Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

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AMBIENT WATER QUALITY MONITORING IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS: A SUMMARY OF BIOLOGICAL, HABITAT, AND SEDIMENT QUALITY DURING 2007

April 2011

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, Illinois 60611-2803 312-751-5600

AMBIENT WATER QUALITY MONITORING IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS: A SUMMARY OF BIOLOGICAL, HABITAT, AND SEDIMENT QUALITY DURING 2007

By

Dustin Gallagher
Associate Aquatic Biologist

Justin Vick
Associate Aquatic Biologist

Thomas Minarik, Jr.
Senior Aquatic Biologist

Jennifer Wasik
Supervising Aquatic Biologist

Monitoring and Research Department
Thomas C. Granato, Ph.D., Acting Director

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

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DISCLAIMER

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

SUMMARY AND CONCLUSIONS

During 2007, biological and habitat monitoring focused on the Calumet River System, as well as the 15 annual Ambient Water Quality Monitoring (AWQM) Program stations located throughout the Chicago, Calumet, and Des Plaines River Systems, for a total of 25 monitoring stations. Sediment chemistry and toxicity analyses were also performed on samples from the southern Chicago River System. Chlorophyll samples were collected at each of the 59 AWQM stations monthly.

Chlorophyll

Chlorophyll *a* concentrations decreased directly downstream of water treatment plants due to dilution of the waterway with effluent. In the Chicago River System, chlorophyll *a* means ranged from 1 µg/L (Touhy Avenue and Foster Avenue, North Shore Channel) to 18 µg/L at Frontage Road on the Skokie River. The maximum recorded chlorophyll *a* concentration in the Chicago River System during 2007 was at Oakton Street on the North Shore Channel (102 µg/L).

Mean chlorophyll *a* values in the Calumet River System ranged from 1 µg/L (Ewing Avenue, Calumet River) to 101 µg/L (Burnham Avenue, Grand Calumet River). The maximum concentration measured was 691 µg/L at Burnham Avenue on the Grand Calumet River.

The range of mean chlorophyll *a* concentrations in the Des Plaines River System was 4 µg/L (Wille Road, Higgins Creek) to 39 µg/L (Higgins Road, Salt Creek). The maximum concentration measured in this system was 85 µg/L at Higgins Road on Salt Creek.

Habitat

Habitat is a major limiting factor for aquatic life in the Calumet River System since it is predominantly man-made or man-altered. The Calumet River System consists largely of deep, wide, and channelized waterways with low sinuosity but also contains some wadeable streams and shallow portions of deep-draft waterways. The riparian land use is predominantly urban, industrial, and commercial with minimal canopy cover. Man-made structures are prevalent throughout the system and contribute some instream cover for fish. The presence of fine sediment deposits and the lack of heterogeneous substrate in this system provides inadequate habitat for a balanced benthic invertebrate community.

Fish

Forty-six species of fish, including 21 game fish species, were collected from 25 monitoring stations during 2007. The most abundant species in the catch from the deep-draft waterways of the Chicago and Calumet River Systems included gizzard shad, common carp, and pumpkinseed. Fathead minnow, green sunfish, and spotfin shiners were the most abundant species in the wadeable sites in the Des Plaines and Calumet River Systems. In general, all three waterways would be considered fair in terms of their biological integrity as measured by the Index of Biotic Integrity (IBI).

Benthic Invertebrates

Benthic invertebrates were collected from side and center locations using two methods at 25 AWQM stations during 2007. Total species richness for ponar and Hester Dendy samplers combined was 117 species, while total Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness was 19 species (EPT taxa are considered relatively sensitive to pollution). Comprehensive benthic invertebrate data from 2007 is catalogued in a separate report at mwrd.org (MWRD 2006-2008 Chicago Waterways Benthic Report).

Sediment Chemistry

During 2007, sediment samples were collected from the side and center of the waterway at 12 stations and only from the side at one station. Sediment samples were analyzed for eight general chemistry constituents, 11 trace metals, and a total of 111 total organic priority pollutants. In addition, a contracted laboratory performed acid volatile sulfide/simultaneously extracted metals (AVS/SEM) analysis, particle size determinations, and total organic carbon analysis.

Sediment Toxicity

Ten-day *Chironomus tentans* toxicity testing was performed using sediment from side and center locations at 12 stations and only from the side at one station. Nine out of the 25 samples elicited a percent survival rate that was significantly less than the control sites, indicating that the sediment was unsuitable for *Chironomus* survival. Eleven additional locations showed ash-free dried weights that were significantly less than control sites, indicating that these sediments were unsuitable for optimal *Chironomus* growth.

INTRODUCTION

The Metropolitan Water Reclamation District of Greater Chicago (District) began monitoring the biological component of the AWQM Program at 59 sampling stations on 21 waterways in 2001. While water samples were collected monthly at these stations to assess water quality, this report focuses on the biological, habitat, and sediment quality during 2007. The biological monitoring portion of the AWQM Program operates on a four-year cycle, with a primary focus each year on a different river system in the Chicago area. Fifteen of the 59 stations located across all of the waterways are monitored annually based on their proximity to District water reclamation plants (WRPs) or municipal boundaries. During 2007, biological monitoring focused on the Calumet River System, including the Calumet River, Little Calumet River (LCR), Calumet-Sag Channel (CSC), Grand Calumet River (GCR), Thorn Creek and the Wolf Lake Outlet.

Characterization of physical habitat, fish, and benthic invertebrate populations, along with sediment toxicity and chemistry, are among the most crucial components for a comprehensive evaluation of a waterway. Each parameter represents a piece of the overall picture that is necessary to identify problem areas, make regulatory decisions, and determine plausible, attainable uses for a waterway.

In addition to analyzing the AWQM Program data in order to assess and manage the impact of the District's WRPs, our data are often shared with other government agencies, non-governmental organizations, and academic institutions. For instance, the AWQM Program data are shared with the Illinois Environmental Protection Agency (IEPA) to support their efforts to make regulatory decisions, prepare the 305 (b) report in accordance with the Clean Water Act, and perform Use Attainability Analyses.

DESCRIPTION OF THE STUDY AREA

Chicago, Calumet, and Des Plaines River Systems

The Chicago area waterways consist of man-made canals as well as natural streams which have been altered to varying degrees. Some natural waterways have been modified by being deepened, straightened, and/or widened to such an extent that reversion to their natural state would be impossible. The waterways serve the Chicago area by draining urban storm water runoff and allowing commercial navigation in the deep-draft portions. The waterways are also the receiving stream for treated municipal wastewater effluent.

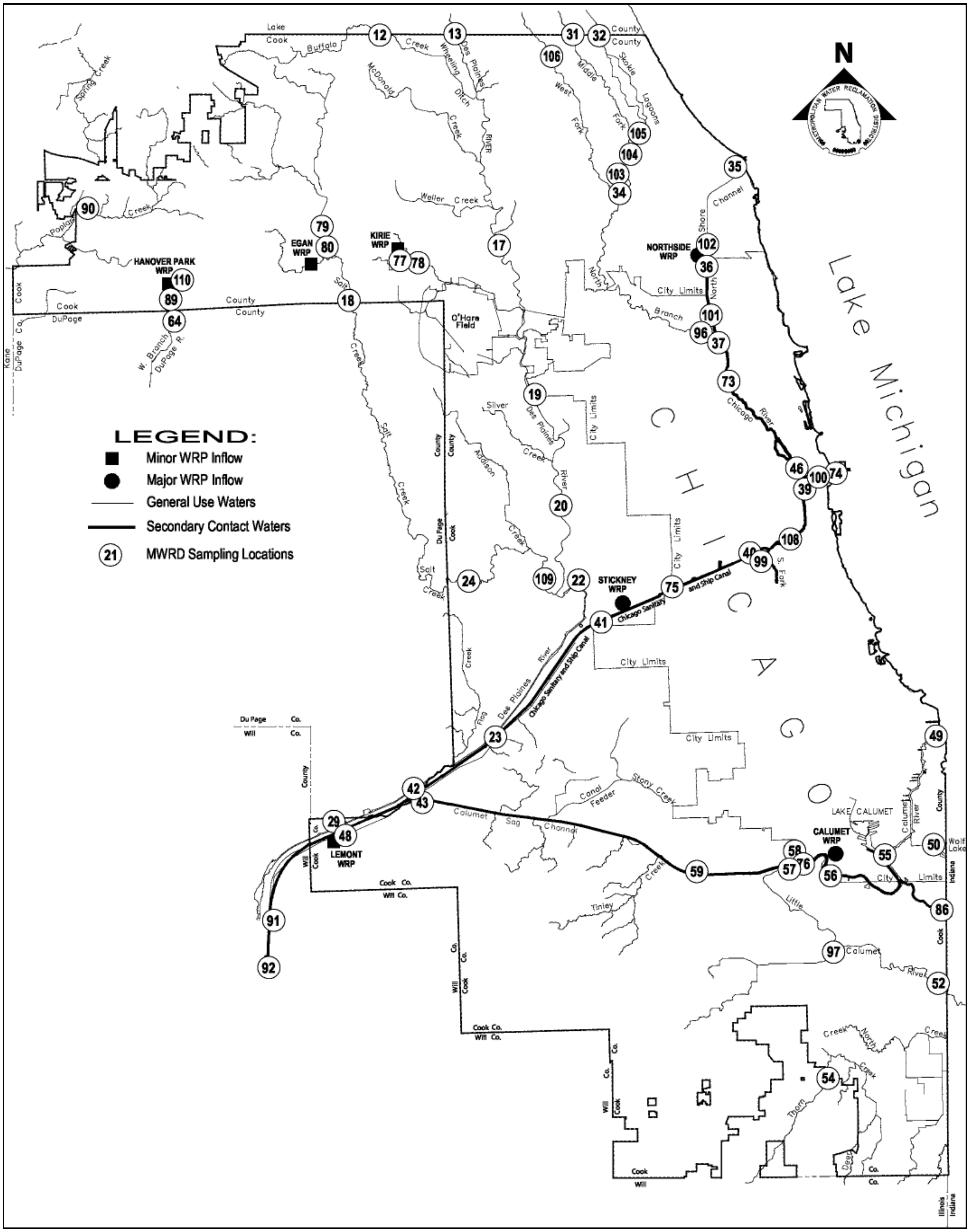
The primary man-made waterways are the Chicago River System, including the North Shore Channel (NSC), connecting Lake Michigan at Wilmette to the North Branch Chicago River (NBCR); the Chicago Sanitary and Ship Canal (CSSC), extending from Damen Avenue to the Lockport Powerhouse; and the CSC, connecting the LCR with the CSSC. The primary natural waterways include the wadeable branches of the NBCR, flowing south from Lake County into the NSC and continuing as the deep-draft portion of the NBCR, which joins the Chicago River and becomes the South Branch Chicago River (SBCR); the Des Plaines River System, flowing south from Lake County and joining with the discharge from the CSSC downstream of the Lockport Powerhouse; and the Calumet River System, which flows south and west into the CSSC.

Sampling Stations

The sampling stations for the AWQM Program are located on natural and man-made waterways throughout the District's service area. A map of the Chicago area waterways, including the 59 sampling stations and the District's WRPs, is shown in Figure 1. Stations were primarily selected such that there was at least one monitoring station on the lower end of an IEPA 303 (d) impaired waterway segment. Secondary criteria for selecting sampling locations included: (1) above and below District WRPs, (2) below Lake Michigan diversion points, (3) above junction of two major waterways, (4) below county municipal boundaries, and (5) in areas of environmental concern. Fifteen of the 59 stations were chosen for annual biological monitoring.

In addition to the 15 annual stations, biological sampling was focused in the Calumet River System during 2007, including the Calumet River, LCR, GCR, CSC, Thorn Creek, and the Wolf Lake Outlet.

FIGURE 1: AMBIENT WATER QUALITY MONITORING PROGRAM
SAMPLE STATIONS



MATERIALS AND METHODS

Chlorophyll

Water samples for chlorophyll analysis were collected monthly at each AWQM station along with the water samples for various chemical analyses.

Sample Collection. Surface water grab samples for chlorophyll analysis were collected using a stainless steel bucket. The bucket was lowered into the waterway generally from the upstream side of the bridge at the most central location. The bucket was submerged, filled, and then raised to the top of the bridge. An aliquot was poured into an amber, plastic one-liter sample bottle containing 1 mg magnesium carbonate as preservative, and a one-half inch airspace was left at the top of the bottle. Samples were then placed in a cooler with ice and returned to the lab for processing.

Laboratory Analysis. *Filtration.* Prior to filtering samples, water was mixed by rapidly inverting sample bottles 25 times before the first pour. Samples were filtered through Whatman type GF/F glass-fiber filters (0.7 micrometers) using Millipore filtration equipment and vacuum pressure. Water samples were filtered until the rate of flow decreased but before it became clogged. Following filtration, sample filters were folded and wrapped with aluminum foil and extracted the following day.

Extraction. Filters were placed in glass extraction tubes with 5 mL of 90 percent aqueous acetone solution. Using a motorized tissue grinder set at 500 rpm and a pestle, the top layer of the filter was separated. Samples were then transferred to centrifuge tubes, and additional acetone was added until the total volume equaled 10 mL. These tubes were inverted five times and then placed at 4°C for approximately 24 hours to steep.

Spectrophotometric Analysis. After removing samples from refrigeration, they were centrifuged for 20 minutes at 2,500 rpm. Three mL of the supernatant was transferred into a spectrophotometric cell, and the absorbance read at 750, 664, 647, and 630 nm. To correct for the degradation product, pheophyton, 0.1 mL of 1 percent hydrochloric acid was added, and after one minute, absorbance was read again at 750 and 665 nm. The spectrophotometer was programmed to calculate corrected chlorophyll *a, b,* and *c* values based on the volumes filtered and used to extract samples.

