of a WRP showed a transient increase after the cessation of wastewater effluent chlorination, but that beyond 15 miles from the WRP discharge no additional effect upon the microbial water quality could be observed.

BENTHIC INVERTEBRATES

A total of 28 benthic taxa was collected from the Western Avenue, Southwest Highway, and Route 83 stations. The estimated overall mean faunal density was 89,909 organisms/m² (1). The benthic invertebrate population was composed of almost 100% oligochaete worms at each Cal-Sag Channel station, indicating degraded sediment quality throughout the length of the Cal-Sag Channel. In the Cal-Sag Channel the mean number of benthic invertebrates at the Western Avenue station was 97,664 organisms/m², 126,006 organisms/m² at the Southwest Highway station, and 45,993 organisms/m² at the Route 83 station (Figure 1).

FISH

The number of fish and fish species were lower in the Cal-Sag Channel than in the other waterways (Figure 1). Relative abundance was 19 and 13 fish per 30 minutes, with 9 and 8 fish species, at the 130th Street and O'Brien Lock and Dam

sample stations, respectively. Sixty-four percent of the fish collected were pollution tolerant carp, goldfish, and carp x goldfish hybrids. The Cal-Sag Channel total catch was 159 fish composed of 11 species. The total weight of the catch was 50 kilograms (110 pounds). The major species by number and weight was the carp. Harvestable size fish included carp and largemouth bass. In 1989, the Cal-Sag Channel was a limited aquatic resource, with poor stream quality for fish (2).

PERIPHYTON

The increase in total numbers of periphyton (Figure 1) also indicated nutrient enrichment, indicating degraded water quality, in the Cal-Sag Channel.