Quality Control. A reagent blank of 90 percent acetone was placed in the spectrophotometer every tenth sample and read between -0.1 and 0.1 ug/L. A method blank of distilled water was prepared for each group of samples and run through the entire laboratory procedure. One duplicate sample was chosen randomly for each group of samples and would have to be within 20 relative percent difference of the original sample. Chlorophyll *a* and *b* standards from spinach were also analyzed every 20 samples and displayed at least a 90 percent recovery.

Physical Habitat

Data Collection. Physical habitat assessment data sheets (Figure 2) were completed by a staff biologist in the field at each station. Table 1 displays the 2007 field monitoring schedule for physical habitat as well as biological and sediment quality assessments. Assessments made in the field included weather conditions, channel morphology, bank erosion, shore cover, aquatic vegetation, man-made structures, floatable materials, riparian land-use, sediment composition, sediment color and odor, depth of fine sediments (fines), and presence of oil in sediment. Channel width was determined using a Yardage Pro 800 rangefinder in the non-wadeable waterways. A fiberglass telescoping leveling rod was used to measure water depth and depth of fines (in sediment). The smallest extension of the round leveling rod (1" diameter) was pushed into the sediment with reasonable force as far as possible to determine depth of fines in feet. A 6- x 6-inch petite Ponar grab sampler was used to collect sediment for analysis. Staff biologists estimated the percent composition of plant debris, clay, inorganic silt, organic sludge, sand (0.06-2 mm diameter), gravel (<2-64 mm diameter), cobble (>64-256 mm diameter), boulder (>256 mm diameter), or bedrock/concrete in the sediment. Sediment color and odor were recorded as well as the appearance of oil in the sample.

Assessment Locations. Physical habitat was evaluated at the beginning and end of the fishing range in the center and on one side of the waterway at each station. The range was 40 meters for wadeable sites, 100 meters for sites in which the small boat electrofisher was employed, and 400 meters for deep-draft waterways.

Fish

Deep-Draft Stream Sampling. Fish were collected at each sampling station using a boat- mounted electrofisher. The electrofisher was powered by a direct current (DC) generator. Stunned fish were picked out of the water with long-handled dip nets by either of two netters who were positioned on the bow of the boat.

For deep-draft sites, the section of canal sampled extended for 400 meters. For shallow sites, a small electrofishing boat was used, and 100 meters of the waterway was sampled. Whenever possible, both sides of the waterways were electrofished.

Wadeable Stream Sampling. Fish were collected at each sampling station using a backpack electrofisher and a bag seine. Conductivity and temperature (°C) were recorded before each sample collection. A DC backpack electrofisher was employed to electrify the water with 0.7 to 1.0 amps of current, stunning the fish. In most instances, two 40-meter long backpack electrofisher collections were conducted at each station. A 40-meter reach of the creek was electrified by moving upstream parallel to the bank. Additional personnel followed the electrofisher collecting the stunned fish with dip nets. Following the first collection, a second 40-meter electrofishing survey was conducted on the opposite bank. If the creek was less than five meters wide, electrofishing occurred only once along a 40-meter reach. The total electrofishing time during each 40-meter collection was noted.

FIGURE 2: METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO PHYSICAL HABITAT ASSESSMENT

Date ____________ **Time** ____________ **Station Number** ____________

Station Name ____________ **Latitude** ____________

Waterbody ____________ **Longitude** ____________

Assessment Observer (s) ____________

Weather Conditions SUNNY CLOUDY RAIN (circle one)

Stream Order ________ **Assessment Location** BEGINNING END (circle one)

Assessment Location Facing Upstream LEFT CENTER RIGHT (circle one)

Channel Habitat POOL RUN RIFFLE (circle one)

Water Depth (ft) ____________ **Channel Width** (ft) ____________

Water Level LOW NORMAL HIGH FLOODED (circle one)

Man-made Structures DAM RIPRAP BRIDGE LEVEE ISLAND OUTFALL SHEET PILING OTHER ____________ (circle all applicable)

(Specify)

Channelization YES NO (circle one)

Bank Erosion NONE SLIGHT MODERATE SEVERE (circle one)

Floatable Materials YES NO (circle one)

If YES, characterize (circle all applicable)

STREET LITTER SANITARY SEWAGE VEGETATIVE MATERIAL

Aquatic Vegetation YES NO (circle one)

If YES, is vegetation (circle all applicable)

ROOTED EMERGENT ROOTED SUBMERGENT ROOTED FLOATING

ATTACHED ALGAE FLOATING ALGAE OTHER ____________

(Specify)

Instream Cover for Fish (circle all applicable)

AQUATIC VEGETATION BOULDERS BRUSH-DEBRIS JAMS LOGS

SUBMERGED TREE ROOTS SUBMERGED TERRESTRIAL VEGETATION

UNDER CUT BANK ROCK LEDGE OTHER ____________

(Specify)

Canopy Cover OPEN PARTLY SHADED SHADED (circle one)

Immediate Shore Cover		**Riparian Land Use**	
DENUDED	______ %	GRASSLAND	______ %
GRASSES	______ %	URBAN RESIDENTIAL	______ %
SHRUBS	______ %	URBAN COMMERCIAL/INDUSTRIAL	______ %
TREES	______ %	WETLAND	______ %
OTHER (Specify)		FOREST	______ %
____________	______ %	ROW CROPS	______ %
		OTHER ____________ (Specify)	______ %

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FIGURE 2 (Continued): METROPOLITAN WATER RECLAMATION DISTRICT OF GREATER CHICAGO PHYSICAL HABITAT ASSESSMENT

Station Number ____________

Sediment Composition

Plant Debris	________	%
Clay	________	%
Inorganic Silt	________	%
Organic Sludge	________	%
Sand (0.06 mm to 2 mm diameter)	________	%
Gravel (>2 mm to 64 mm diameter)	________	%
Cobble (>64 mm to 256 mm diameter)	________	%
Boulder (>256 mm diameter)	________	%
Bedrock or Concrete	________	%

Sediment Color ______________________________ **Sediment Odor** ______________________

Oil in Sediment	NONE	LIGHT	MODERATE	HEAVY	(circle one)
Embeddedness	NONE	NORMAL	MODERATE	EXTENSIVE	(circle one)
Sinuosity	NONE	LOW	MODERATE	HIGH	(circle one)

Depth of Fines (In feet using 1 inch diameter probe) ________________________

Photo Numbers Looking Upstream ____________________ Looking Downstream ____________

Site Location/Map (Draw a map of the site and indicate the area assessed)

Additional Remarks ____

____

____

____

____

____

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TABLE 1: AMBIENT WATER QUALITY MONITORING PROGRAM
SAMPLING DATES DURING 2007

Station No.	Sampling Station	Waterway	Date Sampled
		CHICAGO RIVER SYSTEM	
96	Albany Avenue[1]	North Branch Chicago River	7/9/07
36	Touhy Avenue[1]	North Shore Channel	7/12/07
46	Grand Avenue[1]	North Branch Chicago River	7/11/07
75	Cicero Avenue[1]	Chicago Sanitary & Ship Canal	7/17/07
41	Harlem Avenue[1]	Chicago Sanitary & Ship Canal	7/16/07
92	Lockport[1]	Chicago Sanitary & Ship Canal	7/10/07
		CALUMET RIVER SYSTEM	
49	Ewing Avenue	Calumet River	7/26/07
55	130th Street[1]	Calumet River	7/27/07[2], 9/6/07[3]
56	Indiana Avenue	Little Calumet River	7/30/07
76	Halsted Street[1]	Little Calumet River	7/31/07
57	Ashland Avenue	Little Calumet River	7/23/07[2], 8/16/07[3]
52	Wentworth Avenue	Little Calumet River	7/23/07[2], 9/11/07[3]
58	Ashland Avenue	Calumet-Sag Channel	8/1/07
59	Cicero Avenue[1]	Calumet-Sag Channel	8/2/07
43	Route 83	Calumet-Sag Channel	8/9/07[2], 9/14/07[3]
86	Burnham Avenue	Grand Calumet River	7/25/07[2], 9/5/07[3]
50	Burnham Avenue	Wolf Lake Outlet	7/25/07[2], 8/13/07[3]
97	170th Street	Thorn Creek	7/24/07[2], 9/5/07[3]
54	Joe Orr Road	Thorn Creek	7/24/07[2], 8/13/07[3]
		DES PLAINES RIVER SYSTEM	
78	Wille Road[1]	Higgins Creek	6/21/07
18	Devon Avenue[1]	Salt Creek	6/26/07
64	Lake Street[1]	West Branch DuPage River	6/20/07
13	Lake-Cook Road[1]	Des Plaines River	6/22/07
22	Ogden Avenue[1]	Des Plaines River	9/20/07
91	Material Service Rd.[1]	Des Plaines River	6/28/07

[1]Annual sampling station.
[2]Sediment chemistry and invertebrate sampling only on this date.
[3]Electrofishing and habitat assessment conducted on this date.

A 15-foot bag seine with 3/16-inch mesh was also used to collect fish. Staff pulled the seine for 40 meters traveling upstream parallel to the bank. In most instances, a separate 40-meter seine collection occurred along each bank.

Fish Processing. In the field, most fish were identified to species, weighed to the nearest gram or nearest 0.1 gram (depending on size), measured for standard and total length to the nearest millimeter, and examined for the incidence of disease, parasites, or other anomalies. Following processing, these fish were returned live to the river. Minnows and other small fish that were difficult to identify were preserved in 10 percent (v/v) formalin and returned to the laboratory for further analysis. These fish were processed in a similar manner to the field-measured fish except that they were weighed to the nearest 0.01 gram.

Index of Biotic Integrity. Biological integrity of aquatic ecosystems has been defined as the ability to support and maintain a balanced, integrated, and adaptive community having a species composition, diversity, and a functional organization comparable to that of a natural habitat (Karr et al., 1986). Karr's 1986 Index of Biotic Integrity (IBI) was used to analyze fish data from 2007.

The limitations of this tool should be recognized. Karr's 1986 Index of Biotic Integrity is designed to assess wadeable streams, not man-made channelized waterways.

Karr's IBI integrates information from 12 fish community metrics that fall into three major categories: (1) species richness and composition, (2) trophic composition, and (3) fish abundance and condition. Each metric is scored as a 1, 3, or 5 based on whether its evaluation deviates strongly, deviates somewhat, or approximates expectations, respectively, as compared to an undisturbed site located in a similar geographical region and on a stream of comparable size. Individual metrics are added to calculate a total IBI score. A high IBI indicates high biological integrity or health and low disturbance or lack of perturbations. A low IBI indicates low biological integrity and high disturbance or degradation. Separate IBI metric scores were determined based on the relative abundance of fish collected with each fishing gear. IBI categories of good (IBI 41 - 60), fair (IBI 21 - 40) or poor (IBI < 21), as derived by the IEPA (IEPA, 1996), were determined and reported.

Benthic Invertebrates

Ponar Sediment Sampling. Triplicate sediment samples were collected with a petite Ponar Grab (0.023 m^2) from the center and one side of the deep-draft and wadeable waterway stations. Grab samples were taken at locations upstream from any prior sampling disturbance, such as Hester Dendy retrievals (see description in next section), to avoid collecting disturbed sediment. An appropriate area for ponar sampling was chosen by a staff biologist to avoid any obvious obstructions, such as large rocks or plants. The sediment samples were sieved in the field using a field-sieving bucket with 250 micrometer (μm) openings. The sieved material was poured into one-gallon plastic containers, preserved to 10 percent formalin concentration, and brought back to the laboratory for analysis. All samples were stored at 4°C until processed.

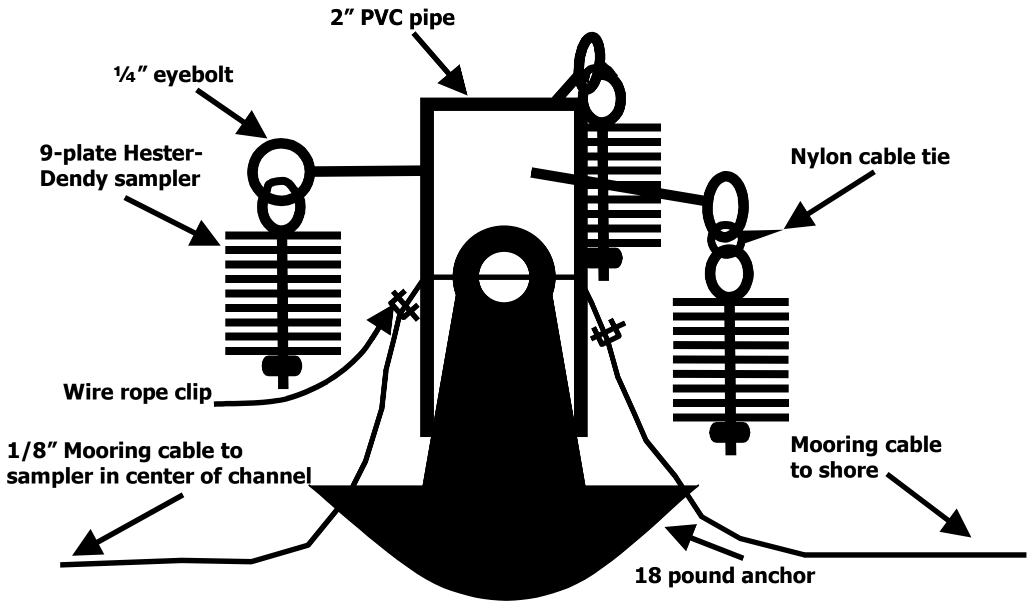
Artificial Substrate Sampling. Hester Dendy artificial substrate samplers were deployed at each station between May and early June of 2007. Figure 3 shows a diagram of the plate configuration that was assembled prior to deployment in the waterways. In all, 27, 3- x 3-inch sampling plates were attached to two 18-pound river anchors, connected to an object on shore (usually a tree) by a cable, and then placed on the bottom of the waterway in the center and on one side. These substrates were left in the waterway between six and eight weeks and then retrieved concurrent to other biological sampling when possible. We made a concerted effort to collect the Hester Dendy samples on the sixth to seventh week of deployment. This occasionally resulted in benthic and fish samples collected on separate dates for a station. Major factors that affect our field schedule are unsafe weather conditions, river flow velocity, and river stage. Hester Dendy set-ups were located and the anchors were lifted out of the waterway with a 250 micron mesh plankton net underneath to avoid organism loss. Then, plates were cut from the anchors and placed into a one-gallon bucket with a secure leak-proof lid. Invertebrates from the plankton net reservoir were also rinsed into the buckets, which were then filled with river water and brought to a 10 percent final concentration of formalin.

Benthic Invertebrate Processing. In the laboratory, the ponar sediment samples were gently washed and screened through a U.S. Standard number 60 mesh sieve (250 μm openings). The formalin mixture in which the Hester Dendy plates were immersed was also sieved through a number 60 mesh sieve, and then the sampling bucket was filled with tap water to cover the plates. Each plate was removed from the sampler and gently brushed with a paintbrush on both sides while under a slow stream of running water in order to rinse the attached invertebrates into the sieve. Rinsings from both ponar and Hester Dendy sampling containers were thoroughly sieved. The sieved material was examined in small batches under a compound microscope in a 100- x 50-mm glass crystallizing dish filled about 1 cm high. Laboratory technicians then counted oligochaete worms and removed all other invertebrates from the finer residual material. In situations where large numbers of any one taxon (usually worms) were encountered (>3000), estimates of their abundance were made by using a sub-sampling device. Invertebrates other than worms were sent to a consultant (EA Engineering) for identification to genus or species when possible.

Sediment Chemistry

Sample Collection. Prior to sample collection, the Ponar grab sampler and the metal and plastic pans and scoops were cleaned with hot water and lab detergent, rinsed with de-ionized water, and allowed to air dry. The ponar and metal pans and scoops were then rinsed with acetone, allowed to air dry, and dried in an oven at 105°C for one hour. When dry and cool, each set was placed in a plastic bag and sealed to prevent contamination until ready for use. Sediment

FIGURE 3: CONFIGURATION OF HESTER DENDY LARVAL PLATE SAMPLER



samples were collected from the center and side of the waterway using separate cleaned 6- x 6-inch Ponar grab samplers. The sediment samples were either transferred into plastic or metal pans and then put into the appropriate container using plastic or metal scoops. The constituents analyzed in sediment, sample containers used, and preservation methods are summarized in Table 2. Metal scoops and pans were used for samples collected in glass containers, whereas plastic scoops and pans were used for sediment collected in plastic containers. After being filled, sample containers were placed on ice until they could be refrigerated.

Sample Analyses. The sediment samples were analyzed for total solids (TS), total volatile solids (TVS), ammonia nitrogen (NH_3-N), nitrate plus nitrite nitrogen, total Kjeldahl nitrogen (TKN), total phosphorus (TP), total cyanide, phenols, total metals (including arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc), and Organic Priority Pollutants (OPPs) (listed in Table 3) by the District's Analytical Laboratory Division. Sediment samples were sent on ice to a contract laboratory for AVS/SEM, total organic carbon (TOC), and particle size. In the laboratory, all constituents were analyzed using procedures established by the United States Environmental Protection Agency (USEPA) or described in Standard Methods for the Examination of Water and Wastewater (19th edition, 1998).

Sediment Toxicity

Sediment samples were collected using a 6- x 6-inch Ponar grab sampler from the center and side of the waterways and scooped into one-gallon plastic buckets (at least one-half full). Buckets were kept on ice until they could be refrigerated. These samples were sent in coolers on ice to a contractor for ten-day *Chironomus tentans* toxicity testing (USEPA, Test Method 100.2, 2000). Tests were performed within 14 days of sediment collection.

TABLE 2: CONSTITUENTS ANALYZED, SAMPLE CONTAINERS, AND PRESERVATION METHODS FOR SEDIMENT SAMPLES COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM

Constituents	Units of Measure[1]	Sample Container	Preservative
Total Solids	percent	Glass	Cool, 4°C
Total Volatile Solids	percent	Glass	Cool, 4°C
Un-ionized Ammonia	mg/kg	Glass	Cool, 4°C
Nitrite plus Nitrate Nitrogen	mg/kg	Glass	Cool, 4°C
Total Kjeldahl Nitrogen	mg/kg	Glass	Cool, 4°C
Total Phosphorus	mg/kg	Glass	Cool, 4°C
Phenols	mg/kg	Glass	Cool, 4°C
Total Cyanide	mg/kg	Glass	Cool, 4°C
Acid Volatile Sulfide	µmoles/g	Plastic	Cool, 4°C
Simultaneously Extracted Metal	µmoles/g	Plastic	Cool, 4°C
Total Organic Carbon	mg/kg	Glass	Cool, 4°C
Particle Size	percent	Plastic	Cool, 4°C
Toxicity (survival)	percent	Plastic	Cool, 4°C
Toxicity (growth)	mg/org[2]	Plastic	Cool, 4°C
Total Metals (Arsenic, Cadmium, Chromium Copper, Iron, Lead, Manganese, Mercury, Nickel, Silver, and Zinc)	mg/kg	Glass	Cool, 4°C
Organic Priority Pollutants (Volatile Organic Compounds, Polynuclear Aromatic Hydrocarbons, Polychlorinated Biphenyls, Pesticides)	µg/kg	Glass	Cool, 4°C

[1]Expressed on a dry weight basis.
[2]Org = organism.

TABLE 3: LIST OF ORGANIC PRIORITY POLLUTANTS ANALYZED IN SEDIMENT SAMPLES COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM DURING 2007

Volatile Organic Compounds	Acid Extractables	Base/Neutral Extractables	Pesticides and PCBs
Acrolein	2-Chlorophenol	Acenaphthene	Aldrin
Acrylonitrile	2,4-Dichlorophenol	Acenaphthylene	a-BHC-alpha
Benzene	2,4-Dimethylphenol	Anthracene	b-BHC-beta
Bromoform	4,6-Dinitro-o-cresol	Benzidine	BHC-gamma
Carbon tetrachloride	2,4-Dinitrophenol	Benzo(a)anthracene	BHC-delta
Chlorobenzene	2-Nitrophenol	Benzo(a)pyrene	Chlordane
Chlorodibromomethane	4-Nitrophenol	3,4-Benzofluoranthene	4,4'-DDT
Chloroethane	Parachlorometacresol	Benzo(ghi)perylene	4,4'-DDE
2-Chloroethylvinyl ether	Pentachlorophenol	Benzo(k)fluoranthene	4,4'-DDD
Chloroform	Phenol	Bis(2-chloroethoxy)methane	Dieldrin
Dichlorobromomethane	2,4,6-Trichlorophenol	Bis(2-chloroethyl)ether	a-Endosulfan-alpha
1,1-Dichloroethane		Bis(2-chloroisopropyl)ether	b-Endosulfan-beta
1,2-Dichloroethane		Bis(2-ethylhexyl)phthalate	Endosulfan sulfate
1,1-Dichloroethylene		4-Bromophenyl phenyl ether	Endrin
1,2-Dichloropropane		Butylbenzyl phthalate	Endrin aldehyde
1,3-Dichloropropene		2-Chloronaphthalene	Heptachlor
Ethyl benzene		4-Chlorophenyl phenyl ether	Heptachlor epoxide
Methyl bromide		Chrysene	PCB-1242
Methyl chloride		Dibenzo(a,h)anthracene	PCB-1254
Methylene chloride		1,2-Dichlorobenzene	PCB-1221
1,1,2,2-Tetrachloroethane		1,3-Dichlorobenzene	PCB-1232
Tetrachloroethylene		1,4-Dichlorobenzene	PCB-1248
Toluene		3,3-Dichlorobenzidine	PCB-1260

TABLE 3 (Continued): LIST OF ORGANIC PRIORITY POLLUTANTS ANALYZED IN SEDIMENT SAMPLES COLLECTED FOR THE AMBIENT WATER QUALITY MONITORING PROGRAM DURING 2007

Volatile Organic Compounds	Acid Extractables	Base/Neutral Extractables	Pesticides and PCBs
1,2-trans-Dichloroethylene		Diethyl phthalate	PCB-1016
1,1,1-Trichloroethane		Dimethyl phthalate	Toxaphene
1,1,2-Trichloroethane		Di-n-butyl phthalate	
Trichloroethylene		2,4-Dinitrotoluene	
Vinyl chloride		2,6-Dinitrotoluene	
Trichlorofluoromethane		Di-n-octyl phthalate	
		1,2-Diphenylhydrazine	
		Fluoranthene	
		Fluorene	
		Hexachlorobenzene	
		Hexachlorobutadiene	
		Hexachlorocyclopentadiene	
		Hexachloroethane	
		Indeno(1,2,3-cd)pyrene	
		Isophorone	
		Naphthalene	
		Nitrobenzene	
		N-Nitrosodimethylamine	
		N-Nitrosodi-n-propylamine	
		N-Nitrosodiphenylamine	
		Phenanthrene	
		Pyrene	
		1,2,4-Trichlorobenzene	

RESULTS AND DISCUSSION

Chlorophyll

As a photosynthetic component of all algae cells, the determination of chlorophyll *a* is an accepted way of quantifying algal biomass in lakes and streams. Chlorophyll *a* values are of interest to regulatory agencies since it is also widely accepted that high algae concentrations may indicate nutrient impairment. In light of this consideration, the District began monitoring chlorophyll on a monthly basis in August 2001 as part of the AWQM Program. Results from 2007 are shown in Table 4.

During 2007, the lowest mean chlorophyll *a* concentrations in the Chicago area waterways were 1 mg/L at Ewing Avenue on the Calumet River, along with Touhy Avenue and Foster Avenue on the NSC. The highest mean chlorophyll *a* value in this system was at Burnham Avenue on the GCR (101 mg/L); this value was an order of magnitude higher than most values in this system. Average values of chlorophyll for stream segments downstream of District WRPs are as follows: North Side (2 mg/L), Kirie (6 mg/L), Egan (11 mg/L), Hanover Park (15 mg/L), Stickney (5 mg/L), Calumet (7 mg/L), and Lemont (6 mg/L).

Physical Habitat

Physical habitat is one of the most crucial factors limiting aquatic life in urban environments. Channelization, limited instream and canopy cover, siltation, and lack of adequate flood plain area are some of the physical characteristics that challenge waterways in the Chicago area. Tables 5 - 10 summarize the observed and measured characteristics of sampling stations located in the Calumet River System.

The water depth in the deep-draft portion of the Calumet River System ranged from 3 - 32 feet. The wadeable streams and shallow stations in the Calumet River System had a maximum depth of 4 feet (Ashland Avenue, LCR). Man-made structures like bridges and riprap were prevalent throughout the Calumet River system. Floatable materials were observed at most stations, with vegetative material being the only type present. Boulders were the predominant source of instream habitat for fish in the deep-draft portion of this system, and brush-debris jams and logs were the primary source of instream habitat for fish in the shallow and wadeable areas in the Calumet River System. Canopy cover was very limited at deep-draft stations because the riparian habitat was dominated by commercial and industrial land use. Shallow and wadeable stations had similar riparian habitat, but canopy cover was more prevalent due to the narrowness of the waterways. Route 83 on the CSC and Ashland Avenue on the LCR were the only two stations with riparian areas that were completely forested.

Silt was the predominant component in most sediment samples, and oil was found in all but three sampling stations (Joe Orr Road and 170th Street on Thorn Creek and Wentworth Avenue on the LCR). The greatest depth of fines measured (8.5 feet) was at Cicero Avenue on the

TABLE 4: RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Station No.	Station Name	Waterway	N[1]	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
106	Dundee Road	W Fork N Branch Chicago River[2]	4	6	4	8	2
103	Golf Road	W Fork N Branch Chicago River[2]	11	12	4	22	7
31	Lake-Cook Road	M Fork N Branch Chicago River[3]	10	8	2	17	4
32	Lake-Cook Road	Skokie River	10	9	3	20	6
105	Frontage Road	Skokie River	11	18	3	55	14
104	Glenview Road	North Branch Chicago River	11	12	< 1	39	12
34	Dempster Street	North Branch Chicago River	11	10	2	32	10
96	Albany Avenue	North Branch Chicago River	11	9	2	31	9
35	Central Street	North Shore Channel	9	6	< 1	22	7
102	Oakton Street	North Shore Channel	12	16	1	102	29
36	Touhy Avenue	North Shore Channel	12	1	< 1	2	0
101	Foster Avenue	North Shore Channel	12	1	< 1	2	1
37	Wilson Avenue	North Branch Chicago River	12	3	< 1	7	2
73	Diversey Avenue	North Branch Chicago River	12	2	< 1	7	2
46	Grand Avenue	North Branch Chicago River	11	5	2	13	4
74	Lake Shore Drive	Chicago River	11	2	< 1	6	2
100	Wells Street	Chicago River	11	2	< 1	6	2
39	Madison Street	South Branch Chicago River	11	4	1	12	4
108	Loomis Street	South Branch Chicago River	12	4	1	11	3
99	Archer Avenue	Bubbly Creek	11	7	< 1	22	8
40	Damen Avenue	Chicago Sanitary and Ship Canal	12	5	1	14	4
75	Cicero Avenue	Chicago Sanitary and Ship Canal	12	5	1	16	4
41	Harlem Avenue	Chicago Sanitary and Ship Canal	12	3	< 1	7	2
42	Route 83	Chicago Sanitary and Ship Canal	11	5	< 1	18	5
48	Stephen Street	Chicago Sanitary and Ship Canal	11	6	2	19	5
92	Lockport	Chicago Sanitary and Ship Canal	50	6	1	19	4

TABLE 4 (Continued): RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Station No.	Station Name	Waterway	N[1]	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
49	Ewing Avenue	Calumet River	10	1	< 1	2	0
55	130th Street	Calumet River	10	4	1	14	4
50	Burnham Avenue	Wolf Lake	10	7	4	14	3
86	Burnham Avenue	Grand Calumet River	10	101	4	691	212
56	Indiana Avenue	Little Calumet River	9	14	3	40	11
76	Halsted Street	Little Calumet River	11	7	< 1	41	12
52	Wentworth Avenue	Little Calumet River	11	13	1	82	23
54	Joe Orr Road	Thorn Creek	10	3	< 1	8	2
97	170th Street	Thorn Creek	11	9	3	26	7
57	Ashland Avenue	Little Calumet River	11	7	2	24	7
58	Ashland Avenue	Calumet-Sag Channel	11	7	< 1	39	11
59	Cicero Avenue	Calumet-Sag Channel	11	8	< 1	43	12
43	Route 83	Calumet-Sag Channel	11	7	1	29	8
90	Route 19	Poplar Creek	11	11	1	31	10
110	Springinsguth Road	West Branch DuPage River	9	21	2	53	19
89	Walnut Lane	West Branch DuPage River	12	7	2	34	9
64	Lake Street	West Branch DuPage River	11	23	4	42	11
79	Higgins Road	Salt Creek	10	39	6	85	26
80	Arlington Heights Road	Salt Creek	12	14	3	31	10
18	Devon Avenue	Salt Creek	12	14	4	31	10
24	Wolf Road	Salt Creek	10	8	1	22	7
109	Brookfield Avenue	Salt Creek	10	7	1	23	7
77	Elmhurst Road	Higgins Creek	4	15	8	28	9
78	Wille Road	Higgins Creek	11	4	< 1	10	3
12	Lake-Cook Road	Buffalo Creek	9	23	9	35	9

TABLE 4 (Continued): RANGE AND MEAN CHLOROPHYLL *a* VALUES IN THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Station No.	Station Name	Waterway	N[1]	Mean µg/L	Minimum µg/L	Maximum µg/L	Standard Deviation µg/L
13	Lake-Cook Road	Des Plaines River	12	14	3	71	19
17	Oakton Street	Des Plaines River	11	12	1	58	16
19	Belmont Avenue	Des Plaines River	11	7	1	16	5
20	Roosevelt Road	Des Plaines River	11	7	1	18	6
22	Ogden Avenue	Des Plaines River	11	6	< 1	16	5
23	Willow Springs Road	Des Plaines River	11	5	< 1	13	4
29	Stephen Street	Des Plaines River	10	9	3	18	5
91	Material Services Road	Des Plaines River	10	12	3	27	9

[1]N = Number of Observations.
[2]West Fork North Branch Chicago River.
[3]Middle Fork North Branch Chicago River.

TABLE 5: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THE CALUMET RIVER DURING 2007

	Calumet River	
	Station #49 Ewing Avenue	Station #55 130th Street
Depth Range (ft)	14 - 32	3 - 28
Man-Made Structure Present	Riprap, Bridge, Sheet Piling	Bridge
Floatable Materials	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Rock Ledge, Pilings, Rip Rap	Aquatic Vegetation, Boulders, Logs
Canopy Cover	Open	Open
Immediate Shore Cover	Rock Debris, Grasses, Shrubs	Grasses, Shrubs, Trees
Riparian Land Use	Urban Commercial/Industrial	Urban Commercial/Industrial, Forest
Sediment Composition (Descending Percentage)	Zebra Mussel Shells, Gravel, Silt, Cobble, Boulder, Organic Sludge	Sand, Silt, Zebra Mussels, Clay, Gravel, Plant Debris
Amount of Oil in Sediment	None to Heavy	None to Light
Depth of Fines Range (ft.)	< 0.1[1]	< 0.1 to ND

[1]Only one measurement due to deep water.
ND = No Data. Water too deep to get all measurements.

TABLE 6: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR THE BURNHAM AVENUE STATION ON THE WOLF LAKE OUTLET DURING 2007

	Wolf Lake Outlet Station #50 Burnham Avenue
Depth Range (ft)	1 - 3
Man-Made Structure Present	Bridge
Floatable Materials	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Brush-Debris Jams, Logs, Submerged Terrestrial Vegetation
Canopy Cover	Open
Immediate Shore Cover	Grasses, Road, Bridge
Riparian Land Use	Urban Commercial/Industrial
Sediment Composition (Descending Percentage)	Silt, Plant Debris, Sand
Amount of Oil in Sediment	None to Light
Depth of Fines Range (ft.)	0.1 - 0.5

TABLE 7: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR THE BURNHAM AVENUE STATION ON THE GRAND CALUMET RIVER DURING 2007

	Grand Calumet River Station #86 Burnham Avenue
Depth Range (ft)	1 - 3
Man-Made Structure Present	Bridge
Floatable Materials	Vegetative Material
Instream Cover for Fish (Side)	Aquatic Vegetation, Brush-Debris Jams, Logs, Submerged Terrestrial Vegetation
Canopy Cover	Open to Partly Shaded
Immediate Shore Cover	Grasses, Shrubs, Trees
Riparian Land Use	Grassland, Urban Commercial/Industrial
Sediment Composition (Descending Percentage)	Cobble, Bedrock or Concrete, Silt, Sludge, Plant Debris
Amount of Oil in Sediment	Heavy
Depth of Fines Range (ft.)	< 0.1 - 5.4

TABLE 8: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THE LITTLE CALUMET RIVER DURING 2007

	Little Calumet River	
	Station #52 Wentworth Avenue	Station #56 Indiana Avenue
Depth Range (ft)	1 - 3	5 - 15
Man-Made Structure Present	Outfall	Bridge
Floatable Materials	None	None
Instream Cover for Fish (Side)	Brush-Debris Jams, Logs	Boulders, Logs, Submerged Tree Roots, Submerged Terrestrial Vegetation, Rock Ledge
Canopy Cover	Partly Shaded to Shaded	Open
Immediate Shore Cover	Grasses, Trees	Grasses, Shrubs, Trees
Riparian Land Use	Urban Residential	Urban Commercial/Industrial
Sediment Composition (Descending Percentage)	Silt, Sludge, Plant Debris, Sand	Silt, Gravel, Sand, Organic Sludge, Bedrock or Concrete, Shells
Amount of Oil in Sediment	None	None to Light
Depth of Fines Range (ft.)	3.2 - 5.1	0.1 - 6.6

TABLE 8 (continued): SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THE LITTLE CALUMET RIVER DURING 2007

	Little Calumet River	
	Station #76 Halsted Street	Station #57 Ashland Avenue
Depth Range (ft)	2 - 13	1 - 4
Man-Made Structure Present	Bridge, Outfall	Bridge
Floatable Materials	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Boulders, Brush-Debris Jams, Logs, Submerged Tree Roots	Brush-Debris Jams, Logs, Submerged Tree Roots, Submerged Terrestrial Vegetation
Canopy Cover	Open to Partly Shaded	Open to Partly Shaded
Immediate Shore Cover	Grasses, Shrubs, Trees	Grasses, Tree, Shrubs
Riparian Land Use	Urban Commercial/Industrial, Forest	Forest
Sediment Composition (Descending Percentage)	Sand, Bedrock or Concrete, Silt, Gravel, Clay, Mussel shells	Silt, Plant Debris, Bedrock or Concrete, Gravel, Sand
Amount of Oil in Sediment	None to Light	None to Light
Depth of Fines Range (ft.)	< 0.1 to 2.5	< 0.1 - 1.2

TABLE 9: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THE CALUMET-SAG CHANNEL DURING 2007

	Cal-Sag Channel	
	Station #58 Ashland Avenue	Station #59 Cicero Avenue
Depth Range (ft)	4 - 12	4 - 13
Man-Made Structure Present	Riprap, Bridge	Riprap, Rock Cut Walls, Bridge
Floatable Materials	Vegetative Material	Vegetative Material
Instream Cover for Fish (Side)	Boulders, Brush-Debris Jams, Logs	Boulders, Logs, Rock Ledge
Canopy Cover	Open to Partly Shaded	Open
Immediate Shore Cover	Grasses, Shrubs, Riprap	Grasses, Shrubs, Trees
Riparian Land Use	Urban Commercial/Industrial	Urban Commercial/Industrial, Forest
Sediment Composition (Descending Percentage)	Silt, Boulder, Sand, Plant Debris, Gravel	Silt, Organic Sludge, Sand, Plant Debris, Mussel Shells
Amount of Oil in Sediment	None to Light	None to Heavy
Depth of Fines Range (ft.)	< 0.1 - 1.6	< 0.1 - 8.5

TABLE 9 (continued): SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THE CALUMET-SAG CHANNEL DURING 2007

	Calumet-Sag Channel Station #43 Route 83
Depth Range (ft)	3 - 15
Man-Made Structure Present	Rock Cut Walls, Bridge
Floatable Materials	None
Instream Cover for Fish (Side)	Boulders, Rock Ledge
Canopy Cover	Open
Immediate Shore Cover	Grasses, Shrubs, Trees
Riparian Land Use	Forest
Sediment Composition[1] (Descending Percentage)	Silt, Organic Sludge, Clay
Amount of Oil in Sediment[1]	Moderate
Depth of Fines Range (ft.)[1]	1 - 7.4

[1]Assessed only at the beginning of sampling location.

TABLE 10: SUMMARY OF PHYSICAL HABITAT OBSERVATIONS FOR STATIONS ON THORN CREEK DURING 2007

	Thorn Creek	
	Station #54 Joe Orr Road	Station #97 170th Street
Depth Range (ft)	1 - 3	1 - 2
Man-Made Structure Present	Riprap	Bridge, Outfall
Floatable Materials	Vegetative Material	None
Instream Cover for Fish (Side)	Boulders, Brush-Debris Jams, Logs, Submerged Tree Roots, Under Cut Bank	Brush-Debris Jams, Logs, Submerged Tree Roots, Submerged Terrestrial Vegetation, Under Cut Bank, Rock Ledge
Canopy Cover	Open to Shaded	Partly Shaded to Shaded
Immediate Shore Cover	Grasses, Shrubs, Trees, Rip Rap/Cobble	Grasses, Shrubs, Trees
Riparian Land Use	Wastewater Treatment Plant	Urban Residential
Sediment Composition (Descending Percentage)	Sand, Cobble, Boulder, Gravel, Plant Debris	Plant Debris, Silt, Sand, Cobble, Gravel
Amount of Oil in Sediment	None	None
Depth of Fines Range (ft.)	< 0.1 - 2.0	0.4 - 1.3

CSC, where silt and organic sludge were the predominant substrates. Depths of fines measurements were not possible at certain center locations on the Calumet River due to very deep water. Interstitial pockets of bedrock or concrete were the source of depth of fines measurements that were less than 0.1 feet.

Fish

Table 11 lists the common and scientific names of the fish species collected during 2007 and indicates the particular river system from which each species was collected. The number of individuals, total species and game species collected, and weight of total catch at each station are shown in Table 12. During 2007, 4,179 fish composed of 46 fish species, including 21 game species, and two hybrids were collected from Chicago area waterways. Numbers of fish collected from each AWQM station are shown in Appendix Tables A-1 - A-3. Gizzard shad, common carp, and pumpkinseed sunfish were the most abundant species in the deep-draft waterways. Fathead minnows, green sunfish, and spotfin shiners were the most abundant species at the wadeable streams stations.

IBI scores calculated for each AWQM station and collection method are shown in Table 13. Most of the stations were rated as “fair” in terms of biological integrity. Three collections were rated as poor, including Wentworth Avenue on the shallow portion of the LCR, the backpack fish collections at Wille Road on Higgins Creek, and Devon Avenue on Salt Creek. The fish collection at 130th Street on the Calumet River earned a good rating with a score of 44.

Benthic Invertebrates

Table 14 contains a list of benthic invertebrate taxa collected by each of the two sampling methods. A report focusing on detailed benthic invertebrate data from 2007 is available at mwrd.org (MWRD 2006-2008 Chicago Waterways Benthic Report). Total species richness for ponar and Hester Dendy samplers combined was 117 species, while total EPT richness was 19 species. The total species richness was higher than the 2003 collection at the same stations, which yielded 108 total species.

Chicago River System. Benthic samples were collected from one station on the NSC and two stations on the NBCR. Albany Avenue on the NBCR had the highest total taxa richness (37 taxa) among Hester Dendy and lowest total taxa richness (six taxa) among petite ponar samples. The Hester Dendy sample at Albany Avenue was also the only sample to contain EPT taxa (eight). Touhy Avenue exhibited the highest taxa richness (14 taxa) among ponar samples in this system. Dominant taxa of this watershed were Oligochaeta, Turbellaria, and the sow bug Caecidotea. Head capsule deformities in Chironomidae specimens were found in the Hester Dendy sample at Touhy Avenue, which amounted to less than 2 percent of the total midges examined from this sample.

TABLE 11: COMMON AND SCIENTIFIC NAMES OF FISHES COLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Common Name	Scientific Name	River System		
		Chicago	Calumet	Des Plaines
HERRING FAMILY	CLUPEIDAE			
Alewife	*Alosa pseudoharengus*	X		
Gizzard shad	*Dorosoma cepedianum*	X	X	
MINNOW FAMILY	CYPRINIDAE			
Goldfish	*Carassius auratus*	X	X	
Common carp	*Cyprinus carpio*	X	X	X
Carp x Goldfish Hybrid	*Cyprinus carpio x Carrassius auratus*		X	X
Spotfin shiner	*Cyprinella spiloptera*	X	X	X
Golden shiner	*Notemigonus crysoleucas*	X	X	X
Emerald shiner	*Notropis atherinoides*	X	X	X
Spottail shiner	*Notropis hudsonius*		X	
Sand shiner	*Notropis stramineus*		X	
Bluntnose minnow	*Pimephales notatus*	X	X	X
Fathead minnow	*Pimephales promelas*		X	X
Creek chub	*Semotilus atromaculatus*		X	X
SUCKER FAMILY	CATOSTOMIDAE			
Quillback	*Carpiodes cyprinus*		X	
White sucker	*Catostomus commersonii*	X	X	X
Smallmouth buffalo	*Ictiobus bubalus*		X	
Black buffalo	*Ictiobus niger*		X	
CATFISH FAMILY	ICTALURIDAE			
Black bullhead[1]	*Ameiurus melas*		X	
Yellow bullhead[1]	*Ameiurus natalis*	X	X	X
Brown bullhead[1]	*Ameiurus nebulosus*		X	
Channel catfish[1]	*Ictalurus punctatus*	X	X	
Tadpole madtom	*Noturus gyrinus*			X
PIKES	ESOCIDAE			
Grass pickerel[1]	*Esox americanus*			X
Northern pike[1]	*Esox lucius*		X	
MUDMINNOWS	UMBRIDAE			
Central mudminnow	*Umbra limi*		X	X
KILLIFISH FAMILY	*FUNDULIDAE*			
Blackstripe topminnow	*Fundulus notatus*	X		X
LIVEBEARER FAMILY	POECILIIDAE			
Western mosquitofish	*Gambusia affinis*	X	X	X

TABLE 11 (Continued): COMMON AND SCIENTIFIC NAMES OF FISHES COLLLECTED FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Common Name	Scientific Name	River System		
		Chicago	Calumet	Des Plaines
SILVERSIDES FAMILY	ATHERINOPSIDAE			
Brook silverside	*Labidesthes sicculus*		X	
TEMPERATE BASS FAMILY	MORONIDAE			
White perch[1]	*Morone Americana*	X	X	
Yellow bass[1]	*Morone mississippiensis*	X	X	
GOBY FAMILY	GOBIIDAE			
Round goby	*Neogobius melanostomus*		X	
SUNFISH FAMILY	*CENTRARCHIDAE*			
Rock bass[1]	*Ambloplites rupestris*	X	X	X
Green sunfish[1]	*Lepomis cyanellus*	X	X	X
Pumpkinseed[1]	*Lepomis gibbosus*	X	X	
Orangespotted sunfish[1]	*Lepomis humilis*		X	X
Bluegill[1]	*Lepomis macrochirus*	X	X	X
Longear Sunfish[1]	*Lepomis megalotis*		X	
Green sunfish x Orangespotted sun-fish	*L. cyanellus x L.humilis*			X
Smallmouth bass[1]	*Micropterus dolomieu*		X	X
Largemouth bass[1]	*Micropterus salmoides*	X	X	X
White crappie[1]	*Pomoxis annularis*		X	
Black crappie[1]	*Pomoxis nigromaculatus*	X	X	X
PERCH FAMILY	*PERCIDAE*			
Johnny darter	*Etheostoma nigrum*			X
Yellow perch[1]	*Perca flavescens*		X	
Blackside darter	*Percina maculata*			X
Sauger[1]	*Stizostedion canadense*			X
Walleye[1]	*Stizostedion vitreum*	X		
DRUM FAMILY	*SCIAENIDAE*			
Freshwater drum	*Aplodinotus grunniens*		X	
	Total Number of Species	22	38	24
	Total Number of Hybrids	0	1	2

[1]Game fish species

TABLE 12: TOTAL NUMBER, TOTAL WEIGHT, AND NUMBER OF SPECIES FOR FISH COLLECTED BY STATION FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Station No.	Location	Waterway	Sample Gear	Total Number of Fish	Total Weight (grams)	Number of Species		Most Abundant Species
						Total	Game	
96	Albany Avenue[1]	North Branch Chicago River	BP/Seine	14	75	4	1	White sucker
36	Touhy Avenue[1]	North Shore Channel	Large EF Boat	387	84,777	14	8	Gizzard shad
46	Grand Avenue[1]	North Branch Chicago River	Large EF Boat	117	35,998	13	5	Gizzard shad
75	Cicero Avenue[1]	Chicago Sanitary & Ship Canal	Large EF Boat	280	23,652	13	7	Pumpkinseed
41	Harlem Avenue[1]	Chicago Sanitary & Ship Canal	Large EF Boat	282	142,295	12	5	Pumpkinseed
92	Lockport[1]	Chicago Sanitary & Ship Canal	Large EF Boat	64	9,292	6	3	Gizzard shad
49	Ewing Avenue	Calumet River	Large EF Boat	102	10,493	5	2	Rock bass
55	130th Street[1]	Calumet River	Large EF Boat	610	124,939	20	9	Gizzard shad
50	Burnham Avenue	Wolf Lake Outlet	BP/Seine	9	73	6	5	Green sunfish
86	Burnham Avenue	Grand Calumet River	Small EF Boat	18	11,938	5	2	Carp
52	Wentworth Avenue	Little Calumet River	Small EF Boat	16	4,640	6	1	Gizzard shad
56	Indiana Avenue	Little Calumet River	Large EF Boat	322	257,411	18	6	Gizzard shad
76	Halsted Street[1]	Little Calumet River	Large EF Boat	281	150,737	21	10	Carp
57	Ashland Avenue	Little Calumet River	Small EF Boat	135	41,150	13	6	Gizzard shad
58	Ashland Avenue	Calumet-Sag Channel	Large EF Boat	131	175,711	12	5	Gizzard shad
59	Cicero Avenue[1]	Calumet-Sag Channel	Large EF Boat	297	59,095	12	7	Gizzard shad
43	Route 83	Calumet-Sag Channel	Large EF Boat	261	19,271	9	3	Gizzard shad
54	Joe Orr Road	Thorn Creek	BP/Seine	42	4,609	5	2	Green sunfish
97	170th Street	Thorn Creek	Small EF Boat	12	8,654	5	3	Carp, Green sunfish
78	Wille Road[1]	Higgins Creek	BP/Seine	465	2,117	6	1	Fathead minnow

TABLE 12 (Continued): TOTAL NUMBER, TOTAL WEIGHT, AND NUMBER OF SPECIES FOR FISH COLLECTED BY STATION FROM THE CHICAGO, CALUMET, AND DES PLAINES RIVER SYSTEMS DURING 2007

Station No.	Location	Waterway	Sample Gear	Total Number of Fish	Total Weight (grams)	Number of Species		Most Abundant Species
						Total	Game	
18	Devon Avenue[1]	Salt Creek	BP/Seine	20	395	4	3	Green sunfish
64	Lake Street[1]	West Branch DuPage River	BP/Seine	59	2,506	7	4	Green sunfish
13	Lake-Cook Road[1]	Des Plaines River	BP/Seine	146	901	6	3	Green sunfish
22	Ogden Avenue[1]	Des Plaines River	BP/Seine	71	1,233	13	7	Bluegill, Moquitofish
91	Material Service Road[1]	Des Plaines River	BP/Seine	38	6,822	10	4	Green sunfish
		TOTAL		4,179	1,179 kg	46	21	

[1]Annual sampling station.

TABLE 13: INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2007

Station No.	Location	Waterway	Sample Gear	IBI[1] Score	IBI[1] Category
96	Albany Avenue	North Branch Chicago River	BP	24	Fair
96	Albany Avenue	North Branch Chicago River	Seine	ND	ND
36	Touhy Avenue	North Shore Channel	Large EF Boat	34	Fair
46	Grand Avenue	North Branch Chicago River	Large EF Boat	32	Fair
75	Cicero Avenue	Chicago Sanitary and Ship Canal	Large EF Boat	30	Fair
41	Harlem Avenue	Chicago Sanitary and Ship Canal	Large EF Boat	28	Fair
92	Lockport	Chicago Sanitary and Ship Canal	Large EF Boat	22	Fair
49	Ewing Avenue	Calumet River	Large EF Boat	30	Fair
55	130th Street	Calumet River	Large EF Boat	44	Good
50	Burnham Avenue	Wolf Lake Outlet	BP	34	Fair
50	Burnham Avenue	Wolf Lake Outlet	Seine	ND	ND
86	Burnham Avenue	Grand Calumet River	Small EF Boat	26	Fair
52	Wentworth Avenue	Little Calumet River	Small EF Boat	20	Poor
56	Indiana Avenue	Little Calumet River	Large EF Boat	34	Fair
76	Halsted Street	Little Calumet River	Large EF Boat	38	Fair
57	Ashland Avenue	Little Calumet River	Small EF Boat	34	Fair
58	Ashland Avenue	Calumet-Sag Channel	Large EF Boat	26	Fair
59	Cicero Avenue	Calumet-Sag Channel	Large EF Boat	32	Fair
43	Route 83	Calumet-Sag Channel	Large EF Boat	32	Fair
54	Joe Orr Road	Thorn Creek	BP	22	Fair
54	Joe Orr Road	Thorn Creek	Seine	26	Fair
97	170th Street	Thorn Creek	Small EF Boat	26	Fair
78	Wille Road	Higgins Creek	BP	20	Poor
78	Wille Road	Higgins Creek	Seine	28	Fair
18	Devon Avenue	Salt Creek	BP	20	Poor
18	Devon Avenue	Salt Creek	Seine	ND	ND

TABLE 13 (Continued): INDEX OF BIOTIC INTEGRITY SCORE AND CATEGORY BY STATION DURING 2007

Station No.	Location	Waterway	Sample Gear	IBI[1] Score	IBI[1] Category
64	Lake Street	West Branch DuPage River	BP	28	Fair
64	Lake Street	West Branch DuPage River	Seine	32	Fair
13	Lake-Cook Road	Des Plaines River	BP	22	Fair
13	Lake-Cook Road	Des Plaines River	Seine	32	Fair
22	Ogden Avenue	Des Plaines River	BP	28	Fair
22	Ogden Avenue	Des Plaines River	Seine	ND	ND
91	Material Services Road	Des Plaines River	BP	24	Fair
91	Material Services Road	Des Plaines River	Seine	24	Fair

[1]IBI = Index of Biotic Integrity.
ND = No fish were caught in the seine or conditions were unfavorable for seining.

TABLE 14: BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2007

Taxa	Hester Dendy	Petite Ponar
COELENTERATA (Hydroids)		
Hydra	X	X
PLATYHELMINTHES (Flat worms)		
Turbellaria	X	X
NEMERTEA (Ribbon Worms)	X	
ECTOPROCTA (Bryozoans)		
Plumatella	X	X
ANNELLIDA		
Oligochaeta (Aquatic Worms)	X	X
Hirudinea (Leeches)		
Helobdella[1]	X[1]	
Helobdella papillata	X	X
Helobdella stagnalis	X	X
Helobdella triserialis	X	X
Placobdella	X	X
Erpobdella punctata punctata	X	X
Mooreobdella microstoma	X	X
CRUSTACEA		
Ostracoda (Seed Shrimp)	X	X
Isopoda (Sow Bugs)		
Caecidotea	X	X
Amphipoda (Side Swimmers)		
Hyalella azteca	X	X
Gammarus	X	X
Crangonyx	X	X
Echinogammarus ischusa	X	
DECAPODA (Crayfish)		
Orconectes rusticus	X	
Procambarus	X	
ARACHNOIDEA		
Hydracarina (Water Mites)	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2007

Taxa			Hester Dendy	Petite Ponar
INSECTA				
	Ephemeroptera (Mayflies)			
		Baetis intercalaris	X	X
		Centroptilum	X	
		Maccaffertium integrum	X	
		Stenacron	X	
		Tricorythodes	X	X
		Caenis		X
		Anthopotamus myops grp.	X	
		Hexagenia	X	X
	Odonata (Damselflies and Dragonflies)			
		Argia	X	X
		Enallagma	X	
		Libellulidae		X
	Hemiptera (True Bugs)			
		Rheumatobates	X	
		Corixidae	X	X
	Megaloptera (Dobsonflies and Alderflies)			
		Sialis	X	
	Trichoptera (Caddisflies)			
		Cyrnellus fraternus	X	X
		Ceratopsyche morosa	X	
		Cheumatopsyche	X	X
		Hydropsyche	X	
		Hydropsyche betteni	X	
		Hydropsyche bidens	X	
		Hydropsyche orris	X	
		Hydropsyche simulans	X	
		Hydroptila	X	X
		Ceraclea maculata		X
		Nectopsyche	X	X
	Coleoptera (Beetles)			
		Laccophilus maculosus		X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2007

Taxa	Hester Dendy	Petite Ponar
Coleoptera (Beetles) (Continued)		
Peltodytes	X	
Dubiraphia	X	X
Macronychus glabratus	X	
Stenelmis	X	X
Diptera (True Flies)		
Ceratopogonidae	X	
Hemerodromia	X	
Simulium	X	X
Chironimidae (Midges)		
Coelotanypus		X
Procladius	X	X
Psectrotanypus		X
Tanypus	X	X
Ablabesmyia janta	X	X
Ablabesmyia mallochi	X	X
Thienemannimyia grp	X	X
Brillia	X	
Corynoneura	X	
Cricotopus bicinctus grp.	X	X
Cricotopus sylvestris grp.	X	X
Cricotopus tremulus grp.	X	X
Hydrobaenus		X
Nanocladius[1]	X	
Nanocladius distinctus	X	X
Nanocladius minimus	X	
Rheocricotopus robacki	X	X
Thienemanniella similis	X	X
Thienemanniella xena	X	X
Chironomus	X	X
Cladopelma	X	X
Cryptochironomus	X	X
Cryptotendipes	X	

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2007

Taxa	Hester Dendy	Petite Ponar
Chironimidae (Midges) (Continued)		
Dicrotendipes fumidus	X	X
Dicrotendipes lucifer	X	X
Dicrotendipes modestus	X	X
Dicrotendipes neomodestus	X	X
Dicrotendipes simpsoni	X	X
Endochironomus nigricans	X	
Glyptotendipes	X	X
Harnischia	X	X
Microchironomus		X
Microtendipes	X	X
Parachironomus	X	X
Paratendipes	X	X
Phaenopsectra[1]	X	
Phaenopsectra flavipes	X	
Polypedilum fallax grp.	X	
Polypedilum flavum	X	X
Polypedilum halterale grp.		X
Polypedilum illinoense	X	X
Polypedilum scalaenum grp.	X	X
Pseudochironomus		X
Stenochironomus	X	
Stictochironomus	X	
Tribelos fuscicorne	X	
Xenochironomus xenolabis	X	
Cladotanytarsus mancus grp	X	X
Paratanytarsus	X	X
Rheotanytarsus	X	
Tanytarsus	X	X
Tanytarsus glabrescens grp.	X	X
Tanytarsus sepp.	X	X

TABLE 14 (Continued): BENTHIC INVERTEBRATE TAXA COLLECTED BY PONAR AND HESTER DENDY SAMPLERS DURING 2007

Taxa		Hester Dendy	Petite Ponar
GASTROPODA (Snails)			
	Ferrissia	X	X
	Bithynia tentaculata	X	
	Amnicola	X	X
	Physa	X	X
	Helisoma	X	X
	Menetus	X	X
	Valvata		X
PELECYPODA (Mussels and Clams)			
	Corbicula fluminea	X	X
	Dreissena bugensis	X	X
	Dreissena polymorpha	X	X
	Eupera cubensis	X	X
	Musculium		X
	Pisidium		X
TOTAL SPECIES RICHNESS BY SAMPLE TYPE		105	83
EPT[2] SPECIES RICHNESS BY SAMPLE TYPE		17	9
TOTAL SPECIES RICHNESS FOR 2007		117	
EPT[2] SPECIES RICHNESS FOR 2007		19	

[1]Not counted as a discreet taxon.
[2]Ephemeroptera, Plecoptera, and Tricoptera are considered relatively sensitive taxa.

Benthic samples were collected from three stations in the CSSC. Total Hester Dendy taxa richness ranged from 12 at Cicero Avenue, 16 at Harlem Avenue, to 22 at Lockport. The number of EPT taxa for these samples were zero, one, and two, respectively. The Harlem Avenue ponar sample had one EPT taxon, and the other two sites had none. Chironomid head capsule deformities were observed in the Hester Dendy samples at Harlem Avenue and Lockport (0.5 percent and 1.5 percent of total midges, respectively) and the ponar sample at Lockport (7.4 percent).

Calumet River System. In 2007, biological sampling focused on the Calumet River System. This watershed includes the Calumet River, Wolf Lake Drainage Channel, GCR, Thorn Creek, LCR, and the CSC. Benthic invertebrate samples were collected at 13 stations therein. Tolerant invertebrate taxa dominated Hester Dendy and Ponar samples throughout the system. Oligochaeta was the dominant taxon in 92 percent of petite ponar samples. Total taxa richness varied considerably within this set of stations, with 170th street on Thorn Creek having the highest among the Hester Dendy samples (38 taxa) and Wentworth Avenue on the LCR having the largest amount within the petite ponar samples (23 taxa). Wolf Lake Drainage Channel had the lowest taxa richness for both Hester Dendy and Ponar samples for the Calumet River system (five and four, respectively). Representation of EPT taxa was low in this system. The highest EPT taxa value was four at Ashland Avenue on the LCR and 170th Street on Thorn Creek. Two of the 13 sites (Burnham Avenue on the Grand Calumet River and Wentworth Avenue on the Little Calumet River) had no EPT taxa represented for ponar or Hester Dendy samples. Chironomid head capsule deformities were observed in five of the six waterways sampled.

Des Plaines River System. Benthic invertebrate samples were collected from six AWQM stations on the Des Plaines River, West Branch DuPage River, Salt Creek, and Higgins Creek during 2007. The Hester Dendy samples at Ogden Avenue were lost to heavy flow or vandalism. There was substantial spatial variability throughout the watershed as well as within individual waterways. The highest total and EPT taxa richness in the Des Plaines River System occurred at the furthest upstream station on the Des Plaines River (Lake Cook Road) and decreased in the downstream direction. Combined, the Hester Dendy and ponar samples from the three Des Plaines River stations yielded 69 total taxa and 16 EPT taxa , the highest values observed among all the waterways samples in 2007. Of the 6 samples collected in this system, three demonstrated Chironomid deformities.

Sediment Chemistry

Sediment quality can considerably impact overlying water quality, benthic community structure, food chain dynamics, and other elements of freshwater ecosystems. Since sediment acts as a reservoir for persistent or bioaccumulative contaminants, sediment data reflects a long-term record of quality. It should be noted that grab sample sediment data can be difficult to interpret, as samples may reflect a "hot spot," or an area with an unusually high concentration of a specific pollutant. This can be caused by an accidental release or spill of a contaminant that sinks down through the water column and resides in the sediment. Similarly, sediment chemistry can vary widely between side and center samples from the same station.

General Chemistry. The concentrations of the eight general chemistry constituents measured in sediment from the side and center at each of the 13 sample stations are presented in Table 15. Sediment samples from the center channel at Burnham Avenue (GCR) exhibited the highest concentrations of TKN and TP (6,034 and 7,062 mg/kg, respectively). The sample from the side channel at Burnham Avenue (GCR) also had the highest concentrations of total ammonia nitrogen and total phenols (168 and 1.0 mg/kg, respectively). The sediment taken from the side channel at Burnham Avenue near the Wolf lake outlet contained the highest concentration of total cyanide (17.3 mg/kg).

Trace Metals. The 11 trace metal concentrations measured for the side and center samples at each of the 13 sample stations are presented in Table 16. Sediment samples taken from the center channel at Burnham Avenue (GCR) exhibited elevated levels of most trace metals measured. Burnham Avenue (GCR) had the highest concentrations of cadmium, chromium, copper, lead, mercury, silver and zinc in samples taken from center channel (11, 149, 370, 467, 1.899, 3, and 1,677 mg/kg, respectively). Other notable concentrations of trace metals were 45,305 mg/kg of iron at Ewing Avenue on the Calumet River and 3,178 mg/kg of manganese at Halsted Street (LCR).

Acid Volatile Sulfide, Simultaneously Extracted Metals, Total Organic Carbon, and Particle Size. Table 17 presents the AVS, SEM, TOC, and particle size data for thirteen sampled sites. The ratio of SEM to AVS can affect the bioavailability of divalent metals for which sulfide ions have a high affinity. For instance, if AVS is greater than SEM concentration, it is less likely that metals are available for biological uptake, thus rendering them less toxic to organisms. The two sites with the largest SEM/AVS ratios were the side channel samples at Cicero Avenue on the CSC (2.1) and Indiana Avenue on the LCR (1.9). As a measure of oxidizable organic material, the TOC concentration in sediment affects nonionic organic chemicals, as well as metal bioavailability. The four samples with the highest concentration of TOC were as follows: the center channel sample at Burnham Avenue on the GCR (53,000 mg/kg), center channel sample at Cicero Avenue on the CSC (46,000 mg/kg), center and side channel samples at Route 83 on the CSC (37,000 and 36,000, respectively). Particle size is a useful analysis since it influences chemical reactions that take place in the sediment and the type of invertebrate taxa able to colonize the substrate (USEPA, 2001).

Organic Priority Pollutants. There were 111 total OPPs analyzed for each sample collected (listed in Table 3). Tables 18 - 21 present the concentrations of 26 OPPs that were detected in sediment samples during 2007. The sample with the highest number of OPPs detected in 2007 was from the center at Burnham Avenue (GCR) with 18. Sixteen to 17 OPPs were detected in samples from the CSC at Ashland Avenue (side), Cicero Avenue (side and center), and Route 83 (side).

TABLE 15: CHEMICAL CHARACTERISTICS OF SEDIMENT COLLECTED FROM THE CALUMET RIVER SYSTEM DURING 2007

WATERWAY	SITE#	LOCATION		Constituents (Expressed on a dry weight basis) TS (%)	TVS (%)	NH_3-N (mg/kg)	$NO_2 + NO_3$ (mg/kg)	TKN (mg/kg)	TP (mg/kg)	Phenols (mg/kg)	TCN (mg/kg)
Little Calumet River	52	Wentworth Ave.	Side	38	11	87	19	3,272	2,355	0.2	0.3
Little Calumet River	52	Wentworth Ave.	Center	27	12	20	15	2,144	1,174	0.3	0.4
Thorn Creek	54	Joe Orr Rd.	Side	79	2	8	4	241	223	0.1	0.1
Thorn Creek	54	Joe Orr Rd.	Center	83	2	2	6	219	149	0.1	<0.1
Thorn Creek	97	170th St.	Side	51	6	12	7	1,104	1,381	0.4	0.2
Thorn Creek	97	170th St.	Center	74	3	4	3	568	546	0.2	0.1
Little Calumet River	57	Ashland Ave.	Side	38	10	22	11	2,476	1,570	0.3	0.2
Calumet River	49	Ewing Ave.	Side	63	4	29	7	809	286	0.1	0.5
Calumet River	49	Ewing Ave.	Center	65	5	10	6	746	266	0.2	0.8
Wolf Lake	50	Burnham Ave.	Side	60	4	14	3	372	59	0.3	17.3
Wolf Lake	50	Burnham Ave.	Center	71	1	19	2	289	47	0.3	0.3
Calumet River	55	130 St.	Side	69	2	4	2	333	108	0.2	0.1
Calumet River	55	130 St.	Center	56	4	21	5	891	426	0.1	0.5
Grand Calumet River	86	Burnham Ave.	Side	28	15	168	6	4,658	4,503	1.0	1.7
Grand Calumet River	86	Burnham Ave.	Center	27	19	63	16	6,034	7,062	0.2	3.6
Little Calumet River	56	Indiana Ave.	Side	42	6	53	8	1,876	1,722	0.4	0.4
Little Calumet River	56	Indiana Ave.	Center	42	6	52	10	2,026	1,750	0.4	0.6
Little Calumet River	76	Halsted St.	Side	81	3	1	2	168	621	0.2	<0.1
Little Calumet River	76	Halsted St.	Center	59	5	31	6	1,095	493	0.6	11.6
Calumet-Sag Channel	58	Ashland Ave.	Side	48	8	53	9	2,406	2,647	0.1	2.3
Calumet-Sag Channel	58	Ashland Ave.	Center	62	9	21	4	1,071	1,363	0.1	2.5
Calumet-Sag Channel	59	Cicero Ave.	Side	ND	ND	ND	ND	ND	ND	ND	ND
Calumet-Sag Channel	59	Cicero Ave.	Center	ND	ND	ND	ND	ND	ND	ND	ND
Calumet-Sag Channel	43	Route 83	Side	49	8	15	1	2,312	4,579	0.2	4.7
Calumet-Sag Channel	43	Route 83	Center	50	8	2	0	2,339	4,518	0.2	2.8

ND = No Data.

TABLE 16: TRACE METALS IN SEDIMENT COLLECTED FROM THE CALUMET RIVER SYSTEM DURING 2007

WATERWAY	SITE NO.	LOCATION	As	Cd	Cr	Cu	Fe	Pb	Mn	Hg	Ni	Ag	Zn
			(mg/kg dry weight)										
Little Calumet River	52	Wentworth Ave. Side	< 25	< 2	41	61	24,667	53	442	0.223	25	< 1	310
Little Calumet River	52	Wentworth Ave. Center	< 25	< 2	64	47	21,830	63	357	0.177	31	< 1	262
Thorn Creek	54	Joe Orr Rd. Side	< 25	< 2	21	16	13,991	19	213	0.035	14	< 1	54
Thorn Creek	54	Joe Orr Rd. Center	< 25	< 2	18	32	11,627	18	316	0.026	13	< 1	140
Thorn Creek	97	170^{th} St. Side	< 25	< 2	29	29	10,757	56	286	0.190	15	< 1	131
Thorn Creek	97	170^{th} St. Center	< 25	< 2	19	17	10,024	27	324	0.596	13	< 1	80
Little Calumet River	57	Ashland Ave. Side	< 25	< 2	22	38	16,172	58	432	0.243	20	< 1	248
Calumet River	49	Ewing Ave. Side	< 25	< 2	24	37	33,840	84	767	0.100	23	< 1	230
Calumet River	49	Ewing Ave. Center	< 25	< 2	40	49	45,305	123	1,123	0.148	25	< 1	254
Wolf Lake	50	Burnham Ave. Side	< 25	< 2	6	5	4,351	15	468	0.012	4	< 1	42
Wolf Lake	50	Burnham Ave. Center	< 25	< 2	5	4	4,276	15	310	0.008	4	< 1	33
Calumet River	55	130 St. Side	< 25	< 2	13	9	9,802	66	477	0.023	7	< 1	115
Calumet River	55	130 St. Center	< 25	< 2	40	37	28,442	113	835	0.092	25	< 1	378
Grand Calumet River	86	Burnham Ave. Side	< 25	4	57	138	12,375	180	238	0.862	16	1	641
Grand Calumet River	86	Burnham Ave. Center	< 25	11	149	370	24,231	467	381	1.899	30	3	1,677
Little Calumet River	56	Indiana Ave. Side	< 25	< 2	42	84	24,522	334	632	0.450	24	< 1	311
Little Calumet River	56	Indiana Ave. Center	< 25	2	52	99	27,990	107	628	0.475	29	< 1	382
Little Calumet River	76	Halsted St. Side	< 25	< 2	121	21	37,614	70	3,178	< 0.006	13	< 1	384
Little Calumet River	76	Halsted St. Center	< 25	2	40	69	28,205	161	438	< 0.006	19	< 1	361
Calumet-Sag Channel	58	Ashland Ave. Side	< 25	< 2	30	58	19,014	250	407	0.175	18	< 1	290
Calumet-Sag Channel	58	Ashland Ave. Center	< 25	< 2	33	31	13,510	63	283	0.107	14	< 1	246
Calumet-Sag Channel	59	Cicero Ave. Side	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calumet-Sag Channel	59	Cicero Ave. Center	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calumet-Sag Channel	43	Route 83 Side	< 25	6	104	89	32,546	301	488	0.404	32	< 1	1,099
Calumet-Sag Channel	43	Route 83 Center	< 25	4	83	66	31,831	219	471	0.289	28	< 1	668

ND = No Data.

TABLE 17: ACID VOLATILE SULFIDE, SIMULTANEOUSLY EXTRACTED METALS, TOTAL ORGANIC CARBON, AND PARTICLE SIZE SEDIMENT DATA FROM THE CALUMET RIVER SYSTEM DURING 2007

WATERWAY	SITE NO.	LOCATION		AVS (µmoles/g)	SEM (µmoles/g)	SEM/AVS	TOC (mg/kg)	(Particle Size) GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)
Little Calumet River	52	Wentworth Ave.	Side	49.9	5.3	0.1	24,000	1.1	9.5	64.9	24.5
Little Calumet River	52	Wentworth Ave.	Center	37.4	4.4	0.1	18,000	4.3	26.2	61.0	8.5
Thorn Creek	54	Joe Orr Rd.	Side	1.1	1.7	1.5	6,400	10.1	83.8	3.2	2.9
Thorn Creek	54	Joe Orr Rd.	Center	ND	0.6	ND	5,200	32.7	65.4	0.8	1.2
Thorn Creek	97	170th St.	Side	5.0	2.3	0.5	15,000	0.6	66.8	26.0	6.6
Thorn Creek	97	170th St.	Center	2.1	1.3	0.6	6,700	11.9	83.8	3.2	1.0
Little Calumet River	57	Ashland Ave.	Side	34.3	4.4	0.1	25,000	1.0	47.5	42.8	8.7
Calumet River	49	Ewing Ave.	Side	2.6	3.6	1.4	21,000	0.7	61.2	21.9	16.1
Calumet River	49	Ewing Ave.	Center	5.3	3.6	0.7	27,000	20.0	70.2	4.6	5.2
Wolf Lake	50	Burnham Ave.	Side	7.2	0.6	0.1	3,900	0.3	97.1	2.1	0.6
Wolf Lake	50	Burnham Ave.	Center	4.7	0.6	0.1	4,700	0.2	96.7	1.4	1.7
Calumet River	55	130 St.	Side	9.0	1.6	0.2	5,700	6.2	87.4	4.4	2.0
Calumet River	55	130 St.	Center	5.9	5.7	1.0	20,000	5.0	58.3	18.2	18.4
Grand Calumet River	86	Burnham Ave.	Side	74.9	15.5	0.2	32,000	3.2	72.6	20.6	3.6
Grand Calumet River	86	Burnham Ave.	Center	56.1	22.7	0.4	53,000	0.9	62.0	29.2	7.9
Little Calumet River	56	Indiana Ave.	Side	2.8	5.3	1.9	28,000	5.7	46.4	26.3	21.6
Little Calumet River	56	Indiana Ave.	Center	8.3	8.0	1.0	27,000	1.9	22.2	45.1	30.7
Little Calumet River	76	Halsted St.	Side	3.5	3.3	0.9	28,000	21.6	76.7	1.1	0.6
Little Calumet River	76	Halsted St.	Center	23.1	5.6	0.2	16,000	0.5	90.9	5.3	3.3
Calumet-Sag Channel	58	Ashland Ave.	Side	13.6	5.0	0.4	2,400	4.7	48.8	34.0	12.5
Calumet-Sag Channel	58	Ashland Ave.	Center	7.5	4.2	0.6	17,000	10.2	80.8	5.7	3.3
Calumet-Sag Channel	59	Cicero Ave.	Side	14.7	30.3	2.1	26,000	0.9	54.2	31.1	13.8
Calumet-Sag Channel	59	Cicero Ave.	Center	63.2	15.1	0.2	46,000	5.9	40.9	36.9	16.3
Calumet-Sag Channel	43	Route 83	Side	42.1	16.3	0.4	36,000	0.0	7.2	48.5	44.3
Calumet-Sag Channel	43	Route 83	Center	24.1	10.4	0.4	37,000	0.0	12.3	43.2	44.5

ND=No Data.

TABLE 18: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE LITTLE CALUMET RIVER DURING 2007

Compound	Little Calumet River (μg/kg dry weight)					
	52 side	52 center	57 side	56 side	76 side	76 center
Chlorobenzene	ND	ND	ND	ND	ND	ND
Methylene chloride	287	42.9	57.6	ND	303	ND
Toluene	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	1,060	ND	ND	ND	435
Benzo(a)anthracene	1,570	2,700	2,340	813	ND	1,580
Benzo(a)pyrene	2,090	2,850	2,580	901	439	1,640
3,4-Benzofluoranthene	3,140	3,520	3,730	1,730	861	2,710
Benzo(ghi)perylene	1,500	1,500	1,630	565	291	682
Benzo(k)fluoranthene	2,500	3,360	3,380	775	285	978
Bis(2-ethylhexyl) phthalate	ND	ND	ND	ND	ND	5,340
Chrysene	2,720	3,500	3,370	1,340	423	1,920
Dibenzo(a,h)anthracene	481	ND	596	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Fluoranthene	5,810	10,000	7,640	1,790	837	3,220
Fluorene	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	1,680	1,850	1,810	446	ND	687
Phenanthrene	1,660	5,650	2,170	949	392	1,560
Pyrene	4,470	7,550	5,970	2,020	709	2,870
4,4'-DDT	ND	18.4	46.6	ND	ND	ND
4,4'-DDE	12.9	28.6	13.8	ND	ND	ND
4,4'-DDD	ND	21.8	90.5	ND	ND	ND
PCB-1242	ND	ND	ND	ND	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND

ND = Not Detectable.

TABLE 19: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THORN CREEK AND WOLF LAKE DURING 2007

Compound	Thorn Creek (µg/kg dry weight)				Wolf Lake (µg/kg dry weight)
	54 side	54 center	97 side	97 center	50 center
Chlorobenzene	ND	ND	ND	ND	ND
Methylene chloride	ND	17.5	15.2	ND	28.0
Toluene	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND
Anthracene	ND	414	ND	ND	ND
Benzo(a)anthracene	408	1,350	505	324	ND
Benzo(a)pyrene	411	1,420	588	319	ND
3,4-Benzofluoranthene	488	1,560	771	382	ND
Benzo(ghi)perylene	ND	509	512	ND	ND
Benzo(k)fluoranthene	436	1,340	729	317	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND
Chrysene	500	1,600	736	465	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND
Fluoranthene	1,260	4,420	1,680	1,120	474
Fluorene	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	626	553	ND	ND
Phenanthrene	415	2,470	595	451	ND
Pyrene	1,020	3,610	1,340	1,060	368
4,4'-DDT	ND	ND	ND	11.2	ND
4,4'-DDE	ND	ND	9.0	ND	ND
4,4'-DDD	ND	ND	29.3	23.1	ND
PCB-1242	ND	ND	ND	768	ND
PCB-1248	ND	897	ND	127	ND

ND = Not Detectable.

TABLE 20: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE CALUMET RIVER AND GRAND CALUMET RIVER DURING 2007

Compound	Calumet River (µg/kg dry weight)				Grand Calumet River (µg/kg dry weight)	
	49 side	49 center	55 side	55center	86 side	86 center
Chlorobenzene	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	26.7	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND	ND	2,190
Acenaphthylene	ND	ND	ND	ND	1,870	2,530
Anthracene	ND	ND	ND	ND	885	4,940
Benzo(a)anthracene	531	512	ND	1,260	4,460	18,500
Benzo(a)pyrene	520	446	ND	1,380	4,910	19,300
3,4-Benzofluoranthene	464	333	380	2,260	3,200	19,200
Benzo(ghi)perylene	ND	ND	ND	661	1,570	7,600
Benzo(k)fluoranthene	476	304	ND	773	3,550	14,600
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	5,340	11,500
Chrysene	630	601	ND	1,620	4,990	20,400
Dibenzo(a,h)anthracene	ND	ND	ND	ND	480	2,180
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
Fluoranthene	1,090	959	482	3,710	ND	28,800
Fluorene	ND	ND	ND	ND	ND	2,350
Indeno(1,2,3-cd)pyrene	ND	ND	ND	677	1,640	7,850
Phenanthrene	913	894	ND	3,500	2,530	22,900
Pyrene	1,190	1,100	405	3,320	7,230	27,800
4,4'-DDT	ND	ND	ND	ND	ND	21.8
4,4'-DDE	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	17.4	26.6
PCB-1242	ND	ND	ND	1,160	ND	ND
PCB-1248	ND	ND	ND	ND	ND	ND

ND = Not Detectable.

TABLE 21: ORGANIC PRIORITY POLLUTANTS DETECTED IN SEDIMENT COLLECTED FROM THE CALUMET-SAG CHANNEL DURING 2007

Compound	Calumet-Sag Channel (µg/kg dry weight)					
	58 side	58 center	59 side	59 center	43 side	43 center
Chlorobenzene	ND	ND	86.0	59.2	89.4	ND
Methylene chloride	25.9	ND	ND	ND	ND	ND
Toluene	67.1	ND	ND	ND	ND	ND
Acenaphthene	1,670	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	2,440	ND	1,000	827	ND	ND
Benzo(a)anthracene	7,290	1,060	2,780	2,210	ND	1,070
Benzo(a)pyrene	7,520	1,060	2,740	1,870	628	1,450
3,4-Benzofluoranthene	12,000	2,100	4,830	3,080	759	2,130
Benzo(ghi)perylene	2,500	518	1,200	751	670	1,210
Benzo(k)fluoranthene	4,900	799	1,600	1,020	726	1,740
Bis(2-ethylhexyl)phthalate	7,330	ND	13,200	8,050	9,020	8,280
Chrysene	8,890	1,510	3,830	2,720	864	1,650
Dibenzo(a,h)anthracene	ND	ND	ND	ND	443	573
1,4-Dichlorobenzene	ND	ND	214	132	455	ND
Di-n-butyl phthalate	ND	ND	ND	ND	1,250	ND
Fluoranthene	21,700	2,920	5,740	4,600	1,260	2,880
Fluorene	1,690	ND	1,550	804	ND	ND
Indeno(1,2,3-cd)pyrene	3,520	515	1,080	782	642	1,220
Phenanthrene	19,200	1,090	2,920	1,600	663	717
Pyrene	16,800	2,530	5,790	5,040	1,720	2,690
4,4'-DDT	ND	ND	ND	ND	ND	ND
4,4'-DDE	17.0	ND	76.6	15.5	114	ND
4,4'-DDD	ND	ND	ND	20.4	ND	ND
PCB-1242	ND	ND	ND	ND	7,390	ND
PCB-1248	ND	ND	ND	ND	ND	ND

ND = Not Detectable.

Sediment Toxicity

The toxicity data resulting from the *Chironomus tentans* ten-day toxicity tests for each sediment sample collected are presented in Table 22. The table includes Chironomus survival compared to control sediment. The control sediment was collected from West Bearskin Lake. If there was a significant difference in Chironomus survival compared to the control sediment, the sediments collected were unsuitable for Chironomus survival. If there was a significant difference in Chironomus dried weight and or Chironomus ash-free dried weight compared to the West Bearskin Lake sediment, the sediments collected were unsuitable for optimal Chironomus growth.

The majority of samples (64 percent) analyzed for *Chironomus* survival exhibited results which were not significantly different from the negative control (West Bearskin Lake). The center sample from Halsted Street was the one of seven sites on the Little Calumet River that exhibited a decreased level of survival (30 percent). One sample on the Calumet River also exhibited a decreased level of survival. This was the center sample at Ewing Avenue which exhibited a 58 percent *Chironomus* survival. Other sites with a significantly lower survival than the control were as follows: side and center samples at Burnham Avenue on the GCR (58 percent and 14 percent, respectively), the center sample at Ashland Avenue on the CSC (73 percent survival), side and center samples at Cicero Avenue on the CSC (7.5 percent and 2.5 percent, respectively), side and center samples at Route 83 on the CSC (43 percent and 33 percent, respectively). Sites on the Wolf Lake Drain and Thorn Creek showed no impairment for *Chironomus* survival.

Analysis of the ash-free dried weight of the *Chironomus* after the ten-day test resulted in most of the samples (54 percent) showing no significant difference from the West Bearskin Lake control results. Sites which were significantly different than the control included the center sample at Ewing Avenue on the Calumet River, the center sample at 130th Street on the Calumet River, the center sample at Burnham Avenue on the GCR, the side and center samples at Halsted Street on the LCR, the side and center samples at Ashland Avenue on the CSC, the side and center samples at Cicero Avenue on the CSC, and the side and center samples at Route 83 on the CSC. Sites on the Wolf Lake Drain and Thorn Creek exhibited no detrimental effect on *Chironomus* growth.

The majority of the samples impaired for Chironomus survival and Chironomus growth were from the center of the channel. Twice as many center samples (six) were impaired for survival as there were for side samples (three). There were nearly twice as many center samples (seven) impaired for Chironomus growth as there were side samples (four).

TABLE 22: TOXICITY DATA FOR SEDIMENT COLLECTED FROM THE CALUMET RIVER SYSTEM DURING 2007

WATERWAY	SITE NO.	LOCATION		(*Chironomus tentans* 10-Day Test Data) Survival (%)	Ash-free Dried Weight (mg/org)
Little Calumet River	52	Wentworth Ave.	Side	83	1.47
Little Calumet River	52	Wentworth Ave.	Center	81	1.41
Thorn Creek	54	Joe Orr Rd.	Side	93	1.06
Thorn Creek	54	Joe Orr Rd.	Center	79	1.11
Thorn Creek	97	170^{th} St.	Side	85	1.10
Thorn Creek	97	170^{th} St.	Center	90	1.22
Little Calumet River	57	Ashland Ave.	Side	94	1.20
Calumet River	49	Ewing Ave.	Side	91	1.05
Calumet River	49	Ewing Ave.	Center	58[a]	0.27[a]
Wolf Lake	50	Burnham Ave.	Side	90	1.03
Wolf Lake	50	Burnham Ave.	Center	79	1.53
Calumet River	55	130 St.	Side	84	1.41
Calumet River	55	130 St.	Center	74	0.80[a]
Grand Calumet River	86	Burnham Ave.	Side	58[a]	0.88
Grand Calumet River	86	Burnham Ave.	Center	14[a]	0.22[a]
Little Calumet River	56	Indiana Ave.	Side	94	1.07
Little Calumet River	56	Indiana Ave.	Center	96	1.08
Little Calumet River	76	Halsted St.	Side	100	0.79[a]
Little Calumet River	76	Halsted St.	Center	30[a]	0.17[a]
Calumet-Sag Channel	58	Ashland Ave.	Side	90	0.46[a]
Calumet-Sag Channel	58	Ashland Ave.	Center	73[a]	0.45[a]
Calumet-Sag Channel	59	Cicero Ave.	Side	7.5[a]	0.17[a]
Calumet-Sag Channel	59	Cicero Ave.	Center	2.5[a]	0.21[a]
Calumet-Sag Channel	43	Route 83	Side	43[a]	0.17[a]
Calumet-Sag Channel	43	Route 83	Center	33[a]	0.20[a]

[a]Significantly different than the West Bearskin Lake control results.

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APPENDIX AI

FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION

TABLE AI-1: FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE NORTH SHORE CHANNEL, NORTH BRANCH CHICAGO RIVER (DEEP DRAFT), CHICAGO SANITARY AND SHIP CANAL AND CALUMET-SAG CHANNEL DURING 2007

Fish Species or Hybrid (x)	North Shore Channel	North Branch Chicago River	Chicago Sanitary and Ship Canal			Cal-Sag Channel		
	Station #36 Touhy Avenue	Station # 46 Grand Avenue	Station #75 Cicero Avenue	Station #41 Harlem Avenue	Station #92 Lockport (16th Street)	Station #58 Ashland Avenue	Station #59 Cicero Avenue	Station #43 Route 83
Alewife	0	2	0	0	0	0	0	0
Gizzard shad	249	56	63	52	44	61	230	202
Goldfish	0	1	0	1	0	3	0	0
Common carp	16	11	11	45	3	44	20	5
Golden shiner	45	5	3	9	1	2	0	0
Sand shiner	0	0	0	0	0	0	0	1
Spotfin shiner	16	9	14	3	0	0	0	0
Bluntnose minnow	3	3	43	22	0	1	9	21
Fathead minnow	0	0	0	0	0	0	1	0
Emerald shiner	0	9	0	0	0	1	0	17
White sucker	1	0	0	0	0	0	0	0
Channel catfish	1	0	4	0	0	0	0	0
Yellow bullhead	1	0	8	12	0	4	3	1
Mosquitofish	0	0	1	6	0	0	0	1
White perch	0	3	0	1	0	0	1	0
Yellow bass	0	0	1	0	0	0	0	0
Black crappie	1	0	0	0	0	0	0	0
Rock bass	2	0	0	0	0	0	0	0
Largemouth bass	7	4	4	0	2	5	19	0
Smallmouth bass	0	0	0	0	0	0	1	0
Green sunfish	0	2	16	11	8	1	10	9
Bluegill	5	1	38	2	0	4	1	4

TABLE AI-1 (Continued): FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE NORTH SHORE CHANNEL, NORTH BRANCH CHICAGO RIVER (DEEP DRAFT), CHICAGO SANITARY AND SHIP CANAL, AND CALUMET-SAG CHANNEL DURING 2007

Fish Species or Hybrid (x)	North Shore Channel	North Branch Chicago River	Chicago Sanitary and Ship Canal			Cal-Sag Channel		
	Station #36 Touhy Avenue	Station # 46 Grand Avenue	Station #75 Cicero Avenue	Station #41 Harlem Avenue	Station #92 Lockport (16th Street)	Station #58 Ashland Avenue	Station #59 Cicero Avenue	Station #43 Route 83
Pumpkinseed	39	11	74	118	6	4	1	0
Walleye	1	0	0	0	0	0	0	0
Freshwater drum	0	0	0	0	0	1	1	0
Total Number of Fish	387	117	280	282	64	131	297	261

TABLE AI-2: FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE CALUMET RIVER, LITTLE CALUMET RIVER, GRAND CALUMET RIVER, AND THORN CREEK DURING 2007

	Calumet River		Little Calumet River				Grand Calumet River	Thorn Creek
Fish Species or Hybrid (x)	Station #49 Ewing Avenue	Station #55 130th Street	Station #52 Wentworth Avenue	Station #57 Ashland Avenue	Station #56 Indiana Avenue	Station #76 Halsted Street	Station #86 Bunrnham Avenue	Station #97 170th Street
Gizzard shad	1	147	5	89	77	10	6	0
Central mudminnow	0	0	0	0	0	2	0	0
Goldfish	0	0	2	0	1	21	2	0
Common carp	0	21	2	16	70	60	7	4
Carp x goldfish	0	0	2	0	0	0	0	0
Golden shiner	0	0	0	3	12	30	0	0
Spottail shiner	0	0	0	0	0	4	0	0
Spotfin shiner	0	7	0	1	6	1	0	0
Bluntnose minnow	0	131	0	7	26	1	0	0
Fathead minnow	0	0	0	1	10	0	0	0
Emerald shiner	1	127	1	4	43	1	0	0
Sand shiner	0	1	0	0	0	0	0	0
Smallmouth buffalo	0	1	0	0	0	0	0	0
Black buffalo	0	6	0	0	1	0	0	0
Quillback	0	1	0	0	0	0	0	0
White sucker	0	4	3	0	0	9	0	2
Black bullhead	0	0	0	0	0	1	0	0
Yellow bullhead	0	0	1	1	0	24	0	0
Brown bullhead	0	0	0	0	0	1	0	0
Channel catfish	0	0	0	0	1	0	0	1
Brook silverside	0	4	0	0	3	0	0	0
Yellow bass	0	0	0	0	14	0	0	0

TABLE AI-2 (Continued): FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE CALUMET RIVER, LITTLE CALUMET RIVER, GRAND CALUMET RIVER, AND THORN CREEK DURING 2007

Fish Species or Hybrid (x)	Calumet River		Little Calumet River				Grand Calumet River	Thorn Creek
	Station #49 Ewing Avenue	Station #55 130th Street	Station #52 Wentworth Avenue	Station #57 Ashland Avenue	Station #56 Indiana Avenue	Station #76 Halsted Street	Station #86 Burnham Avenue	Station #97 170th Street
White perch	0	1	0	0	30	0	0	0
Black crappie	0	1	0	1	0	3	0	0
White crappie	0	0	0	0	0	0	1	0
Rock bass	51	18	0	0	0	0	0	0
Green sunfish	0	4	0	5	0	1	0	4
Pumpkinseed	0	14	0	0	3	47	0	0
Orangespotted sunfish	0	0	0	1	0	0	0	0
Bluegill	0	44	0	1	5	43	2	1
Smallmouth bass	36	37	0	0	0	0	0	0
Largemouth bass	0	39	0	5	11	16	0	0
Yellow perch	0	2	0	0	0	4	0	0
Northern pike	0	0	0	0	0	1	0	0
Freshwater drum	0	0	0	0	8	0	0	0
Round goby	13	0	0	0	1	1	0	0
Total Number of Fish	102	610	16	135	322	281	18	12

TABLE AI-3: FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE NORTH BRANCH CHICAGO RIVER (WADEABLE), DES PLAINES RIVER SYSTEM, WOLF LAKE OUTLET, AND THORN CREEK DURING 2007

Fish Species or Hybrid (x)	North Branch Chicago River	Des Plaines River			Higgins Creek	Salt Creek	West Branch DuPage River	Wolf Lake Outlet	Thorn Creek
	Station #96 Albany Avenue	Station #13 Lake-Cook Road	Station #22 Ogden Avenue	Station #91 Material Service Road	Station #78 Wille Road	Station #18 Devon Avenue	Station #64 Lake Street	Station #50 Burnham Avenue	Station #54 Joe Orr Road
Grass pickerel	0	0	0	3	0	0	0	0	0
Central mudminnow	0	0	0	1	0	0	0	0	0
Common carp	1	0	0	4	0	0	2	0	1
Common carp x goldfish	0	0	0	0	1	0	0	0	0
Golden shiner	0	0	0	0	0	0	0	1	0
Creek chub	0	0	0	1	0	0	0	0	6
Spotfin shiner	0	56	0	0	0	0	0	0	0
Fathead minnow	0	0	2	0	454	0	0	0	0
Bluntnose minnow	0	0	8	4	2	4	1	0	0
Emerald shiner	0	0	0	0	0	0	0	0	0
Bigmouth shiner	0	0	0	0	0	0	0	0	0
Sand shiner	0	0	0	0	0	0	0	0	0
White sucker	7	0	0	0	5	0	1	0	1
Spotted sucker	0	0	0	0	0	0	0	0	0
Yellow bullhead	0	2	1	1	0	3	4	0	4
Tadpole madtom	0	1	0	0	0	0	0	0	0
Blackstripe topminnow	1	12	5	0	0	0	0	0	0
Mosquitofish	0	0	15	1	0	0	0	0	0
Black crappie	0	0	2	0	0	0	0	0	0
Rock bass	0	0	1	0	0	0	0	0	0

TABLE AI-3 (Continued): FISH SPECIES ABUNDANCE AT EACH SAMPLING STATION ON THE NORTH BRANCH CHICAGO RIVER (WADEABLE), DES PLAINES RIVER SYSTEM, WOLF LAKE OUTLET, AND THORN CREEK DURING 2007

Fish Species or Hybrid (x)	North Branch Chicago River	Des Plaines River			Higgins Creek	Salt Creek	West Branch DuPage River	Wolf Lake Outlet	Thorn Creek
	Station #96 Albany Avenue	Station #13 Lake-Cook Road	Station #22 Ogden Avenue	Station #91 Material Service Road	Station #78 Wille Road	Station #18 Devon Avenue	Station #64 Lake Street	Station #50 Burnham Avenue	Station #54 Joe Orr Road
Smallmouth bass	0	0	0	1	0	0	0	0	0
Largemouth bass	0	0	0	0	0	1	3	1	0
Green sunfish	5	74	12	17	1	12	47	3	30
Bluegill	0	1	15	0	0	0	1	1	0
Pumpkinseed	0	0	0	0	0	0	0	1	0
Orangespotted sunfish	0	0	2	0	0	0	0	0	0
Longear sunfish	0	0	0	0	0	0	0	2	0
Johnny darter	0	0	5	5	2	0	0	0	0
Blackside darter	0	0	1	0	0	0	0	0	0
Sauger	0	0	1	0	0	0	0	0	0
Green sunfish x Orange spotted sunfish	0	0	1	0	0	0	0	0	0
Total Number of Fish	14	146	71	38	465	20	59	9	42